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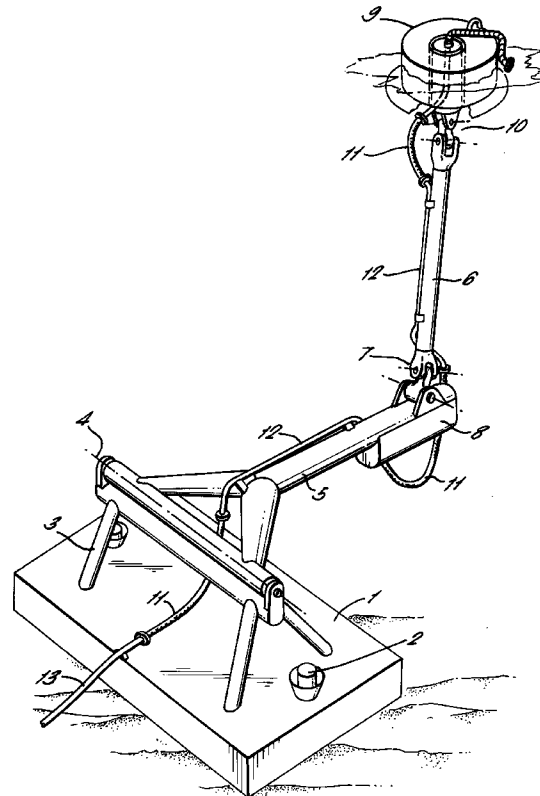
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54 **Single point mooring terminals.**

57 The disclosure relates to a single point mooring terminal. A base (1) is installed on the seabed on which a hinge support structure (3) is mounted on which a yoke (5) is hinged. A vertically extending tension leg (6) is connected by a universal joint (7) to the yoke and has a floating buoy (9) at its upper end connected to the leg by a second universal joint (10). The buoy has a mooring lug and piping for coupling to a tanker.



Traditionally, tankers which require loading or unloading in less sheltered offshore areas, are moored by means of nylon ropes to so-called Single Point Mooring terminals (SPM terminals). Such terminals allow the tanker to remain aligned with the direction of the main environmental conditions much like a weathervane. Simultaneously the cargo is loaded or unloaded through a floating and submarine hose system.

Such SPM terminals are well documented and described in many patents and patent applications world-wide. Many types of SPM terminals have been developed to cater for specific conditions at a given location; many such systems cannot be re-used at other locations due to this, nor is this always desired.

This disclosure describes a SPM terminal designed primarily to overcome problems encountered in traditional SPM systems when high currents and very large tidal variations are encountered. Applications in other areas are also possible.

Very large tidal variations have a large impact on the design of an SPM terminal. The waterdepth is in almost any SPM design a parameter which contributes significantly to the SPM's ability to cope with the forces and motions which are imposed on it by the tanker to be moored. Therefore, large variations of this waterdepth result in significant differences in behaviour of the system and hence does not allow sufficiently for optimization.

Furthermore, many SPM terminals employ submarine hose configurations to convey products between the terminal itself and the seabed pipeline. When large waterdepth variations and high tidal currents occur, such submarine configuration may no longer be safely accommodated.

The invention provides a single point mooring floating terminal including a leg for connection to a seabed anchorage, the anchorage including a base for location on the seabed and means to connect the lower end of the leg to the base to allow the leg to rise and fall and to tilt with the tide/current to which the terminal is subjected.

The following is a description with reference to the accompanying diagrammatic illustration of a preferred embodiment of an SPM terminal for such large tidal variations. It should be obvious to those skilled in the art, that modifications and refinements to the preferred embodiment are easily made and as such this description should be taken as a generalized one.

An anchoring base 1 is installed on the seabed by means of piles 2 or alternatively by ballasting. The base may be designed such that it could serve also as a transport barge for the entire SPM system, allowing the system to be self installable by selected flooding of the base compartment.

A structure 3 is fitted on top of the base which supports hinges 4. These hinges in turn support a mooring yoke 5. The other end of the mooring yoke

is fitted to one or more nominally vertical tension legs 6 by means of a universal joint 7. This tension leg may consist of rigid or flexible elements. The yoke is fitted with ballast 8 near this universal joint.

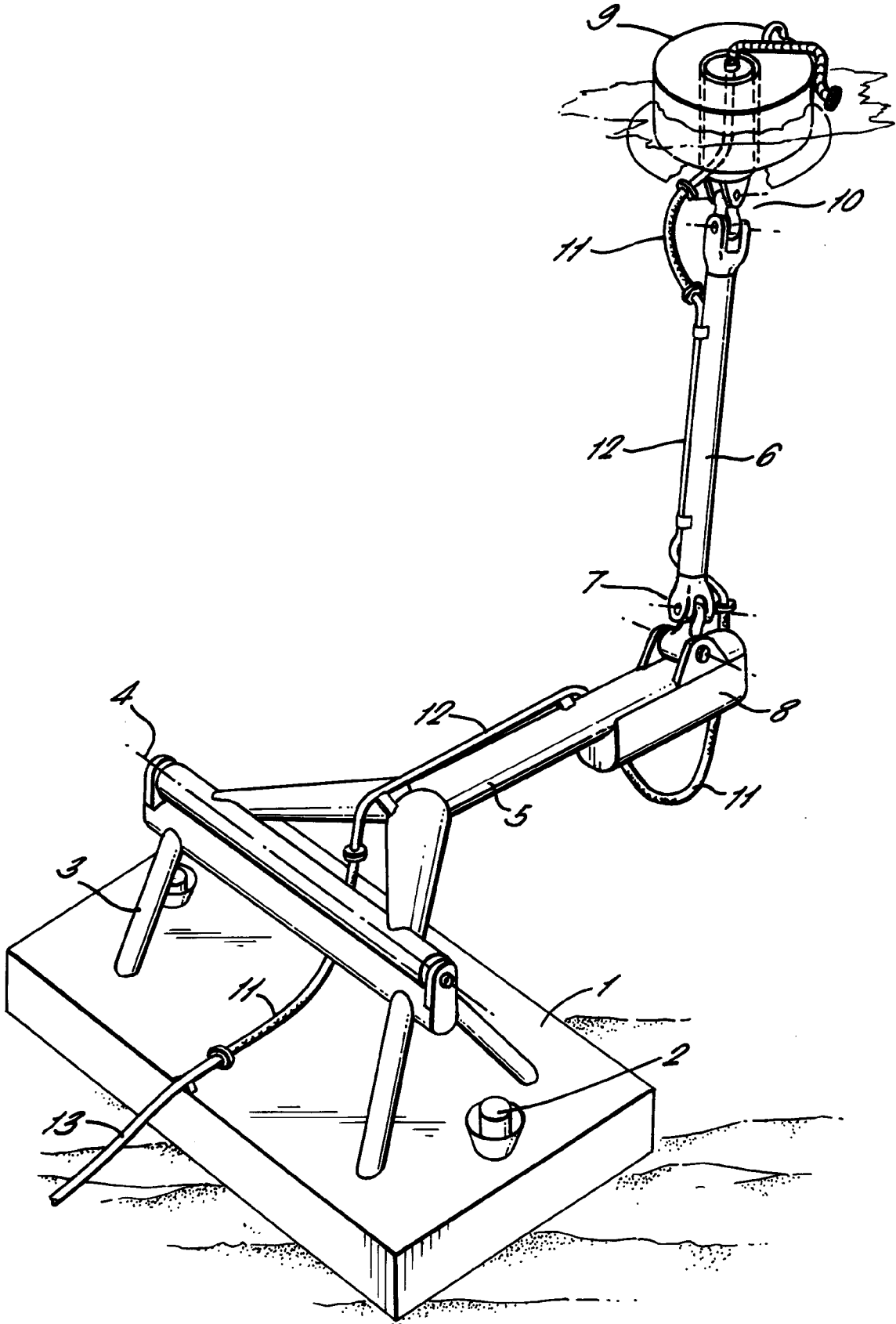
The vertical tension leg is supported from a floating buoy 9 through the intermediary of a universal joint 10. The floating buoy may be of the type known in the industry as "turret" type or "turntable" type. Although different shapes, such as tall, cylindrical shapes may also be used.

At some sites it may be advantageous to delete the upper universal joint 10 and to connect the tension leg 6 rigidly with the buoy 9. The buoy is equipped with a mooring lug and piping such that tankers may readily moor to it by means of a hawser and a floating hose.

A combination of jumper hoses 11 and hard piping 12 is employed to convey the fluids between the piping on the buoy and the seabed pipeline 13.

Claims

1. A single point mooring floating terminal including a leg for connection to a seabed anchorage, the anchorage including a base for location on the seabed and means to connect the lower end of the leg to the base to allow the leg to rise and fall and to tilt with the tide/current to which the terminal is subjected.
2. A terminal as claimed in Claim 1, wherein the lower end of the leg is connected to the base by an arm adapted to allow rise and fall of the leg with respect to the base and a universal joint is provided between the leg and arm to allow the leg to tilt as aforesaid.
3. A terminal as claimed in Claim 2, wherein the arm is pivotally connected to the base to swing about a horizontal axis to swing in a vertical plane and thereby cater for rise and fall of the column.
4. A terminal as claimed in Claim 3, wherein the arm is in the form of a yoke, the divided end of which is pivotally mounted to the base and the unitary end of which is connected by said universal mounting to the lower end of the leg.
5. A terminal as claimed in any of the preceding claims, wherein the leg comprises a rigid or flexible elements.





European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 93 30 8197

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.5)
X	FR-A-2 418 146 (BLUEWATER TERMINAL SYSTEMS N.V.) * the whole document * -----	1-5	B63B22/02
			TECHNICAL FIELDS SEARCHED (Int.Cl.5)
			B63B
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
THE HAGUE		19 January 1994	DE SENA, A
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document</p>			

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