March 14, 1967 R. F. SCHNEIDER 3,308,574

WAVE-POWERED SPINNING AQUATIC TOY

Filed Aug. 27, 1964 2 Sheets-Sheet 1

Fig. 1.

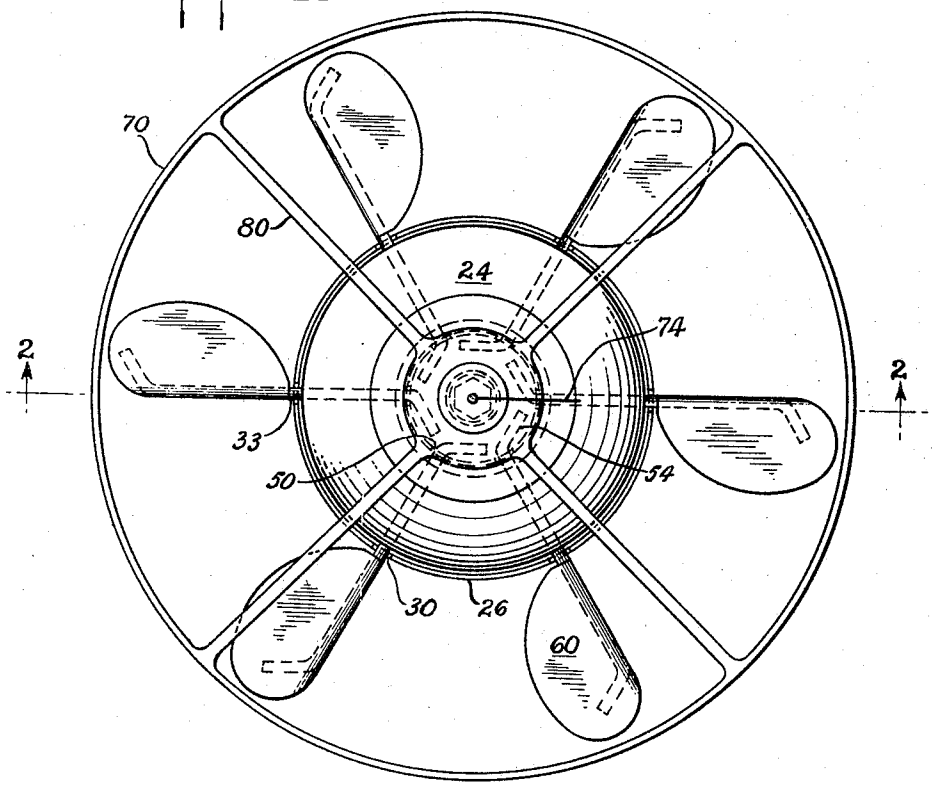


Fig. 4.

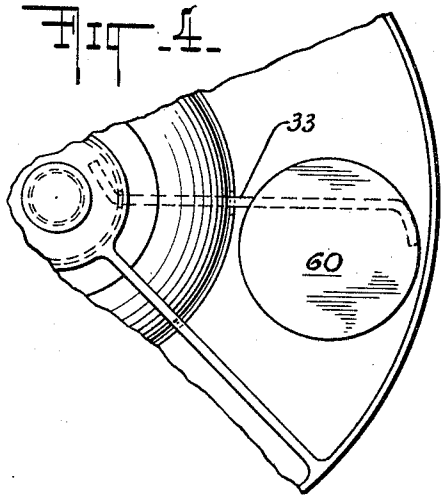
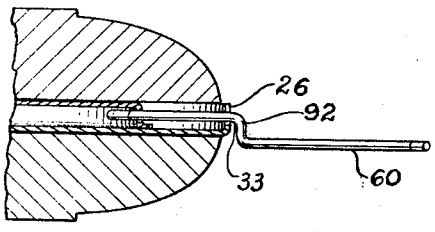


Fig. 5.



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Fig. 2.

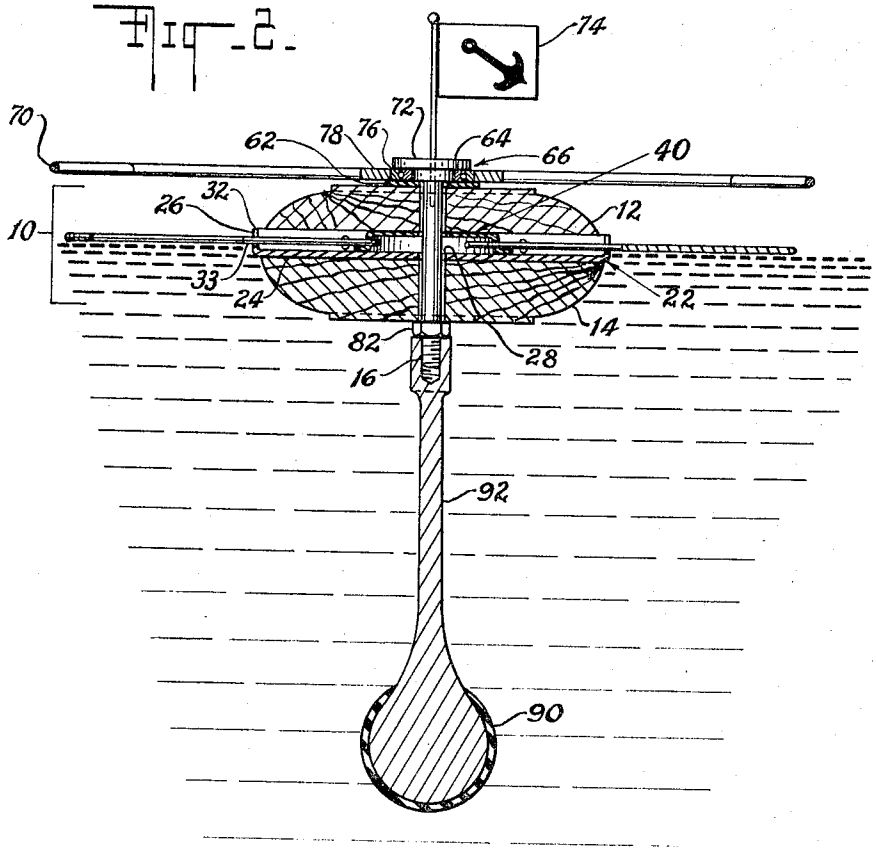


Fig. 3.

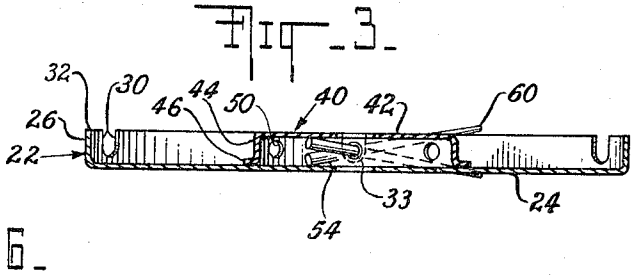
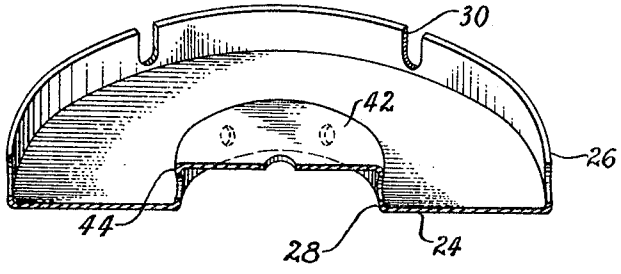


Fig. 6.



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WAVE-POWERED SPINNING AQUATIC TOY

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Filed Aug. 27, 1964, Ser. No. 386,979
6 Claims. (Cl. 46—41)

The present invention relates to aquatic toys. More particularly it relates to wave-operated revolving aquatic toys.

In accordance with the present invention, a wave-powered aquatic toy comprises a body disposed about a vertical axis, a plurality of paddles supported from said body circularly about said axis not above the water line of said toy, said paddles being free to flap to a restricted extent along an axis eccentric thereto under the influence of waves thereon, and means disposed below said paddles for stabilizing said toy against tilting from said vertical axis under the influence of said waves thereon, whereby said paddles remain in contact with such waves to spin said toy at a high rate of speed under the influence of waves thereon.

The invention will be described further in connection with the accompanying drawings which are to be considered as exemplary of the invention and do not constitute limitations thereof.

In the drawings:

FIG. 1 is a top view of a wave-operated revolving aquatic toy in accordance with the present invention, showing six equally spaced driving paddles and a guard ring supported by a four-armed spider;

FIG. 2 is a side elevational view of the aquatic toy of FIG. 1 along the line 2—2 thereof, illustrating particularly a decorative flag at the top thereof and a non-buoyant stabilizer at the bottom thereof;

FIG. 3 is a fragmentary view in elevation on enlarged scale of the toy of FIGS. 1 and 2 with certain elements omitted for clarity of illustration;

FIG. 4 is a fragmentary top view of an alternate paddle shape and mounting position;

FIG. 5 is a fragmentary view in elevation of a modified spoke structure; and

FIG. 6 illustrates a one-piece bearing structure for supporting the spokes which carry the driving paddles of the instant toy.

In the figures, and particularly in FIGS. 1, 2 and 3, a buoyant body designated generally by the reference character **10** comprises a flattened hemispheroidal upper member **12** and a second, inverted, flattened hemispheroidal lower member **14**, both of which are mounted on a threaded shaft **16** which passes axially through them. The upper and lower members **12** and **14** respectively are uniform bodies of revolution about their common central axis and suitably are made of wood or other highly buoyant material.

Sandwiched between the upper and lower body members **12** and **14** is an upward-facing shallow dished member **22** having the same outer diameter as said body members and comprising a circular base plate **24** and a upwardly extending cylindrical side wall **26** integral at its base with the base plate **24**. The base plate is pierced by a central opening **28**, through which passes a threaded shaft **16**, and the cylindrical side wall **26** is pierced by six U-shaped bearing slots **30** which depend from the upper edge **32** of the cylindrical wall **26** and which are uniformly spaced about its circumference. These bearing slots form outer journal bearings for horizontal shafts or spokes **33**, one of which is journalled in each bearing slot **30**.

A downwardly facing inverted cup **40** is nested centrally within the shallow dished member **22**. As best illustrated in FIG. 3, the inverted cup **40** is integrally

composed of an annular plate **42**, from which depends a cylindrical side wall **44** which carries an outwardly projecting flange **46** at its bottom edge. The flange **46** at the bottom edge of the inverted cup **40** rests on and is affixed to the base plate **24** of the dished member **22** by cement or by other suitable means.

Disposed circumferentially about the cylindrical side wall **44** of the inverted cup **40** are circularly-shaped journal bearing openings **50** which are in radial and vertical alignment with the U-shaped bearing slots **30** in the cylindrical side wall **26** so as to receive and bear the inner portion of the spokes **33** disposed radially about the main body **10**.

The inner end **54** of each spoke **33** projects into the inverted cup **40** and is offset laterally from the axis of the spoke. As shown in FIG. 3, the upper face of the base plate **24** and the lower face of the annular plate **42** act as stops to limit rotation of the spokes **33** by engaging the offset inner end **54** thereof in such manner as to restrict rotation of the spokes on their own longitudinal axes to about 30 degrees. (FIG. 3 shows a paddle **60** and inner offset portion **54** of the spoke **33** which bears the paddle in each of its extreme positions.)

Mounted over the outwardly projecting portion of each of spokes **33** is a paddle **60**. In the embodiment of FIGS. 1, 2 and 3 the spoke **33** forms the leading edge of the paddle **60**, and the thickness of each paddle tapers from substantially the thickness of the spoke **33** at its leading edge to a knife edge at its trailing edge. The paddles preferably are fabricated of wood or other material having a specific gravity approximately equal to that of water, e.g., on the order of about 0.85 to 1.0, whereby they tend by buoyancy and surface tension effects to follow readily any undulations or waves in the surface of a body of water in which the toy is disposed. Other materials such as metals and rigid and suitably flexible plastics (e.g. rubber) may also be employed, however, provided the paddle is sufficiently light in weight and properly balanced such that the paddle is able to pivot freely and follow wave motion when exposed thereto.

A rearward, lateral offset in the outer end of the spoke **33** serves, together with the weight of the paddle **60**, to counterbalance the weight of the forward offset used on the inner end **53** of the spoke to limit its rotatiton.

A washer **62** spaces the inner race **64** of an antifriction ball bearing **66** from the uppermost surface of the upper flattened hemispheroidal member **12**. The inner race **64** is mounted on the threaded shaft **16** and is held thereon by a head **72** which caps the top of the shaft. Optionally, a flag or other novelty item **74** may be mounted on the head **72** to project above the toy and to rotate therewith.

Press-fitted to the outer race **76** of the ball bearing **66** is an annular supporting member **78** from which four radial arms **80** of equal length project horizontally outward at 90 degree intervals to support, at their outer extremities, a guard ring **70**. Inasmuch as the guard ring **70** projects radially outwardly beyond the outer tips of the paddles **60** and also beyond any other element of the instant toy, the guard ring **70** acts to fend off or otherwise protect the toy from collision with foreign bodies.

The guard ring **70** is free to rotate on the bearing **66** completely independently of the remainder of the toy. Thus, impingement of the guard ring on a foreign object does not interfere with rotation of the toy.

A threaded nut **82** carried on the shaft **16** maintains the buoyant body **10**, the shallow dished member **22** sandwiched therein, and the anti-friction ball bearing **66**, in their respective positions on the shaft **16**.

A portion of the threaded shaft **16** depends below the threaded nut **82**. Threaded to the protruding portion of the shaft is a non-buoyant mass in the form of a bulb

90 and stem 92. The bulb 90 is rubber-covered to protect from injury any foreign objects it may encounter. The length of the stem 92 and bulb 90 and their specific gravities are such that the center of gravity of the toy is located a minimum distance of two times the diameter of the flattened hemispheroidal member 12 of FIG. 2. The stability of the unit increases with the depth the stem and bulb take in the water, with an optimum practical distance being approximately five times the diameter of the hemispheroidal member 12. The specific gravity of the stem and bulb will vary with the size of the toy. The main consideration being keel stability to prevent tipping of the toy and total weight being adjusted to bring the paddles 60 to the optimum operating position. The toy is balanced such that the water line of the toy is at or slightly above the horizontal plane of the paddles 60.

A modified means of mounting circular paddles 60 on spokes 33 is illustrated in FIG. 4. In this embodiment the paddles 60 are mounted on the spokes 33 approximately through the center of the zone between the center of gravity of the paddle and its leading edge.

FIG. 5 illustrates an alternative paddle construction in which the spokes 33 are provided with a short vertically downward offset or stop 92 between the paddle 60 and the side wall 26. This displacement in the horizontal plane of the spoke 33 facilitates adjustment of the height of the paddle by bending of the spoke if necessary in order to accommodate variations in buoyancy of the toy as a whole, the positions of the bearings for the spokes, and the like.

FIG. 6 illustrates a one-piece bearing structure in which the vertical cylindrical walls 26 and 44 and the annular plates 24 and 42 are combined into a single, integral unit with the inner circular opening 28 in annular plate 24 being of the same diameter as the inner diameter of the inner vertical wall 44.

In use, the toy, which is buoyant, is floated in water of a depth greater than its vertical height and is exposed to wave action in the water, the paddles being disposed at or slightly below (e.g., up to about ½ inch) the water line of the toy and free to oscillate or flap up to about ±15 degrees from the horizontal. As a wave encounters a paddle, the trailing edge of the paddle elevates and rotates the paddle and its spoke until the paddle is restrained from further rotation by the limiting action of the offset inner end of the spoke 54 within the cup 40. After the crest of a wave passes over a paddle, the trailing edge of the paddle immediately drops downwards until the offset on the inner end of the spoke associated therewith reaches its lower "stop" position by engaging the annular plate 24, or, in the case of the structure of FIG. 6, the upper surface of the lower hemispheroidal member 14. The continued downwards pressure of the water above the paddle on the upper surface thereof exerts on the paddle an unbalanced force having a horizontal component directed towards the trailing edge of the paddle, which is conjunction with similar forces acting on the other paddles, causes the toy as a whole, with the exception of the freely spinning guard ring 70, to spin at a high rate of speed. The non-buoyant bulb 90 and stem 92 serve to stabilize the toy against undue tipping and bobbing in rough water, and thereby insure that all paddles remain in contact with the water at all times.

It is to be understood that the invention herein illustrated and described is to be limited only by the scope of the appended claims and that various changes and modifications may be made in details of construction without departing from the true spirit of the invention.

What is claimed is:

1. A wave-powered aquatic toy comprising a body disposed about a vertical axis, a plurality of paddles supported from said body circularly about said axis not above the water line of said toy, said paddles being free to flap to a restricted extent along an axis eccentric thereto under the influence of waves thereon, and means disposed below said paddles for stabilizing said toy against tilting from said vertical axis under the influence of waves thereon, whereby said paddles remain in contact with such waves to spin said toy at a high rate of speed under the influence of waves thereon.

2. A revolving wave-powered aquatic toy comprising a circular body disposed about a central vertical axis, a plurality of paddles suspended from said body circularly about said axis in a horizontal plane slightly below the water line of said toy, said paddles being free to flap to a limited extent on an axis eccentric to the center of gravity thereof under the influence of waves thereon, and means disposed below said paddles for stabilizing said toy against tilting from said vertical axis under the influence of said waves thereon, whereby said paddles remain in contact with such waves to spin said toy at a high rate of speed under the influence of waves thereon.

3. A revolving wave-powered aquatic toy comprising a buoyant circular body, a plurality of spokes projecting radially from said body, each of said spokes having a paddle mounted on the outwardly projecting end thereof, said paddles having a specific gravity substantially the same as that of water and being mounted eccentrically on said spokes in a substantially horizontal plane at approximately the water line of said toy, means for permitting limited rotary oscillation of said spokes along the principal axis thereof to enable said paddles to flap under the influence of wave action thereon, and a stabilizing mass of non-buoyant material depending from said toy and disposed on the axis of said circular body substantially below the water line of said toy to minimize tilting thereof under the influence of waves thereon, whereby all of said paddles remain substantially in contact with such waves to spin said toy at a high rate of speed under the influence of said waves thereon.

4. A revolving wave-powered aquatic toy comprising a buoyant circular body, a plurality of spokes projecting radially from said body, said spokes being journalled into said body to permit rotation thereof in said journals, the inwardly projecting ends of said spokes being laterally offset, stop means on said body which engage said offset ends to limit rotation of said spokes to about 15 degrees from the horizontal, an offset on the outwardly projecting ends of said spokes which counterbalances the offset on the inwardly projecting ends, paddles mounted on each over the outwardly projecting end of each of said spokes including the offset thereon, said paddles having substantially the same specific gravity as water and being disposed, when said spoke is in mid-position of its path of limited rotation, in a substantially horizontal plane at approximately the water line of said toy, the center of gravity of said paddle being displaced from said spoke on which said paddle is mounted in the direction in which said outwardly projecting end is offset, and a non-buoyant mass suspended from and disposed below said buoyant body substantially below the water line of said toy to stabilize said toy against tilting under the influence of waves thereon, whereby said paddles remain in contact with such waves to spin said toy at a high rate of speed under the influence of waves thereon.

5. A wave-operated floating aquatic revolving toy comprising a body disposed symmetrically about a vertical axis, said body having a buoyant upper portion, support means supporting a plurality of paddles coaxially with said body in a substantially horizontal plane not above the water line of said toy, said paddles being adapted to flap under the influence of waves thereon, means for restricting the flapping of said paddles above and below said substantially horizontal plane, guard means disposed beyond the outermost projection of said paddles to protect said paddles from impinging upon foreign objects during operation of said toy, and a non-buoyant stabilizer disposed below said buoyant upper portion for stabilizing said toy against tilting under the influence of waves thereon, whereby said paddles remain in contact with

such waves to spin said toy at a high rate of speed under the influence of waves thereon.

6. A wave-operated floating aquatic revolving toy comprising a body disposed symmetrically about a vertical axis, said body having a buoyant upper portion, support means supporting a plurality of paddles coaxially with said body in a substantially horizontal plane not above the water line of said toy, said paddles being adapted to flap under the influence of waves thereon, means for restricting the flapping of said paddles above and below said substantially horizontal plane, a guard ring mounted on said body coaxially therewith, said ring having a radius greater than the maximum radially outward projection of said paddles and paddle-support means and being free to rotate on said body so as to protect said paddles and paddle-support means from impinging upon foreign objects during

operation of said toy, and a non-buoyant stabilizer disposed below said buoyant upper portion for stabilizing said toy against tilting under the influence of waves thereon, whereby said paddles remain in contact with such waves to spin said toy at a high rate of speed under the influence of waves thereon.

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