April 14, 1953 H. A. BECKER 2,634,698

HIGH-SPEED MOTOR BOAT

Filed Feb. 26, 1948

Fig. 1

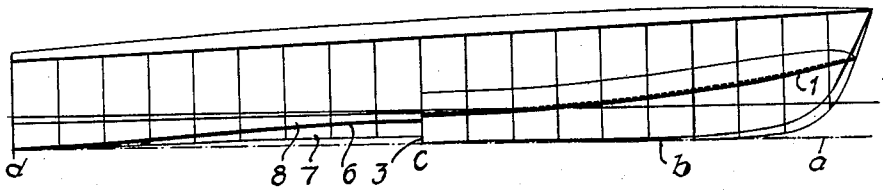


Fig. 2

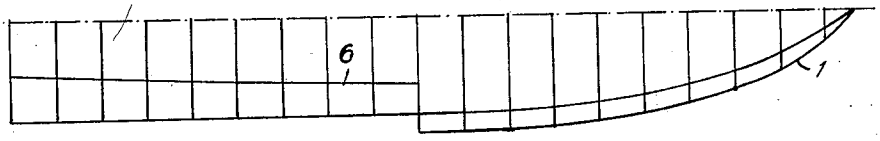


Fig. 3

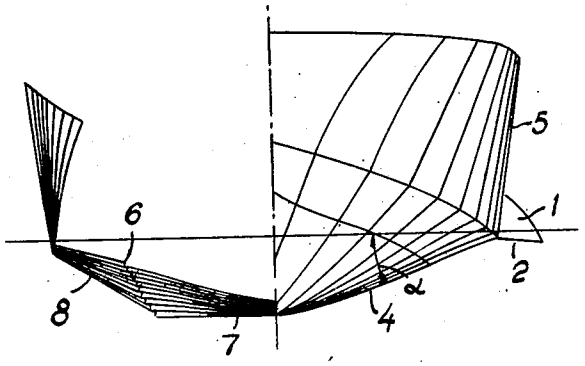
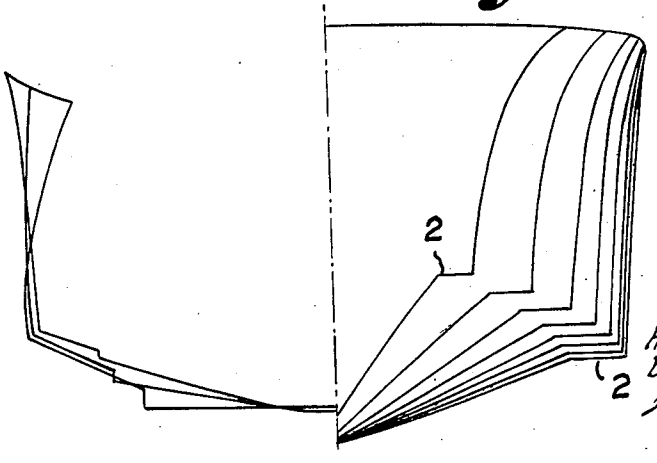


Fig. 4



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HIGH-SPEED MOTOR BOAT

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3 Claims. (Cl. 114—66.5)

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The present invention refers to an arrangement in high-speed motor boats, particularly in heavy boats or such that are intended for heavy loads, such as motor torpedo boats, with a generally V-shaped prow suitable for progress in high sea and provided with a step or steps athwart ships.

The invention is principally distinguished by horizontal or substantially horizontal additional carrying planes arranged athwart ships on both sides of the prow portion, said carrying planes being located outside the normal cross sectional outline of the V-shaped prow portion and extending astern to about the half or somewhat more than the half, for instance to about 60% of the length of the boat, while being inclined astern, so that their rear end is situated at or near, preferably somewhat below the real water line at normal trimming, in combination with outwardly directed lengthwise steps extending in the bottom surface abaft said additional carrying planes, and these lengthwise steps being arranged in the break line between a middle bottom surface and side bottom surfaces extending at an angle to the horizontal plane, obliquely outwards and upwards, the width of said middle bottom surface, counted from the longitudinal midship line, being at the forward portion (adjacent to the step athwart ships) to the width of the side bottom surface as 1.5:1 to 3:1.

The invention will be described more closely hereinafter with reference to an example of embodiment of a motor torpedo boat illustrated in the accompanying drawing. Fig. 1 is a side view of the boat. Fig. 2 is a plan view of the boat on one side of the longitudinal midship line, and Fig. 3 shows the body-plan of the boat. Fig. 4 shows the body-plane of the boat with the additional planes built into the hull.

In the drawing, 1 designates the additional plane pertaining to the one side of the boat, said plane being supposed, in the example illustrated in Fig. 3, to have been applied afterwards onto a boat the construction of which is already finished, although it may obviously be secured or built into the hull already from the beginning as shown in the body-plane in Fig. 4. The lower active surface of the additional plane facing the water is denoted by 2. Said surface being arranged in the place where the bilge is normally situated. On the upper side, the additional plane merges in a wedge-like manner into the normal planking.

The additional plane, which extends for a distance of between 40% and 60% of the length

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of the boat in the water line, commences, in the example shown, immediately at the prow and continues to a step 3 athwart ships, which step is located approximately at the middle of the boat. In this zone, the boat is substantially V-shaped, as will be found from the body-plan, so that the prow shows a configuration suited for progress in heavy sea. Astern of the step, the bottom of the boat is of a more plane shape, but is even here formed in a special suitable manner to be described in the following.

On the fore-end, the lower surface of the additional plane is located clearly above the water line, in the example at about half of the height of the designed load-line. The additional planes are preferably inclined astern, and in the example shown the stern end of the active surface 2 is located below the designed load-line, preferably even below the real water line, still perhaps somewhat above or about exactly at the latter. The inclination amounts, counted for a straight line connecting the fore-end of the surface 2 with the stern end thereof, to 15° at the most, but is not very well below 3°. The most suitable inclination may be stated to be about 5° to 7° in the construction shown.

The additional plane is preferably of about the same width all over the length thereof, save, perhaps, for the fore portion thereof, which may be drawn in to some extent. The average width of the additional plane preferably amounts to between $\frac{1}{6}$ and $\frac{1}{40}$ of the greatest width of the boat, preferably to about $\frac{1}{10}$ thereof. Viewed from the side of the boat, the additional plane is preferably bulged downwardly, and the largest bulge may amount to about 30% to 90%, preferably to about 75% of the width of the additional plane. The active surface 2 of the additional plane is preferably at right angles or approximately at right angles to the planking above the surface 2. In the example shown, the active surface 2 of the additional plane follows the bilge of the prow, which in the V-ribbed boat is located in the break line between the bottom plane 4 and the side plane 5 of the planking. Expressed in another way, the active surface 2 may form at the fore-end an angle of, for instance, 110° to 115° to the vertical line, while at the rear edge the same angle may be about 95° to 100°.

The after-part of the boat is provided with lengthwise steps 6, the height of which may amount, for instance, to between 0.5% and 2% of the greatest width of the boat. The height of said lengthwise steps does therefor, at least at the bottom surface adjacent the athwart step,

not exceed 2% of the greatest width of the boat. In the example shown, the bottom of the boat in the after-part shows, viewed on both sides of the longitudinal midship line, a middle bottom surface 7 and a side bottom surface 8 which surfaces, viewed on the whole, form an angle with one another the step 6 being arranged in the break line between said surfaces. In the forepart, that is to say adjacent to the step athwart ships, the width of the middle bottom surface, counted from the longitudinal midship line, is preferably related to the width of the side bottom surface according to the ratio 1.5:1 to 3:1, while the same ratio abaft, that is to say at the stern, may be 0.75:1 to 2:1, preferably about 1:1. As will be seen from the body-plan, in the illustrated example the middle bottom surface and the side bottom surface have approximately the same inclination on each side of the longitudinal midship line adjacent to the step athwart ships. This inclination may be between 5° and 20°, for example, preferably about 15° to the horizontal plane. Toward the stern, the surfaces continuously assume an ever increasing break relatively to each other. It is preferred to have the middle bottom surface aftermost extend substantially horizontally, while the side bottom surface aftermost forms an angle to the horizontal plane which amounts to about 30°. The last-mentioned angle may be taken to vary between 20° and 40°, for example.

In experimental investigations, the illustrated shape of the bottom of the after-part has been found to have an exceedingly good stabilizing effect in cooperation with the additional planes while having at the same time a favourable effect on the manoeuvring capacity of the boat.

As regards the shape of the forepart, such as it has been indicated in the example shown, it might be stated in addition that the angle shown in the body-plan may be advantageously between 5° and 20°, for instance between 15° and 17°, the corresponding angle for the remaining ribs then varying in a corresponding degree.

In the example shown, the additional plane 1 is shown as being made in one coherent length. It is conceivable, however, to divide it up lengthwise into two or more parts, which may have somewhat different inclinations to the horizontal plane and to the water line respectively.

In the example shown, the bottom of the boat is, as will be clearly seen from the body-plan, of exactly or nearly exactly the same width from the step athwart ships and up to the stern. It is obvious, however, that the shape of the bottom of the boat may vary in this respect, but the shape as illustrated has been found to be very advantageous from the point of view of carrying-power.

In the drawing, the chain-dotted line *a* designates the straight basic construction line of the bottom. This line forms a tangent to the real bottom line of the boat at three points, one *b* at the prow, another *c* at the step athwart ships, and a third *d* at the stern. Between these points the bottom of the boat is drawn in. This "three point hanging" has been found to be of great importance.

What I claim is:

1. A hull for high-speed motor boats, particularly heavy boats and such that are intended for heavy loads, such as torpedo motor boats, comprising a step athwart ship, said hull having a generally V-shaped prow portion suitable for progress in high sea, substantially horizontal carrying planes arranged athwart ship on both sides of the prow portion, said carrying planes being located outside the normal cross sectional outline of the V-shaped prow portion and extending astern from the stern of the hull to about 50 per cent to 60 per cent of the length of the hull and terminating in said step while being inclined from the stern downwardly astern, so that their after end is situated in the vicinity of the real water line at normal trimming, in combination with outwardly directed lengthwise steps extending in the bottom surface abaft said carrying planes, said lengthwise steps originating in said step athwart ship and extending along all of the afterpart, and being arranged at the line of intersection between a middle bottom surface and side bottom surfaces extending at an angle to the horizontal plane, obliquely outwards and upwards, said middle bottom surface and the said side bottom surface having approximately the same inclination on each side of the longitudinal midship line at the forepart of the surfaces adjacent to the step athwart ship, said inclination being between 5° and 20° to the horizontal plane, while said surfaces assume astern an ever increasing break relatively to each other, the middle bottom surface being aftermost substantially horizontal, while the side bottom surface in the same aftermost place forms an angle to the horizontal plane between 20° and 40°.

2. A hull for high-speed motor boats, particularly heavy boats and such that are intended for heavy loads, such as torpedo motor boats, comprising a step at the keel line, said hull having a generally V-shaped prow portion suitable for progress in high sea, said prow in front of said step at the keel line showing an inward bend, substantially horizontal carrying planes arranged athwart ship on both sides of the prow portion, said carrying planes being located outside the normal cross sectional outline of the V-shaped prow portion and extending astern from the stern of the hull to about 50 percent to 60 percent of the length of the hull while being inclined from the stern downwardly astern, so that their after end is situated in the vicinity of the real water line at normal trimming, in combination with outwardly directed lengthwise steps extending in the bottom surface abaft said carrying planes, and being arranged at the line of intersection between a middle bottom surface and side bottom surfaces extending at an angle to the horizontal plane, obliquely outwards and upwards, said middle bottom surface and the said side bottom surface having approximately the same inclination on each side of the longitudinal midship line at the forepart of the surfaces adjacent to the step athwart ship, said inclination being between 5° and 20° to the horizontal plane, while said surfaces assume astern an ever increasing break relatively to each other, the middle bottom surface being aftermost substantially horizontal, while the side bottom surface in the same aftermost place forms an angle to the horizontal plane between 20° to 40°, the bottom of the after part abaft the said step showing a constructional depth increasing toward the stern, the outline of the bottom of the hull being such in side elevation that the aftermost portion, the lower edge of the step, and a point in the forepart of the hull are on the same straight line.

3. A hull for high speed motor boats, particularly heavy boats and such that are intended for heavy loads, such as torpedo motor boats, comprising a generally V-shaped prow portion suit-

able for progress in high sea, substantially horizontal carrying planes arranged athwart ships on both sides of the prow portion, said carrying planes being located outside the normal cross sectional outline of the V-shaped prow portion and extending astern from the stern of the hull to about 50 per cent to 60 per cent of the length of the hull while being inclined from the stern downwardly astern, so that their after end is situated in the vicinity of the real water line at normal trimming, in combination with outwardly directed lengthwise steps extending in the bottom surface abaft said carrying planes, said lengthwise steps being arranged at the line of intersection between a middle bottom surface and side bottom surfaces extending at an angle to the horizontal plane, obliquely outwards and upwards, the width of said middle bottom surface counted from the longitudinal midship line aftermost (adjacent to the stern) is related to the width of said side bottom according to the ratio, 0.75:1 to 2:1, and the width of said middle bottom surface, counted from the longtudinal midship line, being at the forward portion to the width of the said bottom surface as 1.5:1 to 3:1,

said middle bottom surface and the said side bottom surface having approximately the same inclination on each side of the longitudinal midship line at the forepart of the surfaces, said inclination being between 5° to 20° to the horizontal plane, while said surfaces assume astern an ever increasing break relatively to each other, the middle bottom surface being aftermost substantially horizontal, while the side bottom surface in the same aftermost place forms an angle to the horizontal plane between 20° and 40°.

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