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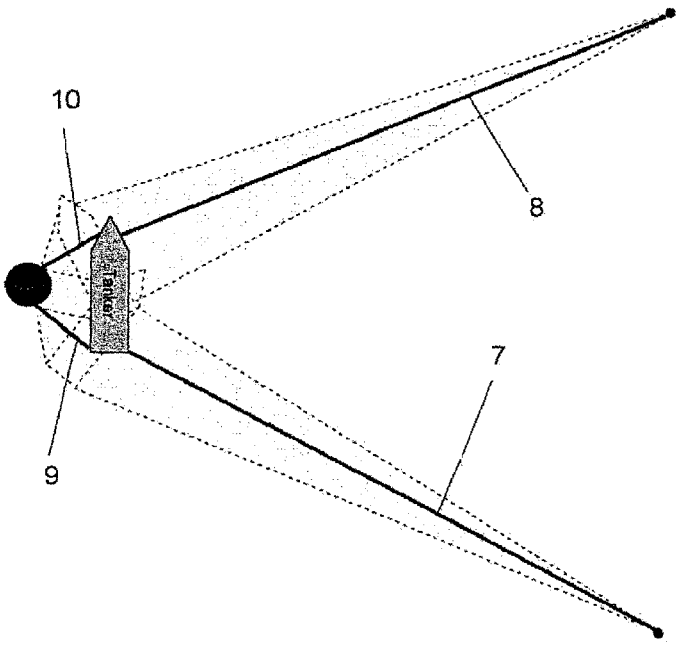
(54) **Title:** MOORING SYSTEM FOR A CONVENTIONAL TANKER



(57) **Abstract:** Mooring system for a tanker, i.e. a mooring of a conventional tanker to an installation with fixed orientation, wherein a conventional tanker (3) which is to be moored to the installation is arriving in a direction favourable to wind, current and waves. By mooring a conventional tanker (3) in four points (A, B, C, D) on a tanker (3), wherein the hawsers to the points (C, D) are connected on board a platform (1) and hawsers to the points (A, B) are connected to two separate buoys (4, 5) and then tightening/slackening the hawsers until the tanker (3) has arrived in the desired/correct position.

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Mooring system for a conventional tanker

The present invention relates to a mooring system for a tanker, i.e. mooring of a conventional tanker to an installation with fixed orientation, according to the preamble of the claims.

Mooring of a conventional tanker i.e. a tanker without dynamic positioning and bow loading equipment for load transfer to/from a fixed or floating platform with a fixed orientation, is traditionally done via a loading station. The loading station comprises a hawser which connects the tanker to the platform and where the transfer of load takes place through a hose leading from the platform to the mid-ship manifold of the tanker.

In order to keep the tanker in position, an auxiliary vessel is necessary to keep the tanker away from the platform. An incorrect operation of the auxiliary vessel or line tear off has with this type of mooring led to collision between the tanker and the platform.

In case of changing wind and/or current conditions, this can lead to that a loading operation must be interrupted. An interrupted loading operation can easily lead to one or several days delay, which can be very costly for the owner of the tanker but also for supplier due to tight delivery conditions.

It is therefore an object of the present invention to provide a mooring system for conventional tankers, which on one side shall reduce the need for costly auxiliary vessels during the loading operation of the tanker and on the other side reduce the risk and the need for interruptions in the loading process. This is achieved with the mooring system according to the present invention as it is defined by the features of the appended claims.

The present invention will be described further in connection with an embodiment and with reference to the drawings, in which figure 1 shows a tanker approaching the platform for load transfer, figure 2 shows how an auxiliary vessel from the platform helps out with the hawsers to the tanker, figure 3 shows how the tanker independently can turn according to wind and current by adjusting the hawsers, and figure 4 shows a conventional tanker ready moored to a platform and with load transfer hoses attached to the mid-ship manifold.

The mooring system according to the invention is based on mooring a conventional tanker 3 in four points A,B,C,D on the tanker 3, where the hawsers to the points C,D are connected on board a platform 1 and the hawsers to the points A,B are connected to two separate buoys 4, 5. Each buoy 4, 5 is anchored by means of a rope

consisting of a wire, chain and/or polyester rope, down to at least one anchor on the seabed. The anchor can be at least one of the anchors used by the platform.

With reference to figures 1 and 2, a conventional tanker 3 which is to be moored to a platform 1, is approaching. The tanker 3 arise in a direction which is favourable for wind, current and waves to a position between the nearest buoy 5 and the platform 1. On/by the platform 1 is an auxiliary vessel 2 which is to assist in the delivery of hawsers to the tanker 3. In the sailing direction 6 to the tanker 3 another buoy 4 is positioned, which also is to be used to moor the tanker 3.

The auxiliary vessel on the platform will now be subject to a routine as follows (ref figure 2):

1) The auxiliary vessel 2 has in turn arrived and fixed a hawser 7 , with a forerunner if necessary, to the buoy 5 nearest the arriving tanker 3 and thereafter provide the forerunner to someone on board the tanker. The tanker 3 will then lay down the line on the aft capstan A and take control of the hawser 7.
2) The auxiliary vessel 2 will then proceed to the next buoy 4 and connects a hawser 8, with a forerunner if necessary, to this buoy and thereafter provide the forerunner to someone on board the tanker. The tanker 3 will then lay down the line on the forward capstan B and take control over the hawser 8.
3) The auxiliary vessel 2 will then return to the platform 1 and fetch a hawser 9 with a forerunner if necessary, and thereafter provide the forerunner for the hawser to someone on board the tanker. The tanker 3 will then lay down the line on the aft capstan C and take control over the hawser 9.
4) The auxiliary vessel 2 will then once again return to the platform 1 and fetch another hawser 10, with a forerunner if necessary, and thereafter provide the forerunner to someone on board the tanker. The tanker 3 will then lay down the line on the forward capstan D and take control over the hawser 10.
5) The auxiliary vessel 2 then return to the platform 1.

During this procedure the tanker 3 will move in the sailing direction 6 until the hawsers 7, 8, 9, 10, which are connected aft and forward, are tightened in order to place the tanker 3 in the most favorable position to wind, current and waves.

In figure 3 it is shown how the tanker 3, on its own, can position itself by tightening or slackening the hawser 7, 8, 9, 10 to obtain a suitable distance to the platform and orientation with regards to the waves, wind and current as indicated by the dotted lines of the tanker and hawsers.

Referring to figure 4, the tanker 3 is shown ready moored in the four points in relation to the platform 1 and at least one loading hose 11 is transferred to the tanker 3 mid-ship manifold in order to start the loading.

Patent Claims

1. Mooring system for a tanker, i.e. a mooring of a conventional tanker to an installation with fixed orientation, wherein a conventional tanker (3) which is to be moored to the installation is arriving in a direction favourable to wind, current and waves, **characterized by** mooring a conventional tanker (3) in four points (A, B, C, D) on a tanker (3), wherein the hawsers to the points (C, D) are connected on board a platform (1) and hawsers to the points (A, B) are connected to two separate buoys (4, 5) and then tightening/slackening the hawsers until the tanker (3) has arrived in the desired/correct position.

2. Mooring system according to claim 1, **characterized by** each buoy (4, 5) is moored with at least one line down to at least one anchor on the seabed.

3. Mooring system according to claim 1, **characterized by** the line consisting of wire, chain and/or polyester rope.

4. Mooring system according to claim 1, **characterized by** the anchor being at least one of those used by the platform (1).

5. Method for mooring a conventional tanker to an installation of fixed orientation, **characterized by** an auxiliary vessel (2) on the platform (1) is subjected to the following steps:

1) the auxiliary vessel (2) drives out and connects a hawser (7) with a forerunner if necessary, to the buoy (5) nearest the arriving tanker (3) and thereafter provide the forerunner to someone on board the tanker (3) who will position this line on the aft capstan (A) and take control over the hawser (7),
2) the auxiliary vessel (2) drives to the next buoy (4) and connects a hawser (8), with a forerunner if necessary, to this buoy and thereafter provide the forerunner to someone on board on the tanker (3) who then position the line on the forward capstan (B) and take control over the hawser (8),
3) the auxiliary vessel (2) drives to the platform (1) and collects a hawser (9), with a forerunner if necessary, providing the forerunner of the hawser to someone on board the tanker (3) who then position the line on the aft capstan (C) and take control over the hawser (9),
4) the auxiliary vessel (2) will then once again return to the platform (1) and fetch another hawser (10), with a forerunner if necessary, providing the forerunner to someone on board the tanker (3) who will then lay down the line on the forward capstan (D) and take control over the hawser (10),
5) the auxiliary vessel (2) drives back to the platform (1).

Fig. 1

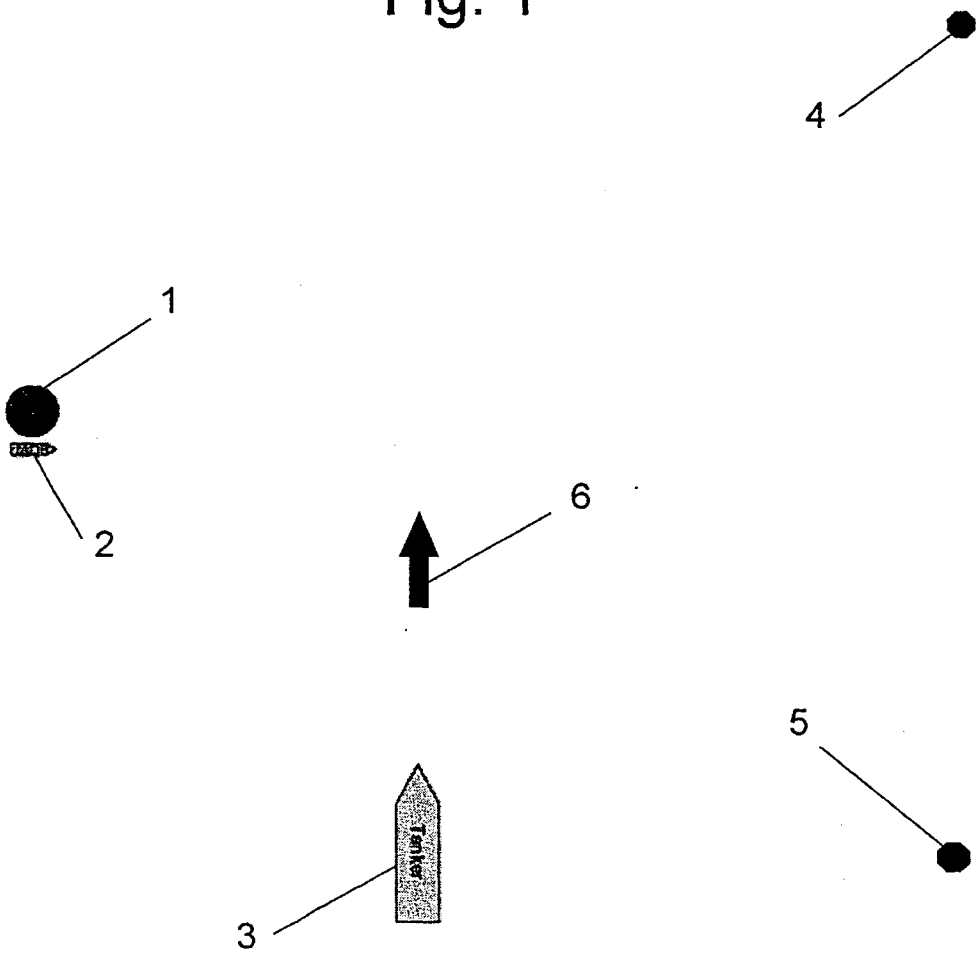


Fig. 2

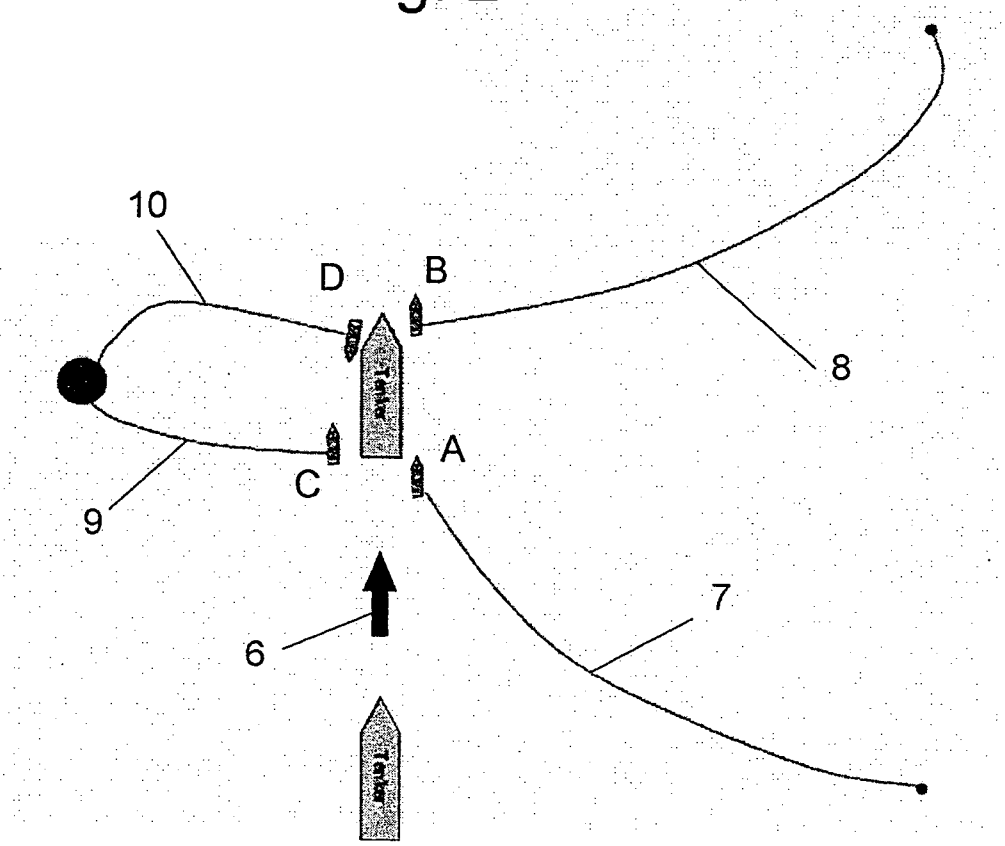


Fig. 3

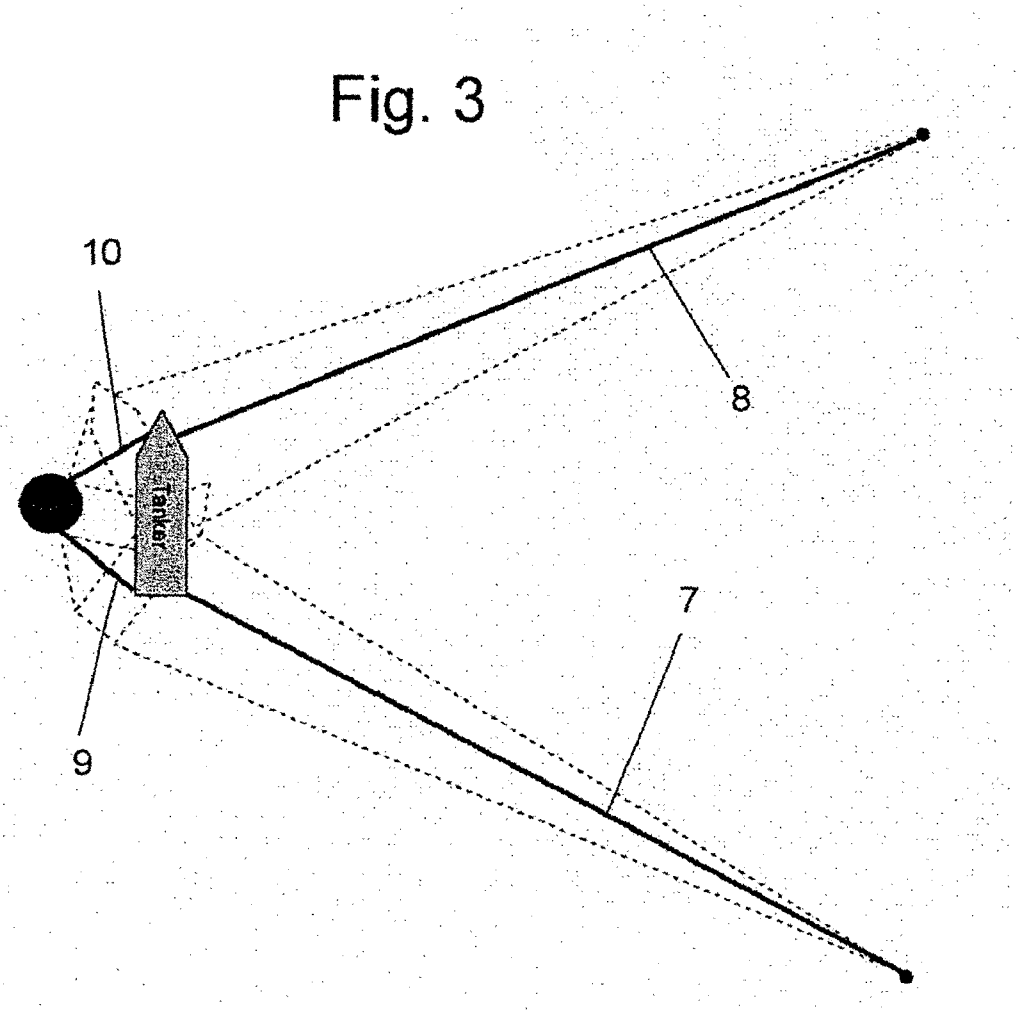
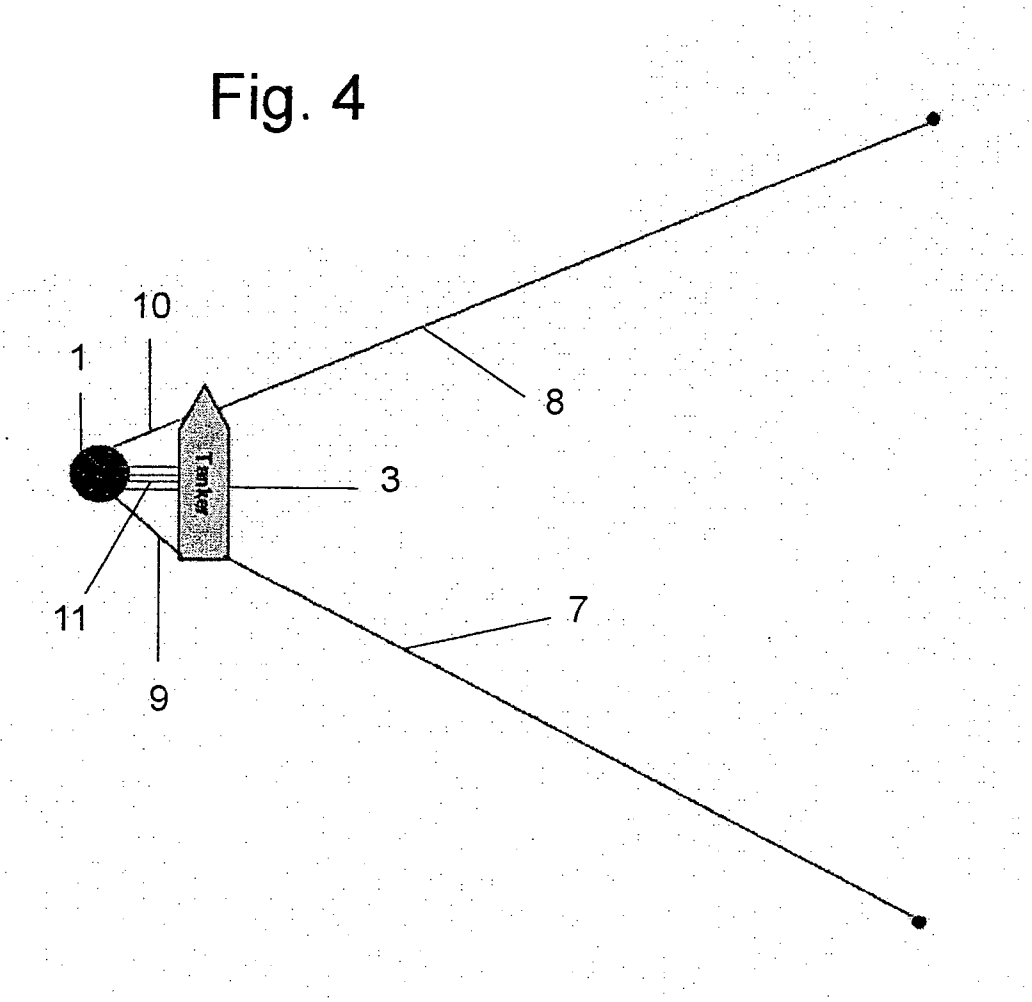


Fig. 4



INTERNATIONAL SEARCH REPORT

International application No.
PCT/NO2007/000361

A. CLASSIFICATION OF SUBJECT MATTER

IPC: see extra sheet
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: B63B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-INTERNAL, WPI DATA, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 9747516 A1 (DEN NORSKE STATS OLJESELSKAP A.S.), 18 December 1997 (18.12.1997), figure 1, abstract --	1-5
X	WO 0110707 A1 (SINGLE BUOY MOORINGS INC.), 15 February 2001 (15.02.2001), page 3, line 23 - line 33, figure 1 --	1-5
X	WO 9835874 A1 (HITEC ASA), 20 August 1998 (20.08.1998), figures 4,5, abstract --	1-5
X	US 3552343 A (SCOTT, G R), 5 January 1971 (05.01.1971), figures 1,3, abstract --	1-5

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
7 February 2008	08 -02- 2008
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Carl Fröderberg/PR Telephone No. +46 8 782 25 00

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Paper copies can be ordered at a cost of 50 SEK per copy from PRV InterPat (telephone number 08-782 28 85).

Cited literature, if any, will be enclosed in paper form.

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