Aug. 28, 1962 R. BAJULAZ 3,051,114

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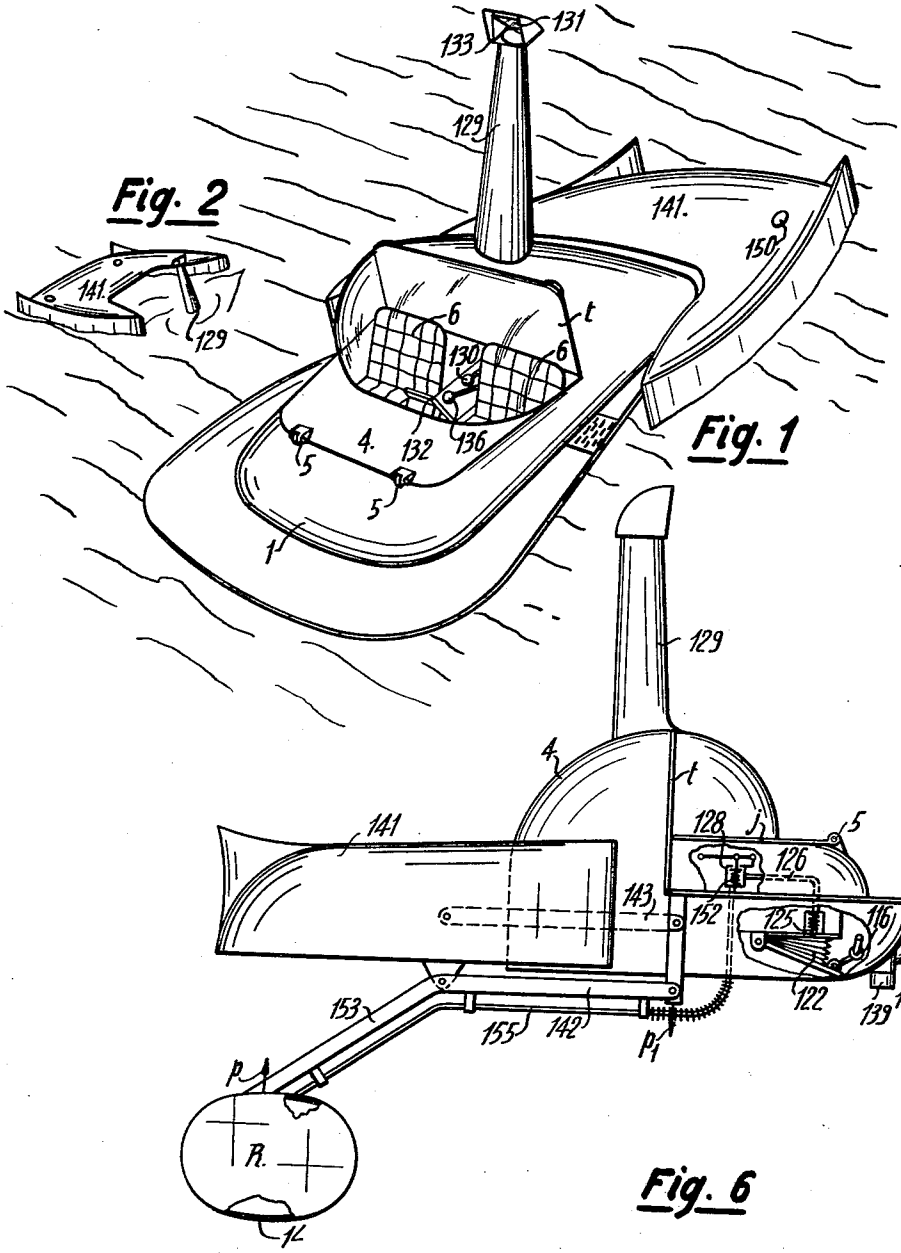



Fig. 2

Fig. 1




Fig. 6

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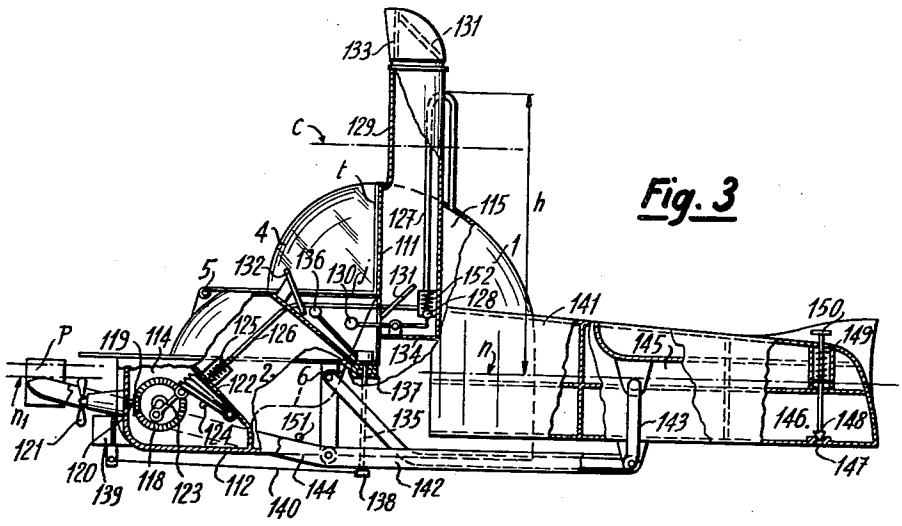
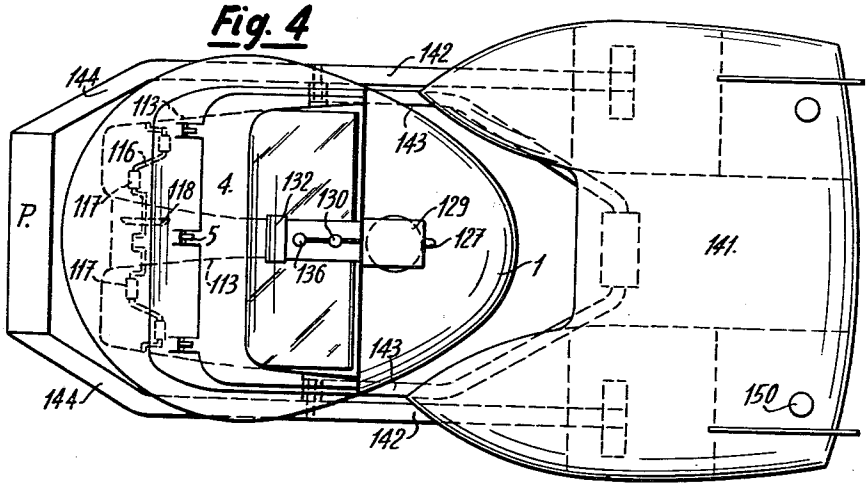



Fig. 3

Fig. 4




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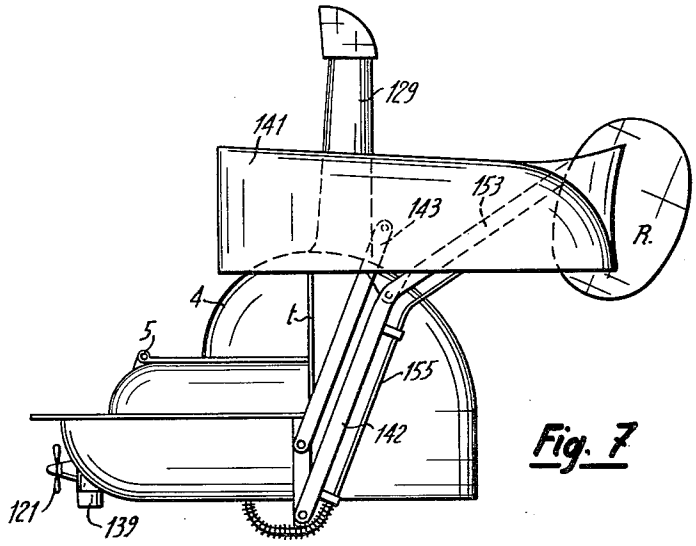



Fig. 7

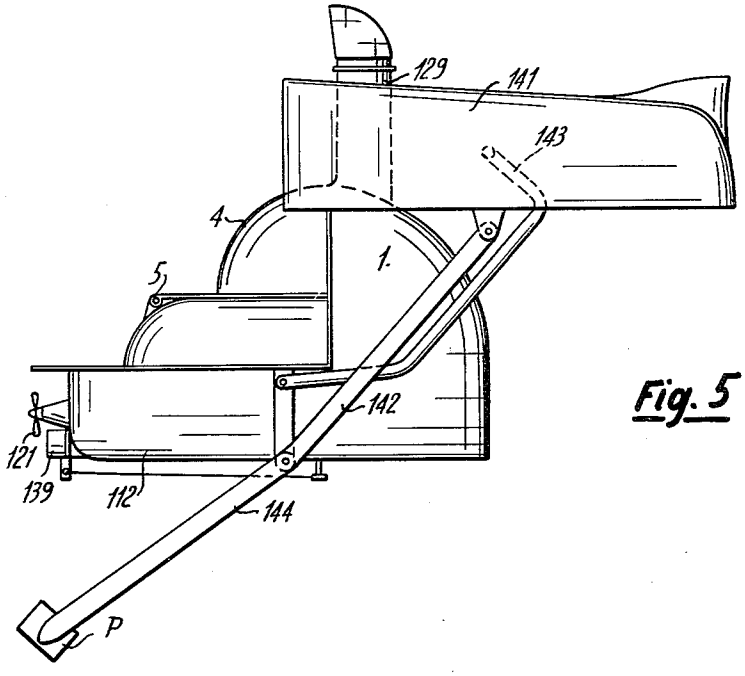



Fig. 5

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United States Patent Office 3,051,114 Patented Aug. 28, 1962



3,051,114

# SUBMERSIBLE

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Filed June 23, 1959, Ser. No. 822,237
Claims priority, application Switzerland May 12, 1959
7 Claims. (Cl. 114—16)

The present invention has for its object a submersible comprising a hull including a compartment equipped with control means allowing one to control its immersion and its ascension to the surface of the water and provided with a safety device limiting the immersion depth and connecting the hull to a device located above the surface of the water. Said submersible is characterized by the fact that said safety means are constituted by at least a float mechanically connected to the hull, and by the fact that it comprises at least a water chamber the emptying and the filling of which are controlled by said control means in view of the immersion of the hull and its ascension to the surface of the water.

The accompanying drawing illustrates schematically and by way of example some embodiments of the submersible object of the invention.

FIG. 1 is a perspective view of the submersible according to the first embodiment and sailing on the water surface.

FIG. 2 is a perspective view of said submersible navigating under water.

FIG. 3 is a side view of said submersible with certain parts being broken away and others seen in cross section.

FIG. 4 is a top view of said submersible.

FIG. 5 is a side view of the submersible illustrated at FIGS. 3 and 4 but with the hull in immersed position.

FIG. 6 is a side view of a second embodiment of the submersible.

FIG. 7 is a side view of the submersible illustrated at FIG. 6 but with the hull in immersed position.

According to the FIGS. 1 to 4 of the accompanying drawing, the submersible comprises a hull 1 including a compartment 2 provided with two seats 6 for the passengers and an opening closed in a water-tight manner by a cover 4 of which at least a part is made of transparent material. Said cover is hinged on the hull 1 by means of hinges 5 enabling the passengers to get into the compartment.

Water-tight partitions 111, 112 and 113, located behind the back of the seats, under the seats 6 and shutting the fore parts 114 of said compartment intended to receive the legs of the passengers, separate said compartment in a water-tight manner from a chamber 115 in direct connection with the water through the under part of the hull 1, which comprises no bottom.

A crank-shaft 116, provided with foot-rests 117, is disposed transversely in the fore part of the hull 1 and revolves freely in bearings (not shown) carried by the partitions 113. Said crank-shaft carries a crown-wheel 118 meshing with a pinion 119 secured to one of the ends of a shaft 120 which goes through the hull 1 and carries at its other end a propulsion propeller 121.

Bellows 122 are mechanically connected to the crank-shaft by a rod 123 and comprise an air inlet valve 124 which opens in the compartment 2 and a stop valve 125. Said latter valve is connected to the chamber 115 by a delivery piping 126 and a pipe 127 bent in the form of a U. The piping 126 is provided with an exhaust-valve 128 which opens into a periscope 129 located behind the seats 6 and in connection with the compartment 2. Said valve is controlled by a control member 130 located in the compartment between the two seats 6.

The periscope 129 rises above the hull 1 and is provided with mirrors 131 which reflect onto an observation



screen 132, located in the compartment, the visible field through an aperture 133 provided in the front face of the upper part of the periscope 129. The bottom of said periscope is tightly closed by a wall 134.

The compartment 2 comprises further a control member 136 disposed between the two seats 6 and connected by a shaft 135 guided in a water-tight bearing 137 and carrying a swing bar 138 fixed to its lower end. A rudder 139 articulated in the fore part of the hull 1 is connected by two cables 140 to said control lever 138.

Said submersible is further provided with a safety device limiting its immersion depth and constituted by a water-tight compartment 141 connected to the hull 1 by two pairs of arms 142, 143 articulated on the hull 1 and on the compartment 141 and forming two deformable parallelograms, i.e. a deformable parallelogram on each side of hull 1.

The arms 142 comprise each an extension 144 which projects toward the fore part of the hull 1 and carries a mass P.

The compartment 141 comprises an air chamber 145 tightly shut on all sides and a water compartment 146 provided with a filling orifice 147 stopped by a valve 148 submitted to the action of a spring 149 tending to maintain it in stopped position. A manual control member 150 allows the opening of said valve against the action of its return spring.

The cover 4 comprises a wall $t$ which, in the closing position of said cover, constitutes the back of the seats 6. Thus, the seal $j$ between said cover and the hull is situated in a plane which facilitates in a great measure the realization of a perfect tightness.

As illustrated the connection between the compartment 2 and the chimney is located underneath the seal $j$.

The operation of the described submersible is as follows:

When said submersible is set afloat for the first time, the operator actuates the control member 150 so as to provoke the opening of the valve 148 and thus the filling of the water compartment 146. The compartment 141 sinks partially in the water surface and constitutes thus a ballasted float sunk in water up to the floating-line $n$.

It is clear that in a variant, the ballast of said float may be constituted by a mass of lead, for example, secured to the float.

The passengers take their seats in the compartment 2 and shut down the cover 4 whose seal $j$ ensures the tightness. Under the weight of the passengers, of that of the hull 1 and of the mass P, said hull sinks partially in the water, that is to say up to the floating-line $n$.

By actuating the crank-shaft 116 with the help of their feet, the passengers actuate the propeller 121 which propels the hull 1 pulling after itself the compartment 141. They steer by watching the screen 132 and by actuating the rudder 139 with the help of the control member 136.

The crank-shaft 116 actuates likewise the bellows 122 which suck air into the compartment 2 connected with the atmosphere through the periscope 129 and compresses said air into the chamber 115. Said air escapes from the lower part of said chamber 115 which is entirely open. Thus, the floating-line rises slightly, for example up to the level $n_1$.

When the pasengers desire to navigate under water, it suffices that they actuate the control member 130 so as to provoke the opening of the exhaust-valve 128. Effectively, from that moment, the air coming from the bellows 122 escapes through the periscope 129, as well as the air of the chamber 115 compressed by the water through the pipe 127 bent in the form of a U. Consequently, the hull 1 sinks in the water under the action of its proper weight, of that of the passengers and of the mass P, the arms 142 and 143 bearing on the ballasted float 141.

The deformable parallelograms formed by said arms ensure the maintaining of the hull 1 in a normal position, that is to say in a position for which its floating-line *n* shifts parallelly with itself. The immersion depth of the hull 1 is limited by the length of the arms 142, 143 and the angle of maximum oscillation of said arms which is defined by abutments 151. As shown in the drawing, the pipe 127 rises up to a height *h* above the floating-line *n* greater than the maximum immersion depth *c*, so that in no case will water coming from the chamber 115 get into the periscope 128 or the compartment 2.

To cause the reascending of the hull 1, it suffices to release the control member 130. Effectively, the exhaust-valve 128 shuts automatically under the action of its return spring 152, so that the air compressed by the bellows 122 compresses progressively the water held in the chamber 115.

In the embodiment according to FIG. 6, the members and elements already described with reference to FIGS. 1 to 4, bear the same reference figures. The arms 142 of both deformable parallelograms connecting the hull 1 to the compartment 141 comprise each an extension 153 projecting behind the hull 1 and carrying at their end a tank R. Said tank is provided with a water intake port 154 made in its lower wall and a piping 155, connected to the piping 126, opens into its upper part. Finally, the compartment 141 comprises, as described previously in the above embodiment, an air chamber and a water compartment.

The operation of said embodiment is similar to the operation of the submersible described with reference to FIGS. 1 to 4. However, the mass P being replaced here by a tank R, the immersion of the hull 1 is caused by the closure of the exhaust-valve 128, whilst its reascending is obtained by opening of said same valve against the action of its return spring 152. Effectively, when the valve 128 is shut, air is compressed by the bellows 122 through the pipings 126 and 155 into the tank R. Said tank exerts on the arms 142 a thrust *p*. Said arms bearing on the ballasted compartment 141 exert on the hull 1 a pull $p_1$ which causes the sinking of said hull into the water. The immersion depth is defined by the volume of the tank R which defines the maximum value of the pull $p_1$ exerted on the hull 1.

On the other hand, when the exhaust-valve 128 is open, the air compressed by the bellows 122 escapes through the periscope 129. Likewise the air contained in the tank R is compressed by the water going in through the port 154 and escapes through the periscope 129.

I claim:

1. In a submersible boat for movement on and under the surface of the water having a hull, a watertight compartment located inside said hull, control means located inside said compartment to control the immersion and ascension of said submersible boat, safety means resting on the surface of the water and adapted to carry the whole weight of said submersible boat, connecting means hinged to said safety means and to said hull for connecting said safety means to said hull so that said hull submerges to a depth limited by said connecting means, said connecting means comprising two deformable parallelograms each having arms, said arms being hinged on both said hull and said safety means and one of said arms of each deformable parallelogram being prolonged in the direction of the forepart of said hull beyond its articulation on said hull for carrying a mass, and a water chamber connected to said hull, the emptying and the filling of which are controlled by said control means for the immersion of said hull and its ascension to the surface of the water.

2. In a submersible boat for movement on and under the surface of water having a hull, a watertight compartment located inside said hull, control means located inside said compartment to control the immersion and ascension of said submersible boat, safety means resting on the surface of the water and adapted to carry the whole weight of said submersible boat, connecting means hinged to said safety means and to said hull for connecting said safety means to said hull so that said hull submerges to a depth limited by said connecting means, a water chamber connected to said hull, the emptying and the filling of which are controlled by said control means for the immersion of said hull and its ascension to the surface of the water, said water chamber being formed by the walls of said watertight compartment housed in said hull and having no bottom, bellows disposed in said watertight compartment sucking air into said watertight compartment from the atmosphere, a piping connecting said bellows to said water chamber, and an exhaust valve provided for said piping and opening in the atmosphere.

3. A submersible boat according to claim 2, in which a control means controls said exhaust valve, whereby the opening of said valve causes the immersion of said hull while the closing of said valve causes the ascension of said hull.

4. In a submersible boat for movement on and under the surface of water having a hull, a watertight compartment located inside said hull, control means located inside said compartment to control the immersion and ascension of said submersible boat, safety means resting on the surface of the water and adapted to carry the whole weight of said submersible boat, connecting means hinged to said safety means and to said hull for connecting said safety means to said hull so that said hull submerges to a depth limited by said connecting means, a water chamber connected to said hull, the emptying and the filling of which are controlled by said control means for the immersion of said hull and its ascension to the surface of the water, said connecting means comprises two deformable parallelograms each having arms which are articulated to said hull and safety means, each arm containing a prolongation extending rearwards beyond the articulation of said arms on said safety means, said water chamber being secured between both of said prolongations, and said water chamber having a port provided in the bottom thereof.

5. A submersible boat for movement on and under the surface of water comprising a hull, a watertight compartment located inside said hull, control means located inside said compartment to control the immersion and the ascension of said submersible boat, safety means resting on the surface of the water and adapted to carry the whole weight of said submersible boat, connecting means hinged to said safety means and to said hull for connecting said safety means to said hull, said connecting means comprising two deformable parallelograms each having arms, said arms being hinged on both said hull and said safety means and in which one of said arms of each deformable parallelogram is prolonged in the direction of the forepart of said hull beyond its articulation on said hull for carrying a mass, and a water chamber connected to said hull, the emptying and the filling of which are controlled by said control means for the immersion of said hull and its ascension to the surface of water.

6. In a submersible boat for movement on and under the surface of water having a hull housing a watertight compartment, control means located in said compartment to control the immersion and ascension of said hull, safety means resting on the surface of the water and adapted to carry the whole weight of said submersible boat, connecting means connecting said hull to said safety means comprising two deformable parallelograms each having arms hinged on both said hull and said safety means, each deformable parallelogram comprising further a prolonged arm, carrying means adapted to apply a vertical force to each prolonged arm, and a water chamber connected to said hull, the emptying and the filling of which are controlled by said control means for the

immersion of said hull and its ascension to the surface of the water.

7. A submersible boat for movement on and under the surface of water comprising a hull, a watertight compartment located inside said hull, control means located inside said compartment to control the immersion and ascension of said hull, safety means resting on the surface of the water and adapted to carry the whole weight of said submersible boat, connecting means hinged to said safety means and to said hull for connecting said safety means to said hull, said connecting means comprising two deformable parallelograms each having arms, said arms being hinged on both said hull and said safety means, each of said arms of each deformable parallelogram having a prolongation in a direction toward the rear part of said hull beyond its articulation on said safety means, a water chamber connected to said hull, the emptying and the filling of which are controlled by said control means for the immersion of said hull and its ascension to the surface of the water, said water chamber being secured between both of said prolongations of said arms, and a port being provided in the bottom of said water chamber.




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