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 channelled 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. 2a
PERSONAL WATERCRAFT LIFT ASSEMBLY AND KIT

BACKGROUND OF THE INVENTION

[0001] 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] 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 bumper 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 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. 2a 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. 2b is an exploded detail of a portion of the carriage assembly depicted in FIG. 2a, 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. 4a is a perspective view of a bank assembly of the present invention;

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

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

[0019] FIG. 6 depicts the attachment of the bank assemblies to the carriage forks;

[0020] FIG. 7 is a side view of the attachment of the bank 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 ratcheting 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.

FIG. 2a shows an exploded view of the forks and 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. 2a 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. 2a 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. 2b.

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.

Turning now to FIGS. 4a and 4b, illustrated is a fork 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 adjustable 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.

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.

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 top-sided l-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

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 lifts 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 each carriage arm generally to twist under uneven loads.

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.

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; and
   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 pivotally supported by fixation to the at least one pivoting bunk clip.

3. The watercraft lift apparatus according to claim 2, wherein at least one fastener is set in the bunk pivot bar restraining movement of 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 generically 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 trunk;
   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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