United States Patent [19]

Weeks

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[54] **HIGH SPEED BOAT HULL**

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[52] **U.S. Cl.** ..... **114/56,** 114/66.5 P, 9/6, 9/6.5, 115/11

[51] **Int. Cl.** **B63b 1/34**

[58] **Field of Search** ..... 114/56, 66.5 R, 66.5 P, 114/140; 9/6, 6.5, 1 R; 115/11

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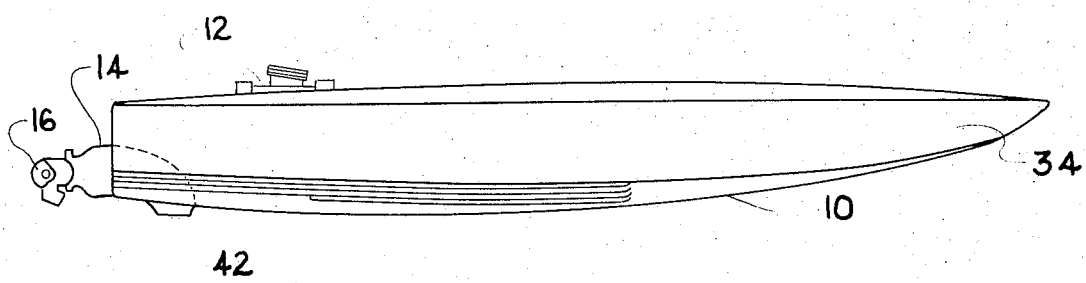
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[57] **ABSTRACT**

A high-speed boat hull for preferred use with a hydrojet engine having a plurality of substantially parallel strakes on the surface of the hull commencing from aft of the bow and all but the two center-most strakes running to the stern, the cross section of the strakes presenting a series of inwardly sloping steps to raise the hull in the water, direct the water flow inward toward the center of the hull and assist in turning the hull when operating at high speeds.

8 Claims, 6 Drawing Figures



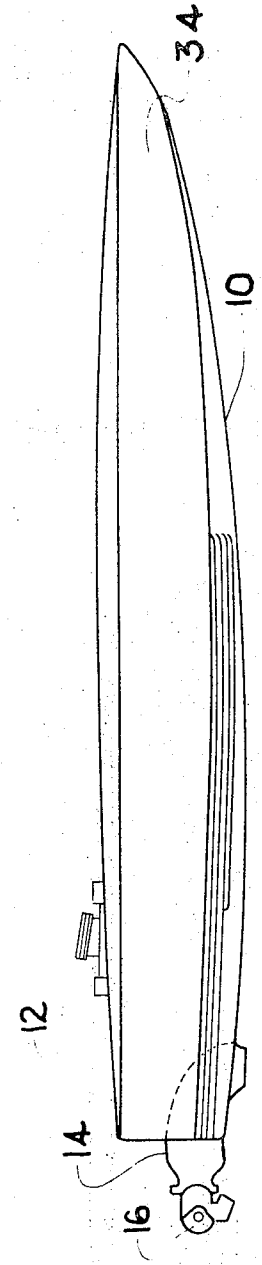


FIG. 1

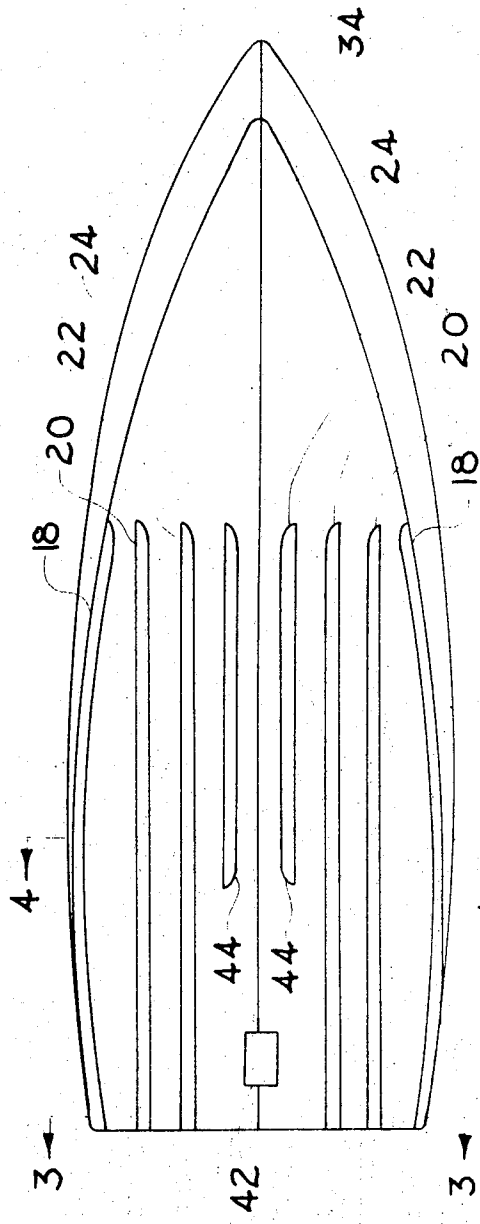


FIG. 2

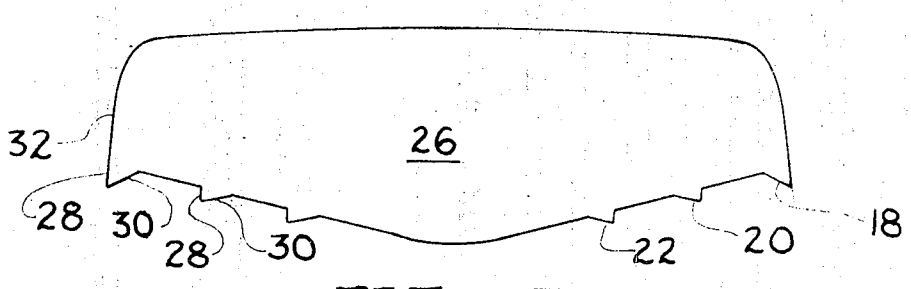


FIG. 3

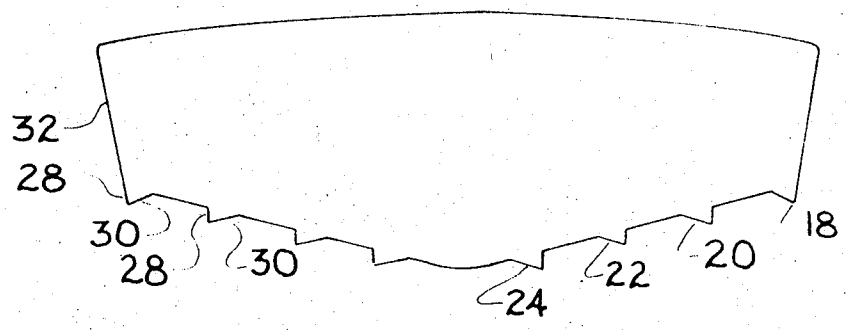


FIG. 4

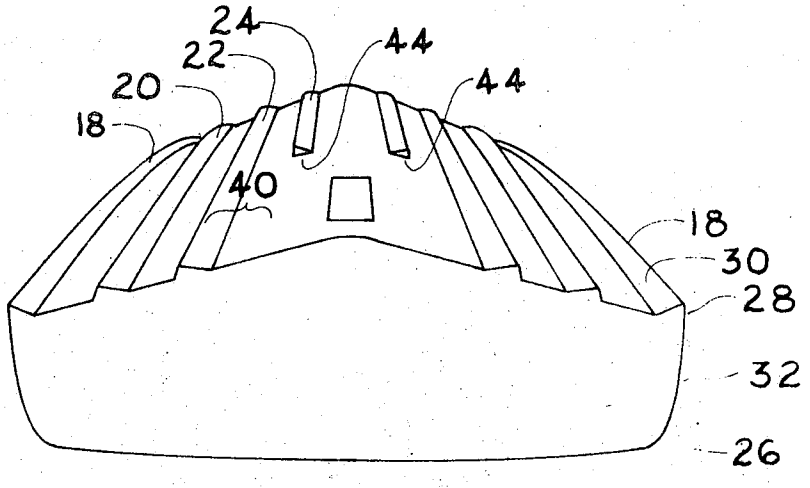


FIG. 5

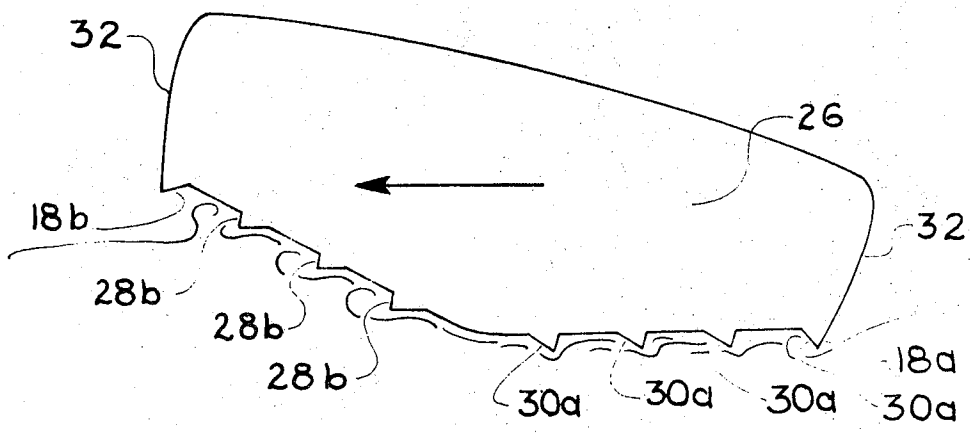


FIG. 6

HIGH SPEED BOAT HULL

BACKGROUND OF THE INVENTION

The art of designing and constructing boat hulls is perhaps an endeavor of man having one of the earliest origins of any of the useful arts. With each introduction of a new power source from paddle, to sail, to propeller the configuration of the hull has been continually redesigned to take full advantage of the particular power source employed. As power sources for smaller craft improved to the powerful high-speed engines of modern craft, the refinements have become more sophisticated.

The introduction of the hydrojet engine which operates by pumping a high volume, high velocity stream of water from the stern of a hull, has created particular problems not presented by the more common propeller engines. Principally, a hull driven by a hydrojet engine does not have the advantage of a rudder projecting into the water which provides a control surface for high-speed turns and a limitation to side slip.

Irregular hull surfaces and projecting or step-like strakes have been used on prior art hulls for controlling maneuverability. However, none of the prior art designs have been found to be as suitable for high-speed maneuverability using a hydrojet power source as the hull design of the present invention. Generally, strakes are extended too far forward and interfere with controlled turns, or are of insufficient width to provide any significant lift to the hull.

SUMMARY OF THE INVENTION

The high-speed hull of my invention employs a plurality of strategically located, step-like strakes to control the water flow under the hull. The step-like strakes are formed integral with the hull and are parallel to one another running from substantially aft of the bow and, all but the two centermost strakes, running to the stern. The two centermost strakes end forward of the stern to allow center line mounting of a water intake for a hydrojet propulsion system.

From a cross section perspective the strakes are step-like in form, and are sloped slightly inward from the horizontal whereby corresponding strakes on opposite sides of the keel present a composite concave surface as opposed to the generally convex surface of the curved hull. This concave surface directs the flow of water under the hull centerward, which both increases lift and enhances the water flow and supply at the hydrojet intake.

In addition to these characteristics, the strakes greatly enhance the high-speed maneuverability of the hull. The vertical faces of the step-like strakes form a plurality of low profile, longitudinal rudders and prevent excessive sideslip on high speed turns. It has been discovered, however, that the strakes must commence substantially aft of the bow. The location of the forward end of the strakes is extremely important, for if the strakes commence too far forward, it is found the forward ends tend to catch on natural waves or boat wakes, and are capable of causing a craft to flip on a high speed turn. Thus, the forward third of the hull is smooth to allow interference waves to slip under the bow.

While the hull is constructed primarily for use with hydrojet propulsion, it may nevertheless be used with a more conventional propeller-type propulsion. The hull of the invention is described in greater detail in the following specification and in the attached drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a side elevational view of the high-speed hull and hydrojet nozzle.

FIG. **2** is a plan view of the hull of FIG. **1**.

FIG. **3** is an enlarged sectional view taken on the lines **3—3** in FIG. **2**.

FIG. **4** is an enlarged sectional view taken on the lines **4—4** in FIG. **2**.

FIG. **5** is an enlarged perspective view of the hull of FIG. **1**.

FIG. **6** is a schematic view of the hull of FIG. **1** in a high-speed turn.

DETAILED DESCRIPTION OF THE INVENTION

Referring to FIG. **1**, a high-speed boat hull **10** is shown for a hydrojet craft capable of speeds of 60 knots. The preferred embodiment illustrated has a length of 18 feet, 1 inch. The particular dimensions detailed in this description are not critical, but rather provide a basis for determining the relative configuration of the hull. If the length of the hull is altered the other primary dimensions should be altered in general proportion to the length. The craft shown is powered by a high-power inboard engine **12** which drives a pump (not shown) in a hydrojet propulsion unit **14.** Water ejected at a nozzle **16** at volume and high velocity generates a Newtonian reaction on the hull **10** propelling the hull through the water. To turn the craft, the direction of the nozzle **16** is altered, shifting the direction of reaction forces on the hull and causing the craft to turn by action of the transverse forces at the stern. Since turning is accomplished wholly by reaction forces on the hull, and not by direct forces from water flow on a rudder, it is necessary that the hull incorporate means to inhibit sideslip caused by the straight line momentum of the craft prior to initiating a turn.

The means employed to inhibit sideslip comprise a series of substantially parallel strakes. Referring to FIG. **2**, corresponding strakes on each side of the centerline of the hull are for convenience identified as chine strakes **18,** outer strakes **20,** inner strakes **22** and center strakes **24.** The strakes are uniformly spaced approximately 9 inches from one another, on a hull having a beam of 70½ inches at the transom **26,** the configuration of which is shown in FIG. **3.** The center strakes are spaced 16 inches apart and as shown in FIG. **2** end a distance measuring 50 inches from the transom **26.**

Referring to the sectional view of FIG. **3** and the sectional view of FIG. **4,** the strakes are step-like in form having an outward vertical face **28** and an incline face **30** as shown in the exemplars. The outward vertical faces **28** of the chine strakes **18** are composite with the sides **32** of the hull.

The incline faces **30** of the chine strakes have an inwardly sloping angle of approximately 21° from the horizontal. Similarly, the incline faces **28** of the outer strakes **20,** inner strakes **22,** and center strakes **24** are inwardly sloping, but with a lesser angle from the horizontal of only approximately 8°. The angle of slope of the incline faces **30** increases the height of the vertical faces **28** and provides a larger bite to the strakes than merely horizontal faces.

The greater angle of the chine strakes **18** permits a bite to be taken by the incline face **30***a* of the inside

chine strake **18***a* on a banking turn as shown in FIG. **6.** Because of the overall V-shaped contour of the hull, the craft banks on a turn, as shown in FIG. **6,** raising the outside chine strake **18***b* partially out of the water and cutting the inside chine strake **18***a* deep into the water. The drag on the incline face **30***a* of the chine strake **18***a*, from a perspective of induced transverse moments on the hull, partially compensates for the drag on the vertical faces **28***b* of the three outer strakes remaining in the water, and thereby aids in stabilizing the hull from overturning. The transverse drag on the hull **10** in a sharp turn caused by the vertical faces **28***b* on the outside strakes and to a lesser extent the incline faces **30***a* on the inside strakes, particularly the chine strake **18***a*, inhibits sideslip, the direction of which is indicated by the arrow in FIG. **6.**

Importantly, the strakes as shown in FIGS. **1** and **2,** commence substantially aft of the bow **34,** running only 10 feet 4 inches of the total 18 feet 1 inch length of the hull. The forward third of the hull is a smooth gradually sloping surface designed to allow waves from any direction to slide under the hull. The absence of strakes in the forward third of the hull enhances maneuverability by eliminating irregularities which can catch on a wave or wake and flip the craft in a high-speed turn. The lead end of the strakes are tapered into the smooth surface of the forward portion of the hull to provide a gradual transition from the straked portion to the smooth portion. At the transom the strakes are rounded.

In addition to inhibiting sideslip in high-speed turns, the strakes control the water flow under the hull by channeling the flow parallel with the keel or center line of the hull. Customarily, a V-shape in a hull permits a greater turning ability, but because it divides the water flow, it causes the hull to ride deeper in the water than a flat bottom hull. The strakes with their wide incline faces perform as hydrofoils and compensate for the V-shape of the hull by lifting the hull higher out of the water than otherwise possible. The 3⅛ inch width of the strake being inclined, almost doubles the effective lift area since it combines with a comparable width on the adjacent sloping hull to form a channel **40,** as exemplified in FIG. **5.** At high speeds, the channels **40** and vertical faces of the strakes inhibit flow division by the hull and cause the relative flow to be substantially parallel with the center line of the hull. The incline faces of the strakes compensate in part for the sloping hull by directing water flow inward toward the center of the hull. This is a particularly important feature for the hydrojet propulsion unit **14** which requires a large supply of water at its intake **42** shown in FIGS. **1, 2** and **5.**

The intake **42** is located aft of the ends **44** of the center strakes **24.** Water, directed in the path of the intake **42,** guided by aid of the incline faces **30** on the center strakes **24,** is sucked by a pump (not shown) in the hydrojet propulsion unit **14,** and ejected at high velocity at the nozzle **18** thereby propelling the craft at high speed.

While the invented hull is designed primarily for compatability with a hydrojet engine, it is not intended to so limit the invention to this means of propulsion.

What is claimed is:

1. A high-speed boat hull with a bow and a transom and with a centerline running from the bow to the middle of the transom, said hull comprising:

a forward portion with a smooth surface approximately one third the length of the hull and an aft portion having a plurality of substantially parallel strakes said strakes having a first vertical face and a second inwardly incline face to raise the hull in the water to assist in turning the hull when operating at high speeds and to direct portions of the relative flow of water inward toward the center of the hull; said hull including a hydrojet intake located in the aft portion of the hull, forward of said transom on the centerline of said hull.

2. The hull of claim **1** wherein said smooth surface is greater than one quarter but less than one half the length of the hull.

3. The hull of claim **1** wherein said strakes include two center strakes arranged on said aft portion of the hull on each side of the centerline and terminating forward of said hydrojet intake.

4. The hull of claim **3** wherein the strakes other than the two center strakes run the length of the aft portion of the hull and terminate at the transom.

5. The boat hull of claim **4** wherein said incline face has an angle from the horizontal exceeding 5°.

6. The boat hull of claim **4** wherein said incline face has a width exceeding 3 inches.

7. The boat hull of claim **4** wherein said strakes have a tapered lead end and a rounded trailing end.

8. The boat hull of claim **4** in combination with a hydrojet power unit for propelling said hull at high speeds.

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