

March 13, 1945.

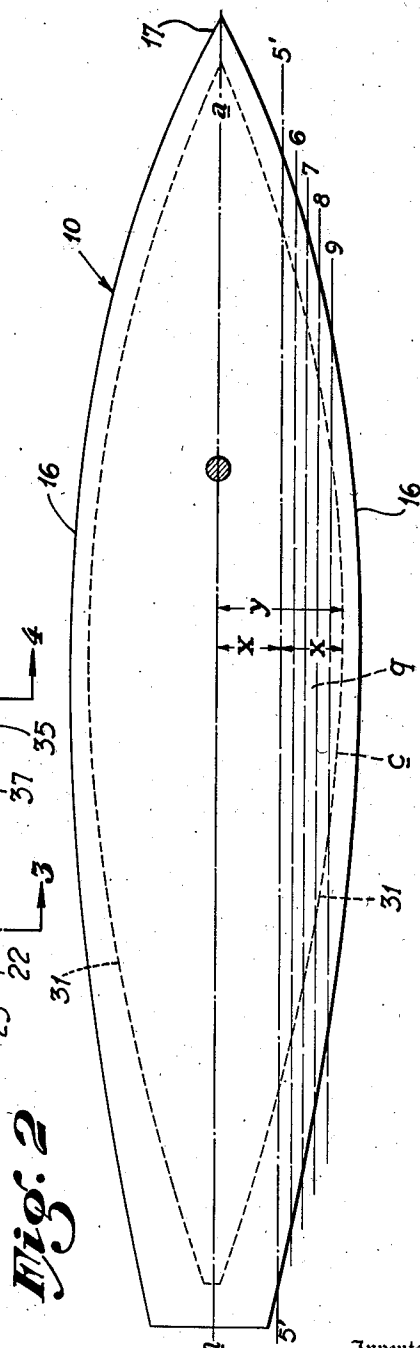
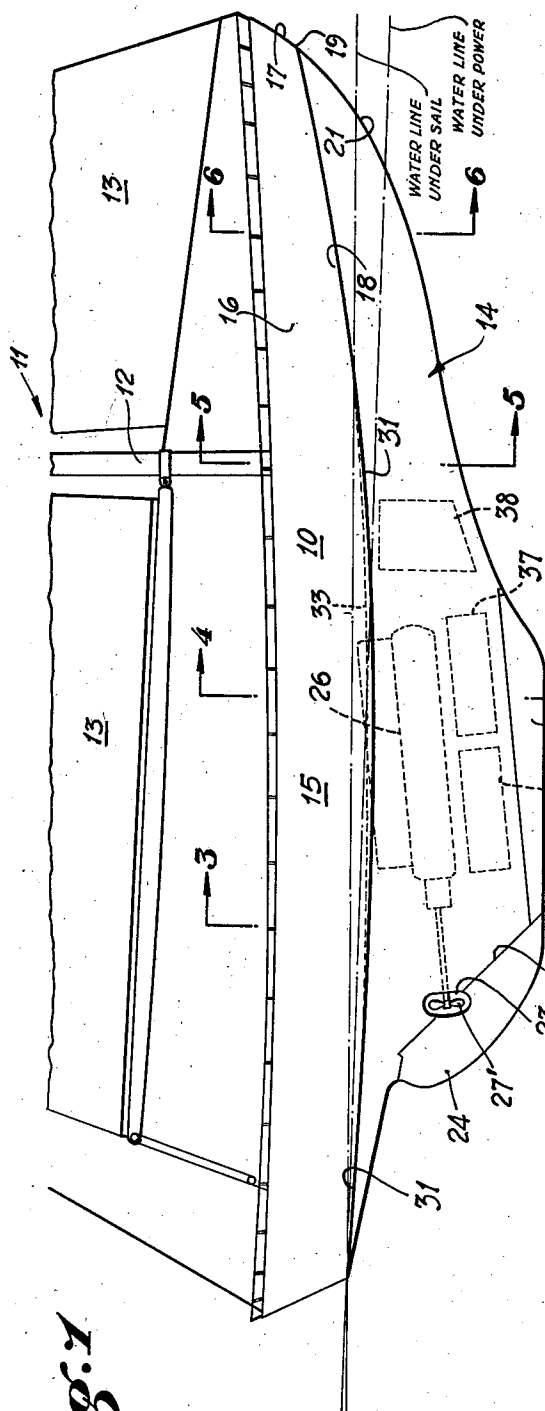
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2,371,478

BOAT HULL

Filed April 5, 1943

2 Sheets-Sheet 1



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Fig. 3

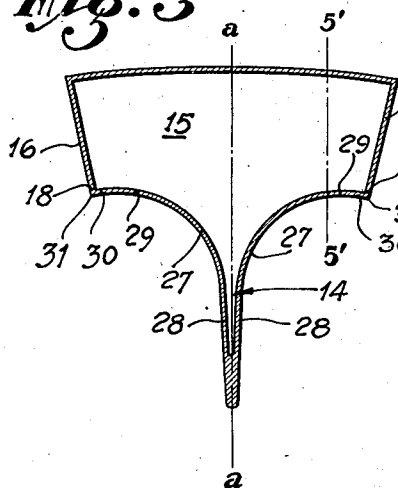


Fig. 4

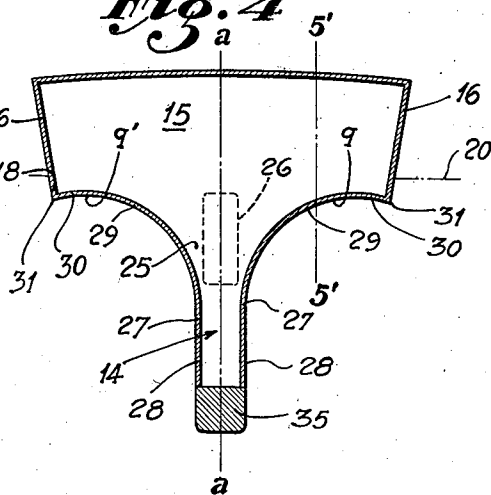


Fig. 5

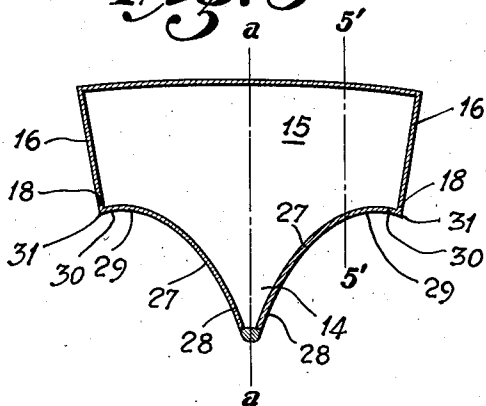


Fig. 6

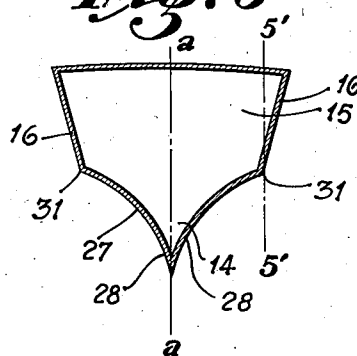
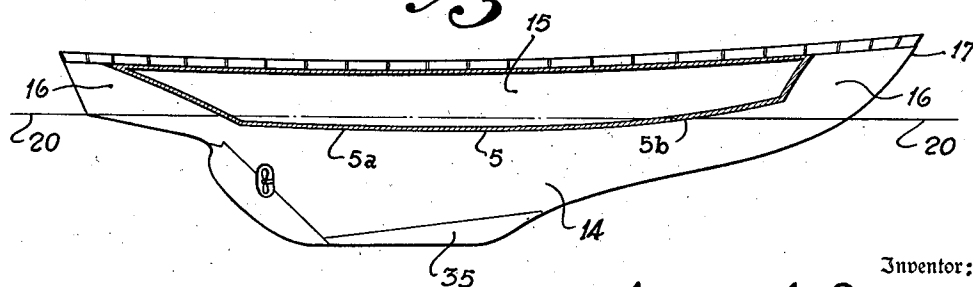


Fig. 7



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UNITED STATES PATENT OFFICE

2,371,478

BOAT HULL

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Application April 5, 1943, Serial No. 481,819

7 Claims. (Cl. 114—62)

My invention relates to boats, and relates in particular to a combined sail and motor driven vessel having relatively high speed under either sail or motor power, and for this reason being especially adapted for use as a sub-chaser or coast patrol vessel.

The usefulness and advantages of a boat of this character may be readily perceived from a consideration of a proposed 96-foot ship having comfortable accommodations for eighteen men. A vessel as above indicated, made in accordance with my invention and equipped with submarine and atmospheric listening devices, 40 mm. guns, and depth bombs, is capable of patrolling an area at a considerable distance from a base. Its ordinary patrol service would be accomplished under sail power at a speed which would have a maximum of about 13 nautical miles per hour in a good breeze. Through use of its listening devices knowledge would be had of approaching aircraft and watercraft; therefore, the operators of the vessel would have knowledge of the approach of submarines and could stalk them successfully due to the ability to navigate at a reasonable speed without sound audible to the submarine operators. Under motor power of 4800 H. P. this vessel, as estimated from the operation of a 4-foot model, would have an approximate speed of 25 knots, so as to be fast enough to catch or escape from a submarine, as the case required. Cruising under sail would ordinarily require no use of fuel. In view of this, the vessel would have a wide range of operation. Also, the form embodied in the hull of the vessel makes it possible to locate fuel tanks, water tanks, and motors below the water level.

It is an object of my invention to provide a vessel suitable for operation in all kinds of weather, either under sail or motor power, at speeds such as indicated in the foregoing, this vessel having a hull of novel form, making it suitable for use either as a sail boat or power boat.

It is an object of the invention to provide in a vessel of the class described a hull having a displacement keel merging through curved surfaces with concave bottom portions leading to chines which are of a characteristic form and contribute to the accomplishment of the results forming part of the objectives of the present invention.

A further object of the invention is to provide a hull capable of greater speed through the water than ordinary displacement type of hulls of equivalent size, wherein the lines from bow to stern are relatively straight and the hollow body sections between the keel and the chines are so formed

that they will carry trapped air under the vessel for a distance more than 50% of the water length thereof.

It is an object of the invention to provide a hull of the type described which, as the result of a combination of curves and nearly straight buttock lines, is considerably faster than one and one half times the square root of the water line length, which is the accepted maximum speed in nautical miles per hour for a displacement type hull.

A further object of the invention is to provide a hull, the speed of which under sail is enhanced by the boat riding on her own bow wave when heeled over under sail, thereby decreasing the wetted surface by entrapping air in the space especially provided between the chines and the keel, and further to provide a hull having when under power operation a wetted surface decreased by the entrapment of air from the bow wave, supplemented also if desired by running the exhaust from the motors, aided by blowers, so that they will pass into the concave areas under water, which concave areas will retain the air until it reaches the after part of the hull where it will help nullify suction and stern quarter wave formation.

A further object of the invention is to provide a hull which, due to the slight curvature of selected buttock lines, will not squat when propelled forwardly.

Further objects and advantages of the invention will be brought out in the following part of the specification.

Referring to the drawings which are for illustrative purposes only,

Fig. 1 is an elevational view of a vessel having a hull embodying my invention.

Fig. 2 is a schematic plan view showing the body outline of the hull disclosed in Fig. 1.

Fig. 3 is a sectional view taken as indicated by the line 3—3 of Fig. 1.

Fig. 4 is a sectional view on the plane indicated by the line 4—4 of Fig. 1.

Fig. 5 is a sectional view taken as indicated by the line 5—5 of Fig. 1.

Fig. 6 is a sectional view taken as indicated by the line 6—6 of Fig. 1.

Fig. 7 is a sectional view, to reduced scale, taken on a vertical plane represented by the line 5' of Fig. 2.

The boat shown in Fig. 1 comprises a hull 10 and a superstructure shown as rigging 11 including a mast 12 and sails 13. In Fig. 1 a keel 14 is shown. In this description the keel 14 will be

regarded as a part of the hull 10, and in keeping therewith, the upper portion of the hull 10, from which the keel 14 downwardly projects, will be referred to as the body portion 15 of the hull 10.

The body portion 15 of the hull 10 comprises side walls 16 which meet at the prow 17 above the water line of the vessel, diverge rearwardly to a maximum width at substantially the mid-section of the body 15, and then converge toward the stern. The side walls 16 each have a lower edge 18. These lower edges 18 have their front ends 19 starting above the water line and sloping downward so as to pass below the water line 20 amidships of the vessel, as shown in Fig. 1.

I have referred to the keel 14 as a flotation keel for the reason that it is characterized by its capacity to float the entire weight of the vessel so that the body portion 15 of the hull 10 is substantially entirely above the water line 20. In keeping therewith, I have made the keel 14 of such volume that its displacement is substantially equal to the displacement of the entire vessel equipped and carrying its normal crew. The prow end 21 of the keel 14 is relatively sharp, as shown in Fig. 6, so that it will have acceptable water cleavage, but, as shown in Figs. 5 and 4, the width of the keel 14 is broadened or widened as its upward extension is completed. Then, as the keel progresses rearward through the vertical plane indicated by the line 3—3, it is tapered off, as shown in Fig. 3, so that when the edge 22, Fig. 1, is reached, the keel will have a width considerably less than the diameter of the propeller which operates in a recess 23 forming an opening between the edge 22 and the rudder 24 which is hinged thereto.

Amidships of the hull 10 the keel is of such width that a chamber 25 is provided, the upper portion of this chamber 25 being of ample size to receive the combustion engine 26 which drives the propeller 27. As shown in Fig. 4, the keel 14 has side walls 27, the lower portions 28 of which are distinctly upright in position, or, in other words, are vertically disposed. By this descriptive wording we mean that the lower portions 28 of the side walls 27 are near vertical as distinguished from the upper portions 29 of the side walls which are near horizontal so as to form bottom or bilge walls below the body portion 15 of the hull 10. The lateral edge portions 30 of the keel side walls 27 are bent downwardly slightly from a horizontal plane so as to meet the lower edges of the body side walls 16 in a manner to form chines 31, the bow portions of which lie above the water line, and the amidships portions of which project below the water line when the hull is riding level as shown in Fig. 1. The stern portions of the chines 31 lie substantially at the water line, or drop below when the vessel is propelled forward at reasonable speed under motor power. In the preferred form of construction, the chines begin near the stem and extend to or near the transom, the length of the chines being such that concavities or inverted channels 33 are formed lengthwise of the vessel and inwardly of the chines 31, of such length that the concavities will receive air at the front ends thereof during forward motion of the vessel under load, and relatively carry this air under the side portions of the hull body 15 to the stern and discharge the air at the after part of the hull so that it will break or partially break the ordinarily encountered stern suction and diminish stern quarter wave formation. Although the keel 14 has the displacement characteristics here-

inabove described, its slenderness is such that the buttock lines of the keel portion of the hull have small curvature, and as the result of the combination of transverse curves and nearly straight buttock lines, the ship is not only fast under sail power, but also exceptionally fast when under mechanical propulsion.

In Figs. 2 and 4 the line 5'—5' indicates a vertical plane parallel to the vertical median plane $a-a$ of the hull. The plane 5'—5' is positioned a distance x from the median plane $a-a$, which is substantially one-half the greatest distance y from the median plane $a-a$ to the chine. This distance x is substantially one-fourth of the greatest width of the underwater portion of the hull. In keeping with the relation of this dimension x to the width of the wetted or underwater portion of the hull, I have referred to the area q of the hull between the plane 5'—5' and the portion c of the chine lying distally as the outer quarter of the hull. This outer quarter q is duplicated on the left side of the hull as indicated at q' in Fig. 4.

Between the plane 5'—5' of Fig. 2 and the most distal part of the chine portion c , I have shown buttock lines 6, 7, 8, and 9. As viewed from above, these buttock lines appear straight. An important feature of the invention is that these buttock lines when viewed from the side have a curvature of less than one inch in ten feet from substantially the middle section of the hull to the after ends of the individual buttock lines. The forward portions of the buttock lines may be of slightly greater curvature than this. In Fig. 7, the lower line 5 of the section on line 5'—5' comprises the buttock line at the medial limit of the outer quarter q and has the greatest curvature of any of the buttock lines of the outer quarter section. It will be noted that the after portion 5a thereof is nearly straight, having a curvature of not greater than one inch in ten feet; whereas, the forward portion 5b has slightly greater curvature.

This desired effect is enhanced by the boat riding on her own bow wave when she is heeled over under sail, at which time the wetted surface is decreased by the trapping of air between the depressed chine and the keel. The spacing and depth of the chines 31 make possible decreasing of the external metal ballasts 35 to a minimum.

As indicated in Fig. 1, fuel tanks 37 may be disposed in the lower part of the chamber 25 of the keel portion 14, and as indicated at 38, a water tank may be located in the forward portion of the chamber 25, below the water line.

I claim as my invention:

1. In a hull for a sail and power vessel of the character described, the combination of: a body having side walls extending from the bow portion to the stern portion thereof, the bow ends of the lower edges of said side walls starting at a point above the water line of the vessel and sloping downward and rearward so as to pass below said water line; and a flotation keel having a displacement substantially equal to the weight of the vessel disposed centrally below said body, said keel having a vertical depth at least as great as the depth of said body, and having side walls, the lower central portions of which are substantially vertically disposed and the upper portions of which curve outwardly to meet the lower edges of said body side walls in a manner to form chines, the front ends of which are disposed above the water line of the vessel and the intermediate portions of which chines lie close to the water

line, the lateral extremities of the middle portions of said keel side walls being bent downward where they meet said body side walls so that inverted longitudinal channels are thereby formed under said body to trap air during forward motion of the vessel and guide the air toward the stern of the vessel, said keel side walls being so spaced that the intermediate portions thereof will define a chamber of a size to receive a motor to power the vessel.

2. In a hull for a sail and power vessel of the character described, the combination of: a body having side walls extending from the bow portion to the stern portion thereof, the bow ends of the lower edges of said side walls starting at a point above the water line of the vessel and sloping downward and rearward so as to pass below said water line; and a flotation keel having a displacement substantially equal to the weight of the vessel disposed centrally below said body, said keel having a vertical depth at least as great as the depth of said body, and having side walls, lower portions of which are substantially vertically disposed and the upper portions of which curve outwardly to meet the lower edges of said body side walls in a manner to form chines, the front ends of which are disposed above the water line of the vessel and the intermediate portions of which chines lie close to the water line, the lateral extremities of the central portions of said keel side walls being bent downward where they meet said body side walls so that inverted longitudinal channels are thereby formed under said body to trap air during forward motion of the vessel and guide the air toward the stern of the vessel and the forward ends of the side portions of said keel side walls rising above the water line of the vessel and meeting the bow portions of said body side walls.

3. In a hull for a sail and power vessel of the character described, the combination of: a body having side walls extending from the bow portion to the stern portion thereof, the bow ends of the lower edges of said side walls starting at a point above the water line of the vessel and sloping downward and rearward so as to pass below said water line; and a flotation keel having a displacement substantially equal to the weight of the vessel disposed centrally below said body, said keel having side walls, lower portions of which are substantially vertically disposed and the upper portions of which curve outwardly to meet the lower edges of said body side walls in a manner to form chines, the front ends of which are disposed above the water line of the vessel and the intermediate portions of which chines lie close to the water line, lateral extremities of said keel side walls being bent downward where they meet said body side walls so that inverted longitudinal channels are thereby formed under said body to trap air during forward motion of the vessel and guide the air toward the stern of the vessel, said keel side walls being so spaced that the intermediate portions thereof will define a chamber of a size to receive a motor to power the vessel.

4. In a hull for a sail and power vessel of the character described, the combination of: a body having side walls extending from the bow portion to the stern portion thereof, the bow ends of the lower edges of said side walls starting at a point above the water line of the vessel and sloping downward and rearward so as to pass below said water line; and a flotation keel having a displacement substantially equal to the weight of the

vessel disposed centrally below said body, said keel having side walls, the lower central portions of which are substantially vertically disposed and the upper portions of which curve outwardly to meet the lower edges of said body side walls in a manner to form chines, the front ends of which are disposed above the water line of the vessel and the intermediate portions of which chines lie close to the water line, lateral extremities of said keel side walls being bent downward where they meet said body side walls so that inverted longitudinal channels are thereby formed under said body to trap air during forward motion of the vessel and guide the air toward the stern of the vessel and the forward ends of the side portions of said keel side walls rising above the water line of the vessel and meeting the bow portions of said body side walls.

5. In a hull for a sail and power vessel of the character described, the combination of: a body having side walls extending from the bow portion to the stern portion thereof; and a flotation keel having a displacement substantially equal to the weight of the vessel disposed centrally below said body, said keel having a vertical depth at least as great as the depth of said body, and having side walls, the lower central portions of which are substantially vertically disposed and the upper portions of which curve outwardly to meet the lower edges of said body side walls in a manner to form chines, the front ends of which are disposed above the water line of the vessel and the intermediate portions of which chines lie close to the water line, the lateral extremities of the central portions of said keel side walls being bent downward where they meet said body side walls so that inverted longitudinal channels are thereby formed under said body to trap air during forward motion of the vessel and guide the air toward the stern of the vessel.

6. In a hull for a sail and power vessel of the character described, the combination of: a body having side walls extending from the bow portion to the stern portion thereof; and a flotation keel having a displacement substantially equal to the weight of the vessel disposed centrally below said body, said keel having side walls, the lower central portions of which are substantially vertically disposed and the upper portions of which curve outwardly to meet the lower edges of said body side walls in a manner to form chines, the front ends of which chines are disposed above the water line of the vessel, and the intermediate portions of which chines lie close to the water line, the upper portions of said keel side walls projecting downwardly along the line of meeting of said body side walls and said keel side walls so that inverted longitudinal channels are thereby formed under the central portion of said body to trap air during forward motion of the vessel and guide the air toward the stern of the vessel.

7. In a hull for a sail and power vessel of the character described, the combination of: a body having side walls extending from the bow portion to the stern portion thereof; and a flotation keel having a displacement substantially equal to the weight of the vessel disposed centrally below said body, said keel having a vertical depth at least as great as the depth of said body, and having side walls, the lower central portions of which are substantially vertically disposed and the upper portions of which curve outwardly to form outer quarters, the buttock lines of which have an average curve of not greater than about one inch

in ten feet, the lateral extremes of said upper portions meeting the lower edges of said body side walls in a manner to form chines, the front ends of which chines are disposed above the water line of the vessel and the intermediate portions of which chines lie close to the water line and project downwardly along the line of meeting

of the intermediate portions of said body side walls and the intermediate portions of said keel side walls so that inverted longitudinal channels are thereby formed under said body to trap air during forward motion of the vessel and guide the air toward the stern of the vessel.

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