United States Patent

Christians et al.

[15] **3,653,355**

[45] **Apr. 4, 1972**

[54] MUD ANCHOR

[72] Inventors: **John A. Christians**, Springfield; **Otis R. Pannell**, Alexandria, both of Va.

[73] Assignee: **The United States of America as represented by the Secretary of the Army**

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[21] Appl. No.: **61,571**

[52] **U.S. Cl.** ..... **114/206 A**

[51] **Int. Cl.** **B63b 21/28**

[58] **Field of Search** ..... 114/206 R, 206 A, 208 R, 208 A, 114/207, 209, 230; 52/155, 160–164; 61/53.68

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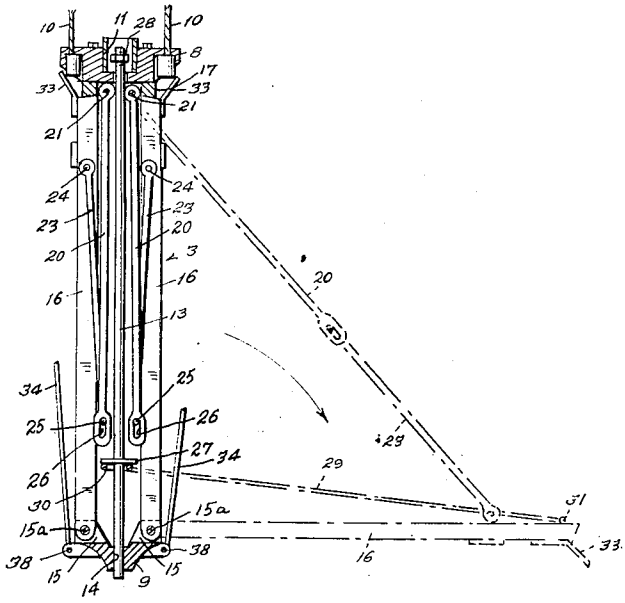
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Primary Examiner—Milton Buchler
Assistant Examiner—F. K. Yee
Attorney—Harry M. Saragovitz, Edward J. Kelly and Herbert Berl

[57] **ABSTRACT**

An explosive embedment anchor for use in mud bottoms which are too soft for efficient utilization of existing explosive embedment anchors. Anchors for this type are shot from a gun into the bed of a body of water, the anchor being the projectile. The anchor, after embedment, unfolds outward when pulled upward, much in the manner of an inverted umbrella. It consists of flukes hinged to a nose. The flukes are connected to a head by tie bars. A fabric attached to the flukes spreads out upon unfolding to hold it in the mud upon an upward pull of the head.

8 Claims, 7 Drawing Figures



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SHEET 1 OF 2

Fig. 1.

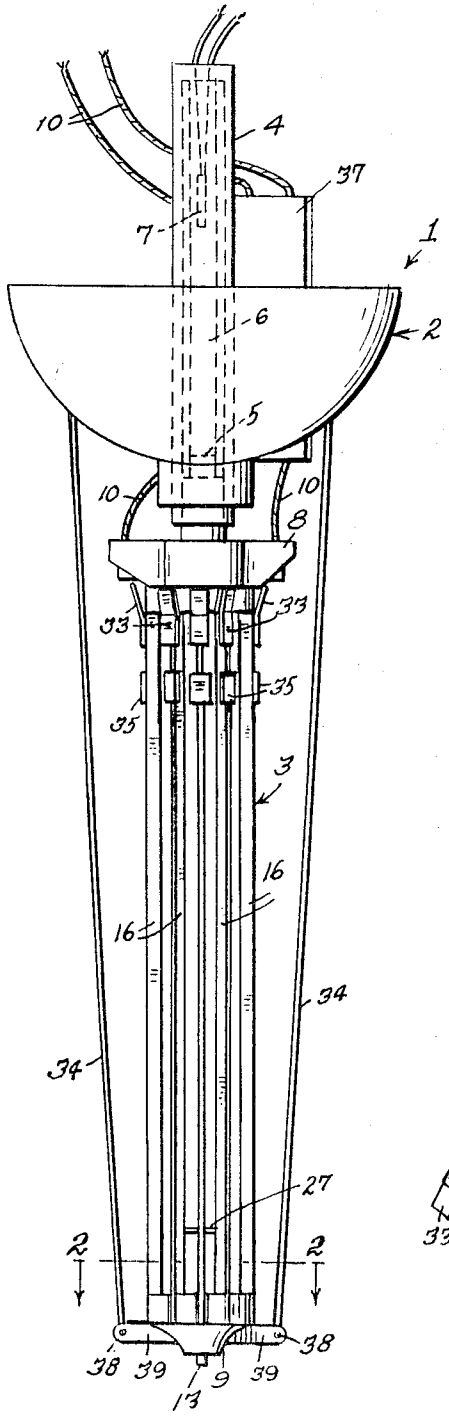


Fig. 2.

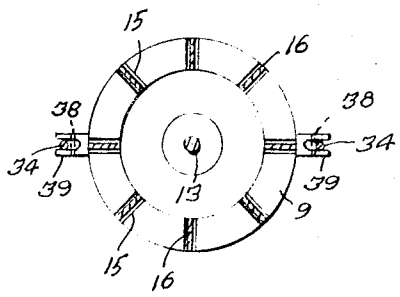
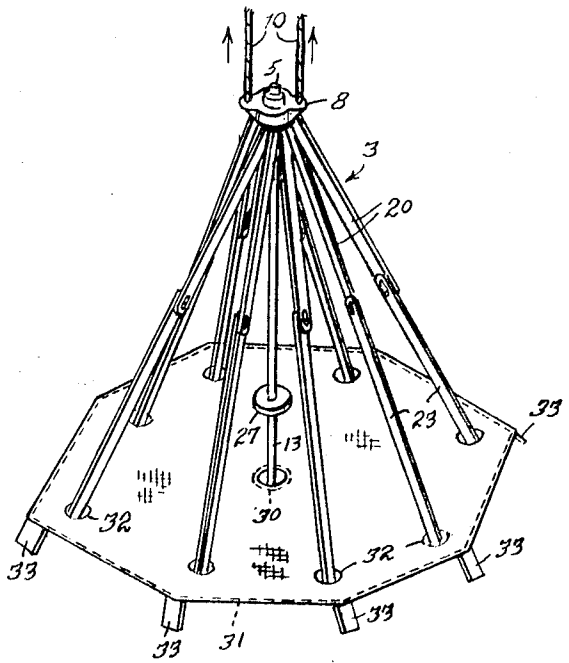


Fig. 3.



INVENTORS,
John A. Christians
Otis R. Pannell

BY: Harry M. Saragovitz,
Edward J. Kelly + Herbert Berl
ATTORNEYS.

Fig. 4.

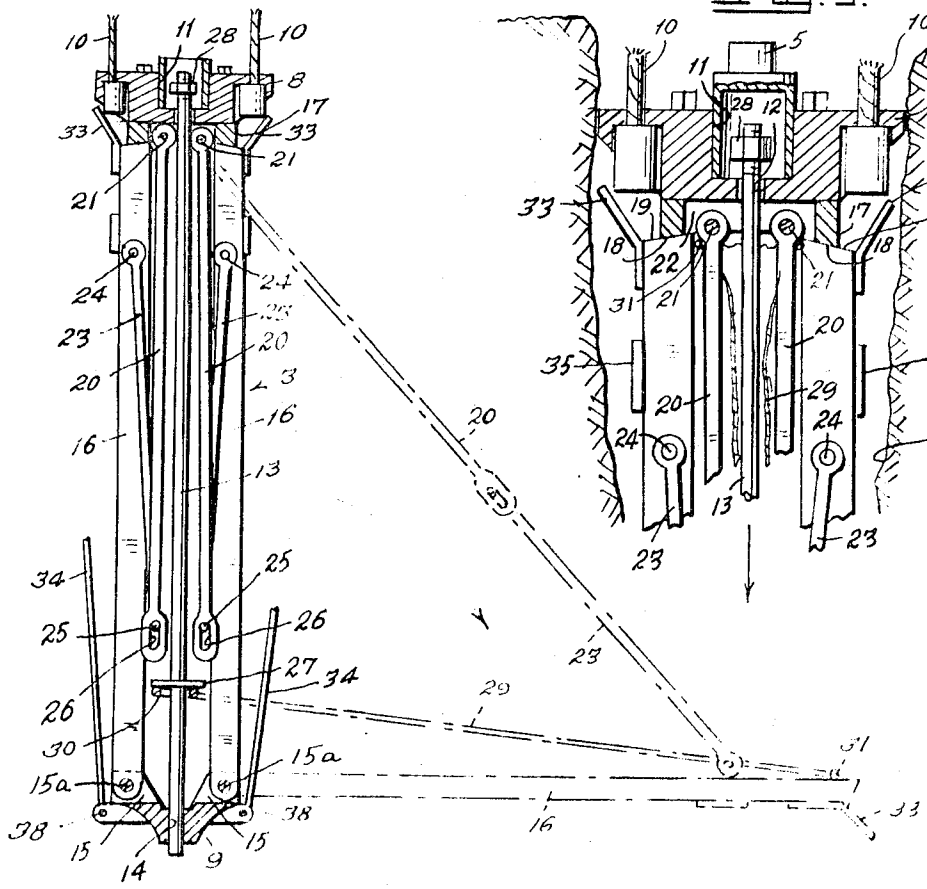


Fig. 5.

Fig. 6.

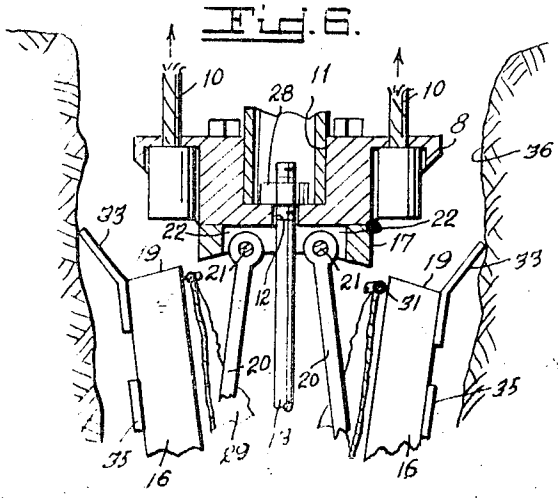
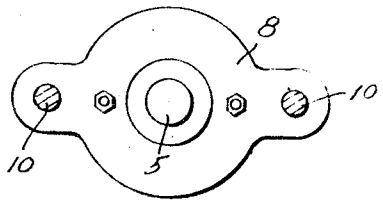


Fig. 7.



INVENTORS,
John A. Christians
Otis R. Pannell

BY: Harry M. Saragovitz,
Edward J. Kelly &
Herbert Berl
ATTORNEYS

MUD ANCHOR

The invention described herein may be manufactured, used, and licensed by or for the Government for governmental purposes without the payment to us of any royalty thereon.

Anchors, of the explosive embedded type have been used for anchoring large craft, etc., but have not been applicable for use where the bottom of the body of water is soft or muddy. These anchors are embedded by a gun with the anchor itself being the projectile. The anchor with the gun is lowered to the bottom, then the gun is fired to embed the anchor, into the bottom. Once embedded the anchor remains in position until force is applied to uplift it. Usually this is done by riser cables. The load on the anchor tends to unfold the flukes which are bars hinged to the nose portion of the anchor. This action is similar to opening an inverted umbrella. However, where the bottom is muddy, the flukes would be easily lifted out of the mud and hence the anchor could not hold fast.

The present invention provides a fabric which may encircle a center rod at its center and be attached to the flukes near their free ends. Upon opening the fabric is spread out over the flukes and provides a surface whereby mud filling in the bore made by the anchor will collect on the top side of the fabric until the weight of the mud will prevent the anchor from pulling loose.

It is therefore a principal object of this invention to provide an anchor for use in muddy bottoms of a body of water.

It is another object to provide an anchor having outfolding flukes with a covering of fabric whereby mud collecting on its upper surface serves to hold the anchor in place in the mud.

Still another object is to provide a mud anchor for use with an embedding gun.

These and other objects and advantages of the present invention will be fully apparent from the following description when taken in connection with the annexed drawing, in which:

FIG. 1 is an elevational view of the anchor of this invention assembled with a firing gun;

FIG. 2 is a cross sectional view taken along line 2—2 of FIG. 1;

FIG. 3 is a perspective view of the anchor in its fully opened position after having been fired by the gun and as being embedded in mud;

FIG. 4 is an enlarged axial section view of the anchor, after firing, and one of the flukes being shown by broken lines in its fully opened position;

FIG. 5 is a partial section view of the upper portion of the anchor as embedded in mud and before an upward pull on the head;

FIG. 6 is a similar view after the head is pulled upward and the flukes beginning to engage the mud, and,

FIG. 7 is a top view of the head.

Referring to the drawings in which:

Reference character 1 indicates the assembled gun and anchor generally, the gun being indicated generally by 2 and the anchor generally by 3.

The gun 2 is a standard items and forms no part of this invention. It consists of a barrel 4 and a plunger 5, a charge 6 and an electrically fired squib 7. Other suitable firing means may be employed and the gun shown is by way of example only.

Anchor 3 includes an annular head 8 and an annular nose 9. A pair of riser cables 10 is connected to head 8, as shown. Head 8 is axially bored as at 11 to receive plunger 5 and is counterbored as at 12 to receive a center rod 13 slidably therein, best viewed in FIGS. 5 and 6. Center rod 13 is fixed in a bore 14 in nose 9 by welding, threads, etc., not shown. A nose 9 is provided with radial slots 15 in its upper perimeter as seen in FIG. 2, eight slots being shown. Slots 15 receive the lower ends of flukes 16 which are pivoted therein by pivots 15*a*. Flukes 16 are bars which extend to an annular reduced portion 17 fixed to the lower end of head 8 and is provided with an annular, inwardly inclined undercut 18 to mate with the upper ends of flukes 16 which are outwardly inclined as at 19 so that they will be locked when in folded position as viewed in FIG. 5. Each fluke 16 is connected to portion 17 by

a foldable linkage consisting of a first tie bar 20 pivoted at its upper end as at 21 in one of a series of radial cutouts 22 (two being shown) formed in portion 17. Cutouts 22 also will be of the same number as slots 15 and flukes 16. A second tie bar 23 is pivoted at its upper end to a fluke 16 as at 24 and at its lower end to a tie bar 20 as at 25. Pivot 25 rides in an elongated slot 26 formed in the lower end of tie bar 20 to provide a sliding connection.

Center rod 13 is provided with s stop 27 near its lower portion and with a nut 28 at its top portion that extends into bore 11 for a purpose to be described.

A fabric 29, such as canvas, etc. is secured by a wire ring 30, which is sewed around a central opening in the fabric, and encircles center rod 13. Another wire ring 31 may be sewed to the perimeter of fabric 29 and secured to the inner edge of each fluke 16, best seen in FIG. 5. Instead of a wire ring, a cable would suffice. Fabric 29 will have openings 32 for the tie rods to pass through as seen in FIG. 3.

Each fluke 16 is provided with a keying fin 33 secured to the outer, upper edge thereof.

Assembly bars 34 to hold the assembly together until fired are provided and they connect to the nose 9 and gun 2. Other securing means may be used and the showing is by way of example only.

Spades 35 may be attached to the outer edges of flukes 16 if desired to aid in holding the flukes 16 in open position in the mud.

OPERATION

The entire assembly 1 is lowered to the bottom of a body of water. The gun 2 is fired and the anchor 3 is driven into the mud 36 as seen in FIG. 5. When an upward pull upon riser cables 10, head 8 is pulled upward against nut 28 to release flukes 16 from undercut 18 as seen in FIG. 6. Keying fins 33 now engage the side wall of the bore made by entry of the anchor 3 in mud 36 and upon continued pull on cables 10, the flukes 16 are pulled outward to a fully open position 90° from the anchor's axis. Tie bars 20 and 23 limit the opening of the flukes 16 and brace them in the open position. As flukes 16 open, fabric 29 is also opened like a parachute. Mud 36 fills in on top of the fabric surface and resists removal of the anchor

Riser cables 10 will not be separated from their attachment to head 8 when the gun 2 is fired. They are coiled on a plate 37 attached to gun 2 by any suitable means, not shown. The assembly 1 will be lowered by a separate cable, also not shown.

The assembly bars 34, upon firing of gun 2, will be separated from the nose 9 of anchor 3 by shear pins 38 that attach the lower ends of the bars 34 to ears 39 that extend from the nose. Two are shown.

Fabric 29 is nested within the flukes 16 when the anchor is in folded position. When the anchor 3 is folded, styrofoam may be used to pack the spaces around the fabric to exclude water, etc., when in storage.

It is apparent from the foregoing that a novel mud anchor has been devised that will be highly efficient for use in muddy bottoms of rivers, lakes, etc.

What is claimed is:

1. In combination with a gun a mud anchor adapted to be fired by said gun into mud and comprising, a head having a plunger adapted to fit in the muzzle end of said barrel, a nose spaced below said head, a series of flukes pivotally connected at their lower ends to said nose, their free ends being outwardly inclined for retainment by the underside of said head in folded position, foldable means connecting each said fluke to said head, means limiting axial movement of said head relative to said nose carried by said head and nose, a canopy normally folded within said flukes, riser cables for lifting said anchor attached to said head, and releasable means for holding said anchor to said gun, said canopy being spread by unfolding of said flukes whereby the weight of mud collecting thereon will hold said anchor in said mud.

2. A mud anchor as set forth in claim 1 wherein said head comprises an annular block having a central bore and an annular reduced portion secured to the underside of said block and having an annular, inwardly inclining underside adapted to receive the outwardly inclined ends of said flukes to retain them in folded position.

3. A mud anchor as set forth in claim 1 wherein said nose comprises an annular block having a series of radial slots in its upper surface adapted to receive the lower ends of said flukes in pivotal arrangement therein.

4. A mud anchor as set forth in claim 1 wherein each said fluke comprises an elongated bar pivotally connected at its lower end in said nose, its upper end being outwardly inclined for retainment under said head when in folded position, and a keying fin attached to the outer upper edge thereof for engagement in mud whereby when said anchor is lifted, said fin will cause said fluke to rotate outwardly.

5. A mud anchor as set forth in claim 1 wherein said foldable means for connecting each said fluke to head comprises a first tie bar pivoted at its upper end to said head and having a slot in its lower end, a second tie bar pivoted at its upper end to the upper portion of its respective fluke and a pivot riding in said slot in said first tie bar pivotally connecting the lower ends of said first and second tie bars whereby said fluke is limited to pivot outwardly 90°.

6. A mud anchor as set forth in claim 1 wherein said means for limiting axial movement of said head relative to said nose

comprises a rod having its upper end slidable axially in said head, its lower end being fixed centrally in said nose and a nut carried by the upper end of said rod whereby axial movement of said head is permitted for freeing the upper ends of said flukes upon an upward pull on said riser cables.

7. A mud anchor as set forth in claim 1 wherein said canopy comprises a substantially disc shaped fabric attached at its perimeter to the upper inner edges of said flukes, said canopy being nested within said flukes when in their folded position and spread out when said flukes are extended outward whereby mud collecting on said spreaded canopy will hold said anchor embedded.

8. An anchor for embedment in mud comprising, a head, riser cables attached to said head, a nose spaced from said head, a series of flukes hinged at their lower ends to said nose, foldable bracing linkage connecting each said fluke with said head, the upper ends of said flukes being normally locked in folded position by the underside of said head whereby when said head is raised by said riser cables said upper ends of said flukes are freed to engage said mud and swing outward 90°, and a canopy, normally nested within said flukes and attached to the upper inner edges thereof, adapted to be spread out by the swinging outward of said flukes to form a platform to receive mud and the weight thereof acting to maintain said anchor in said mud.

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