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SWIMMER'S MARKER BUOY

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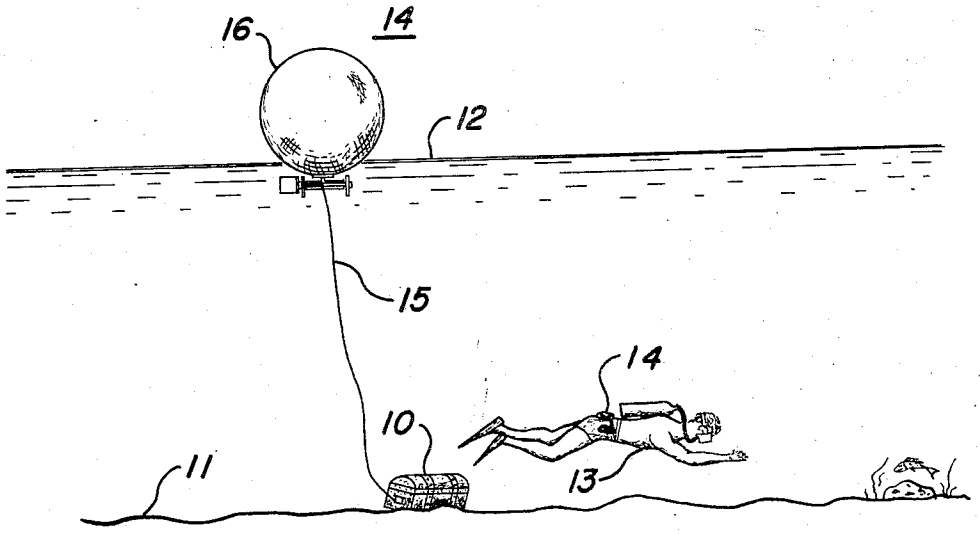


FIG. 1

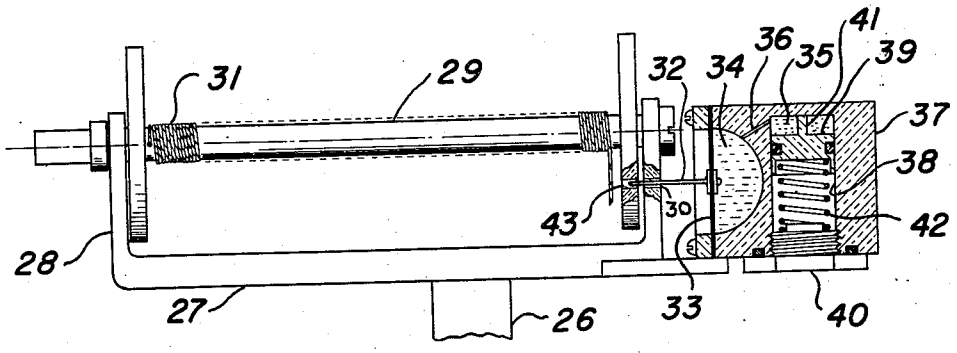


FIG. 2

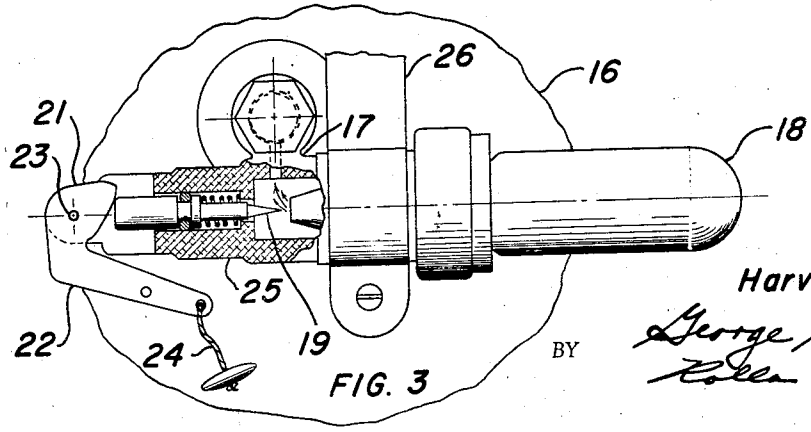


FIG. 3

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SWIMMER'S MARKER BUOY

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1 Claim. (Cl. 9—9)

(Granted under Title 35, U. S. Code (1952), sec. 266)

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

The present invention relates to buoys and more particularly to buoys suitable for use by swimmers for marking at the surface the position of underwater objects discovered or located by them.

Swimmers using "Aqua-Lungs" or similar underwater breathing devices are frequently employed in searching the ocean floor for objects which it is desired to recover, remove, or destroy, or at least avoid. Much of this searching takes place at water depths sufficiently great to endanger the swimmer if he descends and ascends too rapidly or too often. Accordingly, anything which enables a swimmer to increase the percentage of his productive search time during his permissible operating period increases his efficiency while lowering the hazard to his person. One way of accomplishing such increases is to supply the swimmer with buoys which in a collapsed state are compact and light enough to enable him to attach several of them to his belt so that he need not, as heretofore, come to the surface after each successful object buoying operation but may continue his search until his supply of buoys is exhausted or his permissible operating time expires.

In the buoying of submerged objects as described it is essential that the length of line available on the buoy be ample to make certain that it will enable the buoy to reach the surface, and it is very desirable to have no more line payed out than is required for the buoy to surface to the end that the buoy will ride as nearly vertical as local conditions permit and will not render a false marking as would be the case if wind and normal motion of the water surface could result in the paying out of excess line.

The primary object of the present invention is to provide a buoy kit which in a collapsed condition is compact enough to enable a swimmer to carry without inconvenience several of them attached to his belt or otherwise.

Another object of the invention is to provide as a buoy unit an inflatable member, inflation means, and reel means for carrying a line or cord for connecting the unit to an object to be buoyed.

An important object of the invention is to provide a buoy as described which avoids the paying out of too much line to thereby assure accurate marking by the buoy.

Other objects and advantages of the invention will be apparent from the following description when read in connection with the accompanying drawing in which:

Fig. 1 is a view in perspective of the buoy of the invention performing its intended terminal function;

Fig. 2 is a longitudinal view partly in section the reel carrying the buoy line; and

Fig. 3 is a fragmentary bottom view partly in section of a buoy assembly according to the invention.

Referring to the drawing, there is shown in Fig. 1 an object **10** resting on the bottom **11** of a body of water

having a surface **12**. A swimmer **13** after having found the object **10** and marked its position at the surface **12** by attaching one of the buoys **14** from his belt to the object **10** through the buoy line **15** is shown on his way to search for other desirable objects to each of which he will attach another buoy **14** from his supply thereby converting jetsam to lagan. The swimmer **13** can thus continue his search from one discovery to another without surfacing with its attendant loss of time and orientation.

The buoy **14** according to the invention comprises a collapsible inflatable member **16** (a regulation basketball bladder has been found eminently suitable) having a valved neck **17** through which an inflating medium may pass from a pressure cartridge **18** when the latter is ruptured as by a pin **19** under the control of the cammed arm **21** of a bell crank lever **22** when rotated about its pivot **23** as by pulling on a cord **24** secured to the distal end of said lever **22**. It is to be understood that no novelty is claimed for the particular arrangement for inflating the bladder **16** at will by the swimmer **13** and for this reason this particular feature has been illustrated diagrammatically.

The valved neck **17** of the bladder **16** is firmly secured to a casing **25** carrying the cartridge **18** and its rupturing mechanism. Also suitably carried by the casing **25**, as by a bracket clamp **26**, is a yoke **27** having upturned ears **28** in which is journaled a flanged reel **29** on which is wound a string or line **31** one end of which is secured to the reel **29**, leaving the other end free for tying to a submerged object. It is always intended to provide the line **31** with a length in excess of the water depth where searching is to be done to make certain that when used the buoy will always surface. When using the buoy as thus far described the swimmer ties the free end of the line **31** to the object **10**, pulls the cord **24** to pierce the cartridge **18** whereupon the bladder **16** is rapidly inflated, and releases the buoy **14** to permit it to rise, unwinding the line **31** as it ascends. When the buoy **14** surfaces the swimmer unwinds the excess length of the line **31** and reties it to the object **10** so that the buoy **14** is as directly over the object **10** as is practicable under the conditions then prevailing.

In accordance with a feature of the invention, the necessity for retying the line **31** after the buoy **14** has surfaced is obviated by providing means for preventing the reel **29** from paying out excess line. One form this means may take is shown in Fig. 2 as comprising a hydrostatically operated stop pin **32** for restraining the reel **29** against rotation whenever the hydrostatic pressure is less than a few inches of water. As shown, this stop pin **32** is supported by and projects from a flexible diaphragm **33** through an opening **30** in one of the yoke ears **28**. The diaphragm is exposed on its pin projecting side to ambient conditions (water when in use) and on its other side to a body of fluid, preferably oil, confined in two variable volume compartments **34** and **35** connected together by a passage **36** of small diameter for providing a substantial impedance to variations in volume i. e., to the passage of oil from one of the compartments **34** and **35** to the other.

The compartment **34** is defined by a concavity formed in a block **37** of material, which may be metal, and the diaphragm **33** secured over the concavity whereby any change in the volume of the compartment **34** will result in a corresponding displacement of the diaphragm **33**, and vice versa. The compartment **35**, as shown, comprises a cylinder bore **38** and an associated piston **39** having a protuberance **41** adapted to contact the head of the cylinder **38** to fix positively the minimum volume of the compartment **35** and therefore the maximum volume of the compartment **34**. The piston **39** is resiliently urged toward minimum volume position in any suitable manner as by a spring **42** under sufficient compression to require

an oil pressure corresponding to a few inches of water on the diaphragm **33** in order to displace the piston **39** against the loading provided by the spring **42**, the exact spring value being unimportant and not at all critical as long as it is sufficient to overcome the pressure on the diaphragm at the depth it rides when the buoy **14** surfaces because the buoy **14** ascends fairly rapidly while the response of the diaphragm **33** to a reduction in pressure is relatively slow due to the impedance of the passage **36** connecting the two compartments **34** and **35**. Preferably, the open end of the cylinder bore **38** is tightly sealed by a suitable threaded closure plug **40** the inner face of which may be shaped to form a seat for the spring **42**. It may be well to note that when the piston **39** is moved by the oil pressure against the force of the spring **42** the air entrapped between the piston **39** and the closure plug **40** is slightly compressed and therefore stores some energy which supplements the loading provided by the spring **42**.

The manner in which the stop pin **32** arrests or restrains the reel **29** may take any suitable form such as the simple one illustrated in which a flange of the reel **29** is provided with an aperture **43** in alinement (radially) with the stop pin **32** so that whenever the diaphragm **33** is in the position shown, viz., the position of maximum volume for the compartment **34**, less than one revolution of the reel **29** will bring the flange aperture **43** into actual alinement with the pin **32** at which time the pin **32** enters the aperture **43** to lock the reel **29** against rotation and thus prevent any further unreeling of the line **31**.

Whether or not the line **31** is buoyant it is generally desirable so to construct the reel **29** that by friction or other braking action it offers enough resistance to being rotated to maintain the line **31** under some tension and prevent backlash.

While in storage and at all other times prior to entering the water with a swimmer the buoy should be kept with its reel in the position shown in Fig. 2 so that the stop pin **32** projects into the flange aperture **43** where it not only holds the reel against rotation but also does not place a deforming strain on the diaphragm **33** as it would if it could not assume its normal position for the condition of ordinary atmospheric pressure on the diaphragm.

In operation, when the buoy **14** in collapsed condition is carried to the depths by a swimmer the water pressure against the diaphragm **33** is transmitted through the oil to the piston **39** which yields and moves against the force of the spring **42** to compress it (and the entrapped air). The resulting increase in volume of the compartment **35** is accompanied by a corresponding decrease in volume

of the compartment **34** which moves the diaphragm **33** to withdraw the pin **32** from the reel flange aperture **43**. When the swimmer wants to buoy an object he secures the line **31** to the object, operates the inflating mechanism, and releases the buoy **14** which rises rapidly to the surface. The setting of the pressure sensitive device is such that when the buoy **14** surfaces the pressure of the water (a few inches) is no longer great enough to hold the spring **42** compressed and, at a rate determined by the impedance of the restricted oil passage between the compartments **34** and **35**, the piston returns to its minimum volume position and the pin **32** enters the flange aperture **43** the first time they become alined thereby effectively preventing the unreeling of any more line.

While for the purpose of disclosing the invention a preferred embodiment thereof has been described in detail, it is to be understood that the invention is not limited thereto but is of the scope of the appended claim.

What is claimed is:

A swimmer's buoy device for marking at the surface the location of an underwater object comprising in combination a collapsed inflatable bladder, means under the control of a swimmer for inflating said bladder to render said device buoyant, a reel member for storing a length of line and having a part rotatable for playing out the line, an element movable into and out of rotation blocking position with respect to said rotatable part, pressure sensing means normally holding said element in rotation blocking position and responsive to pressure greater than the pressure corresponding to the depth in water said sensing means rides when said device is buoyant and floating on the surface to move said element out of rotation blocking position, and a hydraulic time-delay device associated with the pressure sensing means for retarding the response of the pressure sensing means for a predetermined period of time greater than the period of surface waves, said period of time being chosen of such value that the buoy device when inflated under water will have surfaced when said element is moved into rotation blocking position.

References Cited in the file of this patent

UNITED STATES PATENTS

1,014,804	Bruck	Jan. 16, 1912
2,324,744	Ward	July 20, 1943
2,403,845	Brown	July 9, 1946
2,722,019	Brock	Nov. 1, 1955