

- [54] **ROTATABLE BUOY FOR MOORING VESSELS**
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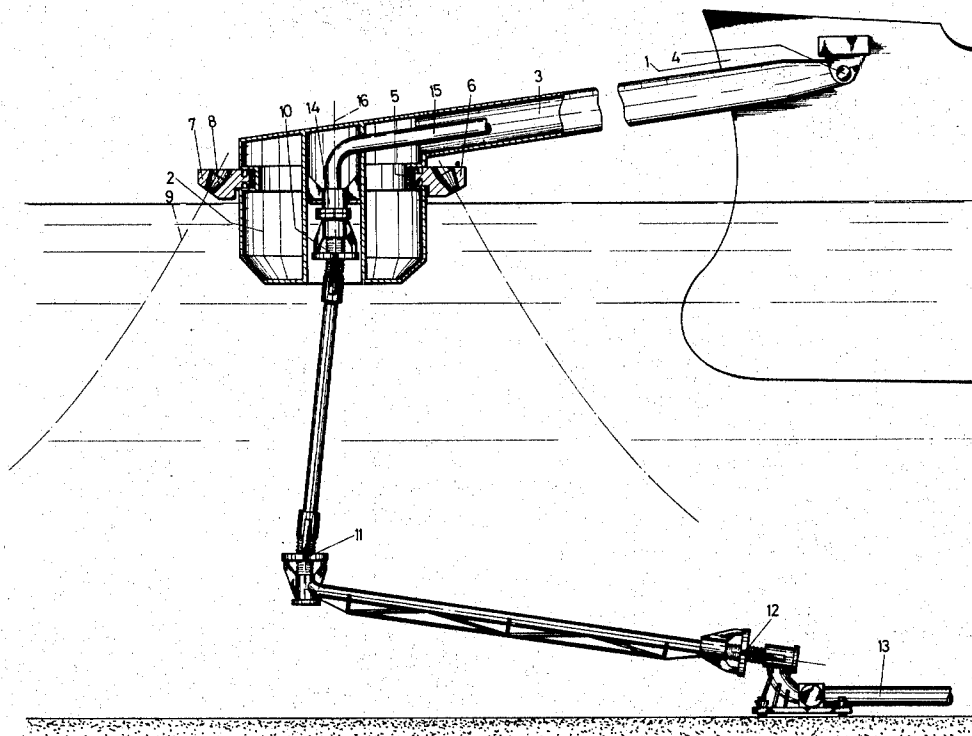
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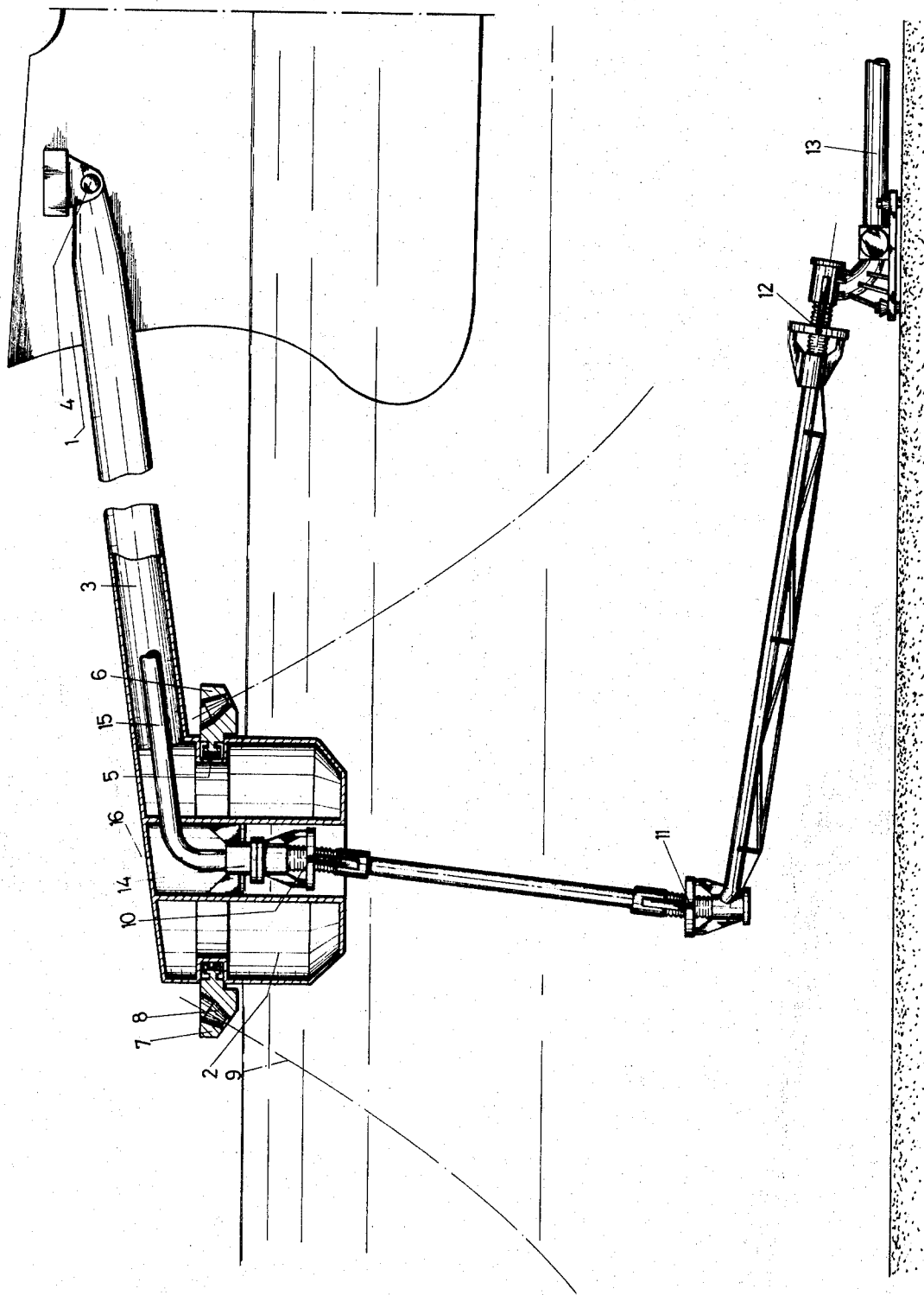
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[57] **ABSTRACT**
A buoy for mooring vessels such as tankers is encircled by a relatively rotatable ring to which are secured a plurality of anchor chains so that the buoy can rotate about a vertical axis within and relative to the ring. At least one coupling member in the form of a rigid arm is integrally and rigidly secured to the buoy for rotation therewith. The end of the arm remote from the buoy is secured to the moored vessel for relative vertical swinging movement about a horizontal pin. A pipeline on the ocean floor enters the buoy and passes through the arm to the moored vessel.

3 Claims, 1 Drawing Figure





ROTATABLE BUOY FOR MOORING VESSELS

The present invention relates to improvements in, or relates to, a buoy with an associated mooring arrangement.

Such a buoy with an associated mooring arrangement is known from the Dutch Patent application No: 66.0032I, now laid open to public inspection, and which buoy is anchored by a number of anchors and anchor chains. The associated mooring arrangement is coupled to the buoy by a number of rigid members which serve to hold the mooring arrangement off from the buoy. Particular ones of these coupling members, on the one hand are each pivotably hinged on a horizontally disposed pin affixed to the mooring arrangement; and others of these coupling members, on the other hand, are coupled to the buoy in such a manner that the mooring arrangement can swing about the axis of a vertically arranged shaft on the buoy.

In this known arrangement of a buoy with its associated mooring arrangement, the rigid coupling members are pivotably hinged with respect to a turn-table arranged on the buoy by means of a horizontally disposed shaft affixed to the turn-table so as to couple the buoy to the mooring arrangement. In certain instances a ship, such as a tanker, may constitute the mooring arrangement and to which yet another ship, or tanker, can be moored.

Buoys with associated mooring arrangements of this type are subjected to tidal and weather conditions which require the buoy to have a considerable inherent stability to cope with the forces exercised thereon by the mooring arrangement, and which forces tend to tip the buoy. This means that the buoy needs to have a relatively large mass with the result that the forces manifesting themselves in the rigid coupling members coupling the buoy to the mooring arrangement, i.e., a ship, or a tanker, are also of considerable magnitude.

The present invention therefore is directed to the provision of a buoy with an associated mooring arrangement in which considerably lesser loads are presented thereto. This object is achieved, according to the present invention, in that the buoy and the rigid coupling members which 'hold-off' the mooring arrangement form a rigid integral unit, and inasmuch that the anchor chains are affixed, at one end thereof, to a ring rotatably arranged on and with respect to the buoy. With such an arrangement the buoy no longer needs to have an inherent stability. The displacement of the buoy does not need to then be greater than that which is necessary for the buoyancy thereof to support the anchor chains and to effect transmission of the forces required for the mooring of the ship, or tanker, and other means moored thereto, to the anchors. The buoy is coupled to the mooring arrangement in a manner which may be likened to the manner in which a wheel barrow is held by its user i.e., the single wheel of the wheel barrow may be likened to the buoy, the two handles thereof to the coupling members, and the mooring arrangement to the user of the wheel barrow and such that any lateral roll of the ship is transferred to the buoy via the rigid coupling members in the same way that any lateral tilting of the barrow by the user will be transferred through the handles thereof to the single front wheel which has, more or less, only point contact with the ground. Thus the rigid coupling effect of mooring arrangement to the buoy has the same effect as the rigid coupling effect between the user of the wheel barrow

and the single wheel thereof. This rigid coupling effect, between buoy and mooring arrangement, is made possible by the form and dimensions to which the buoy is designed and by which the buoy and mooring arrangement laterally roll together. The design of the buoy being such that the force of inertia of the buoy to be overcome is relatively small since the form is such that it offers very little resistance to the action of waves and tide thereon. A buoy having the underwater portion thereof of a somewhat streamlined or smooth form may be employed without objection. In accordance with the present invention it is preferable that the rigid coupling member, or members, holding the buoy off from the ship should be buoyant, such that when the mooring arrangement casts-off from the buoy the latter's buoyancy should remain stable and relatively undisturbed.

It will be noted that in U.S. Pat. No. 3,354,479 a buoy having a turn-table is well-known, and in which a mooring arm extending therefrom is in the form of a girder provided with floats. This mooring arm is rotatably coupled to the buoy via a vertical shaft. The mooring arm comprises two parts which are hingeably coupled to one another, and which hingeing arrangement permits pivoting of the two parts about the axis of a horizontally disposed shaft, and in which that portion of the mooring arm, which diverges at the end remote thereof from the buoy, is affixed to the side of the tanker. The tanker itself is moored to the buoy by means of cables shackled to the turn-table thereof. Should relative movement occur between the tanker and the buoy through wind and waves this will lead to the imposition of a very heavy load on the vertically disposed hinge about the axis of which pivoting takes place between the mooring arm and the buoy.

It will be noted further from U.S. Pat. No. 3,335,690 that a mooring arrangement is known which has, extending from the stern or bow thereof, a support structure having arranged thereon a ring which, relative to the support structure, is rotatable and to which ring the anchor chains are shackled. Rise and fall of the mooring arrangement due to tidal swell or weather conditions leads to the imposition of very heavy loads on the anchor chains, the ring and the bearings therefor.

In view of the foregoing disadvantages of known mooring arrangements, in the present invention there is provided accordingly:

A buoy with an associated mooring arrangement anchored by means of a number of anchors and the chains therefor in which the mooring arrangement and the buoy are coupled by one or more rigid coupling members holding the mooring arrangement off from the buoy and which said one or more coupling members are, on one hand, each pivotably mounted on a horizontally disposed pin on the mooring arrangement; and which each said one or more coupling members, on the other hand, is coupled to the buoy in such a manner that the mooring arrangement can swing about the axis of a vertical shaft on the buoy; and in which the said buoy and mooring arrangement form an integral and rigid unit, and the anchor chains are affixed to a ring arranged for rotation about the vertical axis of a shaft on the buoy.

The FIGURE illustrates a schematic cross sectional view of the present invention.

The invention will be better understood from the following description read with reference to the accompanying drawing, and in which the mooring arrangement

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is in the form of a tanker 1. The buoy comprises a float 2 of relatively small size having two integral arms, forming the coupling members 3, which are pivotably arranged on a pin 4 extending transversely through the bow of the tanker, or each on a pin extending transversely from the sides of the bow.

A ring 6 is rotatably arranged on the body of the buoy 2 by means of a bearing 5, and which ring is provided with conical recesses 7 for accomodating the members 8 of the anchor chains 9 for retention therein.

A pipe-line or hose 15, supported by the arms or coupling members 3, is coupled to a pipe-line 13 supported by a suitable foundation on the sea bed via an intermediate pipe-line provided with universal joints 10, 11 and 12 or, alternatively, ball-and-socket joints. The pipe-line or hose 13 can rotate or swing about the vertical axis of the buoy with the arms or coupling members 3 and with respect to the intermediate pipe-line by the provision of rotatable coupling 14 therebetween.

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What we claim is:

1. A buoy encircled by a ring, anchor chains secured to the ring, means interconnecting the buoy and the ring for rotation of the buoy relative to the ring about a vertical axis, at least one arm fixedly secured to and rotatable with the buoy and extending laterally from the buoy, and means for interconnecting the end of the arm remote from the buoy to a vessel for vertical swinging movement of the arm and vessel relative to each other about a horizontal axis.

2. A buoy as claimed in claim 1, said arm being buoyant.

3. A buoy as claimed in claim 1, and conduit means extending through said buoy and arm, and means interconnecting a portion of said conduit means with said buoy for rotation of said buoy about an upright axis relative to said conduit means.

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