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M. CANTO ET AL

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TOY SUBMARINE

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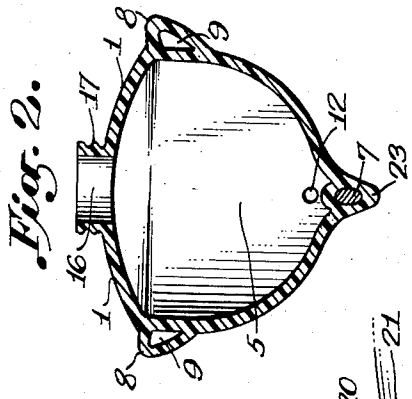


Fig. 2.

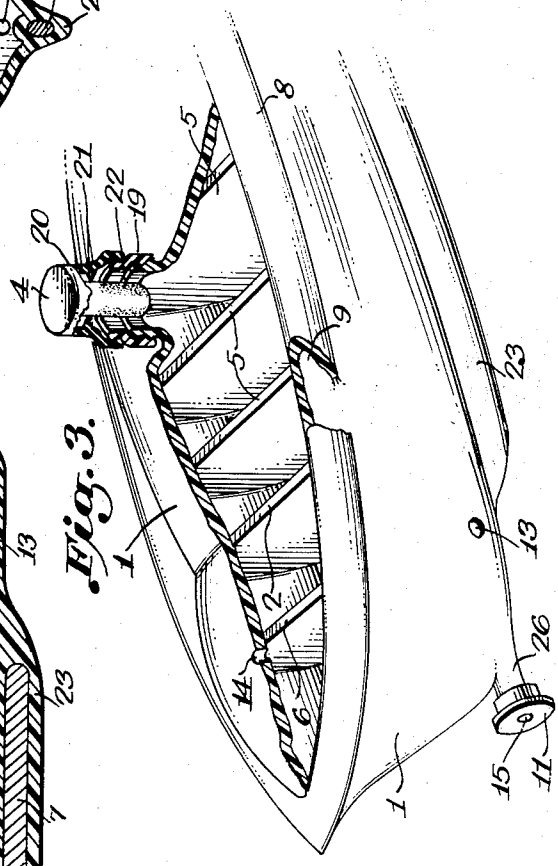


Fig. 3.

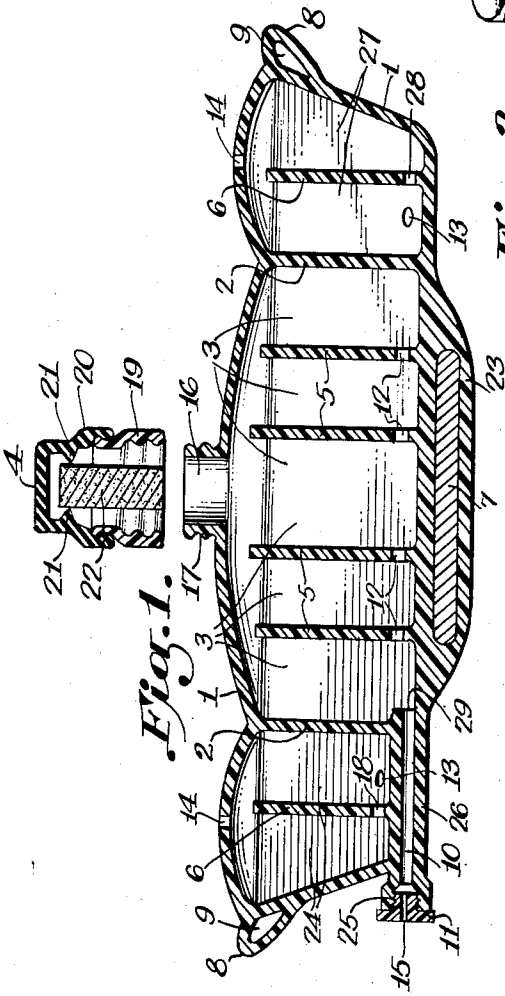


Fig. 1.

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TOY SUBMARINE

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This invention consists in a toy submarine that functions by the action of a tablet that when in contact with water produces carbonic gas or any other gas considered to be harmless to human health.

This toy submarine would be a great attraction for children and even for grown up people, because it is a very similar reproduction, in small size, of true under water vessels, from the point of view of its navigability.

When it is set to function, it automatically begins to move forward on the water surface, and a few moments later, submerges graciously as a true submarine and, continuing moving forward under the surface of the water, it comes up again to the surface and continues moving forward until its motive power is exhausted, not going under water again until being given a new motive power charge.

Having no movable parts, it can be constructed of plastic materials, in two halves, and therefore, its manufacturing cost will be economical.

Its simplicity is a result of ingenuity, because of its functioning, with no mechanical or movable parts, depends on the relation between its weight, the water that comes into its inside ballast reservoirs and the water that is expelled under the pressure of the gas produced by the tablet, which is, in fact, its motive power.

Given above an idea of our invention, let us describe it.

Fig. 1 represents a longitudinal section of the submarine and the cap that closes up the motor compartment and supports the tablet that produces the gas.

Fig. 2 represents a transversal section of the submarine in its middle part.

Fig. 3 represents a partial view of the submarine, in perspective, exposing the interior of the hull and stabilizer.

In the figures, number **1** represents the shell or hull; number **2**, the partition walls that separate the motor compartment from the reservoirs formed by the communicating vessels **24** and **27**; number **3** represents the communicating vessels of the motor compartment; number **5**, the separating walls that separate the communicating vessels **3**; number **6** represents the separating walls of the communicating vessels **24** and **27**; number **7** is a lead ingot or other heavy material to mamintain vertical equilibrium; number **8** is a hollow rim portion constituting an air chamber **9** to equilibrate lateral and longitudinal movements of the vessel; number **10** is the outlet end of a vent tube **26** through which pressure is expelled by the gas pressure; number **11** represents a nozzle screwed to tube **26** through a screw threaded member **25**; number **12** represents the holes that connect the communicating reservoirs **3** of the motor compartment; number **13** represents the holes through which the water comes into the reservoirs formed by the communicating vessels **24** and **27**; number **14** represents the holes through which the air is expelled when the reservoirs are filling up; number **15** is the propulsion jet hole through which the water goes out with velocity under the pressure of the gas of the motor compartment; number **16** is a mouth or opening for filling the motor compartment; number **17** is the screw on which the cap **19** is screwed; number **18** represents the hole that connects the communicating vessels **24**; number **20** is a rubber cover that envelops and closes up the cap **19**; number **21** represents the projecting points formed of the same rubber cover **20** that serve to hold the gas-producing tablet; number **22** is the gas-producing tablet held between the points **21**; number **23** is the keel; number **28** is the hole that connects the communicating vessels **27**; and number **29** is the admission hole of tube **26** through which the water goes out of the motor compartment.

The expression "motor compartment" refers to the fact that the space comprised between the shell or hull **1**, and the partition walls **2**, in which space are the communicating vessels **3**, is filled up with water where it submerges the tablet that produces the gas that expells the water outside, with velocity, through the nozzle **15**. This water jet with velocity has a reaction in the water where the submarine is floating, pushing it forward, that is, acting as a motor. So, for that reason we denominate this section of the submarine "motor compartment."

Operation

To make this toy submarine function, the first thing is to place the gas-producing tablet between the projecting points **21**. Through the mouth **16**, the motor compartment is filled up with water. The cap **19** is manually screwed to screw **17** closing it up hermetically. Then, with the finger, the upper part **4** is pushed, and the tablet **22** is loosened from the projecting points **21**, and falls into the water. There begins, at once, a violent production of gas, and the water goes out with great pressure and velocity through the hole **15**; immediately the submarine must be placed in the water. In these conditions it begins to move forward; a moment later it begins to submerge, always moving forward; it makes a good advance under the water surface and then comes again to the surface, on which it continues moving forward for some distance, until its motive power is exhausted.

This is produced by the numerical relations between the weight of the keel ingot, the capacity of the reservoirs and the capacity of the motor compartment, in the following proportions: the relation of capacity between the motor compartment and the reservoirs formed by the communicating vessels **24** and **27**, is, for example, of 5 to 3, respectively. If the motor compartment admits 5 ounces, the reservoirs 3 ounces, and the keel ingot weighs 1 ounce, the total weight is 9 ounces. Now, when the submarine is filled up with water to make it function, the motor compartment filled up, weighs 5 ounces, and the keel ingot, 1 ounce, that is, a total of 6 ounces; as the capacity of the reservoirs is only of 5 ounces, the submarine is at this moment of greater density than the water, and, therefore, it begins to submerge, because while the motor compartment is emptied, the reservoirs are filling up. So, it remains submerged until the motor compartment is sufficiently emptied to make the submarine of less density than the water, causing it to come up to the surface. On the surface it continues floating and moving some distance forward.

The communicating vessels formed by the separating walls **5** and **6**, in the motor compartment and in the reservoirs, have a stabilizing function, because when the submarine begins to submerge, the water entering each reservoir forms a center of gravity that causes the submarine to maintain an upright position in the water.

The hollow stabilizer **8**, besides producing equilibrium for lateral and longitudinal movements, compensates the total weight of the submarine structure, with the exception of the weight of the keel ingot.

The reason for providing this submarine with the nozzle

11, is twofold: first, to provide the hole 15 parallel to the submarine longitudinally, so that it moves forward, or with the hole inclined laterally, so that it will move the vessel laterally in a circular course; and second, to facilitate the cleaning out of tube 26 if this were obstructed by any particle of solid material.

Having described this toy submarine, what we claim is:

1. An automatic toy submarine vessel comprising a hull, a central fluid pressure power compartment, separate liquid capacity control compartments on opposite sides of the power compartment and located in the forward and aft parts of the hull, buoyancy control means located at the bottom portion of each control compartment for automatically admitting ballast liquid when the vessel is in water; an underwater propulsion vent in communication with the fluid pressure compartment, and means under the control of the operator for releasing a pressurizing means for pressurizing the fluid in said central compartment to effect a continuous discharge from the vent during the operation of the vessel, the weight of the vessel when the central compartment is filled with said pressurizing fluid, and the ballast compartments are empty, being such as to cause the vessel to submerge and the weight of the vessel when the central compartment is empty and the ballast compartments are filled with liquid, the vessel will surface.

2. A submarine vessel as defined in claim 1, in which the pressurizing means comprises a power cartridge suspended in an opening provided in the top wall of the power compartment, and means for sealing said opening, said means for releasing the pressurizing means being a manually operable means for releasing said cartridge to cause it to contact the power fluid and pressurize the same.

3. A submarine vessel as defined in claim 1 in which the pressurizing means comprises a power cartridge suspended in an opening provided in the top wall of the power compartment, and means for sealing said opening including a yieldable member for gripping the cartridge, said means for operating the yieldable member being a manually operable means for releasing said cartridge to cause it to contact the pressure fluid and pressurize the fluid.

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