Jan. 30, 1934. A. V. HOPKINS 1,945,435

MOTOR DRIVEN SURF BOARD

Filed Oct. 12, 1932 2 Sheets-Sheet 1

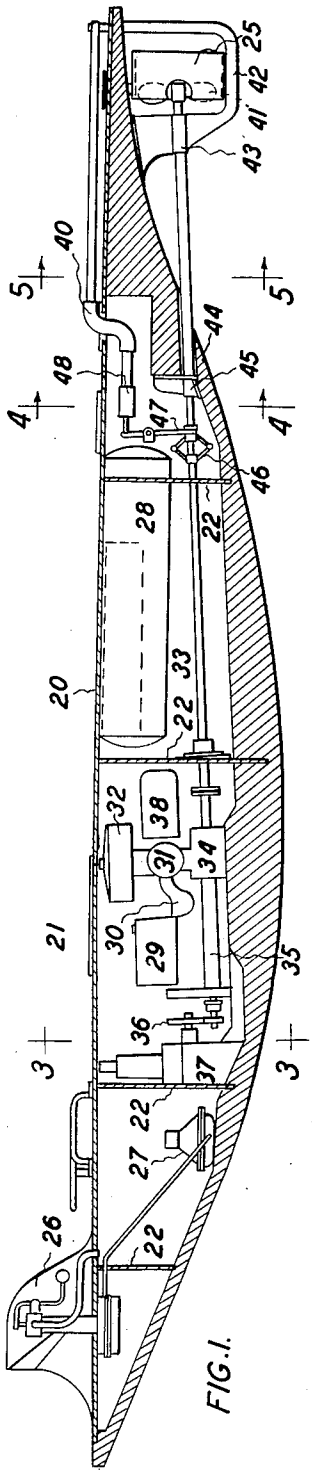



FIG. 1.

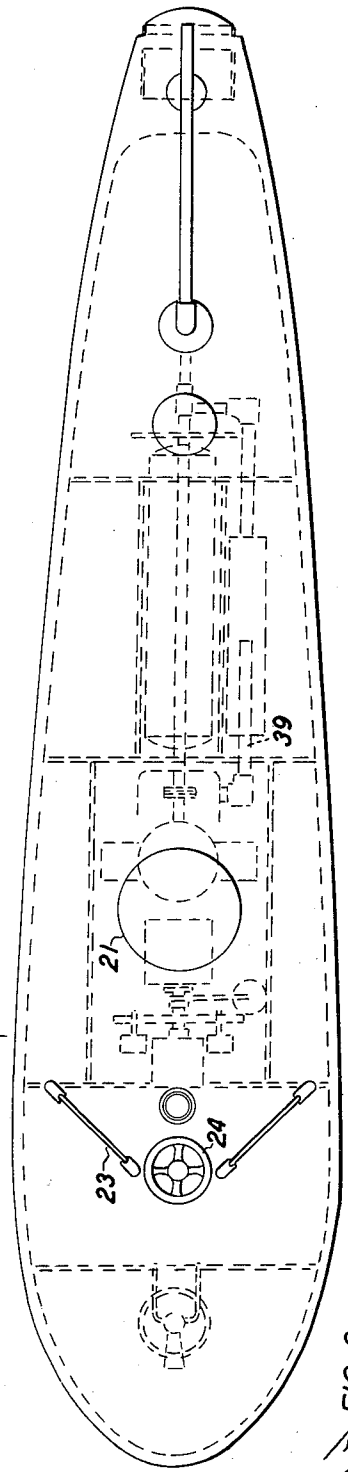



FIG. 2.

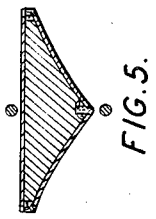


FIG. 5.

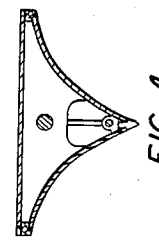


FIG. 4.

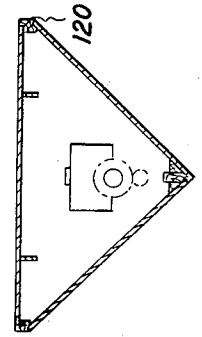



FIG. 3.

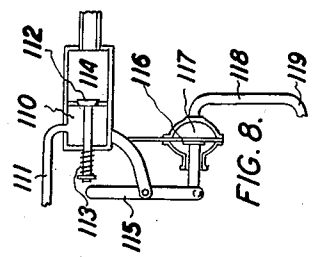



FIG. 8.

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MOTOR DRIVEN SURF BOARD

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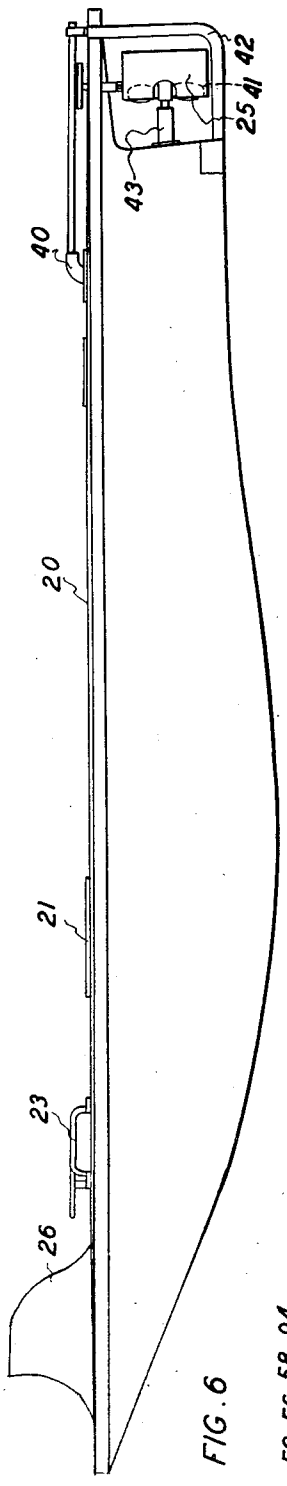



FIG. 6

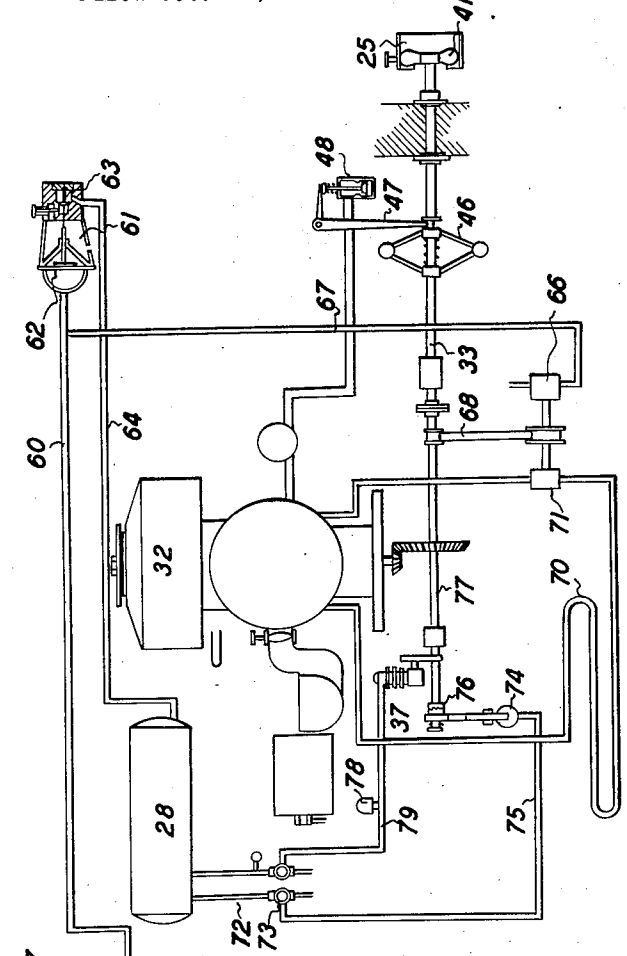
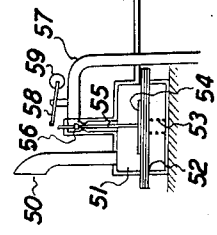



FIG. 7.



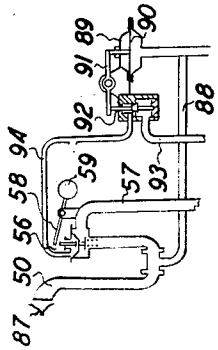




FIG. 12.

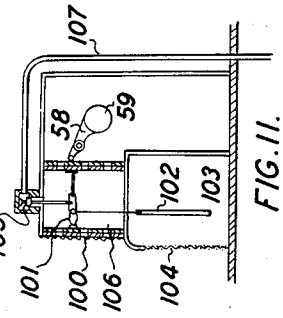



FIG. 11.

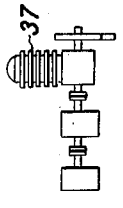



FIG. 9.

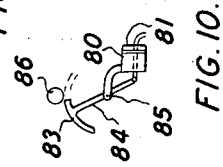



FIG. 10.

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Patented Jan. 30, 1934 1,945,435

# UNITED STATES PATENT OFFICE

1,945,435

## MOTOR DRIVEN SURF BOARD

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Application October 12, 1932, Serial No. 637,489, and in Australia October 27, 1931

2 Claims. (Cl. 115—34)

The object of this invention is to provide a novel device usable for recreation and utility to life saving and other purposes in the form of a surf board equipped with a motor driven screw propeller.

The conditions under which surf boards are used are such that heretofore they have not been fitted with mechanical propulsion means, because an exposed motor or a motor only superficially protected is rendered inoperative when "drowned" by the submerging of the board or by the smothering of the board in heavy spray. Apart from this drowning of the motor, entry of spray and green water with the fuel gas into the motor, and by submersion of the intake vent, must be prevented; flooding of the exhaust vent also chokes the motor and puts it out of operation. It is not practicable to use any type of motor for driving a "surf board" except an internal combustion engine fueled through a carburetter.

The "surf board" in which the present invention consists is a flat flush deck shallow V-section hull designed and balanced for self-righting when capsized. The hull interior is compartmented by transverse bulkheads. An atmospheric air intake cowl is fitted at the fore end of the deck and the engine exhaust pipe is brought out over the stern. The propeller works within a tubular rudder under the stern counter; the rudder is controlled by flexible leads from a steering wheel or tiller lever which is installed on the forward part of the deck between a pair of hand grips by which the surf rider may hold himself lying prone on the deck. A starter control device and an engine spark and throttle control are also installed on the deck assembly accessible for operation by the rider.

Air comes to a fully enclosed compartment in which the engine is installed, through the air cowl via an automatic valve which closes the intake vent under flooding conditions, and simultaneously opens a delivery valve on a storage bottle which carries air under pressure to provide supply for engine demands whilst intake of air direct from atmosphere is arrested. A Pitot tube and pressure diaphragm device holds a valve on the exhaust pipe against the pressure of a light loading spring, whilst the vessel is running above a minimum low speed, say three miles per hour. In low speed running the valve is forced open against the loading spring by the exhaust back pressure only. Preferably the exhaust pipe is led to a submerged position immediately astern of the tubular rudder in order that evacuation of gases will be promoted by their entrainment in the water column which is being driven through the tubular rudder by the propeller action. The engine carburetter may be fitted with a centrifugal control to prevent racing of the propeller when it comes above water level.

Ignition is preferably by magneto; the magneto is enclosed in a waterproof casing in the engine compartment in order to protect it against interference by moisture.

In the accompanying drawings:—

Fig. 1 is a vertical longitudinal section through the vessel;

Fig. 2 is a deck plan;

Figs. 3, 4 and 5 are transverse sections on the planes 3, 4, 5, Fig. 1, respectively;

Fig. 6 is a side elevational view showing the hull contour slightly modified;

Fig. 7 is a diagrammatic view of the air exhaust control and the engine assembly;

Fig. 8 an alternative view showing the Pitot tube exhaust control;

Fig. 9 an elevational view showing the engine circulation pump and a pump for evacuating water which enters through the air inlet cowl;

Fig. 10 is an elevational view of the starter control;

Figs. 11 and 12 are sectional views showing alternative forms of atmospheric air cowl control.

The deck 20 is flat with sealed hatch 21 giving access to the engine compartment; 22 are cross bulkheads. 23 are holdfast rails to enable a surfer to retain himself securely, lying prone on the deck, 24 is a steering wheel connected by flexible lines to the tubular rudder 25, 26 is the atmospheric air cowl, 27 is a compressed air admission valve which operates to open air supply from an air reservoir 28 which is charged with air under high pressure. 29 is an oil fuel pipe connected to the float control of the carburetter 30. The carburetter is fitted to the engine 31 through a swivelling neck which permits the carburetter to come by gravity always to the vertical position, irrespectively of the heeling of the vessel. 32 is the engine fly wheel and 33 the propeller shaft, 34 a gear box through which the engine 31 is connected to the propeller shaft 33 and is also connected through a shaft 35 to the driving gear 36 associated with an air compressor 37, which delivers air to the tank 28. 38 is an engine exhaust receiver box and 39 an exhaust pipe therefrom, led out at 40 over the aft part of the deck with its end bent down and extended below water level rearward of the rudder. The propeller 41 is accommodated in a protective guard frame 42 built under the stern counter and works within

the balanced tubular rudder 25. 43 is the outboard bearing of the propeller shaft, 44 the rear dead wood of the hull, and 45 a stern gland.

46 is a centrifugal governor on the propeller shaft 33 operating through a rock lever 47 to control a valve 48 in the exhaust pipe to open it when the engine is reved up above idling speed; this feature is not an essential of the invention.

The atmospheric air cowl 26 is shown in fuller detail in Fig. 7. 50 is a cowl having its foot fitted into an air box 51. 52 is a flexible rubber diaphragm in this box, and 53 a cushion spring below this diaphragm influencing it upward. A foot 54 rests on the diaphragm and carries a valve rod 55 which operates a valve 56 at the entrance to the air downtake pipe 57 which leads into the engine compartment. 58 is a lever carrying a counterweight 59 on one end of it and having its other end disposed to contact with the top end of the tail rod of the valve 56. In the event of the vessel being capsized, the counterweight 59 throws the lever 58 and closes the valve 56, thus preventing entrance of water through the cowl 50 into the engine compartment. Under normal operating conditions, air coming in through the cowl 50 passes the valve 56 and goes through the downcomer pipe 57 to the engine compartment. If the box 51 should be flooded with water, the diaphragm 52 is depressed and the valve 56 closes automatically, preventing the water from finding its way into the pipe 57. Water taken into the box 51 flows through a pipe 60 to a control valve 61. In this valve it acts against a flexible diaphragm 62; flexure of this diaphragm opens a poppet valve 63 which connects the storage air reservoir 28 through the pipe 64 to the engine compartment. 66 is a drain pump connected by a pipe 67 to the pipe 60. The pump 66 is maintained in continuous operation by a belt drive 68. As soon as flooding of the pipe 60 occurs, immediately following the cut-off of atmospheric air intake, air supply to the engine is maintained from the air tank 28 and the flood water is drawn from the pipe 60 by the pump 66 and is discharged overboard. 70 is the engine radiator and 71 a water circulating pump driven also from the belt 68. The radiator 70 is a pipe rack or coil fitted on the skin of the vessel in such a way that it suffers cooling by contact with the water in which the vessel is operating.

The engine is started by compressed air taken from the tank 28 through a pipe 72 to a compressed air starter. A control valve 73 on this pipe has its stem extended through the deck and fitted with a control head disposed within reach of the rider's hand. 74 is the starter operated by air coming through the pipes 72 and 75, and 76 is a self-engaging and disengaging clutch for connecting the starter 74 to the gear box main shaft 77. 78 is a relief valve in the pipe connection 79 from the air pump 37 to the air reservoir 28.

The starter 74 is shown in fuller detail in Fig. 10, where 80 is its cylinder, 81 piston, 83 toothed quadrant, 84 arm carrying the quadrant 83 and pivoted at 85, and 86 a pinion associated with an overrunning clutch 76. When air is admitted to the back end of the cylinder 80 the quadrant 83 engages the pinion 86, thus rotating the shaft 77. As soon as the engine has started up the quadrant 83 returns to the idle position under spring control. A valve connecting the back end of the cylinder 80 with the air pressure tank 28 is fitted on the deck of the craft within reach of the rider.

An alternative device operating on the same principle for preventing admission of spray and green water into the engine compartment is shown in Fig. 12. In this arrangement the intake funnel 50 is fitted with a cowl 87. Whilst the valve 56 is open, air passes through the pipe 57 to the engine compartment, and water taken in with the air drains through the pipe 88 to the pump 66. If, however, the water is in any considerable quantity it floods up into the chamber 89 and lifts the diaphragm 90 therein, thus tilting the beam 91, thereby forcing open the valve 92 and admitting air from the air reservoir 28 through the pipe 93 and thence by the pipe 94 to the top side of the diaphragm valve 56, closing it. The automatic device 58—59 is provided for closing the atmospheric air intake and opening the storage air intake whilst the vessel is in an inverted position.

Another arrangement for the same object is shown in Fig. 11. In this case the air is taken in through a sliding register 100. The grid plate of this register is carried by a rocking beam 101, and a vane 102 is fixed to the rocking beam and is located in a chamber 103 below the air intake chamber. 104 is a close wire netting front on the chamber 103. The beam 101 operates the valve 105. So long as the vane 102 is in an approximately vertical position sufficient aperture is provided for the incoming air, but when water acting against the vane 102 forces it backward, the beam 101 is moved to close the register 100 and so check the incoming of more water into the reception chamber 106. The chamber 106 is connected to the engine compartment by a pipe (not shown). A similar arrangement for closing the air intake when the vessel is inverted is provided by the counterweight 59 on the beam 58, the operating end of the beam 58 being connected to the register so as to close it when the vessel is in inverted position. Under either condition, that is to say, when the vane 102 is displaced by pressure of water against it so as thereby to tilt the beam 101, or when the vessel is inverted, the valve 105 is opened and air then passes to the chamber 106 and thence to the engine compartment through the pipe 107 from the air pressure tank 28.

In the alternative form of exhaust control device shown in Fig. 8 the exhaust coming into the chamber 110 through the pipe 111 from the engine manifold forces open the poppet valve 112; this valve is normally held lightly seated by a spring 113. If water should enter the back chamber 114 it closes the valve 112 and prevents flooding of the exhaust system. The valve 112 is always closed, except whilst the craft is in motion; it is then opened automatically by the rocking lever 115 which is moved by the diaphragm 116 in a chamber 117; this chamber 117 is fitted with a control pipe 118 having its lower end 119 bent forwardly; this end of the pipe 118 is open and it projects through the hull in a normally immersed position. The water pressure in the pipe 118 produced by the movement of the vessel, acts against the diaphragm 116 and forces up the valve 112. As soon as the craft comes to rest, pressure no longer acts against the diaphragm 116 and the spring 113 closes the valve 112.

Figs. 3, 4 and 5 show transverse sections of the hull at frame positions 3, 4, and 5, Fig. 1. In the mid-portion of the hull the section is triangular as seen in Fig. 3, and thence rearwardly, the triangular section is concaved and flattened so as to run out to a counter over the stern post. If, however, it is desired to carry the rear section

down towards the keel line the section may be modified accordingly as suggested in Fig. 6, so long always as it is so designed that the vessel will have self-righting characteristics. The invention may be utilized in life saving vessels which are subject to capsizing and are required for operation in conditions in which flooding of the air supply with green water or spray takes place.

The waterways 120 which are shown as narrow timber stringers are shod with stout flexible rubber tube buffering to minimize risk of injury to surfers who may come into accidental contact with the vessel.

What I claim as my invention and desire to secure by Letters Patent is:—

1. A motor driven surf-board having a high pressure air reservoir, a water tight compartment, an internal combustion engine in said compartment, an air control chamber open to the atmosphere, an atmospheric air admission valve controlling the supply of atmospheric air to the engine compartment, a high pressure air control chamber, a valve controlling the supply of high pressure air to said compartment, and means including flexible diaphragms for automatically closing said atmospheric air valve and opening said high pressure air valve when water enters the atmospheric air control chamber.

2. A motor driven surf-board as claimed in claim 1, having a deck, a propeller, a propeller shaft, a rudder, a steering control on the deck, connected to said rudder, an engine exhaust pipe, a spring loaded valve in said pipe, means for opening said valve when the engine is speeded up, a pump driven by the engine for discharging water from the air control chamber and means located on said deck for manually controlling the engine.

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