US 20090044739A1

(19) **United States**
(12) **Patent Application Publication**
Imel et al.
(10) **Pub. No.: US 2009/0044739 A1**
(43) **Pub. Date: Feb. 19, 2009**

(54) **ROLLERS FOR USE WITH WATERCRAFT PORTS AND LIFTS**

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(21) Appl. No.: **12/125,206**

(22) Filed: **May 22, 2008**

Related U.S. Application Data

(60) Provisional application No. 60/956,215, filed on Aug. 16, 2007.

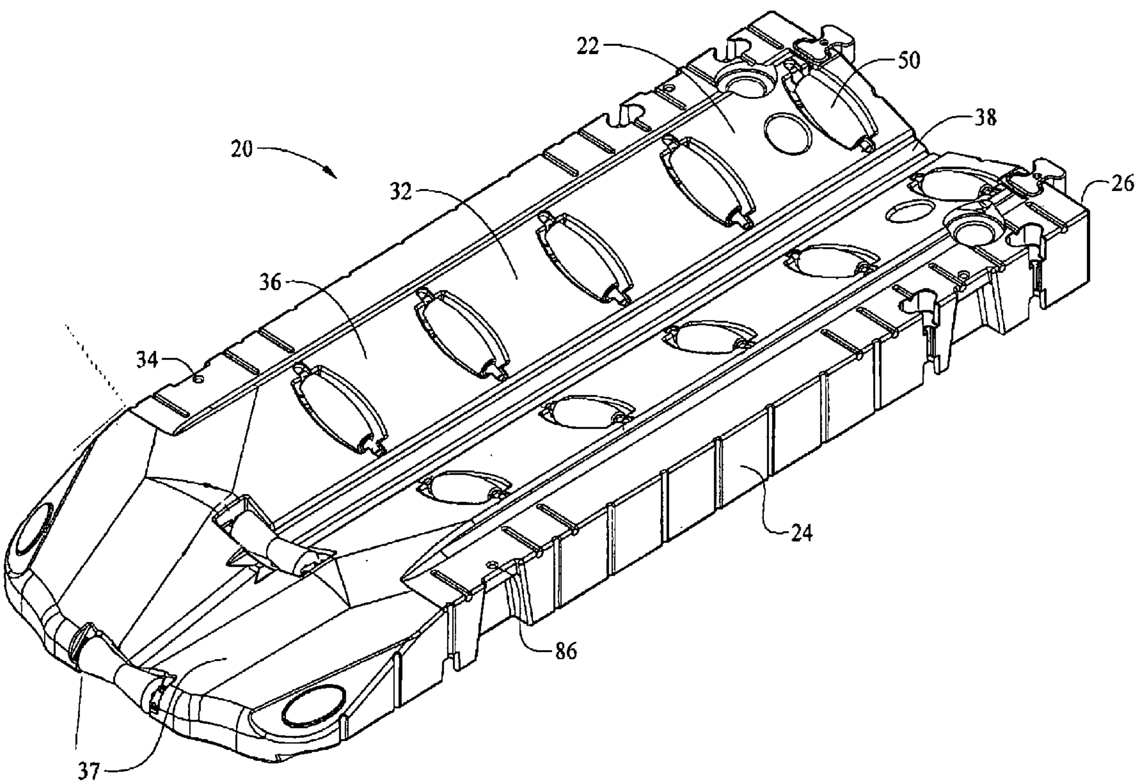
Publication Classification

(51) **Int. Cl.**
B63B 35/44 (2006.01)
B63C 5/04 (2006.01)

(52) **U.S. Cl.** **114/263**; 405/7

(57) **ABSTRACT**

A roller for a floating watercraft port or lift is generally circular in radial cross-section and defines a diameter which decreasing from an axial center of the rollers to opposite ends of the rollers; such that the rollers are variable diameter rollers. In a variation, the rollers include circumferential grooves through which watercraft chines can glide. The rollers are received in roller sockets in the watercraft port or lift. The rollers rotate about an axle in the socket, and the sockets includes axle receiving channels which receive the roller axles. The roller axles and roller socket axle channels are sized and shaped such that the roller axles can be snap fitted into the axle channel to allow for removal of the roller from the socket.



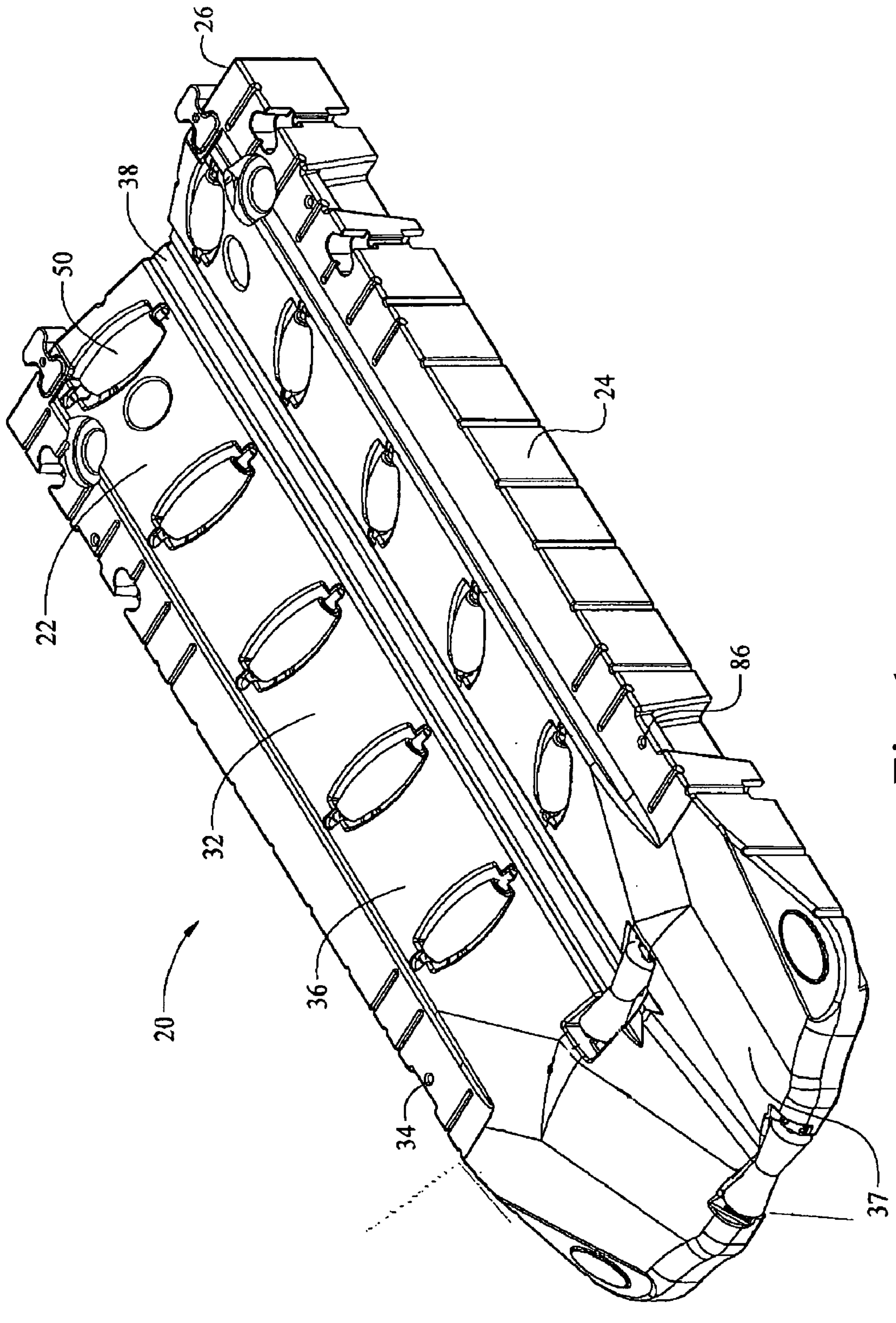


Fig. 1

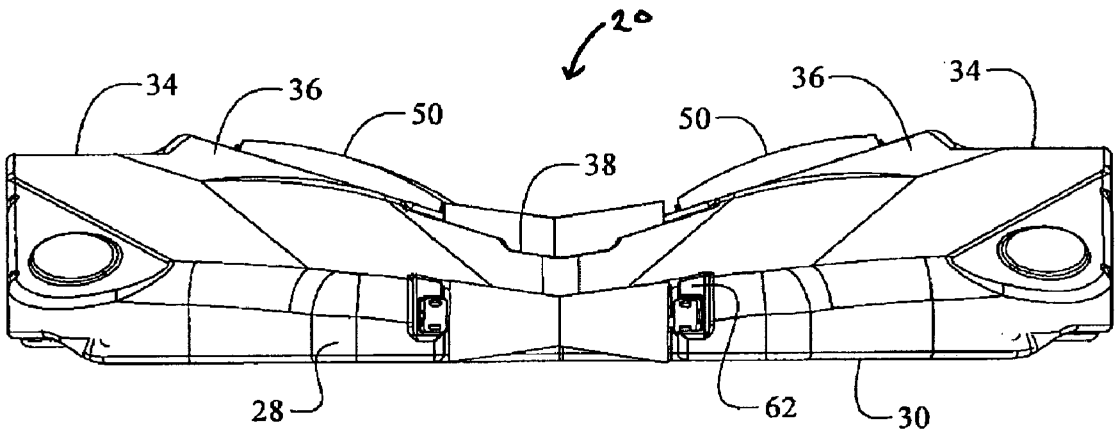


Fig. 2

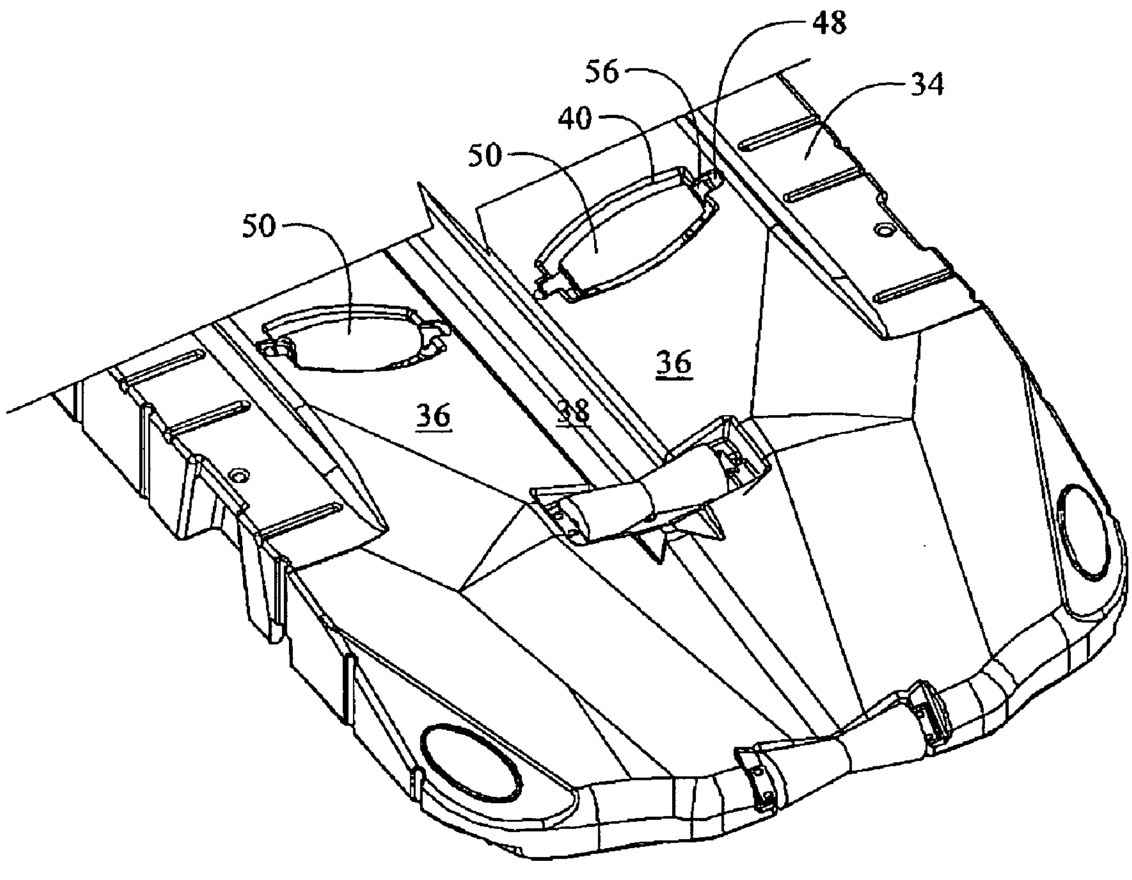


Fig. 3

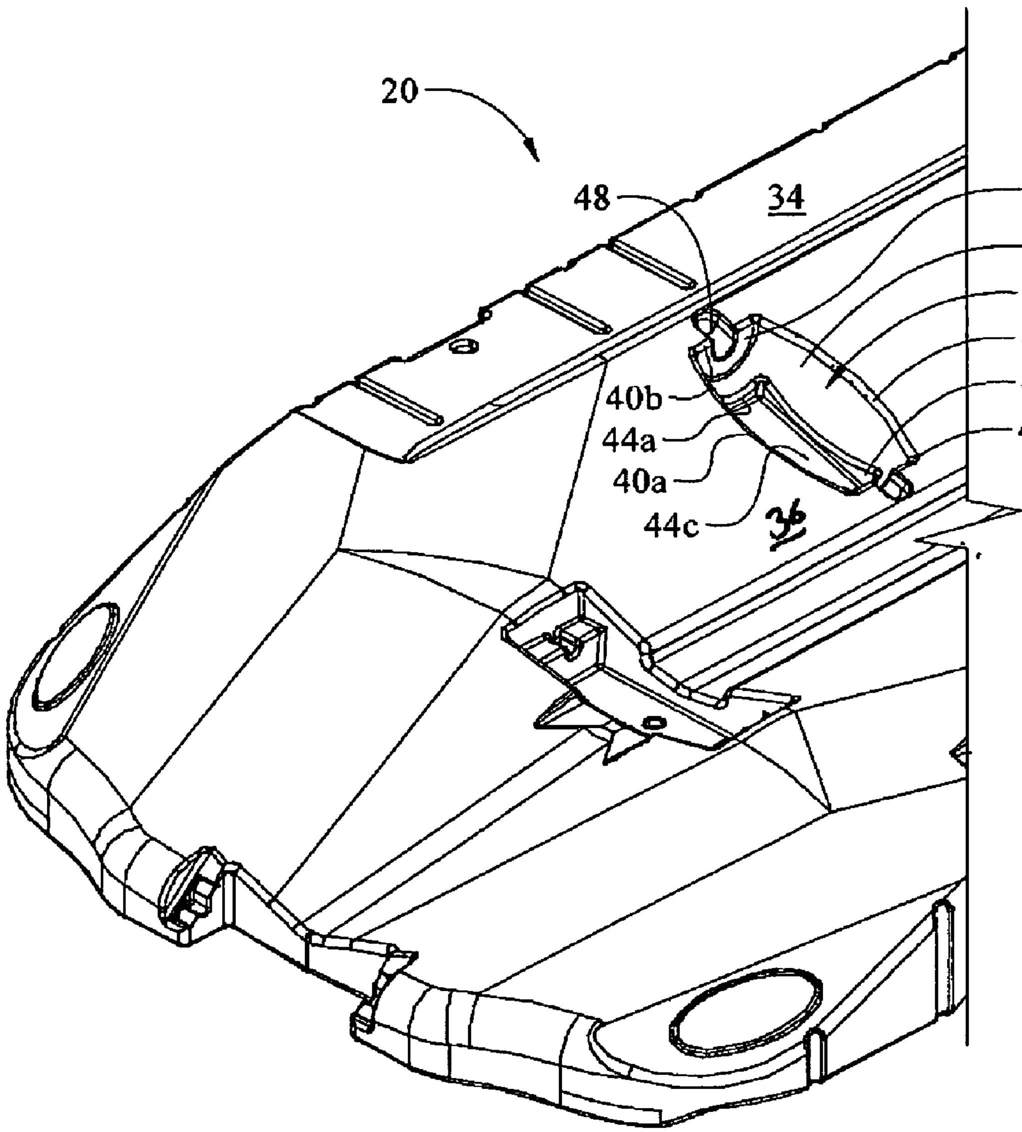


Fig. 4

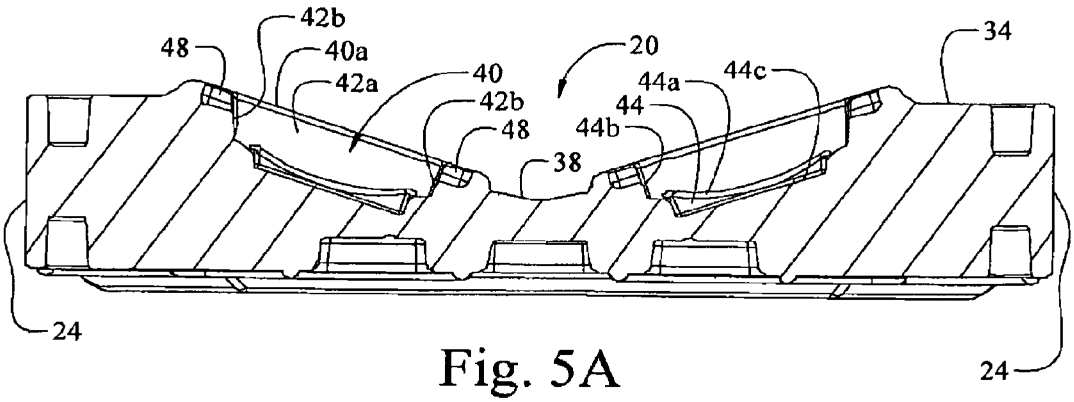

42b
48
40a
42a
40
20
42b
48
38
44a
44c
44
44b
34
24
24

Fig. 5A

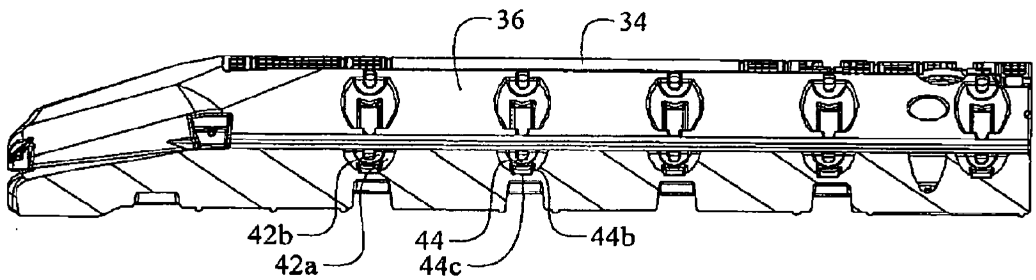

36
34
42b
42a
44
44c
44b

Fig. 5B

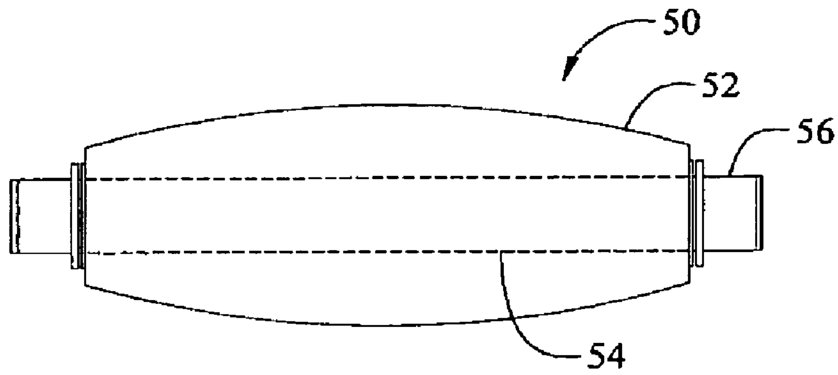


Fig. 6A

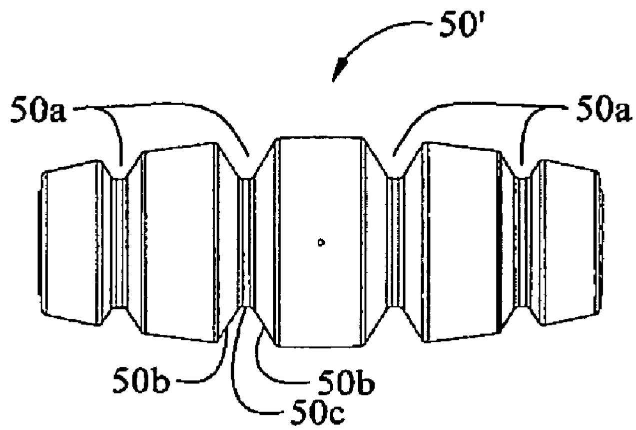


Fig. 6B

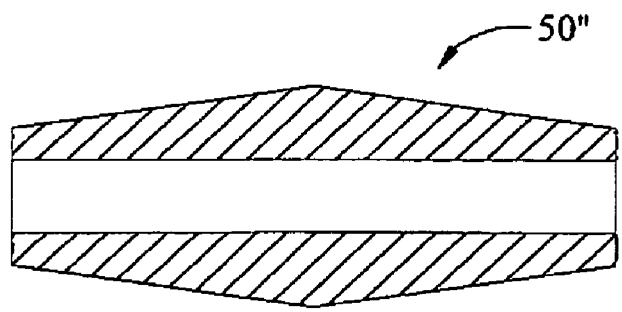


Fig. 6C

ROLLERS FOR USE WITH WATERCRAFT PORTS AND LIFTS

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to U.S. Provisional App. No. 60/956,215 filed Aug. 16, 2007 which is titled Modular Floating Watercraft Assembly, and which is incorporated herein by reference.

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

[0002] Not Applicable.

BACKGROUND OF THE INVENTION

[0003] This invention relates to floating docks or ports and lifts for personal and small water craft, and, in particular to rollers for use with such ports and lifts.

[0004] Over the past several years, manufacturers have begun producing larger (and heavier) personal water craft. Many of the existing floating ports are too small to support the newer personal watercraft out of the water when the personal water craft are placed on the ports. Further, the new personal water craft vary in their general shape, particularly, the shape of their hulls. Because of the difference in hull shapes, the position of the rollers on existing ports often needs to be adjusted. If the roller position is not adjusted, the rollers may not roll easily, and thus will not ease entry and exit of the watercraft on to the port. Further, when the rollers do not roll properly, the hull of the personal watercraft can be marred.

SUMMARY OF THE DISCLOSURE

[0005] Briefly stated, a roller for a floating watercraft port or lift is disclosed. The floating watercraft port/lift comprises an upper surface, a bottom surface, side surfaces, a front surface and a back surface. A cradle defined by a pair of opposed inwardly sloping walls is formed in at least a part of the upper surface. A plurality of roller sockets positioned along the cradle walls and the rollers received in at least a pair of the roller sockets.

[0006] The rollers are generally circular in radial cross-section, and thus define a diameter. The diameter of the rollers decreases from an axial center of the rollers to opposite ends of the rollers, such that the rollers are variable diameter rollers. In an illustrative embodiment, the rollers have an arced outer surface. In a variation, the rollers include circumferential grooves. The grooves are defined by a sloping side surfaces such that the grooves are wider at the roller surface than at a bottom of the groove. The bottoms of the grooves all define diameters that are substantially the same. Hence, grooves positioned closer to the opposite ends of the roller are shallower than grooves positioned closer to the axial center of the roller.

[0007] The roller sockets comprise socket end surfaces and a socket main surface extending between the socket end surfaces. The socket decreases in width from the cradle defining wall to a radial bottom of the socket and the socket decreases in width from an axial center of the socket to opposed ends of the socket. Stated differently, the sockets, in cross-section, define a segment of a circle, and the radius of the circle decreases from the axial center of the socket to the opposed ends of the socket.

[0008] Axles extend through, or from the ends of, the rollers. The roller sockets include axle channels extending from opposite ends of the roller socket. The axles are sized, and the axle channels are shaped, such that the axles are snap fitted into the axle channels; whereby the rollers are removable from the roller sockets substantially without the use of tools.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

[0009] FIG. **1** is a perspective view of a port entry member with rollers and connecting elements;

[0010] FIG. **2** is a back elevational view of the port entry member;

[0011] FIG. **3** is an enlarged sectional perspective view of the entry member to show the mounting and positioning of rollers on the port member;

[0012] FIG. **4** is an enlarged fragmentary perspective view of the port entry member without rollers;

[0013] FIGS. **5**A-B are cross sectional views of the port entry member taken along lines A-A and B-B of FIG. **1**, respectively, in which the cross-hatched area is a void or hollow area;

[0014] FIG. **6**A is a side elevational view of a roller for use with the port/lift assembly; the roller having a roller axle extending there through;

[0015] FIG. **6**B is a side elevational view of an alternative roller; and,

[0016] FIG. **6**C is a cross-sectional view of another alternative roller for use with the port member.

[0017] Corresponding reference numerals will be used throughout the several figures of the drawings.

DETAILED DESCRIPTION OF THE INVENTION

[0018] The following detailed description illustrates the invention by way of example and not by way of limitation. This description will clearly enable one skilled in the art to make and use the invention, and describes several embodiments, adaptations, variations, alternatives and uses of the invention, including what we presently believe is the best mode of carrying out the invention. Additionally, it is to be understood that the invention is not limited in its application to the details of construction and the arrangements of components set forth in the following description or illustrated in the drawings. The invention is capable of other embodiments and of being practiced or being carried out in various ways. Also, it is to be understood that the phraseology and terminology used herein is for the purpose of description and should not be regarded as limiting.

[0019] A watercraft port **20** is shown generally in FIGS. **1** and **2**. The port **20** can be a port such as shown and described in U.S. Provisional App. No. 60/956,215, the description of which is incorporated herein by reference. The port **20** is described in detail in the noted application, and will only be described to the extent necessary herein. The port **20** includes an upper surface **22**, side walls **24**, a front end wall **26**, a back end **28**, and a bottom surface **30**.

[0020] The upper surface **22** defines a cradle **32**, upper deck surfaces **34**, and a sloping entrance or ramp section **37** at the back of the port entry. The cradle **32** is defined by a pair of walls **36** which slope downwardly and inwardly to a channel **38** which extends rearwardly from the front end of the port entry member **20** to the forward end of the entrance section **37**. The slope of the cradle walls **36** corresponds generally to the dead rise of a watercraft hull. To accommodate a greater number of watercraft, the slope of the cradle walls **36** corresponds to a median of common watercraft hull dead rise angles. The bottom of the channel **38** is generally level. Hence, the cradle **32** does not slope from front to back, but rather, is generally horizontal.

[0021] A plurality of roller sockets **40** (shown in more detail in FIGS. **4**, **5**A and **5**B) are formed in the cradle walls **36**. As seen, the roller sockets **40** are formed in pairs (i.e., two sockets, one on each of the cradle walls **36**, and which are aligned with each other). The roller sockets **40** are shown to be evenly spaced apart along the length of the cradle **32**, with the forward most socket being spaced slightly rearwardly of the front wall **26**. The roller sockets **40** are generally in the shape of truncated ovals at the walls **36**. That is, the upper edges of the sockets **40** comprise opposed arced side edges **40***a* (FIG. **4**), the ends of which are connected by generally straight end edges **40***b*. The sockets **40** could, of course, have other shapes. For example, the sockets could be rectangular, square, or generally rhombus-shaped. If the sockets are in the form of a rhombus, the rhombus form could be truncated at two opposed corners (to form an elongated hexagon), or at all corners (to form an elongated octagon).

[0022] The illustrative sockets **40**, as best seen in FIGS. **4** and **5**A are defined by curved surfaces **42***a* which extend downwardly from the socket side edges **40***a*, and end walls **42***b* which extend downwardly from the socket end edges **40***b*. The surfaces **42***a* generally define a semi-circle in cross-section, as best seen in FIG. **5**B. The surface **42***a* curves both radially and axially (or in both the vertical plane and the horizontal plane). Hence, the diameter or radius of the semi-circle defined by the surface **42***a* is largest at the axial or lateral center of the socket and decreases towards the opposite ends of the socket. The socket **40** additionally includes a generally rectangular recess **44** at the bottom of the socket surface **42***a*. The recess **44** has generally straight side walls **44***a*, generally straight end walls **44***b* and a floor **44***c*. A drain hole is formed in the floor **44***c*. Lastly, the sockets **40** include opposed axle receiving channels **48** which extend axially outwardly from the socket end walls **42***b* at the cradle wall **36**. The axle receiving sockets define a line that is parallel to the cradle defining walls. The axle channels **48** are shallower than the socket end walls **42***b*, having a depth of about one-half the depth of the socket end walls **42***b*.

[0023] Rollers **50** are received in the roller sockets **40**. In one illustrative embodiment, the roller **50** is shaped complementarily to the socket **40**. Having the roller **50** and roller socket **40** shaped complementarily to each other provides for a gap of uniform size between the roller and socket. However, the roller and socket need not be shaped complementarily to each other. As seen in FIG. **6**A, the illustrative roller **50** has an arced or curved outer surface **52** and generally flat end surfaces. As can be appreciated, in end elevation, the roller defines a circle. However, the diameter of the circle defined by the surface **52** decreases from a middle of the roller towards the opposite ends of the roller. The roller **50** also includes a through hole **54** through which an axle **56** (FIG. **6**A) extends. The axle is sized to be snap fitted into the axle receiving channels **48** of the socket **40**. Thus, the roller can be easily removed from the socket if necessary. Inasmuch as the axle receiving channel is parallel to the cradle wall, when the roller is received in the socket, the axis of the roller will also be generally parallel to, and hence define the same angle as, the cradle wall. Although the axle is described to be an independent piece, the axle could be formed with the roller, such that the roller and axle are formed as a one-piece assembly. The ability to remove rollers **50** from the sockets **44** enhances the ability to configure (or reconfigure) the dock and port assemblies incorporating the port members **20**. The axle **56**, the roller through bore **54**, and the axle channels **48** are sized relative to each other such that the roller can rotate freely relative to the socket **40**. Hence, the roller can rotate about the axle (and the axle can be relatively fixed in place in the socket axle channels **48**), or the roller can be positionally fixed to the axle, and the axle can freely rotate in the socket axle channels **48**. As seen in FIG. **2**, the rollers **50** extend well above the cradle surface **36**. In fact, approximately one-half of the roller is above the cradle wall **36**.

[0024] The roller can take on other configurations. For example, the roller **50'** of FIG. **6**B has generally the same overall configuration as the roller **50**. However, it is provided with a series of circumferential grooves **50***a*. The grooves **50***a* are each defined by inwardly sloping side walls **50***b* and a floor **50***c* extending between the radial inner ends of the side walls **50***b*. The roller **50'** is shown with four grooves **50***a*. The two outer grooves are of the same dimensions and the two inner grooves are of the same dimension. Additionally, the two outer grooves are shallower than the two inner grooves, such that the diameter of the groove floor **50***c* of each groove **50***a* is the substantially the same. Further, the spacing between the grooves is generally constant. Thus, the roller is symmetrical about both a horizontal plane (i.e., a plane parallel to the axis of the roller) and a vertical plane (i.e., a plane that is perpendicular to the axis of the roller **50'**). As will be discussed further below, the grooves **50***a* are sized to receive chines or strakes from the watercraft to be parked on the port member.

[0025] In another embodiment, the roller **50"** can have a generally straight, rather than arced or curved, side surface, such as seen in FIG. **6**C, such that the roller has the appearance of a pair of trapezoids (or truncated cones) connected together at their bases.

[0026] The roller configurations shown in FIGS. **6**A-C are unitary, one piece rollers. However, the roller of FIG. **6**C could, in fact, comprise two truncated tapered rollers (i.e., in the shape of a truncated cone) which are mounted on an axle with their bases adjacent each other. The rollers could, alternatively be comprised of a plurality of roller elements of varying sizes, with the center roller element being the largest in diameter, and then roller elements of progressively smaller diameter being placed on opposite sides of the center roller. If the roller elements are all cylindrical, then the roller would have a stepped appearance in side elevation. However, the roller elements could have curved or sloped surfaces to more closely resemble the surface of the rollers as shown in FIGS. **6**A-B. Further, the length and diameter of the rollers can be varied as desired, so long as the roller can fit and rotate within the socket **40**. In a further variation, the rollers could decrease in diameter from one end to the other (as opposed to decreasing in diameter from the axial center to the two opposite ends). In this case, the roller would be wide at one end and narrow at the opposite end. Such a roller would be mounted in the port member with the narrow end facing the cradle channel and the wide end facing the side of the port member.

[0027] The use of the roller of varying diameter (such as shown in FIGS. **6**A-C) is preferred over a cylindrical roller. As noted above, because of the difference in hull shapes, the position of the rollers on the ports often needs to be adjusted in ports which use cylindrical rollers. Thus, a port using cylindrical rollers can be used with only one or a limited number of models of watercraft without the need to adjust the position of the rollers. If the roller position is not adjusted, the rollers may not roll easily. Thus, entry and exit of the watercraft on to the port will be more difficult. Further, when the rollers do not roll properly, the hull of the personal watercraft can be marred. The varying diameter of the roller **50** overcomes these problems and allows the port member **20** to be used with different models and brands of personal watercraft (PWC) without the need to adjust the rollers. Because the effective slope of the roller changes over the axial length of the roller, the varying diameter roller (which presents an axially curving surface) will ensure a more rolling-like contact with a greater range of watercraft hull designs. In addition, the slope or dead rise of a watercraft hull is not constant over the length of the hull. In general, the slope is steep at the bow of the watercraft and almost flat at the stern of the watercraft. The varying diameter rollers also help ensure that the watercraft hull will engage the roller at a position which will allow the roller to rotate about its axis. Hence, the use of the varying diameter roller with a cradle having a slope that to a median of common watercraft hull dead rise angles will allow the port member to accommodate a greater variety of watercraft than a port with cylindrical rollers and a cradle wall slope that corresponds to only a few watercraft dead rise angles.

[0028] The rollers **50'** (FIG. **6**B) have further advantages over the rollers **50**. The grooves **50***a* in the roller **50'** receive the chines of the watercraft as the watercraft passes over the rollers. Depending on the particular model of watercraft, chines may pass through one or more of the grooves as watercraft are loaded onto or unloaded off of the port. As is known, the chines typically do not extend the full length of the watercraft hull, and end forwardly of the stern of the watercraft. Thus, when the watercraft is being backed off the port member **20**, the watercraft chines will have to be urged over the rollers if the rollers **50** (FIG. **6**A) are used. This can require lifting of the back of the watercraft or an initial extra effort as the back end of the chines pass over the rollers **50**. When the rollers **50'** are used, the watercraft chines will automatically find one of the roller grooves **50***a* to slide through. Hence, this initial extra effort or the need to raise the back end of the watercraft will not be needed to easily back the watercraft off the port member

[0029] As various changes could be made in the above constructions without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense. For example, although the rollers are described for use with a watercraft port, it will be apparent that the rollers could also be used with a watercraft lift. This example is merely illustrative.

1. A floating watercraft port/lift comprising an upper surface, a bottom surface, side surfaces, a front surface and a back surface; a cradle being formed in at least a part of said upper surface; said cradle being defined by a pair of opposed inwardly sloping walls; a plurality of roller sockets positioned along said cradle walls and rollers received in at least a pair of said roller sockets;

said rollers being generally circular in radial cross-section and defining a diameter; the diameter of said rollers decreasing from an axial center of said rollers to opposite ends of said rollers; such that said rollers are variable diameter rollers.

2. The floating watercraft port of claim **1** wherein said roller sockets comprise socket end surfaces and a socket main surface extending between said socket end surfaces; said socket decreasing in width from said cradle defining wall to a radial bottom of said socket and said socket decreasing in width from an axial center of said socket to opposed ends of said socket.

3. The floating watercraft port of claim **1** wherein said roller sockets, in cross-section, define a segment of a circle; the radius of the circle decreasing from the axial center of the socket to the opposed ends of the socket.

4. The floating watercraft port of claim **1** wherein said rollers define an axis; said rollers being are circular in cross-section in a plane generally perpendicular to said axis and having an arced outer surface such that the diameter of said roller decreases from an axial center of said rollers to the opposed ends of said rollers.

5. The floating watercraft port of claim **4** wherein said rollers include circumferential grooves formed in said rollers.

6. The floating watercraft port of claim **5** wherein said grooves are defined by a sloping side surfaces such that said groove is wider at said roller surface than at a bottom of said groove.

7. The floating watercraft port of claim **5** wherein the bottoms of said grooves all define a diameters that are substantially the same.

8. The floating watercraft of claim **7** wherein grooves positioned closer to the opposite ends of said roller are shallower than grooves positioned closer to the axial center of said roller.

9. The floating watercraft port of claim **1** wherein axles extend through said rollers; said roller sockets including axle channels extending from opposite ends of said roller socket; said axles being sized, and said axle channels being shaped, such that said axles are snap fitted into said axle channels; whereby said rollers are removable from said roller sockets substantially without the use of tools.

10. The floating watercraft port of claim **1** including a cradle channel extending along a center of said cradle, said cradle channel being positioned between said sloping walls.

11. The floating watercraft port of claim **1** wherein said roller sockets of said pair of walls are aligned with each other to define pairs of roller sockets.

12. A roller for use in a watercraft port or lift assembly; said roller comprising an outer surface and end surfaces and having an axis; said outer surface defining a circle in cross-section and having a diameter; the diameter of said roller outer surface decreasing from an axial center of said roller towards said end surfaces.

13. The roller of claim **12** wherein said outer surface defines an axial curvature.

14. The roller of claim **12** further including circumferential grooves formed in said roller outer surface.

15. The roller of claim **14** wherein said grooves are defined by a sloping side surfaces such that said groove is wider at said roller surface than at a bottom of said groove.

16. The roller of claim **15** wherein the bottoms of said grooves all define a diameters that are substantially the same.

17. The roller of claim **16** wherein grooves positioned closer to the opposite ends of said roller are shallower than grooves positioned closer to the axial center of said roller.

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