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(54) **PERSONAL WATERCRAFT LIFT ASSEMBLY AND KIT**

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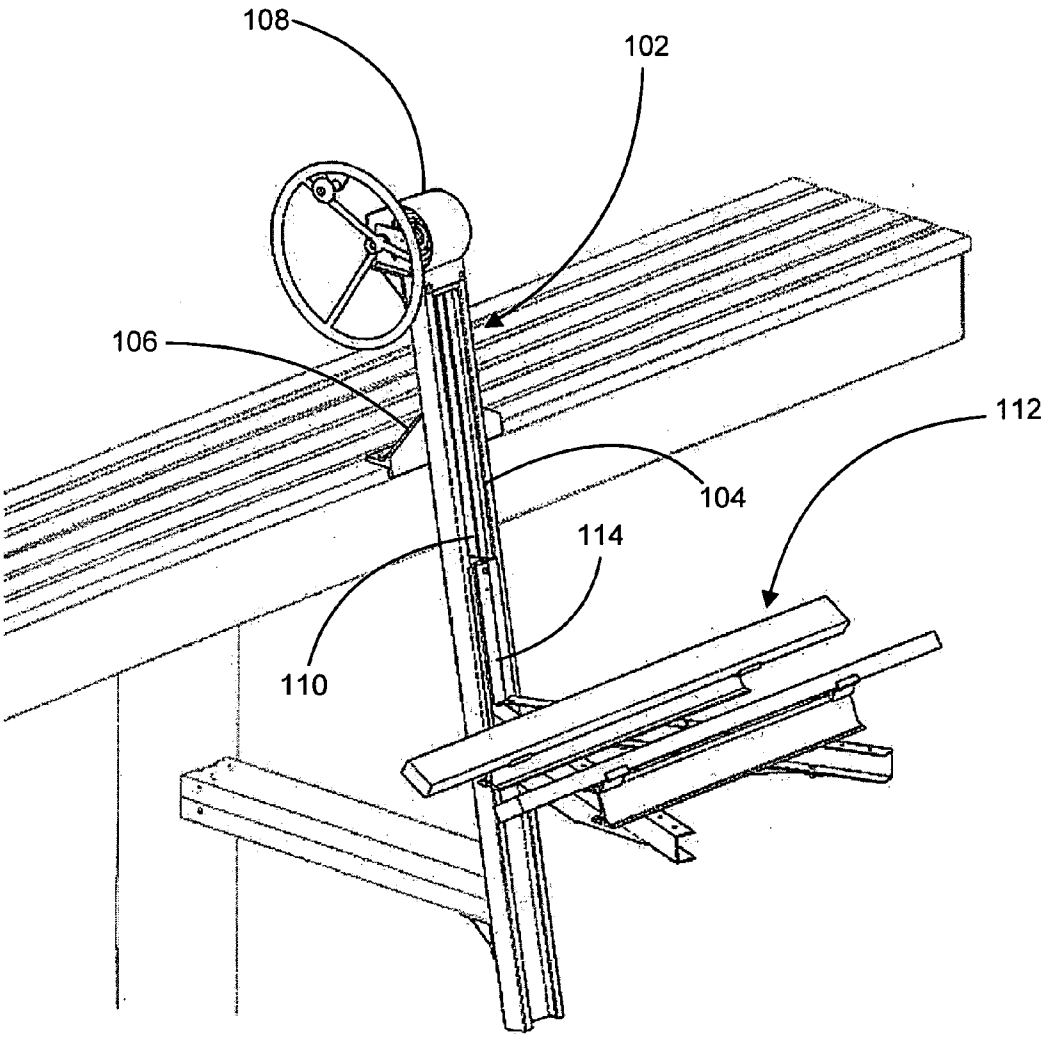
(57) **ABSTRACT**

A lift for low profile watercraft is substantially comprised of modular extruded components and minimal or no welded parts. The lift comprises a tower to be mounted to a dock. A winch is mounted on the tower for raising and lowering a carriage assembly engaged with the tower. The carriage assembly is comprised of a pair of forks in the form of a forked v-configuration, the intersection of the two arms retained by a carriage that engages and travels along a channeled track in the tower, transported by a winch-driven cable. Further comprising the carriage assembly and traversing the arms of the fork are two bunk assemblies, each bunk assembly comprising a pivot bar adjustably attached to both carriage forks. Connected to each bunk pivot bar and pivoting therewith is a bunk board, disposed upon which is a bunk for engaging the hull of the watercraft.



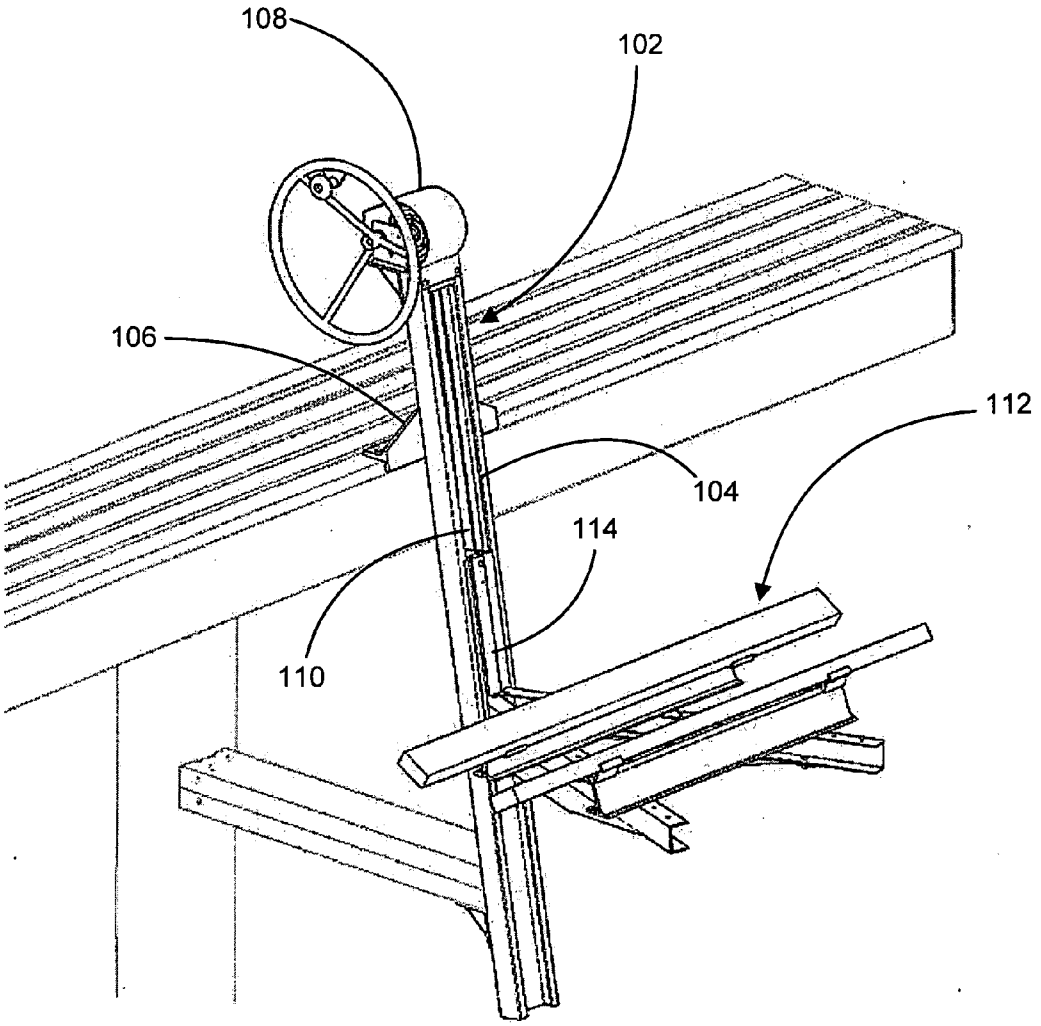


Fig. 1

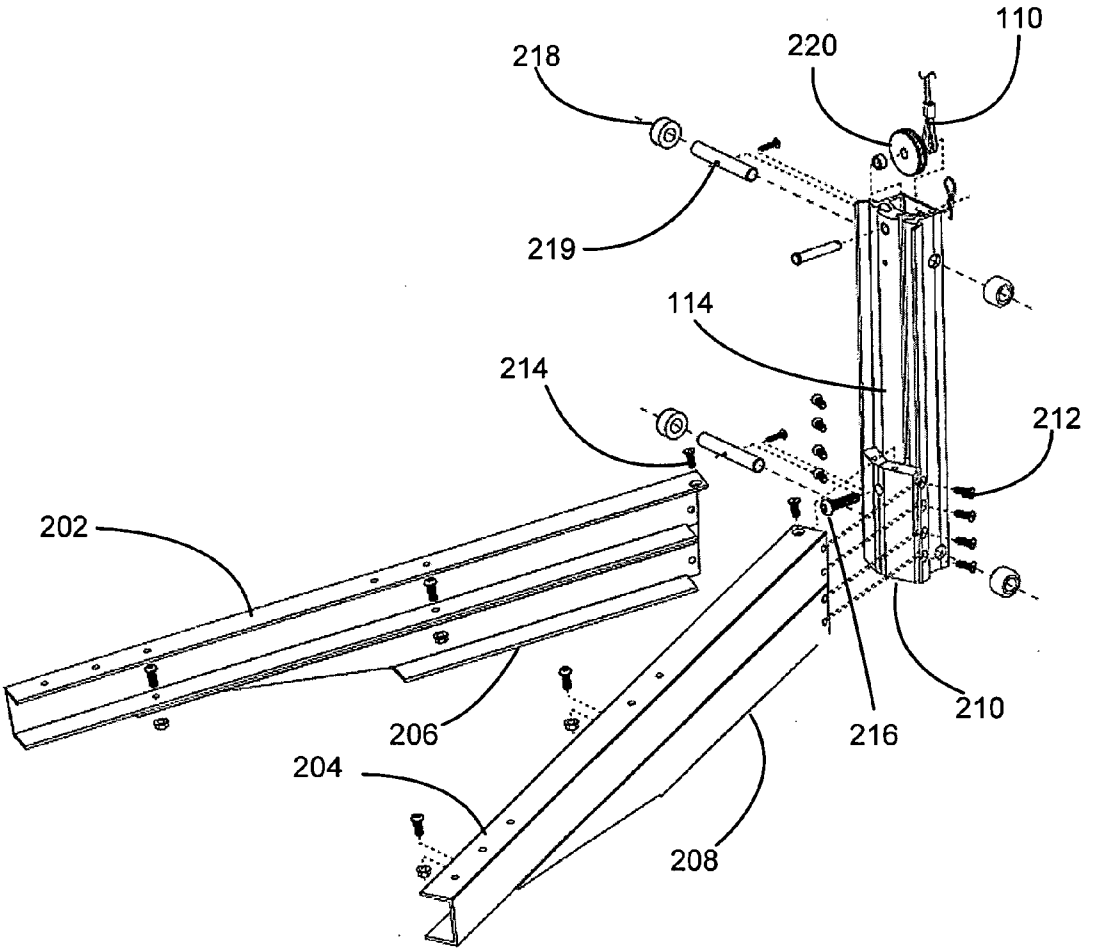


Fig. 2a

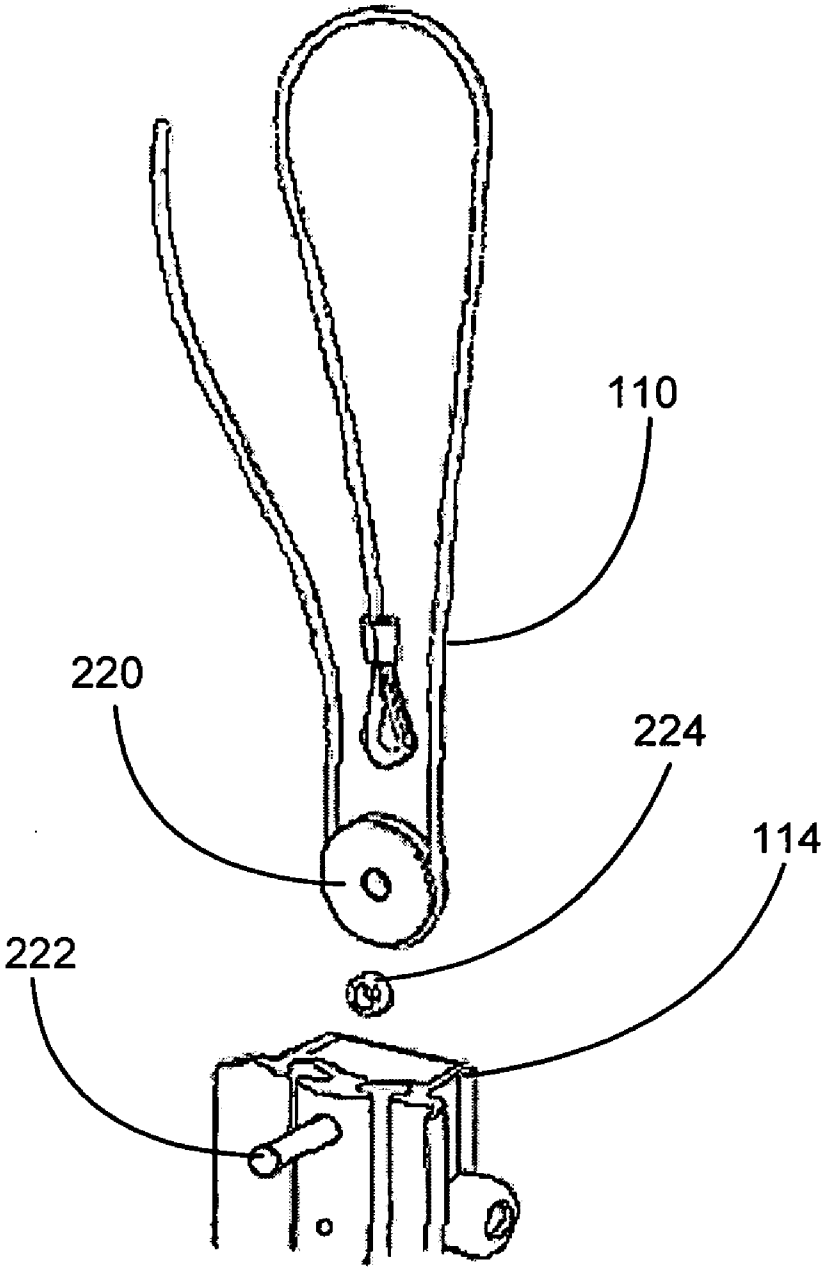


Fig. 2b

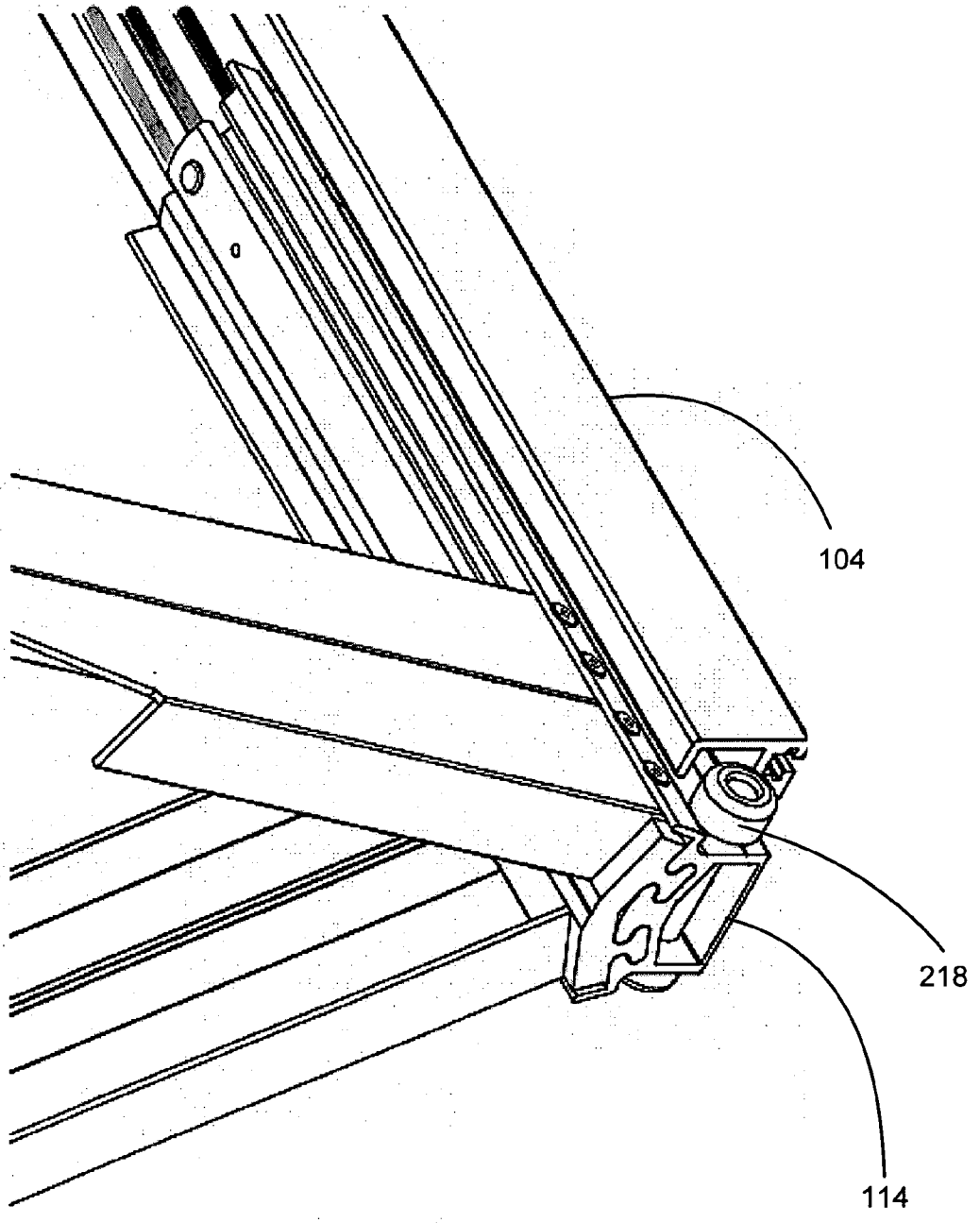


Fig. 3

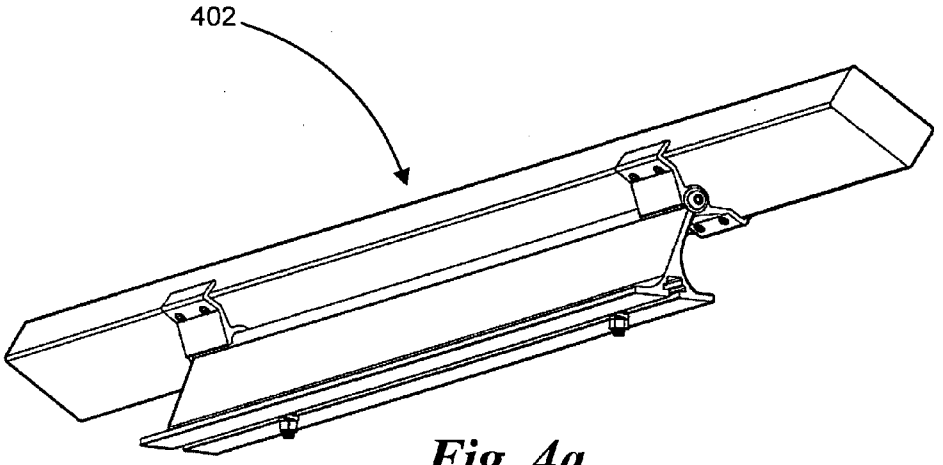


Fig. 4a

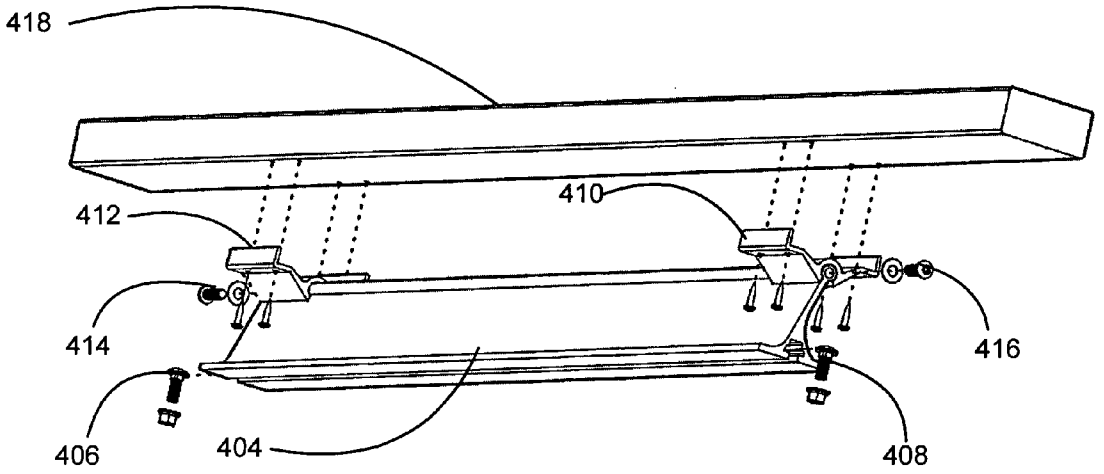


Fig. 4b

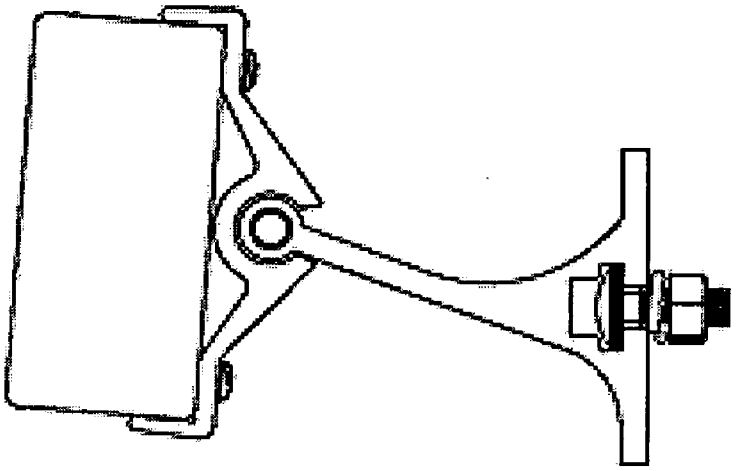


Fig. 5b

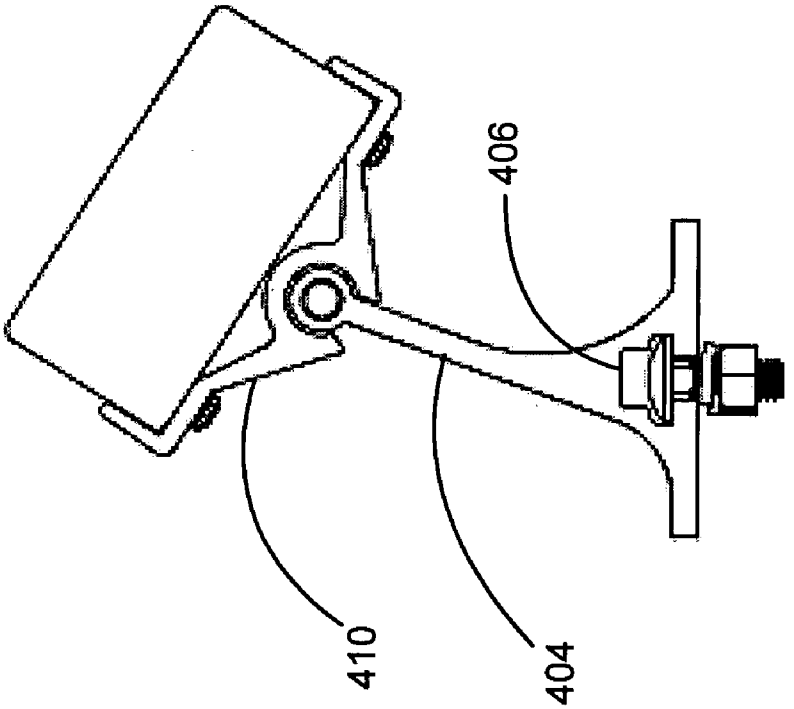


Fig. 5a

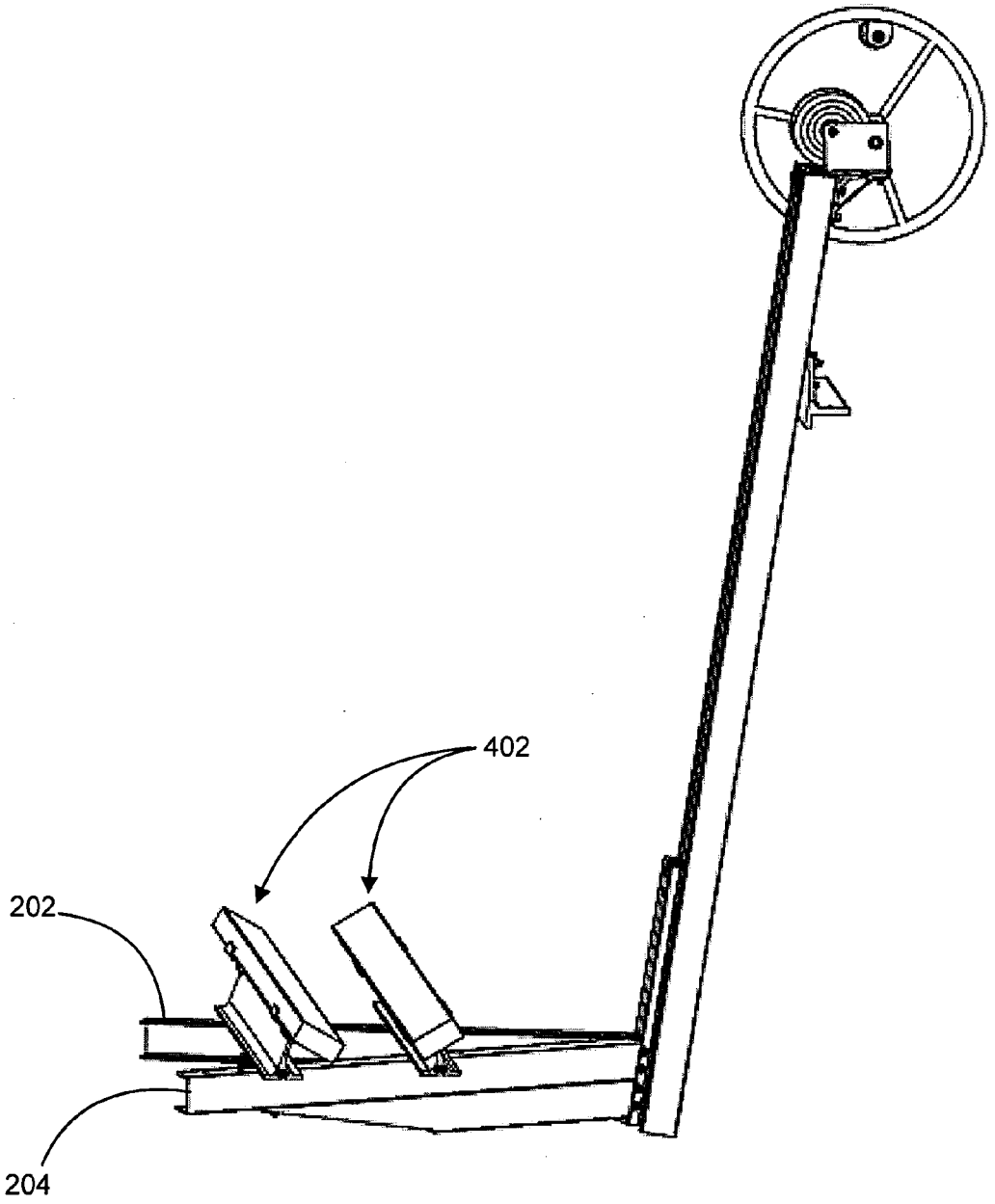


Fig. 6

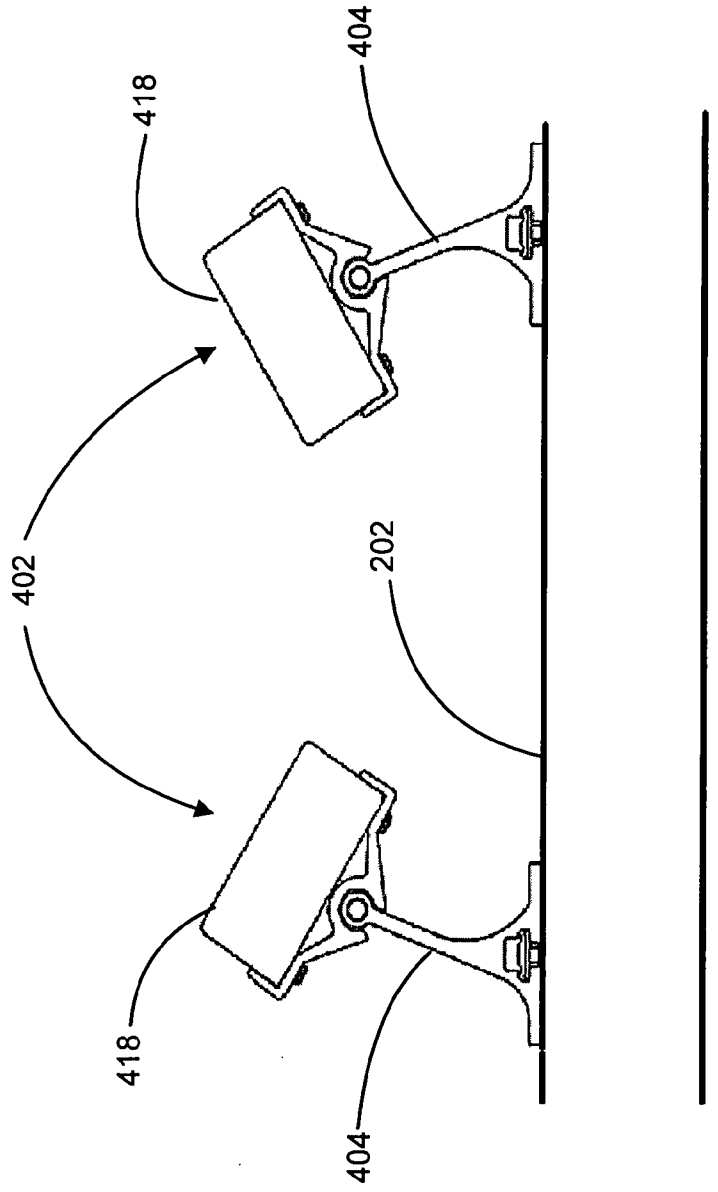


Fig. 7

PERSONAL WATERCRAFT LIFT ASSEMBLY AND KIT

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] This invention relates to lifting devices for watercraft, specifically to improvements in such devices that are employed to lift lighter weight, low profile watercraft, such as personal watercrafts.

[0003] 2. Description of the Related Art

[0004] Users of watercraft have need to lift their watercraft from the water, for example for maintenance or in preparation for land transportation of the watercraft as well as for safe storage. Equally, watercraft users have need to lower their watercraft into the water, for example for launching or simply for flotation at dock. Users have heretofore employed a number of devices for such lifting and lowering.

[0005] Exemplary of such devices for small profile watercraft such as Jet Skis®, U.S. Pat. No. 5,143,182, issued to the inventor of the present invention, specifies a lift comprising a single heavy-duty column having a winch mounted on the top thereof for raising and lowering a carriage that is engaged with a track formed on the column. Adjustable arms and bunk rails on the carriage enable adjustment to fit a watercraft. The carriage may be locked in the raised position by a number of means, such as a retaining pin. The winch can be mounted to any side of the column to meet the needs of a particular installation.

[0006] Prior art personal watercraft lifts are typically comprised of a large number of welded connections. Such welded connections present risk of metal fatigue and fracture at welded stress points, leading to structural failure. Furthermore, in general there has heretofore been little effort in the art of personal watercraft lift crafting to modularize construction and minimize the number of distinct parts comprising a lift. Prior art design for lifts for personal watercrafts and other low profile watercraft does not lend itself easily to lift construction from a kit by unskilled users.

[0007] A further significant limitation of prior art personal watercraft lifts is that the carriage arms of the lift are subject to uneven forces without substantial supporting elements to balance such forces, creating the risk of twisting or even breaking a carriage arm when the lift is under load.

[0008] Yet further, while some prior art bunk rails, such as described in U.S. Pat. No. 6,830,410 to Davidson, et al. and U.S. Pat. No. 5,543,837 to Arbaugh, et al. are deformable to adapt to varying hull configurations, the adaptability of such bunk rails to the highly varied hull configurations found in personal watercraft and other light craft is limited.

[0009] What is needed is a lift for personal watercraft and other low profile watercraft employing few or no welds, that is adapted for modular assembly permitting distribution of lifts in kit form, that provides support for unbalanced loads on lift arms and that has bunk rails that are adaptable to highly varied hull configurations.

BRIEF SUMMARY OF THE INVENTION

[0010] The present invention is a lift for low profile watercraft, substantially comprised of channel-ridge interlocking extruded components, enabling easy construction with minimal or no welded parts. The lift comprises a tower to be mounted to a dock. A winch is mounted on the tower for raising and lowering a carriage assembly engaged with the tower. The carriage assembly is comprised of a pair of forks in the form of a forked v-configuration, the intersection of the two arms retained by a carriage that engages and travels along a channeled track in the tower, transported by a winch-driven cable. Further comprising the carriage assembly and traversing the arms of the fork are two bunk assemblies, each bunk assembly comprising a pivot bar adjustably attached to both carriage forks. Each pivot bar has a ridge along its length, which is configured to engage with channels in bunk clips that are pivotally disposed on the pivot bar, the bunk clips retaining a bunk board, disposed upon which is a bunk for engaging the hull of the watercraft.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

[0011] The foregoing objects, as well as further objects, advantages, features and characteristics of the present invention, in addition to methods of operation, function of related elements of structure, and the combination of parts and economies of manufacture, will become apparent upon consideration of the following description and claims with reference to the accompanying drawings, all of which form a part of this specification, wherein like reference numerals designate corresponding parts in the various figures, and wherein:

[0012] FIG. **1** is a perspective view of a low profile watercraft lift, according to an embodiment of the present invention;

[0013] FIG. **2***a* is an exploded view of a portion of the carriage assembly for an embodiment of the invention, showing the manner of attaching the carriage forks to the carriage;

[0014] FIG. **2***b* is an exploded detail of a portion of the carriage assembly depicted in FIG. **2***a,* showing the connection of the carriage to the winch-driven cable;

[0015] FIG. **3** is a perspective view from below of the insertion of the carriage into the tower of the lift;

[0016] FIG. **4***a* is a perspective view of a bunk assembly of the present invention;

[0017] FIG. **4***b* is an exploded view of the bunk assembly depicted in FIG. **4***a;*

[0018] FIGS. **5***a* and **5***b* depict the pivoting action of a bunk assembly of the present invention;

[0019] FIG. **6** depicts the attachment of the bunk assemblies to the carriage forks; and

[0020] FIG. **7** is a side view of the attachment of the bunk assemblies to a carriage fork of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0021] Referring to FIG. **1**, illustrated is an embodiment of the watercraft lift according to an embodiment of the present invention. The lift **102** comprises a tower **104** mounted to a deck, in this case via upper deck mount **106**. In the depicted embodiment, hand wheel operated winch **108** is mounted on top of tower **104** and connects via internal cable **110** to carriage assembly **112** which is slideably disposed via carriage **114** in a track in tower **104**. Winch **108** raises carriage assembly **112** by retracting cable **110** and lowers assembly **112** by extending cable **110**.

[0022] As will be clear to those of skill in the art, hand winch **108** is one of many means available for raising and lowering the carriage assembly **112** of the present invention. Among manually operated means are many providing gear advantage and racheting functionality, such as set forth in U.S. Pat. No. 5,211,124 to Reiser. Alternative means include electrically, hydraulically or pneumatically driven winches, such as that of Ledford in U.S. Pat. No. 7,226,041, as well as one or more retractable hydraulically or pneumatically powered pistons, and also cog-driven lift mechanisms and related assemblies well known to those in the art for raising and

lowering carriage assemblies for watercraft lifts. The present invention incorporates all such means.

[0023] FIG. **2***a* shows an exploded view of the forks and carriage of carriage assembly **112**. Left and right upper forks **202**, **204** are connected with bolts to left and right lower forks **206**, **208** respectively. The forks all connect to fork lock **210** via a plurality of bolts **212** along the vertical axis and bolts **214** along the horizontal axis (only one of each of bolts **212** and **214** are labeled in FIG. **2***a* for clarity). Fork lock **210** is connected to carriage **114** via a bolt **216** of substantial size. On the side of carriage **114** are track wheels **218**, rotatably mounted on axles **219** (only one wheel **218** and one axle **219** are labeled in FIG. **2***a* for clarity). Internal cable **110** attaches to the top of carriage **114** via pulley **220** that is retained with clevis pin **222** and positioned with pulley spacer **224**, as shown in FIG. **2***b*.

[0024] Turning to FIG. **3**, illustrated is a perspective view from below of the insertion of carriage **114** into the track in tower **104**. Wheels **218** rotatably mounted to carriage **114** slide into channels in tower **114** adapted to receive them.

[0025] Turning now to FIGS. **4***a* and **4***b*, illustrated is a bunk assembly **402**, comprising a bunk pivot bar **404** formed as an extrusion. Sliding into a channel in the bunk pivot bar are bunk bolts **406**, **408** the heads of which are retained in channels in the bunk pivot bar adapted to receive them. In the assembled lift, bunk bolts **406**, **408** adjustably connect bunk assembly **402** to carriage forks **202**, **204** (FIG. **2**). Bunk clips **410**, **412** are pivotally disposed on pivot bar **404** via channel-ridge arrangement described in greater detail in relation to FIG. **5** below and are retained on pivot bar **404** by clip bolts **414**, **416**. Bunk bar **418** is retained in bunk clips **410**, **412** by screws or bolts passing through the bunk clips and engaging the bunk bar.

[0026] FIG. **5** illustrates the pivotal disposition of a bunk clip **410** on bunk pivot bar **404**. In this side view, clip bolt **416** (FIG. **4**) is removed to show the channel-ridge engagement of clip **410** on bar **404**, the channel in clip **410** adapted to engage a ridge in pivot bar **404** so as to permit pivoting of the clip on the bar. Also illustrated is the retention of a bunk bolt **406** within a channel in pivot bar **404** adapted to receive and retain the head of bolt **406**.

[0027] FIG. **6** depicts the arrangement of the lift's two bunk assemblies, **402**, retained on forks **202**, **204**. FIG. **7** illustrates the configuration of each bunk pivot bar **404** as a lop-sided I-beam and the disposition of the two bunk pivot bars **404** on fork **202** so that the bunk bars **418** pivot inward, thereby accommodating a range of V-shaped hulls.

Conclusions, Ramifications, and Scope

[0028] As will be evident to those in the art, all metal parts of the boat lift described herein are comprised of either mass produced parts (such as nuts and bolts) available off the shelf, or of extruded materials which are easily manufactured. The parts may be broken down into components that are easily shipped and reassembled, permitting the lift to be sold as a kit for purchaser assembly. As will be further evident to those in the art, the v-configuration of the forks and the engagement of the forks by the bunk pivot bars results in a lift carriage assembly of considerable strength, resisting the tendency of bunk carriage arms generally to twist under uneven loads.

[0029] Although the detailed descriptions above contain many specifics, these should not be construed as limiting the scope of the invention but as merely providing illustrations of some of the presently preferred embodiments of this invention. Various other embodiments and ramifications are possible within its scope.

[0030] While the invention has been described with a certain degree of particularity, it should be recognized that elements thereof may be altered by persons skilled in the art without departing from the spirit and scope of the invention. Accordingly, the present invention is not intended to be limited to the specific forms set forth herein, but on the contrary, it is intended to cover such alternatives, modifications and equivalents as can be reasonably included within the scope of the invention. The invention is limited only by the following claims and their equivalents.

1. A watercraft lift apparatus, comprising:
- a substantially vertical tower;
- a carriage assembly; and
- a means for lifting and lowering the carriage assembly along the tower, the carriage assembly further comprising:
  - an extruded carriage defining at least one carriage channel and being slideably disposed along the tower responsive to the means for lifting and lowering;
  - an extruded fork lock defining at least one ridge configured to slidingly engage the carriage channel;
  - two forks branching out from the fork lock in a substantially horizontal v-configuration
- a bunk pivot bar having a ridge along its length;
- at least one pivoting bunk clip having a channel pivotally engaging the ridge of the bunk pivot bar; and
- a bunk bar held by the at least one pivoting bunk clip.

2. The watercraft lift apparatus according to claim **1**, wherein the two forks include at least one bunk assembly including:
- an extruded bunk pivot bar having a ridge along its length;
- at least one extruded bunk clip defining a channel configured to pivotally engage the ridge in nested relationship; and
- a bunk bar rockingly supported by fixation to the at least one pivoting bunk clip in nested relationship to the ridge.

3. The watercraft lift apparatus according to claim **2**, wherein at least one fastener is set in the bunk pivot bar restrain movement of the at least one bunk clip along the ridge.

4. The watercraft lift apparatus according to claim **1**, wherein the means for lifting and lowering is selected from a group consisting of a winch and cable, a hydraulically driven piston, and a pneumatically driven.

5. A bunk assembly comprising:
- an extruded bunk pivot bar having a ridge along its length, the ridge having a generally circular cross-section;
- at least one extruded pivoting bunk clip a generally circular channel configured to pivotally engage the ridge of the bunk pivot bar in nested relationship; and
- a bunk bar supported by affixed engagement with the at least one pivoting bunk clip.

6. A kit of components suited to forming a watercraft lift apparatus, comprising
- a tower including:
  - an extruded track;
  - a winch disposed generally at a top of the tower;
  - a winch cable;
- an extruded carriage configurable to be disposed slideably within the tower in rolling engagement with the track, the carriage having at least one channel defined therein in opposed relation to the track;
- an extruded fork lock defining at least one ridge configured to nestingly engage at least one channel to restrict move-

ment of the fork lock relative to the carriage in any direction except parallel to the orientation of the channel;

two forks adapted to be received into the fork lock at an aspect generally opposed to the at least one ridge such that, when received in the fork lock, the two forks extend from the fork lock in a v-configuration.

7. The kit of claim **6**, further including a fastener that when inserted into the carriage prevents movement of the fork lock relative to the carriage when the at least one ridge is nestingly engaged in the at least one channel.

8. The kit of claim **6**, wherein the two forks, when received in the fork lock are configured to receive a bunk assembly, the bunk assembly, when assembled, comprising:

an extruded bunk pivot bar having a ridge along its length, the ridge having a generally circular cross-section;

at least one extruded pivoting bunk clip having a generally circular channel configured to pivotally engaging the ridge of the bunk pivot bar in nested relationship; and

a bunk bar held supported by affixed engagement with the at least one pivoting bunk clip.

9. The kit of claim **6**, wherein the bunk bar is affixed to the at least one pivoting bunk clip by means of at least one threaded fastener extending through and bearing on the bunk clip.

10. The kit of claim **6**, wherein at least one fastener is set in the bunk pivot bar to restrain movement of the at least one bunk clip along the ridge

11. The bunk assembly of claim **5** wherein the bunk bar is affixed to the at least one pivoting bunk clip by means of at least one threaded fastener extending through and bearing on the bunk clip.

12. The bunk assembly of claim **5** wherein at least one fastener is set in the bunk pivot bar to restrain movement of the at least one bunk clip along the ridge.

13. The watercraft lift of claim **1**, further comprising a carriage fastener that when inserted into the carriage prevents movement of the fork lock relative to the carriage when the at least one ridge is nestingly engaged in the at least one channel.

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