Oct. 22, 1968 R. L. MELA 3,406,653

AQUATIC PROPULSION SYSTEM

Filed July 27, 1966 2 Sheets-Sheet 1

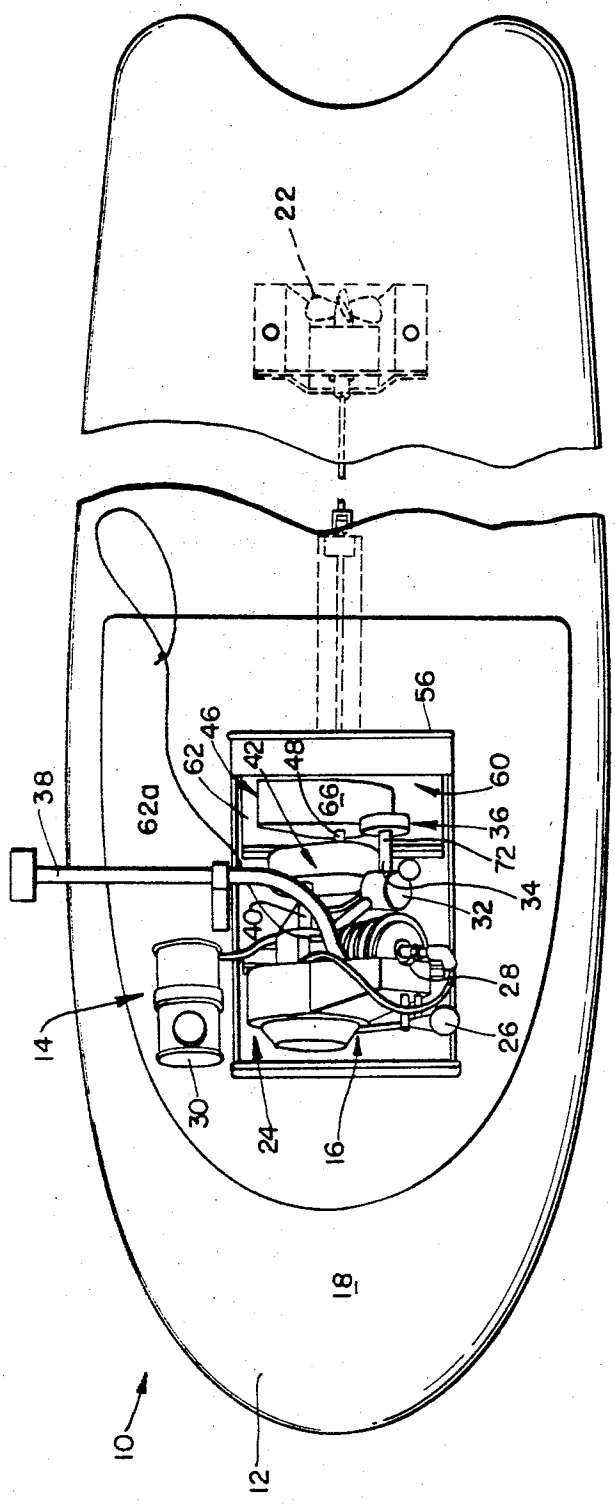


FIG. 1

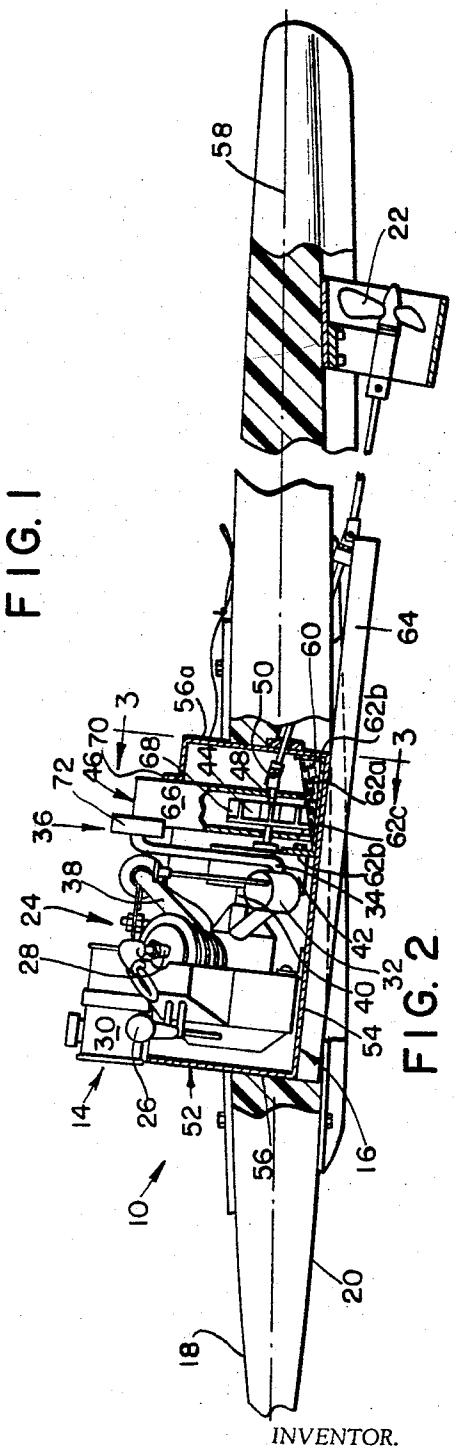


FIG. 2

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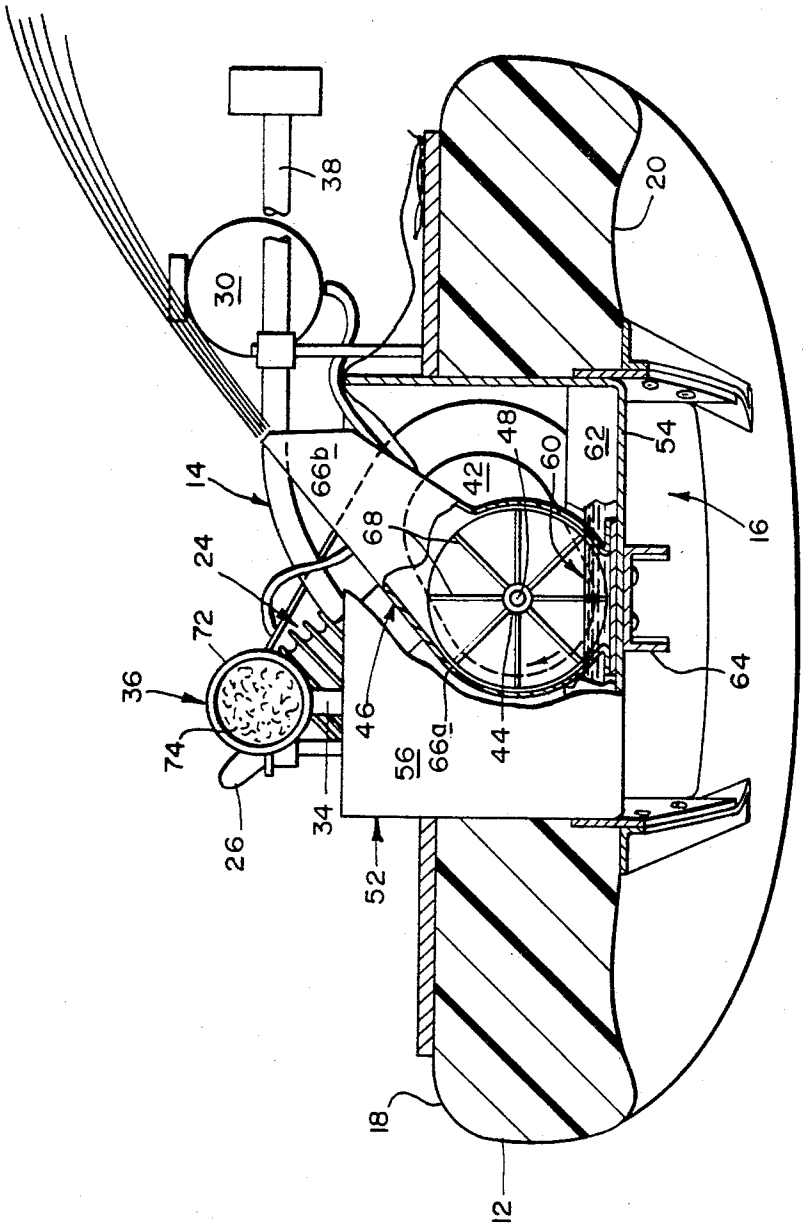


FIG. 3

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AQUATIC PROPULSION SYSTEM

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ABSTRACT OF THE DISCLOSURE

A powered floatboard is constructed with a substantially solid hull. An openly exposed power unit is seated in a recess formed in the upper surface of the hull. The recess is shaped to form a sump and a pump operating directly off the power unit continuously removes water from the sump. An air intake connected directly to the power unit is shielded from spray and splashing water and has a filter which is water-impervious, but air-pervious.

This invention relates to a powered aquatic craft and more particularly to the arrangement of a powered floatboard in which the engine is relatively openly exposed to water. The absence of a waterproof or like protective housing for the engine enables the craft to be inexpensive. It also facilitates making the craft compact and lightweight. However, omitting such a housing introduces several problems for which the present invention provides economic solutions.

The prior art is replete with powered aquatic craft in which a housing seals or substantially fully protects the engine from water. However, such a housing adds materially to the cost of the craft, and often also adds to the weight or bulk. This is particularly true with prior small craft for propelling one person who is substantially openly exposed to the water.

Further, recreational aquatic craft often employ a pump to bail bilge water from within the hull. These pumps have heretofore been fairly costly. For example, many require a relatively complex drive linkage between the engine and the pumping mechanism, which is often a multielement assembly.

It is an object of the present invention to provide a low cost powered aquatic craft. Further, it is an object to provide a compact and lightweight construction for a powered floatboard.

In particular, it is an object of the invention to provide a relatively low cost construction of a floatboard powered with an internal combustion engine that is not sealed from the water and yet is guarded from disablement by water. Further, it is an object to provide such a powered floatboard having means that relatively freely passes air to the air intake of the engine but blocks water from entering therein.

Another object of the invention is to provide an improved bailing pump for craft of the above character. Specifically, it is an object of the invention to provide a bailing pump characterized by low cost. Further, the pump should be simply constructed. It is also an object that the pump be highly reliable.

Other objects of the invention will in part be obvious and will in part appear hereinafter.

The invention accordingly comprises the features of construction, combinations of elements, and arrangement of parts exemplified in the constructions hereinafter set forth, and the scope of the invention is indicated in the claims.

For a fuller understanding of the nature and objects of the invention, reference should be had to the following detailed description taken in connection with the accompanying drawings, in which:

FIGURE 1 is a top plan view of a powered floatboard embodying the invention;

FIGURE 2 is a side elevation view, partly broken away, of the powered board of FIGURE 1; and

FIGURE 3 is a transverse cross-section view of the floatboard of FIGURE 1 taken along line 3—3 of FIGURE 2.

In accordance with the invention, the engine of the present aquatic craft is seated in an enclosure recessed in a floatboard-like hull. The engine and associated drive elements are mounted fairly low on the floatboard so as not to block the user's vision and to maintain the height of the craft small. However, due to this low disposition of the engine, water that invariably enters the enclosure can not merely be drained out. Accordingly, a novel bailing pump is arranged in a sump in the enclosure to expel the water. The pump has a single pumping element normally driven directly from the engine shaft.

Further, the air intake on the engine is fitted with means that relatively freely admits air to the engine but efficiently blocks water. Thus, there is little likelihood that water will enter the carburetor.

With this arrangement, the engine continues running and propelling the floatboard even when it is operated in the midst of surf or splashing.

More specifically, as shown in FIGURES 1 and 2, a powered floatboard **10** embodying the invention has a highly buoyant hull **12** of expanded polystyrene or other highly buoyant material or construction. The user typically reclines on the craft with his trunk resting on the hull behind a power unit **14** with his legs overhanging into the water. Alternatively, he can stand on the hull when it is constructed for this use.

The power unit **14** is mounted recessed into the hull in an aperture **16** extending through the hull between its top surface **18** and its bottom surface **20**. The power unit drives a propeller **22** mounted near the back end of the hull to propel the floatboard.

The illustrated power unit **14** employs a small internal combustion engine **24** having a pull starter **26**, a spark plug **28** and a fuel tank **30**. A carburetor **32**, connected to the fuel line leading from the tank **30**, receives air from a conduit **34** having an air intake unit **36** at its other end. The exhaust pipe **38** extends laterally from the engine **24** to beyond the hull **12**, as seen in FIGURE 1.

The motor shaft **40** is coupled to a gear box **42** mounted behind the engine **24**. The impeller **44** (FIGURES 2 and 3) of a bailing pump indicated generally at **46** is secured on the shaft **48** from the gear box. Behind the pump a flexible torque coupling **50** connects the shaft **48** to the drive shaft leading to the propeller **22**.

Referring to FIGURES 2 and 3, the engine **24**, gear box **42** and pump **46** are mounted in the aperture **16** secured in a box-like enclosure **52** having a substantially rectangular planar bottom panel **54** and upstanding peripheral rectangular walls **56**. The walls **56** protrude upward from the aperture **16** above the top surface **18** of the hull **12** and form a splash guard that blocks water from spilling into the interior of the enclosure. Top covers can also be provided on the enclosure to enhance the appearance and for additional splash protection.

As shown in FIGURE 2, the illustrated enclosure **52** is seated in the aperture **16** inclined several degrees relative to the longitudinal axis **58** of the hull **12**. The back edge of the bottom surface **20** of the hull and the front edge of the bottom surface **20** of the hull and the front edge of the bottom panel is considerably above the bottom surface **20**. As a result, the enclosure back wall **56***a* and the back portion of the bottom panel **54** form a sump **60** that is lower than the rest of the enclosure when the board is in the water, even without a user on it.

In particular, when the floatboard is resting in the

water under its own weight, as shown in FIGURE 2, the longitudinal axis **58** of the hull is substantially horizontal and hence the bottom panel **54** of the enclosure is inclined downwards forming a small but definite sump in which whatever water is in the enclosure settles. When a user is on the board, the longitudinal axis of the hull inclines 10° to 20° relative to the horizontal and the enclosure bottom panel and back wall form a considerably deeper sump. Thus, whatever water is in the enclosure is effectively constrained in the back portion, away from the engine **24** and from the carburetor **32**.

Further, a cross channel member **62** at the back end of the enclosure **52** helps to keep the water in the sump **60** from splashing on the engine when the floatboard moves unevenly. In particular, as also shown in FIGURE 2, the channel member **62** is preferably disposed with the back flange **62***a* against the rear wall **56***a* of the enclosure and with the forward flange **62***b* serving as a mount for the gear box **42**. The channel member is secured through the enclosure bottom panel **54** to a longitudinal channel member **64** (FIGURES 2 and 3) that provides the main structural support for the elements of the power unit **14**. Further, the front flange **62***b* of the channel member **62** generally protrudes above the level of the water in the sump **60** and hence constrains the water in the enclosure from sloshing back and forth.

As indicated above and shown in FIGURES 2 and 3, a bailing pump **46** formed with an impeller **44** housed within a chute **66** is provided at the back of the enclosure **52**. The impeller is keyed or otherwise fastened on the shaft **48** to rotate therewith; it is thus disposed to rotate in a substantially vertical plane (FIGURE 2) transverse to the axis **58**. The impeller has a plurality of radial vanes **68** (FIGURE 3) that pass close above the channel member web **62***c* and hence dip into the water in the sump.

As also shown in FIGURE 3, the pump chute **66** has a cylindrical portion **66***a* and a guide portion **66***b*. The cylindrical portion **66***a* fits closely around the impeller **44**. It is apertured at the bottom to admit water that is in the sump **60**. The guide portion **66***b* extends from the cylindrical portion above and to the side of the impeller; its discharge opening is above the walls of the enclosure **52**.

The chute **66** is conveniently secured in place by fastening it to the bottom to the channel member web **62***c* and to a bracket **70** (FIGURE 2) extending from the back wall **56***a* of the enclosure.

With further reference to FIGURE 3, the motor **24** drives the impeller clockwise causing it to scoop water from the sump **60** and throw it upward with sufficient force to expel it from the chute and over the side of the hull **12**. The capacity of the bailing pump **46** is readily made sufficiently high to ensure that whatever water splashes and otherwise spills into the enclosure **52** is quickly expelled from it, so that the level of the water in the sump **60** seldom rises above the bottom tips of the impeller vanes **68**.

The bailing pump **46**, of course, requires no priming and is in no way damaged by continued operation without water in the sump. As a result, it can be directly coupled to the drive linkage between the engine **24** and the propeller **22**; no controls or clutching elements are needed to disable the pump when there is no water in the sump **60**. Further, the bailing pump **46** is inexpensive and requires essentially no maintenance.

A further feature of the invention is the construction and arrangement of the air intake unit **36** and the conduit **34** leading to the carburetor **32**. As shown in FIGURES 2 and 3, the conduit **32** extends upward to well above the hull **12** and its upper end is well inward from the sides of the hull. This positions the intake unit **36** removed from most splashes and spray.

Moreover, the intake unit has a shield **72** secured to the upper end of the conduit **34**. The shield is closed at the top, sides and front, and forms an enlarged rearwardly-facing opening for the conduit. Alternatively, the opening can face downward.

An air filter **74** is secured inside the shield **72** filling its rearwardly-facing opening so that all air entering the conduit must pass through the filter. The filter is of a material that relatively freely passes air but blocks water; polyurethane foam, an open cell plastic, is an example of such a filter material. Further, in the event that the filter becomes clogged with water, no air will pass therethrough and the engine will shut down. In fact, this will occur before the filter **74** becomes fully wet because as the air supply to the engine is cut down due to water blocking the filter, the fuel-air mixture in the engine will become too rich for the engine to operate. This is desirable to prevent appreciable water from being drawn from the filter into the engine.

Alternatively, the air intake unit **36** can be constructed with an additional length of air conduit connected to the existing conduit **34** in place of the air filter **74** and shield **72**. The additional length of conduit can have a J-shape and be oriented with the crook portion uppermost and the leg portion extending down, parallel to the upstanding portion of the illustrated conduit **34**. With the conduit **34** as shown in FIGURE 1, this forms an inverted U-shaped air intake that blocks water from the carburetor. Further, when the additional conduit has sufficient length, the engine will be incapable of drawing water up the additional air conduit in the event water enters its open-bottom end. Other shielded air conduit arrangements can also be employed. However, the illustrated arrangement with the water-blocking filter appears most desirable.

In summary, the low cost powered floatboard described above has a bailing pump that requires no priming, can be driven directly with the means for propelling the floatboard, and is simply constructed at low cost and so as to require essentially no maintenance. The pump has sufficient capacity and efficiency to remove from the engine enclosure whatever water enters therein under essentially any operating conditions. Although described with reference to an internal combustion engine, the bailing pump is equally applicable to a floatboard or like craft powered with an electric motor.

Further, in accordance with the invention described above, the engine for the floatboard has an air intake arrangement that is not only shielded from the water, but also incorporates a filter element that blocks water from passing into the air conduit leading to the carburetor. These features enable the floatboard to be constructed at unusually low cost. Also, it has small size and light weight. These factors are of particular importance in attaining a powered floatboard at a sufficiently low cost to be readily marketable to the vast market of aquatic enthusiasts.

It will thus be seen that the objects set forth above, among those made apparent from the preceding description, are efficiently attained and, since certain changes may be made in the above constructions without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

It is also to be understood that the following claims are intended to cover all of the generic and specific features of the invention herein described, and all statements of the scope of the invention which, as a matter of language, might be said to fall therebetween.

Having described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. A powered aquatic craft comprising:

(A) a substantially solid floatboard hull having substantially opposed top and bottom surfaces,

(B) a power unit for propelling said hull in water,

(C) means forming a recess in said top surface of said hull with said power unit mounted therein fully exposed to the atmosphere, said recess

(1) being open so that water can spill into the

interior thereof, with said engine being substantially openly exposed to water splashing over said hull, and

(2) forming a sump at the lowest point thereof when said craft is floating in a normal operative position, and

(D) pump means

(1) directly coupled with said power unit and operating whenever said power unit is operating,

(2) arranged to pump water from said sump and expel it from said recess.

2. An aquatic craft according to claim 1, wherein:

(A) said power unit includes an internal combustion engine having an intake pipe connected directly to said engine for air consumed in combustion of fuel therein,

(B) said air intake pipe being arranged to block water from passing therethrough to said engine.

3. An aquatic craft according to claim 1 in which said pump has an impeller rotatable in a substantially vertical plane and disposed with the bottommost portion thereof extending into said sump and arranged to lift water from said sump when so rotated.

4. An aquatic craft according to claim 3 in which:

(A) said power unit includes a shaft that is rotated when said power unit is operative,

(B) said impeller is mounted on said shaft for rotation therewith, and

(C) said pump further comprises a chute enclosing said impeller and arranged to deflect water expelled from said impeller outward from said recess.

5. An aquatic craft comprising:

(A) a substantially solid floatboard hull having an inclined recess in its upper surface, said inclined recess forming a sump at its lowest point,

(B) an internal combustion engine

(1) seated in said recess,

(2) being substantially openly exposed to water splashing over said hull, and

(3) including a rotative shaft terminating in a propeller arranged to propel said craft in water,

(C) an openly exposed impeller attached directly to said shaft for removing water from said sump, and

(D) an air intake unit for delivering air directly to said engine to be consumed in the combustion of fuel therein, said air intake unit having

(1) shield means,

(2) a conduit connecting said shield means directly to said engine, and

(3) a filter element disposed in said shield means to interrupt the passage of air, said filter being an air-pervious, water-impervious filter.

6. An aquatic craft according to claim 5 in which said filter element is a plastic foam.

7. A powered aquatic craft comprising:

(A) a hull having substantially opposed top and bottom surfaces,

(B) a power unit for propelling said hull in water, said hull having a longitudinal axis that is substantially horizontal when said craft is afloat with no load thereon,

(C) means forming a recess in said top surface of said hull with said power unit mounted therein fully exposed to the atmosphere, said recess

(1) being open so that water can spill into the interior thereof,

(2) having a bottom wall inclined relative to said horizontal axis with the depth of said recess increasing from the front end to the back end thereof so that said bottom wall and a back wall of said recess form a sump when said craft is floating in a normal operative position, and

(D) pump means

(1) comprising an impeller rotatable in a substantially vertical plane and disposed with the bottommost portion thereof extending into said sump and arranged to lift water from said sump when so rotated,

(2) directly coupled with said power unit and operating whenever said power unit is operating, and

(3) arranged to pump water from said sump and expel it from said recess.

8. An aquatic craft according to claim 7

(A) further comprising barrier means extending across said recess between sidewalls thereof and protruding upward from the bottom of said recess and spaced from the back wall thereof, and

(B) in which said impeller is disposed intermediate said barrier means and the back wall of said recess.

9. An aquatic craft comprising:

(A) a substantially solid hull, having substantially opposed top and bottom surfaces,

(B) an internal combustion engine, said engine

(1) being mounted in a recess in the top surface of said hull and arranged to propel said craft in water, and

(2) being substantially openly exposed to water splashing over said hull,

(C) an air intake unit connected to said engine for delivering to said engine air consumed in combustion of fuel therein, said air intake unit comprising

(1) an air conduit connected directly to and extending upward from said engine,

(2) shield means

(a) connected to the top end of said air conduit,

(b) having side and top walls closed to the environment,

(c) having means forming an opening therein,

(d) forming an air passage between said opening and said conduit, and

(3) an air-pervious, water-impervious filter member disposed in said shield means intermediate said opening and said conduit and interrupting said air passage so as to block the passage of water therethrough to said engine,

(D) said recess forming a sump at the lowest point thereof, and

(E) a pump coupled to said engine and arranged to pump water from said sump.

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