July 18, 1950 W. L. HANSEN 2,515,511

SUBMARINE MOTOR-DRIVEN TOY

Filed Oct. 9, 1945 3 Sheets-Sheet 1

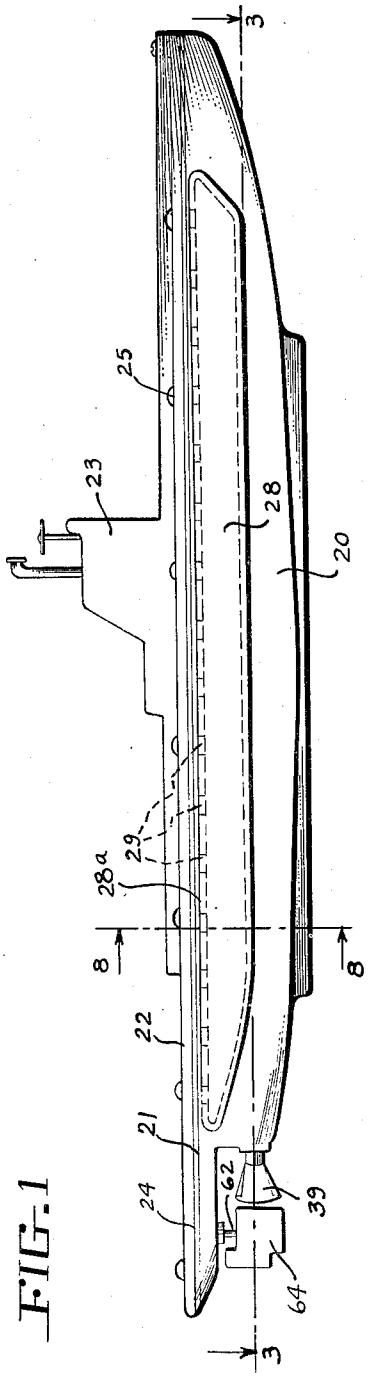

FIG. 1

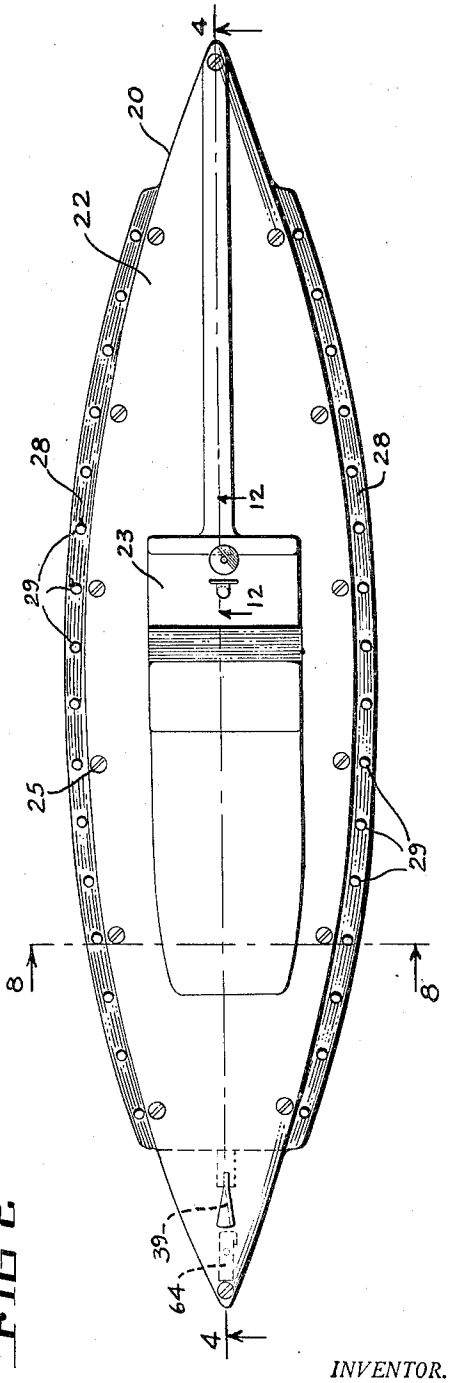

FIG 2

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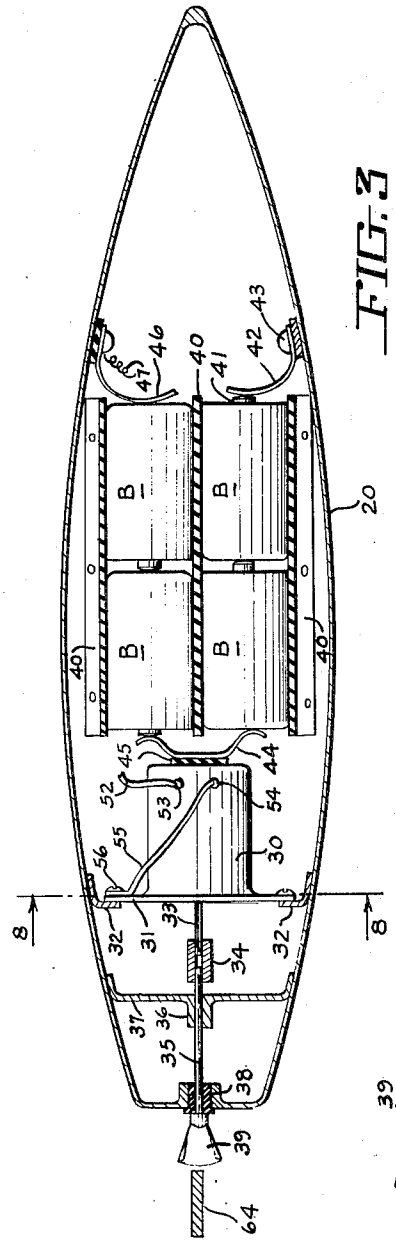

FIG. 3

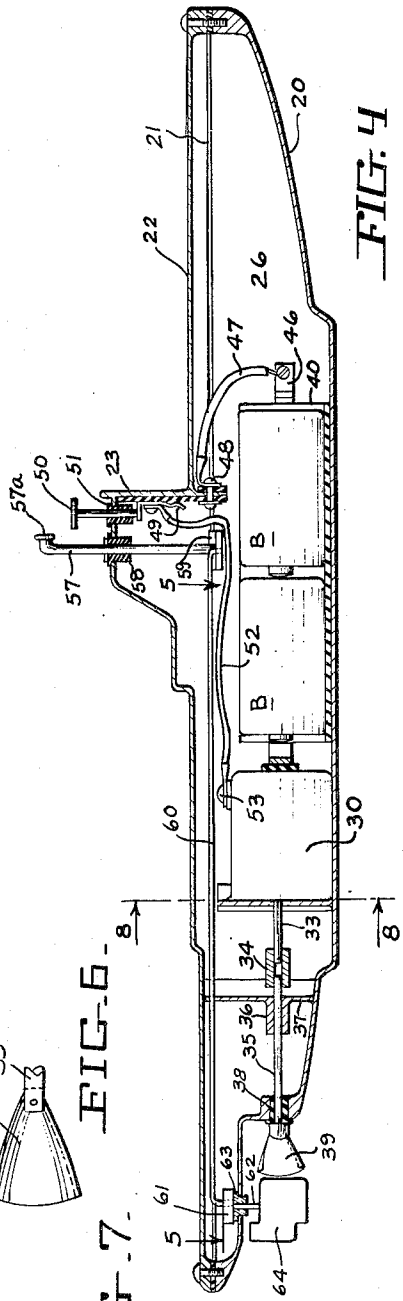

FIG. 4

FIG. 5.

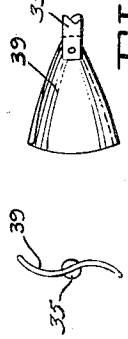

FIG. 6.

FIG. 7.

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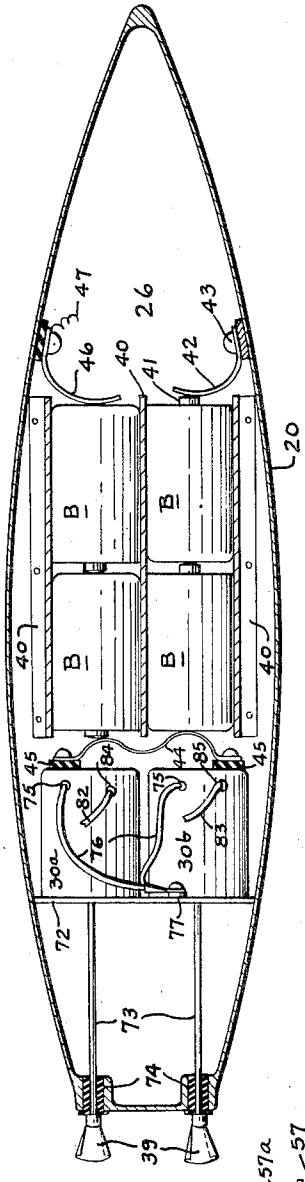

FIG. 11.

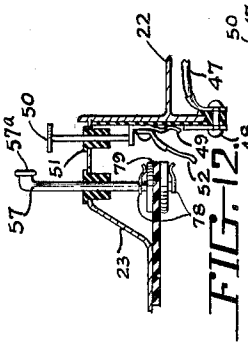

FIG. 12.

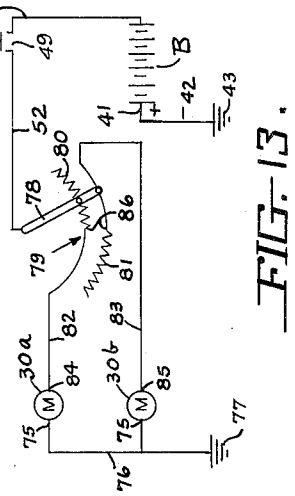

FIG. 13.

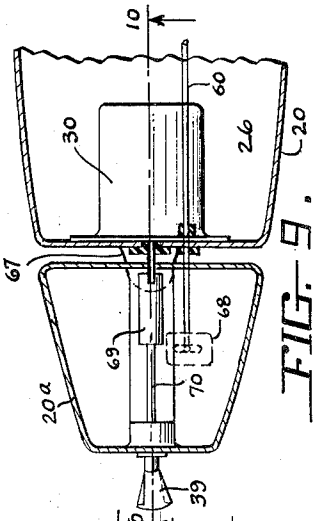

FIG. 9.

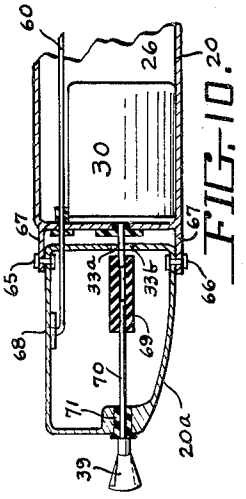

FIG. 10.

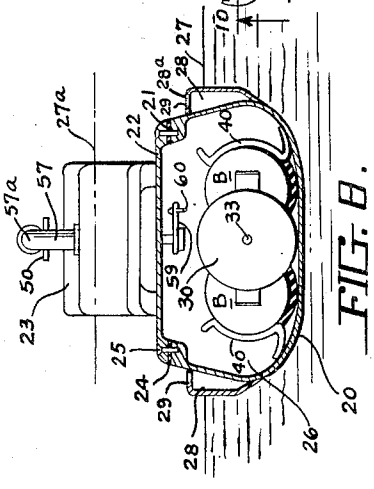

FIG. 8.

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2,515,511

SUBMARINE MOTOR-DRIVEN TOY

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Application October 9, 1945, Serial No. 621,307

5 Claims. (Cl. 46—94)

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This invention pertains to improvements in power driven mobile toys and is particularly related to a submarine motor driven toy boat.

One of the objects of this invention is to provide a submarine toy boat which may be readily operated in either a normal surface cruising position or in a submerged position.

Another object is to provide a submarine toy boat having a simplified ballast changing arrangement adapted to vary the buoyancy of the submarine for surface or submerged operation.

And still another object is to provide improved steering control and direction indicating mechanism for a submarine power driven toy boat.

Further features and advantages of this invention will appear from a detailed description of the drawings in which:

Figure 1 is an elevational view of the starboard side of a submarine power driven toy incorporating the features of this invention.

Figure 2 is a plan view of the submarine toy shown in Figure 1.

Figure 3 is a horizontal section through the hold of the submarine toy on the line 3—3 of Figure 1.

Figure 4 is a vertical section on the line 4—4 of Figure 2.

Figure 5 is a fragmentary horizontal sectional view of the steering link on the line 5—5 of Figure 4.

Figure 6 is an enlarged fragmentary view showing the screw propeller for driving the submarine toy.

Figure 7 is an end view of the propeller shown in Figure 6.

Figure 8 is a cross-sectional view on the line 8—8 of Figures 1, 2, 3, and 4.

Figure 9 is a fragmentary horizontal sectional view showing an alternate construction of an adjustable stern arrangement for steering the submarine toy boat.

Figure 10 is a fragmentary vertical section on the line 10—10 of Figure 9.

Figure 11 is a horizontal sectional view, similar to Figure 3, but showing an alternate driving arrangement for steering the submarine toy boat.

Figure 12 is a fragmentary vertical section on the line 12—12 of Figure 2.

Figure 13 is a wiring diagram of the control circuit applicable to the steering arrangement shown in Figure 11.

This invention is shown applied to a submarine power driven toy having a hull 20 the upper edge of which is provided with a rimmed

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surface 21 to which the top cover plate 22 containing the conning tower 23, is securely held by a gasket 24 and the screws 25 to thus provide a water-tight sealed hold 26 in the hull 20.

Novel means is provided for controlling the displacement and buoyancy of the hull 20 so as to vary the depth at which the hull floats in the water. During the normal surface cruising position of the submarine toy the water line with respect to the hull is shown at 27, Figure 8, and when it is desired to operate the submarine toy in a submerged position the water line then exists at the position 27a with only the upper portion of the conning tower 23 projecting above the water surface. In order to rapidly and easily effect this change of displacement and buoyancy to adjust the submarine boat to either of these conditions of operation, a pair of ballast tanks 28 are provided on each side of the hull along its waistline as best seen in Figures 1, 2, and 8. These tanks are totally enclosed and are preferably formed integral with the outer sides of the hull 20 as best seen in Figure 8. The tanks are provided with vertically disposed entrance and discharge passageways or holes 29 which open upwardly through the top surface 28a of the ballast tanks 28.

Normally, with no water in the tanks 28, the submarine boat floats in the surface cruising position shown in Figure 8. When it is desired to submerge the submarine boat for operation in submerged condition, the submarine boat is merely depressed below the surface sufficiently to allow water to flow into the openings 29 to fill the ballast tanks 28 and thereby decrease the displacement and buoyancy of the hull so as to now cause it to float with the water line at the position 27a, Figure 8.

The novel arrangement of the vertically disposed holes 29 in the ballast tanks 28 permits the submarine to be submerged by normally dipping the bow under water first, as in normal submarine diving operations, so that water enters into the holes 28 toward the bow of the boat while air may rapidly escape through the holes 29 toward the stern of the boat, which at this time are still elevated above the water surface during the initial diving motion. Thus air may rapidly escape from these holes toward the stern to let the water flow in very rapidly to fill the tanks 28. Thus by normal diving manipulation of the submarine, it may readily be adjusted from surface cruising position to submerged operating position.

In a similar way the ballast tanks may be

emptied for again bringing the boat back to the surface cruising position by elevating the bow to a surface position to let air flow in rapidly through the holes 29 toward the bow of the submarine boat to in this way allow the water to rapidly drain out through the openings 29 toward the stern which are now lower than the holes toward the bow as a normal surfacing manipulation of the submarine boat is performed.

It is also to be noted that the tanks may be rapidly drained by merely picking up the submarine boat and holding it in a vertical position while the water rapidly runs out of the holes 29 in the ballast tanks 28.

It is to be further noted with this particular arrangement of the holes 29 in the ballast tanks 28 that they do not allow water to flow into the ballast tanks from wave action as the submarine operates in surfare cruising position since the horizontal movement of the waves over these openings precludes normal flow of water into the ballast tanks, the holes being positioned substantially perpendicular to the horizontal movement of the boat through the waves.

This novel submarine power propelled toy boat is driven by suitable electric motor 30, Figures 3 and 4, which has a flange 31 securely fixed to brackets 32 formed in the hull 20. This motor 30 has a shaft 33 which is connected through a suitable coupling 34 to the propeller shaft 35 journaled in a bearing 36 fixed to the hull 20 by a suitable plate 37 and journaled at its outer end in a water-tight sealed bearing 38 held in the stern end of the hull 20. On the outer end of the propeller shaft 35 is mounted a suitable propeller 39 as best seen in Figure 6.

Power for operating the motor 30 may be derived from a series of suitable batteries B held rigidly in clips 40 attached to the hull 20 so as to rigidly hold these batteries to the hull under all operating conditions. These batteries are preferably serially connected electrically with the positive terminal 41, Figure 11, of the series being connected through a contact 42 to a ground connection 43 with the hull 20. A suitable jumper clip 44 mounted by suitable insulated support 45 on the motor 30 serves to interconnect two of the batteries B so as to complete the serial connection from the ground terminal 43 to the negative terminal 46 which in turn is connected through a lead 47 to the contact 48 of the stop and start control switch 49, Figure 4, which is actuated by the stop and start control button 50 carried in a suitable water-tight bearing 51 in the top of the conning tower 23. When the button 50 is depressed, the switch contact 49 engages the contact 48 so as to complete a circuit through the lead 52 to the motor terminal 53 of the motor 30, the other terminal 54 of the motor being connected through a lead 55 which is grounded to the hull 20 by a suitable screw 56 so as to cause the motor to be energized from the batteries B. Raising the stop and start button 50 on the conning tower disconnects the contact 49 from terminal 48 to stop operation of the motor 30.

The steering of the submarine boat is accomplished by turning the periscope 57 with its observation window 57*a* in the direction it is desired to have the submarine boat travel. This periscope 57 is rotatably mounted in a suitable water-tight bearing 58 carried in the conning tower 23 and has fixed on its lower end, Figure 5, a crank arm 59 which is connected through a suitable link 60 to a similar crank arm 61 fixed on the vertical rudder shaft 62 journaled in a suitable water-tight bearing 63 carried in the stern of the hull 20 as best seen in Figure 4. A rudder 64 fixed on the rudder shaft 62 is positioned in proper relationship to the propeller 39 so that turning of the periscope 57 will similarly adjust the rudder 64 to cause the boat to travel in the desired direction indicated by the periscope window 57*a*.

As an alternate structure to effect the steering of the submarine boat, there is shown the arrangement of Figures 9 and 10 in which the axis of the propeller shaft is varied with respect to the axis of the hull of the boat to effect a change in direction of travel of the boat. In this arrangement the stern portion 20*a* of the hull is carried on suitable pivots 65 and 66 supported by integral brackets 67 projecting rearwardly from the hull 20 and is controlled in swinging movement about these pivots by the same link 60 utilized to operate the rudder as shown in Figure 4, this link 60 being connected by a suitable journaled connection 68 with the stern portion 20*a* so that by rotating the periscope 57 the stern portion of the boat may be swung in a horizontal plane relative to the longitudinal axis of the hull 20.

The motor 30 in this instance has a motor shaft 33*a* which passes through a clearance hole 33*b* in the stern portion 20*a* and is connected to a flexible coupling 69 to which is also connected in driving relationship the propeller shaft 70. This shaft 70 is supported at its outer end in a suitable water-tight bearing 71 in the stern portion 20*a* and has a suitable propeller 39 fixed on its outer end. Thus by swinging the stern portion 20*a* by manipulating the periscope 57 the propeller shaft 70 may be swung in a horizontal plane to angularly related positions relative to the longitudinal axis of the hull of the submarine boat to thereby change the direction of thrust imparted by the propeller to the hull and thereby effect a steering of the boat.

Still another method of steering the boat by electrical control means is contemplated which is best shown in Figures 11, 12, and 13. In this structure, a pair of driving motors 30*a* and 30*b* are provided, each mounted rigidly on a suitable partition 72 fixed to the hull 20 and having suitable propeller drive shafts 73 which are journaled at their outer ends in water-tight bearings 74 and are provided with suitable propellers 39 fixed on their outer ends. In this arrangement, the motors 30*a* and 30*b* are electrically interconnected for differential speed control, as shown in Figure 13, so that both motors may be run at full speed for normal forward operation or one or the other of the motors may be decreased in speed to thereby alter the direction of the submarine boat as desired since each of the propellers 39, Figure 11, is to one side of the central axis of the hull so that a difference in speed between them will effect a steering action on the boat.

In this arrangement, the batteries B are connected as in the case of Figure 3 with their positive terminal 41 connected through a ground clip 42 to the ground terminal of the hull 43. Both motors 30*a* and 30*b* have their terminals 75 connected through leads 76 to a common ground terminal 77 on the hull. The negative terminal 46 of the serially connected batteries B is connected through lead 47 to the terminal 48 of the stop and start switch 49, Figure 12, while the lead 52 from this switch is connected to the

central arms 78 of the differential control rheostat 79. Noting Figure 13, this rheostat comprises two windings 80 and 81, each respectively connected through the leads 82 and 83 with the terminals 84 and 85 of the motors 30*a* and 30*b* so that when the periscope is positioned for straightaway direction of travel of the submarine boat, the arms 78 will simultaneously effect full power connection at the common terminals 86 of both of the rheostats 80 and 81. When the periscope is turned to either side for changing the course of the submarine boat, the motor on the side to which the periscope is turned will be connected through resistance 80 or 81 to thereby decrease the speed of that motor while allowing the other motor to continue at normal full speed, thereby turning the boat in the direction desired. Thus, in this structure, complete electrical control means is provided for steering the boat by manipulation of the periscope on the conning tower.

While the apparatus herein disclosed and described constitutes a preferred form of the invention, it is to be understood that the apparatus is capable of mechanical alteration without departing from the spirit of the invention and that such mechanical arrangements and commercial adaptations as fall within the scope of the appendant claims are intended to be included herein.

Having thus fully set forth and described this invention, what is claimed as new and desired to be secured by United States Letters Patent is:

1. In a submarine toy boat having a totally enclosed water-tight hull, ballast tanks extending along the sides of said hull and open at the top for permitting selective surface and submerged operation of said boat, power means in said hull for propelling said boat, a conning tower on said hull, a rotatable periscope mounted in and projecting above said conning tower having a periscope window, and steering means connected to said periscope so that exterior manipulation of said periscope in rotary movement controls the course of said boat in the direction indicated by said periscope window when said boat is operating in either surface or submerged operation.

2. In a steering device for a toy submarine boat, having a hull, means to cause said hull to float in surface or submerged positions, a periscope including a periscope window rotatably mounted to project exteriorly from said hull, a propelling device in said hull, a propeller driven by said device, a rudder, and means interconnecting said periscope and said rudder so that external manual rotation of said periscope steers said boat in a direction indicated by the direction of facing of said periscope window when said boat is in either surface or submerged condition.

3. In a steering control for a submarine toy boat including means to effect surface or submerged operation of said boat, a rudder, a periscope, a periscope window in said periscope, and means interconnecting said rudder and periscope operable by the exterior manual turning of said periscope and its window to effect a steering action of said boat in the direction indicated by the direction of facing of said window.

4. In a toy submarine boat having a water-tight enclosed hull adapted to operate at surface cruising or in submerged positions, a pair of driving devices including a pair of propellers located one on each side of the keel axis of said submarine, and control means for differentially varying the speed of said driving devices including a periscope rotatably mounted in said hull for exterior manipulation having a periscope window adapted to point in the direction of the course of travel effected in said boat by the differential speed control of said driving devices in accordance with rotation of said periscope.

5. In a toy submarine boat having a totally enclosed water-tight hull including a conning tower, a periscope including a periscope window journaled for outside manipulation in said conning tower, a pair of electric driving motors each connected to a propeller located each side of the keel axis of said hull, a source of electric power for operating said motors, and electric control means for differentially varying the speed of rotation of said motors including a pair of rheostats interconnected between said source of power and said motors and connected for simultaneous operation by the rotation of said periscope, so that said periscope window when positioned for straightaway operation causes simultaneous full speed operation of both of said motors, and when positioned to either side of said strightaway position will decrease the speed of the motor on the side to which said periscope window is turned.

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