March 4, 1969 H. W. TULLENERS 3,430,595

WATERCRAFT

Filed Feb. 20, 1967 Sheet 1 of 4

FIG-1

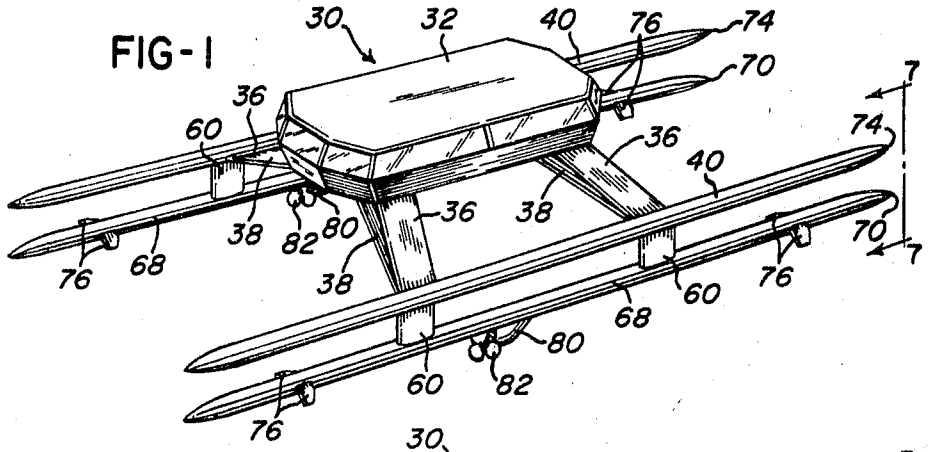


FIG-2

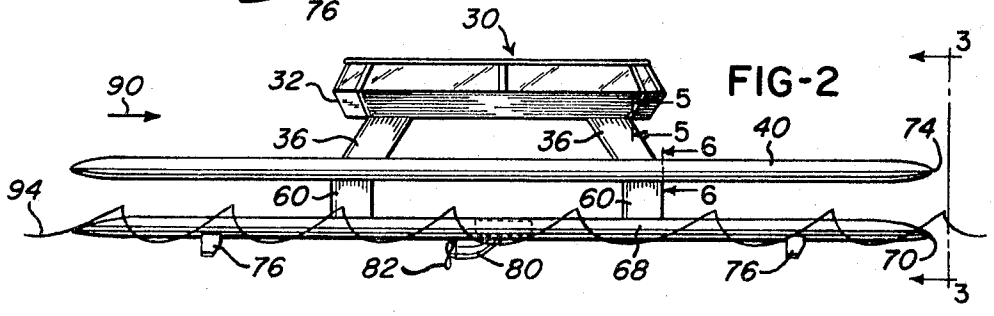


FIG-3

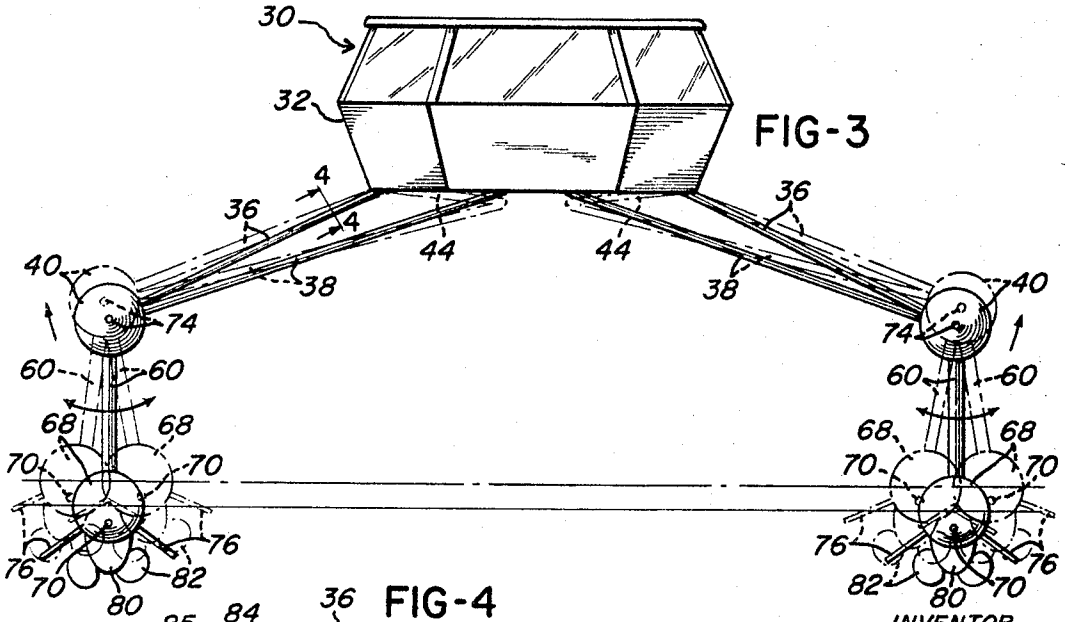
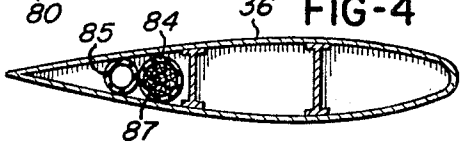


FIG-4



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HARRY WERNER TULLENERS

BY William R Jacox

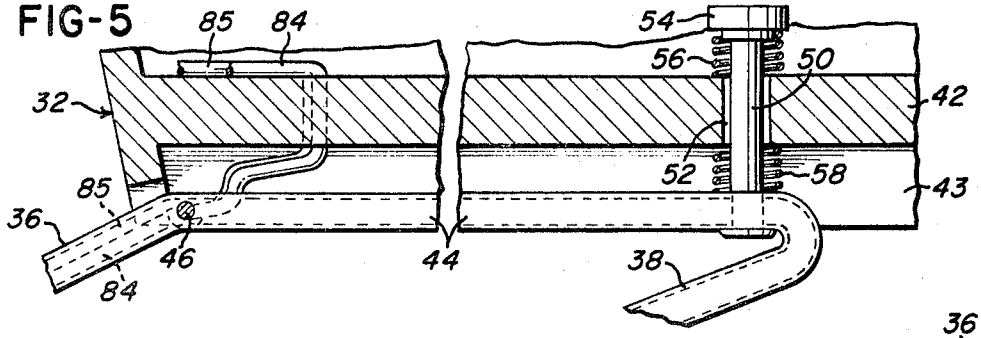
ATTORNEY

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FIG-5



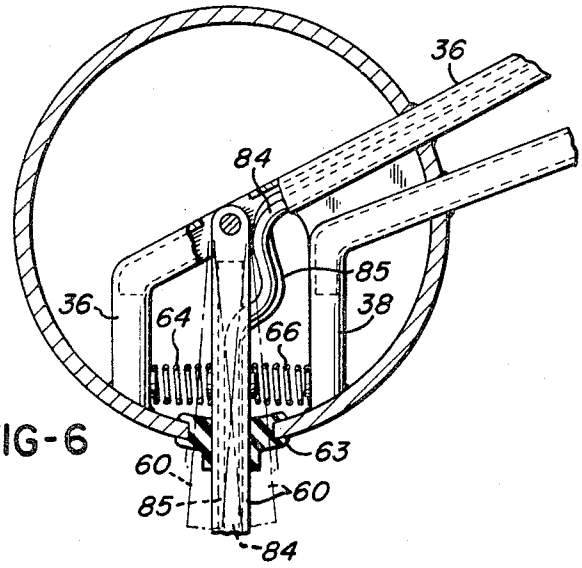


FIG-6

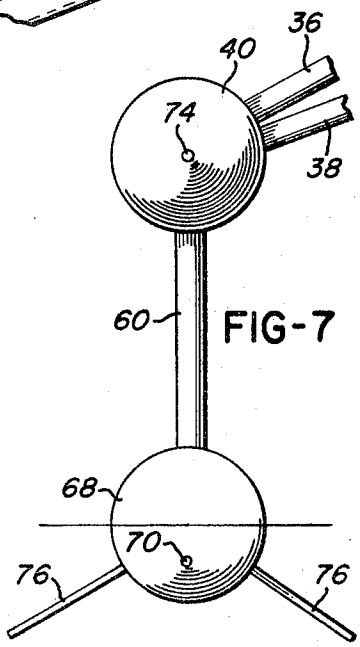


FIG-7

FIG-8

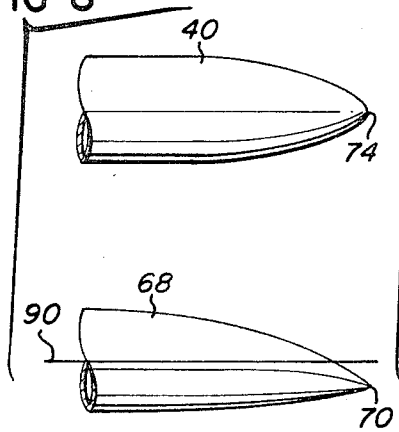
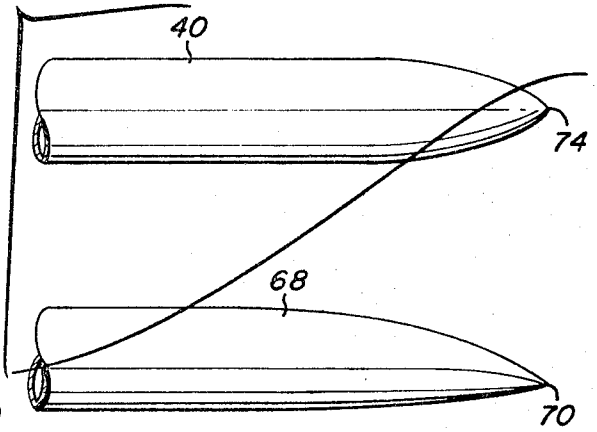


FIG-9



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FIG-10

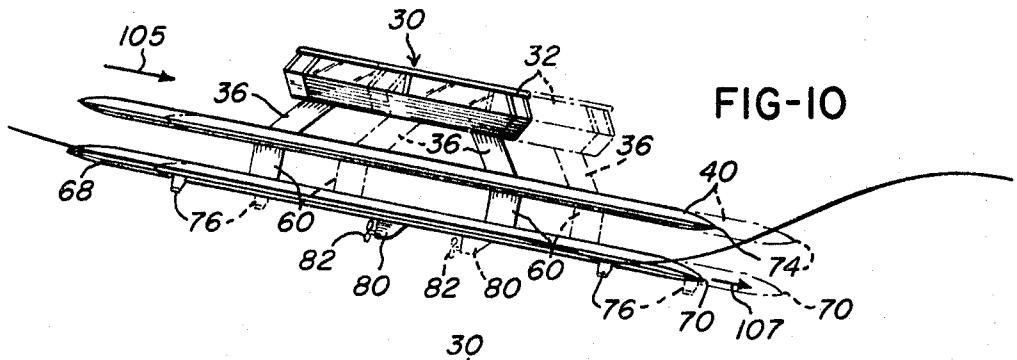


FIG-11

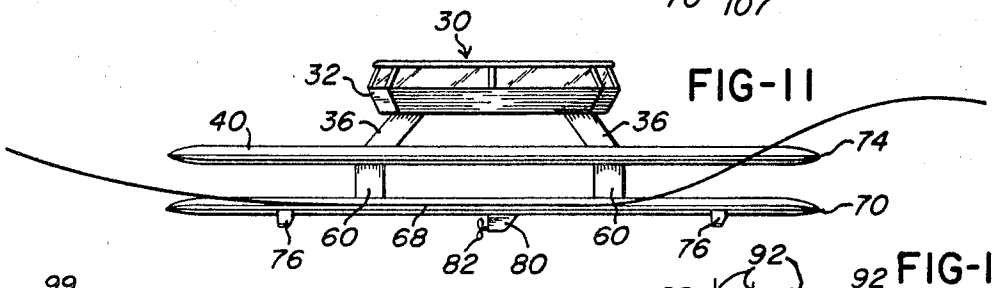


FIG-12

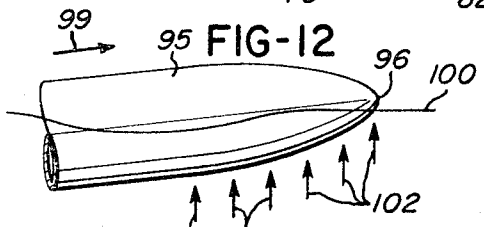


FIG-13

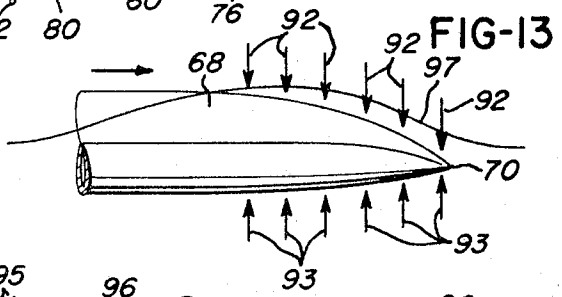


FIG-14

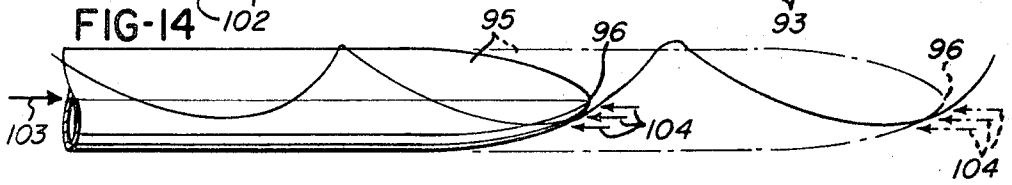


FIG-15

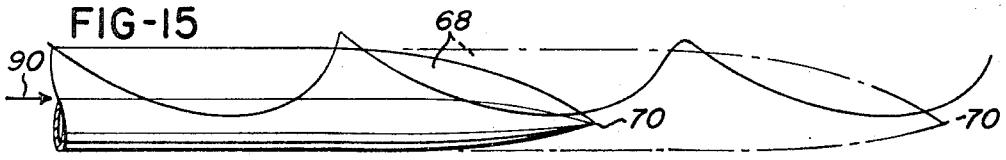
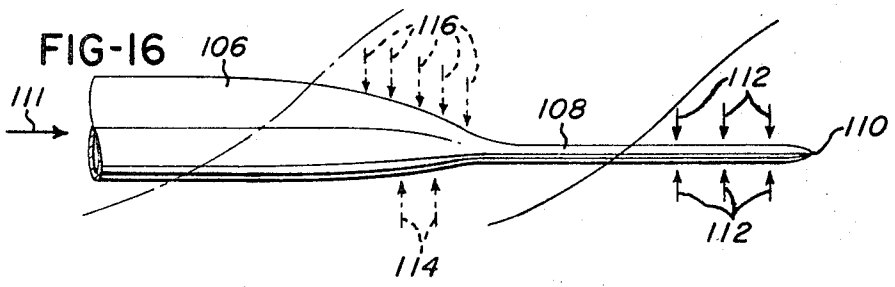


FIG-16



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FIG-17

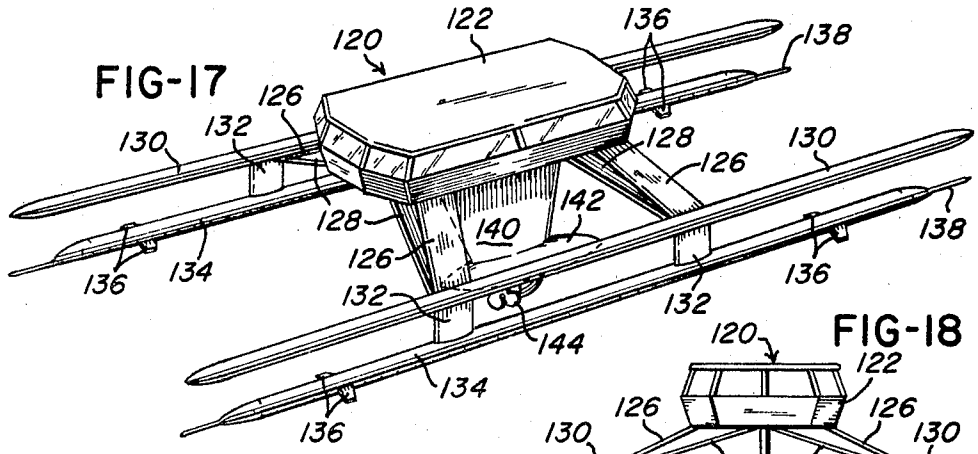


FIG-18

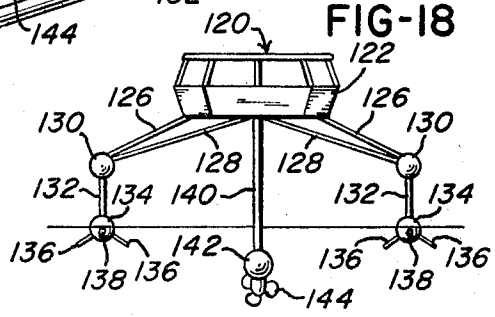


FIG-19

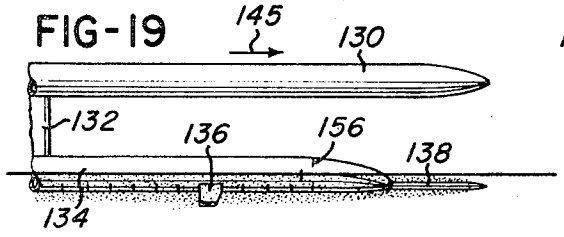


FIG-20

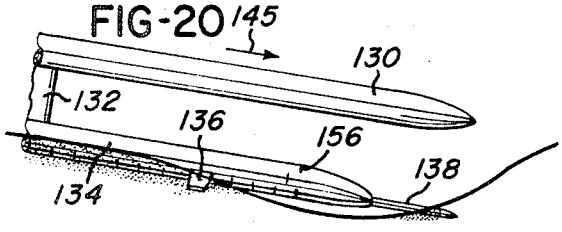
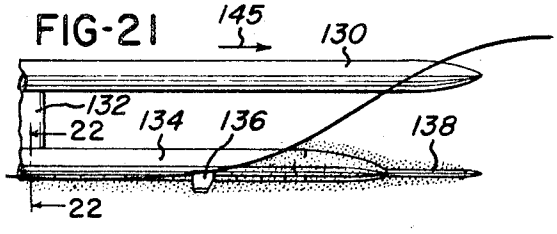


FIG-21



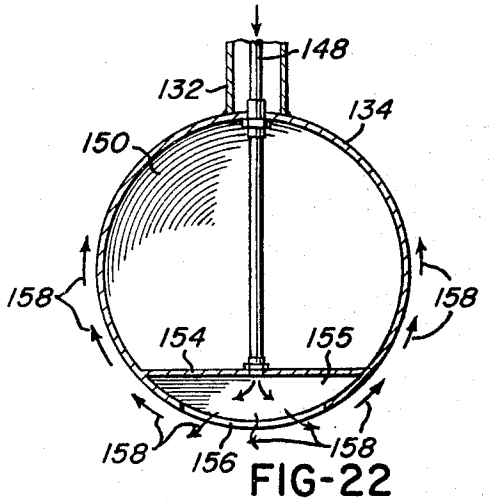
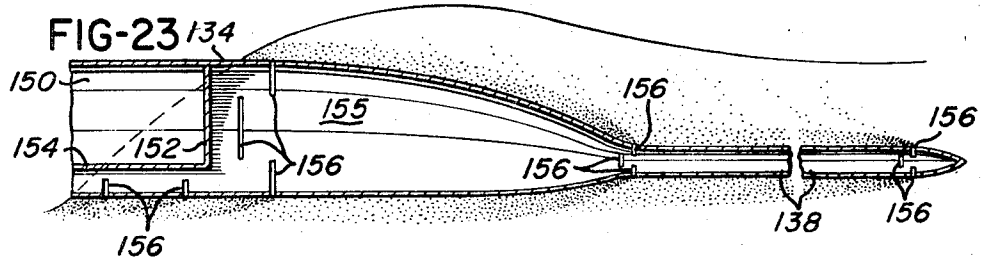


FIG-22

FIG-23



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Patented Mar. 4, 1969

3,430,595

WATERCRAFT

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Filed Feb. 20, 1967, Ser. No. 617,157
U.S. Cl. 114—61 24 Claims
Int. Cl. B63b 1/14, 35/36

ABSTRACT OF THE DISCLOSURE

A watercraft adapted to travel upon a smooth surface or upon a wavy surface while maintaining a load carrier portion of the watercraft relatively level. A lower pontoon and an upper pontoon are attached to the load carrier portion of the watercraft at each of opposite portions thereof. The lower pontoons are adapted to normally travel upon the surface of the water and to normally support the watercraft. The upper pontoons do not normally engage the water. The upper pontoons engage the water and assist in support of the watercraft only during travel of the watercraft upon a wavy surface.

Background of the invention

In the past watercraft have been devised for rapid travel. However, rapid travel of the watercraft, particularly upon a wavy water surface, has resulted in rough travel of the watercraft.

Watercraft such as catamarans or hydrofoil water vehicles have been devised. However, these watercraft, as well as other known watercraft, are designed to move upon the surface of the water and are not capable of wave piercing. Thus, known watercraft are not capable of rapid relatively smooth travel.

Thus, an object of this invention is to provide a watercraft which has portions thereof which are capable of movement through the water in submerged or partially submerged conditions. Thus, a watercraft of this invention is capable of smooth rapid travel upon a water surface which is smooth or wavy.

Other objects and advantages reside in the construction of the invention, combinations thereof, the method of manufacture, and the mode of operation, as will become more apparent from the following description.

Brief description of the drawings

FIGURE 1 is a perspective view of a watercraft of this invention.

FIGURE 2 is a side elevational view of the watercraft of FIGURE 1.

FIGURE 3 is an enlarged front elevational view of the watercraft of FIGURES 1 and 2. The view of FIGURE 3 is taken substantially on line 3—3 of FIGURE 2.

FIGURE 4 is an enlarged sectional view taken substantially on line 4—4 of FIGURE 3.

FIGURE 5 is an enlarged sectional view taken substantially on line 5—5 of FIGURE 2.

FIGURE 6 is an enlarged sectional view, with parts broken away, taken substantially on line 6—6 of FIGURE 2.

FIGURE 7 is an enlarged fragmentary elevational view taken substantially on line 7—7 of FIGURE 1.

FIGURE 8 is an enlarged fragmentary view of a portion of the ends of an upper and a lower pontoon of the watercraft. FIGURE 8 shows operation of the pontoons on a relatively smooth water surface.

FIGURE 9 is a fragmentary side elevational view, similar to FIGURE 8, and illustrating operation of the pontoons of FIGURE 8 in a wavy water surface.

FIGURES 10 and 11 are side elevational views on a smaller scale than FIGURE 2 and illustrating the movement of the watercraft upon a wavy surface.

FIGURE 12 is a fragmentary side elevational view, drawn on substantially the same scale as FIGURES 8 and 9, illustrating the operation of a pontoon upon a relatively smooth water surface, the pontoon having a forward end tip which is at substantially the longitudinal center of the pontoon. The pontoon of FIGURE 12 is not necessarily made according to this invention.

FIGURE 13 is a fragmentary side elevational view of a pontoon of this invention and illustrates the operation thereof upon a relatively smooth water surface, the pontoon having a forward end tip which is below the longitudinal center thereof.

FIGURE 14 is a fragmentary side elevational view showing the pontoon of FIGURE 12 and illustrating the operation thereof upon a wavy water surface.

FIGURE 15 is a fragmentary side elevational view showing the pontoon of FIGURE 13 and illustrating the operation thereof upon a wavy water surface.

FIGURE 16 is a fragmentary side elevational view showing a modification in the forward end portion of a pontoon of this invention.

FIGURE 17 is a perspective view drawn on substantially the same scale as FIGURE 1 and showing another watercraft of this invention.

FIGURE 18 is a front elevational view of the watercraft of FIGURE 17.

FIGURE 19 is a fragmentary side elevational view showing the forward portion of an upper pontoon and a lower pontoon of the watercraft of FIGURE 17 and illustrating the operation thereof upon a smooth water surface.

FIGURES 20 and 21 are fragmentary side elevational views showing the pontoons of FIGURE 19 and illustrating operation thereof upon a wavy water surface.

FIGURE 22 is an enlarged sectional view taken substantially on line 22—22 of FIGURE 21.

FIGURE 23 is an enlarged fragmentary longitudinal sectional view of the forward portion of the lower pontoon shown in FIGURES 19, 20, and 21.

Summary of the invention

The watercraft of this invention comprises a load carrier member which is adapted to be positioned a sufficient distance above the water surface that the load carrier member does not engage the surface of the water. The watercraft is provided with a main pontoon or float member on either side of the load carrier member and below the load carrier member. The two main pontoon members are elongate float members in which the transverse dimension thereof is very small in consideration of the length dimension thereof. The two main pontoons or floats are capable of supporting the load carrier member and the load thereof while each of the two main pontoons has a substantial portion thereof in a submerged condition. Above each main pontoon is an auxiliary pontoon, which has substantially the same length and transverse dimensions as the main pontoons. The auxiliary pontoons are adapted to assist in supporting the watercraft upon a water surface which is rough and wavy. Means are provided for connecting each main pontoon to its respective auxiliary pontoon and to the load carrier member.

Each pontoon is a wave piercing pontoon which is capable of readily moving through the water and through a wave so that the watercraft during travel over the surface of the water does not necessarily move up and down with the wave formation. Furthermore, due to the fact that the pontoons are adapted to move through waves rather than to move over the waves, the line of movement of the watercraft is as straight as possible and can therefore be faster, as well as smoother than is possible with other watercraft. Also, a minimum amount of energy is expended in propulsion of a watercraft of this invention.

Description of the preferred embodiments

Referring to the drawings in detail, a watercraft **30** of this invention is shown in FIGURES 1, 2, and 3. The watercraft **30** is provided with a load carrier member or cabin **32**. The load carrier member **32** may be of any suitable size or shape and is herein shown as being enclosed.

A plurality of leg members **36** and **38** are used to attach the load carrier member **32** to auxiliary pontoons or floats **40**, there being one auxiliary pontoon **40** at each of the two sides of the cabin **32** and at a lower level than the cabin **32**, as best shown in FIGURE 3.

FIGURE 5 shows the manner in which the leg members **36** and **38** are attached to the load carrier member **32**. The load carrier member **32** has a base **42**. A flange **43** is integral with the base **42** and extends downwardly therefrom. A rigid connector member **44** joins each pair of leg members **36** and **38** together and to the flange **43** directly below the base **42**. Each of the leg members **36** and **38** and the connector member **44** may have a cross-sectional appearance similar to that of the leg member **36** as shown in FIGURE 4, or each leg member **36** or **38** or the connector member **44** may have any other suitable appearance or shape.

The connector member **44** is pivotally attached to the flange **43** by means of a pin **46** which is adjacent the leg member **36**. A support stem **50** is attached to the connector member **44** adjacent the leg member **38**. The stem **50** extends loosely through an opening **52** in the base **42** and has a head **54** at the upper end thereof. A coil spring **56** encompasses the stem **50** between the base **42** and the head **54** and urges the stem **50** upwardly.

A coil spring **58** encompasses the stem **50** between the base **42** and the connector member **44** and urges the connector member **44** and the stem **50** downwardly. Thus, the coil springs **56** and **58** normally maintain the connector member **44** in the position shown in FIGURE 5 with respect to the base **42**. However, the connector member **44** is pivotally movable with respect to the base **42**, and thus the leg members **36** and **38** are movable with respect to the base **42**.

The upper ends of each pair of leg members **36** and **38** are separated and spaced apart by the connector member **44**. However, each pair of the leg members **36** and **38** converge downwardly and terminate within one of the upper or auxiliary pontoons **40** and are secured thereto, as shown in FIGURE 6.

A strut **60** has the upper end thereof pivotally attached to the leg member **36** within the auxiliary pontoon **40**, there being at least one strut **60** for each pair of the leg members **36** and **38**. A pin **62** pivotally attaches each strut **60** to its respective leg member **36**. Each strut **60** may have a cross-sectional configuration similar to that shown in FIGURE 4 or may have any other suitable configuration. Each strut **60** extends through the lower portion of its respective auxiliary pontoon **40**. An elastomeric bushing **63** joins each strut **60** to its respective auxiliary pontoon **40** and seals against passage of water into the auxiliary pontoon **40** between the strut **60** and the auxiliary pontoon **40**, while permitting the strut **60** to move with respect to the auxiliary pontoon **40**.

A compression spring **64** is disposed within each auxiliary pontoon **40** between each leg member **36** and its respective strut **60**. A compression spring **66** is disposed within each auxiliary pontoon **40** between each leg member **38** and its respective strut **60**. Thus, each pair of compression springs **64** and **66** urge each strut **60** to a position midway between the respective leg members **36** and **38**, as shown in FIGURE 6. However, pivotal movement of the strut **60** is permitted, as illustrated in FIGURE 6.

An elongate main pontoon or float **68** is attached to the lower end of the struts **60** which extend downwardly from each auxiliary pontoon or float **40**. Thus, there is one main pontoon **68** disposed below each of the auxiliary pontoons **40** and joined thereto through struts **60**.

Each main pontoon or float **68** and its respective auxiliary pontoon **40** are substantially equal in length dimension and in transverse dimension. Preferably each pontoon **40** and **68** is circular in cross-section. Also, preferably, each pontoon **40** and **68** has a length to diameter ratio in the range of from 10 to 1, to 50 to 1. If desired, however, each main pontoon **68** and each auxiliary pontoon **40** may comprise a plurality of axially aligned spaced-apart pontoons attached to struts **60** and to leg members **36** and **38**.

The forward end of each of the main pontoons **68** has a tip **70** which is below the longitudinal axis of the pontoon **68**. Preferably, the tip **70** of each main pontoon **68** is located at a position which is approximately one-quarter of the height of the pontoon **68**.

However, preferably, each auxiliary pontoon **40** has a tip **74** at the forward end thereof which is on the longitudinal axis thereof.

Each of the main pontoons **68** is provided with a plurality of trim tabs or fins **76** which are preferably pivotally adjustable for steering and/or for other control of the watercraft **30**.

At the central portion of each of the main pontoons **68** is a housing **80** which contains any suitable engine means or motor means, not shown, which is operably connected to a propeller **82** for rotation thereof for propulsion of the watercraft.

FIGURES 4, 5, and 6 show a conduit **84** and a conduit **85** which extend from the load carrier member **32** through the leg members **36** and through the auxiliary pontoons **40** and through the struts **60** and through a portion of the main pontoons **68** to the engine or motor means within the housings **80**. The conduits **85** may serve to provide air to the motor means or engine means within the housing **80** and control conductors **87** or the like may extend through the conduit **84** to the engine or motor within the housing **80**.

Operation

The watercraft **30** is propelled by operation of the propeller members **82** or by operation of any other suitable propulsion means.

Each of the main pontoons **68** is created so that when a normal load is carried by the load carrier member **32**, a substantial portion of each of the main pontoons **68** is submerged. Preferably, each main pontoon or float **68** is normally substantially one-half submerged when a load is carried by the load carrier member **32**. Thus, regardless of the surface conditions of the water which supports the watercraft **30**, each of the main pontoons **68** tends to maintain a ratio of one-half of the total exterior surface thereof submerged and one-half of the total exterior surface thereof unsubmerged. For example, FIGURE 2 illustrates movement of the watercraft **30** upon a wavy water surface **94**. Along the length of each main pontoon **68** there are alternate portions thereof which are completely submerged and alternate portions thereof which are completely unsubmerged. Thus, substantially one-half of the total volume of each pontoon or float **68** is normally submerged and substantially one-half of the total volume thereof is normally unsubmerged.

Each of the main pontoons **68** is very long in consideration of its transverse dimension. Thus, each of the main pontoons **68** is capable of traveling through waves of water by wave piercing action, as illustrated in FIGURES 2 and 9. The forward end portion of each of the main pontoons or floats **68** is created to provide optimum wave piercing action. As shown in FIGURES 2, 8, 9, 13, and 15 and as discussed above, each main pontoon **68** has a forward tip **70** which is below the longitudinal axis of the pontoon **68**. Preferably, each main pontoon **68** has a forward tip **70** which is located at a position which

is approximately one-quarter of the height dimension of the pontoon **68**.

Thus, as each main pontoon **68** travels forwardly as illustrated by an arrow **90** in FIGURES 13 and 15, the tip **70** thereof is normally below the surface of the water. In FIGURE 13 the water is shown as having a substantially smooth surface. However, due to the fact that the tip **70** is below the surface of the water, as the pontoon **68** moves forwardly, water is forced to flow over the forward end of the pontoon **68** as illustrated by a flow pattern **97** in FIGURE 13. Thus, water pressure is created upon the forward end portion of the pontoon **68**, as illustrated by arrows **92** in FIGURE 13, urging the forward end of each pontoon **68** downwardly. The downward pressure as illustrated by the arrows **92** is balanced a predetermined amount by an upward pressure on the forward end of each pontoon **68**, as illustrated by arrows **93** in FIGURE 13. The amount of balancing pressure illustrated by the arrows **93** is such that the pontoons **68** tend to move forwardly while remaining substantially horizontal.

FIGURE 12 shows a forward end portion of a pontoon **95** which is not necessarily made according to the preferred embodiment of this invention. The main pontoon **95** has a tip **96**, as shown in FIGURE 12, which is located on the longitudinal axis of the pontoon **95**. Therefore, if a smooth water surface **100** exists, the tip **96** would normally be located at the smooth water surface **100** shown in FIGURE 12. Thus, as the pontoon **95** is moved forwardly, as shown by an arrow **99**, water at the lower forward surface of the pontoon **95** produces an upward pressure or force, as illustrated by arrows **102**. Thus, there is a resulting lifting effect upon the forward end portion of the pontoon **95**, and the forward end of the pontoon **95** would tend to rise. Thus, as the pontoon **95** is moved rapidly forwardly a planing action of the pontoon **95** would occur. The planing action would tend to cause the pontoon **95** to travel over the smooth water surface **100** rather than to travel in or through the water.

FIGURE 14 illustrates movement of the pontoon **95** in a wavy water surface. As the pontoon **95** moves forwardly in the water, as illustrated by an arrow **103** in FIGURE 14, waves of the water strikingly engage the forward end of the pontoon **95** and apply appreciable forces thereto, as illustrated by arrows **104**, which tend to reduce the forward motion thereof. Thus, the pontoon **95** of FIGURES 12 and 14 does not represent the preferred embodiment of this invention but illustrates the action obtained by a pontoon which has a forward end portion which is not formed according to the preferred embodiment of this invention.

However, the pontoon **68**, as shown in FIGURE 15, which is formed in accordance with the preferred embodiment of this invention, readily pierces the waves due to the fact that the point **70** thereof is below the longitudinal axis of the pontoon **68**. Furthermore, due to the fact that the forward end of the pontoon **68** is shaped substantially as shown in FIGURES 13 and 15, the pontoon **68** engages waves with a minimum force.

Thus, the main pontoons **68** readily pierce the waves of water with a minimum force and tend to remain substantially horizontal during forward movement of the watercraft **30** as the watercraft **30** is propelled forwardly as illustrated by the arrow **90** in FIGURES 13 and 15.

If the watercraft **30** should travel upon a water surface which has primary waves which are spaced-apart a distance which is substantially equal to the length of the pontoons **68** or farther apart, the watercraft **30** sometimes moves at a downward angle as illustrated by an arrow **105** in FIGURE 10. Due to the fact that the main pontoons **68** are capable of piercing action, the forward portion of the pontoons **68** may enter a wave in the manner illustrated by an arrow **107** in FIGURE 10. When such action of the main pontoons **68** occurs and if the wave formation is of sufficient magnitude the auxiliary pontoons **40** also enter the water as shown in FIGURE 10. When the forward portion of the upper or auxiliary pontoons **40** enters the water, additional buoyancy is provided to the forward portion of the watercraft **30**.

Thus, the forward portion of the watercraft **30** rises and the watercraft **30** tends to become horizontal, as illustrated in FIGURE 11. Thus, the watercraft **30** tends to remain horizontal, regardless of the surface conditions of the water upon which the watercraft **30** travels.

FIGURE 16 shows the forward end portion of a pontoon **106** which is a modification of the preferred embodiment of a part of this invention. The pontoon **106** has a nose **108** which extends forwardly from a position below the longitudinal axis thereof. It is preferable that the length of the nose **108** is in the range of two to four times the diameter of the pontoon **106**. The height dimension of the nose **108** is preferably in the order of one-fourth the height dimension of the pontoon **106**. The forward end of the nose **108** has a tip **110** which is preferably at the longitudinal axis of the nose **108**.

Thus, during forward movement of the pontoon **106** as illustrated by an arrow **111** in FIGURE 16, an excellent piercing action occurs. Also, as the nose **108** enters the water, pressure forces upon the nose **108** are substantially equal on the top and bottom of the nose **108**, as illustrated by arrows **112** in FIGURE 16.

Also, as shown in FIGURE 16, water pressure upon the forward end portion of the pontoon **106** is greater upon the upper forward portion thereof, as illustrated by arrows **116**, than upon the lower forward end portion thereof, as illustrated by arrows **114**. Therefore, the pontoon **106** tends to remain horizontal and stable during forward movement thereof. Thus, the pontoon **106** is capable of good wave piercing action and is also capable of stability as the pontoon **106** moves forwardly.

As the watercraft **30** travels upon the water, the resilient pivotal connections shown in FIGURE 5 permit relative movement between the legs **36** and **38** and the load carrier member **32**, as illustrated in FIGURE 3. Furthermore, the resilient pivotal connection structure shown in FIGURE 6 permits relative movement between each of the auxiliary pontoons **40** and its respective strut **60** and main pontoon **68**, as illustrated in FIGURE 3. As the pontoons or floats **68** and **40** pierce the waves and enter and exit therefrom at various angles, some degree of shock or impact forces or the like are exerted thereupon. However, the entire structure of the watercraft **30** is capable of absorbing such forces as a result of the resilient pivotal connections illustrated in FIGURES 3, 5, and 6.

FIGURES 17 and 18 show a watercraft **120** of this invention which is provided with a load carrier member **122**. Leg members **126** and **128** are attached to the load carrier member **122**. The attachment of the leg members **126** and **128** to the load carrier member **122** is preferably in the manner shown in FIGURE 5. However, other means of attachment may be satisfactory. The legs **126** and **128** are attached to auxiliary pontoons or floats **130** in the manner illustrated in FIGURE 6 or in any other suitable manner. A strut member **132** joins each auxiliary pontoon or float **130** to a main pontoon or float **134**. Each pontoon **134** is shown as being provided with trim tabs or fins **136**.

Each of the main pontoons or floats **134** is shown as having an elongate nose **138** which is similar to the nose **108** described above with respect to the pontoon **106** shown in FIGURE 16. However, each main pontoon or float **134** may have a forward end portion similar to that shown in FIGURES 13 and 15 or of any other suitable shape.

A strut **140** is attached to the load carrier member **122** and extends downwardly therefrom at the central portion thereof. A motor or engine housing **142** is attached to the strut **140** at the lower portion thereof. A propeller **144** or the like is operatively attached to an engine or motor, not shown, within the housing **142** for propulsion of the watercraft **120**. Suitable conductors for control or for air or

the like may extend through the strut **140** from the load carrier member **122** to the motor or engine within the housing **142**.

FIGURES 19, 20, and 21 illustrate movement of the pontoons **130** and **134** during travel thereof in a direction as shown by an arrow **145**. The main pontoons **134** readily pierce the water and substantially one-half of the volume thereof remains above the water, as shown in FIGURE 19.

The main pontoons **134** readily pierce waves, as illustrated in FIGURE 20, and if the waves are of sufficient height, the auxiliary pontoons **130** also pierce the waves and provide additional buoyancy to the watercraft **120** to urge the watercraft **120** toward a more level or more horizontal condition, as illustrated in FIGURE 21.

FIGURES 22 and 23 illustrate means which have been provided to reduce the frictional forces between the main pontoons **134** and the water at the surface of the pontoons **134**. A conduit member **148** extends downwardly through each strut **132** to its respective main pontoon **134**. Each conduit member **148** preferably has the upper end thereof adjacent the load carrier member **122**. Within each pontoon **134** a closed chamber **150**, which is shown in FIGURES 22 and 23, is formed by partition members **152** and **154**, shown in FIGURE 23. The remainder of the internal region of each pontoon **134** comprises an air chamber **155** which has openings **156** which communicate externally. Prefereably, at least some of the openings **156** are located in portions of the surface of the pontoon **134** at which the greatest changes in diameter thereof occur, as shown in FIGURE 23.

The conduit member **148** terminates within the air chamber **155**. Air or other gas is forced downwardly through the conduit member **148** and into the air chamber **155**.

As the watercraft **120** travels upon or through the water, air or other gas within the chamber **155** flows outwardly from the pontoon **134**, as illustrated by arrows **158** in FIGURE 22, and mixes with the water at the surface of the pontoon **134**. This mixture produces a foam or the like which covers substantially the entire exterior surface of the pontoon **134** which is within the water, as illustrated in FIGURE 23. The foam at the surface of the pontoon **134** serves as a lubricant and reduces the frictional forces between the pontoon **134** and the water as the pontoon **134** moves upon or through the water.

As the air or other gas flows from the pontoon **134** at portions of the surface thereof at which the greatest changes in diameter occur, the foam created provides a cushion and reduces the impact forces which normally occur at these regions of the pontoon **134**. Thus, the pontoon **134** is capable of movement through water at a higher rate of speed and with the expenditure of less energy for such movement than would otherwise be possible.

It is to be understood that other means may be provided within the purview of this invention for applying a gas such as air or the like to the exterior surface of a pontoon for reducing frictional and impact forces thereupon.

Each of the pontoons shown herein has forward and rear end portions which are substantially the same in shape. However, the pontoons do not need to have the same shape at each end thereof.

It is to be understood that a watercraft of this invention is capable of rapid travel over the surface of water which is wavy or smooth. Due to the fact that the pontoons are wave piercing float members, the direction of travel of the watercraft is continuously more horizontal than is possible with other watercraft which travel above the surface of the water. Thus, a load carried by the load carrier member travels more smoothly. Also, due to the fact that the pontoons are long and slender the energy required for movement through or upon the water is a minimum in consideration of the load carrying capacity thereof. Furthermore, the auxiliary pontoons of the watercraft provide means for stabilizing the travel of the watercraft when necessary and without adding resistance to forward motion except when employed for increasing the buoyancy of the watercraft.

Although the preferred embodiment of the invention has been described, it will be understood that within the purview of this invention various changes may be made in the form, details, proportion and arrangement of parts, the combination thereof and mode of operation to provide structure within the scope of the appended claims and to accomplish the objects set forth.

The invention having thus been described, the following is claimed:

1. A watercraft comprising:
- main float means, the main float means normally floating upon the surface of the water,
- auxiliary float means being disposed at a higher elevation than the main float means,
- load carrier means disposed at a higher elevation than the main float means,
- means connecting the load carrier means to the float means.

2. The watercraft of claim **1** in which the main float means includes a pair of elongate main pontoons disposed in spaced-apart parallel relationship and laterally disposed with respect to the carrier means, the auxiliary float means including a pair of elongate auxiliary pontoons, there being one auxiliary pontoon disposed in substantially parallel relationship with each of the main pontoons.

3. The watercraft of claim **1** which includes propulsion means carried by the watercraft for movement thereof.

4. The watercraft of claim **3** in which the propulsion means are carried by the main float means.

5. The watercraft of claim **3** in which the propulsion means are carried by the load carrier means.

6. The watercraft of claim **1** in which the means connecting the load carrier means to the float means includes arm means, and means attaching the arm means to the load carrier means and to the float means.

7. The watercraft of claim **6** in which the means attaching the arm means to the load carrier means and to the float means includes pivotal means.

8. The watercraft of claim **7** in which the means attaching the arm means to the load carrier means and to the float means also includes resilient means.

9. The watercraft of claim **2** in which the means joining the pontoons to the load carrier means includes arm members which are pivotally attached to the load carrier means and which are attached to the auxiliary pontoons, and connector means joining each of the auxiliary pontoons to its respective main pontoon.

10. The watercraft of claim **2** in which each of the elongate pontoons is substantially circular in cross-section and in which the ratio between the length of each pontoon and the diameter thereof is in the range of from 10 to 1, to 50 to 1.

11. The watercraft of claim **1** which includes means for supplying air or other gas to the external surface of the float means so that a foam is created at the external surface of the float means.

12. The watercraft of claim **2** in which each of the main pontoons has a tip at the forward end thereof, the tip being below the longitudinal axis of the main pontoon.

13. The watercraft of claim **2** in which each main pontoon has an elongate nose at the forward end thereof.

14. The watercraft of claim **13** in which the elongate nose is below the longitudinal axis of the main pontoon.

15. The watercraft of claim **13** in which the elongate nose has a length which is substantially equal to two to four times the transverse dimension of the main pontoon.

16. The watercraft of claim **14** in which the elongate nose has a transverse dimension which is substantially equal to one-fourth the transverse dimension of the main pontoon.

17. The watercraft of claim 1 in which the load carrier means is disposed at a higher elevation than the auxiliary float means.

18. A watercraft comprising:

a plurality of main pontoons which are adapted to be normally in engagement with the surface of the water for support of the watercraft,

a plurality of auxiliary pontoons, each auxiliary pontoon being disposed at a higher elevation than the main pontoons,

a load carrier member disposed at a higher elevation than the auxiliary pontoons,

connector means joining the load carrier member to the auxiliary pontoons and to the main pontoons.

19. The watercraft of claim 18 in which the main pontoons are elongate.

20. The watercraft of claim 19 in which the auxiliary pontoons are elongate and substantially parallel with the main pontoons.

21. The watercraft of claim 18 in which the connector means includes a plurality of leg members, there being at least one leg member connecting the load carrier member to each of the auxiliary pontoons, and a plurailty of strut members, there being at least one strut member connecting each auxiliary pontoon to a main pontoon.

22. The watercraft of claim 18 in which each main pontoon has a volume such that substantially one-half

of the main pontoon is normally submerged when a normal load is carried by the load carrier member.

23. The watercraft of claim 18 in which each main pontoon has a plurality of fluid outlets at the exterior surface thereof, means for supplying a gas to the main pontoons and for forcing the gas outwardly from the main pontoons through the fluid outlets.

24. The watercraft of claim 20 in which each main pontoon is substantially circular in cross-section and in which the ratio between the length of each main pontoon and the diameter thereof is in the range of from 10 to 1, to 50 to 1.

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