June 1, 1954 L. E. PERKINS 2,679,655

MARKER FOR SUBMERGED ARTICLES

Filed Dec. 18, 1950

Fig. 1.

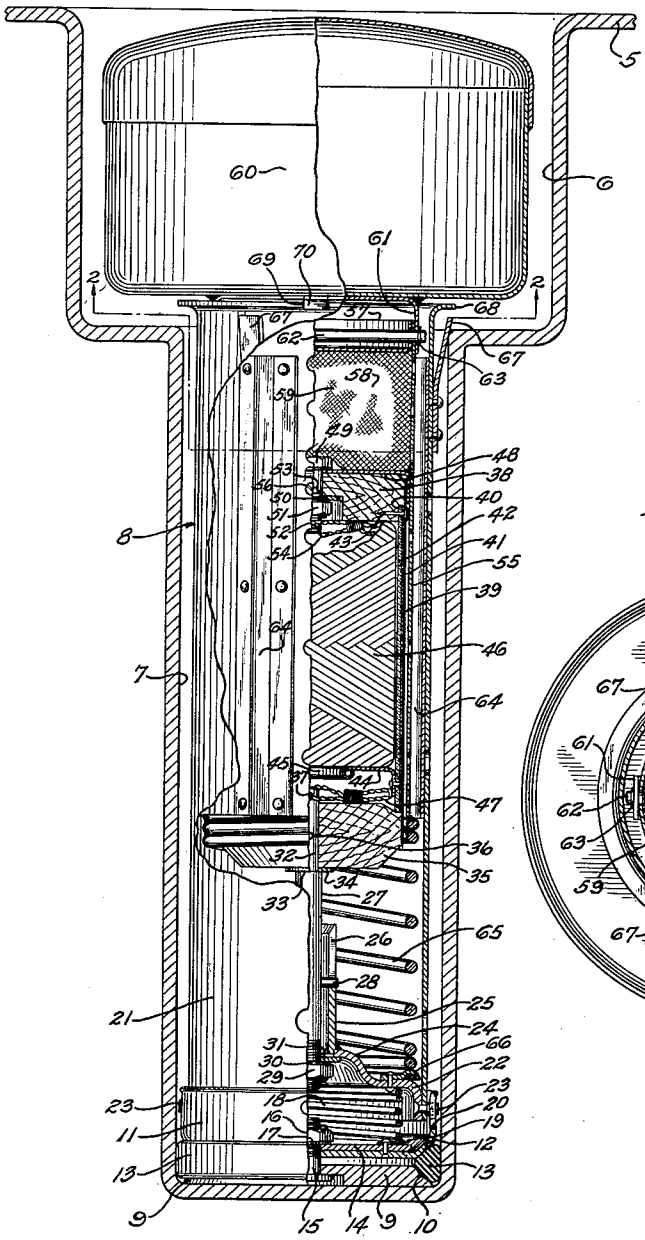


Fig. 3.

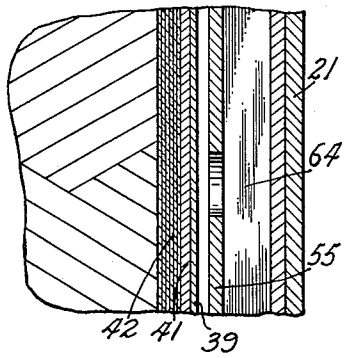
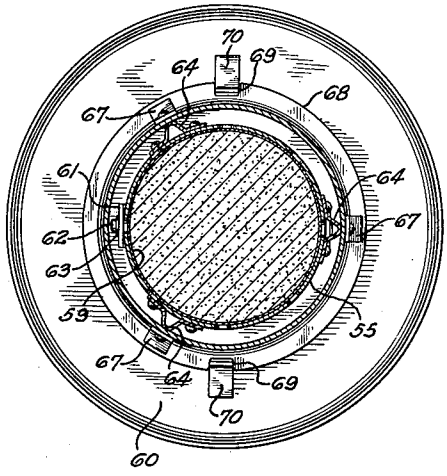


Fig. 2.



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MARKER FOR SUBMERGED ARTICLES

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8 Claims. (Cl. 9—9)

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This invention relates to improvements in markers for submerged articles and more particularly, although not exclusively, to markers for indicating the location of submerged mines. The invention embodies certain principles of operation which are disclosed in my Patent No. 2,479,021, issued August 16, 1949.

In order to become proficient in the laying of mines, naval submarines engage in practice with the use of dummy mines. These mines are not charged with explosives, but are otherwise similar to standard mines. Due to the fact that these dummy mines are expensive, it is necessary that they be retrieved after practice use, and heretofore it has been difficult to locate the submerged mines because there is nothing which is visible from the surface.

Because of the fact that mines layed from submarines are ejected from tubes in the submarines by the use of relatively high air pressure, the mines cannot have any attachments projecting from the periphery. Practice mines are, however, formed with an elongated cylindrical well.

With the above in mind, it is a general object of the present invention to provide an improved marker assembly of the general type shown in my Patent 2,479,021 which is so constructed that it may be positioned in the cylindrical well of a mine entirely within the periphery of the mine, said assembly being provided with means for anchoring itself in position within said well without requiring the use of any attaching members of a type which would have to extend through or into the wall of the mine.

A further object of the invention is to provide an improved marker assembly having an elongated tubular body portion which is anchored within the well and also having a float-equipped, water sensitive cartridge anchored within said housing in a position to compress an ejecting spring, there being spring means for centering the outer end of the housing within the well, and there being elongated guiding means on the cartridge for centering the cartridge within the tubular housing.

A further, more specific object of the invention is to provide an improved marker assembly of the class described wherein the housing, cartridge, float and ejecting spring form a unit which is readily connectible to and removable from an anchoring means without use of tools.

A further object of the invention is to provide an improved marker of the class described wherein the ejecting spring is positioned at one

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end of the water sensitive cartridge rather than in a surrounding relationship whereby, during release, jamming of the ejectible portion of the marker assembly is prevented. The position of the spring at one end of the cartridge also minimizes the possibility of tangling of the float line upon release of the cartridge.

A further object of the invention is to provide an improved marker of the class described wherein the float and the adjacent end of the housing are provided with cooperable abutment means for preventing relative rotation between the float and housing, whereby rotation of the housing for the purpose of connecting the same to the anchoring means can be accomplished by rotation of the float, without danger of rupturing the disintegratable release member of the cartridge.

A further specific object of the invention is to provide in a marker assembly of the class described, improved anchoring means for frictionally holding the assembly in a cylindrical well.

A further specific object of the invention is to provide in a marker of the class described, a cartridge having a tubular release member formed of material which disintegrates in response to the action of water thereon, said tubular release member having a tubular cardboard liner for preventing the deposit of condensation on the inner surface of the release member, and a porous tubular reinforcing member of substantial strength made of material whose strength is not affected by water snugly positioned concentrically within said liner, said reinforcing member being effective to prevent rupture of the tubular release member when the latter is exposed to high pressures such as those encountered in submarine mine laying tubes.

A further object of the invention is to provide an improved marker of the class described which is positive in operation, relatively simple in construction, easy to manufacture, and otherwise well adapted for the purposes described.

With the above and other objects in view, the invention consists of the improved marker assembly, and all of its parts and combinations, as set forth in the claims, and all equivalents thereof.

In the drawing accompanying and forming a part of this specification, wherein is shown one complete embodiment of the preferred form of the invention, and wherein like characters of reference indicate the same parts in all of the views:

Fig. 1 is a fragmentary longitudinal sectional

view taken through a well in a mine showing the improved marker assembly in anchored condition therein, parts of said assembly being broken away shown in section; and

Fig. 2 is a transverse sectional view taken approximately along the line 2—2 of Fig. 1; and Fig. 3 is a fragmentary longitudinal sectional view showing the release member, tubular liner, reinforcing member, outer metal tube, and rails.

Referring more particularly to Fig. 1 of the drawing, the numeral 5 indicates the wall of an article such as a dummy mine which is adapted to be submerged in use. The wall 5 is formed with a cylindrical well 6 having an elongated portion 7 of reduced diameter. The numeral 8 indicates the improved marker assembly which is normally positioned in the well 6 and elongated portion 7 thereof as shown.

Positioned adjacent the inner end wall of the portion 7 is a circular plate 9 having an annular beveled peripheral surface 10 which slopes outwardly and radially inwardly, as shown. Spaced outwardly from the plate 9 is a cup-shaped anchoring member 11 positioned with its closed end inwardly. The cup-shaped member 11 is formed with an annular beveled peripheral surface 12 which slopes in the opposite direction from the surface 10 to assume a V-shaped relationship therewith. An annular ring 13 of rubber or other suitable resilient material is seated on the beveled surfaces 10 and 12 within the well portion 7, as shown. The closed end of the cup-shaped member 11 may be reinforced by a centrally apertured plate 14 and said closed end and plate are centrally apertured to receive an axially extending bolt 15 having a nut 16 and lock washer 17 thereon. Turning the nut 16 down on the bolt 15 draws the cup-shaped member 11 and plate 9 together, and the annular beveled surfaces 10 and 12 force the resilient ring 13 radially outwardly into frictional contact with the wall of the well portion 7 as the nut 16 is so turned. The cup-shaped member 11 and the plate 9 are thereby anchored in the well portion 7. A helical compression spring 18 is held in position on the outer surface of the plate 14 by a clip 19. The side walls of the cup-shaped member 11 are formed with a pair of diametrically oppositely disposed generally L-shaped bayonet slots 20 which communicate with the outer edge of the cup-shaped member.

An elongated cylindrical casing or housing member 21 is positioned within the well portion 7 and has its inner end positioned within the open end of the cup-shaped member 11. The inner end of the housing 21 is closed by an inverted cup-shaped member 22 which may be held in position by a pair of diametrically oppositely disposed rivets 23. The rivets 23 may have enlarged outer ends which project radially outwardly from the housing 21 to serve as connecting pins which are positionable in the bayonet slots 20 to removably hold the housing 21 in position within the cup-shaped member 11. The spring 18 is normally in compressed condition between the plate 14 and cup-shaped member 22 to prevent disengagement of the bayonet slot connection between the cup-shaped member 11 and housing 21. It is apparent that the housing 21 may be readily disengaged from the cup-shaped member 11 by moving the housing 21 slightly inwardly and by simultaneously turning the housing in a clockwise direction as viewed from the top of Fig. 1.

The inverted cup-shaped member 22 may be formed with a centrally apertured, outwardly pressed central portion 24, and fixed, as by welding, to the portion 24 is a co-axial, outwardly projecting tubular extension 25 which is formed in its outer end with a longitudinally extending groove 26. An elongated bolt 27 is positioned within the tubular extension 25 and has a transverse pin 28 positioned at the bottom of the groove 26, as shown. The lower end of the bolt 27 is threaded to receive a nut 29, the latter coacting with a lock washer 30. A washer 31 may be positioned around the bolt 27 between the portion 24 of the member 22 and the lock washer 30. Threading of the nut 29 onto the bolt 27 draws the pin 28 tightly against the bottom of the groove 26 and securely holds the bolt 27 in position.

The outer end of the bolt 27 is formed with a portion 32 of reduced diameter to form an annular shoulder 33 against which a washer 34 is positioned. A generally cylindrical end block 35 of wood or other suitable material is axially bored to receive the portion 32 of the bolt 27 and is positioned in abutment with the washer 34. A locking pin 36 extends diametrically through the end block 35 and portion 32 of the bolt 27 to hold the block 35 in position on said bolt. The outer end of the bolt 27 projects beyond the block 35 and is formed with a transverse aperture 37.

Spaced outwardly from the end block 35 is a generally cylindrical end block 38 which is preferably of substantially the same diameter as the block 35 and coaxial therewith. The blocks 38 and 35 are connected by a tubular release member 39, said blocks preferably fitting snugly into the open ends of the release member and being suitably fixed to said member. The release member 39 is made of a paper-like substance which is relatively strong when dry, and which rapidly loses its strength when submerged in water, being readily breakable when water soaked. The end walls 35 and 38 and the tubular release member 39 form a hollow breakable cartridge.

The inner end of the block 38 is formed with a portion of reduced diameter 40, as shown, and mounted concentrically on the portion 40, within the release member 39, are a tubular liner 41 of cardboard or other suitable absorbent material, and a porous tubular reinforcing member 42 which may be made of some material, such as glass fibers, which is not affected by water and which has substantial strength to resist compressive forces. The inner ends of the tubular members 41 and 42 abut the end block 35, as shown, and said members may be fixed to the portion 40 of the block 38 by brads as at 43. The inner end portions of the tubular members 41 and 42 are fixed as by riveting to a cup-shaped bulk head member 44 positioned therein and having a central aperture 45 formed with a marginal bead.

Positioned within the tubular member 42 between the end block 38 and bulk head 44 is a roll of line 46, preferably nylon. A section of wire rope 47 has one end looped through the aperture 37 in the outer end of the bolt 27 and secured thereto, the other end of the rope 47 being fixed to one end of the nylon line 46. An inverted metal cup-shaped member 48 is positioned over and around the outer end of the block 38 and said cup-shaped member and block are axially apertured to receive a bolt 49. The inner surface of the end block 38 is axially recessed to receive a washer 50 and nut 51, the

latter being threaded on the inner end of the bolt 49. The inner end of the bolt 49 is formed with a transverse aperture 52, and a locking pin 53 extends transversely through the block 38 and bolt 49 to fix said bolt in said block. A wire rope 54 has one end looped through the aperture 52 in the bolt 49 and fixed thereto, the other end of the rope 54 being fixed to the other end of the nylon line 46.

A perforated longitudinally extending, cylindrical metal tube 55 is positioned around the cup-shaped member 48 and tubular release member 39, said tube having an inner diameter substantially equal to the outer diameter of the member 48 and slightly larger than the outer diameter of the release member 39 to space the member 55 from the release member as shown. The tube 55 extends axially outwardly from the cup-shaped member 48 as well as inwardly to a terminus adjacent the end block 35. The tubular member 55 is fixed to the cup-shaped member 48 and end block 38 by screws, preferably three, such as the screw 56. The screws extend radially inwardly through the member 55 and side walls of the cup-shaped member 48 into the end block 38. A cup-shaped member 57 closes the outer end of the tubular member 55 and forms an enclosed chamber 58 within the tube 55 and outwardly of the cup-shaped member 48. Positioned in the chamber 58 is a bag 59 containing a water soluble dye, said bag being made of a treated fabric or other suitable material which readily disintegrates upon contact with water.

A generally cylindrical float 60 is positioned within the well 6 adjacent the outer end of the tubular housing 21. The float 60 is preferably hollow, and has fixed to its inner end wall a U-shaped bracket 61, the latter having spaced, apertured, inwardly directed arms which engage diametrically opposite external side wall portions of the outer end of the tube 55. A removable pivot shaft 62 extends diametrically through the apertures in the arms of the bracket 61, through the tube 55 and through the side walls of the cup-shaped member 57 to pivotally connect the float 60 to the members 55 and 57. The pivot shaft 62 may be held in position by suitable retaining rings 63 at each end thereof and outwardly of the bracket 61.

Fixed as by riveting to the outer surface of the tube 55 are longitudinally extending, equally spaced rails 64, preferably three in number. The rails 64 are all of the same radial height and slidably engage the inner surface of the tubular housing 21 to center the tube 55 therein. A relatively strong compression spring 65 is fixed at its inner end to the outer surface of the cup-shaped member 22, as by a clip 66, and has its other end in engagement with the inner ends of the rails 64. Fixed to the outer surface of the housing 21 adjacent the outer end of the well portion 7 are longitudinally extending, cantilever type, leaf springs 67 preferably three in number, which extend radially outwardly into contact with the mouth of the well portion 7 to center the outer end of the housing 21 within the well portion 7.

As shown in the drawing, the outer end of the tubular housing 21 is formed with a radially outwardly projecting annular flange 68 which is positioned adjacent the inner end wall of the float 60. The annular flange 68 is formed with a pair of diametrically oppositely positioned peripheral slots or notches 69, and fixed to the inner end wall of the float 60 is a pair of spaced lugs 70 which project toward the flange 68 and have end portions positioned in the notches 69 to prevent relative rotation between the float 60 and the flange 68. The members 69 and 70 constitute cooperable abutment means.

Operation

The improved marker assembly is normally in assembled condition, as shown in Fig. 1, when a dummy mine equipped therewith is ejected from a submarine mine laying tube. As soon as the mine enters the water, the well 6 and elongated portion 7 thereof become filled with water. Since the housing 21 and tubular member 55 are perforated, water enters through the perforations and also through the open end of the housing 21 and contacts the tubular release member 39. Upon being acted upon by the water the release member 39 rapidly loses its strength.

After a pre-determined period of exposure to the water, the release member 39 is no longer able to resist the force of the compressed spring 65 which spring urges the end block 38 outwardly by acting against the rails 64 and tube 55. As a result, the tubular release member 39 ruptures and the spring 65 forces the tube 55, outer end block 38, and float 60 axially out of the well 6 with a projectile action. During this action the rails 64 slidingly contact the inner surface of the housing 21, and by maintaining the tube 55 centered in the housing 21 during the outward movement prevent binding. The tubular members 41 and 42, bulk head 44 and roll of nylon line remain attached to the outer end block 38 during this projectile movement, and as the float 60 rises in the water, the nylon line pays out of the bulkhead opening 45.

The wire rope 47 is of sufficient length so that the nylon line 46 does not come in contact with those portions of the marker assembly which remain in the mine well and does not come in contact with portions of the mine itself. This prevents fraying of the nylon line and possible severing thereof. Similarly, when the float has reached the surface and/or when the line 46 has been completely unwound from its roll, the wire rope 54 extends beyond the lower end of the tube 55 and thereby prevents contact of the nylon line with edge portions of said tube. The nylon line is thus kept from being frayed because of contact with the tube 55, and from the possibility of being severed thereby.

After a predetermined length of exposure to the water, the bag 59 disintegrates and releases the dye therein. The dye, in turn, brightly colors the water in the vicinity of the float 60. This bright color of the water is readily detectable by surface craft, and it is then a relatively simple matter for a diver to locate the dummy mine by following the line 46 downwardly from the float 60. The dummy mine is retrieved in the usual manner after its location by a diver.

By pressing inwardly on the outer end of the casing 21 and by rotating it in a clockwise direction as viewed in Fig. 1, the casing and its contents can be readily removed from the well portion 7. A replacement casing assembly identical with the casing 21 and its contents, and including a float equipped cartridge, can be readily inserted in the well 6 and in its portion 7, and then connected to the cup-shaped member 11 by use of the bayonet slots 20. In making this connection the replacement casing 21 can be safely rotated by rotation of the float of the replacement assembly without

any danger of rupturing the release member. This is due to the fact that the float is held against rotation relative to its housing 21 by the locking action of the lugs 70 in the slots 69 of the flange 61.

It will be noted that the spring 65 is positioned inwardly of the cartridge formed by the end blocks 35 and 38 and release member 39. This prevents binding or entanglements which might occur if the spring surrounded the cartridge. Upon rupture of the release member 39, the spring 65, end block 35 and bolt 37 remain anchored within the casing 21. As previously mentioned, the guide rails 64 serve to center the tubular member 55 within the casing 21. It should also be noted that the resilient spring members 67 serve to center the casing 21 within the well portion 7. The latter centering also prevents possible binding of the float 60 on portions of the well 6.

Various changes and modifications may be made without departing from the spirit of the invention, and all of such changes are contemplated as may come within the scope of the claims.

What I claim as new is:

1. A marker assembly comprising: a hollow housing having an inner end and having an open outer end, said housing being connectible with an article of a type which is adapted to be submerged in use; a float normally positioned adjacent the open outer end of said housing; a cartridge within said housing spaced from the inner end thereof, said cartridge having oppositely disposed inner and outer end members, the inner end member being spaced from and connected to the inner end of said housing and the outer end member being connected to said float, said end members being normally connected by a release member at least a portion of which is acted upon by water to detrimentally affect the connection between said end members when submerged in water; a compression spring within said housing having its inner end in engagement with the inner end of said housing and having its outer end adjacent the inner end of said cartridge; and longitudinally extending means extending substantially the full length of the cartridge, said last means having one end connected to the outer end member of said cartridge and having its other end in engagement with the outer end of the spring for transmitting forces from said spring directly to said outer end member of the cartridge.

2. A marker assembly comprising: a hollow housing having an inner end and having an open outer end, said housing being connectible to an article of a type which is adapted to be submerged in use; a float normally positioned adjacent the open outer end of said housing; a cartridge smaller than said housing within said housing and spaced from the side walls and from the inner end thereof, said cartridge having oppositely disposed inner and outer end members, the inner end member being spaced from and connected to the inner end of said housing and the outer end member being connected to said float, said end members being normally connected by a release member at least a portion of which is acted upon by water to detrimentally affect the connection between said end members when submerged in water; a compression spring within said housing having its inner end in engagement with the inner end of said housing and having its outer end positioned adjacent the inner end member of said cartridge; and force transmitting and spacing means positioned in the space between the cartridge and the housing side wall for centering the cartridge within the housing, said means extending substantially the full length of the cartridge, said means having one end connected to the outer end member of said cartridge and having its other end connected to the outer end of the spring for transmitting forces from said spring to said outer end member of the cartridge.

3. A marker assembly comprising: a tubular housing having an inner end and having an open outer end, said housing being connectible to an article of a type which is adapted to be submerged in use; a float normally positioned adjacent the open outer end of said housing; a cartridge within said housing spaced from the inner end thereof, said cartridge having oppositely disposed inner and outer end members, the inner end member being spaced from and connected to the inner end of said housing and the outer end member being connected to said float, said end members being normally connected by a release member at least a portion of which is acted upon by water to detrimentally affect the connection between said end members when submerged in water; a compression spring within said housing having its inner end in engagement with the inner end of said housing and having its outer end positioned adjacent the inner end member of said cartridge; and a tubular member surrounding said cartridge and extending substantially the full length thereof, said tubular member having one end connected to the outer end member of said cartridge and having its other end provided with means for engaging the outer end of the spring to transmit forces from said spring to said outer end member of the cartridge through said tubular member.

4. A marker assembly comprising: a hollow cylindrical housing having an inner end and having an open outer end, said housing being connectible to an article of a type which is adapted to be submerged in use; a float normally positioned adjacent the open outer end of said housing; a cartridge within said housing spaced from the inner end thereof, said cartridge having oppositely disposed inner and outer end members, the inner end member being spaced from and connected to the inner end of said housing and the outer end member being connected to said float, said end members being normally connected by a release member at least a portion of which is acted upon by water to detrimentally affect the connection between said end members when submerged in water; a compression spring within said housing having its inner end in engagement with the inner end of said housing and having it outer end positioned adjacent the inner end member of said cartridge; a tubular member of smaller diameter than said hollow housing surrounding said cartridge and having one end connected to the outer end member of said cartridge; and longitudinally extending spacing means on said tubular member for centering said tubular member within said housing, said spacing means having an end positioned adjacent the inner end of the cartridge and in engagement with the outer end of the spring for transmitting forces from said spring to said outer end member of the cartridge through said means and tubular member.

5. In a marker assembly adapted to be posi-

tioned in a cylindrical well: a pair of co-axial circular members formed with divergently beveled annular peripheral surfaces; an annular ring of resilient material in the annular space between said annular peripheral surfaces; connecting means between said circular members for drawing said members together to urge said resilient ring radially outwardly into frictional contact with the side wall of a well; one of said circular members having an outwardly projecting annular flange; a marker body; and cooperable means on said body and on said annular flange of said last mentioned circular member for removably connecting said body to said circular member in response to rotation of said body.

6. In a marker assembly adapted to be positioned in a cylindrical well; an anchoring member; means for locking said member in position in a well; a cylindrical marker housing having an inner and an outer end; an ejectable float connected to said housing; cooperable means on the inner end of said housing and on said anchoring member for removably connecting said housing to said anchoring member; and resilient, axially and radially outwardly projecting leaf spring spacing members on the outer end portion of said body engageable with the sidewalls of the well to center said housing in said well.

7. In a marker assembly: a hollow housing having an open outer end; anchoring means connectible to an article of the type which is adapted to be submerged in use; cooperable means on said housing and said anchoring means for connecting said housing to said anchoring means by relative rotative movement; a float normally positioned adjacent the outer end of said housing; a cartridge within said housing having one end connected to said float and having its other end connected to said housing; and cooperable abutment means on said float and housing for preventing relative rotative movement thereof, whereby said housing can be rotated by rotation of said float without any rotational forces being transmitted through the cartridge.

8. In a marker assembly: a hollow housing having an open outer end formed with flange means having diametrically oppositely disposed slots therein; anchoring means connectible to an article of the type which is adapted to be submerged in use; cooperable means on said housing and said anchoring means for connecting said housing to said anchoring means by relative rotative movement; a float normally positioned adjacent the outer end of said housing; a cartridge within said housing having one end connected to said float and having its other end connected to said housing; and a pair of spaced projections on said float positioned in the slots in said housing flange for preventing relative rotative movement of said float and housing, whereby said housing can be rotated by rotation of said float without any rotational forces being transmitted through the cartridge.

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