UNITED STATES PATENT OFFICE

AER CUSHIONED BOAT HULL

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This invention relates to an improvement in
gothe hull construction particularly applicable to
to a hull of the type covered in my Patent No.
2,141,111, granted January 17, 1936.

This hull has a broad spoon-shaped bow capable
of engulfing the aerated water churned up by the forefoot so that the vessel rides largely
upon air bubbles. It has a deadrise or V-shaped
bottom, back of the forefoot so that the bubbles
continually travel up the inclined surfaces of the
bottom of the hull and escape at the chine, which
term as used herein refers to the line or angle
of juncture between the bottom and side, the
purpose being to prevent the aerated water flow-
ing into the path of the propeller, and the hull
has a longitudinal semi-tunnel of progressively
increasing cross-section, beginning aft of that
portion of the hull of maximum beam, into which
tunnel the upper part of the propeller extends,

the object of the tunnel being to draw up from
the depths below the boat, through the vacuum
produced by forward movement of the hull, the
column of solid (un-aerated) water against which
the propeller thrusts, avoiding cavitation.

The object of the present invention is the pro-
vision of longitudinal ribs or rails located in
strategic positions on the bottom of the hull and
accomplishing the following results:
(a) To deflect inwardly the spray which
dashes against the bow of the boat so that it
will be entrained beneath the hull and not pushed
aside by the displacement of the hull;
(b) To prevent the aerated water thus en-
gulfed, from going straight back into the path
of the propeller;
(c) To prevent the sidewise escape of the
aerated water until it reaches the middle of
the hull;
(d) To permit the lateral escape of the aerated
water in the midship region of the hull;
(e) To prevent the aerated water which has
escaped at the midship section, from being drawn
back under the quarters and into the path of
the propeller by the vacuum created in the after
region by the passage of the boat through the
water.

Other objects of the invention will appear as
the following description of a preferred and prac-
tical embodiment thereof proceeds.

In the drawing throughout the several figures
of which the same characters of reference denote
identical parts:

Figure 1 is a side elevation of a boat hull em-
bodying the principles of the present invention;
Figure 2 is a bottom plan view;
Figure 3 is a front end view; and
Figures 4 and 5 are sections taken, respective-
ly, along the lines 4—4 and 5—5 of Figure 1.

Referring now in detail to the several figures,
the numeral 1 represents in general the hull
which has a broad transverse bow log 2, which
gives the broad spoon shape to the overhanging
portion 3 of the bow. The bow overhang is slight-
ly and smoothly curved at its juncture with the
bow log 2, the curvature gradually meeting into
a deadrise or V-shape. Figure 3 shows that ad-
jacent the water line the V-shape at the bow is
quite slight and that it increases to a fairly steep
pitch at the cross-section of greatest breadth.
Under the quarters the boat becomes flat bot-
tomed, as is indicated by the reference character
4 in Figure 5, with a longitudinal semi-tunnel 5
deepening as it extends rearwardly and into
which the upper part of the propeller preferably
extends. The rear portion of the hull bottom
latterly of the semi-tunnel is substantially flat.

A boat hull built in the manner above de-
scribed has the inherent quality of riding upon a
film of aerated water engulfed beneath the fore-
foot and of dissipating the most of the air from
the water before it reaches the tunnelled portion
of the hull. The bubbles continually rise along
the inclined planes of the V-bottom toward the
chines, so that the propeller reacts against a
body of solid, that is to say, un-aerated water.

It happens, however, that at high speeds the
hull may overrun the aerated water to such an
extent that some of it will reach the propeller,
causing more or less cavitation, and thus putting
a limit to the maximum speed.

The present invention provides an outer pair
of rails 7 and 8 at the forward part of the hull,
the front ends 9 and 10 of said rails converging
toward the keel line well above the water line
on the overhanging portion of the bow. The
rails 7 and 8 diverge with a smooth curvature
so that their rear portions 11 and 12 lie adjacent
and preferably parallel to the chines. The rear
ends 13 and 14 of these rails terminate in the
midship region of the hull.

The function of the forward portions of the
rails 7 and 8 is to catch the frothy portion of the
wave which slides up against the bow, and which
ordinarily would be dashed laterally in the form
of spray, and to tuck it under the forefoot, aug-
menting the volume of aerated water upon which
the boat hull glides. The rear or under water
portions of these rails function to confine the
aerated water beneath the forward part of the
hull so that practically none of it will be lost

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before it reaches the midship region of the boat. Inside of the outer pair of rails 7 and 8 is an inner pair 15 and 16 which, like the outer pair, consists of two opposite sides of the keel. The inner pair of rails, however, diverge at a much smaller angle than the outer pair, and have their rear portions extending along the hull intermediate the keel and the outer pair, and being fairly close to the keel. The object of this inner pair of rails is to exclude the aerated water from this area of the hull which they encompass, so as to prevent aerated water from flowing back into the propeller stream. Thus, it may be stated that the aerated water is confined to that portion of the hull between the inner and outer pairs of rails. The inner pair of rails, as shown, likewise terminates adjacent the midship region of the boat.

The rails 7, 8, 15 and 16 may be designated as cushion rails, for they define between them an area in which the hull is supported or cushioned on the aerated body of water.

A pair of rails 17 and 18 are positioned along the bottom of the hull at the quarters, preferably arranged along the chine lines on opposite sides and extending from the stern to a point approaching the midship region of the hull, leaving gaps 19 and 20 of considerable width between the outer rails 7 and 8 and the rails 17 and 18.

This gap occurs where the pitch of the V-bottom is steepest, and the object of this gap is to provide an avenue for the escape of the aerated water from beneath the hull. This area of the V-bottom intermediate the forward and rear guide rails constitutes an unimpeded discharge area.

The rear portions of the inner rails 15 and 16 materially assist in directing the aerated water toward these gaps. Thus, all of the aerated water is discharged from beneath the hull anterior to the region of the semi-tunnel 6.

It is, of course, a matter of elemental knowledge that the narrowing portion of any boat hull rearward of the part of greatest cross-section induces a vacuum beneath and behind the boat, and if it were not for the rails 17 and 18 this vacuum would draw in beneath the rear portion of the hull at least some of the aerated water which has been expelled through the gaps 19 and 20. The function of the rear rails 17 and 18, therefore, is to keep this aerated water from returning and mixing with the water in which the propeller operates.

By virtue of this construction, it is assured that the propeller will always operate in a body of unaerated water, thus avoiding cavitation, regardless of the speed at which the boat is driven, thus materially advancing the maximum speed limit.

The shape of the air cushion rails and of the rear rails, which may be termed solid water concentration rails, is a matter of option with the boat designer and builder, but I prefer to give them a stream-line shape, as shown, so that they will oppose the minimum of resistance to the forward movement of the boat.

While I have in the above description disclosed what I believe to be a preferred and practical embodiment of my invention, it will be understood that the system of rails as shown and described is applicable as well to hulls capable of entraining aerated water at the forefoot and discharging it at the midship region, even though the semi-tunnel feature may not be employed.

What I claim as my invention is:

1. In a power boat hull having a broad, substantially flat bow overhang and forefoot, and of V-bottom shape aft of said forefoot, a pair of deflecting rails projecting downwardly from the bottom of the hull, arranged symmetrically with respect to the longitudinal central line, parallel to said forefoot and it's lateral escape prevented until it reaches the midship region, the sharply inclined planes of the hull immediately aft of said rails being unimpeded to permit said aerated water to escape laterally beyond the rear ends of said rails.

2. In a power boat hull as claimed in claim 1, the rear portions of said rails being substantially parallel to the chines and lying closely adjacent thereto.

3. In a power boat hull having a broad, substantially flat bow overhang and forefoot, and of V-bottom shape aft of said forefoot, a plurality of pairs of deflecting rails projecting downwardly from the bottom of the hull, arranged symmetrically with respect to the longitudinal central line, the forward ends of the rails of each pair being adjacent the keel line, the forward ends of the outer pair being above the water line, the outer pair of rails diverging from the keel line toward the chines and having their rearward portions substantially parallel to the chines, lying closely adjacent thereto and terminating adjacent the midship region of the hull, the inner pair of rails diverging from the keel line and extending interiorly between the keel and chines, said inner and outer pairs of rails defining between them a course for guiding the aerated water beneath the forefoot and along the forward portion of the bottom of the hull, excluding that region between the rails of the inner pair, the outer pair preventing the lateral escape of the aerated water until it reaches the midship region of the hull, the inclined planes of the hull bottom immediately aft of said rails being unimpeded to permit the aerated water to escape laterally beyond the rear ends of said rails.

4. In a propeller driven power boat hull having a broad, substantially flat bow overhang and forefoot, and of V-bottom shape aft of said forefoot, a forward pair of deflecting rails projecting downwardly from the bottom of the hull, arranged symmetrically with respect to the longitudinal central line on opposite sides thereof, the forward ends of the rails being adjacent the keel line, adjacent the bow above the water line, and their rear portions adjacent the chines, and terminating adjacent the midship region, for guiding the aerated water churned up by the forefoot to a course in which it will be engulfed by the forefoot and its lateral escape prevented until it reaches the midship region, and a rearward pair of rails projecting downwardly from the bottom of the hull on opposite sides thereof, adjacent the stern to points rearward of said forward rails, leaving longitudinal unimpeded gaps between said forward and rearward rails in the area of the V-bottom, the aerated water rising laterally along the inclined planes of the hull being permitted to escape laterally by way of said gaps, said rearward rails preventing the
thus laterally diverted aerated water from being inducted under the rear portion of the hull and into the propeller path by the vacuum incident to the forward movement of the hull.

5. In a propeller driven power boat hull having a broad, substantially flat bow overhang and forefoot, and of V-bottom shape aft of said forefoot, a plurality of forward pairs of deflecting rails projecting downwardly from the bottom of the hull, arranged symmetrically with respect to the keel longitudinal central line, the forward ends of the rails of each pair being adjacent the keel line, the forward ends of the outer pair being above the water line, the outer pair of rails diverging from the keel line toward the chines and having their rearward portions substantially parallel to the chines, lying closely adjacent thereto and terminating adjacent the midship region of the hull, the inner pair of rails diverging from the keel line and extending immediately between the keel and chines, said inner and outer pairs of rails defining between them a course for guiding the aerated water beneath the forefoot and along the forward portion of the bottom of the hull, excluding that region between the rails of the inner pair, the outer pair preventing the lateral escape of the aerated water until it reaches the midship region of the hull, and a rearward pair of rails projecting downwardly from the bottom of the hull on opposite sides substantially at the chine lines along the quarters from points adjacent the stern to points rearward of said outer pair of forward rails, leaving unimpeded longitudinal gaps between said outer pair of forward rails and said rearward rails in that section of the hull of the sharpest V-bottom, the aerated water rising laterally along the inclined planes of the hull being permitted to escape laterally by way of said gaps, said rearward rails preventing the thus laterally diverted aerated water from being inducted under the rear portion of the hull and into the propeller path by the vacuum incident to the forward movement of the hull.

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