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R. B. COLT
BUOY AND LIKE FLOATING OBJECT INCORPORATING
MEANS FOR RESILIENTLY CONNECTING
SAME TO ITS ANCHOR
Filed May 7, 1959

3,020,567

FIG. 2.

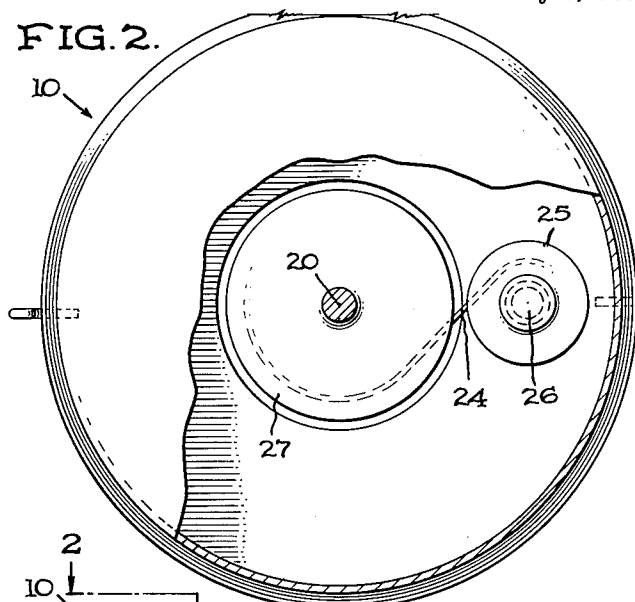


FIG. 3.

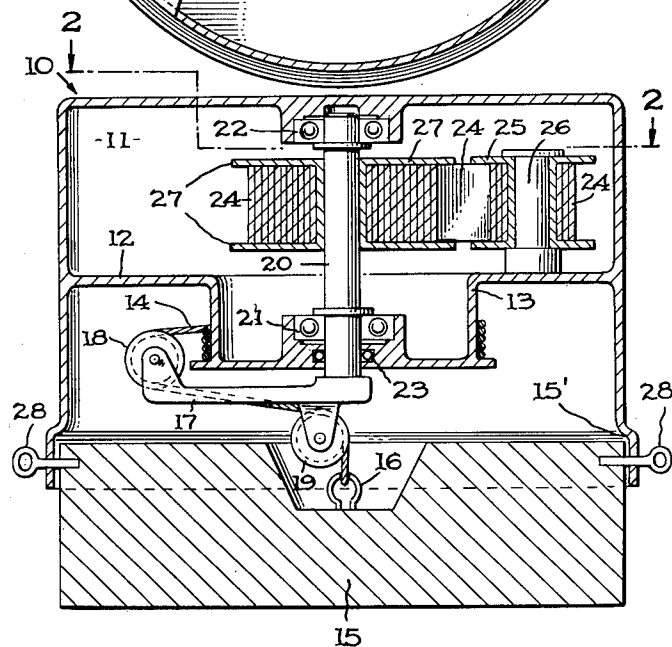
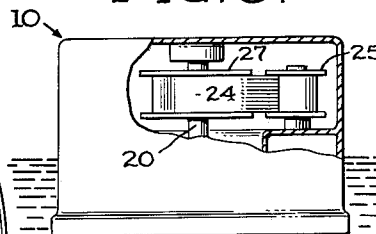


FIG. 1.

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3,020,567

BUOY AND LIKE FLOATING OBJECT INCORPORATING MEANS FOR RESILIENTLY CONNECTING SAME TO ITS ANCHOR

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2 Claims. (Cl. 9—8)

The primary object of this invention is to provide a marking buoy or the like incorporating improved means for resiliently connecting the buoy to its anchor in a manner such as to prevent flotation forces resulting from rough water, rise and fall of the tide, and strong currents from displacing the anchor and hence the buoy itself from its original "planted" position.

A more specific object is to provide a combined buoy and anchor package incorporating a compact constant-force spring mechanism acting through the anchor cable, without being directly connected to or forming part of the cable, to minimize the effects of buoy flotation forces on the anchor which might otherwise cause the latter to drift or "walk" and permit the marking buoy to drift from its initial marking position.

Briefly stated, the improved buoy and anchor combination comprises a marking float or buoy proper including a housing defining a hollow chamber within which is located a cable drum or like storage member and associated cable winding and unwinding mechanism together with an operatively related constant-force spring and reel assembly utilizing a spring of the so-called Neg 'ator type, i.e. a pre-stressed metallic ribbon spring wound on a reel; it has a constant spring force characteristic such that when the spring is unwound by drawing it from its reel the torque opposing unwinding remains substantially constant throughout the effective length of the spring. If such a spring is rewound from the first reel onto a second reel arranged to flex the spring in a direction opposite the direction of flexure of the first reel, a constant torque will be exerted on the shaft of the second reel whenever it is driven in a spring winding or unwinding direction. The "second reel" herein is arranged to apply a resilient cable take-up torque to a winch shaft, cable drum or other rotatable member driven by buoy flotation forces acting on the anchor cable when the anchor is in "planted" position. The take-up torque exerted by the Neg 'ator spring through the take-up reel is of a value such as to permit the buoy to "give" and absorb the shocks of changes in flotation forces without transmitting a force of displacement magnitude to the buoy anchor.

The foregoing and other objects and advantages will become apparent in view of the following description taken in conjunction with the drawing wherein:

FIG. 1 is a view in substantially central transverse section of a buoy and anchor combination package in accordance with the invention;

FIG. 2 is a top plan view of FIG. 1, partly broken away; and

FIG. 3 is a view in elevation, with the buoy housing partly broken away, of the buoy of FIGS. 1 and 2 but showing the anchor released from the housing and in planted position.

Referring to the drawing in detail, the buoy housing is indicated at 10; it is provided with a hollow float chamber 11, which may be provided with a predetermined air fill or in part packed with a suitable buoyant material other than air. A partition wall 12 constitutes the bottom wall of the chamber 11; it is formed with an offset providing a cable drum 13, for storing an anchor cable 14 thereon when the anchor, indicated

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at 15, is retracted to its seat 15', the said cable being connected to the anchor as by an eye 16.

The winding and unwinding mechanism for the cable is shown in the form of a swiveled arm 17, having journaled thereon guide pulleys 18 and 19, over which the cable 14 is trained, the said arm being secured on the lower end of shaft 20, mounted in suitable bearings 21 and 22, carried by the bottom and the top walls of the buoy. A packing ring 23 insures sealing of the chamber 11 against leakage around the shaft 20.

A so-called Neg 'ator spring is indicated at 24; it is originally wound on a take-up reel 25, mounted to rotate on an upright shaft 26 fixed at its lower end in wall 12, and unwinds on an output reel 27, secured on, or mounted to rotate with the shaft 20. The spring on the take-up reel 25 resists unwinding to the extent that shaft 20 has applied thereto a substantially constant resilient torque tending to rotate the shaft in a cable wind-up direction (it resiliently opposes unwinding) with sufficient force to always return the buoy to its marking position against flotation forces tending to displace the buoy; but regardless of whether the spring is being pulled out or taken up as a result of flotation forces rising above or dropping below the predetermined wind-up torque exerted by the Neg 'ator spring 24, the tension on the cable will remain substantially constant. As heretofore indicated, spring 24 is made of pre-stressed ribbon steel and is wound on the take-up reel 25 and output reel 27 in a manner such as to cause the spring to flex in opposite directions when wound on one reel and unwound from the other reel. Springs of this type are known as "Neg 'ator springs" and may be purchased in the open market. The wind-up torque exerted by the take-up reel should be such as to permit the buoy to "give" and absorb the shocks of changes in flotation forces without transmitting sufficient force to the anchor 15 to displace the latter after it has been "planted."

The anchor 15 may be made of any desired contour; it is shown in the form of a simple disc which fits into the offset seat 15' in the skirt portion of the housing 10. The pins 28 releasably lock the anchor to the housing until the buoy is planted.

Operation

In view of the foregoing description taken in conjunction with the drawing, the operation of the buoy should be apparent. When it is desired to plant the buoy, the anchor 15 is released by retracting the pins 28, whereupon it is free to drop down to the floor or bottom of a body of water, as indicated in FIG. 3. As the anchor descends, the arm 17 drives the shaft 20 in a direction such that the spring 24 unwinds from the output reel 27 and winds on the take-up reel 25, the resilient torque exerted on the said shaft remaining substantially constant irrespective of how much of the spring 24, within reason, is required to accommodate the anchoring depth. After the anchor has been planted, the buoy will "give" and absorb the shocks of changes in flotation forces resulting from rough water, rise and fall of the tide and swift currents without transmitting forces of sufficient magnitude to anchor to displace the latter from its original planted position.

In certain installations, the cable drum, instead of being fixed as shown herein, may be rotated to wind the cable thereon and unwind the cable therefrom, in which case the swivel arm 17 would be dispensed with. With any type of cable drum or reel, to accommodate the constant spring assembly, it is only necessary to have available a member which is caused to rotate when the cable is payed out or taken up in response to variable flotation forces.

In predetermining the effective force of the Neg 'ator

spring, the weight of the anchor and flotation characteristics of the buoy should obviously be taken into consideration. However, no fine tolerances are required, since in most installations the strength of the spring may be well on the plus side, to ensure return of the buoy to its marking position without displacing the anchor.

What I claim is:

1. In combination, a buoyant device and an anchor therefor, an anchor cable for connecting said device to its anchor, a cable drum, means including a member which rotates in relation to the effective anchoring length of cable payed out or taken up when the cable is wound on or unwound from said drum, a spring take-up reel having a metallic pre-stressed constant-force ribbon spring wound thereon, and a spring output reel adapted to rotate with said member and to have said spring wound thereon and unwound therefrom in response to variations in flotation forces acting on the buoyant device when the anchor is in anchoring position.

2. A combination marking buoy and anchor comprising a housing defining a buoyant chamber, means for releasably connecting an anchor to the housing, an an-

chor cable for connecting the buoy to its anchor, means for storing said cable in coiled condition in said housing exterior of said chamber, means for uncoiling and guiding said cable when the anchor is released and drops to anchoring position including a member which rotates in relation to the effective length of cable required to anchor the buoy, a spring take-up reel having a metallic pre-stressed constant-force ribbon spring wound thereon, and a spring output reel adapted to rotate with said rotatable member and to have said spring wound thereon and unwound therefrom in response to variations in flotation forces acting on the buoy when the anchor is in anchored position.

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