

Oct. 7, 1958

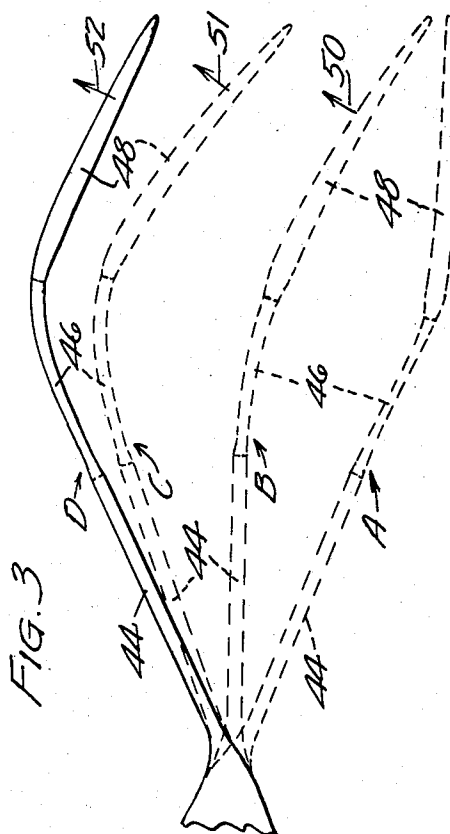
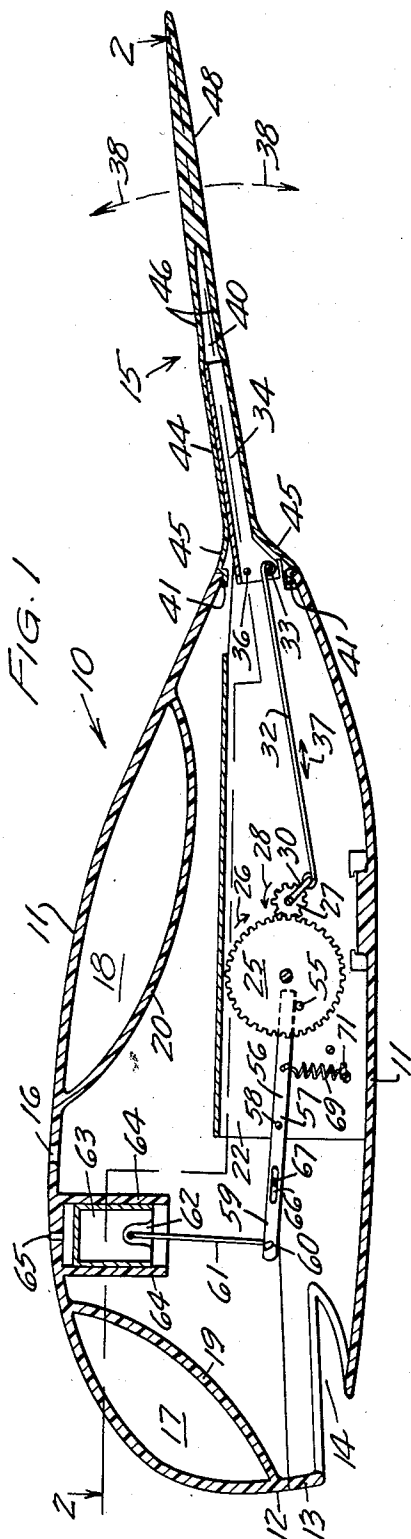
P. E. OBERG

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SELF PROPELLED TOY FISH

Filed March 19, 1956

2 Sheets-Sheet 1



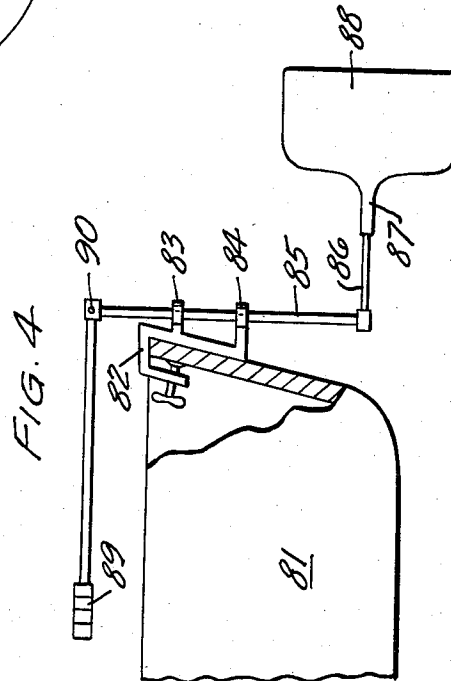
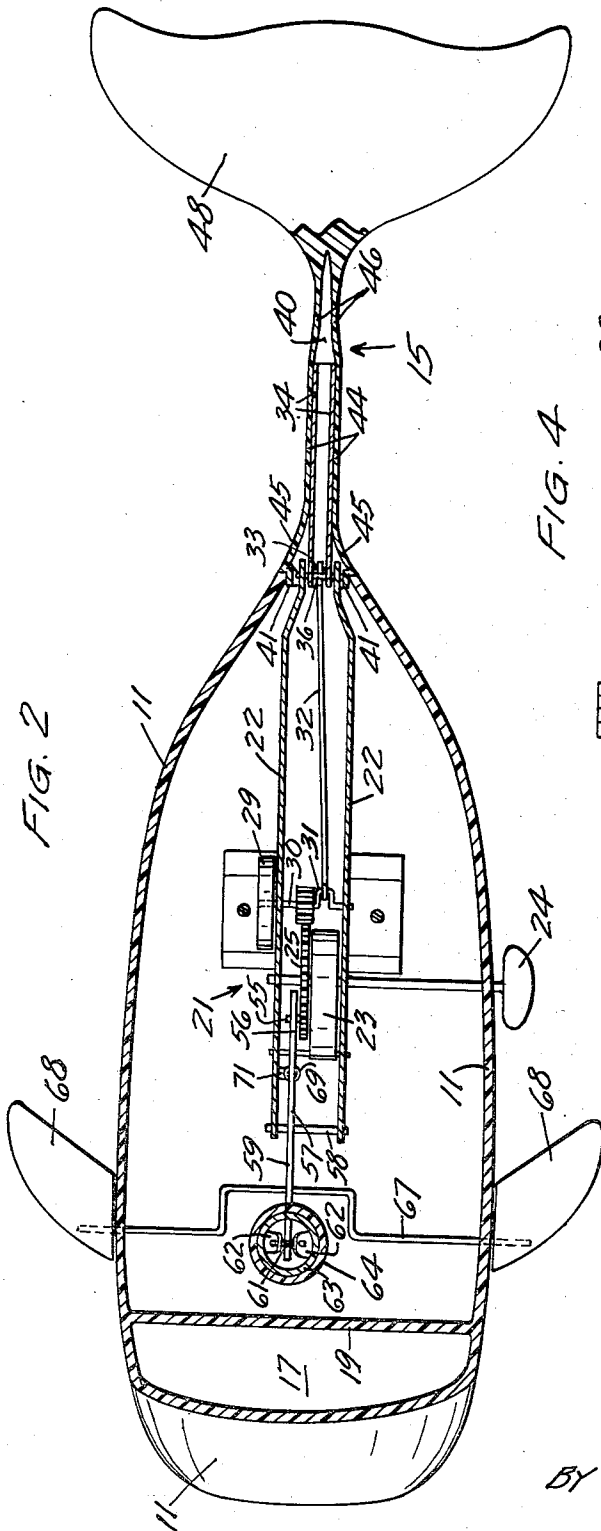
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SELF PROPELLED TOY FISH

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6 Claims. (Cl. 46—92)

This invention relates to a novel device for propelling and steering a buoyant object in a liquid medium. More particularly, the invention is concerned with means for propelling toy aquatic creatures. In a specific embodiment, a toy whale incorporates means for self-propulsion as well as novel means generated by the propulsion means for diving, surfacing, and spouting after surfacing.

In the long and colorful development of power-driven boats, a wide variety of propellers have been suggested, many of which derive from manually-driven devices such as the sculling oar of Venetian gondolas. An early power-driven boat utilized as its propeller a rudder-like device, i. e., a flat, rigid blade hinged vertically at the stern. By oscillating this propeller, it was said that the boat would be driven in a forward direction, but a casual inspection of the forces involved reveal that the major thrust is sidewise and that the driving thrust is equaled by the reverse thrust.

Subsequently, the device was improved by fabricating the rudder-like propeller of flexible material. The improved propeller still exerted a major sidewise thrust and a substantial, but greatly decreased, reverse thrust. The sidewise thrust, however, rendered the propeller highly inefficient by creating considerable drag as well as by imparting a severe oscillating motion to the boat.

I have now contrived an improved device for propelling aquatic objects by means of an oscillating rudder-like appendage, which device is highly efficient with respect to comparable propellers and has considerable utility in driving small boats as well as toy fish and the like. Briefly, my invention consists of a propeller having three sections: a straight rigid bar; a flexible, normally straight, connecting rod collinearly attached to said bar; and a wide flat blade attached to the other end of the flexible connecting rod such that a line through the rigid bar and connecting rod normally lies in the plane of and bisects the blade. The rigid bar of the propeller is pivotally mounted to the aquatic object, conveniently but not necessarily at the rear of the aquatic object. When oscillated in a plane perpendicular to the plane of the blade, the propeller exerts a substantial thrust in a direction away from the point at which it is mounted to drive the object with greatly improved efficiency as demonstrated in the attached drawings in which:

Fig. 1 is a central vertical section of a toy whale incorporating my novel propeller as its tail assembly in addition to possessing novel means for driving, surfacing, and spouting after surfacing;

Fig. 2 is a sectional view taken along line 2—2 of Fig. 1;

Fig. 3 is a time-sequence presentation of the forces generated in oscillating the tail of the whale shown in Fig. 1 in a vertical plane; and

Fig. 4 illustrates by an elevational view the manner in which my propeller may be used to both drive and steer a small boat manually.

Referring now to Figures 1 and 2, a toy whale 10 is provided with an outer shell 11 of thermoplastic material such as polyethylene and is conveniently molded in two halves, i. e., an upper half 12 and a lower half 13, adapted, after installation of the propulsion mechanism, to be heat-sealed together to form the body of the whale

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10 in a manner well known to one skilled in the art. The tail 15, formed of the same thermoplastic material, is firmly attached to the shell 11 and functions as a propeller for the whale. The shell 11 is provided with a large opening at the mouth 14 and a dorsal vent 16 so that the whale 10 immediately fills with water upon being placed in a lake or tub. The upper half 12 of shell 11 includes two airtight compartments 17 and 18 of sufficient size that about two-thirds of the body of the whale 10 and its entire tail 15 are submerged while it swims at the surface. The compartments 17 and 18 are enclosed by panels 19 and 20, respectively, of the same thermoplastic material and rendered airtight by heat-sealing.

Means for providing power to propel the whale as well as to cause it to dive, surface and spout are provided by an integral motor assembly 21, which assembly is adapted to operate while enveloped by water in that all of its components are constructed either of rust-proof metals or metals provided with a rust-preventive coating such as lacquer or silicone grease. The motor, of conventional clock construction as customarily provided for windup toys, is housed in a U-shaped frame 22 which is conveniently stamped from aluminum sheet. A helical spring 23, which may be wound by handle 24 journaled in frame 22, causes gear 25 to rotate in the direction 26 and, in turn, pinion 27 to rotate in the direction 28 as indicated in Figure 1. Pinion 27 as well as a flywheel 29 are rigidly mounted on crankshaft 30 which is journaled in U-frame 22. Hooked around the crankpin 31 of crankshaft 30 is the end of a rod 32, the other end of which is looped around a rigid pin 33 mounted across a U-shaped bar 34. Both the looped ends of rod 32 are of sufficient diameter to allow the crankshaft 31 and pin 33 to turn easily. The bar 34 is pivotally attached to the U-frame 22 by means of a fulcrum-pin 36.

As crankshaft 30 rotates with pinion 27, essentially reciprocal motion is imparted to connecting rod 32 as indicated by arrows 37. Since the position of fulcrum-pin 36 is fixed, the bar 34 is caused to oscillate about fulcrum-pin 36 in a vertical plane as indicated by arrows 38.

The tail 15 is provided with a substantially rectangular cavity 40, the cross section of which is slightly smaller than the rectangle outlined on three sides by the cross-section of bar 34 so that the tail 15 is securely attached to the body of whale 10 when it is pushed onto bar 34. The tail is retained laterally by means of an essentially cylindrical lip 41 which is adapted to fit snugly into the annular opening in shell 11 through which the bar 34 projects. Accordingly, the bar 34 serves to rigidify the forward portion 44 of tail 15 and to oscillate the tail 15 in a vertical plane.

It should be pointed out that the wall 45 of the tail 15 immediately adjacent and to the rear of the shell 11 must be relatively thin to provide sufficient flexibility to allow the tail 15 to oscillate freely. The tail 15 also includes a thin central portion 46, which portion is quite flexible in that it contains no stiffening reinforcement, and a wide, flat fin 48. Although the fin 48 is constructed of the same material as flexible section 46, it has considerable rigidity in comparison thereto by virtue of its relatively large cross-sectional area.

The action of the tail 15 in driving the whale 10 while it is suspended in water is illustrated in time-sequence in Figure 3 in which the tail 15 is viewed from a side elevation as in Figure 1 and is shown exaggerated in length for purposes of clarity. Reference character A indicates the position and approximate configuration of tail 15 as the bar 34 begins to move upward immediately after reversing direction. At this moment, the fin 48 is essentially at rest at its position of maximum swing since the flexibility of central section 46 causes the motion of fin 48 to lag that of bar 34.

As bar 34 moves up to the position B, the tail 15 takes on an essentially arc-shaped configuration due to the flexibility of central section 46, so that the fin 48 is disposed at a substantial angle from the horizontal before it develops much thrust, the direction of thrust at this point being essentially in the direction indicated by arrow 50. When the bar 34 nears its point of maximum upward deflection to bring the tail 15 to position C, the fin 48 attains its maximum velocity and produces a thrust on the water in the direction of arrow 51. The fin 48 then gradually slows and begins to return to a horizontal position but is still imparting a substantial thrust in the direction of arrow 52 at the moment the shaft reaches maximum deflection and the tail 15 is at position D. Preferably, the fin 48 comes to rest in approximately a horizontal position so that it at no time produces a reverse thrust. Accordingly, whenever the fin 48 is being moved rapidly so as to exert a substantial thrust on the liquid, a large component of that thrust drives the whale 10 straight forward.

Referring again to Figures 1 and 2, the motor assembly 21 which provides the power to propel the whale 10 through the water simultaneously causes the whale to dive, surface, and spout water. Projecting from the face of gear 25 near its periphery is a stud 55, and as the gear 25 rotates in the direction 26, to move the stud 55 upwards, the stud contacts the rearward end 56 of lever 57, which lever includes crossarm 58 by which it is pivotally mounted to U-shaped frame 22. At the forward end 59 of lever 57 is a small hole 60 through which is passed the hooked end of an arm 61, the opposite end of which arm is T-shaped to connect to a pair of tabs 62 of a cylindrical plunger 63. The plunger 63, which is conveniently formed from a thin sheet of metal, fits slidably into the open end of a cylindrical projection 64 of shell 11 extending downwardly from blowhole 65. The forward extension 59 of lever 57 also includes a slot 66 to receive a shaft 67, the extremities of which are forced into under-size holes in side fins 68, whereby the attitude of the fins 68 is controlled.

When lever 57 is not contacting the stud 55 on drive gear 25, the spring 69, attached between its rearward end 56 and a tab 70 punched out from the side of U-frame 22, holds the plunger 63 against the shell 11 and positions the fins 68 in a slightly downward attitude. Accordingly, the whale 10 dives at a shallow angle until the stud 55 begins to pivot the lever 57. As the lever is pivoted, the fins 68 are rotated to make the whale return to the surface. Simultaneously, plunger 63 moves downward to allow water to fill the space within the cylinder 64. The whale is swimming at the surface when the stud 55 slips off the end of lever 57, causing plunger 63 to rise under the urging of spring 69 and to expel water through blowhole 65 in a fine stream. Not until the water stored in cylinder 64 is nearly exhausted do the fins 68 rotate sufficiently to again put the whale 10 into a dive.

Since the ratio between gear 25 and pinion 27 is approximately eight to one, the tail 15 will complete about eight oscillations each time the whale dives and surfaces.

Reference is now made to Figure 4 to illustrate the utility of my invention in the propulsion and steering of boats. My propeller 80 is attached to a small boat 81 by means of a stern bracket 82 of the type conventionally used to fasten outboard motors to boats. The stern bracket 82 includes a pair of bearings 83 and 84 in which a shaft 85 is journaled. Attached at right angles to the lower end of shaft 85 is a straight rigid bar 86, and collinearly attached to the other end of bar 86 is a relatively short, normally straight, rod 87, which rod is flexible in horizontal directions but preferably semi-rigid with respect to the vertical. The rod 87 in turn connects to and supports a wide flat blade 88 disposed in a vertical plane such that a line through the bar 86 and rod 87 lies in the plane of and substantially bisects said blade 88. It should be noted that the shaft 85 must have sufficient length to submerge the blade 88.

Attached at right angles to the upper end of shaft 85 is a handle 89 whereby the propeller 80 may be oscillated horizontally by one sitting in the stern of the boat to propel the boat. The handle 89 is locked to shaft 85 by a setscrew 90 for adjustment such that the propeller may be operated by either hand.

It is submitted that this propeller, although it is admittedly somewhat inefficient and tends to oscillate the boat to a certain extent, has considerable utility for the fisherman in that it enables him to propel and steer his boat with one hand while fishing with the other.

I claim:

1. A propeller comprising a shape-retaining wide flat blade; a straight rigid bar lying substantially in the plane of said blade when the propeller is at rest; and a flexible, normally straight rod connecting said blade and bar and collinear with said bar; said blade exerting a propelling thrust, when the propeller is pivotally mounted to an aquatic object at the extremity of said rigid bar and oscillated in water about the pivotal mounting and perpendicularly to said plane of the blade, said thrust being substantially free from components in the direction of the pivotal mounting from the midpoint of oscillation of the blade.

2. As a new article of manufacture, propulsion means for an aquatic object comprising a fulcrum mounted on said object; an appendage pivoted at and extending away from said fulcrum and normally immersed when the aquatic object is placed in a body of water, said appendage comprising a shape-retaining wide flat blade, a straight narrow rigid portion connected to said fulcrum and lying substantially in the plane of said blade and bisecting the blade when the propeller is at rest, and a narrow flexible normally straight central portion connecting said blade to said narrow rigid portion and collinear with said rigid portion; and means for oscillating said appendage about said fulcrum and perpendicularly to the said plane of the blade, whereby the blade exerts a propelling thrust substantially free from components in the direction of the fulcrum from the midpoint of oscillation of the blade.

3. A toy fish-like creature comprising a body; a tail, the said tail comprising a shape-retaining large caudal fin, a narrow rigid portion pivotally attached to said body and lying in the plane of said fin when the fin is at rest, and a narrow flexible central portion connecting said caudal fin to said narrow rigid portion and collinear with said rigid portion; a motor housed by said body; and means connecting the motor to said narrow rigid tail portion to cause the tail to oscillate perpendicularly to said plane of the caudal fin, whereby when placed in water the caudal fin exerts a propelling thrust substantially free from components tending to drive the toy creature in a reverse direction.

4. A toy fish-like creature as defined in claim 3 and further having a pair of normally horizontally disposed pectoral fins and means connecting the motor to the pectoral fins to control the attitude of the toy creature, whereby the creature periodically dives and surfaces.

5. A toy fish-like creature as defined in claim 3 and in the likeness of a whale and further having a dorsal vent and means connecting the motor to the vent, whereby the toy creature periodically spouts water.

6. A toy fish-like creature as defined in claim 3 and in the likeness of a whale.

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