A boat hull comprises a hull body having two lateral flanks linked by a bottom surface, and at least two propulsion compartments provided in two bulges protruding below the bottom surface of the hull body. Each propulsion compartment lodges a propulsion engine located below the bottom surface of the hull body. The propulsion engines are located at the deepest position in the hull and below the water plane.
BOAT HULL STRUCTURE

FIELD OF THE INVENTION

[0001] The present invention generally relates to boat hull designs, and more particularly to water surface vessels provided with a mono-hull structure and powered by engine propulsion.

DESCRIPTION OF THE RELATED ART

[0002] A variety of different boat hulls have been implemented in diverse types of conventional water surface vessels. Continued demands for stability and increased speeds stimulate further developments in boat hull designs.

[0003] In certain mono-hull water vessels known in the art, the boat hull has a generally V-shaped profile for cutting through water. Unfortunately, one commonly known disadvantage of the V-shaped hull is its lack of stability on water with a hard drive in rough water and significant side rocking. Another drawback of the V-shaped mono-hull is its significant drag and draft, which thus require significant power to cruise the boat at high speeds.

[0004] The trimaran or catamaran is another type of boat which assembles a plurality of thin hulls together to provide a more stable ride. Though this multi-hull boat is able to cruise at a generally faster speed, it is more affected by pitch polling when the front of the hulls dives into a wave and becomes covered with water.

[0005] Other types of boat hulls known in the art may combine the hulls of the catamaran into a single body by providing a mono-hull construction having projecting hull portions. Such a hull design is described in, for example, U.S. Pat. No. 6,546,890, the disclosure of which is incorporated herein by reference. This design arranges two lateral hull portions at two sides of a front hull. The lateral hull portions partly protrude out of the water surface when the boat vessel floats motionless in still water.

[0006] U.S. Pat. No. 6,851,991, the disclosure of which is also incorporated herein by reference, describes a mono-hull design with streamlined projecting parts towards the stern. The projecting parts terminate with propeller blades which lie partly inside a bottom surface of the hull projecting part. At a cruising speed, the boat is lifted so that reduced areas of contact with water are formed on a tail end of the projecting parts. In this cruising configuration, the propeller blades rotate partly under and above the water plane.

[0007] Like the catamaran model, the hull designs described in the aforementioned patent references reduce the hull contact with water to two lateral thin hull portions projecting from the hull body. This approach intends to reduce the hull draft, and accordingly reduce the drag of the vessel while the vessel is cruising. Unfortunately, these designs have several drawbacks. First, though the mono-hull forms lateral protruding portions like the lateral hulls of the catamaran, it still keeps a general profile and characteristics of a traditional V-shaped hull. In particular, the weight distribution of the vessel may be insufficient to provide effective stability. In addition, lodging the propeller blades partly through the bottom surface of the hull as described in U.S. Pat. No. 6,851,991 will greatly affect the propulsion efficiency of the propeller blades.

[0008] Therefore, there is presently a need for an improved hull design that can overcome the disadvantages of the boat hulls of the prior art.

SUMMARY OF THE INVENTION

[0009] The present application describes a mono-hull structure with improved stability and less fuel consuming suitable for water surface boats powered by engine propulsion.

[0010] In one embodiment, the boat hull comprises a hull body including two lateral flanks linked by a bottom surface, and at least two propulsion compartments provided in two bulges protruding below the bottom surface of the hull body, wherein each propulsion compartment lodges a propulsion engine located below the bottom surface of the hull body. With respect to the overall load distribution of the boat vessel, the propulsion engines thus are located at the deepest position of the hull below the water plane.

[0011] In some embodiments, the bulges are located on each side of a keel centerline of the hull body. In specific embodiments, the bulges have a streamlined profile which extends into a tapered tail end. In some variations, the tapered tail end of each bulge is offset a distance from the bottom surface of the hull.

[0012] In certain embodiments, each propulsion engine is connected to a propeller shaft extending out of the tail end of each bulge. In other embodiments, each propeller shaft extends substantially parallel with a water plane.

[0013] In some variant embodiments, the bulges are formed with a continuous profile having a generally oval shape in a transversal section. The bulges can be placed at a rear half of the length of the hull body.

[0014] According to further embodiments, the hull body includes a keel placed between the two propulsion compartments. The keel may extend substantially from a sternpost of the hull toward a bow of the hull, and has a depth greater than a height of the bulges.

[0015] In some variations, the bottom surface of the hull body may include concave portions above the tail ends of the bulges. The hull body is configured so that a water plane is located above the bottom surface of the hull body.

[0016] The foregoing is a summary and shall not be construed to limit the scope of the claims. The operations and structures disclosed herein may be implemented in a number of ways, and such changes and modifications may be made without departing from this invention and its broader aspects. Other aspects, inventive features, and advantages of the invention, as defined solely by the claims, are described in the non-limiting detailed description set forth below.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] FIG. 1 is a perspective side view of a boat hull according to an embodiment of the invention;

[0018] FIG. 2 is a perspective bottom view of a boat hull according to an embodiment of the invention;

[0019] FIG. 3 is a side view of a boat hull according to an embodiment of the invention;

[0020] FIG. 4 is a rear view of a boat hull according to an embodiment of the invention;

[0021] FIG. 5 is a bottom view of a boat hull according to an embodiment of the invention; and

[0022] FIG. 6 is a side view of a boat hull according to a variant embodiment of the invention.
DETAILED DESCRIPTION OF THE EMBODIMENTS

[0023] The present application describes a mono-hull structure with improved stability and less fuel-consuming. The mono-hull structure is suitable for water surface boats powered by engine propulsion, such as yachts, marine transportation boats and like displacement boat implementations. "Displacement boat" means that the boat vessel glides smoothly through the water, in contrast to the "planing boat" which rises up on top of the water.

[0024] FIGS. 1 through 5 are schematic views of a hull structure suitable for a mono-hull boat vessel according to an embodiment of the invention. The boat hull 100 includes an elongated hull body 102 which forms a sharp bow 104 and widens towards the stern 106. The hull 100 has a generally V-shaped cross-section near its bow 104, which progressively widens into a U-shaped cross-section towards the stern 106 with a bottom surface 108 linking two lateral flanks 109.

[0025] As shown, the V-shaped profile of the hull body 102 near the bow 104 forms two flank portions converging and joining at a keel centerline 103. The bottom surface 108 is formed with a profile that continuously narrows and slopes from the stern 106 deeper toward the bow 104 to merge with the keel centerline 103 proximate to the bow 104. Accordingly, the bow 104 has a profile which sharpens downward to promote water penetration. A keel 101 is provided along the keel centerline 103 on the bottom surface 108 of the hull body 102. In the illustrated embodiment, the keel 101 extends substantially from the sternpost toward the bow 104.

[0026] Referring to FIGS. 1 through 5, reference number 114 designates two separate propulsion compartments placed below the bottom surface 108 of the hull 100 for respectively lodging propeller engines 122. The propulsion compartments 114 are located inside two distinct streamlined bulges 112 protruding from the bottom surface 108 of the hull body 102. The streamlined bulges 112 constitute the deepest loading spaces of the hull body 102, and isolate the propulsion compartments 114 symmetrically relative to the keel centerline 103.

[0027] The front end 117 of each bulge 112 has a converging profile which merges with the shape of the hull body 102. To separate the propulsion compartments 114 with a maximal distance, the bulges 112 may protrude from locations respectively adjacent to two chines 107 of the hull body 102 linking the bottom surface 108 with the port and starboard flanks 109. The front end 117 of each bulge 112 preferably is proximate to the middle of the hull length. As illustrated, the bulges 112 is formed with a continuous streamlined profile having a generally oval shape in a section transversal to the lengthwise axis of the hull, similar to a torpedo or bullet shape. The bulges 112 and the hull 100 may be formed as a single body.

[0028] As illustrated in FIG. 1, the propeller engines 122 respectively connect to propeller shafts 124 that extend out of the propulsion compartments 114 through a rear end of the bulges 112. In the illustrated embodiment, the rear end of each streamlined bulge 112 forms a tapered tail 116 detached a distance downward from the bottom surface 108. Each propeller shaft 124 and its twisted blade 128 thus can be placed under the bottom surface 108 of the hull 100.

[0029] To accommodate the propeller shafts 124 and its blades 128, the bottom surface 108 of the hull 100 may include a concave portion 105 respectively located above each of the propeller shafts 124 at the two sides of the keel 101. The two concave portions 105 extend lengthwise approximately from the tail ends 116 of the bulges 112 to the sternpost. The concave portions 105 allow a greater diameter of the blades 128 to be placed underneath, and its curved profile may be configured to improve the hydrodynamic flow generated by the propeller blades 128 along the bottom surface 108.

[0030] Referring to FIGS. 1, 3, 4 and 6, reference number 130 designates the water plane, which is located at a level of the lateral flanks 109 above the propulsion compartments 114 and the bottom surface 108. With respect to the overall load distribution within the boat vessel, the propeller engines 122 placed inside the propulsion compartments 114 thus concentrate the heaviest weight located at the deepest load position of the boat vessel below the water plane 130.

[0031] According to an embodiment, a boat vessel provided with a hull design of this invention floats motionless with the propulsion compartments 114 under the water plane. At a cruising speed, the boat vessel displaces through water with the bulges 112 of the propulsion compartments 114 substantially under the water plane. This hull configuration according to the present invention provides at least the following features and advantages.

[0032] The propulsion compartments 114 entirely lodging the engines 122 below the bottom surface 108 of the hull 100 displaces the center of inertia of the boat substantially downward, and spaces apart the significant weight of each propulsion block along the width of the hull body 102. As a result, the V-shaped hull substantially gains in stability against side and front waves, and rolling effects can be advantageously reduced. The placement of the propulsion compartments 114 also enables to move the center of inertia of the vessel toward the middle of the hull body 102 where, according to an embodiment, the fuel tank can also be placed. As a result, undesirable inclination of the boat vessel due to a variation of the fuel level, which affects the hydrodynamics of the boat vessel, can be advantageously prevented.

[0033] Other advantages are provided with the placement of the engines 122 in two independent and isolated propulsion compartments 114 below the bottom surface 108 of the hull 100. More space becomes available and the hull capacity is increased. Further, the isolation of the propulsion compartments 114 below the bottom surface 108 of the hull 100 can effectively prevent noise propagation and amplification generated from the engine operation. In addition, it can effectively prevent any damages to one propeller engine from propagating and affecting the other engine. More particularly, if one compartment is subject to water infiltration, the other one being completely separated from the damaged compartment will not be affected. A boat vessel provided with the mono-hull design according to the invention thus has improved safety and comfort in navigation.

[0034] According to another advantage, the arrangement of the propulsion compartments 114 below the bottom surface 108 of the hull 100 allows an adjustment of the propeller shaft angle as desired. In the illustrated embodiment, the propeller shafts 124 are configured parallel to the water plane 130, e.g. at zero angle axis. The rotation of the blades 128 thus can provide an optimal thrust to more efficiently propel the boat vessel. As a result, the boat consumes less fuel. As described below in conjunction with
FIG. 6, another feature of the propulsion compartments 114 of the present invention is that it permits an adjustment of the position of the propeller shafts 124 along its axis for different modes of propeller operations.

0035] FIG. 6 illustrates a variant embodiment of the present invention, in which the propeller shafts are configured slightly different from the previous embodiment. In FIG. 6, the boat hull 100 is similarly includes two bulges 112 forming the propulsion compartments 114 below the bottom surface of the hull. However, in this variant embodiment, the propeller shafts 124 are longer and extend rearward beyond the sternpost. Shaft brackets 152 may be mounted at the rear end of the hull to support the longer propeller shafts 124. This configuration can be adapted for surface-piercing vessels which travel with the rotating propeller blades cutting through the water surface.

0036] The foregoing only describes some of the advantages of the invention, and many other advantages and features stemming from the inventive concepts described herein will be apparent to a person skilled in the art.

0037] The hull according to this invention may be built with materials such as fiberglass, wood, steel, or composites. A person skilled in the art will appreciate that a combination of these materials would also be possible. In addition, the dimensions of the hull may vary according to the boat design requirements and specification. In an example of implementation, a yacht vessel designed according to this invention may have a hull length of about 28 meters, a height of about 3 meters, and a beam width of about 6 meters. The bulges lodging the propulsion compartments may be located at about 12.5 meters from the bow of the hull, and have a length of about 11 meters. The keel height taken at the sternpost is about 1.5 meters. The distance between the bottom surface of the hull and the axis of the propeller shaft is about 0.9 meters. The draft is about 2.26 meters for a vessel weighing about 150 tons. It will be understood that the hull design according to this invention is not limited by the foregoing dimensions, which may be adjusted according to the design requirements.

0038] The hull design according to this invention is suitable for high speed as well as moderate speed cruises with good stability. At high speeds, a boat with the hull design according to this invention can reach 50 kph with a substantially stable navigation. Of course, the highest cruising speed of the boat vessel may be increased by providing more powerful propeller engines. Though the embodiments described herein make reference to a specific propeller drive, the hull design according this invention may be suitable with any propulsion means in general.

0039] Realizations in accordance with the present invention therefore have been described in the context of particular embodiments. These embodiments are meant to be illustrative and not limiting. Many variations, modifications, additions, and improvements are possible. Accordingly, plural instances may be provided for components described herein as a single instance. Structures and functionality presented as discrete components in the exemplary configurations may be implemented as a combined structure or component. These and other variations, modifications, additions, and improvements may fall within the scope of the invention as defined in the claims that follow.

1. (canceled)
2. (canceled)
3. (canceled)
4. (canceled)
5. (canceled)
6. The hull structure according to claim 19, wherein the tapered tail end of each bulge is offset a distance from the bottom surface of the hull.
7. The hull structure according to claim 6, wherein each propulsion engine is connected to a propeller shaft extending out of the tail end of each bulge.
8. The hull structure according to claim 7, wherein each propeller shaft extends substantially parallel with a water plane.
9. The hull structure according to claim 7, wherein each propeller shaft extends rearward beyond a sternpost of the hull body.
10. (canceled)
11. The hull structure according to claim 19, wherein the bulges have a generally oval shape in a transversal section.
12. The hull structure according to claim 19, wherein the bulges occupy a rear half of the length of the hull body.
13. The hull structure according to claim 19, wherein the bulges are formed with the hull in a single body.
14. The hull structure according to claim 19, wherein the keel placed between the two propulsion compartments and protruded from the bottom surface of the vessel is of a height greater than that of any one said two bulges.
15. The hull structure according to claim 14, wherein the keel extends substantially from a sternpost of the hull toward a bow of the hull.
16. (canceled)
17. The hull structure according to claim 19, wherein the propulsion compartments further includes a fuel tank.
18. The hull structure according to claim 7, wherein the bottom surface of the vessel further includes at least one shaft bracket to support the propeller shaft.
19. A hull structure for a water vessel comprising:
a hull body including two lateral flanks linked by a bottom surface;
a keel extending along the centerline of the bottom surface and protruding therefrom below a water plane; at least two propulsion compartments provided in bulges protruding below the bottom surface of the hull body and arranged between said two lateral flanks of the hull body and symmetrically with respect to the centerline of the bottom surface separated by the keel, each of said bulges having a streamlined profile and each bulge extending into a tapered tail end;
wherein the bottom surface of the hull body includes concave portions extending lengthwise along the keel for receiving said at least two propulsion compartments symmetrically at two sides of the keel on the bottom surface of the hull body; and
wherein each propulsion compartment lodges a propulsion engine located below the concave portions of the bottom surface of the hull body and between said two lateral flanks of the hull body such that the center of inertia of the vessel is displaced downward and toward the middle of the hull body.

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