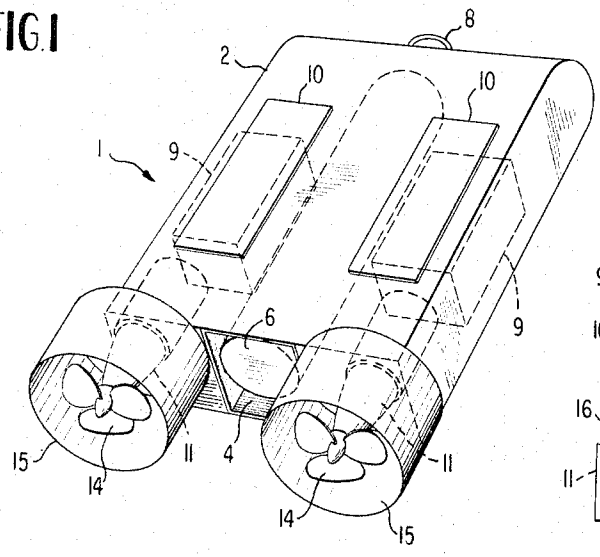
July 4, 1967 J. G. STRADER 3,329,118

BATTERY OPERATED PROPULSION UNIT FOR SWIMMERS

Filed March 23, 1966 2 Sheets-Sheet 1

FIG. 1



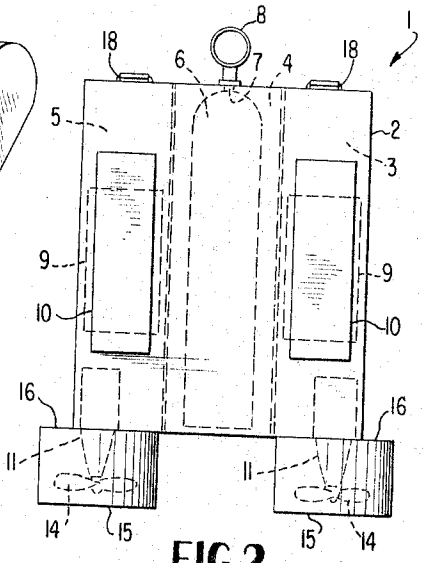
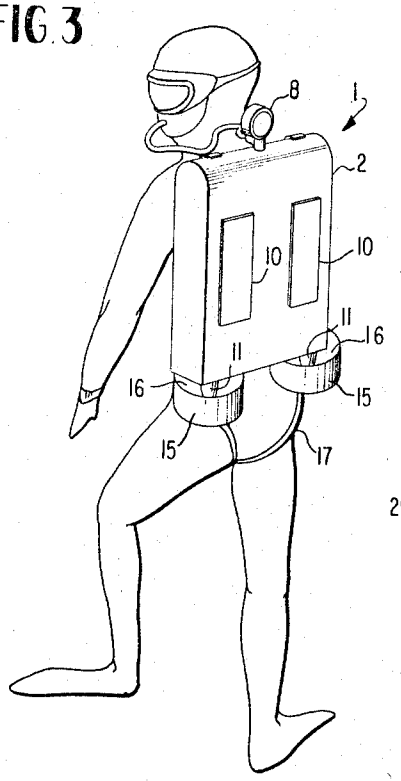


FIG. 2

FIG. 3



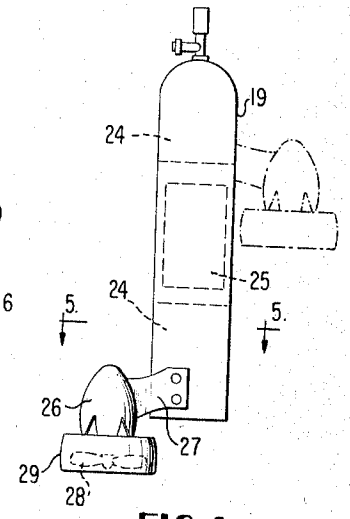


FIG. 4

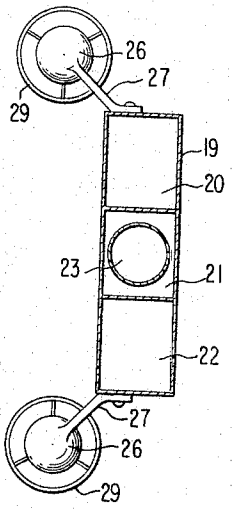


FIG. 5

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BATTERY OPERATED PROPULSION UNIT FOR SWIMMERS

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FIG.6

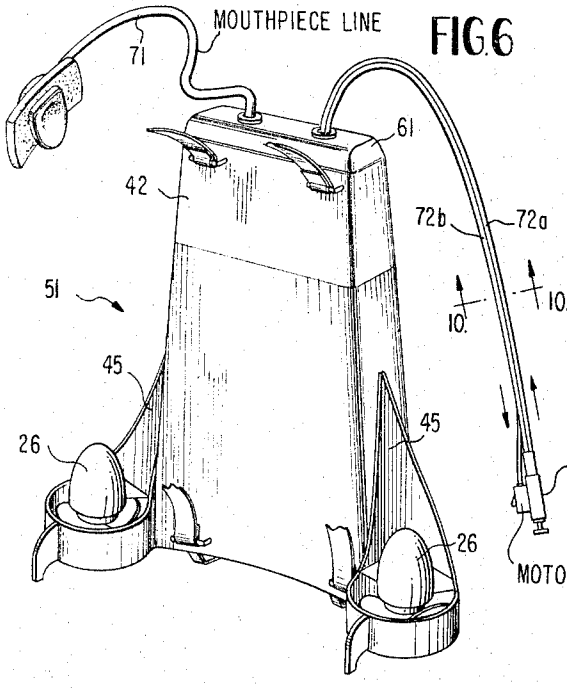


FIG.10

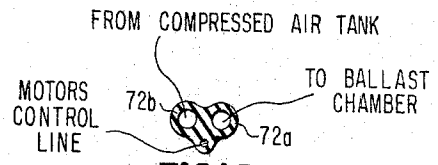


FIG.8

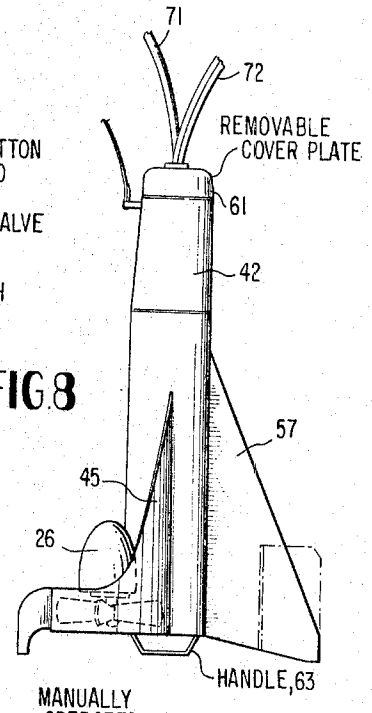


FIG.7

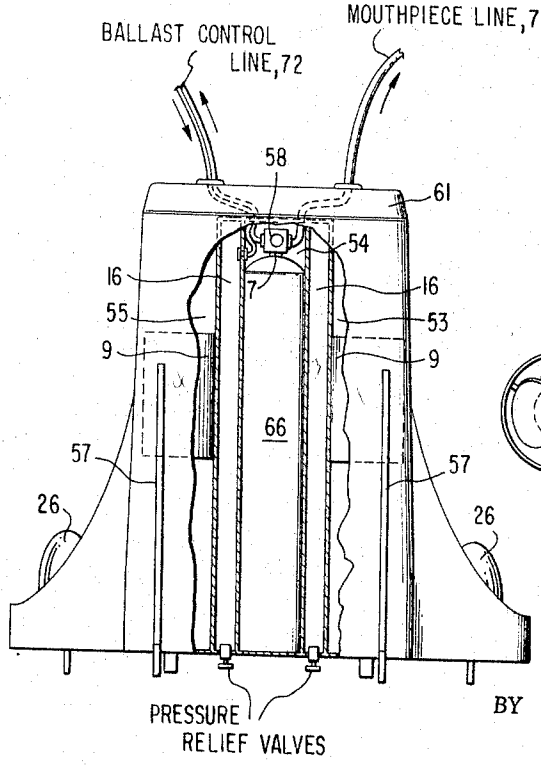
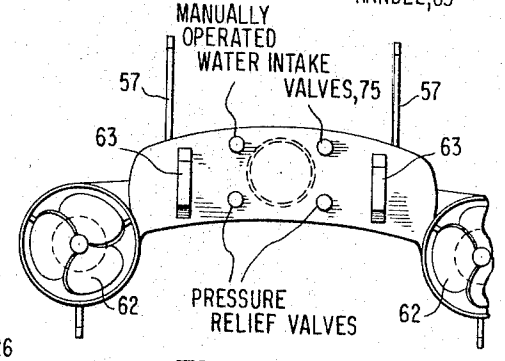


FIG.9



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United States Patent Office 3,329,118
Patented July 4, 1967

3,329,118

BATTERY OPERATED PROPULSION UNIT FOR SWIMMERS

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Filed Mar. 23, 1966, Ser. No. 536,732
8 Claims. (Cl. 114—16)

ABSTRACT OF THE DISCLOSURE

A battery operated propulsion unit, attachable to swimmers or divers, wherein a unitary structure is divided into chambers for housing batteries, a compressed air tank and for serving as a water-compressed air ballast chamber. An air control valve means is located near and manipulated by the swimmer, so that the swimmer at all times can control the flow of air from the tank to the ballast chamber to regulate water flow into and out of the ballast chamber to vary its buoyancy effect as required. Electrically operated shrouded propeller means are secured to the structure and are operated from the batteries. The speed of the propellers is remotely controlled by the swimmer by means adjacent the air valve control means. The air tank also supplies breathing air when such is required.

This invention relates to a new buoyancy-controlled propulsion unit for swimmers and more particularly to a battery operated propulsion unit including a compressed air tank which is secured to the body of a swimmer. The new propulsion unit of the invention includes an adjustable water-air ballast chamber which permits the swimmer to use the propulsion unit at and below the surface of the water in a more efficient manner.

Heretofore battery powered outboard motors for boat propulsion were known and have been described in Smith, U.S. Patent No. 2,919,392, issued Dec. 29, 1959, and are also described in the patents cited in the Smith patent file. Outboard electric motor propeller units of large size have also been used in small boats in the past and a teaching for outboard motor use is found in Buchet, U.S. Patent No. 1,764,388, granted June 17, 1930. Recently there has been an advance in the degree of sophistication which has resulted in the development of pushbutton controls to separate the heavy battery carried in the boat from the heavy motor placed outside of the boat, as shown in Moser, U.S. Patent No. 2,804,838, and in providing separated windings for the electrical motor to provide different speeds, as shown in Miner, U.S. Patent No. 3,140,689. These advances in the boat art have required heavy complicated equipment and have not, as far as I am aware, been suggested as being practical for underwater swimming equipment because, in general, it was not conceived that there could be any advantage achieved, especially because of the requirement for heavy weight batteries, heavy weight propulsion units, and further because of the need for guiding, steering and rudder devices.

The present invention conceives a new combination of buoyant chambers in a single unit which distinguishes over these disparate teachings of the uncombined elements in the prior art and produces a new result by introducing a new coaction of adjustable ballast in a waterproof chamber which is part of the center chamber of a single propulsion unit sufficiently light and compact for securing to the body of a swimmer. In one main aspect of the invention, the swimmer is free to use his hands for any desired task which makes the present unit entirely different from prior art units, either of the boat type or of the sled type, which requires the constant attendance and

control of the conventional propeller pull-type propulsion unit. This is especially the case in the under water sled.

The freeing of the swimmer for any desired manipulation by using the new unit of the present invention is based upon the additional new concept of means for simple hand manipulation of the compressed air in the ballast tank of the central chamber which is provided in the waterproof housing and whereby zero buoyancy can be achieved at every level. In a practical sense, this achievement of zero buoyancy permits the swimmer to dispense with heavy lead weights or to constantly make adjustments by expending substantial swimming movements, which tire the swimmer because of the physical exertion involved and this achievement represents a principal object of the invention.

Another object of this invention is to provide a battery powered buoyancy-controlled propeller driven propulsion unit for swimmers.

Another object of this invention is to provide a more efficient multiple chambered propulsion unit for swimmers, the unit being capable of carrying an air tank in a chamber therein without separate harnessing.

Another object of this invention is to provide a waterproof multiple chamber propulsion unit for swimmers in which the driving motor is cooled by a controlled water flow.

Another object of this invention is to provide a propulsion unit for swimmers having a controlled water flow for maneuvering.

Another object of this invention is to provide a battery powered propulsion unit for swimmers, the speed of which is easily adjustable from finger-operated remote control buttons positioned in the harness at the front of the swimmer.

Another object of this invention is to provide a ballast-adjusted propulsion unit for swimmers capable of suspending the swimmer at a predetermined depth.

Another object of this invention is to provide a propulsion unit for swimmers that is attractive in appearance, inexpensive to manufacture and highly efficient in operation.

Another object of this invention is to provide a propulsion unit for swimmers that can carry and drive a plurality of propulsion motors.

Further objects and advantages of the invention will be brought out in the following specification wherein, for the purpose of completeness of disclosure, the preferred embodiments have been described in great detail, without limiting the scope of the invention set forth in the appended claims.

Referring to the drawings, which are for illustrative purposes only:

FIG. 1 shows a perspective view of one embodiment of the invention in which a single housing combines an air tank, a battery motor combination as a unit, and a propeller, the propeller and battery motor combination constituting a detachable unit fitting into the base of the rectangular housing unit.

FIG. 2 illustrates a back view of the first embodiment of FIG. 1.

FIG. 3 illustrates the unit of FIG. 1 provided with a harness for securing to the body of the swimmer.

FIG. 4 shows a plan view of a second embodiment illustrating the single housing with a detachable battery powered propulsion unit adapted to be removably attached at the location show, or to be moved to a central location, if desired.

FIG. 5 shows a cut away top view along line 5—5 of FIG. 4.

FIG. 6 illustrates a perspective view of a third embodiment, the preferred embodiment, for manual buoyancy control in which the battery controlled propulsion unit is

provided with a stabilizing fin, partial cowling which includes the remote controlled electrical switch mechanism, the pushbutton ballast control unit, and the mechanical support features adapting the preferred embodiment for all-purpose work, e.g., scuba and towing.

FIG. 7 is a cut away section, partly in elevation, taken from the back of the embodiment of FIG. 6 and shows the flow of air from the compressed air tank supply to the mouthpiece line and to the ballast chamber and illustrates the electrical and compressed air line arrangement.

FIG. 8 is a side elevation of the embodiment of FIG. 6.

FIG. 9 is a bottom view of the embodiment of FIG. 6 illustrating the intake flutter valves and the output flutter valves which are spring adjusted to a predetermined pressure and are of the basic structure as in Topper, U.S. Patent No. 2,152,110.

FIG. 10 is a section view along line 10—10 of FIG. 6, which illustrates the electrical line and compressed air alternator for controlling buoyancy of the unit.

Referring now to the drawings, FIGS. 1 to 3 show a propulsion unit **1**, comprising a substantially rectangular streamlined waterproof housing **2** having three integral parallel longitudinal chambers **3**, **4** and **5**, respectively, therein. The multiple compartmented housing **2** is streamlined in order to reduce the frictional power loss and thereby increase the speed and efficiency of the unit as it travels through the water. Chamber **4**, which separates chambers **3** and **5**, is open at either its lower or upper end in order to receive an air tank **6** for providing the swimmer with a supply of air while under water, and has an orifice in its upper end through housing **2**. Chamber **4** is provided with water intake valves, water outlet valves and bypass valves from the compressed air tank pressure regulator **8** which bleeds air into the chamber, thereby adjusting the buoyancy of the unit. These valves are shown in greater detail in FIG. 6 and, in the later part of the specification, their operation to alternate air and water into the chamber, is explained. When air tank **6** is inserted in chamber **4** the outlet end **7** of air tank **6** extends through the orifice and the pressure regulator **8** is secured to the extended end **7** externally of housing **2**. A flexible hose may be connected to the regulator **8** for carrying air to the swimmer.

Thus, in addition to regulating the supply of air, the pressure regulator **8** and its bypass valve serve to alternate the air from and between the diver to the ballast chamber **4** for buoyancy control of the unit, the air serving to expel water when the ballast is too great and to let water into the intake valves when the ballast is too small. By securing the air tank **6** within chamber **4**, a separate harness for the air tank **6** is rendered unnecessary since the air tank **6** and the housing **2** are assembled as a unit. The unit is adapted for mounting on an object to be towed.

Chamber **3** and **5** are waterproof and have a power source **9** diagrammatically consisting of lightweight storage batteries of either wet or dry cell construction, or a fuel cell, mounted therein.

The lightweight battery is preferably a high-energy, dry cell battery, of the type shown in Gordon, U.S. Patent No. 2,050,173, issued Aug. 4, 1936, and improved by Davis in U.S. Patent No. 2,594,879. This Gordon battery, and the Davis improvement, is a magnesium silver dry cell of the deferred action type which has an open circuit voltage of 1.3 volts and delivers one ampere for each 640 square cm. of surface. These batteries are among the lightest which can be used.

Another type of high energy battery which may be used is the alkaline dry cell, as shown in Ellis, U.S. Patent No. 2,575,337, this dry cell being particularly useful because it can be completely sealed to protect it absolutely from the water environment during use.

A heavy duty battery which can be used is the nickel-cadmium battery of the type shown in Fischbach, U.S. Patent No. 2,616,939 and Schilke, U.S. Patent No. 3,196,049, under conditions of long submergence or for the towing of heavy loads for long distances. It is necessary that the use of the heavy nickel-cadmium battery be accommodated to the physical movements of the swimmer by introducing a higher degree of buoyancy to the central ballast chamber.

Other types of batteries which can be used are those shown in Wilke, U.S. Patent No. 2,711,437, and Kordesch, U.S. Patent No. 2,935,547, or Amiet et al., U.S. Patent No. 3,222,225, the Kordesch battery being especially suitable in colder waters.

The foregoing batteries have become available only within the last few years and it is an important advantage of the present invention that certain of these new power devices can be adapted to be hermetically sealed within the present unit for protection from sea water, and can be used without giving off excess heat so as to be capable of long life under high energy drain.

The chambers **3** and **5** are provided with a suitable side access panel **10** which is water-tight when closed and enables replacement, recharging or inspection of the batteries when open.

Supported externally and longitudinally of chambers **3** and **5** are waterproof streamlined motors **11** (shown diagrammatically) which are electrically connected to the power source **9** by a waterproof conductor **12** (shown diagrammatically). Conductor **12** has a rheostat or switch **13** (not shown) connected along its length between the power source **9** and the motors **11** and by varying the resistance of the rheostat **13**, the speed of the motors can be adjusted.

Attached to the shafts of motors **11** are propellers **14** which extend rearwardly of chambers **3** and **5** and when actuated propel the swimmer in a forward direction. A pair of semicircular ducts **15** are mounted adjacent chambers **3** and **5** and surround the motors **11** and propellers **14**. The ducts **15** are supported in spaced surrounding relationship to the outer surface of the chambers **3** and **5** to provide an annular water passageway **16**, so that a controlled flow of water is forced over the motors **11** thereby cooling the motors. An improved cooling of the motor is shown in connection with the scoop structure shown in FIG. 6. Ducts **15** additionally serve as a shroud for the propellers **14** for achieving greater maneuverability of the unit. In addition to controlling the water flow, ducts **15** make an ideal stand to support the propulsion unit **1** out of the water and to make the attachment to the body easier.

A conventional body harness **17** for securing the propulsion unit **1** to the back of the swimmer in both a standing of swimming position, is attached to the housing **2** by ears **18** located along the top and bottom of the housing **2** in laterally spaced relationship. The harness **17** is of the type that encircles the chest and legs of a swimmer while leaving his arms and legs free for any desired manipulations. The harness **17** is provided with suitable length adjustment means and fastening buckles for enabling swimmers of various sizes to use the same harness.

Another embodiment of the invention is shown in FIGS. 4 and 5 in which housing **19** is identical to housing **2** and chambers **20**, **21** and **22** are identical to chambers **3**, **4** and **5**. An air tank **23** having a pressure regulator is mounted in chamber **21** in a manner hereinbefore described.

Mounted in chambers **20** and **22** is the power source **25** which is a low-cost unit when it consists of lightweight batteries of wet or dry cell construction. Chambers **20** and **22** are provided with suitable watertight side access panels for recharging, replacing and inspecting the batteries.

Extending laterally and downwardly from the aft compartments **20** and **22** are streamlined waterproof motors **26**. The motors **26** are detachably attached to the housing **19** by brackets **27** which support the motors **26** in

parallel spaced relationship. When the propulsion unit of FIGS. 4 and 5 is secured to the body of the swimmer in a manner described hereinbefore with respect to propulsion unit **1**, the motors **26** will lie in a parallel direction to chambers **20** and **22** and will be along the sides of the swimmers.

Secured to the shafts of motors **26** and extending rearwardly are propellers **28** which, when revolving, propel the swimmer in a forward direction. A pair of circular shrouds **29**, similar to those in FIG. 1, are mounted on brackets **27** in spaced surrounding relationship to propellers **28** to provide a controlled water flow through the propellers **28** for increased steering and guiding maneuverability.

The water cooling of the totally enclosed outboard motors **26** in FIG. 4 or **11** in FIG. 1 can be rendered more efficient if the motor housing is modified to include water intake channels and water outlet passageways of the type illustrated in Alexander, U.S. Patent No. 3,164,121. These channels and passageways are particularly desirable for underwater operations of long duration and under propulsion conditions requiring maximum battery or fuel cell drain, both conditions tending to cause a build-up of heat.

Power source **25** and motors **26** are electrically connected by a conductor and rheostat in the same manner as the embodiment of FIGS 1–3. Motors **26** being external and lateral of the housing **19**, will be in constant contact with a cooling flow of water, which due to the streamlined shape of the motors **26**, will be directed into the annular opening of the shroud **29**.

The relationship between the material weight of each of the structural supporting components (housing **2**, battery motor **9**, **11**, etc.) and tanks **6** and the volume of the three chambers **3**, **4** and **5** controls the buoyancy of the unit **2**. The watertight chambers **3** and **5** are only partially occupied by the power source **9** and the rear portion of the motors **11** which are sealed at the lower surface of the casing, as shown in dotted section in FIGS. 1 and 2, to thereby provide a head space or air volume in chambers **3** and **5** which produces buoyancy for the unit. There is head space or air volume also provided in the center chamber **4**. Obviously, the total weight may be adjusted by adjusting the dimensions of the unit to make it larger or smaller and to thereby produce a difference in buoyancy which can be compensated by making the motor or battery part smaller or by adding weights within the chambers and by balancing the added weights in order to have the unit rest comfortably on the back of the swimmer.

The objective is to achieve a comfortable harness-held unit which includes the battery-propulsion units, motors, and air supply tank for zero net buoyancy in surface use and in underwater use, the adjustments to the zero condition being effected by the swimmer by the use of simple hand controls as are illustrated in FIGS. 6–10.

The ducts **15** in FIG. 1 and **29** in FIGS. 4 and 5 serve as a shroud or cowling extending over the propellers for enhancing propulsion. This shroud or cowling is an important feature of the invention in all of the embodiments herein because it increases the efficiency of propulsion even at relatively low propeller velocities. Reference is made to Jerger, U.S. Patent No. 3,112,610, which describes the improvement of efficiency from 80 to 90% for shrouded propeller units at high horsepower output. A similar result is achieved at low power output with the present motors.

In the three-chambered controlled buoyancy construction of all of the figures of the present invention, the initial condition is for close to zero buoyancy in connection with the type of swimming, e.g., ocean or fresh water swimming. In salt water, the unit will be heavier than in fresh water and appropriate weight additions can be made inside of the unit to fit it for the intended marine location. In putting on a wet suit for underwater sport or for heavy salvage operations, additional weight is carried by the swimmer and the unit of FIG. 1, for example, may be modified by the inclusion of detachable weights in the inside of the center chamber **4** which are removed in order to adjust for the weight added by the wet suit and thereby bring the unit closer to zero buoyancy.

In this connection, the swimmer recognizes that the zero buoyancy is achieved at a particular level when he pumps or alternates air into the center chamber which is filled partly with water and partly with air based upon an entirely new concept of swimmer buoyancy control which is particularly pointed out in respect to the preferred embodiment of FIGS. 6–10.

Ordinarily, pumping or alternating air into a closed chamber partly filled with water would do no more than to bring the head space pressure close to the pressure of the compressed air which is introduced. The center chamber in all of the embodiments of the present invention is provided with a flutter inlet valve and with a flutter valve for the expulsion of water. The prototype valve used in diving is that described in Topper, U.S. Patent No. 2,152,110, wherein the valve permits the escape of the diver's compressed air at the head of the diving suit. This valve is a differential pressure valve and was improved by Akerman et al. in U.S. Patent No. 2,449,683 to provide adjustable spring bias on the movable diaphragm element, thereby making the valve responsive to a predetermined fluid pressure condition before opening.

These flutter valves of the Topper-Akerman et al. type have now been improved to be responsive to very small differences in pressure, e.g. less than one-half pound pressure, and an example of this more sensitive valve is the amplifying demand valve of Holm, U.S. Patent No. 2,886,049.

In short, there are numerous valves known and commercially available which are adapted to control the buoyancy of the unit by admitting a predetermined amount of water into the center chamber whereby the swimmer himself brings about zero buoyancy under the conditions of use.

The zero buoyancy term has been used hereinabove to define the unit for two conditions of underwater use, salt water and fresh water, and for different working conditions which may require the diver to add equipment which has not been adjusted for buoyancy. It is for these different conditions that the detachable weights may be used in the center chamber to adapt the unit for all purposes. The diver may, with his hands free, take an additional unit with him for heavy towing operations and can enter completely dark underwater areas without the need for even a hand flashlight by wearing the headgear of Orland, U.S. Patent No. 2,115,744. The illuminating bulb in this patent can be fed from the battery source for the motors. The tow unit may be lit by having an electric light bulb of the type shown in the Orland patent mounted at an appropriate location near the valve location **8** of the compressed air tank which has the advantage of permitting one diver of a pair to monitor the other diver's air pressure if the tow unit were used for swimming.

When the device of the present invention is used as a tow unit, electrical remote control switches which are known in the art may be employed in order to start the motors and the device may be guided with a tow line by the swimmer, who also wears the present device, after the device is harnessed to a load which the swimmer desires to move from one to another underwater location. Thus, the use of two units of the present device permits the swimmer to direct the power unit acting as the tow sled from a line. For this purpose and if desired, a rudder may be attached to each of the fins **57** in the embodiment of FIGS. 6–10 and a remote control manipulating unit for the rudder, as shown in Buchet,

U.S. Patent No. 1,764,388, may serve to direct the unit acting as a tow sled under the control of the swimmer who can maneuver in advance of the unit, to the side of the unit or behind the unit used as a tow sled.

Referring now to FIGS. 6–10, the propulsion unit **51** comprises a slab-like, substantially rectangular die cast or injection molded, impact-resistant waterproof housing **42** including longitudinal chambers **53**, **54** and **55** therein which are in the same relation and for the same purpose as in FIGS. 1 and 5. The housing **42** is streamlined at its top and sides by the inclusion of scoop elements **45** which serve to reduce the frictional power loss and act to increase the stability, speed and efficiency and to enhance its travel through the water. Similarly to FIGS. 1 and 5, chamber **54** separates chambers **53** and **55** but is opened at its upper side through removable cover plate **61** in order to receive the air tank **66** for providing the swimmer with a supply of air while under water. Air tank **66** has a valve and an orifice in its upper end fitting into mouthpiece line **71** and into ballast lines **72***a*, **72***b*, these lines **71** and **72** extending through plate **61**. When air tank **66** is inserted into chamber **54**, the outlet end **7** of the air tank is completely within the chamber below the coverplate **61** and the pressure regulator is not observable outside of the unit as in FIG. 1. The flexible hose **71** is connected to the pressure regulator **58** for carrying air to the swimmer.

Chambers **53** and **55** are each waterproof and each has a power source **9**, shown diagrammatically, consisting of lightweight storage batteries of either wet or dry cell construction or a fuel cell mounted within. The chambers **53** and **55** are opened by lifting cover plate **61**. Cover plate **61** is watertight when closed and enables replacement, recharging or inspection of the batteries when opened.

Supported externally and to the side at the base of each of the chambers **53** and **55**, respectively, are the waterproof streamlined motors **26** which are electrically connected to the power source **9** by a waterproofed conductor (not shown) and which, if desired, can be connected to a rheostat (not shown) along its length between the power source **9** and the motors to adjust the speed of the motors. An adjustable control may be provided for said rheostat. In most cases, it is preferred to use constant speed motors.

Attached to the shafts of motors **61** are propellers **62** which extend rearwardly of the scoop elements **45**; and, when actuated, these propellers move the swimmer in a forward direction. The scoops **45** are stabilized with longitudinal fins **57** which extend beyond the back and stabilize the unit. The scoops **45** and fins **57** are integral with the housing. As shown in FIG. 7, each of these sides of the chambers **53** and **55** are separated by means of longitudinal wall structure to provide a closed annular water-air buoyancy passageway **16**, so that a controlled flow of water is taken into the intake valve, depending upon the pressure. Air is metered into the passageway through the swimmer's punching operation of the ballast supply valve. Thus, the water flow is controlled through intake valves **75** and the air flow is controlled in short bursts by the swimmer. The handle **63** aids in taking propulsion unit **51** out of the water and also makes easier the attachment of unit **51** to the body or to a load when the device is used for towing.

From the foregoing description, it will be seen that there are three distinct embodiments of the invention all having three compartments, the first two (FIGS. 1 and 4) utilizing detachable weights to permit the unit to be adjusted for neutral, slight positive and slight negative buoyancies and the third (FIG. 6) using a dynamic weight change in the form of incoming water.

Obviously, it is within the scope of the invention to utilize the static weight attachment feature in combination with the dynamic water intake and air pressure adjustment embodiment shown in FIG. 6.

Further, it is within the contemplation of the invention to utilize additional remote control devices in order to achieve better control of a towing unit, such as, for example, the Bowden linkage diaphragm control of the type which is used in Curtis, U.S. Patent No. 2,648,518, as the metering valve for introducing air into the annulus of the embodiment of FIG. 6 when it is being towed. This remote control of the Curtis patent may be connected to the compressed air source in the towed unit or in the swimmer's compressed air tank. If desired, the remote control device may be of the type shown in Fox, U.S. Patent No. 1,920,192, the knob of this device being used in a rotational movement rather than in a push button movement.

The air supply regulator for the swimmer may be of the by-pass valve type, such as shown in Blackwell, U.S. Patent No. 3,054,414. The swimmer's compressed air tank may be provided with a sound alarm to indicate air depletion below a critical pressure valve and this type of alarm is desirable for the embodiment of FIG. 6.

The towed unit in the embodiment of FIG. 6 may have a semi-automatic valve in the annulus for introduction of air of the type shown in Haverland et al., U.S. Patent No. 3,067,760.

Although the invention has been set forth in conjunction with exemplary embodiments thereof, it is to be understood that modifications may be made within its broader spirit and scope as defined in the following claims.

I claim:

1. An electrically operated propulsion unit for swimmers comprising a housing unit having a plurality of longitudinally arranged chambers including a first chamber, a second chamber and a third chamber, an electricity supply source in said first chamber, a compressed air tank in said second chamber, the said third chamber serving as a ballast tank, water valve means in said third chamber to permit inlet and outlet of water depending upon the pressure in said third chamber, pipe means extending outside the housing for connecting the air tank to the third chamber, an air valve in said pipe means to control air flow therethrough and thereby the pressure in the third chamber, said air valve located outside the housing and in a position to be manually controlled by the swimmer to facilitate the variance of ballast at all times, propeller means secured to said housing and driving electric motor means operatively secured to said propeller means and connected to said electricity supply means.

2. An electrically operated propulsion unit set forth in claim **1** wherein a fourth chamber is arranged to house additional electricity supply means, said fourth chamber being symmetrically located in the housing relative the first chamber.

3. An electrically operated propulsion unit as claimed in claim **2** wherein the third chamber is an annular chamber surrounding the second chamber.

4. An electrically operated propulsion unit as claimed in claim **1** wherein the plurality of chambers are arranged from side to side in the following order: the first chamber, the third chamber, the second chamber within the third chamber thereby making the second chamber annular, and a fourth chamber similar to the first chamber; and said propeller means comprising a propeller and its driving motor secured as a unit to the housing adjacent the first and fourth chambers.

5. An electrically operated propulsion unit as claimed in claim **4** wherein a shroud structure surrounds and supports the propeller and its motor, and a water scoop means is connected to the shroud and secured to the housing.

6. An electrically operated propulsion unit of claim **1** wherein a second pipe line is connected to the compressed air tank to carry breathing air to the swimmer.

7. An electrically operated propulsion unit as in claim 1 wherein the housing is an integral unit and forms the walls and one end of each of the chambers, and a common cap member forms a closure for the opposite ends of the chambers.

8. An electrically operated propulsion unit set forth in claim 1 including manually operated control means for said motor means, said control means being located adjacent the air valve means.

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