Jan. 3, 1967 H. R. DESSAU 3,295,153

PASSIVE STABLE BUOY

Filed March 24, 1965 2 Sheets-Sheet 1

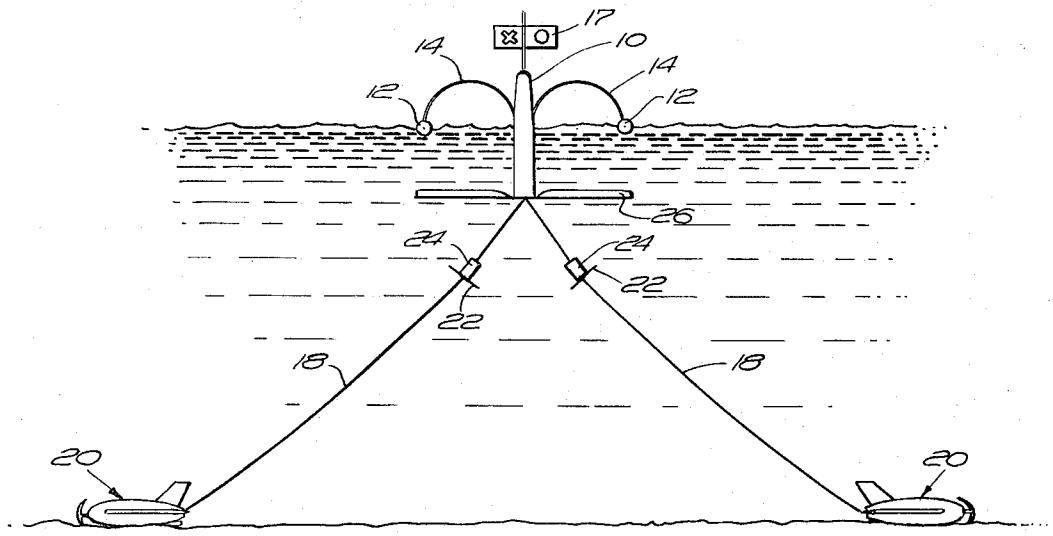


FIG. 1

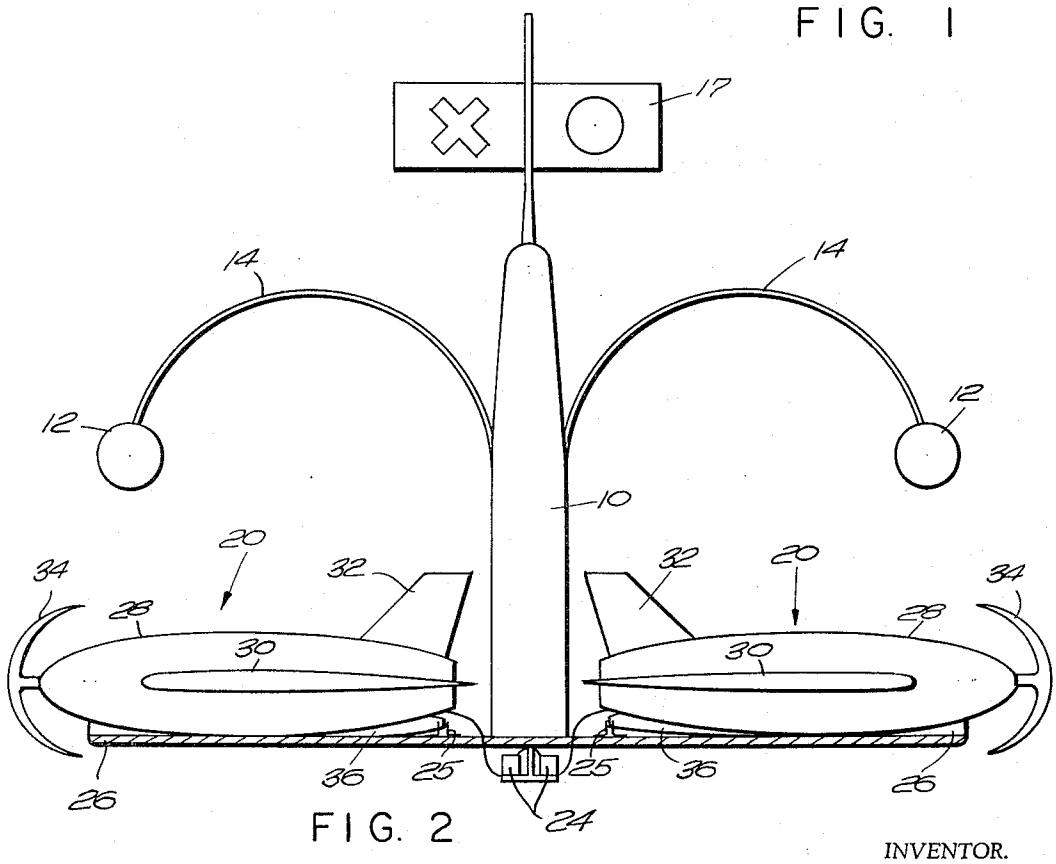


FIG. 2

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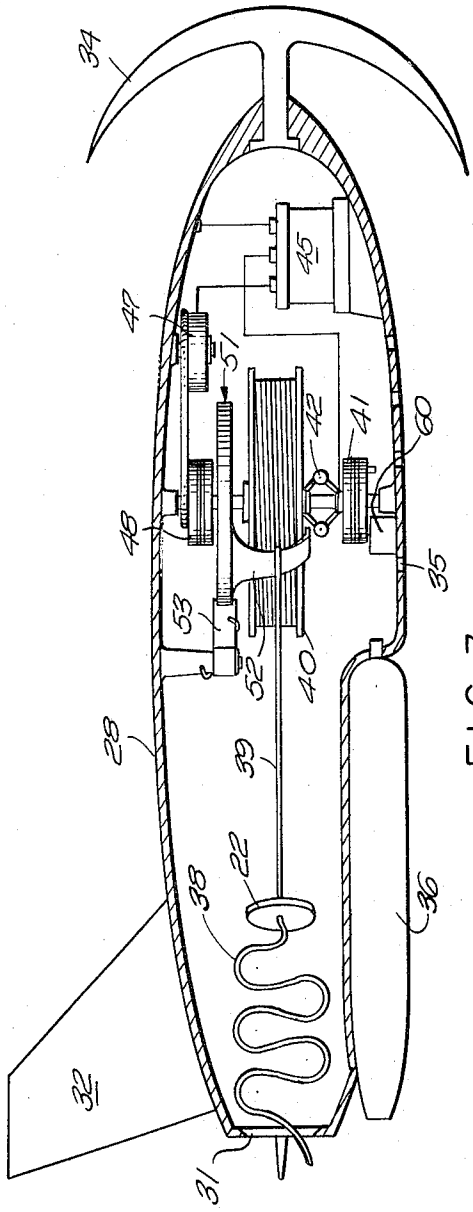


FIG. 3

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PASSIVE STABLE BUOY

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9 Claims. (Cl. 9—8)

The present invention relates to buoys and more particularly to buoys which may be employed as temporary markers for providing a stable reference point at a certain fixed position on the surface of a body of water.

Traditionally, buoys have been positioned by securing them by cable to anchors. When only a single anchor and cable is used, the buoy is subject to drift under the effects of winds or sea. To overcome this drifting problem and to provide a stability to the buoy, multiple anchors manually placed in position are used. In many situations such manual positioning of multiple anchors is impossible and easily placed single anchor buoys are inadequate because of their tendency to drift.

A typical example of such a situation would be a mine sweeping operation while under enemy fire. In such an operation the mine sweeper cannot remain in a fixed position for a sufficient length of time to manually secure multiple mooring lines and a single mooring will not provide the stable reference point required. In other situations such as navigational surveys, such buoys may be positioned only with a great expenditure of time and effort by the survey crew.

The present invention, however, overcomes these and other problems associated with both singly moored and multiply moored buoys and simultaneously provides other advantageous features never before available in such devices.

Broadly speaking, the buoy of the present invention includes a central floatation section carrying a beacon and having releasably attached thereto a plurality of self-anchoring cable carriers. These anchoring devices are arranged to release themselves from the central floatation section upon immersion and to submerge to the bottom and thereafter affix themselves to the bottom in such a manner as to moor the floatation section so that its position is not adversely affected by changes in the sea condition.

The device thus can be readily dropped from a moving ship or aircraft and will automatically anchor itself at multiple points to provide a stable reference. Furthermore, by making each anchor a part of a self-propelled hydrodynamically designed cable carrier, the anchors ultimately secure themselves at long distances from the central floatation section thus assuring that the central floatation section is tightly restrained by long shallow lines. By placing weights on the lines after anchoring added stability of position is provided and permanent mooring of the anchors is assured.

In each of the cable carriers there is a clutch and rewind mechanism for maintaining the tension on each line at a constant value when the anchor is secured to the bottom. The cable carriers horizontally plane outwardly from the central floatation section and simultaneously play out a cable secured to the central floatation section until their power is expended after which they sink to the bottom and secure themselves thereto thus assuring that long shallow lines are securing the central float.

The use of such self-propelled cable carriers in which the bulk of the entire weight of the unit is concentrated provides for maximum buoyancy of the central floatation section for a given size, thus reducing considerably the overall size of the unit necessary and making the unit very compact.

Thus, the present invention provides an automatic self-placing stable reference buoy which can be placed in the water under all types of conditions with minimum time and effort.

Still further, the device is arranged to apply compensating tension to each of its anchoring lines to maintain the floatation section in a fixed stable position relative to the bottom of the sea.

These and further advantages and features of the invention will become apparent from the following detailed description of a preferred embodiment thereof when read in connection with the accompanying drawings in which:

FIG. 1 is an elevational view of the buoy in extended operative position;

FIG. 2 is a figure of the buoy when the buoy is ready to be dropped; and

FIG. 3 is a cross-sectional view of the anchor section of the buoy shown in FIG. 1.

As shown in FIG. 1, the unit is formed of a buoyant generally cylindrical floatation section **10** which may be a hollow tank or other suitable float having a plurality of stabilizers **12** affixed thereto by outrigger arms **14**. Firmly affixed to the uppermost portion of the float **10** is a signal or beacon marker **17** which may consist, for example, of a flashing light. The float **10** is affixed by wire cables **18** to torpedo mechanisms **20** which serve as cable carriers and anchoring devices. Stop mechanisms **22** are firmly affixed to each line **18**, at a predetermined distance from the point where it is secured to the body of float **10**. These stop mechanisms **22** are fastened to each line **18** so as to firmly position a weight **24** at a predetermined distance from the float **10**. These stop mechanisms **22** are fastened to each line **18** so as to firmly position a weight **24** at a predetermined distance from the float **10**. The weights **24** are selected to supply a final amount of tension to the lines **18** to add an increased stability to float **10**. The tensioned cables **18** attached to the float **10** thereby acts as a triangulated structure to retain the float **10** in a fixed position relative to bottom.

The maximum depth of water in which the device can be used is limited only by the practical difficulty of handling great lengths of mooring lines.

In order to fully appreciate the device and the use to which it would be put, reference must now be made simultaneously to FIGS. 2 and 3. Three torpedo mechanisms **20** are preferably placed at 120° around the body of float **10**. In order to provide a rigid structure so as to prevent premature shearing off of torpedoes **20** when the unit is dropped in the water, it is preferable that each torpedo **20** be supported by a rail mechanism **26** positioned under the torpedoes **20**. The torpedoes **20** are firmly but releasably affixed to the rails **26** by means of devices such as explosive bolts **25**. The rails **26** prevent undue shearing stress from being applied to the explosive bolts **25** and prevent disturbance of the torpedoes **20** so that they remain in a relatively fixed and stable position with reference to section **10** until released.

The torpedoes are of a generally streamlined shape adapted to be propelled easily through water and preferably are hydro-dynamic shells which will plane through the water beneath the surface thereof so as to reach the maximum desired distance with a given amount of propellant. Attached to the body **28** of torpedo **20** are horizontal planing surfaces or vanes **30** protruding from either side of torpedo body **28** which provide a predetermined amount of lift to the torpedo **20**. A vertical stabilizer plane **32** is also provided on body **28**. The vanes **30** and stabilizer **32** are constructed to be adjustable to any position such that the torpedo may be driven at any angle through the water. In order that the torpedo **20** can be fixed to the bottom of the sea, an anchor

mechanism 34 is provided on its nose. In its preferred form, the torpedo 20 is made as a single compartment having in its tail an opening 31 through which the cable 18 and stopper 22 may be drawn and has rigidly provided on its underside a propelling mechanism such as a gas cartridge 36 to propel torpedo 20 through the water. The distance that the torpedo 20 will travel through the water will depend in great degree on the amount of charge contained in cartridge 36. It should, of course, be understood that any other convenient propulsion mechanism may be substituted for gas cartridge 36.

The unit, as represented in the configuration of FIG. 2, is dropped in the water either from an aircraft such as a helicopter or from a ship such as a mine sweeper.

After landing in the water the entire unit will float and stabilize itself on a substantially even keel. However, the cable carriers are arranged such that they will immediately begin to fill, with water, through holes 35 provided in their bottoms. As these cable carrying torpedoes 20 fill, the entire unit will sink since the buoyancy of the float 10 is not sufficient to keep the filled cable carriers afloat. At a predetermined depth, which is selected to prevent any of the torpedoes from striking the hull of the ship the bolts 25 are exploded and the gas cartridge 36 is ruptured, thus releasing the torpedos 20 and propelling the torpedoes 20 away from the float 10.

The initiation of the gas cartridge 36 and the exploding of explosive bolts 25 may be provided by any well-known depth sensing device.

After release of the torpedoes 20 from the central float 10 the buoyancy of the float 10 is such that it now rises to the surface.

As torpedoes 20 move away from float 10, the cable 18 is drawn from the interior of the torpedo body 28. This cable 18, which is firmly affixed to the body of float 10 by means of any suitable mechanism such as ring bolt, has portion 38 loosely stored within the body of torpedo 20 and a second portion 39 stored on a reel 40 firmly fixed within the torpedo 20. As the torpedo initially moves away from the float 10, the loosely stored portion 38 of cable 18 is released without providing any drag or tension on the cable 18. When the end of stored portion 38 is reached, a stopper cap 22 is pulled from the body 28 of torpedo 20 and simultaneously the unreeling of portion 29 from reel 40 is initiated. As the torpedo 20 proceeds through the water, the portion 39 of cable 18 uncoils from reel 40. A slipping clutch mechanism 41 having a balanced pendulum governor 42 affixed thereto maintains a predetermined tension on the cable 18 as it is drawn from reel 40.

When the entire charge of the gas cartridge 36 is expended the cable carrying torpedo 20 will sink to the bottom. When the torpedo hits bottom, the flukes of the anchor 34 sink into and engage the bottom. In order to assure that the flukes of anchor 34 securely engage the bottom and to stabilize the position of the floatation section 10, tension must be applied to the entire cable 18.

This tension is provided cable 18 by the following sequence of events. When the torpedo 20 hits bottom the friction generated by slipping clutch 41 stops the reel 40 causing the cable 18 to go slack. As the reel 40 stops the balanced governor 42 affixed thereto stops spinning and closes on itself. This closing of the governor 42 actuates and electrical contact which fires an explosive pin 60 which jams the slipping clutch 41 and locks reel 40 so that it cannot backspin. Simultaneously, the same electric contact also turns on an electric timer 45. The timer 45 will, after a selected period, initiate a spring motor 47, which is coupled through a rewinding clutch 48 to a ratcheted rewind mechanism. This rewind mechanism consists of a gear 51 bearing against a spring loaded pawl 53. An arm 52 attached to the gear 51 picks up the cable 39. Spring motor 47 drives the gear 51 through clutch 48 in a direction opposite to reel 40.

This arm 52 attached to gear 51 picks up the cable and rewinds it on the reel 40. When the tension on cable 18 reaches a value equal to the slipping factor of clutch 48 no further rewinding of cable 18 will occur and spring motor 47 will run free until it runs down and stops. To prevent backslippage of gear 51, pawl 53 is positioned to engage the tooth surface of gear 51. When all the torpedos 20 have completed the above-described sequence of operation, the float 10 will have assumed a position relative to the sea bottom consistent with constant tension on all lines. At this time a release mechanism (not shown) provided in the central float releases weights 24. The weights preferably consist of metal cylinders each having a longitudinal opening through which the cable 18 may pass. Each weight is attached to float 10 at a common point by any suitable means such as a clamp. Release of these weights from the float 10 is accomplished by any convient apparatus such as by a relay or a small explosive charge, initiated by an electrical timer in the float 10 (not shown) or by any other siutable mechanism. The weights upon release fall along cable 18 to stoppers 22 where they provide a final desired degree of tension on the anchor lines and pull the buoy into a final equilibrium position. These weights 24 may be of any predetermined size, depending upon the buoyancy of the floatation tank, the depth of the water and other considerations. It should, of course, be understood that all the electrical apparatus and wires are insulated from the water in the carrier so that short circuits do not occur.

The size of the unit and the depth to which the unit may be employed will vary upon its use. Although the line 18 is conceived to be a steel cable, other materials may readily be used. For example, synthetic materials such as fiberglass or natural materials such as impregnated sisal may be readily utilized. It should also be obvious that further adaptations and modifications of the present device may now become apparent to one skilled in the art. Therefore, it is desired that the invention be limited in scope only by the appended claims.

What is claimed is:

1. A marine buoy adapted to remain on the surface of a body of water in a fixed stable position with reference to the bottom of said body of water not withstanding winds and adverse sea conditions comprising a central float and plurality of self-propelled, self-anchoring cable carriers releasably secured thereto, each of said carriers containing a cable, each of said cables being affixed to said float and maintained on a reel within said carrier, each of said carriers further including means for releasing the cable maintained therein and for applying a compensating tension to said cable to maintain said float in a fixed stable position relative to the bottom of the body of water after the carriers sink to said bottom and anchor themselves thereto.

2. The device described in claim 1 wherein said carriers are symmetrically disposed about said float.

3. The device described in claim 1 wherein three carriers are disposed about said float 120° apart.

4. The device of claim 1 wherein gas cartridge means are provided on said cable carriers to propel said carriers horizontally through the water after said carriers are released from said float and said cartridge is ruptured.

5. The device of claim 1 wherein anchoring means are disposed in the nose of each carrier.

6. The device of claim 1 wherein said carrier is releasably secured to the said float by explosive bolts whereby upon firing of the explosive charge in each of said bolts said cable carrier is released from said float.

7. The device of claim 1 wherein a plurality of weights are releasably secured to said float and means on said float for releasing said weights from said float thereby permitting a weight to pass down a respective cable a fixed distance after said carriers have sunk to the bottom and compensating tension has been applied to said cables.

8. A marine buoy adapted to remain on the surface of a body of water in a fixed stable position with reference to the bottom notwithstanding winds and adverse sea conditions, comprising a central float, a plurality of cable carriers releasably secured thereto, said cable carriers being symmetrically disposed about said float, and cables secured to said float at a common point, each cable passing into the interior of a respective cable carrier and being maintained therein on a reel, said cable carrier further having disposed therein a clutch mechanism connected to said reel for releasing said cable at a fixed rate, means affixed to said clutch and said reel to lock said clutch and said reel after said cable carrier bottoms and a mechanism for appyling a predeterminable tension to said unreeled cable.

9. A buoy comprising a central flotation tank, a plurality of cable carriers releasably secured thereto, said cable carriers being symmetrically disposed about said

tank, and a cable secured to said tank and passing into the interior of each of said cable carriers and maintained therein on a reel, said cable having a stop mechanism maintained thereon a fixed distance from said float, a clutch mechanism connected to said reel, a governor affixed to said clutch mechanism and said reel, an actuator to lock said clutch when said cable carrier bottoms and a rewind mechanism comprising a toothed gear bearing against a pawl, and an arm attached to said gear, said arm being adapted to pick up said cable and rewind said cable on said reel thereby applying a fixed tension to said cable, said pawl bearing against said gear as to prevent said gear from reversing its direction of travel.

No references cited.

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