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TOY SUBMARINE WITH BALLAST CONTROL THEREFOR

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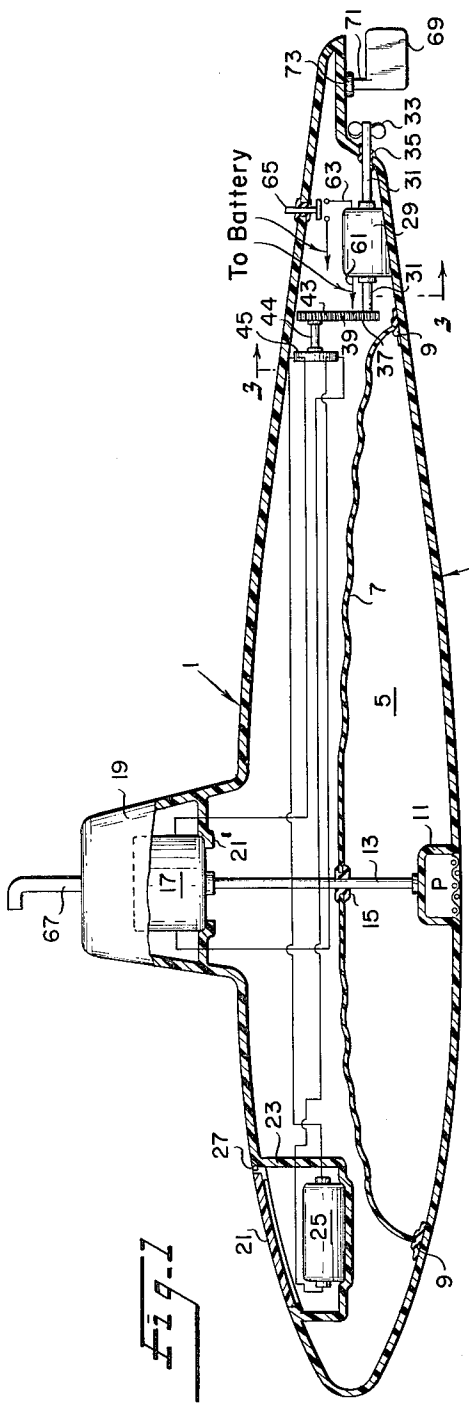


Fig. 1

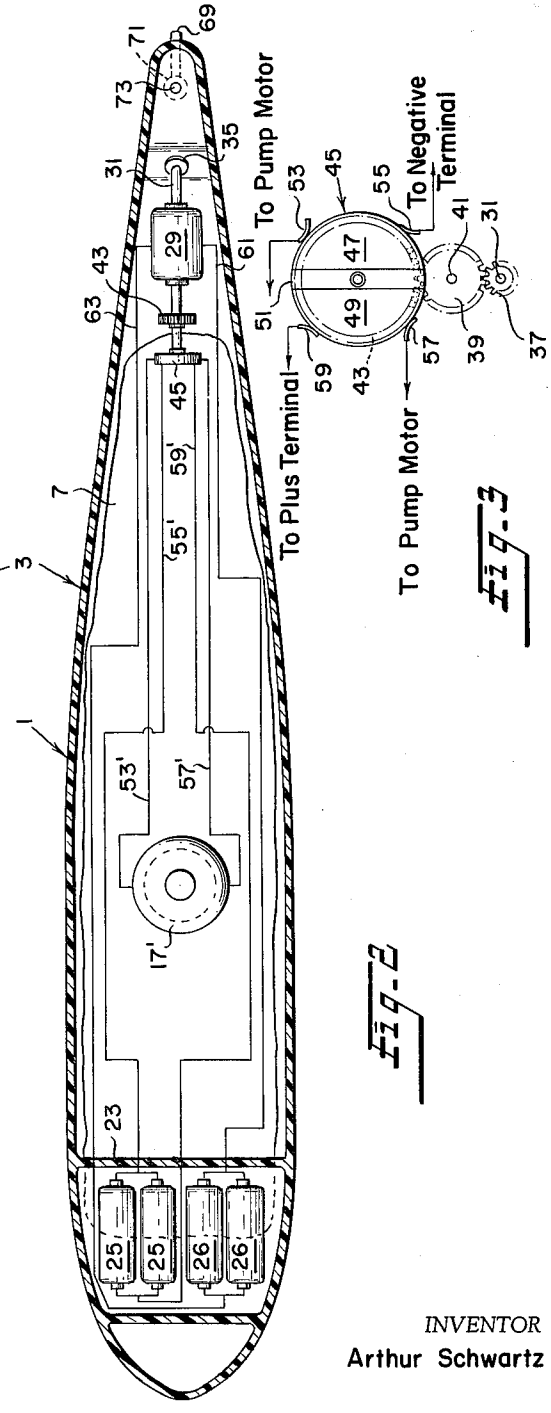


Fig. 3

Fig. 2

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TOY SUBMARINE WITH BALLAST CONTROL THEREFOR

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This invention relates to underwater toys, and more particularly to battery operated toy submarines.

Battery operated toy submarines have in the past been primarily of the variety that stay submerged once their ballast tanks have been filled. Those that rise after a period of time must rely on complicated floats and valves or on a chemical solution.

It is, therefore, an object of this invention to provide an underwater toy that will be able to completely submerge and surface periodically.

It is another object to provide a toy submarine which is battery operated and will submerge and surface periodically.

It is a further object to provide a toy submarine with a ballast tank and a reversible pump connected to the ballast tank.

It is still another object to provide a pump driven by a motor, the polarity of the pump motor being reversed periodically.

It is another object to provide a polarity reversing mechanism, whereby the polarity of a device will be reversed after a given number of revolutions of a controlling motor.

Another object is to provide a motor operated pump, the polarity of the pump motor being controlled by another motor.

One form of the invention includes a submarine hull, a ballast tank in the hull, and a motor to propel the submarine. Connected to the interior of the ballast tank is a pump which communicates with the outside of the hull. The pump is motor driven, the polarity of the pump motor being regulated by the propelling motor.

Other objects and advantages will become obvious upon reference to the following description of one embodiment of the invention as illustrated in the accompanying drawings, wherein:

FIGURE 1 is a vertical section view of the submarine;

FIGURE 2 is a top section view of a submarine embodying the invention;

FIGURE 3 is an end view of the switching means taken along lines 3—3 in FIGURE 1.

Referring now to the drawings in detail, a submarine **1** has a hull **3**. Inside the hull **3** is a ballast tank **5** the upper portion of which may include a flexible wall or membrane **7** which is attached to the bottom of the hull at **9**.

At the lower portion of the hull **3** is located a pump **11**, the function of which will be further explained below. Connected to the pump is a drive shaft **13** which enters through the ballast tank membrane **7** through a seal **15**. The shaft **13** may also be encased in an outer watertight member which in turn would be sealed to the membrane **7**. The end of the drive shaft **13** not connected to pump **11** is connected to the rotor of motor **17**.

The motor **17** is located in the conning tower **19** by means of braces or supports **21'**. Extending above the conning tower is a simulated periscope **67**.

Located near the bow of the submarine is a door or hatch **21**. Located below hatch **21** is a compartment defined by walls **23** which support a plurality of batteries **25** and **26**. The hatch **21** may be provided with seal **27** which will provide a water-tight arrangement around the compartment containing the batteries.

At the stern of the submarine is a drive motor **29**, having a drive shaft **31** and a prop **33**. The hull **3** may

include a seal **35** to provide a water-tight arrangement at the location where the shaft **31** comes through the hull. The other end of drive shaft **31** is connected to a gear **37**. This, in turn, is connected to a second gear **39** revolving on a shaft **41**. The second gear may in turn be connected to a third gear **43** to provide a step-down relationship. It is understood that any number of gears of appropriate size may be used to provide a slow moving commutator switch means **45**. This switch **45** is connected to gear **43** by means of shaft **44**. It is well known in the art that by using increasingly larger gears the final output will be a gear that will rotate at a small fraction of the speed of the original motor. The gears shown herein are merely schematic of such a relationship.

The commutator wheel **45** is provided with a pair of conducting sections **47** and **49** separated by an insulating member **51**. This relationship is best seen in FIGURE 3. Located approximately 90° from one another around the commutator wheel **45** are a plurality of brush contacts **53**, **55**, **57**, **59**. Brush contacts **53** and **57** are connected to the pump motor through conductors **53'** and **57'**; and brush contacts **55** and **59** are connected to the negative and positive terminals of a source of electrical potential respectively through conductors **55'** and **59'**. In the instant case the power source is the batteries **25**.

Extending from motor **29** to batteries **26** are conductors **61** and **63**. In the circuit of conductor **63** is located a lever-actuated or push-button switch **65** to energize the motor **29**.

At the stern of the submarine is a rudder **69** having a shaft **71** which is frictionally engaged into a fitting **73** in the hull **3**. The boat may be set on a particular course by rotating the rudder **69**.

OPERATION

Upon closing switch **65** motor **29** will be connected to batteries **25**, thus rotating the prop **33** to drive the submarine. At the same time shaft **31** connected to gear **37** will rotate, and through gears **39** and **43** the switch commutator **45** will slowly turn. In the form seen in FIGURE 3 current will flow from the positive side of batteries **26** through line **59'** to brush **59**. Current will flow through conducting section **45** to the contact **57**, and hence through conductor **57'** to motor **17**. The other side of motor **17** is connected to line **53'**, which in turn is connected to contact terminal **53**. The current then continues to flow through section **47** to contact **55** and hence through line **55'** to the other side of the battery.

As the contact commutator **45** rotates, the polarity of motor **17** will change. It will thus be seen that periodically the pump will pump water in and out of the ballast tank **5**. As the water is pumped into the tank, the air will expand membrane **7** slightly. As the water is pumped out, the air will help force the water out and also the membrane **7** will be able to collapse slightly. Depending upon the strength of the pump, the air in the ballast tank will become compressed slightly.

It will be appreciated that the submarine, as it takes on water, will submerge. When the polarity on the pump motor is reversed, the water will be pumped out and the submarine will surface.

The sizes of the various gears and commutator **45** are selected in accordance with the amount of water necessary in a particular vessel to submerge same.

While the invention has been described it will be understood that it is capable of further modifications and this application is intended to cover any variations, uses, or adaptations of the invention following in general, the principles of the invention and including such departures from the present disclosure as come within knowledge or

customary practice in the art to which the invention pertains, and as may be applied to the essential features hereinbefore set forth and as fall within the scope of the invention or the limits of the appended claims.

Having thus described my invention what I claim is:

1. A toy submarine comprising:
(a) a hull,
(b) a ballast means in said hull,
(c) motor means for propelling said hull,
(d) a reversible pump means for filling and emptying said ballast, and
(e) means responsive to the completion of a predetermined number of revolutions of said motor means for reversing the direction of said pump means.

2. A toy submarine as defined in claim 1, wherein said reversing means includes gearing means connected to said motor means, a polarity reversing switch means, a reversible motor connected to said pump means, said switch means connected to reversible motor.

3. A toy submarine as defined in claim 1 wherein said motor means is powered by at least one battery.

4. A toy submarine comprising:
(a) a hull,
(b) a ballast tank,
(c) a first motor having a drive shaft,
(d) a pump connected to said ballast tank for filling and emptying the same,
(e) a reversible motor connected to said pump,
(f) a propeller connected to said drive shaft,
(g) gearing means connected to said drive shaft,
(h) polarity reversing switch means connected to said gearing means,
(i) said switch means being connected to said reversible motor, whereby as said first motor rotates the polarity of said reversible motor is periodically reversed so that water will be pumped in and out of said ballast tank.

5. A toy submarine comprising:
(a) a hull,

(b) a ballast tank,
(c) a first motor having a drive shaft,
(d) a first gear mounted on said shaft,
(e) at least a second gear engaging said first gear,
(f) a switch operatively connected to said second gear,
(g) said switch including a circular disc, said circular disc including two substantially semi-circular conducting members, said conducting members being separated by insulation, four contacts approximately 90° from each other engaging said disc,
(h) a second motor,
(i) two of said contacts operatively connected to said second motor,
(j) the other two of said contacts connected to a source of electricity,
(k) said second motor being connected to a pump,
(l) said pump being in communication with said ballast tank.

6. A submarine comprising:
(a) a hull,
(b) a ballast tank in said hull,
(c) a motor,
(d) a propeller connected to said motor,
(e) a pump connected to said ballast tank for filling and emptying the same,
(f) means responsive to the completion of a predetermined number of revolutions of said motor for reversing the direction of said pump.

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