June 6, 1967 R. A. HARVEY 3,323,481

SWIMMING APPLIANCES

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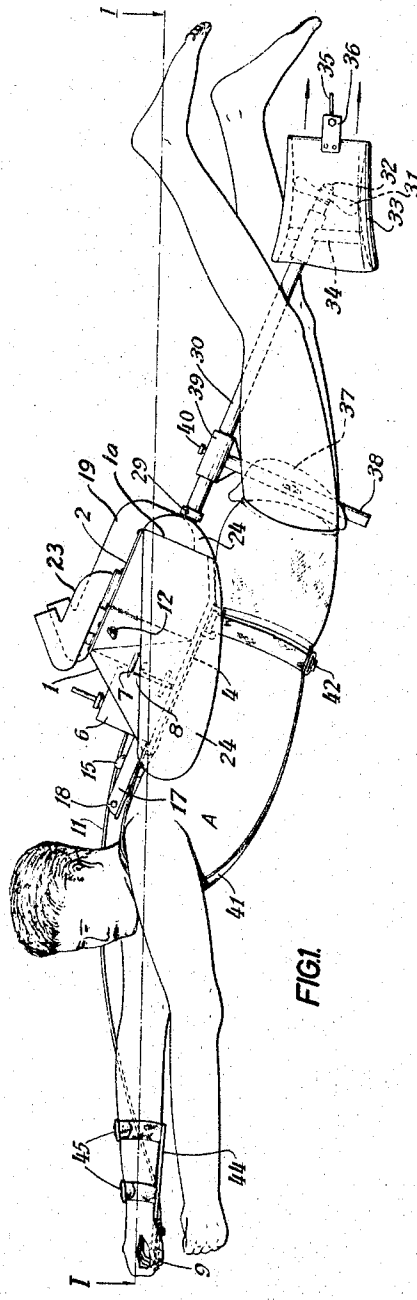

FIG. 1.

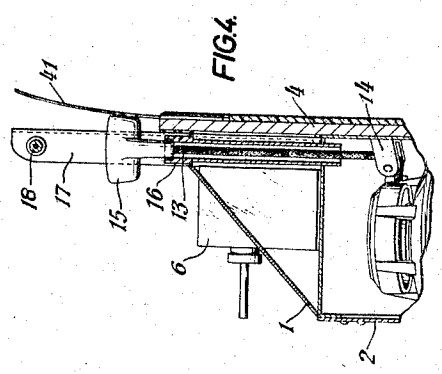

FIG. 4.

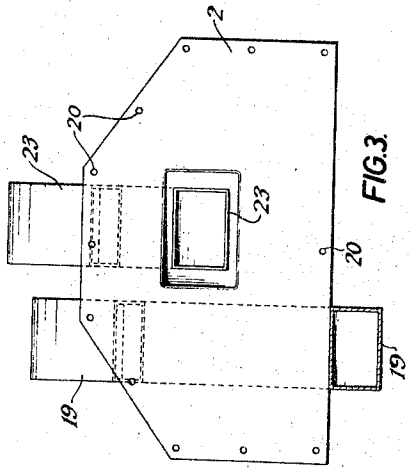

FIG. 3.

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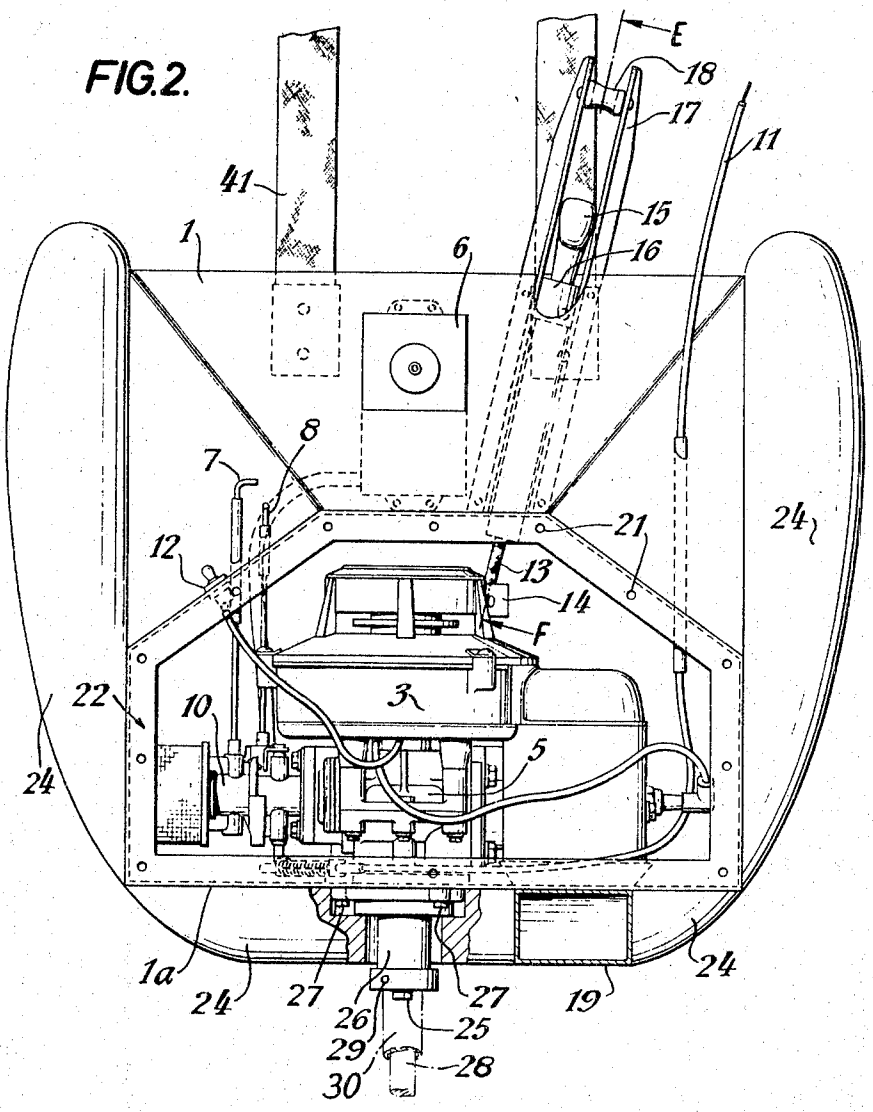
FIG.2.



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SWIMMING APPLIANCES

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This invention relates to swimming appliances and more particularly to a motivated appliance for assisting a swimmer or like user in his passage through water so as firstly to overcome the resistance of the water to his body and then indefinitely to sustain his rate of passage therethrough. There are known appliances of this kind which are more ferquently adapted to be used by aqualung divers but, hitherto, such appliances have either been rather bulky and complicated to use or when compact, as in one known example, restrict the freedom of the users' limbs; in all these known devices the swimmer or diver either sits or lies upon or is towed by the device in a manner imposing various restrictions to the freedom of the limbs.

The swimming appliance of the invention is both very compact and allows complete freedom of the limbs and furthermore is comparatively very light, inherently buoyant, simple to operate and safe to use. For these reasons, the invention is especially suitable for sporting activities and for such purposes as life-saving in the water and may readily be adapted for attachment to a light boat or inflatable craft as a propulsion means therefor.

The device of the invention is applied to the body of a swimmer as a "pack" or "ruck-sack," there being straps or a harness not unlike those used on parachutes or aqualung equipment, having a quick-release fastening means. When attached to the body, the inherent buoyancy of the device maintains the wearer in an appropriate attitude for swimming and affords a very considerable degree of lateral stability. Steerage by the swimmer is simply achieved by using the hands or feet as rudders or paddles there being no appreciable torque or like extraneous moments to be compensated for by the swimmer. The device is provided with ample protection for both wearer and other swimmers against injury by moving mechanical parts thereof and all controls are readily at hand, the primary control means always being immediately available to hand.

The appliance according to the invention comprises a motor which is either immune to immersion or so enclosed as to be protected from the water, means to control the motor, propelling means powered by the motor, means to attach the whole to the body of the user in a manner to transmit thrust thereto without impeding the natural swimming motions of the limbs or affecting the natural attitude of swimming and means to support and stabilise the body of the user in the water, when the whole is so attached.

The motor may be of the internal combustion engine type, electric turbine or any other suitable small motor unit and, depending upon requirements of the particular type, may be insulated against immersion or enclosed in a casing and, if necessary, suitably ventilated, in order that it may operate whilst either partially or completely submerged in water. In the case where an internal combustion engine or turbine is used ducts may be provided to allow the engine to aspirate and these either may be fitted with snorkel arrangements at their openings or simply be arranged to open well clear of the water when the appliance is in its operating position, in order to prevent the entry of water therethrough to the working parts of the engine.

The propelling means driven by the motor may comprise a propeller or impellor working either directly in the water or as a pump to water jet propulsion system, and the drive from the motor may be transmitted directly through a shaft or through a chain and sprocket system or gears or a combination of any of these, where weight does not become excessive. In the case where there is a shaft drive to a propellor, the shaft may be enclosed so as to provide a seal with the motor casing and so prevent entry of water thereinto.

Where a water jet propulsion is contemplated, the direction of thrust may be determined by nozzles, vanes or hydrofoils which may be adjustable or controllable by the user.

In the case where an external propellor or impellor is used it is preferable to provide a shroud which may be either rotary or fixed. Such a shroud may be tubular and surround a propellor, which is on an axis inclined to that of the shroud, have a convergent forward duct part in the sense of flow, a throat and an after part downstream from the propellor, the external diameter of the forward part being greater than that of the after part. Additional means to control the direction of thrust may be provided, such as one or more vanes or hydrofoils which in effect may act as elevators or rudders. These may most conveniently be fitted to the shroud and may be controllable by suitable linkages thereto, or simply adjustable to desired fixed positions.

Control of the motor may simply be contrived in stop start means or in addition rheostat or throttle controls may be provided. Where an internal combustion engine is employed a choke control, priming control and the like may be incorporated. Any one or more of the above motor controls may be operable through a cable or by rods and pivots in order that the user of the device may readily have them at his disposal. For example, a cable or cables may have a control box or the like at one end which is attachable to the wrist of the user, said cable or cables being flexible and linked to the motor in a manner to provide remote control thereof. A small signal transmitter may be used similarly as a remote control to the motor there being a signal receiver to actuate motor controls, within the appliance.

Means to attach the whole device to the body of a user may compromise, as aforesaid, a harness which may be provided with a quick release mechanism for safety and additional means better to distribute the load of thrust, may compromise a saddle-like support disposed adjustably on the appliance.

Floats being hollow bodies, polystyrene or the like may be fitted to the appliance to provide or to add to the buoyancy and the stability which the appliance affords the user.

Cooling of an internal combustion engine may be achieved through suitable air circulation for example, by vents and a blower or may be provided with a water jacket cooling system using ambient water as the cooling agent or may be a combination of both air and water cooling with fins or like means where necessary to assist in conducting away excessive heat. Padding may be provided between the appliance and the user to insulate the user from heat produced by the motor and to provide added comfort.

A suitable clamp or bracket may be incorporated on the appliance whereby it may be attached to a light boat or inflatable craft as a means of propulsion therefor.

A preferred embodiment of the invention is hereinafter described with reference to the accompanying drawings in which:

FIGURE 1 is a side elevation of the device showing its relative disposition in the water when attached to the body of the user;

FIGURE 2 is a plan view of the greater part of the appliance with the top hatch cover removed and the exhaust vent shown in section;

FIGURE 3 is a plan view of the underside of the hatch cover showing the relative positions of the exhaust and inlet vents;

FIGURE 4 is a detailed section through the starting system of the motor, on the line E–F in FIGURE 2.

A water-tight casing **1** having an inspection and service hatch cover **2** is constructed of heat conductive metal, such as aluminium, in order to assist cooling of the motor which it encloses.

The motor **3** comprises a 3½ B.H.P., air-cooled, magneto ignition, internal combustion engine made mainly of light alloys and having a fuel system which enables it to operate in any attitude. The motor **3** is mounted together and within the casing **1** upon a wooden base board **4** by bolts and is further secured to the rear wall **1***a* of the casing **1** by bolts to maintain the crankcase **5** of the motor in contact with said wall **1***a* so that heat may be transmitted away from the crankcase.

A fuel tank **6** is incorporated in the casing **1** and a choke control **7**, mixture control **8** and a throttle control **9** are all linked to the carburettor **10** of the motor **3** and all emerge from the casing **1** through seals. The throttle control **9** is disposed adjacent the users hand and is linked to the carburettor **10** by a flexible cable **11**.

The motor magneto is wired to a waterproof switch **12**. When this switch is on, the motor may be started by pulling the cord **13** see FIGURE 4 which is linked to the fly wheel of the motor through the pulley **14**. The cord **13** has a rubber handle **15** which serves to plug and seal one end of the tube **16** to prevent the entry of water therethrough to the motor. The handle **15** returns to the sealing position after pulling through the resilient action of the cord produced at the fly wheel. The tube **16** is braced by a bracket **17** having a roller **18** at its upper end over which the cord **13** may run when it is being pulled.

Exhaust from the motor combustion and air cooling system is conducted away through the exhaust duct **19** which is secured on the wall **1***a* and passes over the top of the motor as shown in FIGURE 1.

The hatch cover **2** comprises a part of and closes the water-tight casing **1** and is secured by brass bolts which pass through the holes **20** into the threaded bores **21** in the casing **1** so as to form a water-tight seal. A gasket or plastic coating applied to the surface **22** ensures this seal. The casing **1**, is provided with an intake duct **23** through which cool air is drawn by the motor air cooling system for subsequent expulsion through the exhaust duct **19**.

Polystyrene floats **24** are secured about the body of the casing **1** to provide additional buoyancy and give lateral stability to the appliance and user when in water as shown in FIGURE 1.

The water-tight casing **1**, the ducts **19** and **23** and the floats are all substantially streamlined to reduce water resistance in a forward direction.

The motor crankshaft coupling **25** projects rearwardly through the casing wall **1***a* and rotates within a bracketed collar **26** which is secured to the crankcase **5** of the motor by bolts **27** which pass through the wall **1***a*. A gasket is sandwiched together with the wall **1***a* between the crankcase **5** and the bracketed collar **26** to further ensure a water-tight seal.

The propeller shaft **28** is housed in a light alloy tube **30** and rotates in phosphor bronze bearings which are fixed one at each end within the tube **30**. The propeller shaft **28** is adapted at one end to engage a spigot on the coupling **25** and is maintained in the tube **30** by a flange

secured to said shaft so as to abut the bearing at the lower end. The tube **30** extends concentrically from the collar **26** and is secured by the screws **29** threaded in the collar **26** which screws may be tightened upon said tube **30**. Any frictional heat produced by rotation of the shaft **28** in its phosphor bronze bearings, is rapidly lost to the surrounding water.

A light alloy propeller **31** is splined on the lower end of the shaft **28** and secured by a brass nut **32**. The tube **30** and propeller **31** are surrounded by a shroud **33** and secured by a diametrical strut **34** which disposes the axes of the propeller and the shroud at an angle to each other. As shown in broken lines in FIGURE 1, the shroud **33** has a convergent forward duct part, a throat surrounding the propeller, and an after part downstream of the propeller, the diameter of the forward part being greater than that of the after part. A vane or hydrofoil **35** may be mounted by arms **36** to the after part to control the line of thrust in a vertical plane.

A saddle **37** on a pole **38** is secured to the tube **30** through a collar **39** adjustable and fixable by a grub screw **40**.

The whole device is securable to the body of the user A by the harness **41** which is secured to the user A by a quick release fastener **42**.

The cable **11** passes from the water-tight casing along the arm of the user to a throttle control **9** mounted to a plate **44** which is attached to the wrist and forearm of the user by straps **45** so that he may manipulate the control lever **9** with his finger and thumb.

The mean water level when the appliance is in use is generally indicated by the broken line I—I in FIGURE 1.

In favourable conditions the user of the appliance of the invention may attain speeds in excess of 7 m.p.h. in the water, the streamlined nature of the floats **24** tending to create a planing effect so raising the body of the user higher in the water thereby slightly reducing water resistance.

I claim:

1. Power swimming apparatus, comprising a buoyant structure, harness attached to said structure and adapted to detachably embrace the user's body and mount said structure on the user's back as a dorsal pack, an internal combustion engine and fuel tank therefor carried by said structure, a propeller shaft, a propeller shaft housing tube, means for detachably coupling said shaft to said engine, means for detachably fixing said tube to said structure, a propeller secured to said shaft, a shroud fixed to said tube and comprising a substantially circular cross sectioned and aerofoil longitudinal sectioned wall defining a tubular convergent duct, the common axis of said tube and shaft being inclined at such angle to the axis of said duct that the direction of flow at exit from the duct is substantially horizontal while the propeller shaft is inclined, so that said structure and engine are substantially freeboard and the propeller and duct are wholly submerged.

2. A swimming appliance for providing a motor drive for a swimmer, comprising a motor protected from the water, means for controlling said motor, propelling means powered by said motor, means secured to said motor for the attachment of said motor in position on the back of a swimmer with said propelling means disposed so that thrust transmitted to said motor by said propelling means is transmitted to the swimmer, supporting means secured to said motor to stabilize the body of the swimmer in the water, the motor means comprising an internal combustion engine and including duct means connected thereto whereby the engine can aspirate while submerged in the water, the engine being enclosed by a waterproof casing into which said duct means opens for cooling the motor, the means for controlling said motor including a resilient action starting cord having a sealing member secured thereto near one end, and said casing having an aperture through which said cord passes and which is sealed by

said sealing member when it is drawn to said aperture through the resilient action of said cord.

3. A swimming appliance for providing a power drive for a swimmer, comprising a watertight casing, power means within said casing, a body harness secured to said casing for attaching said casing to the back of a swimmer, control means for said power means and extending forwardly of said casing for ready access by the swimmer, propelling means drivingly connected with said power means and including a shaft extending rearwardly and downwardly from said casing for disposition between the swimmer's legs, the shaft being mounted within a tube fixed to said casing, a rod fixed to said tube and extending substantially radially thereof between the swimmer's legs, and a saddle on said rod to fit in the swimmer's crotch for

transmitting thrust by said propulsion means directly to the swimmer.

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