April 18, 1961 H. R. STAAF 2,979,861

MAGNETIC TOY DEVICE

Filed March 16, 1959

FIG. 1

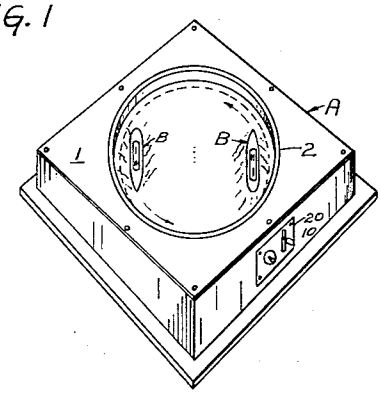


FIG. 2

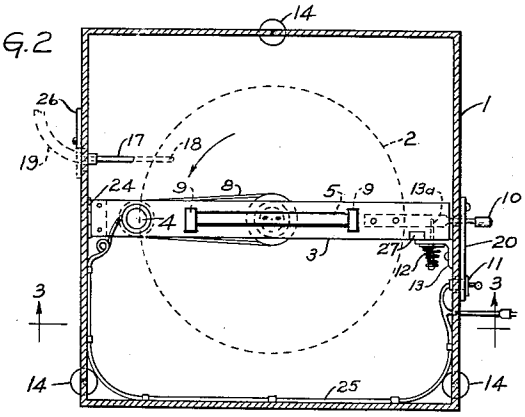


FIG. 3

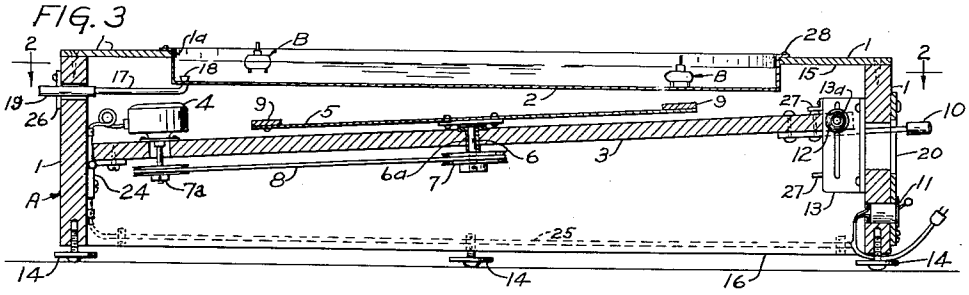


FIG. 4

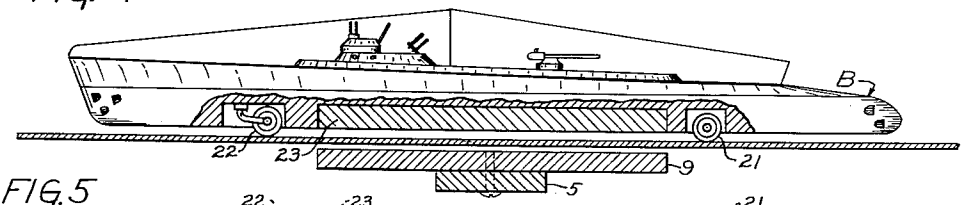


FIG. 5

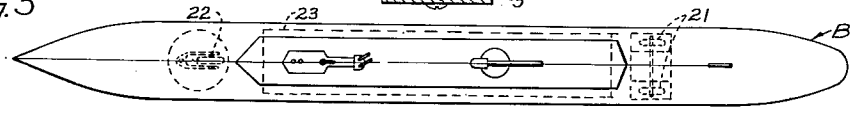
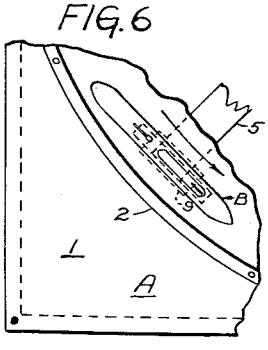


FIG. 6



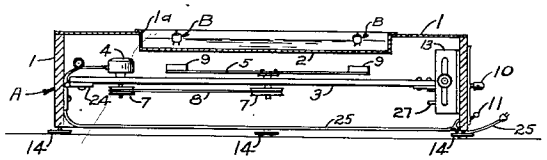


FIG. 7

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MAGNETIC TOY DEVICE

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3 Claims. (Cl. 46—239)

This invention relates to an improved magnetic device; in particular it comprehends a novel magnetically actuated article which can be used for amusement purposes as well as advertising displays and the like.

Previous efforts to cause objects, such as toy ships, model submarines, simulated fish, etc., to change position both vertically and horizontally in a liquid filled tank or reservoir without visible means of propulsion have been characterized by an excessive number of mechanical components and rather complex articulated linkages. Such strategms have been found necessary to propel the driven objects in more than one plane through the medium of an externally applied magnetic field. My patent, No. 2,500,475, Magnetically Actuated Toy, application No. 685,319, filed July 22, 1946, sets forth in detail the features of such a device. While devices of this character have functioned well they have been costly to manufacture because of their intricate construction and large number of moving parts.

It is therefore a broad object of this invention to provide an improved and simplified magnetically actuated device;

Another object of this invention is to provide a magnetically actuated amusement device characterized by a neat outward appearance and ease of manufacture;

Still another object of this invention is to provide in a magnetically operated flotation type toy device novel means for cyclically varying the displacement of a buoyant object in a tank;

Yet another object of this invention is to provide a magnetically operated toy device having facile means for releasably adjusting the spatial relationship between the driven objects and the driving magnetic means;

Another object of this invention is to provide novel and concealed means for causing floating objects in a tank to be propelled in both the horizontal and the vertical direction.

These and other objects and advantages of the invention will become apparent from the following detailed description taken in connection with the accompanying drawings, in which is shown a preferred embodiment of the invention by way of illustration only.

In the drawings:

Figure 1 is a perspective view of the invention;

Figure 2 is a horizontal cross sectional view of the invention;

Figure 3 is a sectional view, somewhat enlarged, taken along the line 3—3 of Figure 2;

Figure 4 is an enlarged elevational view, partly in section, of a driven object used in the invention;

Figure 5 is a plan view of the object shown in Figure 4;

Figure 6 is an enlarged partial plan view of the invention showing the relative movements of selected components, and

Figure 7 is an elevation view of the invention in cross section.

Referring to Figure 1 of the drawings, it can be seen

that the invention has a box like outer housing A with a removable top surface 1. Housing A may be fabricated of suitable materials such as wood, plastic or light metal. Surface 1 is cut out as at 1*a* to provide an opening into which shallow tank 2 is positioned. Tank 2 is preferably made of a non-magnetic easily formed material such as sheet aluminum or it may be of plastic construction.

Buoyant objects B, which may be formed in the shape of a model submarine, toy ship, fish and the like, are placed in tank 2 for use either as flotation members or as dry tank objects. If used for the latter purpose, objects B are equipped with antifriction casters 21 and 22 as shown in Figure 4. For propulsion purposes, each object B is provided with a magnetically attracted keeper 23 that is responsive to a rotating magnetic field, as will be explained.

Drainage of tank 2 is accomplished through an opening in the bottom thereof which is sealed by stopper 18. A small tube 17 permits the liquid in tank 2 to drain into a detachable hose 19. The drainage hole is normally concealed by slidable plate 26 on the outside of housing A.

Located beneath tank 2 and positioned within housing A is support member 3. As illustrated in Figure 3, support member 3 is secured at one end thereof to an inner wall of housing A by hinge 24. Although shown in the drawings as rectangular in cross section, support member 23 may be of any desired cross sectional configuration. An adjusting pin 10 is fastened to the free end of support member 23 and protrudes through housing A by means of a vertical elongated slot in plate 20 which is secured to the outside of housing A. Plate 20 also serves as a mounting for electrical switch 11.

Attached adjacent the free end of support member 3 and at right angles to the longitudinal axis thereof is follower 13*a*, which may be either a screw or a bolt member. The angular travel of support member 3 is confined by positioning follower 13*a* in a vertical elongated slot in hanger 13 which is secured to the inner wall of housing A adjacent the free end of support member 3. As shown in Figures 2 and 3, hanger 13 may be a right angle connection with one leg thereof being slotted to provide a limited vertical travel for follower 13*a*. Compression spring 12 urges support member 3 against hanger 13 and frictionally restrains the movement thereof until an adjustment is made by the operator by moving adjusting pin 10 up or down. Stops 27 on hanger 13 limit the upward travel of support member 3 to a predetermined position and limit the downward movement so that support member 3 cannot be positioned below a horizontal position.

The rotative elements of the invention provide the magnetice field which causes objects B in tank 2 to move in response thereto. These include arm 5 mounted upon shaft 6 which extends through the medial point of support member 3 and is normal to the longitudinal axis of support member 3. A suitable hub and bearing assembly 6*a* allow for the free rotation of shaft 6 through support member 3. Pulley 7 is fastened to shaft 6 at the end thereof remote from arm 5. An electrical motor unit equipped with the proper reduction drive and designated with reference numeral 4 is positioned on support member 3 adjacent the hinged end thereof as shown in Figure 3. The shaft of motor unit 4 extends through support member 3 in a manner similar to shaft 6 of arm 5 and is parallel thereto. Pulley 7*a* is attached to the shaft of motor unit 4 transmitting power to arm 5 through belt 8.

Arm 5 rotates in a plane slightly above and parallel to support member 3 and carries a magnet 9 at each end so that a rotating magnetic field is set up when the unit is energized. This field acts upon the keepers 23 in objects B

causing objects B to move in a well defined path within tank 2.

When support member 3 is in a horizontal position each magnet 9 describes an arc characterized by a uniform elevation throughout the length of the arc. In this condition it can be seen that the magnetic field will remain constant as the distance between the magnets 9 and the keepers 23 does not change during a single revolution. However, if support member 3 is elevated at the free end thereof by means of adjusting pin 10, the arc described by magnets 9 during their rotation will vary in elevation from a high position on the free side of support member 3 to a low position on the hinged side of support member 3. Thus it can be seen that under such conditions keepers 23 will be subjected to cyclical variations in their magnetic "pull" causing vertical as well as horizontal movements to be imparted to objects B.

Motor unit 4 operates on ordinary 110 volt A.-C. current and is provided with cord 25 for ready plug in to an outlet. Three leveling screws 14 serve to enable the device to be operated upon an inclined or uneven surface.

In the operation of the invention water is poured into tank 2 causing objects B to float. By means of adjusting pin 10 support member 3 is set either in a horizontal or an upwardly inclined position. As explained above, it is thus possible to vary the type of movement imparted to the floating objects and observe many interesting and novel displays depending upon the creativity and imagination of the operator.

For dry tank operation support member 3 may be set at the horizontal position to minimize frictional drag.

Thus I have provided a new and improved means for magnetically driving a freely movable buoyant object in both the horizontal and the vertical plane and have eliminated many of the components found in devices similar to the one described herein.

Although the invention has been described in particular terms, it is to be understood that the present disclosure is made for the purpose of illustration and not by way of limitation, the scope of the invention being interpreted in the light of the appended claims.

I claim:

1. In a magnetic toy device having an outer casing and a liquid containing receptacle therein and having buoyant objects freely movable in the receptacle in response to a movable magnetic field, the improvement for varying the vertical movement of the buoyant objects in the liquid in the receptacle, said improvement comprising a support member hingedly connected at one end to said casing beneath said receptacle and adapted to rotate upwardly from a horizontal position, an arm rotatably mounted parallel to and on said support member, magnetic means on said arm, means for rotating said arm, and means for adjusting the free end of said support member in an angular position whereby the distance between said magnetic means and said buoyant objects may be altered to cause vertical displacement of said buoyant objects when said arm rotates beneath said receptacle.

2. In a magnetic toy having a box like outer casing and having a liquid containing receptacle mounted therein, and having movable buoyant objects in the receptacle adapted to be moved by magnetic means, the improvement for readily changing the components of the magnetic field applied to the buoyant objects in the receptacle, said improvement consisting of at least one hinged support member positioned below the receptacle, an arm rotatably mounted parallel to and on said support member, magnets carried on the outer ends of said arm, means for rotating said arm, and means for releasably securing said support member in either an angular or a horizontal position with respect to the water level in the receptacle whereby the magnetic field between said magnets and the movable objects may be altered to cause alternate submersion and flotation of said objects during the rotation thereof.

3. A magnetically actuated device comprising a tank adapted to contain a liquid, means for supporting said tank, a buoyant object responsive to a magnetic field freely movable in said tank, a support member hinged at one end to said tank support means and below said tank to permit the angular relationship between said support member and said tank to be varied, at least one magnet mounted on arm means rotatably mounted on said support member, said arm means being parallely disposed to said support member and below said tank to impart motion to said buoyant object in said tank, and means for releasably adjusting the elevation of the free end of said support member thereby causing said object to alternately submerge and surface during the rotation of said magnets beneath said tank.

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