March 4, 1969 W. J. BUNTON ETAL 3,430,349

UNDERWATER TRIPOD AND PLUMBING GIMBAL

Filed Sept. 14, 1966 Sheet 1 of 2

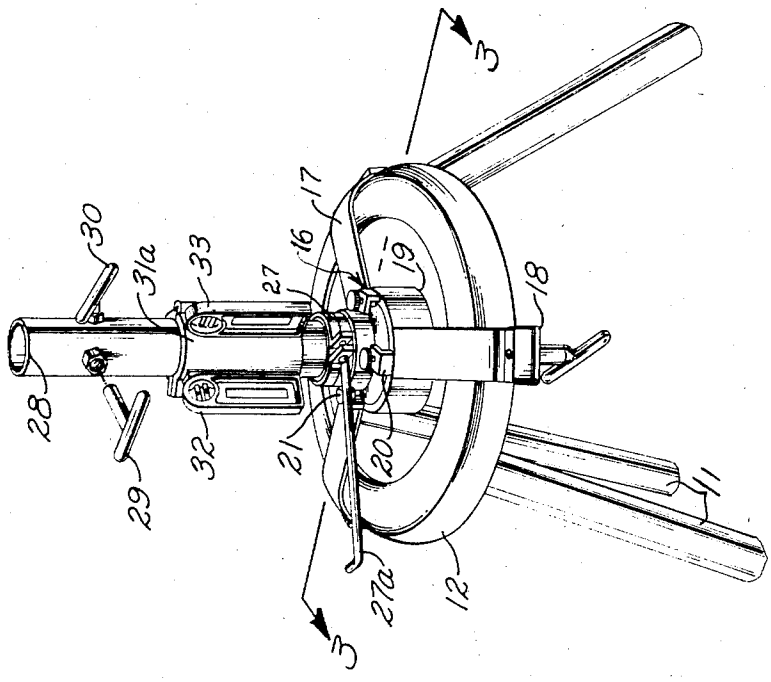


FIG. 2

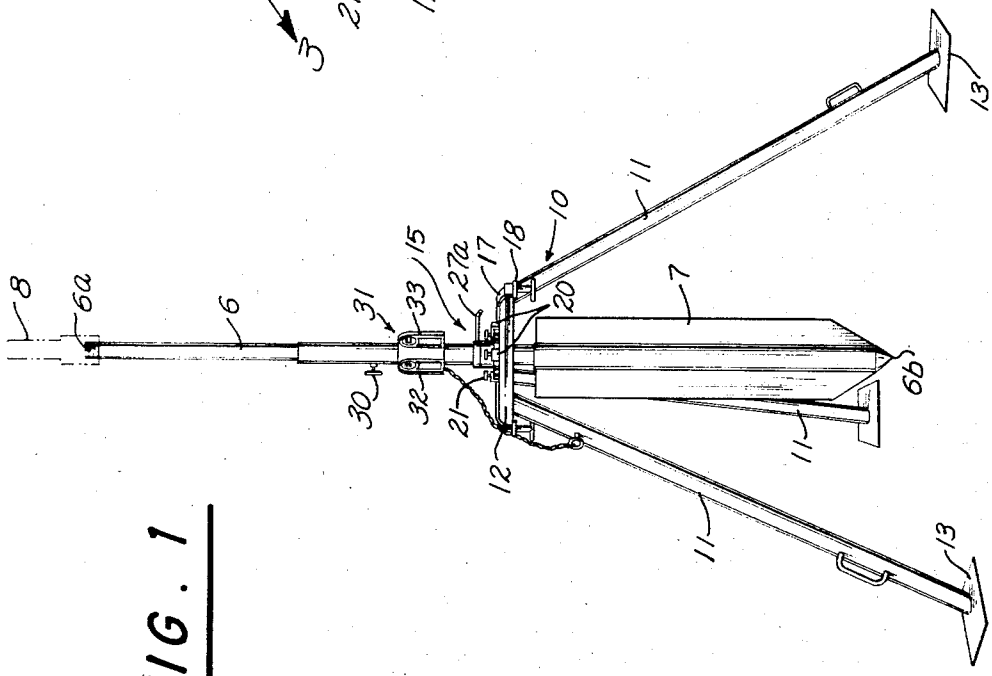


FIG. 1

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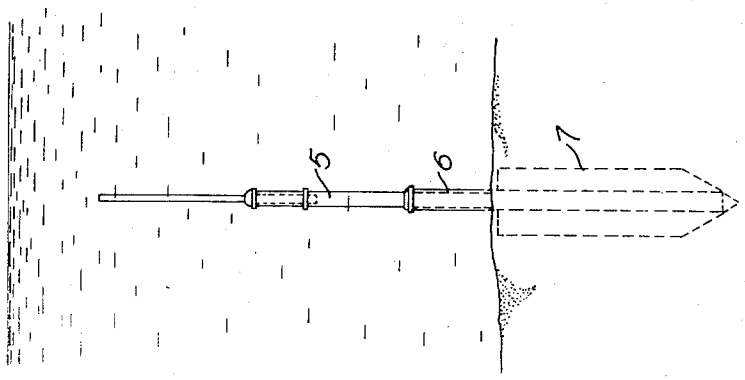


FIG. 4

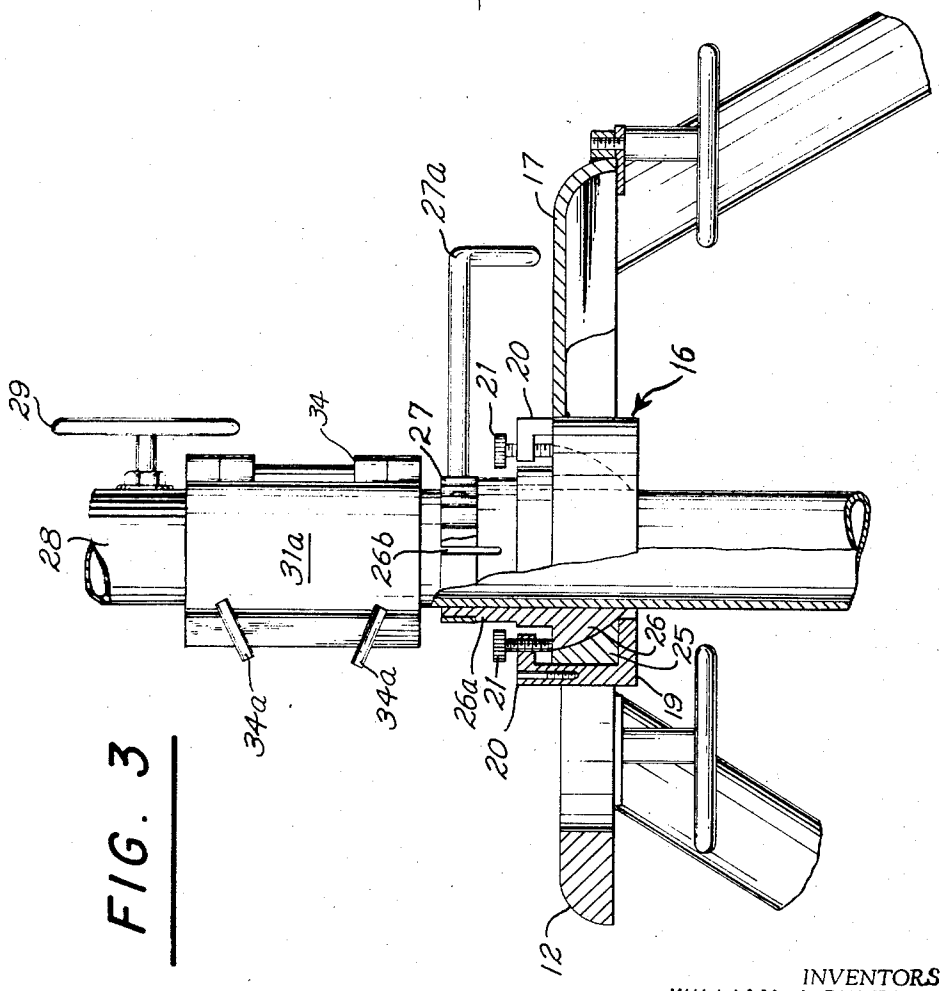


FIG. 3

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UNDERWATER TRIPOD AND PLUMBING GIMBAL

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ABSTRACT OF THE DISCLOSURE

An aligning device including a tripod supports a removable, adjustable pivot means. A stanchion is guided longitudinally through the pivot and water is jetted through the stanchion to permit insertion into the ocean floor.

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 an aligning apparatus and more particularly to a device for aligning and positioning an elongate member on a lake or ocean bottom and a method of embedding an aligned elongate member in such bottom.

Critical placement of underwater equipment has been a source of concern for scientists engaged in the investigation of marine environments. In order to insure accurate readings, monitoring electronic devices must be mounted securely to the ocean floor. Known conventional anchoring techniques are unable to satisfy the needs created by the complex instrumentation presently in use.

One such technique involves mounting the devices on large tripod assemblies having legs embedded in large concrete footings. An obvious disadvantage of this technique is that the weight involved requires a large surface vessel with heavy duty winches and booms to position the tripods on the ocean bottom. Also, since the assemblies are resting on the bottom, they are susceptible to wave scouring which may change the position and orientation of the electronic devices relative to the bottom.

Another known method of placing a properly oriented, embedded shaft into the ocean floor, is objectionable since it calls for a heavy duty, surface controlled embedding device that is lowered to the bottom and requires an elaborate system of support and control cables extending from the ship to the bottom. This method is further objectionable as being unduly time consuming. Therefore, all the known anchoring techniques involve the use of a heavy equipment which necessitate a supporting surface vessel manned by a large number of personnel. In addition, the existing devices fail to provide a means for quickly aligning an elongate member and indicating such alignment.

It is an object of the present invention to provide an apparatus and method for aligning and embedding a stanchion in the ocean floor.

A further object of the invention is to provide a rugged, light weight, portable aligning device.

Another object of the invention is to provide a device which permits selective alignments of a stanchion in the ocean floor.

A further object is to provide a rapid method for embedding a stanchion in the ocean floor.

Additional objects of the invention will become apparent from the ensuing specification and attached drawings wherein:

FIG. 1 is a side view of the invention supporting the stanchion in a vertically aligned relationship;

FIG. 2 is a perspective view of the aligning mechanism mounted on the supporting frame;

FIG. 3 is a sectional view along lines 3—3 in FIG. 2; and

FIG. 4 is a cross sectional view of an embedded stanchion with an auxiliary length of pipe attached.

Briefly, the invention is directed to a method and device used for embedding a hollow stanchion in the ocean floor. A tripod-like frame carries an aligning mechanism which includes a removable bracket supporting a pivot that permits motion around two orthogonal axes. A sleeve extending through the pivot is sized to permit the insertion of the stanchion therethrough and is provided with means for releasably securing the stanchion. A plurality of adjusting screws mounted on the bracket contact a movable portion of the pivot and are adjusted to selectively align the stanchion. An aligning indicator, attached to the sleeve, indicates such alignment. When thusly aligned, the stanchion is released to abut the ocean floor and is connected to a source of water under high pressure. Water forced, or jetted, through the stanchion and through holes provided in the end abutting the ocean floor displaces sediment permitting insertion of the stanchion in the ocean bottom. After the stanchion is embedded, the source of high pressure water is removed and the aligning device moved to a new location.

In FIGS. 1 and 2, tripod **10**, or supporting frame, includes three diverging legs **11** connected to a tripod ring **12**. At the opposite ends of the legs, plates **13** provide a bearing, support surface for the tripod. An aligning mechanism, generally designated by the numeral **15**, includes a bracket **16** having a center portion **19** and radially extending members **17** releasably connectable to tripod ring **12** by a pivotable latch screw **18**. The center portion houses an annular collar **25** that is provided with an arc-shaped race. Within the annular collar, an annular guide portion **26** is disposed and has its outer surface formed to complementarily fit within the annular collar race.

Integral with and extending from the annular guide portion, a clamp sleeve **26***a* projects substantially perpendicular from a plane defined by the tripod ring. The clamp sleeve is provided with three longitudinally extending circumferentially disposed slots **26***b* and an adjustable clamp **27** is fitted about the slotted portion and may be tightened or loosened by turning an L-shaped handle **27***a*. A guide sleeve **28** is disposed within the clamp sleeve and is provided with a pair of adjustable T-shaped securing screws **29** that may be rotated to extend through the wall to the interior of the guide sleeve. The guide sleeve is sized to permit a sliding longitudinal motion through the clamp sleeve when the adjustable clamp is loosened. Upon tightening the adjustable clamp, the slotted portion of the clamp sleeve is deformed to grip the guide sleeve to prevent further longitudinal motion.

As alignment indicating means **31** is configured to releasably clamp onto the guide sleeve and includes a yoke **31***a* carrying a pair of orthogonally mounted bubble levels **32**, **33**, the level reading of which may be selectively varied in accordance with a desired alignment of the guide sleeve. The yoke is provided with a hinge **34** on one side and a pair of securing screws **34***a* on the other side to permit the aforementioned releasable clamping. The alignment indicating means is connected to the tripod by a chain to prevent loss.

On center portion **19** four circumferentally disposed tapped projections **20** are mounted radially extending toward the guide sleeve **28** and adjacent to annular collar **25** and annular guide portion **26**. An adjusting screw **21**

extends through each of the tapped projections and abuts the top surface of the annular guide portion. By selectively adjusting respective ones of the adjusting screws, the annular guide portion can be made to tilt as desired within the annular collar. The described aligning device is especially adapted for relatively shallow water use; that is to say, use a depth that can be reached by a scuba diver. One or two divers can readily move the tripod **10** to a desired point under water by attaching inflated bags or a float to the tripod.

A stanchion **6**, preferably a hollow pipe, has a threaded end *6a* and a nozzle or open end *6b* and is provided with stabilizing fins **7**. To embed the stanchion, the stanchion is lowered through the tripod ring **12** placing nozzle end *6b* on the ocean floor. The aligning mechanism **15** is fitted over end *6a* and slid along the length of the stanchion until the radially extending members **17** abut tripod ring **12**. Next, the aligning mechanism is secured to the tripod ring by tightening latch screws **18**, and the stanchion is raised from the ocean floor and secured in place by tightening adjustable clamp **27**. The alignment indicating means **31**, having a preset alignment, is attached to guide sleeve **28**. By observing the bubbles in bubble levels **32**, **33** and selectively adjusting adjusting screws **21**, the stanchion can thus be aligned. The T-shaped securing screws **29**, **30** are released to permit a longitudinally aligned motion of the stanchion until the nozzle end abuts the ocean floor.

At this point the alignment indicating means is removed from guide sleeve to prevent any possible injury to the yoke and bubble levels. A source of high pressure water **8**, e.g., a hose connected to a pumping unit, is connected to threaded end *6a* and water is forced through the stanchion and through the nozzle end. This hydraulic process is known as "jetting" (the water is jetted through the nozzle end to displace the sediment and to permit the stanchion to settle down into the recess created in the ocean bottom).

When embedding a stanchion into the ocean bottom by the jetting process, often the connection between the source of high water pressure and the stanchion threaded end eventually comes in contact with the top of guide sleeve **28** preventing further insertion of the stanchion. When this occurs, adjustable clamp **27** is loosened and the guide sleeve travels downward permitting a further downward movement of the stanchion.

After the stanchion has been embedded to the length of fins **7**, the jetting process is stopped. The source of water pressure **8** is removed and aligning mechanism **15** is slid up over the threaded end. The tripod **10** is lifted over the threaded end and moved to a new location where the process is repeated.

As seen in FIG. 4, additional lengths of pipe **5** may be screwed onto the stanchion if it is desired to have a support a considerable distance above the ocean floor.

Using this process a stanchion could be inserted approximately five feet into the ocean bottom in less than ninety seconds. Therefore, the disclosed method is rapid while requiring no surface supporting equipment if a self-contained, sealed motor-pump unit is used on the bottom. If surface support equipment is available, all that is required is a source of high pressure water.

Obviously many modifications and variations of the present invention are possible in the light of the above teachings. It is therefore to be understood that the invention may be practiced otherwise than as specifically described.

What is claimed is:

1. A device for aligning an elongate member comprising:

a supporting frame;

an aligning mechanism carried by said frame and having

a pivot means including an annular collar portion formed with a race and an annular guide portion formed with an outer surface carried within said race mechanically cooperating to permit contiguous motion around two orthogonal axes only;

a sleeve carried in a selectively clamped relationship in and extending through said pivot means and being provided with a means for releasably securing said elongate member;

and a bracket including an annular member and a plurality of radially-extending members and means for adjusting said pivot means to effect selective alignment of said elongate members and adapted to receive said pivot means and to support said pivot means on said frame; and

means for indicating alignment of said elongate member including a yoke carried on said sleeve orthogonally mounting a pair of level indicators, whereupon the securing means is released to permit a longitudinally aligned motion by said elongated member.

2. A device according to claim **1** wherein said collar portion is rigidly mounted within said annular member and said means for adjusting includes a plurality of projections each carrying an adjusting screw thereon, said projections circumferentially disposed on said annular member and extending radially inwardly thereof with each said adjusting screw abutting said guide portion thereby permitting said selective alignment.

3. A device according to claim **2** wherein said yoke is releasably carried by said sleeve.

4. A device according to claim **3** in which said supporting frame includes a ring portion and at least three legs depending from said ring portion.

5. A device according to claim **4** wherein said bracket is releasably coupled to said ring portion.

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