United States Patent [19]

Gratz

[11] **3,722,223**

[45] **Mar. 27, 1973**

[54] **SUBMERSIBLE SINGLE POINT MOORING FACILITY**

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[73] Assignee: **Continental Oil Company,** Ponca City, Okla.

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[21] Appl. No.: **165,222**

[52] **U.S. Cl.** **61/46,** 61/48, 61/65, 9/8, 114/230, 141/387

[51] **Int. Cl.**.....**B63b 21/00,** B65b 3/00

[58] **Field of Search** .....61/46, 48, 46.5, 65; 114/230; 9/8 P, 8; 141/387

[56] **References Cited**

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2,774,322 12/1956 Harris.....61/48 X

FOREIGN PATENTS OR APPLICATIONS

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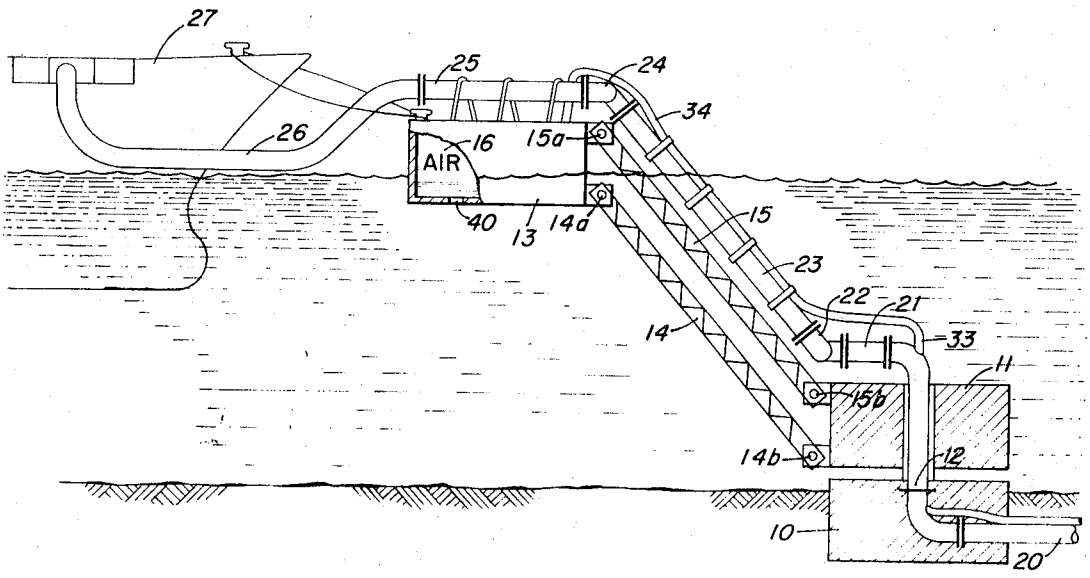
Primary Examiner—Jacob Shapiro

Attorney—Joseph C. Kotarski et al.

[57] **ABSTRACT**

A submersible single point mooring facility for a bed of water which includes a mounting affixed to the bed of the body of water, a base mounted by means of a swivel to the mounting which permits 360° horizontal rotation of the mounting about the base, a buoy which is attached by means of a rigid arm to the base such that the arm is pivotally attached to the base and pivotally attached to the buoy, and means for floating the buoy or submersing the buoy such that the single point buoy can be floated during loading location and subsequently submersed to protect the buoy from accidental impact by passing ships or damage from surface ice.

2 Claims, 3 Drawing Figures



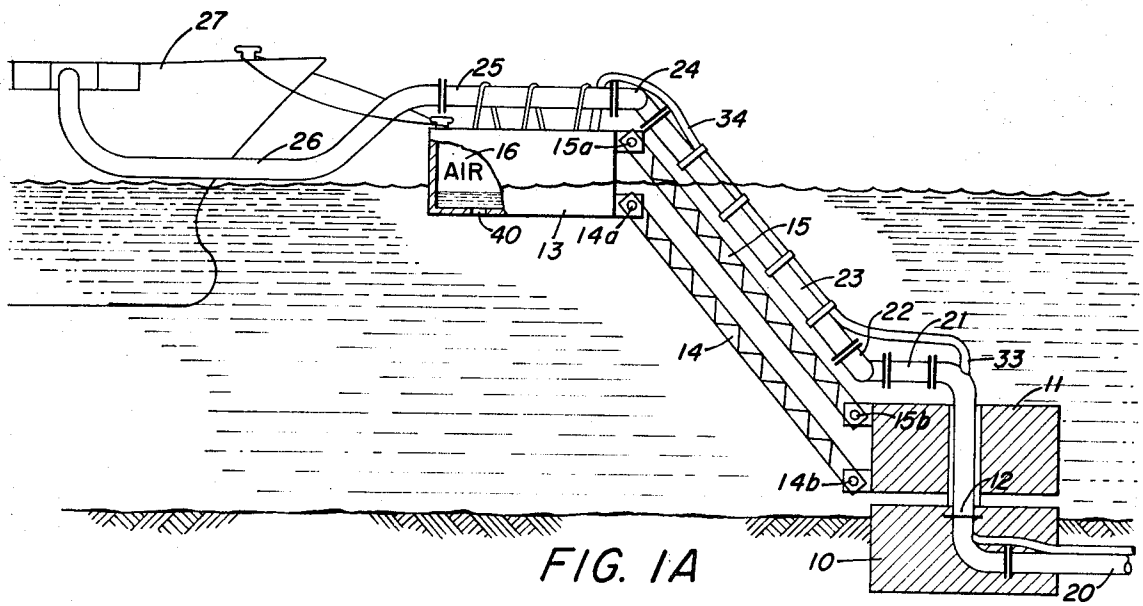


FIG. 1A

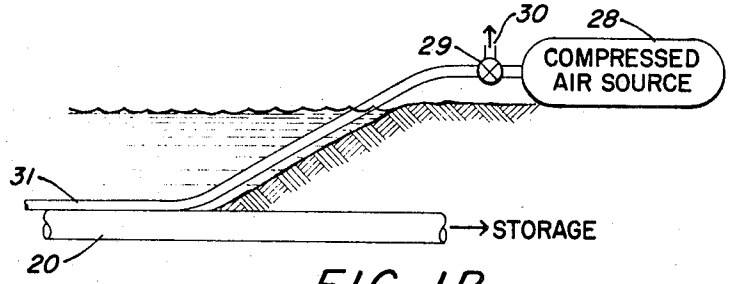


FIG. 1B

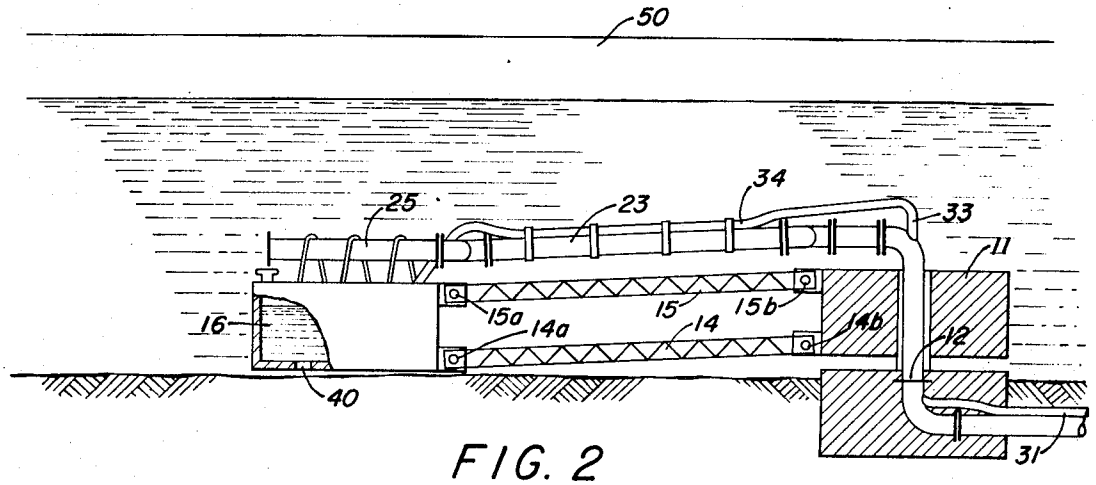


FIG. 2

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SUBMERSIBLE SINGLE POINT MOORING FACILITY

BACKGROUND OF THE INVENTION

Monomoorings, being located offshore and rather low in the water, are subjected to damage by ships passing in the vicinity of the mooring. Monomoorings also require an exceptionally good anchor system, since the mooring is free to float and thus be subjected to any wave action. Furthermore, in areas such as the arctic region where ice forms during a portion of the year, any mooring site is subjected to severe damage caused by the ice sheet being moved by the wind and by other forces. Since the mooring would be floating within the ice, the ice could easily shear any mount or cable system normally used to attach the mooring to the bed of the water.

PRIOR ART

The closest prior art is a patent to W. F. Miller, No. 3,309,879, which discloses a loading system attached to the bed of the body of water and adapted to be raised or lowered by pulling on a line attached to the mooring system, thereby lifting it from the bed of water to the surface. The patent also discloses buoyancy being attached to the system in order to reduce the forces required in order to lift the assembly from the ocean bed.

An article in World Oil, page 88 of the July, 1970, issue discloses a single point mooring facility which has a rigid arm attached to the buoy and a pivotal arm attached to the base.

DESCRIPTION OF THE FIGURES

Referring to the drawing, FIG. 1*a* illustrates the single point mooring facility or monomooring in a surfaced position for loading a ship, FIG. 1*b* illustrates the onshore facility for operating the flotation characteristics of said buoy, and FIG. 2 shows the same mooring facility in a submerged condition below a sheet of ice, for example.

DETAILED DESCRIPTION OF THE INVENTION

Referring to the figures generally but in particular to FIG. 1, the monomooring is illustrated having a mounting **10** attached to a base **11** through a swivel connection **12**. A buoy **13** has a plurality of arms **14** and **15** pivotally connected to the buoy at **14***a* and **15***a*, respectively, and to the base **14***b* and **15***b*, respectively. A pipe **20** is connected through a swivel connection **12** to a pipe **21** through a swivel coupling **22** to pipe **23**, swivel coupling **24**, and pipe **25** to a hose **26** which is connected to a ship **27**. Buoy **13** can be raised or lowered by expelling the water from an internal tank **16** in buoy **13** by means of any suitable gas such as, for example, compressed air.

Referring to FIG. 1*b*, a compressed air source **28** is connected through a valve **29** to either a vent **30** or a pipe **31** such that the valve in the first position will permit passage of compressed air from source **28** to pipe **31** and in a second position will permit venting of the pipe **31** to the atmosphere through pipe **30**. Pipe **31** is connected coaxially through the swivel joint **12** to a pipe **33** which in turn is connected through a hose **34** to tank **16**. An opening **40** in the bottom of the tank **16** permits entry or expulsion of water therefrom.

The pair of arms **14** and **15** tends to stabilize the platform and permit it to rotate so that the platform will seek a generally downwind position, making an approach and docking to the buoy relatively simple for a ship.

OPERATION

In operation if, for example, the buoy is on the surface of the body of water as shown in FIG. 1 and one desires to sink the platform to the seabed, valve **29** is rotated to the second position, venting the pressurized air in tank **16** to the atmosphere through vent **30**. As the pressure decreases, water will enter opening **16** filling the tank and causing the buoy to sink. As the buoy **13** fills with water it will gradually settle until it reaches the bed of the body of water as shown in FIG. **2**.

Since the pair of arms **14** and **15** are the same length, the buoy **13** must also settle in a level condition until it reaches the bed. When it is necessary to lift the monomooring from the seabed, valve **29** is moved to the first position, connecting pipe **31** to the compressed air source **28**. Air pressure is then applied through pipe **31** to the buoy tank **16**, forcing the water out of opening **40** and into the ocean or body of water. When the monomooring reaches the surface of the water, it will be in proper position for use.

If a thin layer of ice **50** as shown in FIG. **2** is present on the surface of the water, the mooring can be raised, impacting the bottom of the ice. In most instances the mooring will fracture the ice and raise to the surface.

In most instances the buoy may be marked with small marker buoys for information as to the location of same in order to protect the buoy against deep draft ships, particularly if the buoy is mounted in fairly shallow water.

It is obvious, of course, that the air under liquefied conditions could be stored on the base **11** so that a second swivel joint would not be needed. A remote electrically-operated valve could operate the source of air as previously described. Also, a remote pump could be mounted to remove the water from tank **16** by incorporating suitable water replacement means such as an air vent.

It is also obvious that modifications and changes in this invention can be made and still remain within the scope of the claims in this application as set out in the specification and appended drawing.

What I claim is:

1. A submersible single point mooring facility for a body of water comprising:

a mounting affixed to the bed of said body of water;

a base;

swivel means rotatably attaching said base to said mounting to permit 360° horizontal rotation of said mounting about said base;

a mooring buoy;

mooring buoy attachment means including a pair of vertically and parallelly-spaced, equal length beams pivotally attached vertically to said base and said mooring buoy respectively; and means for submersing or floating said mooring buoy to cause said mooring buoy to either sink to said bed or float on the surface of the water respectively.

2. A mooring facility as set out in claim **1** wherein said means for submersing or floating said buoy com-

prises a source of compressed air, a valve connected to said source having a first and second position, a tank in said buoy, a pipe connecting said valve to said tank in said first position, and a vent, said vent connected to said valve in said second position, whereby when said valve is in said first position, said compressed air can pass to said tank, and, when said valve is in said second position, the air in said tank can be vented.

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