

June 12, 1962

R. BAJULAZ
SUBMERSIBLE BOAT

3,038,431

Filed Aug. 12, 1958

4 Sheets-Sheet 1

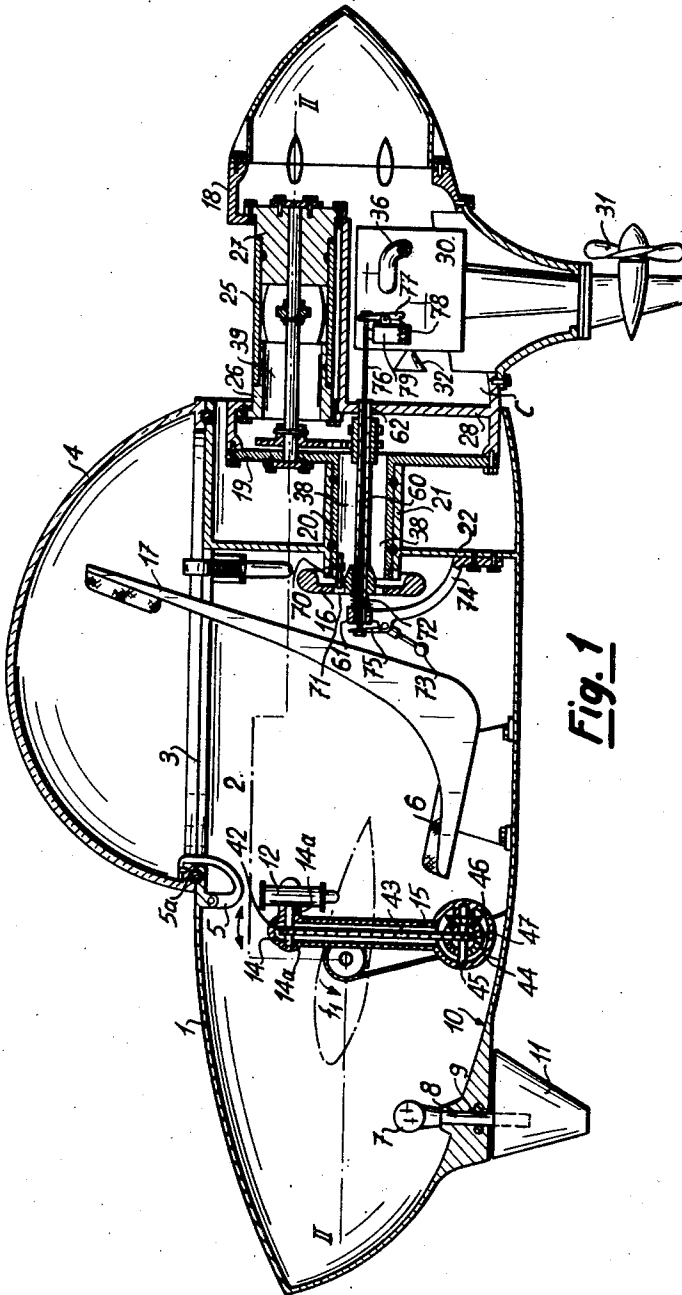


Fig. 1

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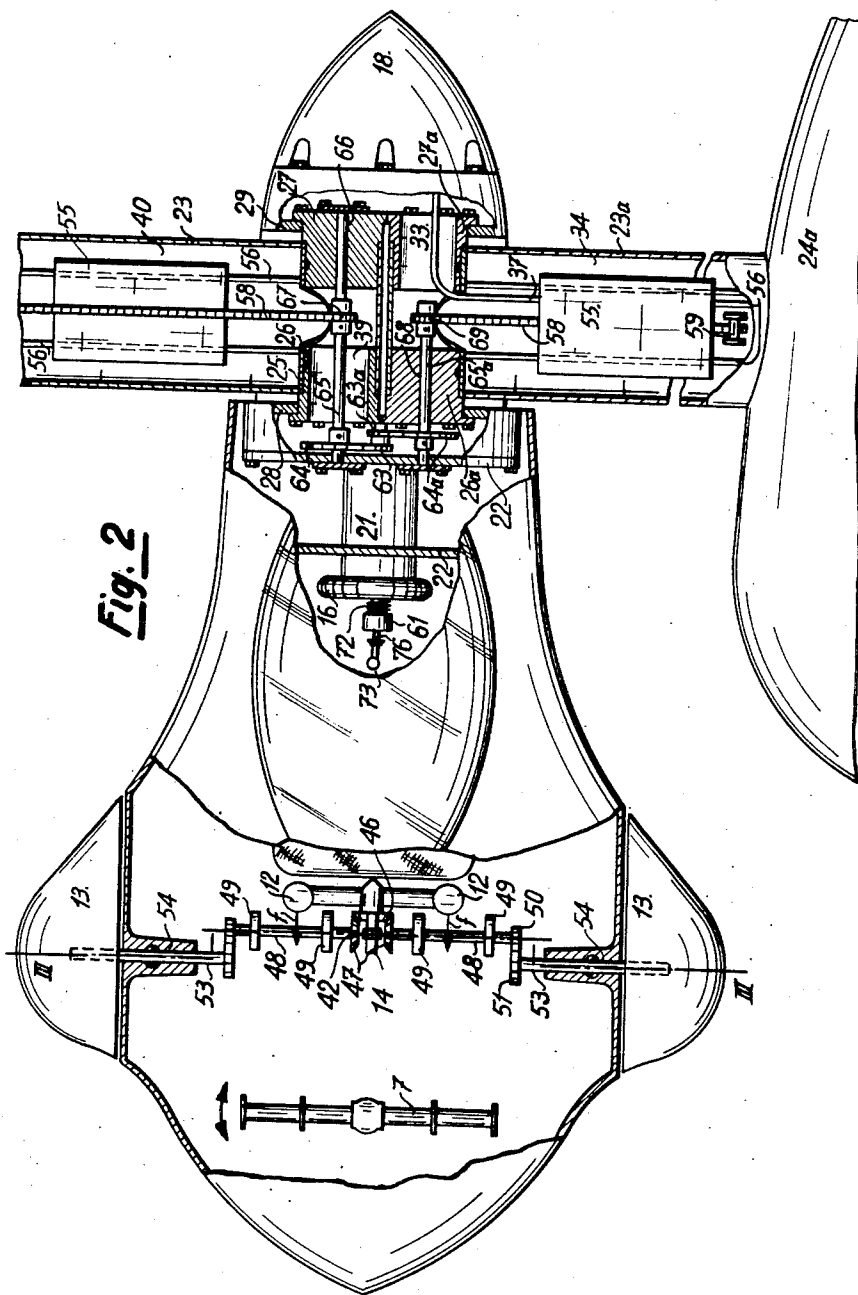
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4 Sheets-Sheet 2



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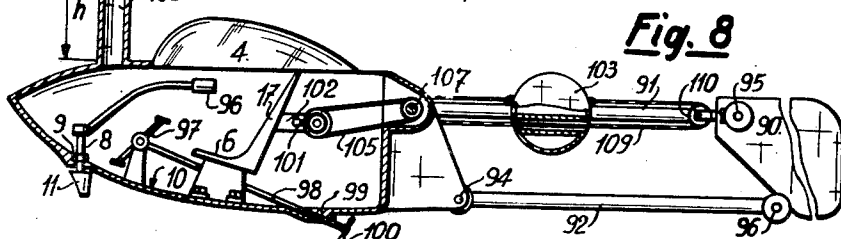
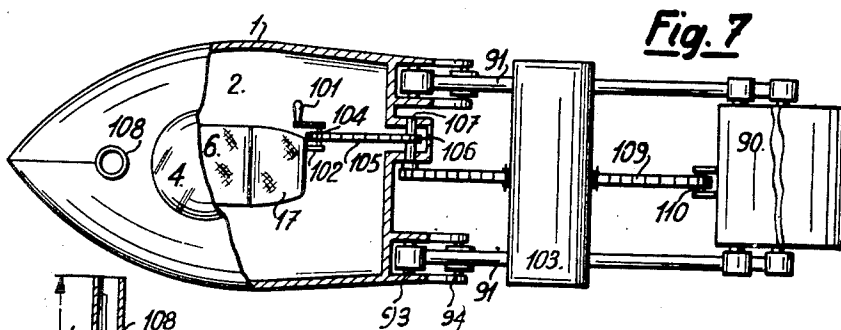
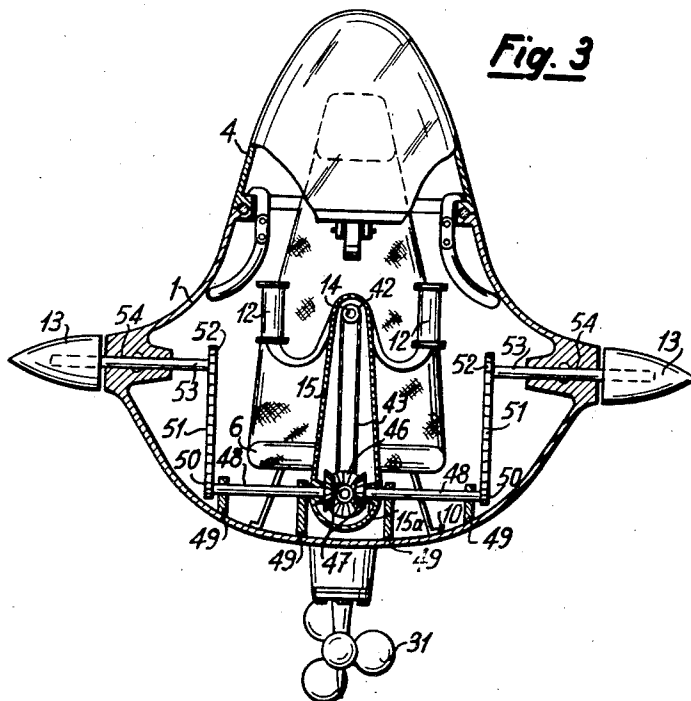
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Fig. 4

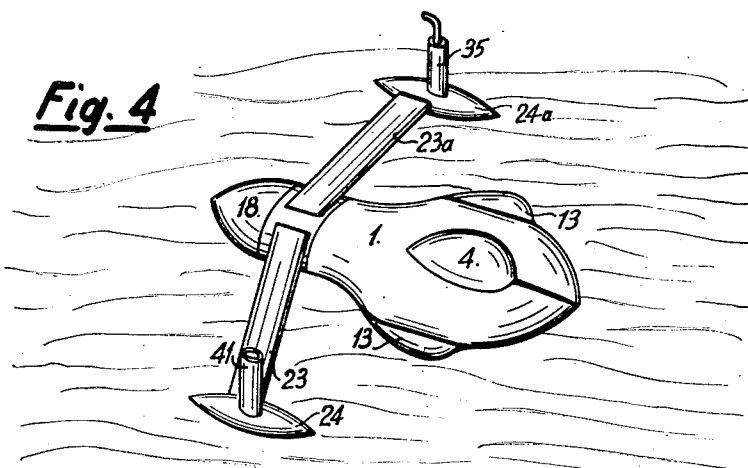


Fig. 5

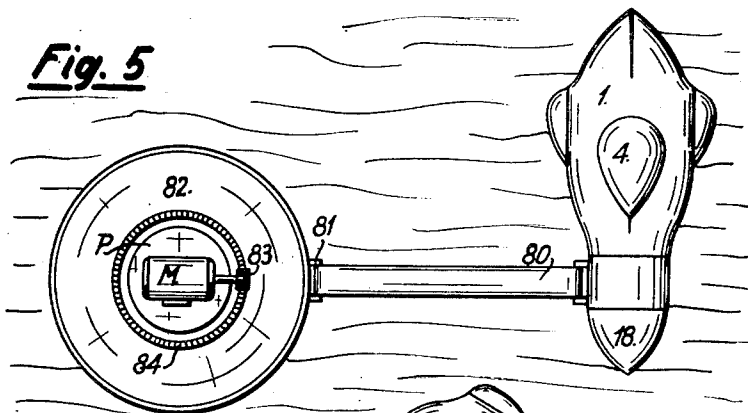
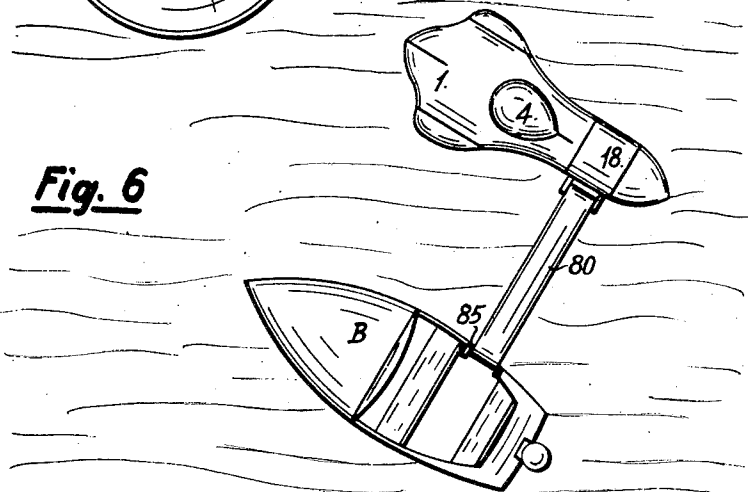


Fig. 6



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3,038,431

SUBMERSIBLE BOAT

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13 Claims. (Cl. 114-16)

The present invention has for its object a submersible boat comprising a hull including a compartment provided with control means to control its immersion and its ascending to the surface of the water. Said submersible boat distinguishes from the known submersible boats by the fact that it comprises safety means limiting the immersion depth and located above the surface of the water and connecting means attached to said safety means and to said hull.

The accompanying drawing illustrates schematically and by way of example four embodiments of the submersible boat of the invention.

FIG. 1 is a longitudinal sectional view of the first embodiment.

FIG. 2 is a top view, certain hull parts being broken away and other parts in cross section along the line II-II of FIG. 1.

FIG. 3 is a sectional view along the line III-III of FIG. 2.

FIG. 4 is a perspective view of the submersible boat on the surface of the water.

FIG. 5 is a top view of the second embodiment.

FIG. 6 is a top view of a third embodiment.

FIG. 7 is a top view of the fourth embodiment with certain parts in cross section.

FIG. 8 is a side view with certain parts in cross section.

According to FIGS. 1 to 4 of the accompanying drawing, the submersible boat comprises a hull 1 including a compartment 2. The hull presents an opening 3 allowing a passenger to get into the compartment. The opening 3 is shut in a water-tight manner by a cover 4 made of transparent material and hinged on the hull 1 by means of hinges 5. A joint 5a secures the tightness.

The compartment provided with a passenger seat 6 is equipped with the following control members:

(1) A control lever 7 disposed in the fore part of the compartment and carried by a shaft 8 rotating freely in a guide 9 going through the bottom 10 of the hull 1. The lower end of said shaft, which emerges outside of the hull 1, carries a steering rudder 11;

(2) A rocking lever provided with handles 12, disposed in front of the seat 6. Said rocking lever is carried by a shaft 14 rotating freely in bearing 14a provided in a housing 15. Said rocking lever and said housing are mechanically connected to two depth rudders 13 disposed on the two lateral sides of the hull 1;

(3) A rear hand wheel 16 disposed opposite the back 17 of the seat 6, which the passenger seated on the seat can however control. Said hand wheel 16 is mechanically connected to a device to cause the immersion of the hull 1 and its ascending to the surface of the water.

The hull 1 is provided with a rear extension 18. The extension is carried by a flange 19 fast with a hollow shaft 20 rotating freely in a guide 21 carried by a wall 22 closing tightly the rear part of the compartment 2. Thus, the hull 1 is able to swivel with respect to its rear extension 18, which is provided with a stabilization and safety device constituted by two lateral arms 23, 23a, one of the ends of which is hinged on said extension, while their second end carries a float 24, 24a.

Each arm 23, 23a carries a tubular guide 25 whose ends are each engaged on a bearing 26, 27 respectively 26a, 27a. Each bearing is rigidly fastened on a transverse wall 28, 29 of the extension 18.

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A motor 30, driving a propulsion propeller 31 is fastened into said extension 18 between the two transverse walls 28, 29 and inside a compartment c tightly closed so that the water cannot get into said compartment. The fresh air necessary for the feeding of the motor 30 is sucked off by a suction pipe 32 opening into the compartment c which is in turn connected to the atmosphere by means of channel 33 provided in the bearing 27a, the inner portion 34 of the arm 23a, which communicates with the inner portion of its float 24a, which is provided with an air inlet 35 opening in the atmosphere above the surface of the water.

The exhaust gas is expelled through a pipe 36 connected to the atmosphere by an exhaust pipe 37 crossing the channel 33 and the inner portions of the arm 23a, of the float 24a and of the air inlet 35.

The compartment 2 is fed with fresh air through the inner portion 38 of the hollowed shaft 20, a channel 39 provided in the bearing 26, the inner portion of the arm 23, the inner portion of its float 24 and an air inlet 41 opening to the atmosphere.

The mechanical connection connecting the handles 12 to the two depth rudders 13 comprises a pinion 42 carried by the shaft 14 and connected by a chain 43 to a pinion 44 fastened on an intermediate shaft 45. Said shaft rotates in bearings provided in the lower part of the housing 15 and carries a bevel-wheel 46 meshing with two bevel-gears 47 fastened each onto a transmission shaft 48 carried by bearings 49. Each shaft 48 carries a gear 50 connected by a chain 51 to a gear 52 fastened to the end of a trunnion 53 rotating in a guide 54 which crosses the hull 1. Each trunnion 53 carries one of the two depth rudders 13 which are driven in opposite direction one to another by the rocking lever.

The housing 15 presents further two bearings 15a traversed by the transmission shafts 48. By actuating said housing 15 from front to back or from back to front, the passenger has then the possibility of actuating both depth rudders 13 in the same direction. Effectively, when the passenger draws towards him or repels the two handles 12, the housing 15 oscillates and drives in its angular displacements the two transmission shafts 48 which are maintained in a fixed angular position, one with respect to the other by the wheel 46 in mesh with the two gears 47.

The immersion and ascending to the surface device comprises two masses 55 located each in the inner portion of one of the arms 23, 23a and sliding along guides 56 rigidly fastened to the end walls of said arms. Each mass 55 is attached to one of the sides of a chain 58 passing on a reversing wheel 59 pivoted on the end of the corresponding arm 23, 23a. Said chain 58 is driven by the hand wheel 16 and by the intermediary of transmission members comprising a hollowed shaft 60 coaxial to the hollowed shaft 20 and rotating in a bearing 62 provided in the wall 28. The hollowed shaft 60 carries the hand wheel 16 and two pinions 63, 63a meshing with two gears 64, 64a fastened each on a shaft 65, 65a. The shaft 65, pivoted in a bore 66 of the bearing 27 and in a bearing fast with the wall 22, goes through the channel 39 and carries a gear 67 driving the first chain 58.

The shaft 65a pivoted in a bore 68 of the bearing 26a carries a gear 69 driving the second chain 58.

A locking device maintains the hand wheel 16 in different desired angular positions with respect to the hollowed shaft 20. Said device comprises, on the one hand, a finger 70 carried by the shaft 20 and, on the other hand, bores 71 provided in the hand wheel 16 and regularly distributed along a circle. The hand wheel 16 is submitted to the action of a spring 72 tending to engage one or the other of said bores 71 on the finger 70. By exerting a traction on the hand wheel 16, the passenger

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releases the finger 70 and releases said hand wheel which can then be angularly displaced.

A control member 73 hinged on a fixed holder 74 carries a lever 75 which acts on the end of a rod 76 against the action of a return spring 78. Said rod 76 controls by the intermediary of a lever 77 the throttle valve of a carburetor 79 feeding the motor 30.

The operation of the submersible boat is described in the following manner:

When the passenger is seated on the seat 6, his head is situated above the opening 3, so that he has a perfect visibility through the cover 4 of transparent material and which presents the general shape of a semi-spherical hood. He places his feet on the two ends of the control lever 7 and grasps the two handles 12.

By displacing angularly the control lever 7, he causes the displacements of the steering rudder 11, which allows him to perform evolutions on the surface of the water, the boat being propelled by the propeller 31 driven by the motor 30, whose speed is regulated at will by actuating the control member 73.

If the passenger desires to descend temporarily under the water, he exerts a push f on the handles 12 in order to move the housing 15 towards the front and to cause thus a rotation of the rudders 13 according to the arrow f_1 . However, the masses 55 being situated at the internal ends of the arms 23 and 23a, the thrust of the water on the hull 1 tends to keep the submersible boat on the surface of the water, so that it can only descend under the surface of the water when it is propelled by the propeller 31. The bulk of the submersible boat and the thrust of propulsion are chosen in order that the submersible boat may not be entirely immersed. Nevertheless, said submersible boat performs very attractive evolutions.

When the passenger desires to ascend to the surface, he draws the handles 12 towards him so as to displace the rudders 13 in a direction opposite to the arrow f_1 .

If the passenger desires, on the contrary, to navigate under water, he releases the finger 70 by exerting a traction on the hand wheel 16, then he actuates said hand wheel 16 in rotation so as to displace the two masses 55 in direction of the hinges of said arms 23, 23a on the extension 18. The submersible boat sinks then progressively into the water according to the moving together of said masses 55. The masses 55 constitute immersion members, which by a modification of their state (distance from the hull) change the conditions of flotation of said hull. The floats 24 and 24a hinder however the submersible boat from descending to a depth greater than a depth determined by the length of the arms 23 and 23a and by the smallest angle that they can form between them.

When the submersible boat is under water or half immersed, the passenger can perform a rotation of the hull 1 on itself and with respect to the extension 18 by pivoting the control lever provided with the handles 12 in one or another direction. Effectively, the angular displacement of the control lever displaces the depth rudders 13 in a direction opposite one to another, which causes a rotation of the hull on itself in one or another direction. When the submersible boat is entirely immersed, the hull can perform 360° rotations on itself, which allows performing evolutions without danger.

The motor 30, being secured within the compartment c and provided with the extension 18, is not driven in the rotations of the compartment 2, but remains always in its normal running position.

It is clear that the air inlets 35 and 41 are provided with a height sufficient for avoiding that, when the boat performs evolutions across waves, some water may enter the compartment 2 and the compartment c. In the embodiment according to FIG. 5, the submersible boat comprises only one arm 80 hinged on the extension 18. Furthermore, the submersible boat is provided with the same

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control members as the above described submersible boat with reference to FIGS. 1 to 4 except that it is not equipped with a propulsion propeller and thus does not comprise a motor.

5 The second extremity of the arm 80 is hinged at 81 on a disc 82 pivoted on a support P, which maintains said disc above the water surface, for instance at the end of a post, and driven in rotation by a motor M and by the intermediary of a pinion 83 fixed on the shaft of said motor and meshing with a toothed crown 84.

10 Here, again, the passenger can have the submersible boat performing evolutions at will, as above described, while said submersible boat is driven in the roundabout movement. The immersion depth is however limited by the arm 80 connecting said submersible boat to the roundabout.

FIG. 6 illustrates a modification in which the second extremity of the arm 80 is hinged at 85 on the hull of a motor-boat B.

20 In the embodiments illustrated by FIGS. 7 and 8, the submersible boat comprises likewise a hull 1, provided with an opening 3, tightly closed by a cover 4 of transparent material. The compartment 2 is equipped with a seat 6 provided with a back 17. However, in said embodiment, the hull 1 does not comprise a rear extension, but is connected to a float 90 by two deformable parallelograms, constituted each by two connecting tubes 91, 92 whose extremities are hinged, on the one hand, on hinge axles 93, 94 carried by the rear portion of the hull 1 and, 25 on the other hand, on pins 95, 96 secured to the float 90.

The compartment 2 is further equipped with:

(1) A control member 96 fixed on the shaft 8 passing through the guide 9 and which carries the steering rudder 11;

35 (2) A pedal-crank 97 mechanically connected to a transmission shaft 98 rotating freely in a guide 99 passing through the bottom 10 of the hull 1 and whose end carries a propulsion propeller 100;

(3) A handle-wheel 101 carried by a bracket 102 and mechanically connected to an auxiliary float 103 sliding along the deformable parallelograms.

Said mechanical connection comprises a pinion 104 fixed on the axle of the handle-wheel 101 and connected by means of a chain 105 to a pinion 106 fixed on a shaft 107 rotating in bearings provided in the rear wall of the hull 1. Said pinion 106 drives an endless chain 109 passing on a reversing pinion 110 carried by the floats 90. The auxiliary float 103 is fastened to one of the sides of said endless chain 109 and slides along the tubes 91.

50 The operation of said submersible boat is as follows: The weight and the bulk of the hull 1 are chosen so that, left alone and to itself, said hull sinks in the water and goes down. The auxiliary float 103 is designed so that when it is placed within a very short distance of the rear wall of the hull 1, said hull floats normally on the water. Thus, the passenger actuating the pedal-crank 97 propels the boat, drawing after it the float 90, and steers said boat by actuating the member 96 connected to the steering rudder 11. An air inlet 108 feeds the compartment 2 with fresh air, so that the passenger is by no means indisposed even when making an effort to propel the boat by means of the pedal-crank.

If the passenger desires the submersible boat to descend in the water and to immerse it partially or entirely, he actuates the handle-crank 101 so as to have the auxiliary float 103 sliding along the connecting tubes 91 in the direction of the float 90. Gradually with said displacement, the hull 1 sinks in the water, but its immersion depth is limited by the length of the connecting tubes and the angle which said tubes can form with the surface of the water. Said immersion depth is designed so as to be always smaller than the height h of the air inlet 108, in order to avoid water entering into the compartment 2.

In the embodiment of FIGS. 7 and 8, the float 103 constitutes an immersion member, which by a modification

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of its state (distance from the hull 1) provides a modification of the flotation conditions of the hull.

Different embodiments of the submersible boat have been described here by way of example and with reference to the accompanying drawing but it goes without saying that multiple variants can be conceived without departing from the scope of the claimed protection. Thus, for example, the masses 55 of the embodiment of FIGS. 1 to 4 could be replaced by auxiliary floats, similar to the float described with reference to FIGS. 7 and 8. Similarly, the auxiliary float 103 of the embodiment illustrated in FIGS. 7 and 8 could be replaced by a mass sliding along tubes 91.

In another embodiment, the submersible boat could comprise one or several watertight compartments incorporated in the hull 1 or fastened near said hull in the arms 23, 23a or on the connecting tubes 91, 92 forming the double deformable parallelogram. A pump (driven by the motor, or the propulsion device of the submersible boat, and by the intermediary of a clutch whose engagement and disengagement of the two parts are controlled by an actuating member accessible for the passenger seated on the seat 6) permits the emptying of said compartments, while a valve, whose control member is also accessible for the passenger seated on the seat, permits refilling said compartments with water. Thus, by filling one or several compartments, the passenger effects the sinking of the submersible boat into the water, while, by emptying said compartments, he effects the ascending of the submersible boat to the surface.

Said compartments constitute then immersion members which by a modification of their state (weight) effect a modification of the flotation conditions of the hull 1.

I claim:

1. In 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 submersible boat, the combination of safety means resting on the surface of the water and adapted to carry the whole weight of said submersible boat, connecting means connected to said safety means and to said hull for connecting said safety means to said hull, slide means carried by said connecting means and extending out from said hull, and at least one immersion means linearly displaceable from a position near said hull to a position near said safety means along said slide means and controlled by said control means whereby the position of said immersion means along said slide means controls, by displacement of the center of mass of the submersible boat, the immersion depth of said hull.

2. A submersible boat according to claim 1, and comprising a seat in said compartment, an opening, and a cover closing tightly said opening, said cover having a substantially spherical shape of transparent material, whereby said cover is disposed above said seat so that the head of a passenger seated on said seat is situated inside said cover.

3. A submersible boat according to claim 1, and in which said slide means are guides carried by said connecting means, said immersion member comprising at least one auxiliary float movable along said guides with respect to said hull.

4. A submersible boat according to claim 1, and comprising a float connected to the rear portion of said hull by the intermediary of two deformable parallelograms.

5. A submersible boat according to claim 1, and in which said hull comprises a rear extension and said connecting means comprises at least one lateral arm hinged on said rear extension.

6. A submersible boat according to claim 1, and in which said safety means comprises a roundabout mounted on a support above the water surface and driven by a motor carried by said support, said connecting means comprising a lateral arm attached to said roundabout and to said hull.

7. A submersible boat according to claim 1, and in which said safety means comprises a motor-boat and said connecting means comprises a lateral arm attached to said motor-boat and to said hull.

8. A submersible boat according to claim 1, and in which said safety means comprises two floats and said connecting means comprises two lateral arms attached each to one of said floats and to said hull.

9. A submersible boat according to claim 1, in which said hull comprises a rear extension, said safety means comprises two floats and said connecting means comprises two lateral arms attached each to one of said floats and to said rear extension, said slide means comprises guides carried by said arms, said immersion means comprises two masses movable each along one of said guides and whose distance from said extension is controlled by said control means located inside said compartment, whereby said distance controls the flotation conditions of said hull.

10. A submersible boat according to claim 9, comprising a steering rudder and two depth rudders.

11. A submersible boat according to claim 10, in which said hull is angularly movable with respect to said rear extension connected by said two lateral arms to said two floats.

12. A submersible boat according to claim 10, comprising a control member located in said compartment, said control member being movable in two directions, means connecting said depth rudders to said control member, whereby the displacement of said control member in one direction effects the rotation of both depth rudders in the same direction in order to obtain immersion and ascension of said hull, and the displacement of said control member in the opposite direction effects the rotation of said depth rudders in opposite directions to obtain a rotation of the hull on itself and with respect to its extension.

13. A submersible boat according to claim 10, in which said hull extension comprises a watertight compartment, a motor mounted in said compartment, a propulsion propeller driven by said motor, channels located inside said lateral arms and opening into the atmosphere above the surface of the water, said channels conducting fresh air for combustion and the exhaust gas of said motor, whereby said motor is maintained in its normal running position when the hull is immersed and submitted to a rotation on itself.

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