July 5, 1966 S. M. TAYLOR 3,259,093

SAILBOAT HULL

Original Filed Sept. 11, 1964 3 Sheets-Sheet 1

FIG. 1

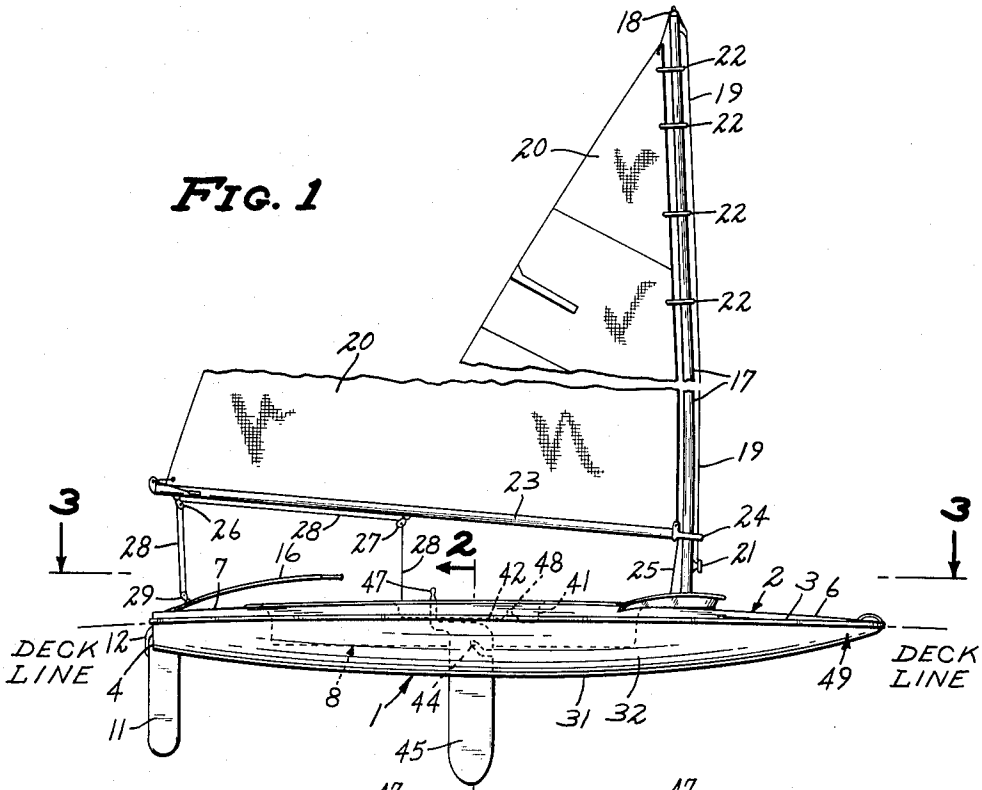
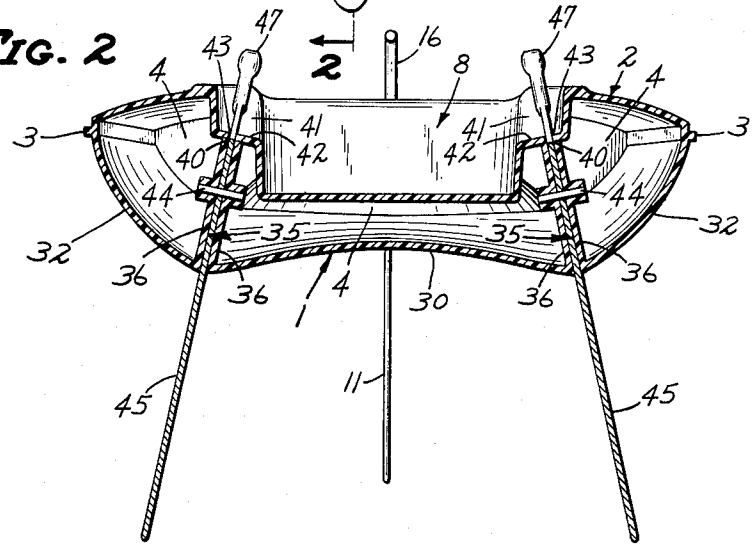


FIG. 2



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SAILBOAT HULL

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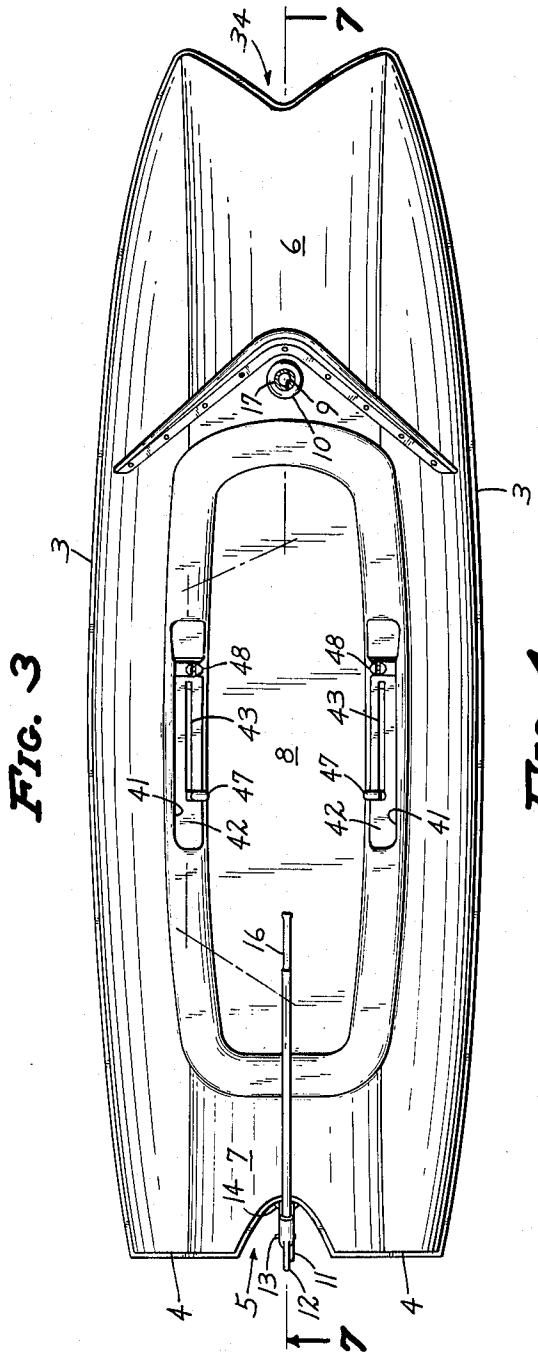


FIG. 3

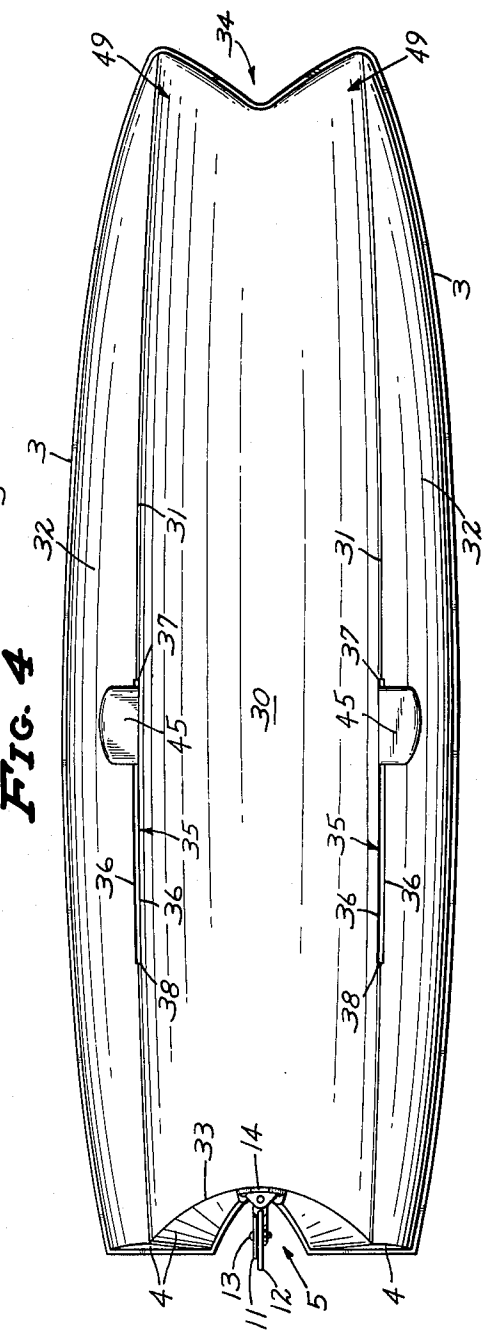


FIG. 4

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SAILBOAT HULL

Original Filed Sept. 11, 1964 3 Sheets-Sheet 3

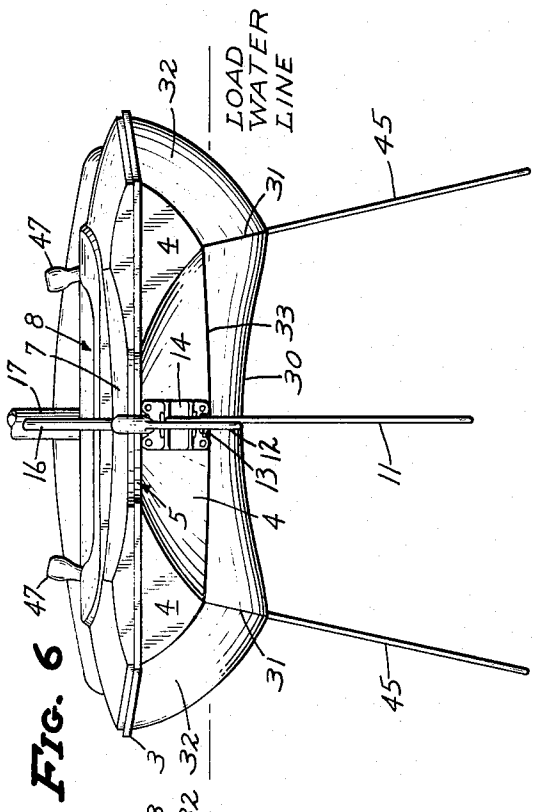


FIG. 6

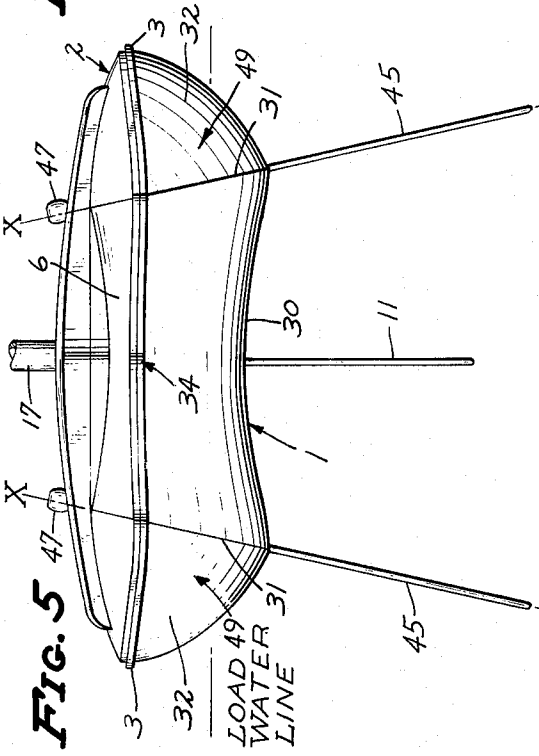


FIG. 5

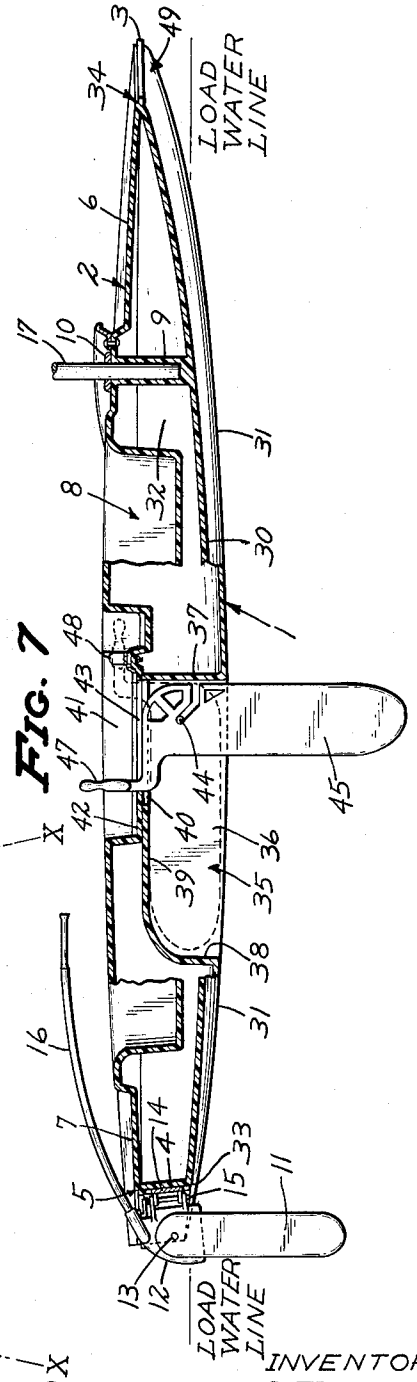


FIG. 7

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United States Patent Office 3,259,093 Patented July 5, 1966

3,259,093

SAILBOAT HULL

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Continuation of application Ser. No. 395,832, Sept. 11, 1964. This application Oct. 7, 1965, Ser. No. 495,766
7 Claims. (Cl. 114—66.5)

This application is a continuation of my copending United States patent application, Serial No. 395,832, filed September 11, 1964, and entitled, "Sailboat Hull."

This invention relates generally to sailboats and more particularly to improvements in the contours of sailboat hulls.

The primary object of this invention is the provision of a sailboat hull having a form which contributes to the highest operating efficiency of the hull in its movement through the water.

More specifically, an important object of this invention is the provision of a sailboat hull which is able to resist the lateral tipping thrust applied thereto by the wind whereby to prevent excessive heeling of the boat.

Another object of this invention is the provision of a sailboat hull which enables a sailboat of a given size and weight to carry a greater area of sail than heretofore.

Another object of this invention is the provision of a sailboat hull which tends to travel in a substantially straight line when in a normally heeled over condition, being devoid of excessive tendency to turn into or away from the wind as a result of uneven hydrodynamic forces acting thereon.

Another object of a preferred form of this invention is the provision of a sailboat hull having a broad bow form capable of dividing the water during movement into waves whereby to promote smooth efficient forward movement through choppy water.

Still another object of a preferred form of this invention is the provision of a sailboat hull having a form which produces the operating characteristics of an efficient low speed displacement hull, an efficient high speed displacement hull and a planning hull; and which effects a smooth transition from one hull characteristic to another during changes in the disposition of the hull in the water as well as during changes in the speed of movement of the boat.

To the above ends, I provide, in general, in the preferred form of my invention herein described, a hull comprising a bottom and an upwardly projecting transom at the stern end of the bottom, the bottom and transom having upper marginal edges defining a deck line, the bottom having a cross-sectionally downwardly facing concave central portion extending substantially the full length of the hull and the side edges of which define a pair of longitudinal keel lines disposed in laterally spaced relationship for substantially the full length of the hull. Further, the bottom includes bottom side portions curving laterally outwardly and upwardly from the keel lines to the deck line to provide a cross-sectionally outwardly convex contour, the concave bottom portion and the keel line curving upwardly from the longitudinally substantially central portions thereof in a rearward direction to the bottom of the transom and in a forward direction to said deck line at the bow of the hull, the concave contour of the central bottom portion at the area of intersection with the deck line at the bow causing that portion of the deck line to define a forwardly opening generally V-shaped notch. Further, I curve the keel lines laterally inwardly at their opposite end portions to the extent that each of these keel lines is disposed in a plane extending longitudinally of the hull and sloping upwardly and inwardly toward the plane of the opposite keel line. Thus, when the hull is running in a predetermined heeled over condition, the forward and aft curved portions of the leeward keel

line are disposed in a generally vertical plane, and that portion of the hull on opposite sides thereof provides a shape of a long, narrow substantially symmetrical hull.

The above, and further highly important objects and advantages of my invention will become apparent from the following detailed specification, appended claims and attached drawings.

Referring to the drawings, which illustrate the invention, and in which like reference characters indicate like parts throughout the several views:

FIG. 1 is a view in side elevation of a sailboat made in accordance with this invention, some parts being broken away;

FIG. 2 is an enlarged transverse section taken on the line 2—2 of FIG. 1;

FIG. 3 is an enlarged view partly in plan and partly in section, taken substantially on the line 3—3 of FIG. 1;

FIG. 4 is a view in bottom plan;

FIG. 5 is a fragmentary view in front elevation;

FIG. 6 is a fragmentary view in rear elevation; and

FIG. 7 is a fragmentary longitudinal section taken on the irregular line 7—7 of FIG. 3.

In the preferred embodiment of the invention illustrated, a sailboat hull is shown as comprising a bottom **1** and a cooperating top **2** rigidly secured together at their marginal edges to provide a peripheral flange **3** which acts as a rub rail and defines the deck line of the hull. The stern end of the hull bottom **1** is formed to provide an upwardly projecting transom **4** which, with the stern end of the top **2**, is formed to provide a rearwardly opening generally U-shaped notch **5**, see FIGS. 3 and 4. The top **2** is formed to provide a fore deck **6**, an after deck **7**, and a cockpit **8** amidships. Forwardly of the cockpit **8**, the top **2** is provided with an upwardly opening mast-receiving cup or socket **9** the lower end of which is rigidly secured to the underlying portion of the bottom **1** and the upper end of which is reinforced by a metallic ring **10** suitably secured to the fore deck **6**. The bottom **1** and top **2** may be made from any suitable material, but are preferably made from molded plastics such as fiberglass or the like and heat sealed or rigidly secured together by well known adhesives suited to this purpose.

Means for steering the boat comprises a rudder **11** that is pivotally secured at its upper end to a rudder head **12** by means of a nut-equipped bolt or the like **13**, the rudder head **12** being hinged to a bracket **14** by means of a hinge pintle **15**, the bracket **14** being rigidly secured to the transom **4**. A tiller **16** is secured to the upper end of the rudder head **12** and extends forwardly therefrom, terminating at its forward end in overlying relationship to the stern end portion of the cockpit **8**.

A mast **17** has its lower end seated in the socket **9** and extends generally vertically upwardly therefrom, being provided at its upper end with a masthead fitting **18** through which extends a halyard **19**, one end of the halyard **19** being secured to the head portion of a generally triangular sail **20**. The opposite end of the halyard **19** is adapted to be secured to a cleat **21** mounted on the mast **17** near the fore deck **6**. The luff portion of the sail **20** is secured to the mast **17** by a plurality of rings **22** loosely slidably mounted on the mast **17**, the lower end portion or foot of the sail **20** being removably secured to a boom **23** the front end of which is swingably and slidably secured to the mast **17** by a so-called gooseneck fitting **24**. The fitting **24** is provided with the usual downhaul **25**, and the boom **23** has secured thereto a pair of pulleys or blocks **26** and **27** for reception of a sheet or rope **28** that is secured at one end to the block **26** and which extends from thence to a block **29** secured to the rear end portion of the tiller **16** and from thence back to the block **26**, and over to the block **27** from whence the same may extend

directly to the hands of the operator or to a sheet hook or block, not shown, but located within the cockpit 8. If a sheet hook block is used, the sheet 28 extends upwardly from thence to the hands of the operator. The mast, sail and boom structure, together with the fittings and lines pertaining thereto do not in and of themselves comprise the instant invention. Hence, in the interest of brevity, further detailed showing and description thereof is omitted.

The bottom 1 is formed to provide a cross-sectionally downwardly facing concave central portion 30 that extends substantially the full length of the hull, the concavity being deepest at the bow end portion of the hull and diminishing toward the stern thereof to the extent that at the transom 4, the central bottom portion 30 is substantially flat. At the side edges of the concave bottom portion 30, the bottom 1 defines a pair of longitudinal keel lines 31 that are disposed in laterally spaced relationship for the full length of the hull. Laterally outwardly of the keel lines 31, the bottom 1 is formed to provide bottom side portions 32 that curve laterally outwardly and upwardly from their respective keel lines 31 to the deck line defined by the flange 3, the bottom side portions 32 extending from the transom 4 to the bow end of the hull. With reference to FIGS. 3 and 4, it will be seen that the deck line defined by the flange 3 at opposite sides of the hull curve laterally inwardly from the longitudinally central portions thereof toward the bow and stern ends of the hull. With reference particularly to FIG. 4, it will be seen that at the stern end of the hull, the deck line is laterally outwardly spaced from the keel lines 31, and that at the bow end of the boat, the sides of the hull converge with their adjacent keel lines 31 and intersect the same at the bow end of the hull. It will be further noted that the keel lines 31 are slightly outwardly bowed when viewed from the bottom as in FIG. 4, the keel lines 31 curving laterally inwardly toward each other at their opposite end portions.

With reference to FIGS. 1 and 7, it will be seen that the concave bottom portion 30 and keel lines 31 curve upwardly from the longitudinally central portion of the hull in a rearward direction toward the bottom of the transom 4, the bottom portions 30 and 32 cooperating with the transom 4 to define a relatively sharp corner edge 33. Further, the concave bottom portions 30 and keel lines 31 curve upwardly from the longitudinally central portion of the hull in a forward direction to the deck line defined by the flange 3 at the bow end of the hull, the bow end of the hull at the deck line being formed to define a forwardly opening generally V-shaped notch 34.

The compound lateral and upward curvature of the keel lines 31 is such that each keel line 31 is disposed in a plane extending longitudinally of the hull and sloping upwardly and laterally inwardly toward the plane of the opposite keel line 31. The planes of the opposite keel lines 31 are shown by broken lines x—x in FIG. 5, these planes being preferably angularly displaced on the order of 12° to 16° from the vertical. Thus, when the hull is laterally tilted or disposed in a predetermined heeled disposition in the water, the plane of the leeward keel line 31 is substantially vertical.

Generally amidships, the bottom 1 is formed to provide a pair of downwardly opening wells 35 each having opposed side walls 36, front and rear walls 37 and 38, respectively, and a top wall 39 having a slot-like opening 40 therein extending longitudinally of the hull. The wells 35 open downwardly through the bottom 1 at the keel lines 31 thereof and are disposed in the planes of their respective keel lines 31, see particularly FIGS. 2 and 4. The top 2 is formed to provide laterally inwardly and upwardly opening recesses 41 having bottom walls 42 disposed normal to the planes of their respective keel lines 31 and having slots 43 therein aligned with the slots 40 in the top walls 39 of the wells 36, see particularly FIGS. 2 and 7. A pair of hinge pins or trunnions 44 each extend transversely through a different one of the wells 35 at the forward end portions thereof and are suitably anchored in the side walls 36 thereof, the trunnions 44 being disposed normal to the planes x—x of their respective keel lines 31. A pair of leeboards 45 are each received in a different one of the wells 35 and are formed to provide relatively deep notches 46 for reception of the trunnions 44 whereby the leeboards 45 are pivotally mounted in the wells 35 for swinging movements between depending operative positions shown by full lines in FIG. 7 and inoperative positions shown by dotted lines in FIG. 7. The leeboards 45 are provided with handle-equipped operating arms 47 that extend upwardly through the slot-like openings 40 and 43 and which are adapted to be operatively engaged by spring clips 48, of conventional construction, when the leeboards 45 are swung upwardly to their inoperative positions within their respective wells 35. The leeboards 45 slidably engage the side walls 36 of their respective wells 35 and are held thereby in the planes x—x of their respective keel lines 31 in all positions of the swinging movement of the leeboards 45.

With reference to FIGS. 2, 5 and 6, it will be seen that the laterally outward and upward curve of the bottom side portions 32 provide the bottom side portions 32 with an outwardly facing convex contour. This contour, together with the downwardly facing concavity of the central bottom portion 30 causes the areas of greatest buoyancy to be located adjacent the keel lines 31. This arrangement causes the hull to possess a high resistance to the tipping torque applied against the sail by the wind due to the shifting of a large portion of the buoyancy of the hull toward the lee side of the hull as the same tilts or heels over. The resulting stability of the hull in the water enables the boat to carry a sail having a substantially larger area than conventional hulls of like size and weight.

During movement of the hull through the water with the hull in a level condition or trim from side to side, it operates efficiently as a low speed displacement hull due to the long gentle upward curve of the central bottom portion 30 and keel lines 31 from the longitudinally central portion of the hull toward the transom 4 and the bow, with these portions terminating above the normal load water line. The concavity of the central bottom portion 30 at the forward end portion of the boat and the shape of the bow thereof produces a pair of laterally spaced stems, indicated generally at 49, which cut through waves to eliminate pounding of the water against the bottom of the hull. At higher speeds, the hull planes easily in its side-to-side trim condition due to the concavity of the forwardly and upwardly sloping bottom portion which provides hydrodynamic lift, the relatively broad flat area of the bottom at the stern which provides hydrodynamic support, the shallow angle between the bottom surface and the surface of the water which prevents formation of a stern wave, and the sharp corner edge at the bottom of the transom which permits efficient release of contact between the water and the hull.

When the boat is heeled over on one keel line 31, the shape that is presented to the water is that of a long narrow and nearly symmetrical high-speed displacement hull with a truncated stern the bottom portion of which operates below the water line. With the hull tipped or heeled to an angle of substantially 12 to 16° so that the leeward keel line is substantially vertical, the hull operates in a manner similar to a conventional single stem boat when sailed flat or in side-to-side trim. It will be borne in mind that a conventional single stem sailboat is most efficient when operating in side-to-side trim, and when operating in a heeled condition tends to turn into the wind due to the uneven hydrodynamic force of the water acting on opposite sides of the bow. This turning tendency must be corrected with rudder pressure which slows the forward progress of the boat. The hull of this invention, when heeled to an angle of approximately 12 to 16° runs in a straight line and passes efficiently through the water

without the necessity of using the rudder to compensate for a tendency to turn into the wind. Further, by forming the transom in the shape of a rearwardly opening generally U-shaped notch, the length of the water line on the side portion of the bottom is preserved when the hull is heeled and is operating as a high speed displacement hull. Still further, when the boat is planing in side-to-side trim, as heretofore mentioned, the notch of the transom permits the water to be released from the bottom surface of the hull at a more shallow angle than would exist if the bottom surface continued in its rearward and upward curve to the plane of the sternmost portions of the transom.

From the foregoing, it will be seen that the hull of this invention will operate with extreme efficiency over a broad range of speeds, due to the fact that it can be operated as a low speed displacement hull or a high speed planing hull when running in side-to-side trim, or as a high speed displacement hull when in a heeled position, as sailing conditions demand or in accordance with the desires of the operator. The provision of laterally spaced keel lines at the opposite side edges of a concave bottom portion and the contour of the bottom side portions, impart extreme stability to the hull and efficiency of movement thereof through relatively choppy as well as relatively smooth water.

The particular shape of the bottom, as above described, permits for a highly smooth transition from one hull characteristic to another during changes in the disposition of the hull in the water caused by changes of speed and direction of movement of the hull relative to the direction of the wind.

This invention has been thoroughly tested and found to be completely satisfactory for the accomplishment of the objectives set forth; and, while I have shown and described a commercial embodiment of my sailboat hull, it will be understood that the same is capable of modification without departure from the spirit and scope of the invention, as defined in the claims.

What is claimed is:

1. A sailboat hull comprising an elongated bottom and an upwardly projecting transom at the stern end of said bottom, said bottom and transom having an upper marginal edge defining a deck line, said bottom having a cross-sectionally downwardly facing concave central portion extending substantially the full length of the hull, said bottom including bottom side portions curving laterally outwardly and upwardly from opposite sides of said central bottom portion to said deck line, said bottom defining a pair of keel lines disposed in laterally spaced relation for substantially the full length of the hull, each of said keel lines for substantially the full length of that portion of the hull below its normal load water line being disposed in a different one of a pair of planes, each plane extending in a direction substantially parallel to the longitudinal dimension of the hull and each plane being angularly displaced from the vertical and sloping upwardly and inwardly toward the plane of the opposite keel line, said keel lines being curved generally upwardly in their respective planes from the longitudinally central portions of said keel lines toward the opposite ends thereof, whereby vertical projections of said keel lines are bowed in directions in which said keel lines are spaced apart a greater distance at the longitudinally central portions of said keel lines than at the opposite ends thereof and horizontal projections of said keel lines curve upwardly from the longitudinally central portions of said keel lines toward the opposite ends thereof, said concave central bottom portion at the longitudinally central portion thereof being disposed below the normal load water line of the hull when the hull is level from side to side, said concave central portion and said keel lines forwardly of the longitudinally central portions thereof curving upwardly above the normal load water line of the hull at the bow end thereof, said concave central bottom portion and said keel lines rearwardly of the longitudinally central portions thereof curving generally upwardly toward said transom, said concave central bottom portion being a smooth and continuous uninterrupted concave curved surface for substantially the full length of the hull between said keel lines, the depth of the concavity of the central bottom portion gradually diminishing adjacent the stern portion of the hull to define a generally flat planing surface, the arrangement being such that, when the hull is tilted laterally in a given direction to a predetermined degree, one of said keel lines for substantially the full length of that portion of the hull below its normal load water line is disposed in a vertical plane substantially parallel to the longitudinal dimension of the hull.

2. The sailboat hull of claim 1 in which each of said keel lines is disposed in its respective plane for substantially the full length of the hull and in which said bottom defines a pair of laterally spaced bow portions which are substantially symmetrical in cross section about their respective keel line planes, said concave bottom portion and said bow portions intersecting said deck line at the bow end of the hull to define a forwardly opening generally V-shaped notch.

3. A sailboat hull comprising an elongated bottom and an upwardly projecting transom at the stern end of said bottom, said bottom and transom having an upper marginal edge defining a deck line, said bottom having a cross-sectionally downwardly facing concave central portion extending substantially the full length of the hull and the side edges of which define a pair of longitudinal keel lines disposed in laterally spaced relationship for the full length of the hull, said bottom including bottom side portions projecting laterally outwardly and upwardly from said keel lines to said deck line, said keel lines each being disposed in a different one of a pair of planes, each plane extending in a direction parallel to the longitudinal dimension of the hull and each plane being angularly displaced from the vertical and sloping upwardly and inwardly toward the plane of the opposite keel line, said keel lines being curved generally upwardly in their respective planes from the longitudinally central portions of said keel lines to the opposite ends thereof, whereby vertical projections of said keel lines are bowed in directions in which said keel lines are spaced apart a greater distance at the longitudinally central portions of said keel lines than at the opposite ends thereof and horizontal projections of said keel lines curve upwardly from the longitudinally central portions of said keel lines to the opposite ends thereof, said concave central portion and said keel lines forwardly of the longitudinally central portion thereof curving generally upwardly beyond the normal water line of the hull at the bow end thereof to define a pair of laterally spaced bow portions, said concave central bottom portion and said keel lines rearwardly of the longitudinally central portions thereof curving generally upwardly to said transom, the arrangement being such that, when the hull is tilted laterally in a given direction to a predetermined degree, one of said keel lines is disposed in a vertical plane parallel to the longitudinal dimension of the hull.

4. A sailboat hull comprising an elongated bottom and an upwardly projecting transom at the stern end of said bottom, said bottom and transom having an upper marginal edge defining a deck line, said bottom having a cross-sectionally downwardly facing concave central portion extending substantially the full length of the hull and the side edges of which define a pair of longitudinal keel lines disposed in laterally spaced relationship for the full length of the hull, said bottom including bottom side portions curving laterally outwardly and upwardly from said keel lines to said deck line, said keel lines each being disposed in a different one of a pair of planes, each plane extending in a direction parallel to the longitudinal dimension of the hull and each plane being angularly displaced from the vertical and sloping upwardly and inwardly toward the plane of the opposite keel line, said keel lines being

curved generally in their respective planes from the longitudinally central portions of said keel lines to the opposite ends thereof, whereby vertical projections of said keel lines are bowed in directions in which said keel lines are spaced apart a greater distance at the longitudinally central portions of said keel lines than at the opposite ends thereof and horizontal projections of said keel lines curve generally upwardly from the longitudinally central portions of said keel lines to the opposite ends thereof, said concave central portion and said keel lines forwardly of the longitudinally central portion thereof curving generally upwardly beyond the normal water line of the hull at the bow end thereof to define a pair of laterally spaced bow portions, said concave central bottom portion and said keel lines rearwardly of the longitudinally central portions thereof curving generally upwardly to said transom, the concavity of said concave bottom portion gradually diminishing from the bow to the stern portion of said hull, the arrangement being such that, when the hull is tilted laterally in a given direction to a predetermined degree, one of said keel lines is disposed in a vertical plane extending parallel to the longitudinal dimension of the hull.

5. A sailboat hull comprising an elongated bottom and an upwardly projecting transom at the stern end of said bottom, said bottom and transom having an upper marginal edge defining a deck line, said bottom having a cross-sectionally downwardly facing concave central portion extending substantially the full length of the hull and the side edges of which define a pair of longitudinal keel lines disposed in laterally spaced relationship for the full length of the hull, said bottom including bottom side portions curving laterally outwardly and upwardly from said keel lines to said deck line, said keel lines each being disposed in a different one of a pair of planes, each plane extending in a direction parallel to the longitudinal dimension of the hull and each plane being angularly displaced from the vertical and sloping upwardly and inwardly toward the plane of the opposite keel line, said keel lines being curved generally upwardly in their respective planes from the longitudinally central portions of said keel lines to the opposite ends thereof, whereby vertical projections of said keel lines are bowed in direction in which said keel lines are spaced apart a greater distance at the longitudinally central portions of said keel lines than at the opposite ends thereof, and horizontal projections of said keel lines curve generally upwardly from the longitudinally central portions of said keel lines to the opposite ends thereof, said concave central portion and said keel lines forwardly of the longitudinally central portion thereof curving upwardly beyond the normal water line of the hull to said deck line at the bow end thereof, said concave central bottom portion and said keel lines rearwardly of the longitudinally central portions thereof curving generally upwardly to said transom, the opposite side edges of said hull at the bow portion thereof curving laterally inwardly to the bow ends of their respective keel lines and the deck line at the bow of said hull defining a forwardly opening V-shaped notch cooperating with the upwardly curving central bottom portion and keel lines to define a pair of laterally spaced bow portions, the arrangement being such that, when the hull is tilted laterally in a given direction to a predetermined degree, one of said keel lines is disposed in a vertical plane parallel to the longitudinal dimension of the hull.

6. The sailboat hull of claim 5 in which said bottom side portions have cross-sectionally convex outer surfaces curving laterally outwardly and upwardly from said keel line to said deck line, and in which the concavity of said concave central bottom portion gradually diminishes from the bow to the stern portion of the hull.

7. The sailboat hull of claim 5 in which the bottom portions adjacent said keel lines at the bow end portion of the hull are substantially symmetrical in cross-section about their respective keel line planes, whereby when the hull is laterally tilted in water to said predetermined degree during forward movement thereof, the water engaging bow end portion of the hull is generally symmetrical about a vertical plane.

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