United States Patent

Szptyman

[15] **3,702,598**

[45] **Nov. 14, 1972**

[54] **WATERCRAFT**

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[21] Appl. No.: **150,419**

[52] **U.S. Cl.** .....**114/67 A,** 114/66.5 R
[51] **Int. Cl.** **B63b 1/38**
[58] **Field of Search** .....114/66.5 R, 67 A, 61, 62

[56] **References Cited**

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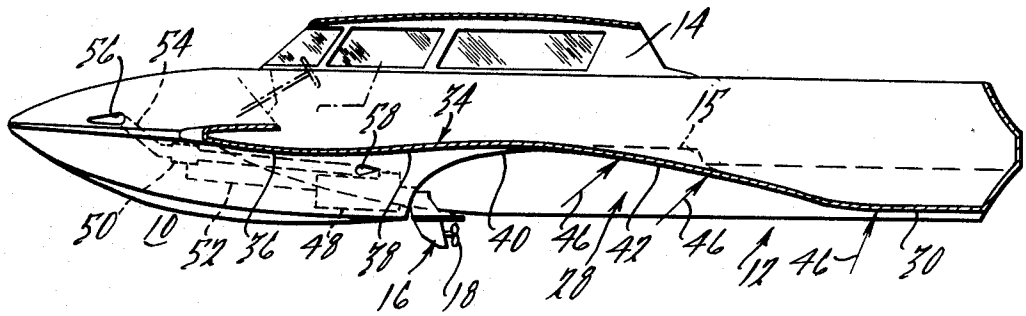
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[57] **ABSTRACT**

A watercraft having a tunnel hull with an aerodynamic curvilinear lifting surface and a propulsion means forward of the aerodynamic lifting surface. The tunnel preferably longitudinally extends substantially the full length of the boat and receives a continuous air flow derived from the forward motion of the craft which acts on the aerodynamic lifting surface to provide a craft lifting force. The craft may be optionally provided with a second air flow passage for the tunnel which includes an air propelling means supplying forced hot air to the tunnel forward of the lifting surface to aid in the generation of the lifting force. In its preferred form, the lift surface has an air foil-like cross section which provides a concave trapping area to augment the lifting effect of the aerodynamic lifting surface. In a first embodiment, a single propulsion device is shown while in a second embodiment three propelling devices and two aerodynamic lifting surfaces are shown in tandem.

19 Claims, 8 Drawing Figures



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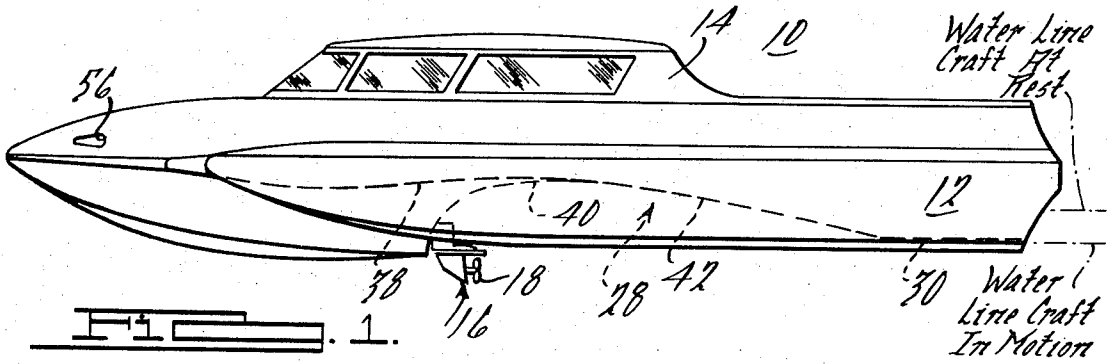


FIG. 1.

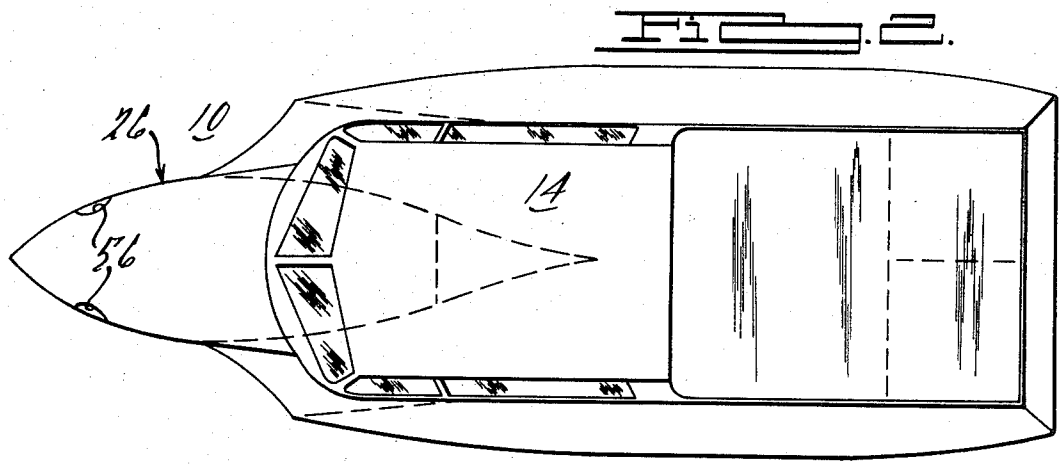


FIG. 2.

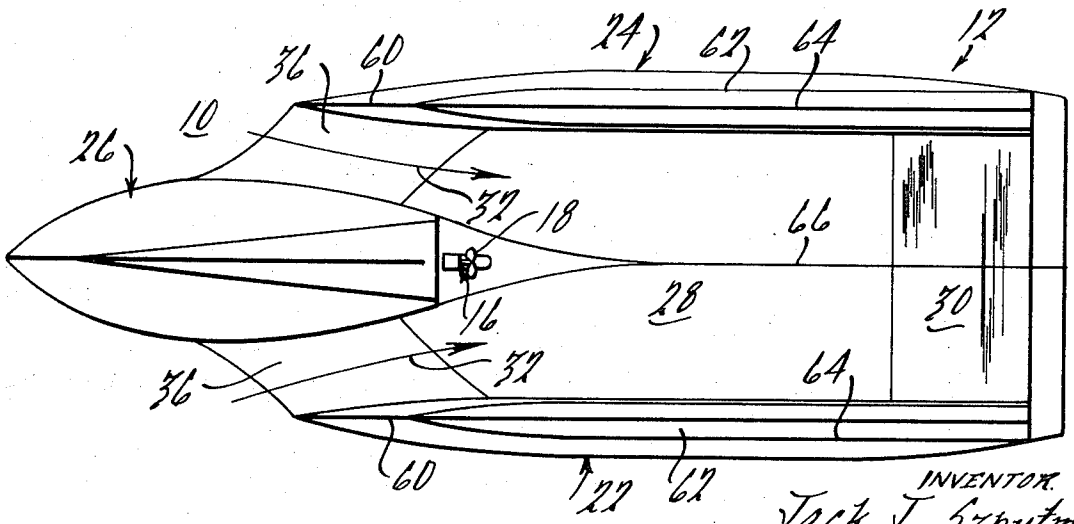


FIG. 3.

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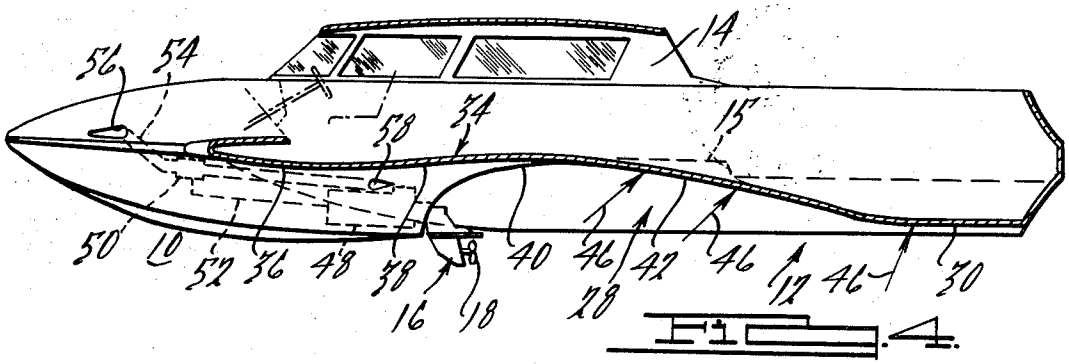


FIG. 4.

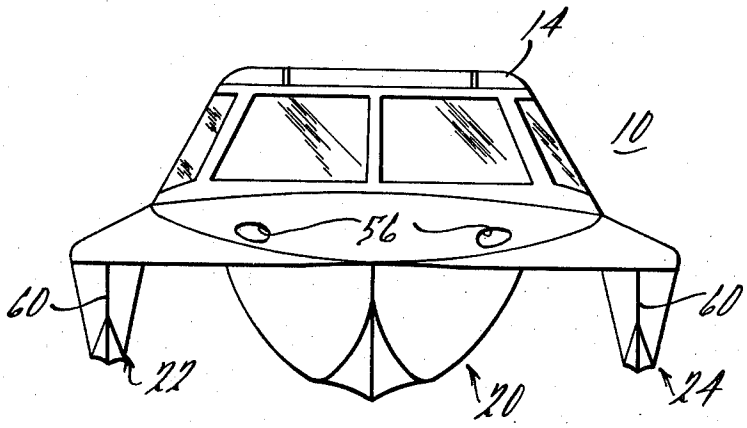


FIG. 5.

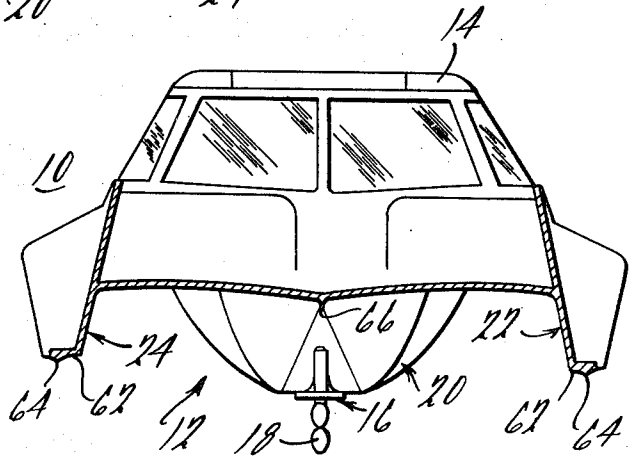
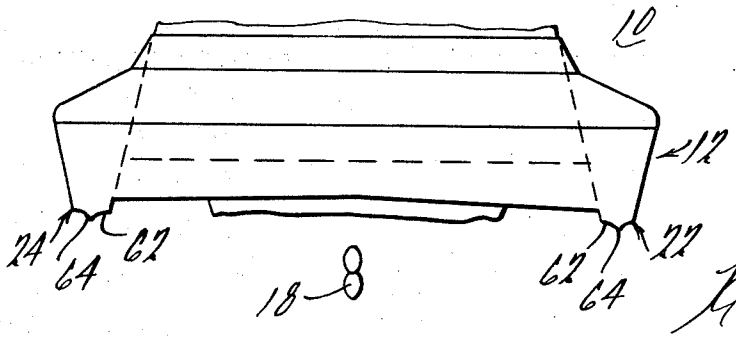


FIG. 6.

FIG. 7.



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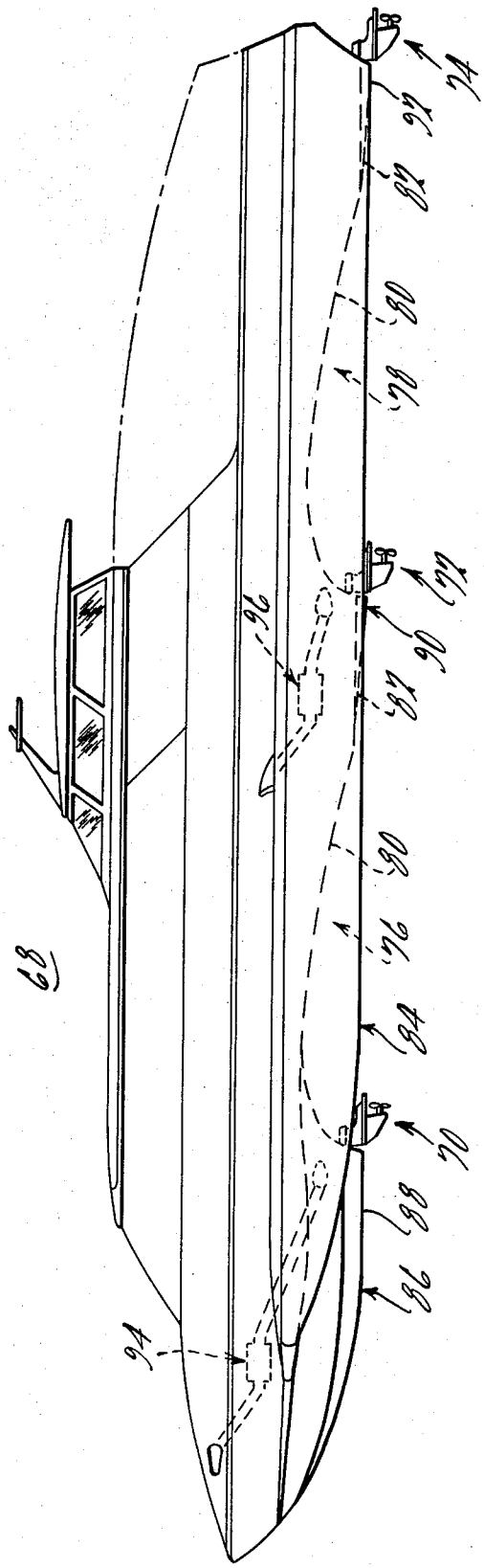


FIG. 3

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WATERCRAFT

BACKGROUND AND SUMMARY OF THE INVENTION

The present invention relates to propelled watercraft, and particularly, to watercraft having longitudinally extending tunnels to effect an aerodynamic lifting force to reduce the weight of the craft which is borne by the water. The present invention provides an improved high speed watercraft which may be generally characterized as having a forward propulsion means in combination with a longitudinally extending tunnel having an aerodynamic lifting surface positioned aft of the propulsion means which is curvilinearly configured so as to trap and to be reacted on by air flowing through the tunnel to provide a generally upwardly acting lifting force which reduces the portion of the craft weight borne by the water. The basic design may be combined with blowers or the like for generating heated air which is directed at the lifting surface to increase the lifting forces generated at the surface. The combination of the front propulsion means with an aftwardly located lifting surface provides a craft of high maneuverability and stability, low drag, desirably reduces stern squat, and controls the pitch attitude of the craft so that it is positioned at an optimum level when planing. In a preferred construction of the lifting surface of the watercraft of this invention, an air foil-like lifting surface is utilized which may be characterized as having an upwardly and aftwardly extending forward surface portion, a generally horizontally extending mid surface portion, and a downwardly and aftwardly extending aft surface portion with each of the surface portions smoothly blending one into the other to provide a continuous curved surface. Preferably, the curved lifting surface is located at the mid portion of the watercraft while a generally horizontally oriented flat lifting surface may be located at the aft portion of the watercraft. In the preferred embodiment, the tunnel is bifurcated at its forward end by a central hull portion which conveniently serves as the passenger and cargo containing section of the watercraft.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side view of a watercraft incorporating a hull configuration and propulsion means location according to the present invention;

FIG. 2 is a top view of the watercraft of FIG. 1;

FIG. 3 is a bottom view of the watercraft of FIG. 1;

FIG. 4 is a side cross-sectional view of the watercraft of FIG. 1;

FIG. 5 is a front view of the watercraft of FIG. 1;

FIG. 6 is an end cross-sectional view of the watercraft of FIG. 1; FIG. 7 is a partial rear view of the watercraft of FIG. 1; and

FIG. 8 is a side view of an alternative embodiment of the watercraft according to this invention having two lifting surfaces and three propelling means located in tandem along the longitudinal axis of the craft.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

In FIGS. 1–7 a watercraft **10** is illustrated which includes a hull **12**, a cabin **14** having a floor **15**, and a propulsion means including a drive **16** which is located

forward of the center line of the watercraft **10**. The detailed construction of the cabin **14** forms no part of this invention, and accordingly, will not be described in detail.

The drive **16** may be an inboard/outboard drive unit having a propeller **18** for providing a reaction force in a well-known manner. The drive unit **16** may be pivotable about the vertical axis to provide a steering control for the craft in the well-known manner of inboard/outboard drives. The drive means **16** may be replaced by any other known drive means such as jet drive, fixed propeller with rudder, etc. Moreover, the propulsion means use any conventional engine such as internal combustion engine, turbine engine, steam engine, etc.

With particular reference now to FIGS. **3**, **5** and **6**, the hull can be seen to comprise a central portion **20** and a pair of side portions **22** and **24** respectively. Referring now to FIG. **3**, the central hull portion **20** includes a forward portion including a passenger or cargo pod **26** which is adapted to engage the water, a curvilinear aerodynamic lift surface **28**, and a flat lifting surface **30**. It can be seen that the central hull portion **20** together with the side hull portions **22** and **24** and the surface of the water form a longitudinally extending tunnel which is bifurcated at its forward end by the forward central hull portion **26**. In this regard, the hull is generally adapted to provide for a flow of air in the directions of the arrows **32**.

Referring now to FIG. **4**, the longitudinally extending tunnel has a generally horizontally disposed upper surface **36** which forms a tunnel entrance, the aforementioned lifting surface **28** comprising an upwardly and aftwardly extending surface portion **38**, a generally horizontally extending surface portion **40**, and a downwardly and aftwardly extending surface portion **42**, and the generally horizontally extending aft surface **30**. Each of the surfaces **30**, **36–42** smoothly merge to form a continuous curvilinear surface. As can be seen in the drawings, the surfaces **38**, **40** and **42** have a generally concave air foil-like cross section to receive and trap air flowing through the entrance **36**. An aerodynamic lifting force generated at the lifting surface **28** acts generally in the direction indicated by arrows **46**.

Referring now to FIG. **4**, the location of the drive unit **16** with respect to the lifting surface **28** can be seen. Preferably, a motor **48** is mounted ahead of the drive unit **16** and is directly coupled to the drive unit **16** to rotate the propeller **18**. It can be seen in FIG. **4** that the propeller **18** is located forward of the lifting surface **28**.

As can be seen in FIG. **3**, the side hull portions **22** and **24** are widely spaced to provide a high degree of lateral stability. Each side portion **22** and **24** is provided with a sharply angulated prow portion **60** which joins a generally horizontal planing surface **62**. The planing surface **62** is provided with a keel-like projection **64** which provides directional stability when the craft is under way. A similar keel-like projection **66** is provided along the lifting surface **28** of the craft **10** for a similar purpose.

The engine **48** also drives a pair of laterally spaced blowers **50** (only one shown) which are connected to the engine by a suitable drive means **52**. The blowers **50** are interposed in a pair of laterally spaced air

passage **54** which is wholly within the forward hull central portion **20** having respective inlet openings **56** near the bow of the boat and respective outlet passages **58** communicating with the tunnel. The blower arrangement supplies air, heated by virtue of the compression effect, to the tunnel for reaction against the lifting surface **28** to augment the lift provided by the flow of air along the paths defined as arrows **32** due of the headway of the craft **10**. Accordingly, there are two distinct air passages, one formed by the forward bifurcated part of the tunnel and the other formed within the forward hull central portion **26**, supplying air to the lifting surface **28** to provide an aerodynamic lifting effect.

The craft **10** sits at rest with a water line as indicated in FIG. **1**. The craft rises onto a plane, aided by the coaction of the forwardly located drive means **60** and the aerodynamic lift produced at the surface **28**. It should also be noted that the combination of the forward located propulsion means **16** and the aftwardly located lifting surface **28** eliminates stern squat thereby enabling the boat to transition onto a plane with a substantially horizontal attitude. After the boat has reached a planing position, as indicated by the upper water line in FIG. **1**, the forward mounted propulsion means **16** and the aftwardly located lifting surface **28** continue to coact to decrease drag and to provide enhanced maneuverability and stability.

The basic principle described with respect to the watercraft **10** in FIGS. **1–7** are generally applicable to any size craft and are readily susceptible to incorporation in larger craft wherein multiple propulsion means are desired. By way of illustration, a larger watercraft **68** is illustrated in FIG. **8** which incorporates three propulsion means **70**, **72** and **74** which are located in tandem along the longitudinal center line of the craft **68**, fore to aft respectively. The watercraft **68** includes a pair of lifting surfaces **76** and **78**, respectively, each having associated lifting surface portions **80** and **82** which correspond to lifting surface surface portions **42** and **30** of the embodiment of FIGS. **1–7**. The hull of the craft **68** has a pair of side portions **84** and a center portion **86** which together form a longitudinally extending tunnel communicating with lifting surfaces **76** and **78**. The tunnel is bifurcated at the downwardly extending hull portions **88**, **90** and **92**. It will be appreciated that the longitudinally extending tunnel provides a flow of air to lifting surfaces **76** and **78** to provide an aerodynamic lifting force as described with respect to the embodiment of FIGS. **1–7**. The lifting force provided by the flow of air through the longitudinally extending tunnel is augmented by forced air systems **94** and **96** for lifting surfaces **76** and **78**, respectively. It will be appreciated that the craft **68** is but one modification of the basic concepts of this invention, and other combinations and modifications are possible within the scope of the teachings of the inventions.

What is claimed is:

1. A craft which is at least partially water borne and is adapted to be forwardly propelled along a longitudinal axis of the craft comprising:

a hull having central portion and a pair of side portions defining at least one longitudinally extending tunnel, said central hull portion including a generally downwardly facing aerodynamic lifting surface which defines at least a portion of said tunnel and which is configured to provide an upwardly acting aerodynamic force applied to said craft in response to a flow of air through said tunnel acting on said aerodynamic lifting surface to reduce the water borne portion of the weight of said craft;

air passage means for supplying air to said tunnel which acts upon said aerodynamic lifting surface to provide said aerodynamic force; and

propulsion means including drive means for propelling said craft with said drive means being located forwardly of said aerodynamic lifting surface.

2. A craft according to claim **1** wherein said tunnel substantially extends the full length of said craft.

3. A craft according to claim **1** wherein said tunnel is forwardly opened at least during propulsion of said craft to provide said air passage means with a longitudinally extending part of said air passage means being at least partially defined by said hull central portion and the surface of said water.

4. A craft according to claim **1** wherein said air passage means extends internally of said hull central portion so that at least a longitudinally extending part of said air passage means is wholly defined by said hull central portion.

5. A craft according to claim **1** wherein said air passage means is provided with blower means for forcing air through said air passage means.

6. A craft according to claim **1** wherein a longitudinally forward part of said hull central portion is adapted to be in engagement with said water to support at least a portion of the weight of said craft.

7. A craft according to claim **1** wherein said aerodynamic lift surface is a continuously curved surface.

8. A craft according to claim **1** wherein said aerodynamic lift surface has a generally air foil-like cross-section.

9. A craft according to claim **1** wherein said aerodynamic lift surface is a concave surface for trapping air from said air passage means.

10. A craft according to claim **9** wherein said aerodynamic lift surface is a continuously curved surface.

11. A craft according to claim **10** wherein said aerodynamic lift surface has a generally air foil-like cross section.

12. A craft according to claim **11** wherein said concave surface has a substantially horizontally extending mid surface portion which smoothly merges with a downwardly and aftwardly extending aft surface portion.

13. A craft according to claim **12** wherein said aerodynamic lift surface has an upwardly and aftwardly extending forward surface portion which smoothly merges with said mid surface portion.

14. A craft according to claim **5** wherein said drive means is associated with said longitudinally forward part of said hull central portion.

15. A craft according to claim **1** wherein said air passage means includes at least two air passages, a first of said pair of air passages being provided by a forwardly opened part of said tunnel so that said first of said pair of air passages is at least partially defined by

said hull central portion and a surface of said water, and a second of said pair of air passages extending internally of said hull central portion so that at least a part of said second of said pair of air passages is wholly defined by said hull central portion.

16. A craft according to claim 1 wherein said propulsion means provides a pair of drive means which are longitudinally spaced along said longitudinal axis of said craft with one of said drive means being located forwardly of said aerodynamic lifting surface.

17. A craft according to claim 1 further including a second generally downwardly facing aerodynamic lifting surface which defines at least a portion of said tunnel and which is configured to provide an upwardly acting aerodynamic force applied to said craft in response to a flow of air through said tunnel acting on said aerodynamic lifting surface to further reduce the water borne portion of the weight of said craft, said air passage means further supplying air which acts upon said second aerodynamic lifting surface to provide said aerodynamic force at said second aerodynamic lifting surface.

18. A craft according to claim 17 wherein said propulsion means provides a pair of drive means being longitudinally spaced along said longitudinal axis of said craft, one of said drive means being located forwardly of said first mentioned aerodynamic lifting surface and the second of said drive means being located forwardly of said second aerodynamic lifting surface.

19. A craft according to claim 14 wherein said longitudinally forward part of said hull central portion bifurcates said tunnel at the longitudinally forward part thereof.

* * * * *

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,702,598 Dated November 14, 1972

Inventor(s) Jack J. Szpytman

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

On the Abstract page the inventor's name is misspelled as "Jack J. Szptyman"; it should be --Jack J. Szpytman--.

Column 1, lines 55 to 57, the description of Figs. 6 and 7 should be in two paragraphs.

Column 3, line 41, delete "surface."

Signed and sealed this 29th day of May 1973.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents

FORM PO-1050 (10-69)

USCOMM-DC 60376-P69
* U.S. GOVERNMENT PRINTING OFFICE : 1969 O—366-334