June 2, 1942. H. G. FERGUS 2,285,023

PROPELLER FOR BOATS AND SHIPS

Filed Dec. 12, 1938

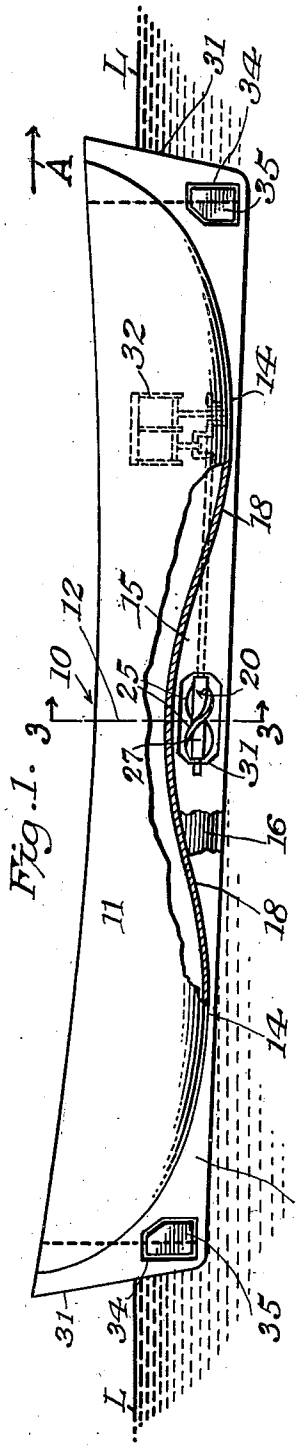


Fig. 1.

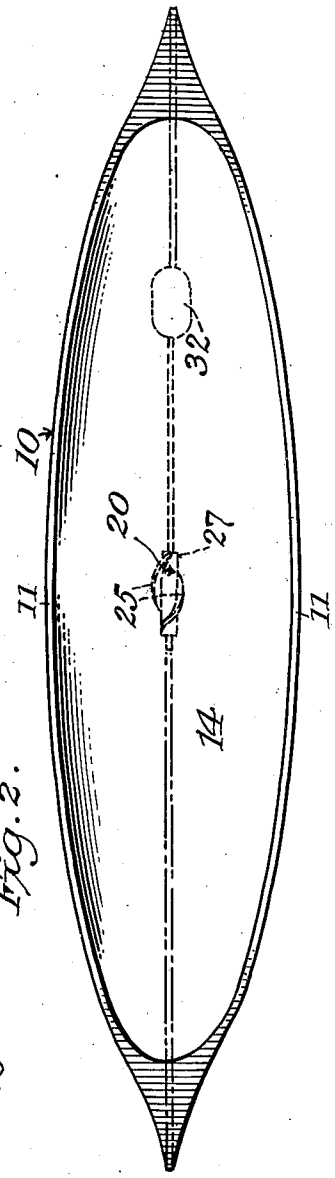


Fig. 2.

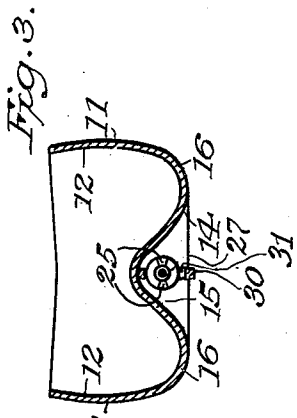


Fig. 3.

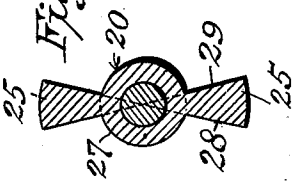


Fig. 5.

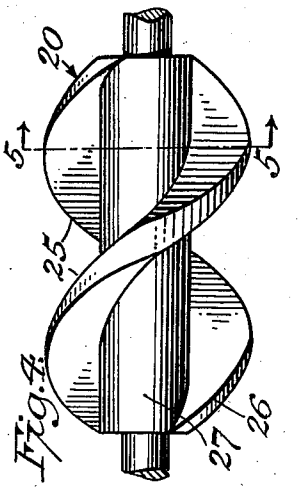


Fig. 4.

Inventor;
Horace G. Fergus,
by H. M. Kilpatrick
Attorney.

Patented June 2, 1942 2,285,023

UNITED STATES PATENT OFFICE

2,285,023

PROPELLER FOR BOATS AND SHIPS

Horace G. Fergus, Keyport, N. J.

Application December 12, 1938, Serial No. 245,325

6 Claims. (Cl. 115—39)

This invention relates to boat propulsion and to means for increasing the efficiency of the propulsion and increasing the speed and more particularly to an especially designed hull and propeller for effecting these.

One object of the invention is to provide an improved hull construction and propeller location whereby the after part of the boat is raised by its own propeller wave and the boat is caused to ride down-hill on its own stern wave, thereby increasing the speed and decreasing the power required.

Other objects of the invention are to provide an improved propeller cooperating with an improved hull construction for still further increasing the speed and efficiency, and to provide a boat and propeller that may be driven with efficiency in either direction, and to provide a propeller that avoids cavitation.

Features of the invention are—

First, an especially designed hull for facilitating the propulsion and an especially designed propeller cooperating with the hull to increase the re-action from the projection of water sternward by the propeller, so as to take advantage in a great degree of the increased thrust a boat derives from the frictional wake or zone of water following in the direction of the boat.

Second, to give to the boat or ship a reduced gravitational downward pull by raising the stern of the boat or ship so that the mass load or tonnage is in a down hill position.

Third, to allow the propeller to reduce its slippage as it increases its speed and the ship increases its momentum or speed.

Fourth, to provide for driving the boat or ship in either direction by the same propeller, by reversing its direction of rotation, in which case the boat can be provided with rudders at both ends, which may be worked in unison.

Fifth, to provide an improved propeller positioned so that the resulting wave sternward raises the rear of the boat or ship so as to throw its mass tonnage forward of the normal center of gravity, taking advantage of the downhill position the boat or ship assumes.

Any vessel designed so to float on the water by its displacement, depends for its motive power to propel it on such unit of power as is installed in or on the boat in such a fashion as to cause its propeller to contact the water and by a rotating or revolving of its propeller, moves the boat in a directed course, and creates a center of gravity contrary to its normal center of gravity when in an idle floating position. I utilize this changing center of gravity by deliberately installing in the midship position in the keel an especially designed propeller, thereby causing the center of gravity or mass load to be thrown in the same direction that the boat is traveling.

Additional objects of the invention are to effect simplicity and efficiency in such constructions and to provide an extremely simple construction which is economical, and reliable in operation, and economical to build.

Still other objects of the invention will appear as the description proceeds; and while herein details of the invention are described in the specification and some of the claims, the invention as described in the broader claims is not limited to these, and many and various changes may be made without departing from the scope of the invention as claimed in the broader claims.

The inventive features for the accomplishment of these and other objects are shown herein in connection with a boat which briefly stated, includes a boat comprising a hull tapering to both ends to form similar bows, and provided at the mid-section of the bottom with a downwardly open bubble pocket in which is longitudinally mounted an axially elongated propeller constructed and positioned to cause water projected sternward from the propeller under the hull to raise the stern so that the load is thrown forward and is in down hill position in the direction of travel to cause downhill riding of the boat thereby to increase the speed and efficiency of the propulsion.

In the accompanying drawing showing, by way of example, one of many possible embodiments of the invention,

Fig. 1 is a side elevation partly in longitudinal vertical section, showing the boat in exaggeratedly inclined down-hill-riding position with the center of gravity forward of the mid-section;

Fig. 2 is plan showing the boat at rest;

Fig. 3 is a transverse vertical sectional view of the mid-section of the boat, showing the bubble pocket and propeller therein, and taken on the line 3—3 of Fig. 1.

Fig. 4 is a side elevation of the propeller; and

Fig. 5 is a transverse vertical plane sectional view of the propeller taken substantially on the line 5—5 of Fig. 4, looking in the direction of the arrows of said line.

My improved boat comprises a hull 10 having approximately vertical sides 11 outwardly rounded between the top and bottom thereof and wide at its mid-section 12 and tapering to both ends to form identical medium sharp inwardly and

downwardly inclined bows merging into the boat bottom 14, said bottom being provided at the mid-section with a longitudinally elongated concaved face portion forming a deep downwardly open bubble pocket 15 having at its sides downwardly projected convexedly rounded longitudinal bulbs 16, 16 forming closed sides of the pocket and merging at their sides and ends respectively with the sides 11 and bottom 14 of the hull.

Said bubble pocket 15 is deepest at the mid-part and has its forward and aft parts 18 of its face inclined downwardly and merging with the hull bottom 14 to form inclined reaction surfaces 18 each extending from the propeller more than a quarter of the length of the submerged portion of the hull, said bottom having a substantially flat reaction part 14 just beyond each end of the pocket. A helical propeller 20 is axially longitudinally disposed in the mid-part of said pocket as will be explained.

The bulbs 16 form closed pocket sides of the pocket serving as a guide means to guide and direct rearwardly from the propeller inward of the sides of the hull and sternward under said inclined reaction surface 18 and flat part 14 any water that may move laterally from the propeller.

The inclined reaction surface 18 and flat part 14 together extend longitudinally of the hull a distance more than half of the submerged length of that portion of the hull forward of the pocket, said distance being great enough in relation to the length of the said portion and the hull to cause the pressure on said reaction surface and flat part by the water directed thereto by the propeller and said closed sides at the bulbs 16 to appreciably raise the stern part of the hull. The propeller, said closed sides, the weight of said portion, the reaction of the water on said surface and part in said relation cooperating to raise the stern part of the hull a useful amount and to raise it enough and tilt the hull forwardly downwardly enough to throw the load forwardly enough in down hill position in the direction of travel to appreciably increase the forward thrust on the hull, thereby increasing the speed and reducing the power required to propel the boat.

The design of the hull causes the bubble pocket above the propeller to assist in its buoyancy. The design of the hull contributes to its steadiness and stabilization thereby increasing its safety.

As shown, the propeller comprises two helical blades 25 diminished at each end, each blade having approximately two complete half turns, the pitch of the blades approximating twice the diameter of the propeller.

The propeller blades are fast on a large elongated cylindrical hub 27, the diameter of the hub being greater than the radial length of each blade, thereby retaining only the more efficient part of the blades and diverting the flow of water to said face 18 and part 14. The radii of both faces 28, 29 of both blades are straight and radial to the axis of the propeller, whereby the thickness of each blade at its peripheral part is approximately twice the thickness of the blade at the hub, whereby cavitation is greatly reduced when the propeller is driven in either direction, whereby the boat may be driven in either direction with great efficiency, and whereby the water is thrust straight to the rear of the propeller against the axis of the reaction surface 18 and said reaction part 14, thereby to increase the lifting action of the water on the after part of the hull.

The especially designed hull cooperates with the propeller to cause the boat or ship to ride on the wave caused by the propeller, thereby changing the center of gravity of the boat from the normal idle position to the position as shown in Fig. 1. The invention is not limited to a single propeller to accomplish the same result. The pitch of the propeller and the lines of the keel or hull are coordinated best to accomplish the desired effect.

The thrust-producing power loss that is termed cavitation is reduced by my especially designed propeller, in that the cavity ordinarily produced at the back of the blades of a propeller from its pitch, is reduced to a minimum by constructing the propeller blades so that the radii of both side faces are straight and radial to the axis of the propeller. The blades of the propeller diminish at both ends to the hub as shown in Fig. 4.

The aforementioned improvement in propelling boats or ships may be used individually or collectively in such a manner as to use the basic principles described therein whether in part or in full if employed in boats or ships or not.

I provide an especially designed keel 30 which allows the installation of the propeller 20 to be placed and revolved in the exact midship section so as to cause the changing of the center of gravity from normal to downhill. The keel 30 is disposed in the axial vertical plane of the hull and has a continuous approximately straight lower edge and upwardly outwardly inclined ends 31 extending as high as, and slightly below the hull and beyond the ends of the hull. Said keel at the bubble pocket is shown as having a longitudinal cut-out 31 in which the elongated helical propeller 20 is longitudinally disposed and protected, the propeller shaft being mounted in bearings at both ends of the cut-out and extended to and driven by a suitable engine or motor 32 within the hull.

Each end of the keel is shown as being provided with an end cut-out 34 in which are mounted rudders 35 respectively, which may be operated in synchronism or independently.

The propeller and its shaft are so positioned that the ship cradles from the center, thereby allowing the horizontal idle position of the boat to be changed when its propeller revolves to shift the mass load forward or aft as the case may be depending upon the direction of rotation. As shown in Fig. 1, the boat is being propelled in the direction of the arrow A and is forwardly and downwardly inclined relative to the water line L.

The invention claimed is:

1. A boat comprising a hull having its sides tapering from its mid-section to both ends to form identical stems; said bottom being provided at the mid-section with a downwardly opening bubble pocket, deepest at its mid-part and having its face downwardly inclined at both ends and merging with the bottom; and a helical propeller axially longitudinally disposed in said pocket and adapted to propel equally well in either direction, whereby said boat may be propelled equally well in either direction with a single propeller.

2. A boat comprising a hull provided near the mid-section of its bottom with a longitudinally elongated downwardly opening upwardly extended bubble pocket closed at each side; a helical propeller axially longitudinally disposed in the mid-part of said pocket; said bubble pock-

et having the aft parts of its face inclined downwardly and merging with the bottom to form inclined reaction surfaces each extending from the propeller more than a quarter of the length of the submerged portion of the hull; said hull having a substantially flat reaction part just beyond the rear of the pocket; the closed pocket sides serving as a guide means to guide and direct, inward of the sides of the hull and sternward under said inclined reaction surface and flat part, water that may be caused to move laterally in the pocket, thereby to raise the stern.

3. In a boat as in claim 2, said inclined reaction surface and flat part together extending longitudinally of the hull a distance more than half of the submerged length of that portion of the hull forward of the pocket, said distance being great enough in relation to the length of the said portion and the hull to cause the pressure on said reaction surface and flat part by the water directed thereto by the propeller and said closed sides to appreciably raise the stern part of the hull; the propeller, said guide means, the weight of said portion, the reaction of the water on said surface and part in said relation cooperating to raise the stern part of the hull a useful amount and to raise it enough and tilt the hull forwardly downwardly enough to throw the load forwardly enough in down hill position in the direction of travel to appreciably increase the forward thrust on the hull, thereby appreciably increasing the speed and appreciably reducing the power required to propel the boat.

4. In a boat as in claim 2, the blades of said propeller being so designed that nearly all of the water is thrust straight to the rear of the propeller against the axis of the reaction surface and said reaction part, thereby to increase the lifting action of the water on the after part of the hull; said inclined reaction surface and flat part together extending longitudinally of the hull a distance greater than half of the submerged length of that portion of the hull forward of the pocket, and greater than half the submerged length of the hull, said distance being great enough in relation to the length of the said portion and the hull to cause the pressure on said reaction surface and flat part by the water directed thereto by the propeller and said closed sides to raise the stern part of the hull; the propeller, its straight rearward thrust, said guide means, the weight of said portion, the reaction of the water on said surface and reaction part in said relation cooperating to greatly raise the stern part of the hull and to raise it enough and incline the hull forwardly downwardly enough to throw the load forwardly enough in down hill position in the direction of travel to greatly increase the forward thrust on the hull, thereby increasing the speed and reducing the power required to propel the boat.

5. In a boat as in claim 2, said propeller comprising a large elongated cylindrical hub, and two helical blades joining the hub; the radii of both faces of both blades being straight and radial to the axis of the propeller, whereby the thickness of each blade at its peripheral part is more than twice the thickness of the blade at the hub whereby cavitation is greatly reduced, and whereby the water is thrust straight to the rear of the propeller against the axis of the reaction surface and said reaction part, thereby to increase the lifting action of the water on the after part of the hull; said inclined reaction surface and flat part together extending longitudinally of the hull a distance more than half of the submerged length of that portion of the hull forward of the pocket; the propeller, its straight rearward thrust, said guide means, the weight of said portion, the reaction of the water on said surface and reaction part in said relation cooperating to raise greatly the stern part of the hull and to raise it enough and incline the hull forwardly downwardly enough to throw the load forwardly enough in down hill position in the direction of travel to greatly increase the forward thrust on the hull, thereby increasing the speed and reducing the power required to propel the boat.

6. A boat comprising a hull provided at the mid-section of its bottom with a longitudinally elongated downwardly opening upwardly extended bubble pocket closed at each side; a helical propeller, adapted to propel in either direction, axially longitudinally disposed in the mid-part of said pocket; said bubble pocket having the forward and aft parts of its face inclined downwardly and merging with the bottom to form inclined reaction surfaces each extending from the propeller more than a quarter of the length of the submerged portion of the hull; said hull having a substantially flat reaction part just beyond each end of the pocket; the closed pocket sides serving as a guide means to guide and direct the water projected sternward from the propeller inward of the sides of the hull and sternward under said inclined reaction surface and flat part thereby to raise the stern; said propeller comprising a large elongated cylindrical hub, and two helical blades joining the hub; the diameter of the hub being greater than the radial length of each blade, thereby retaining only the more efficient part and diverting the flow of water to said part; the radii of both faces of both blades being straight and radial to the axis of the propeller, whereby the thickness of each blade at its peripheral part is more than twice the thickness of the blade at the hub whereby cavitation is greatly reduced when the propeller is driven in either direction with great efficiency by a single propeller; and whereby the water is thrust straight to the rear of the propeller; each of said inclined reaction surfaces and associated flat part together extending longitudinally of the hull a distance more than half of the submerged length of that portion of the hull forward of the pocket, said distance being great enough in relation to the length of the said portion and the hull to cause the pressure on said reaction surface and flat reaction part by the water directed thereto by the propeller and said closed sides to raise the stern part of the hull; the propeller, its straight thrust, said guide means, said portion, the reaction of the water on said surface and part in said relation cooperating to raise greatly the stern part of the hull, when the boat is propelled in either direction.

HORACE G. FERGUS.