May 6, 1952 A. A. STEELE 2,595,422

MULTIPLE CHINE BOAT HULL

Filed Dec. 8, 1945 2 SHEETS—SHEET 1

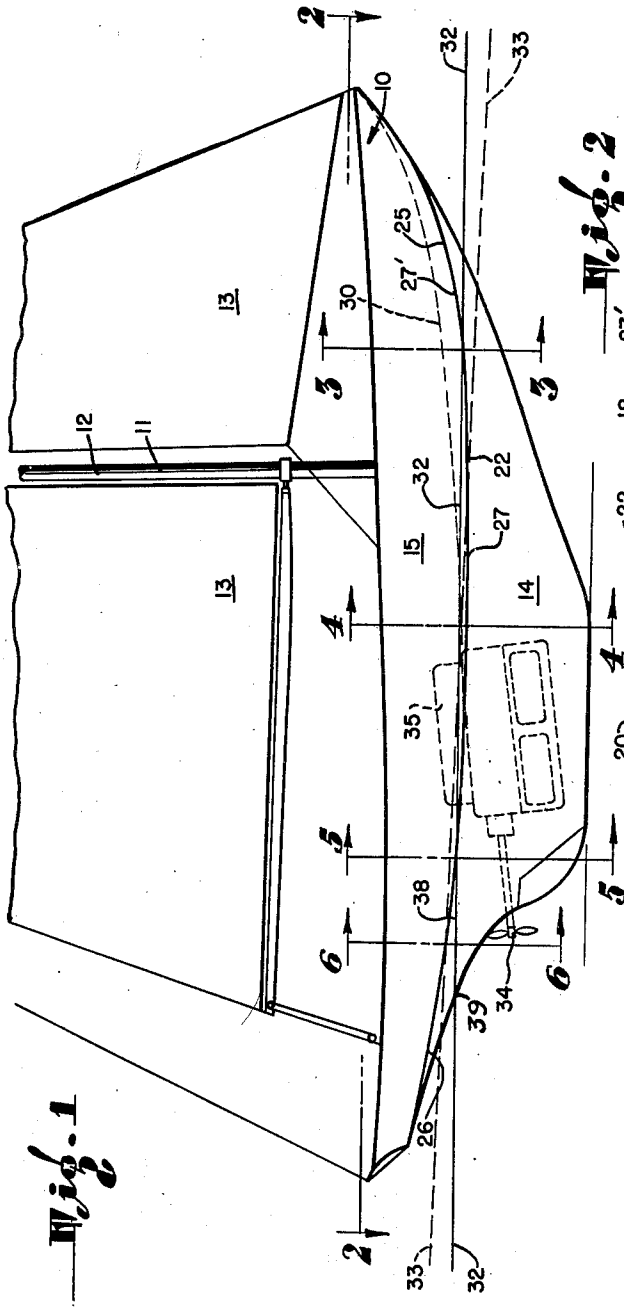


Fig. 1

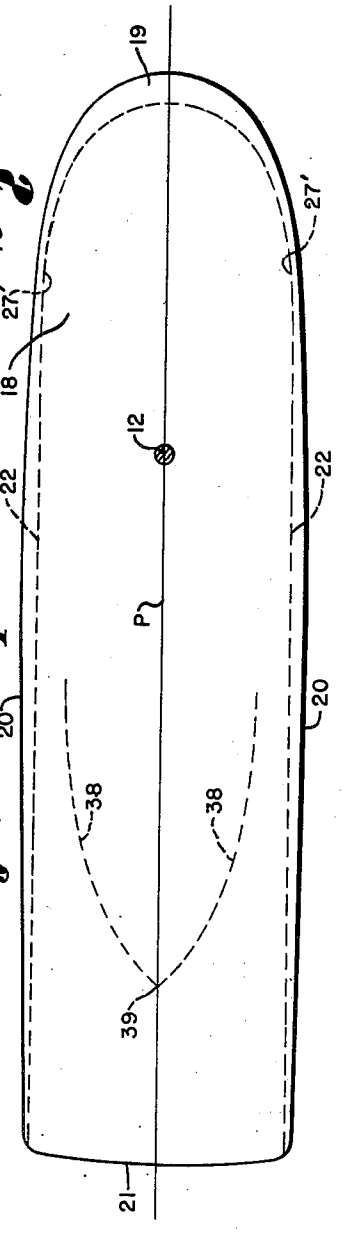


Fig. 2

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Fig. 3

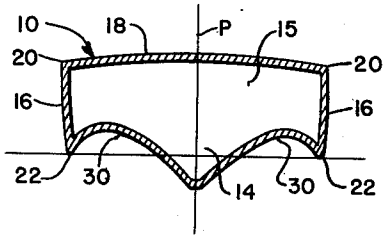


Fig. 4

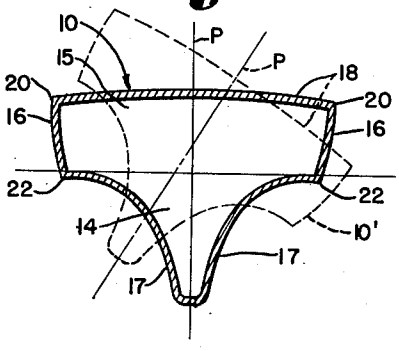


Fig. 5

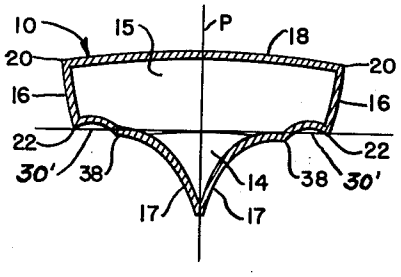
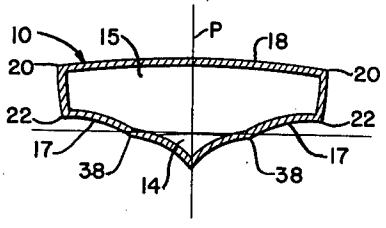


Fig. 6



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Patented May 6, 1952

2,595,422

UNITED STATES PATENT OFFICE

2,595,422

MULTIPLE CHINE BOAT HULL

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Application December 8, 1945, Serial No. 633,647

3 Claims. (Cl. 114—56)

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My present invention relates to a hull for a combined sail and motor driven boat, having relatively high speed under motor power and under sail as compared to usual motor and sail propelled boats, as the result of a novel arrangement of body or superstructure with a keel and a specific arrangement of chines to provide a vessel suitable for operation in all kinds of weather, either under sail or under motor power at speeds above the generally accepted maximum speed for displacement types of hulls. It is an object of the present invention to provide a boat hull having the general characteristics disclosed in the above, but having improved characteristics under both mechanical and sail power, and especially having greater speed under sail for a given size of vessel and spread of sail.

It is an object of the invention to provide a combined sail and motor driven vessel of the character referred to in the foregoing, having increased speed under sail by reason of the provision of a chine on each side of the bottom of the boat body which lies, through a portion or all of its water line length, in a substantially vertical plane disposed parallel to the midline of the hull, this arrangement providing, when the vessel is heeled over, relatively long and straight surfaces in engagement with the water, the opposite side of the ship lifting partly out of the water and allowing the ship thus heeled to sail along the straighter lines and surfaces provided as the result of the joining of the top and bottom surfaces at the relatively straight chine which is in engagement with the water.

A further object of the invention is to provide a hull of the character set forth in the foregoing having side walls and chines which extend along relatively straight parallel lines from a point near the front of the vessel to the stern, the vessel thus having a deck area which is substantially as wide at the stern as in the midportion thereof.

A further object of the invention is to provide a hull having long relatively straight and parallel chines along the sides of the body portion of the hull, this hull having adjacent the stern portion thereof a secondary or auxiliary chine which cooperates in the hull structure in producing comparatively flat sections in the after part of the hull, which keep the vessel from squatting excessively from cavitation due to propeller action.

A further object of the invention is to provide a hull for a sailing vessel which has greater lateral stability than found in accepted types of sailing boat hulls, without reduction in the sailing qualities of the boat. In view of this, it is possible for the sail boat incorporating my invention to carry more sail area than the usual sailing vessel.

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It is an object of the invention to provide a sail boat hull which minimizes the production of current eddies, by reason of the provision of chines parallel to the keel whereby paths of flow for the water are defined, wherein minimum disturbance of the water is achieved.

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

Referring to the drawings which are for illustrative purposes only,

Fig. 1 is a side view of a vessel embodying my invention.

Fig. 2 is a top plan view of the hull of the vessel.

Fig. 3 is the section indicated by the line 3—3 of Fig. 1.

Fig. 4 is the section outline on the plane indicated by the line 4—4 of Fig. 1.

Fig. 5 is the section outline on the plane indicated by the line 5—5 of Fig. 1 with the rudder removed.

Fig. 6 is the section outline on the plane indicated by the line 6—6 of Fig. 1.

In Fig. 1 I show a boat hull 10 and a superstructure consisting of the rigging 11 comprising a mast 12 and sails 13 which form no part of the present invention. For the purpose of distinguishing between the upper and lower parts of the hull 10, I have divided the same substantially along the water line into a keel 14 and a body 15. The body 15, referring to Fig. 4, may be regarded as that portion of the hull lying between the side walls 16, and the keel 14 may be considered as that portion of the hull lying between the keel side walls 17.

In the various views, which are schematic in character, I have shown a deck 18 which, as shown in Fig. 2, has a rounded front end 19, approximately parallel and slightly bulging side edges 20, and a somewhat square rear end 21. The side walls 17 of the keel 14 flare upwardly and outwardly to meet the lower edges of the body side walls 16 at chines 22 which may be either sharp or rounded. The side walls 16 of the body and the side walls 17 of the keel 14 are formed in such cooperative relation that the front and rear ends 25 and 26 of the chines 22 rise above the load water line and the midsection 27 of the chines 22 lie close to the load water line or pass slightly therebelow, as shown in Figs. 1 and 4. It will be perceived accordingly that the keel 14 is of such displacement that it

will support the hull in the water under load so that the lowest portions of the chines **22** will substantially coincide with the load water line.

As shown in Fig. 2, the chines **22** are substantially straight and parallel, as viewed from above, throughout a portion of the length of such chines which engage the water. In the preferred embodiment shown, the chines **22** lie in vertical parallel planes from a point ahead to a point aft of the engagement of the chines with the water. Optimum results are achieved when the chines extend straight from the rear end of the hull, as viewed from above in Fig. 2, to the points **27'** above the load water level where such chines curve inward to join the stem of the hull. The chines **22** throughout a material portion of their length lie in vertical planes parallel to the longitudinal median plane P of the hull.

The upper or outward portions of the side walls **17** of the keel **14** form bottom walls for the body **15**, and the upper or outer portions of the walls **17** are curved so as to provide inwardly of the chines **22** inverted channels **30** which have their inception ahead of the plane indicated by the line **3—3** of Fig. 1 and fade out substantially at the plane indicated by the line **4—4** of Fig. 1, these channels having the purpose of directing air under the bottom of the body **15** when the craft is moving forward, thereby reducing the wetted surface, and cutting down frictional drag. The load water line of the hull is represented in Fig. 1 by two separate lines **32** and **33**, the first of these lines **32** indicating the load water line when the vessel is under sail with substantially no side wind, and the line **33** represents the load water line when the vessel is moving forward under power provided by propeller means **34** operated by an engine **35**. The chines **22** coincide with the forward direction of travel of the vessel and therefore minimum resistance to forward travel is attained. This condition exists when the hull is level in the water and when it is heeled over as indicated by dotted lines **10'** in Fig. 4. Between the chine which is in the water and the median plane P of the hull the upper or outer portion of the side wall **17** defines an inverted channel **30'**, Fig. 5, which extends longitudinally beneath the body portion **15** and constitutes a continuation of the inverted channel **30** disclosed in Figs. 1 and 3.

The side walls **17** of the keel portion **14**, as shown in Figs. 1, 2, 5, and 6, are formed so as to provide within the limits of the chines **22** auxiliary chines **38** which start near the fore to aft middle of the hull and extend rearward along inwardly curving lines so as to meet at a position **39** slightly to the rear of the plane indicated by the line **6—6** of Fig. 1. These chines **38** coincide substantially with the horizontal plane defined by the load water line **32** and have the purpose of resisting the action referred to as squatting when the vessel is being driven under power, such squatting consisting of a marked lowering of the stern of the vessel due to cavitation resulting from propeller action. The hull structure described in the foregoing accomplishes a number of important results as follows:

When the vessel is heeled over as shown by dotted lines **10'** of Fig. 4, a portion of the body volume is included in the displacement volume of the hull so that the midline section of the hull on the opposite side is lifted partly out of the water, and the area of hull surface in engagement with the water is not materially increased over the surface area contact of the hull with the water when the hull is level. Also, the lateral lines extending longitudinally of the hull, and in engagement with the water, are substantially straight and coincident with the forward motion of the travel of the hull.

When the hull is heeled over under sail, the load water line greatly increases so that the theoretical speed, determined by the formula 1.5 times the square root of the water line length, increases.

The keel **14** of the hull has a vertical dimension or depth at least as great as the depth of the body **15**, and may be of standard or center board type in smaller boats. In larger craft the keel **14** is made hollow to provide useful space. For example, the engine schematically indicated at **35** will be disposed in the space provided by the hollow keel construction.

I claim as my invention:

1. In a hull for a sail and power vessel, the combination of: a body having side walls, intermediate portions of which are in parallel relation to the longitudinal center line of the hull; a keel extending down from said body, said keel having a depth at least as great as the depth of the body; main chines on the lateral portions of said body starting at the front end of the body above the water line and dropping below the water line as they extend rearwardly, the portions of said chines which drop below the water line being disposed in planes which are substantially vertical and parallel to the longitudinal axis of the hull; and auxiliary chines on said keel positioned between said main chines and the median vertical plane of the hull and extending rearwardly from a position midpoint of the hull.

2. In a hull for a sail and power vessel, the combination of: a body having side walls, the intermediate portions of which are in parallel relation to the longitudinal center line of the hull; a keel extending down from said body, said keel having a depth at least as great as the depth of the body; main chines on the lateral portions of said body starting at the front end of the body above the water line and dropping below the water line as they extend rearwardly and again rising above the water line at the rear of the body, the portions of said chines which drop below the water line being disposed in planes which are substantially vertical and parallel to the longitudinal axis of the hull; and auxiliary chines on said keel positioned between said main chines and the median vertical plane of the hull and extending rearwardly from a position midpoint of the hull, said keel being formed so as to provide downwardly faced channels between said auxiliary chines and said main chines.

3. In a hull for a sail and power vessel, the combination of: a body having side walls, intermediate portions of which are in parallel relation to the longitudinal center line of the hull; a keel extending down from said body, said keel having a depth at least as great as the depth of the body; main chines on the lateral portions of said body starting at the front end of the body above the water line and dropping below the water line as they extend rearwardly, the portions of said chines extending from the rear ends thereof to a position ahead of the point at which they drop below the water line being disposed in planes which are substantially vertical and parallel to the longitudinal axis of the hull; and auxiliary chines on said keel positioned between said main chines and the median vertical plane

of the hull and extending rearwardly from a position midpoint of the hull, said keel being formed so as to provide downwardly faced channels between said auxiliary chines and said main chines, the rearward portions of said auxiliary chines converging and meeting on said median plane of said body.

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