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Buelk

[11] **3,890,920**

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[54] **CONTROLS FOR AQUATIC TOWING CRAFT**

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[52] **U.S. Cl.** ..... **115/6.1;** 114/16 A; 115/12 R; 415/121 G

[51] **Int. Cl.** **B63b 21/56**

[58] **Field of Search** ..... 115/6.1, 35, 70, 12 R; 114/16 A; 239/265.19, 487; 415/119, 121 G, 195

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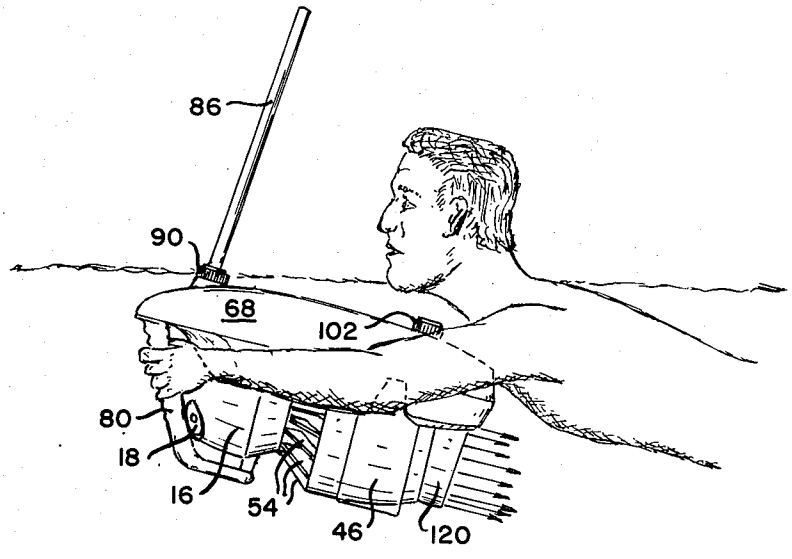
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Primary Examiner—M. Henson Wood, Jr.
Assistant Examiner—Randolph A. Reese

[57] **ABSTRACT**

A compact, unitary, self-powered device for propelling an individual through water at or near the surface. Handles are located at the forward end of the device adapted to be grasped by the individual being towed and by means of which the propelling device may be easily controlled and maneuvered through the water. "Homing" vanes are provided to cause the device to circle about a substantially fixed center when the handles are released by the individual.

5 Claims, 7 Drawing Figures



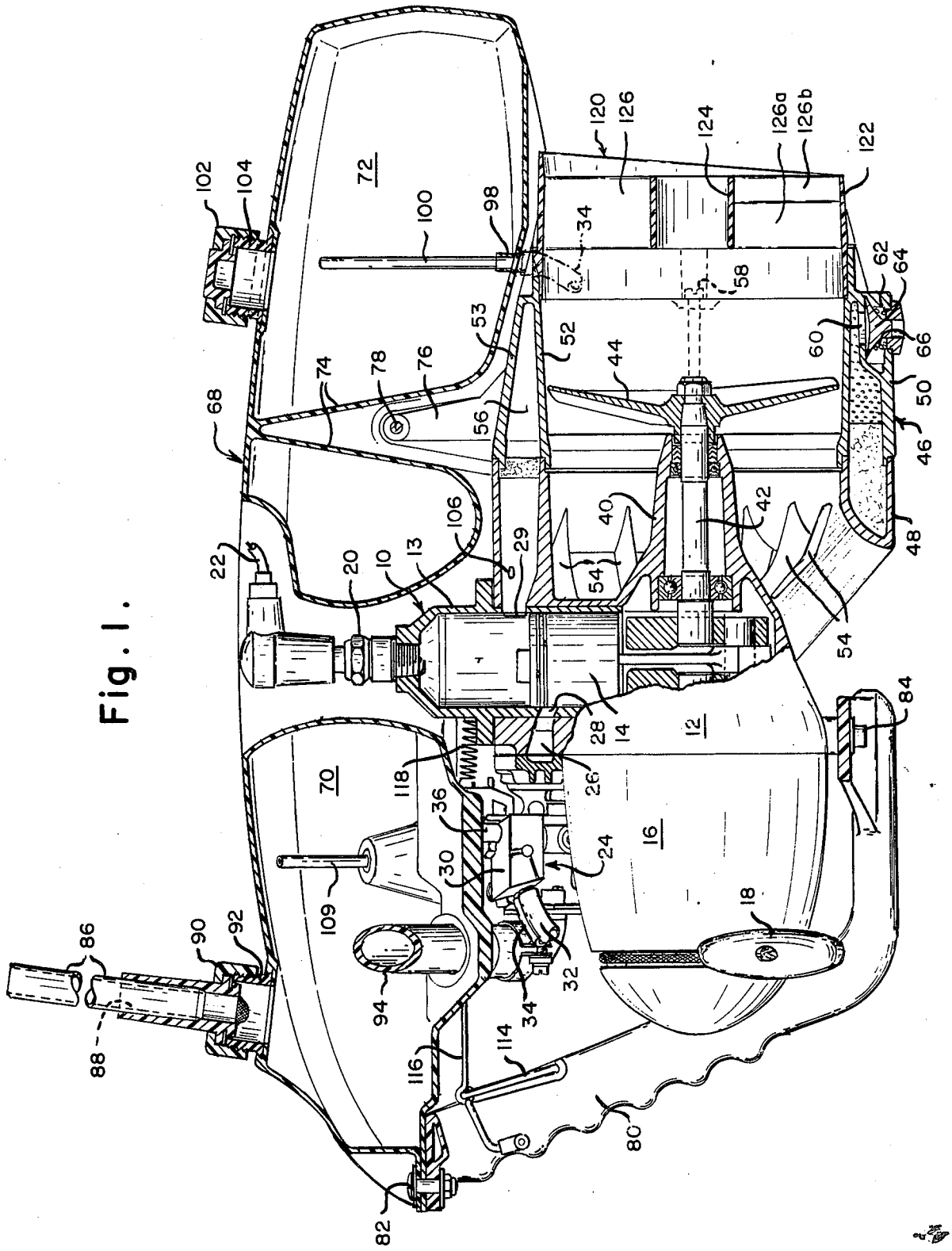

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Fig. 1.

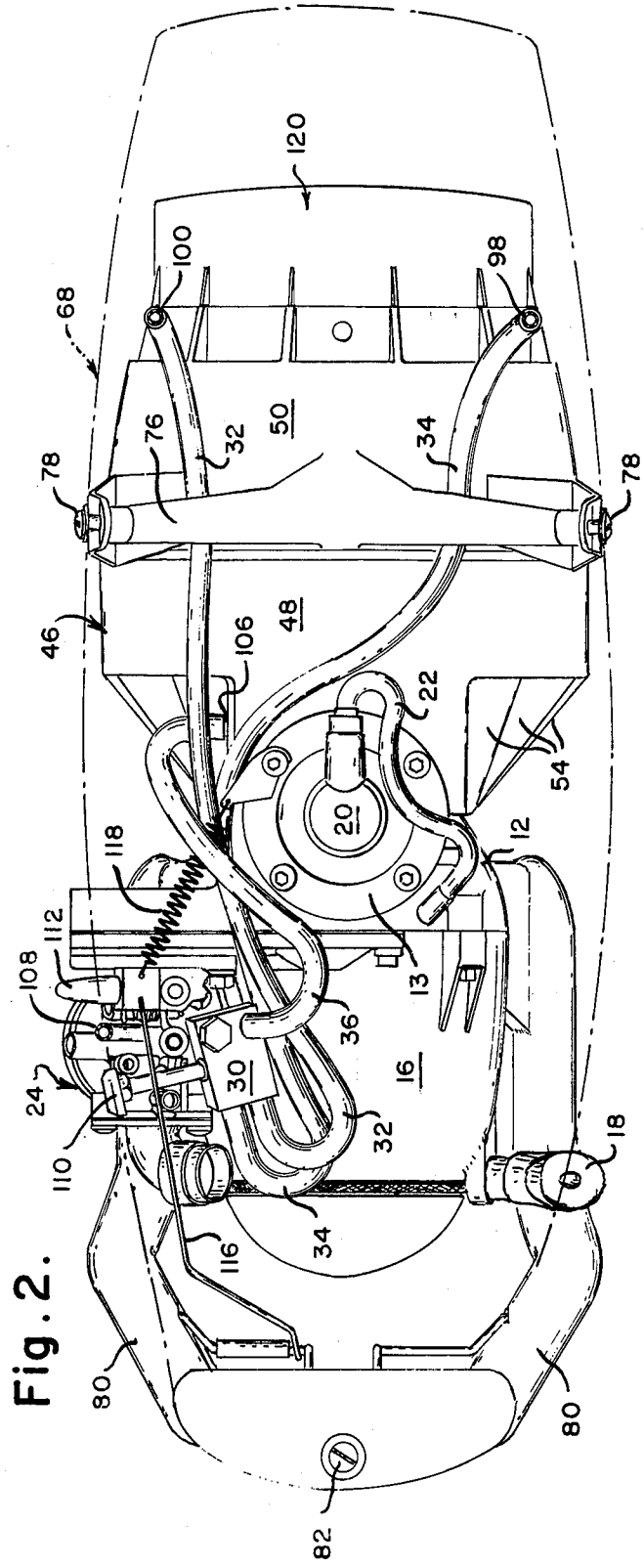


Fig. 2.

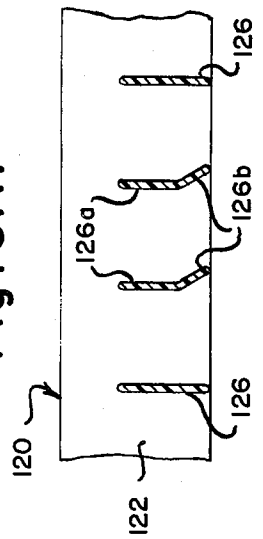


Fig. 3A.

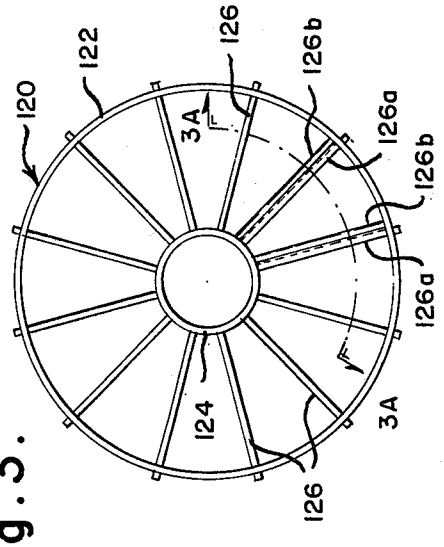


Fig. 3.

Fig. 4.

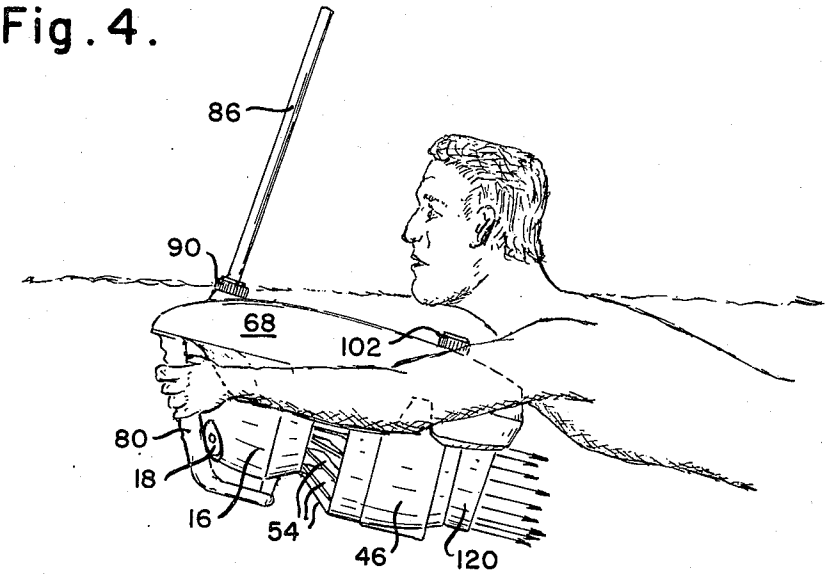
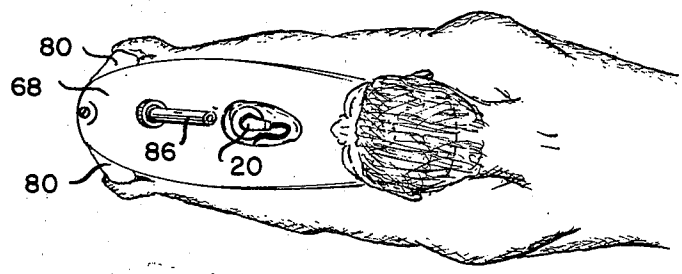


Fig. 5.



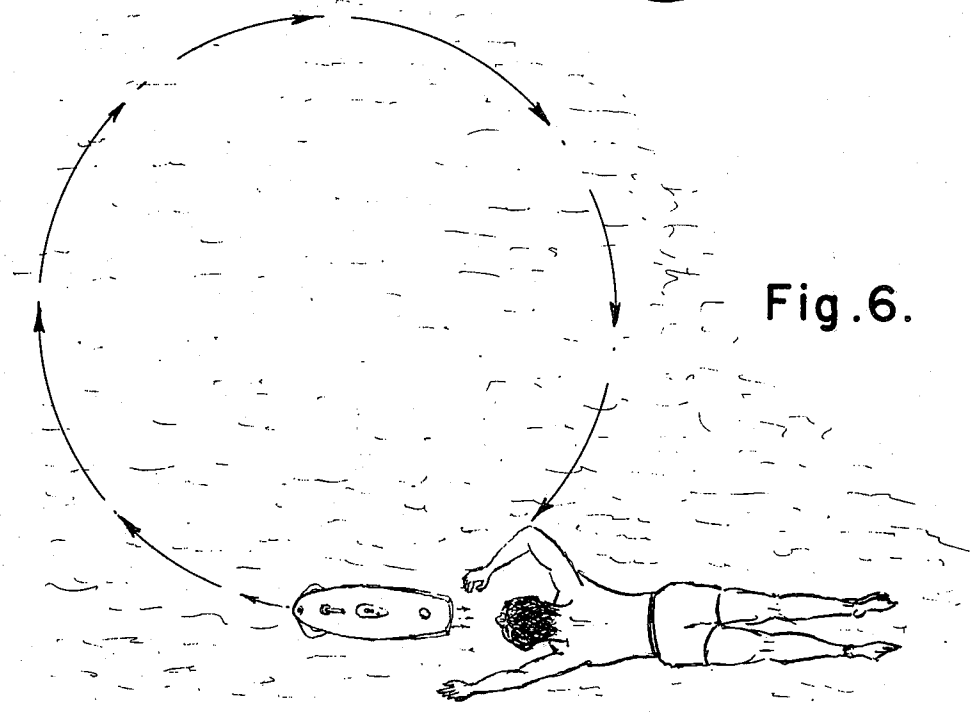


Fig. 6.

CONTROLS FOR AQUATIC TOWING CRAFT

BACKGROUND AND DISCUSSION OF PRIOR ART

The prior art exhibits numerous examples of aquatic towing or propelling devices many of which are provided at or near the rear of the craft with means to be grasped by the person being towed such as shown for example in U.S. Pat. Nos. 1,579,529; 1,691,188; 2,645,792; 2,708,759; 3,358,635 and my 3,630,165. In some cases these devices are steered by the expedient of the person being towed applying suitable manual effort to the rearward portion of the craft to point the craft in the desired direction as shown in U.S. Pat. Nos. 1,579,529; 2,645,792 and my 3,630,165. In other cases as shown in U.S. Pat. Nos. 2,708,759 and 3,650,234 the direction of movement is controlled by manipulation of mechanical controls which change the position of water reaction surfaces or rudders. U.S. Pat. No. 3,492,961 teaches both methods.

In such prior art the control of the craft on one hand is by means of relatively elaborate mechanical arrangements which not only add to the expense of the craft but are unreliable and subject to malfunction. This is particularly true since these craft operate under corrosive conditions; that is, repeated and frequent immersion in and withdrawals from water. On the other hand when the control is accomplished by the person being towed physically pointing the craft in the desired direction by applying the turning effort to the rear of the craft the control tends to be sluggish and relatively difficult of execution. Frequently obstacles are encountered in the water which are not visible to the operator until the craft is hard upon the obstacle. Unless the craft can be quickly and accurately maneuvered a collision may take place.

Also, on occasion the towed person may wish to temporarily relinquish or may inadvertently lose his grasp of the craft. When this happens it is important that the craft be prevented from leaving the vicinity of the operator so that it may be quickly retrieved. In the prior art when a hand throttle or speed control is provided, it is customary to provide means whereby loss of control by the operator will result in the motor stopping or being disengaged from the drive propeller. Stopping the motor is undesirable if the motor is an internal combustion engine particularly if it occurs in deep water, since the usual means of starting internal combustion engines is by means of a conventional recoil starter and restarting the engine particularly in deep water may be difficult. Providing means to allow the engine to idle on such occasions requires some means to automatically disconnect the engine from the drive propeller when the controls are released which of course not only adds to the cost of the craft but is an additional component subject to possible malfunction.

SUMMARY AND OBJECTS OF INVENTION

The present invention overcomes the disadvantages of the prior art by providing a compact, easily maneuverable inexpensive craft which when released by the person being towed will continue to return to the point at which it was released. It has been found that when the control handles are located at the forward portion of the craft the maneuverability and control of the craft by the physical effort of the operator is considerably enhanced. Forward location of the control handles is facilitated by the compact and efficient arrangement of the various interacting elements of the craft as will be hereinafter explained in detail. To further enhance and retain the operator's control of the craft, stationary vanes are provided which are oriented at a fixed angle with respect to the direction of thrust developed by the propeller. It has been found that the constant turning effect imparted by these fixed angularly oriented vanes has no noticeable effect on the operator's ability to control the craft embodying the present invention.

Accordingly it is an object of the invention to provide a small, compact, inexpensive self-propelled aquatic craft which is easily and accurately controlled by the operator being propelled by the craft. Another object is to provide an aquatic craft which when released by the operator will automatically and continuously return to substantially the point or release. A further object is to provide a self-propelled aquatic craft in which the various elements are efficiently and effectively arranged as to result in a craft which is compact, lightweight, inexpensive and easily maneuverable.

DESCRIPTION OF THE DRAWINGS

FIG. **1** is a side view in vertical cross section of an aquatic craft embodying the invention described herein.

FIG. **2** is a top view of the device shown in FIG. **1** with the housing enclosing the fuel and air chambers removed.

FIG. **3** is a view from the rear of the craft shown in FIG. **1** showing only the portion of the propeller guard member which contains the guide vanes.

FIG. **3A** is a view along lines **3A—3A** of FIG. **3** showing "homing" vanes in cross section.

FIG. **4** is a side view showing the craft embodying the present invention propelling an individual through the water.

FIG. **5** is a view from above showing the craft of the instant invention propelling an individual through the water.

FIG. **6** is a view from above the craft of the instant invention and an individual showing the homing action of the instant invention when the craft is released by the individual being propelled.

DESCRIPTION OF THE INVENTION

Referring to FIG. **1** of the drawings, an internal combustion engine generally designated by the numeral **10** has a main body portion **12** shown partially in section and which includes a cylinder **13.** Piston **14** is reciprocally mounted in cylinder **13.** Housing **16** encloses a conventional recoil starter the handle of which is shown at **18.** Also enclosed within housing **16** is a magneto which produces an electrical impulse which by means of conductor **22** is conducted to the spark plug **20** located in the top of cylinder **13.** Since the recoil starter and magneto are conventional and function in a manner which is well known in the art detailed showings and descriptions thereof are not thought to be necessary.

As best shown in FIG. **2** a carburetor **24** is mounted on engine **10** in such a manner that when in operation, fuel/air mixture from the carburetor flows through passage **26** (FIG. **1**) in body portion **12** and inlet passage **28** in cylinder **13.** Secured to carburetor **24** is a valve block **30** to which flow lines **32, 34** and **36** are connected in a manner and for a purpose which will hereinafter appear.

Integrally formed on the body portion 12 and extending rearwardly therefrom is a shaft housing 40 in which drive shaft 42 is journalled and on the rear end of which is secured propeller 44 for rotation therewith. A generally cylindrically shaped propeller shroud 46 made up of a forward shroud member 48 and rear shroud member 50 has an internal cylindrical wall 52 and a generally cylindrical outer wall 53 which is generally concentric to and spaced from wall 52 to form annular exhaust chamber 56 extending circumferentially around wall 52 between walls 52 and 53.

Circumferentially spaced screws 58 shown in dotted lines serve to secure shroud member 50 to shroud member 48, and a plurality of circumferentially spaced vanes 54 extending between main body 12 and shroud member 48 rigidly supports shroud 46 to the rear of engine 10 and in axially alignment with shaft 42. Exhaust port 29 connects the interior of cylinder 13 with exhaust chamber 56.

As shown in FIG. 1, port 60 connects the bottom of exhaust chamber 56 with exhaust discharge passage 62 to allow discharge of the exhaust gases from exhaust chamber 56. Check valve 64 is biased by spring 66 to normally close port 60, the bias of the spring being such to allow the valve 64 to open under the pressure of exhaust being discharged into chamber 56 from engine 10 but to close valve 64 when the pressure in chamber 56 is insufficient to prevent ingress of water through passage 62.

A combined air and fuel tank, generally indicated by the numeral 68, is divided into a forwardly disposed air chamber 70 and a rearwardly disposed fuel tank 72 which are separated from each other by double walls 74. Brackets 76 formed on either side of the top of shroud member 46 serve to rigidly support the rear portion of tank 68 by means of screws 78 threaded into the sides of the tank 68. In addition to a function and purpose to be hereinafter described, one end of each of two handles 80 is secured respectively to one side of the front end of tank 68 by means of bolts 82, the other end of each handle being secured to the bottom of engine 10 by means of screws 84 to thereby rigidly support the front end of tank 68.

An elongated tube 86 is sealingly mounted on tank 68 by means of cap 90 threaded on to boss 92 on the exterior of tank 68. An internal passage 88 extending the length of tube 86 connects the chamber 70 with the atmosphere. Air supply tube 94 passes through the bottom wall of tank 68 and has one end connected to the carburetor to provide a supply of air to the carburetor from chamber 70. Within chamber 70 the other end of air supply tube 94 is curved so it will terminate near the top of the left side wall of tank 68 when the craft of FIG. 1 is viewed from the top by a person facing the front end thereof. By this arrangement the intake end of tube 94 is displaced from the discharge end of tube 86 so that any water which might accidentally be taken into the intake end of tube 86 will not be discharged directly into the intake end of tube 94 but instead will drop to the floor of the inside of tank 70 where it cannot enter tube 94 since its intake end is located near to top of the interior of the tank. A seal between tube 94 and the floor of tank 70 where it passes therethrough prevents leakage of water into tank 70 along the exterior of tube 94.

As shown in FIGS. 1 and 2 one end of each of the flow lines 32, 34 and 36 is connected to valve block 30. The other end of flow line 34 is connected to a fitting 98 which extends through the floor of chamber 72 to connect the fuel supply to valve block 30. The other end of line 32 is connected to one end of a hollow tube 100 which extends through and is sealed with respect to the floor of 72 on the side thereof opposite fitting 98. The other end of tube 100 extends to a point just beneath the fuel tank cap 102 threaded onto boss 104 located on the top of fuel tank 72. Thus the interior of fuel tank 70 is connected at a point above the surface of the fuel to valve block 30. The upper end of tube 100 is positioned close to the internal surface of the boss 104 so fuel may be funneled into the fuel chamber without danger of any getting into tube 100. By means of a fitting not shown, the opposite end of line 36 is connected to a passage 106 (FIG. 1) in the outer wall 53 of shroud 46 whereby the exhaust chamber 56 is connected to valve block 30. Interiorly of valve block 30 the line 36 is connected to line 32 and line 34 is connected to the mixing chamber of the carburetor 24. Thus fuel in tank 72 is connected to the carburetor and the exhaust chamber 56 is connected to the space above the surface of the fuel in fuel tank 72. By means of this arrangement the pressure of the exhaust in exhaust chamber 56 is applied to the surface of the fuel and forces the fuel through line 34 into carburetor 24, thus eliminating the need for a pump to pump fuel from the tank 72 to the carburetor 24. In starting, if the fuel in the tank 72 is not forced by gravity into the carburetor the engine may be turned over a few times by operating the recoil starter which will serve to apply sufficient pressure to the surface of the fuel through exhaust chamber 56 and lines 34 and 36 to supply fuel to the carburetor. Alternatively, the craft may be temporarily tipped so that some of the fuel is taken into the tube 100 and fed to the carburetor.

In order to prevent "fuel lock" within the carburetor the float chamber of the carburetor is vented to chamber 70 by means of tube 108 which connects to the hollow end tube 109. Tube 109 extends through a projection in the floor of chamber 70. The tube 109 is sealed with respect to the projection to prevent leakage along the exterior length of the tube. The upper end of tube 109 terminates near the top of chamber 70 to insure that any water on the floor of chamber 70 will not get into the carburetor. Flow lines 32, 34, 36 and tube 108 are preferably made of some suitable flexible material which does not deteriorate and is otherwise unaffected by fresh or salt water, gasoline or the exhaust from the engine 10.

Valve knob 110 is connected to a fuel valve inside the valve block 30 operable to connect or disconnect line 34 with the mixing chamber of carburetor 24. Thus the fuel supply may be interrupted or established by rotating knob 110. Handle 112 is connected to a throttle valve located within the carburetor to control the supply of fuel/air mixture from the carburetor to cylinder 13 through inlet port 28. As viewed in FIG. 2, movement of throttle handle 112 to the left increases the supply of fuel/air mixture to the cylinder 13 and therefore the speed of the engine while movement of the handle 112 to the right has the opposite effect. Each end of a U-shaped hand control lever 114 is respectively pivotally connected to a respective control handle 80. Rod 116 connects the lever 114 with throttle handle 112 so that manipulation of the control lever changes the position of the throttle valve handle 112.

Spring **118** tensioned between handle **112** and the body of engine **10** biases the throttle to idle position.

FIG. **3** is a view from the rear of the craft showing the rear of vane cage **120** which consists of an outer circular wall **122** and a hub **124** connected together by a plurality of radially extending vanes **126.** Vane cage **120** is press fitted or otherwise secured to the rear of shroud member **46** so that the inner surface of outer wall **122** is an extension of inner surface **52** of shroud member **46.** It should be noted that shroud member **46,** vanes **54** and vane cage **120** act to prevent accidental contact with the propeller **44** from any direction by the person being towed while vanes **54** and **126** allow a free flow of water into and away from the propeller **44.** One or more of the substantially vertically oriented vanes of vane cage **120** have tail portions formed at an angle with respect to the direction of flow of water through the shroud **46.** Such vanes are indicated at **126***a* in FIG. **3** and FIG. **3***a*. As shown these vanes have tail portions **120***b* formed at an angle with respect to the main body of vanes **126***a*. When the craft of the instant invention is operating and proceeding through water, water will be flowing through vane cage **120** and in the absence of directional control by the person being towed, the water flowing through vane cage **120** will react on the surfaces of tail portions **126***b* to cause the craft to move in a circular path having a relatively fixed arc of curvature.

In operation, as shown in FIGS. **4** and **5** the handles **80** are grasped from behind the craft by the person being towed in such a manner that the craft is held in a position between the arms of the person. The tanks **70** and **72** are of a size to provide a buoyancy sufficient to support in water the weight of the engine and the other non-buoyant parts of the craft and to supply additional buoying force sufficient at least to insure floatation of the craft at all times. Depending on the weight of the person being towed, it may be desirable to tilt the craft upwardly at a slight angle to the horizontal as shown in FIG. **4** which will provide a slight vertical buoying force as the craft proceeds through the water which force will be in addition to the buoying force supplied by the tanks **70** and **72.** When the handles **80** are grasped by the person being towed the speed control lever is easily manipulated by the person to vary the speed of the engine. Movement of the lever **114** to the left in FIG. **1** increases the speed while in reverse movement under the influence of spring **118** decreases the speed.

It has been found that with the control handles **80** located at the forward portion of the craft ease of maneuver and directional control of the craft is greatly facilitated resulting in considerable improvement in the ability to control the direction of the movement of the craft over prior art devices utilizing handles located to the rear of the craft. In both cases the body of the swimmer in effect acts as the rudder and in order to turn the craft the body must be oriented at an angle with respect to the craft. It has been found that with the handles located at the forward end of the craft it takes much less effort to point the craft and to angularly orient it with respect to the body of the person being towed. Also, by use of the instant invention the craft may be easily oriented in a downward direction to cause it to submerge below the surface of the water to the extent permitted by the length of the snorkle tube **86.** With handles located to the rear of the craft, it would be difficult for an ordinary person to point the craft downwardly as is necessary to cause it to submerge. However, with the handles located forwardly, this is easily accomplished with very little exertion on the part of the person being towed.

In the event the person being towed inadvertently loses his grasp of the handles **80** or deliberately releases them, the reaction of the water flowing through vane cage **120** against the tail portions **126***b* of vanes **126***a* will cause the craft to circle in a constant arc of curvature about a relatively fixed center so that it will return to substantially the point at which it was released and therefore is easily retrieved. This result is pictorially illustrated in FIG. **6.** The vanes **126***b* impart a constant turning effort to the craft when in operation; however the magnitude of this turning effort is such as to not be noticeable to the person being towed when the craft is controlled by such person in the manner herein described.

Since the entirety of the craft of the instant invention is contained within the arms of the person being towed it is important that its size be held to a minimum. This is accomplished by the compact and functional arrangement of the elements of the craft of the instant invention in which the propeller and the shroud member are aligned with and located to the rear of the engine with the air and fuel chambers contained within one enclosure which is secured to the top of the engine and shroud member with the air chamber positioned over the engine and forwardly of the fuel tank which in turn is positioned over the shroud member. Since the air chamber and snorkle are located at the forward end of the craft, remote from the person being towed, such an arrangement provides a particularly compact unit with a minimum of obstruction to the vision of the person being towed.

The instant invention provides a craft which is safe, easily maneuverable and which does not interfere with the vision of the person being towed, and is therefore particularly useful not only for recreational but also for functional purposes such as lifesaving procedures and as a scuba diver assist.

What is claimed and desired to be secured by letters patent is:

1. A unitary self-powered craft for towing an individual through water at or near its surface comprising; motive power means including means to produce a motive force when immersed in water, handle means on said craft to be grasped by an individual whereby said individual is propelled through the water when said craft is in operation said handle means being fixed and vertically oriented with respect to said craft and adapted to enable said person to control the direction of movement of said craft through the water, and means on said craft to cause said craft to turn in a constant arc of curvature when said handle means is released whereby said craft returns to substantially the same location occupied by the craft when said handle means was released.

2. A unitary self-powered craft for propelling an individual through water at or near its surface comprising; motive power means including means to produce a motive force in a given direction when immersed in water, control means operable by an individual being propelled through the water by said craft to control the direction of movement of said craft through the water, the homing means on said craft operable to turn said

craft in a circle about a substantially fixed center when the direction of movement of said craft is not controlled by said control means, said homing means being comprised of a series of fixed vanes oriented at an angle with respect to said given direction.

3. A unitary self-powered craft adapted to be propelled through water at or near its surface comprising motor means, propeller means driven by said motor means to produce a motive force in a given direction of movement when immersed in water, guard means having a portion thereof surrounding said propeller means and including at least one fixed vane located to the rear of said propeller and oriented at an angle with respect to said direction of movement.

4. A unitary self-powered craft for propelling an individual through water at or near its surface comprising; motor means, motive force producing means driven by said motor means and adapted to produce a motive force in a given direction when immersed in water, handle means on said craft adapted to be grasped by an individual from the rear of said craft whereby said individual is propelled through the water when said craft is in operation, said handle means being fixed on the forward portion of said craft and vertically oriented with respect to said direction and adapted to enable said individual to control the direction of movement of said craft, said motive force producing means being substantially aligned with and located to the rear of said motor means whereby when said handle means is grasped by an individual from the rear of said craft it lies substantially wholly between the arms of said individual.

5. A unitary self-powered craft for towing an individual through water at or near its surface comprising; motive power means including means to produce a motive force in a given direction when immersed in water, control means on said craft operable by an individual being towed to control the direction of movement of said craft through the water, and means on said craft to cause said craft to turn in a constant arc of curvature when said control means is inoperative whereby said craft returns to substantially the same location occupied by the craft when said control means became inoperative said last mentioned means comprising fixed vanes oriented at an angle with respect to said given direction.

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