Aug. 31, 1965 R. C. CALE 3,203,015

APPARATUS FOR PROVIDING A DISPLACEMENT HULL HAVING AUXILIARY PLANING SURFACES

Filed Aug. 15, 1963 4 Sheets-Sheet 1

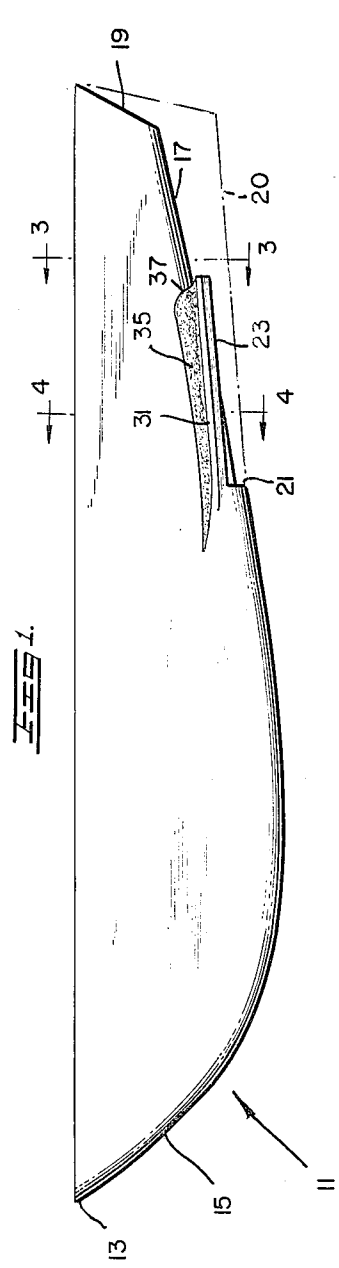

FIG. 1.

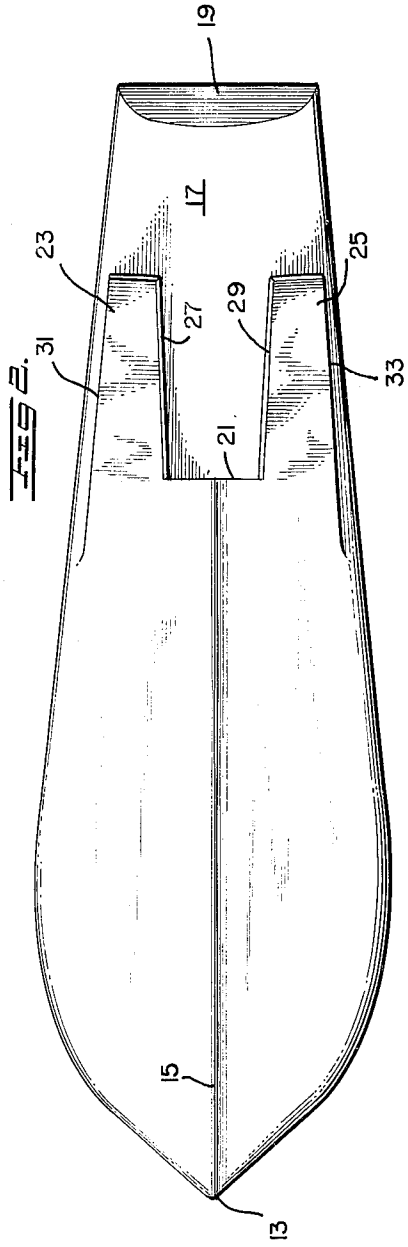

FIG. 2.

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FIG 3.

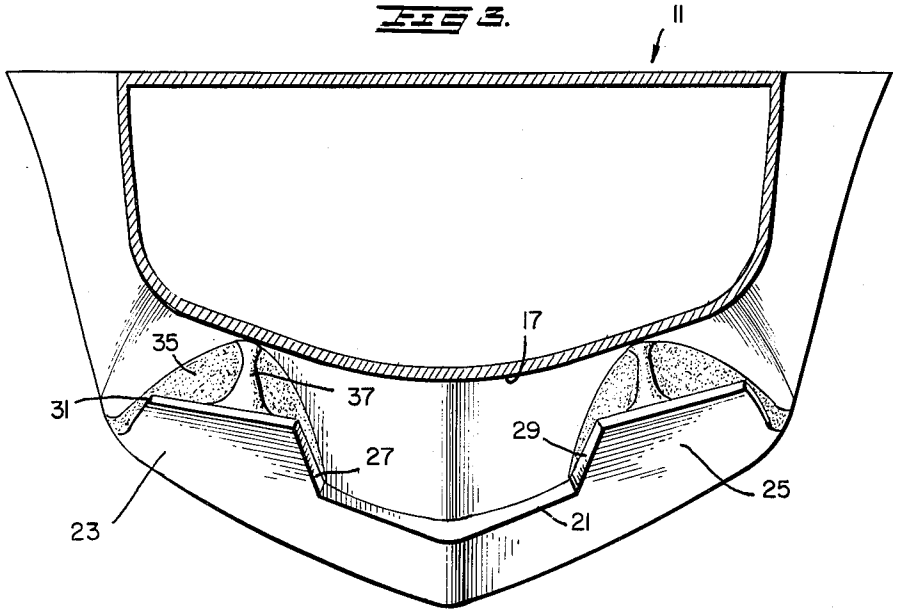
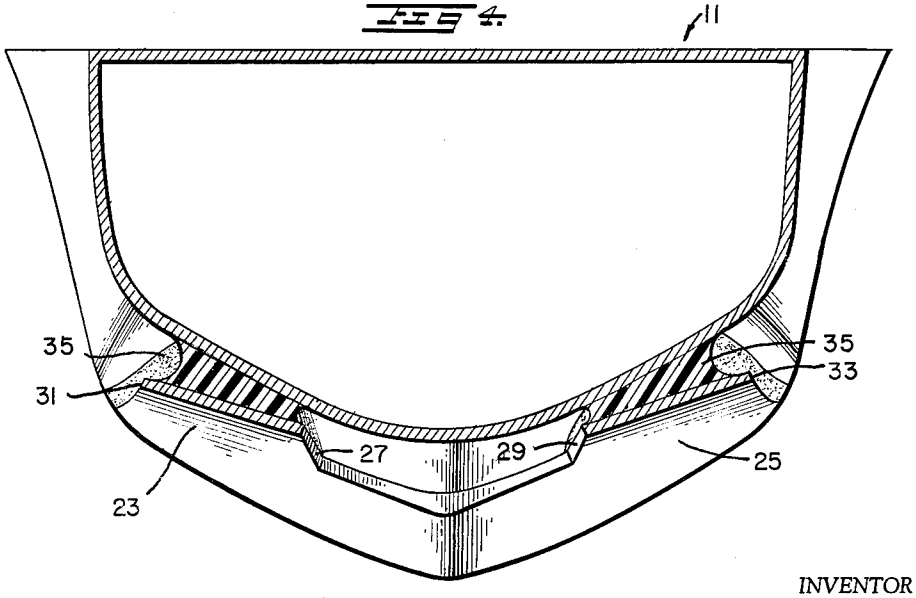


FIG 4.



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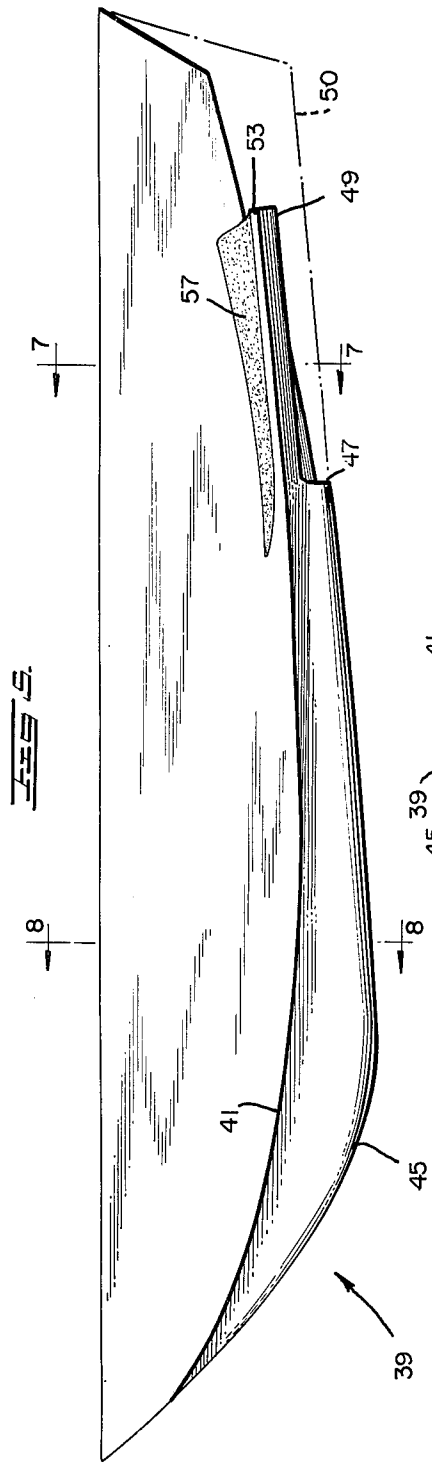

FIG. 5.

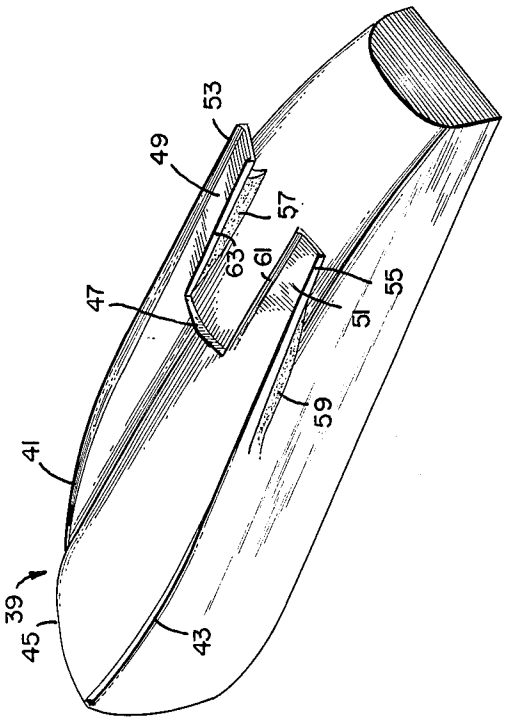

FIG. 6.

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FIG 7.

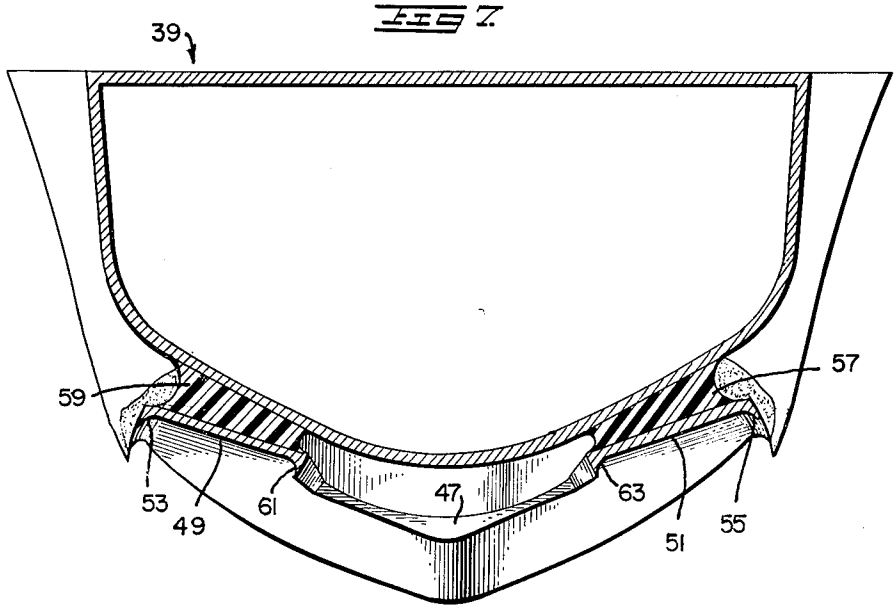
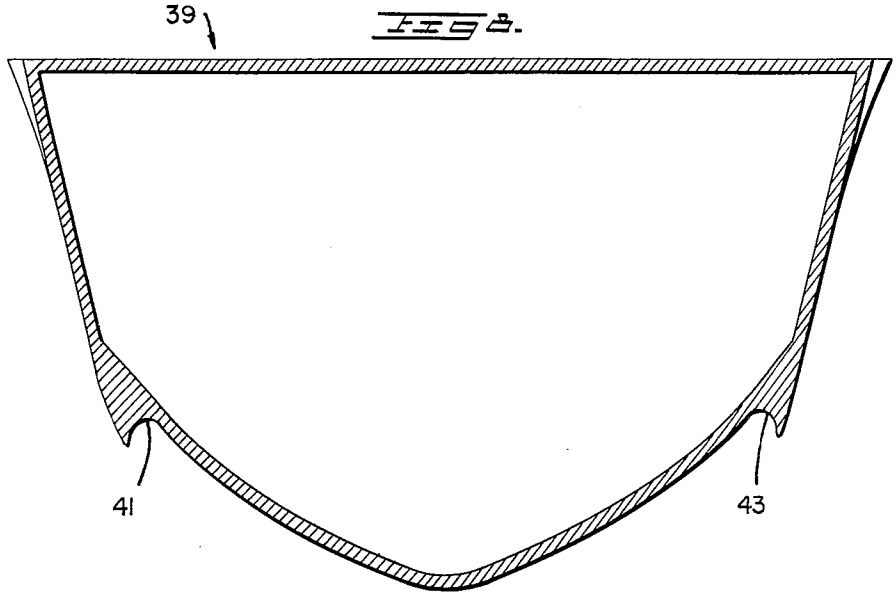


FIG 8.



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RICHARD C CALE

United States Patent Office 3,203,015 Patented Aug. 31, 1965

3,203,015

APPARATUS FOR PROVIDING A DISPLACEMENT HULL HAVING AUXILIARY PLANING SURFACES

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5 Claims. (Cl. 9—6)

This invention relates generally to hull structures and more specifically to a dual purpose hull structure.

Except for some unusual or varied applications, most of the boats used today have either a standard displacement type hull or a basic hull with planing surface. The choice between these two basic hull designs is, of course, dependent upon the primary use for which the hull is to be used. However, there exists a need for hulls which preferably are able to operate efficiently in both a displacement condition and in a planing condition. Attempts have been made to compromise in the design of the hull between a displacement surface and a planing surface with a resultant decrease in efficiency of operation under both conditions.

An example of the type of operation having dual requirements may be seen in patrol type boats as used by the government along the shores and near the coastline. These patrol boats require efficient displacement type operation so that they may cruise over a wide range on the limited fuel which their size permits. However, when an emergency arises, these patrol craft must also be able to attain high speeds to reach their particular objective. In order to obtain these high speeds the boat must reach a planing operation which also must operate as efficiently as possible.

Another application of dual operation occurs in what is now commonly known as a motor-sailor type of boat. At the present time these hulls are designed as displacement type hulls for the sailing operation. However, when the motor is in use, the hull remains a displacement type hull and cannot reach a very high speed under this type of operation. If such a motor-sailor could plane efficiently, maximum efficiency could be obtained from the power plant on the boat.

Accordingly, it is an object of this invention to provide a boat hull which is suitable for efficient displacement and planing purposes.

Another object of this invention is to provide a basic planing hull having auxiliary planing surfaces.

A further object of this invention is to provide auxiliary planing surfaces which may be adapted to any of the known types of displacement hulls.

A still further object of this invention is to provide a method for adapting basic displacement hull for planing operations.

These and other objects will become apparent from the following description when taken in conjunction with the drawings wherein:

FIG. 1 is a side elevational view of the displacement hull having auxiliary planing surfaces thereon;

FIG. 2 is a plan view of the bottom of the hull shown in FIG. 1;

FIGS. 3 and 4 are sectional views taken along the lines 3—3 and 4—4 of FIG. 1;

FIG. 5 is a modified hull incorporating the present invention;

FIG. 6 is a perspective view of the bottom of the hull shown in FIG. 5; and

FIGS. 7 and 8 are sectional views taken along the lines 7—7 and 8—8 of FIG. 5.

Turning now more specifically to the invention as shown in FIGS. 1 through 4, a displacement hull **11** has the standard configuration rearward from the bow **13**, including the forward part of the keel **15**. However, aft of midships

the standard configuration changes with the after keel rising sharply at **17** to meet the transom **19**.

Aft of the midships section of the hull are two auxiliary planing surfaces **23** and **25**. These auxiliary planing surfaces join with the planing hull **11** in a smooth, continuous surface and then extend rearwardly below the after portion **17** of the displacement surface.

Connecting the two forward portions of the planing surfaces **23** and **25** is a comparatively shallow step **21**. This step **21** serves a dual purpose. When the hull is operated in a displacement fashion, it is necessary that the water pass about and over the auxiliary planing surfaces with as little turbulence as possible and without any suction or drag created thereby. The step **21** allows the water to flow so that there will be no such suction or drag built up below the displacement hull aft adjacent to the area **17**.

In order to further assure a smooth flow of water past and along the auxiliary planing surfaces **23** and **25** they may be faired smoothly into the planing hull with any of standard fillers or like material **35** such as resin. This can be more clearly seen in FIGS. 3 and 4. The filter **35** is formed in a substantially streamlined configuration ending in a rather narrow strip **37** at its after edge. This streamline configuration of the fairing allows the water to pass smoothly and evenly around and between the two planing surfaces **23** and **25** when the hull is in displacement operation.

When power is applied to the hull, the increased power tends to make any type hull attempt to attain a planing attitude. However, a basic displacement hull will not plane and its speed, therefore, is very limited. In the present invention, the application of power creates a lift which causes the auxiliary planing surfaces to enter into a planing attitude. In this attitude the after area **17** of the hull is lifted almost entirely out of the water with the hull planing along the forward surface and the auxiliary planing surfaces.

In the planing attitude step **21** serves its second purpose in that it provides a break in the water streaming past the hull, thus aiding the planing operation. Additionally, the step prevents a negative pressure area from being created between the two auxiliary planing surfaces **23** and **25**. It will also be noted that the outer edges **31** of the auxiliary planing surfaces are faired smoothly into the hull itself in order to avoid turbulence.

The auxiliary planing surfaces will vary somewhat as to their particular angle and length in accordance with the particular type of planing hull which is being adapted to the present invention. Possibly the best way to picture the addition of these auxiliary planing surfaces is to envision a phantom representation **20** of a planing hull over the aft section **17** of the displacement hull as shown. In effect, these auxiliary planing surfaces are sections of such a phantom planing hull with the sections faired into the smooth, continuous line of the remaining part of the hull.

FIGS. 5 through 8 show a modification of the present invention using a coved type hull in the forward section. This cove structure is shown and described in copending U.S. patent application Serial No. 145,822, filed October 18, 1961, in the name of the present inventor. For particular details of the operational characteristics of this type of hull reference is made to the above-mentioned application.

The coved structure **41** and **43** commences well forward on the bow below the deckline and extends aft. When adapted to the present invention, the cove structure is carried along to the outer edges of the auxiliary planing surfaces **49** and **51** so as to create the coves **53** and **55** in the planing surface themselves. In effect, this cove structure permits the kinetic energy of the water to be forced outwardly and downwardly thereby giving additional lift to the hull resulting in a high and smooth planing opera-

tion which obtains maximum efficiency from the hull as explained in the above-mentioned specification. Again, the step **47** is used for the purposes described above.

It has been found that neither the planing surfaces as shown in FIGS. 1 through 4 nor the modification of FIGS. 5 through 8 has any basic detrimental affect on the hull during its displacement operation. This is due to the fact that the water may pass smoothly around and over the planing surfaces without any particular turbulence, thereby eliminating substantially any drag which such additional underwater surfaces might possibly cause.

The specific configuration of the auxiliary planing surfaces and the use of the step will depend upon the specific hull configuration. At displacement speeds the shape of area **17** determines the water flow aft of midship. The closing in of the water to displace the hull as it moves forward can come from the water flowing around the sides of the hull and from resurgent water flowing under the hull as long as the hull is streamlined to prevent turbulence. The step **21** would be widest in a design such as a fantail stern, but could be eliminated in a hull with a canoe-type stern.

The application of engine power creates a lift which causes the auxiliary planing surfaces to enter into a planing attitude. The hull is lifted and allowed to free the aft surface **17** completely from contact with the water. In the resultant planing condition, the hull is supported by the action of the water on surfaces **23** and **25** and by a portion of the hull surface forward of these surfaces. The step **21** functions in the known manner of allowing the water to break contact with surface **17**.

However, the hull would operate satisfactorily without the step **21** by widening the forward auxiliary planing surfaces **23** and **25**, allowing them to meet at keel **15**. With a hull of such construction planing, the water would break free of surface **17** along edges **27** and **29** of surfaces **23** and **25**.

The present invention not only provides an efficient displacement hull for low speed operations, but, additionally, provides means for efficient planing during high speed operations.

It is to be understood that the description and drawings are illustrative only and the invention is not to be considered as limited thereby since various modifications of the particular structure could be made by those familiar with the art within the scope of the invention.

I claim:

1. A boat hull comprising,

a basic displacement, non-planing surface extending from bow to stern,

a first auxiliary planing surface permanently and immovably secured to said displacement surface on one side of the keel of said hull and extending aft of the midships section of said hull and below said displacement surface,

a second auxiliary planing surface spaced apart from said first auxiliary surface and permanently and immovably secured to said displacement surface on the other side of said keel of said hull extending aft of the midships section of said hull substantially the same distance as said first auxiliary planing surface and below said displacement surface,

the forward area of each of said planing surfaces joining with said displacement surface so as to form smooth continuous surfaces,

a step between the forward areas of said first and second auxiliary planing surfaces, and

fairing means joining said planing surfaces and said displacement surface for providing streamlined surfaces therebetween.

2. The boat hull of claim **1** further comprising continuous coves extending from below the bow on either side of the hull to the outer aft edges of each of said planing surfaces.

3. In a boat hull having a basic displacement, non-planing surface, apparatus for providing a planing operation at increased speeds comprising,

a first auxiliary planing surface permanently and immovably secured on one side of the keel of said displacement surface extending aft of the midships section of said hull and below said displacement surface,

a second auxiliary planing surface spaced apart from said first auxiliary planing surface permanently and immovably secured on the other side of the keel of said displacement surface and extending aft of the midships section of said hull and below said displacement surface,

the forward areas of each of said planing surfaces joining with said displacement surface to form smooth continuous surfaces, and

a step between the forward areas of said first and second planing surfaces.

4. The hull of claim **3** further comprising continuous coves extending from below the bow on either side of said hull aft to the outer rearward edges of each of said planing surfaces.

5. The hull of claim **3** further comprising fairing means between each of said auxiliary planing surfaces and said displacement surface for providing streamlined surfaces therebetween.

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