Dec. 5, 1944. V. S. MAKAROFF 2,364,541

HIGH SPEED BOAT

Filed June 22, 1944

FIG. 1

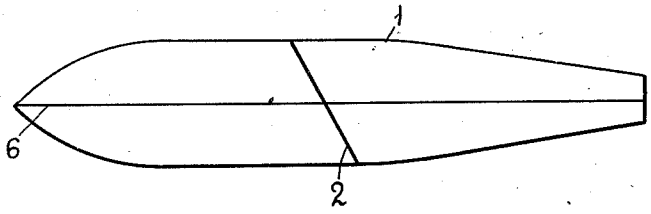


FIG. 2

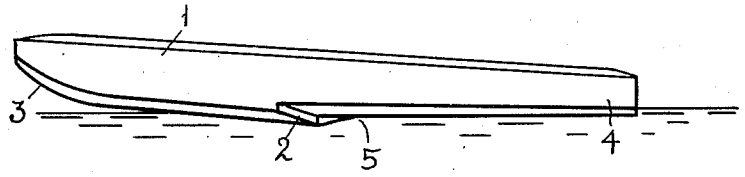


FIG. 3

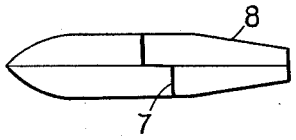


FIG. 4

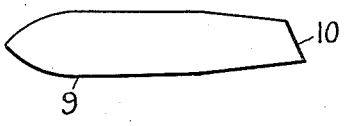


FIG. 5

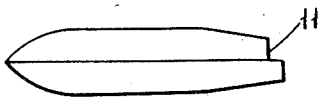


FIG. 6

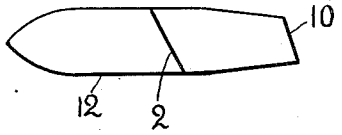
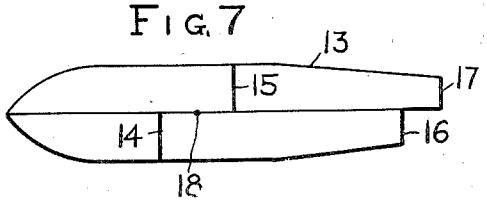


FIG. 7



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HIGH-SPEED BOAT

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Application June 22, 1944, Serial No. 541,581

7 Claims. (Cl. 114—66.5)

My invention relates to high speed boats and has particular reference to high speed boats having a step or steps at the bottom such as are used with variable displacement boats, hydroplanes, seaplanes, flying boats, etc., the step or steps being used for reducing resistance of the hull of the boat at high speeds.

This is a continuation-in-part of my application Serial No. 473,029, filed January 20, 1943.

The main object of my invention is to provide a hull for a high speed boat of such a shape as to avoid or eliminate any tendency of the boat to develop longitudinal oscillations or "porpoising" at high speed, which oscillations or porpoising often reach such a high degree at certain speeds as to render the control of the boat very difficult and may even lead to the damage and destruction of the boat.

The causes of the porpoising have not been fully determined. It is definitely known, however, that relation of the center of gravity of the boat to the longitudinal position of the step is very important. By changing this relative position of the step, the amplitude and frequency of the oscillations can be materially changed for any particular speed.

In my experiments with small models of hulls in a test tank I have found that such oscillations can be largely suppressed and even eliminated if the step is made asymmetrical with reference to the longitudinal axis of the hull, i. e. if different portions of the step are placed at different distances from the end of the hull or from an axis perpendicular to the longitudinal axis.

My invention is more fully described in the accompanying specification and drawing in which:

Fig. 1 is a bottom view of a hull having a step extending diagonally across the hull;

Fig. 2 is an elevational view of the hull;

Fig. 3 is a bottom plan view of a hull with a modified form of the step;

Fig. 4 is a view of a hull with an asymmetrically arranged stern;

Fig. 5 is a similar view of a hull with a modified form of the stern;

Fig. 6 is a similar view of a hull in which a diagonally extending step is combined with an asymmetrically arranged stern;

Fig. 7 is a similar view of a similarly modified hull.

One embodiment of my invention as shown in Figs. 1 and 2 represents a hull 1 of a high speed boat such as a hydroplane or the hull of a flying boat. The main feature of such a boat is a transverse step 2, the front portion 3 of the hull being generally inclined upward so as to facilitate rising of the hull out of water at high speeds thereby reducing the drag on the hull and, therefore, resistance to the movement. The rear portion 4 of the hull behind the step assumes an almost horizontal position so that the head-on resistance is also materially decreased. Air is entrained under the step of the hull so that the space 5 behind the step is largely filled with the air and broken up particles of water which offer greatly reduced frictional or skin resistance.

To prevent oscillations or porpoising of the boat, the step 2 is placed diagonally across the hull so portions of the step at the sides of the longitudinal axis 6 of the hull are at different distances from the end of the hull. In other words, a right hand portion of the step is at a different distance from the end of the hull than the left hand portion. The degree of such a difference or angular inclination of the step may vary, depending on the design and desired performance characteristics of the boat. Asymmetrical steps may, of course, cause a slight tendency for the boat to veer to the right or to the left as the case may be but such a tendency can be easily counteracted by the corresponding construction of the rudder.

I have found that my method is definitely effective for suppressing the oscillations or porpoising, by providing different axis of oscillations for the two sides of the boat.

Instead of a straight angular step as shown in Fig. 1, a zig-zag shaped step 7, Fig. 3, may be used with a hull 8, the step consisting of two portions, each at right angles to the longitudinal axis of the boat but at different distances from the end of the hull.

For certain types of hulls with or without steps, a type of the hull 9 shown in Fig. 4 may be used, the underwater portion of the stern 10 being shaped at an angle to the longitudinal axis of the hull, or, as shown in Fig. 5, the stern 11 being formed with two portions, each at right angles to the longitudinal axis of the hull but at different distances from the end of the boat.

For certain purposes it may be desirable to combine the angular or asymmetrical step in the middle of the hull with the asymmetrical stern as shown in Fig. 6, the hull 12 having a step 2 in the middle and a slanting stern 10 at the rear.

A similar hull 13 is shown in Fig. 7, the hull having a step in the middle consisting of two portions 14 and 15 at a substantial distance apart, the stern having similarly displaced end portions 16 and 17.

I have found that under certain conditions good results are obtained by arranging the step portions 14, 15, at either side of the center of gravity 18 of the hull.

It will be understood that various features and principles of each of the embodiments of the invention above described or referred to may be utilized or substituted in the other embodiments.

While the invention has been described in detail with respect to certain particular preferred examples, it will be understood by those skilled in the art after understanding the invention, that various changes and further modifications may be made without departing from the spirit and scope of the invention, and it is intended therefore in the appended claims to cover all such changes and modifications.

What is claimed as new and desired to be secured by Letters Patent is:

1. A high speed boat comprising a hull having a step at the bottom extending transversely of the hull, the left and right side portions of the step being at different distances from the front end of the hull.

2. A hull for a high speed boat having a step at the bottom extending substantially transversely of the hull, a portion of the step at one side of the longitudinal axis of the hull being formed of a line perpendicular to the longitudinal axis of the boat, and the corresponding portion of the step at the other side of the longitudinal axis being aft of said line.

3. A hull for a high speed boat having a step at the bottom extending transversely of the hull from one side thereof to the other at an angle to the longitudinal axis of the hull.

4. A hull for a high speed boat having a step at the bottom extending from one side of the boat to the other, the step being of a zig-zag shape having right and left portions, one portion being nearer the end of the boat than the other.

5. A hull for a high speed boat having a step in the middle, one portion of the step being nearer the end of the boat than the other, the hull further having a stern so shaped as to have a right portion and a left portion at different distances from the front end of the hull.

6. A hull for a high speed boat having a step in the middle, the step comprising two portions extending from the longitudinal axis of the hull to its sides, one portion being positioned at a greater distance from the front end of the hull than the other, one portion being in front of the center of gravity of the hull, the other portion being behind the center of gravity.

7. A hull for a high speed boat having a step in the middle, the step comprising two portions extending from the longitudinal axis of the hull to its sides, one portion being positioned at a greater distance from the front end of the hull than the other, the stern of the hull having two portions spaced apart extending from the longitudinal axis of the boat to its sides, one stern portion being nearer the front end of the hull than the other.

VADIM S. MAKAROFF.