Nov. 25, 1952 D. D. BRUSH 2,619,065

HULL CONSTRUCTION

Filed March 15, 1950

Fig. 1.

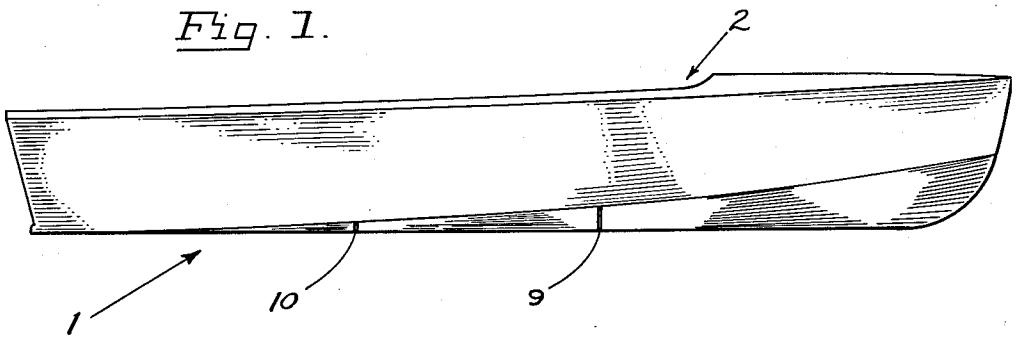


Fig. 2.

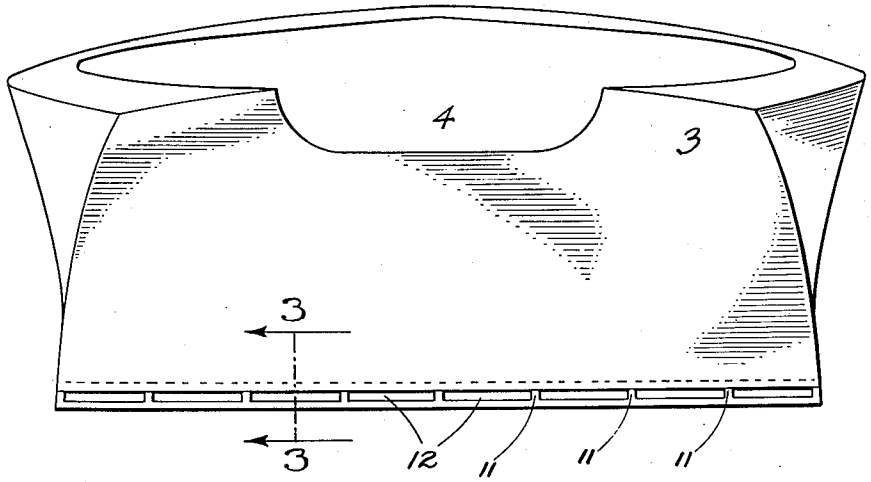
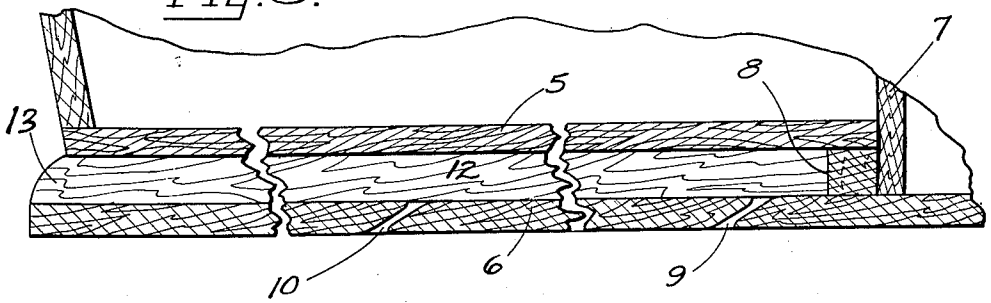


Fig. 3.



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HULL CONSTRUCTION

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9 Claims. (Cl. 114—67)

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My invention relates to hulls and, in particular, to an improved construction for a hull capable of attaining high speed.

It is of general knowledge in the hull art that greater speed may be obtained with a given structure and power plant if the friction between the hull and the water is reduced. One common method of reducing such friction is by pumping air along the bottom of the hull so that a thin layer of air separates the hull from contact with the water. Accordingly, many inventions have been concerned with devices for pumping or forcing air through pipes and lateral ports located along the hull bottom. Some of these inventions comprehend the use of power driven compressors to supply air to the ports. Others utilize funnels or scoops disposed along the hull sides or top to scoop in air as the hull moves at high speed over the water and to force this air out the ports along the bottom of the hull. All known devices of this character, however, require the use of either large compressors or many feet of piping and, where no piping is utilized, the air delivery ports are located in steps built into the bottom of the hull. The disadvantage of all such structures is immediately apparent. Air scoops, compressors, and piping all add undesirable weight to the hull. Similarly, where, by example, the hull is that of a racing boat, outlet ports located in steps along the hull bottom require, by the rules of speedboat racing, that such a boat be classified as a "stepped" racing boat. My invention eliminates the above enumerated disadvantages while, at the same time, materially decreasing water friction drag on a hull and, where utilized by a speedboat, allows the speedboat employing my invention to be raced as a non-stepped boat. The advantages of my hull construction are, therefore, immediately apparent to speedboat racing enthusiasts, seaplane hull manufacturers, and ship builders.

It is a principal object of my invention to provide a hull capable of attaining high speed with air distributing slots which will circulate air over substantially the entire bottom of the hull yet which requires no expensive or burdensome extra equipment.

A more particular object of my invention is the provision of a hull structure which will circulate air to the outlet slots without the use of air compressors or scoops.

Another object of my invention is to provide longitudinal air circulation channels between the bottom and false bottom of a hull, which channels are open at the after end or stern for the

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entrance of air and closed at the forward end so that air must exit through slots in the false bottom.

A further object of my invention comprehends the use of a plurality of air exit slots in the false bottom of a hull with each slot extending over the entire width of the hull bottom so that air from one slot will supplement air from another slot and substantially the entire wetted bottom of the hull will be sheathed in air at all times.

A more specific advantage of my invention is to be found in the fore to aft angle at which I construct my air exit slots. Such angle causes the air to leave the slots in the same direction in which the water is rushing past the bottom of the hull. This construction tends to cause the air to follow the contour of the bottom of the hull rather than to be dissipated sideways as is the case when the air exit angle conflicts with the water over which a hull passes, particularly if it proceeds thereover at high speed.

These and other objects and advantages of my invention will appear from the following detailed description, taken in connection with the accompanying drawing, in which:

Fig. 1 is a side elevation of a boat having a ventilated hull embodying the features of my invention, two transverse air exit slots being shown, by way of example;

Fig. 2 is a stern view of the boat illustrated in Fig. 1 showing the air entrance channels located therein; and

Fig. 3 is a fragmentary sectional view taken along the line 3—3 in Fig. 2, showing details of an air entrance channel and air exit slots, communicating therewith.

A boat embodying my invention comprises a hull of conventional construction 1, having a cockpit 2 built therein. As can be seen from Fig. 1, the bottom of the hull is shown substantially flat near the after end and is rounded or of V-shaped construction near the forward end. Such a construction is not critical, however, and is shown as but one example of the numerous hull constructions which can utilize my invention. The stern 3 is constructed with a profiled section 4 to receive the usual outboard motor (not shown).

I prefer to construct the bottom of the hull of a boat embodying my invention of two pieces. The uppermost of these I term a bottom member 5 and the lowermost a false bottom plate 6. The bottom member 5 extends from the stern piece 3 forward to a bulkhead member 7 where said

bottom member is secured to the top of a transverse or thwart spacer 8. The location of the bulkhead member 7 and, correspondingly, the extent to which the bottom member 5 extends in a fore-and-aft direction, is not critical.

False bottom plate 6 preferably extends from just beyond stern member 3 forward past the bulkhead 7 to the bow of the boat. In this plate I form a plurality of transverse air discharge slots or ports such as 9 and 10. The number of slots utilized is not critical and each given hull may employ as many or as few as best suits its purposes.

Coextensive in fore-and-aft length with the bottom member 5, I preferably place a plurality of longitudinal spacers 11 to form, in cooperation with said bottom member and the false bottom plate 6, numerous fore and aft air circulation spaces 12. As best seen in sectional view Fig. 3, air circulation spaces 12 are open at the stern, as at 13, and are closed at the forward end as by the transverse spacer 8. Transverse slots 9 and 10 span many if not all air circulation spaces 12 and extend to the under side of false bottom plate 6. In addition to the advantages previously mentioned, such a construction is of further novel use in that false bottom plate 6 protects the bottom of the hull against damage; that is to say, if false bottom plate 6 is punctured aft of transverse spacer 8, the hull still will not leak so long as bottom member 5 remains undamaged.

My boat, when at rest, has its waterline substantially above bottom member 5. When, however, the boat travels at high velocities, that is to say at velocities exceeding approximately 12 knots, the hull exhibits a tendency to plane somewhat and the waterline falls away accordingly. The forward motion of the boat causes a relative rearward movement of water at high velocity past air slots 9 and 10. In accordance with Bernoulli's theorem, the static pressure at a given point in a flowing stream is inversely proportional to the square of the velocity of flow at that point, and thus a low pressure area develops along the transverse slots 9 and 10. The low pressure area thus developed causes air to be drawn in from the stern of the boat through openings 13, forward through air circulation spaces 12, and out transverse slots 9 and 10 creating, thereby, a thin separation layer of air between the false bottom plate 6 and the water moving along the bottom of the hull. This layer of air extends substantially over the entire area of the false bottom plate 6 since, in the preferred embodiment of my invention, a plurality of slots are formed therein. Thus, the air supply is continuously supplemented in a fore-to-aft direction by successive elongated slots of small width. These insure a complete separation between the wetted hull surface and the body of water over which the hull is propelled. The resultant decrease in the resistance of the water to forward movement of the hull or in drag as it is sometimes termed produces a substantial increase in velocity available from a given propulsion horse power input.

Of particular interest are the dimensions and shape of my transverse slots 9 and 10. I have found that these slots function most efficiently when they extend over substantially the full width of the boat hull. Furthermore, as previously noted, the slots themselves are preferably slanted from fore to aft as they pass through the false bottom plate in order that resistance to the flow of air therefrom be reduced to a minimum. Since in accordance with my invention, air is drawn in from the stern by the decreased static pressure existing along the bottom of the slots, no expensive and weighty scoops, air compressors, or pipes are required to practice my invention. The ease and simplicity with which I provide a construction to completely cover the bottom of my hull with a layer of air, is an important feature of my invention.

While I have described the practice of my invention in connection with boat hulls, such is not to be taken as a limitation since other uses for the invention will immediately present themselves to those skilled in the art. Amphibious aircraft pontoons, seaplane hulls, barges, boats, vessels, and other buoyant bodies propelled over the surface of a body of water are all examples of such uses and therefore within the scope of my invention. The word "hull" I consider generic to all such structures.

I claim:

1. A hull air channel structure comprising, coextensive bottom and false bottom plate members, spacer means separating said bottom member and said false bottom plate member to form longitudinal air circulation channels open at the after end and closed at the forward end thereof, and elongated transverse slot means extending through said false bottom plate member and connecting with at least one of said longitudinal air channels, each of said air circulation channels being closed and sealed against the entrance or exit of air except for said open after end and said transverse slot means.

2. A hull air channel structure comprising, coextensive bottom and false bottom plate members, spacer means separating said bottom member and said false bottom plate member to form longitudinal air circulation channels open at the after end and closed at the forward end thereof, and elongated transverse slot means extending through said false bottom plate member for the width thereof, said open after end and transverse slot means being the only air entrance and exit openings communicating with the said air circulation channels.

3. A hull air channel structure comprising, coextensive bottom and false bottom plate members, spacer means separating said bottom member and said false bottom plate member to form longitudinal air circulation channels open at the after end and closed at the forward end thereof, and elongated transverse slot means extending through said false bottom plate member for the width thereof and slanted fore to aft from the top to the bottom thereof, each of said air circulation channels being closed and sealed against the entrance or exit of air except for said open after end and said transverse slot means.

4. A hull air channel structure comprising, coextensive bottom and false bottom plate members, spacer means separating said bottom member and said false bottom plate member and with said bottom member and bottom plate member defining longitudinal air circulation channels open at the after end and closed at the forward end thereof, and a plurality of elongated transverse slots, arranged one behind the other from fore to aft, extending through said false bottom plate member, and connecting with at least one of said longitudinal air channels, said open after end and transverse slot means being the only air entrance and exit openings communicating with the said air circulation channels.

5. A hull air channel structure comprising, coextensive bottom and false bottom plate mem-

bers, spacer means separating said bottom member and said false bottom plate member and with said bottom member and bottom plate member defining longitudinal air circulation channels open at the after end and closed at the forward end thereof, and a plurality of elongated transverse slots arranged one behind the other from fore to aft and extending through said false bottom plate member for the width thereof, each of said air circulation channels being closed and sealed against the entrance or exit of air except for said open after end and said transverse slot means.

6. A hull air channel structure comprising, coextensive bottom and false bottom plate members, spacer means separating said bottom member and said false bottom plate member to form longitudinal air circulation channels open at the after end and closed at the forward end thereof, and a plurality of elongated transverse slots arranged one behind the other from fore to aft, extending through said false bottom plate member for the width thereof, and slanted fore to aft from the top to the bottom thereof, said open after end and transverse slot means being the only air entrance and exit openings communicating with the said air circulation channels.

7. A hull comprising a spacer structure reaching athwart, a bottom member connected fore and aft to the top of said spacer structure and to the stern respectively, a coextensive fore and aft false bottom plate connected to the bottom of said spacer structure, longitudinal means spacing said false bottom plate and said bottom member substantially the length thereof to form fore and aft air circulation spaces, and thwart air exit slots through said false bottom plate connected with at least one of said longitudinal air channels.

8. A hull comprising a spacer structure reaching athwart, a bottom member connected fore and aft to the top of said spacer structure and to the stern respectively, a coextensive fore and aft false bottom plate connected to the bottom of said spacer structure, longitudinal means spacing said false bottom plate and said bottom member substantially the length thereof to form fore and aft air circulation spaces, and thwart air exit slots through said false bottom plate the width thereof.

9. A hull comprising a spacer structure reaching athwart, a bottom member connected fore and aft to the top of said spacer structure and to the stern respectively, a coextensive fore and aft false bottom plate connected to the bottom of said spacer structure, longitudinal means spacing said false bottom plate and said bottom member substantially the length thereof to form fore and aft air circulation spaces, and thwart air exit slots through said false bottom plate the width thereof and slanted fore to aft from the top to the bottom thereof.

DON D. BRUSH.

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