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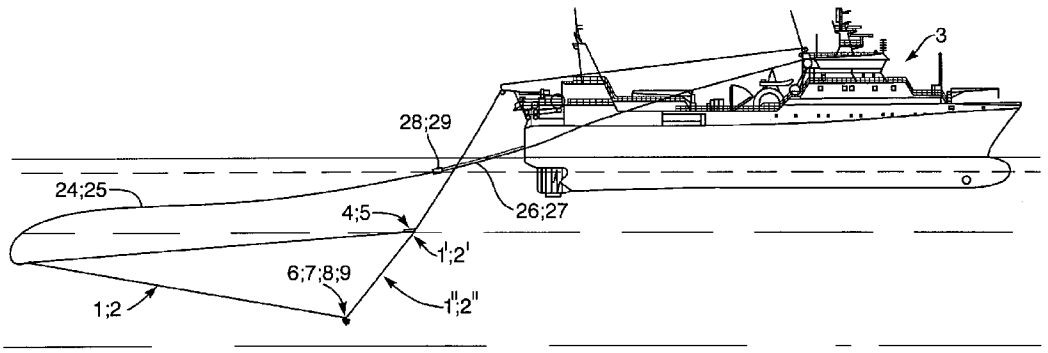
(54) Title: A TRAWL DEVICE




(57) Abstract: A trawl device that is towed after a trawl vessel, wherein the trawl, for spreading open the opening of the trawl, has an elongate hydrofoil to which the trawl, by its upper transverse length of the trawl opening, is attached, and also has a weight or weights attached to at least one position in the lower part of the trawl opening, for example, the two lower corners of the trawl opening. The device can be used with one or more trawls that are towed side by side, or with two trawls one above the other and fastened to a common trawl.

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# A TRAWL DEVICE

The present invention relates to a trawl device for towing after a trawl vessel, wherein the trawl cooperates with a means for spreading open the opening of the trawl, as defined in more detail in the preamble of claim 1.

To elucidate the prior art, reference is made, inter alia, to Norwegian Patent Application 20053371, Norwegian Patent 307541.

In the standard methods of trawling, the trawl is towed behind a trawl vessel using adapted lines with or without otter boards, optionally with the use of a weight or weights attached to the trawl or the trawl lines or by using so-called steering lead weights which in terms of function correspond to otter boards, whereby seafood/ biomass such as fish, shrimp and krill and/or other seafood/biomass is gathered in a trawl bag.

After such a trawl bag has been more or less filled with seafood/biomass, it is normally hauled aboard the vessel and emptied. Alternatively, the trawl bag or sack is emptied whilst floating alongside the vessel. Some types of seafood/biomass, such as for instance krill, have a short lifetime after being gathered in the trawl and brought to the surface before they die and rapidly begin to decompose, their value as a raw material thus diminishing considerably. In general, it is important for all forms of seafood/ biomass that it should come to the vessel undamaged and as quickly as possible for further processing, as delays in this process usually substantially diminish the quality of the seafood/biomass. Seafood/biomass that is subjected to rough handling and crushing through being gathered in a trawl bag, hauled on board the vessel and then emptied from the trawl bag, or by mechanical pumping from the trawl bag for collection on board the vessel, will also be of reduced quality and value because of the damage it suffers. The reduction in value will also extend to by-products from seafood/biomass such as roe, liver or the like. Seafood/biomass that is caught in a traditional manner will also largely be dead the moment it comes aboard the vessel.

Norwegian Patent Application 20053371 therefore describes a solution the object of which is to more efficiently convey undamaged and live seafood/biomass gathered by the trawl to a seafood/biomass receiving vessel, of particular importance for the gathering and conveying of krill, shrimp and other types of seafood/biomass, including all forms of fish, where conveyance to a production vessel for further processing and

continuous, non-stop preservation on board can take place in controlled forms during continuous or prolonged trawling. The patent application indicates that this solution can involve the use of a conveying hose for conveying the seafood/biomass from the rear portion of the trawl to the vessel, fluid, e.g., seawater, being injected into the conveying hose in order, by injector effect, to bring the seafood/biomass up to the vessel, and where the injector, which is, for example, depth-adjustable, is in an upper area of the conveying hose which has a marked gradient towards the sea surface.

In recognition of the fact that otter boards and steering weights are heavy to handle and take up a great deal of space on board, there has long been felt a need, in connection with trawling, for example, for krill, to simplify the spreading open of the trawl opening in a fairly straightforward manner, and especially in those cases where trawling takes place continuously and there is a need for good manoeuvrability of the trawl and simultaneous assurance that the trawl opening remains maximally open, even when the trawl vessel changes course, for example, by trawling parallel to and in the opposite direction of earlier trawl paths.

To this end, the aim is to spread open the opening of the trawl, according to the invention, in that said means, instead of, for example, otter boards, is comprised of an elongate hydrofoil to which the trawl, by its upper transverse length of the trawl opening, is attached, and is also comprised of a weight or weights that is/are fastened to at least one position in the lower part of the trawl opening, for example, the two lower corners of the trawl opening.

"Hydrofoil" in this context is understood as a flat body or an aerofoil-like body (body with wing cross-section) which during movement in water is affected hydrodynamically.

Additional embodiments of the device are set forth in subsidiary claims 2 – 15.

The invention will now be described in more detail with reference to the attached drawing figures.

Fig. 1 is a side view of the device according to the invention when being towed by a trawl vessel.

Fig. 2 is a top view of the device in Fig. 1.

Fig. 3 is a side view of the device according to the invention in connection with bottom trawling.

Fig. 4 is a schematic perspective view of the device as shown used in Figs. 1 and 2.

Fig. 5 shows a modified use of the device according to the invention.

Fig. 6 shows the embodiment in Fig. 5 under tow by a trawl vessel.

The figures show the use of two trawls 1, 2 which are towed simultaneously by a trawl vessel 3. A person of skill in the art will, of course, understand that as an alternative only one trawl may be towed, or more than two trawls, e.g., three or four, may be towed.

As mentioned above, it is important, in a simple manner and without requiring otter boards, to be able to spread open the opening of the trawl, and for this purpose there is used, according to the invention, an elongate hydrofoil 4; 5 to which the trawl 1; 2, by its upper transverse length 1'; 2' of the trawl opening 1''; 2'', is attached, and also weights 6, 7; 8, 9 that are attached to the two lower corners 1''', 1''''; 2''', 2'''' of the trawl opening 1''; 2''.

The hydrofoil 4; 5 is connected to the trawl vessel 3 via at least one tow line 10; 11. The tow line 10; 11 is connected to the hydrofoil 4; 5 via at least two branches 10' - 10''''; 11' – 11'''' from the tow line. If more than one trawl is towed, the trawls could advantageously be spread apart in that respective tow lines 10; 11 extend from cantilevered booms 12; 13 on the vessel 3 which are pivotal along an arc 12'; 13' as shown in Fig. 2. In some cases, depending on the design or outfitting of the vessel, it is possible to trawl with two or even more trawls simultaneously, for example, if the respective trawls lie at different distances from the vessel, lie at different depths or by controlling the hydrofoil are spread laterally.

As shown most clearly in Fig. 4, each weight 6; 7; 8; 9 is suspended from a respective line 14; 15; 16; 17 which extends from an end area 4', 4''; 5', 5'' of the respective hydrofoil 4; 5.

The hydrofoil 4; 5 may optionally be equipped with at least one upright wing 18; 19 which serves as a rudder for lateral steering and stabilisation of the hydrofoil. It is also possible to allow the hydrofoil 4; 5, in its upper surface, to be equipped with adjustable flaps 20, 21; 22; 23 which are upwardly tiltable for adjusting the lifting power of the hydrofoil in water during the towing of the hydrofoil and the trawl. It is conceivable that the wing and/or the flaps can be remote-controllable from the vessel, or that they are pre-set before the trawls are placed in the sea. As indicated in Fig. 4, the trawl 1; 2 may be attached to the hydrofoil 3; 4 at at least three points. However, it is of course possible to fasten the trawl at more points than only three, and therefore it should be understood that the trawl can be attached to the hydrofoil at discrete points or continuously along the whole of the length of the hydrofoil.

Whether the trawl is attached to the hydrofoil at its rear area, its underside or its forward area depends on the chosen design of the hydrofoil and where it is most expedient, hydrodynamically, to make the attachment.

When trawling for, say, krill, but also certain other types of biomass/seafood, it will also be possible, when using the present invention, to arrange in a known way per se a conveying hose 24; 25 for conveying the seafood/biomass from the rear portion of the trawl 1; 2 to the vessel 3, fluid , e.g., seawater or air, or a mixture of seawater and air, being injected into the conveying hose 24; 25 from the vessel via a hose 26; 27 and an injector 28; 29, in order, by injector effect, to bring the seafood/biomass up to the vessel, and where the injector 28; 29 which, for example, is depth-adjustable, is in a upper area of the conveying hose 24; 25 where it has a marked gradient towards the sea surface.

The present example as shown in Figs. 1 – 4 also permits the trawls to be mutually independent as regards at least one of the following parameters: the size of each trawl, the distance of the trawls from each other transverse to the direction of travel of the trawl vessel, the distance between the trawl mouth and the stern of the trawl vessel, the depth of the trawls and the mesh size of the trawls.

Figs. 5 and 6 show a solution where two trawl bags 30, 31 are placed one above the other and interconnected via a hydrofoil 32. The uppermost 30 of the trawl bags is fastened at a lower portion 30' of the trawl opening to the hydrofoil 32 at at least three points 33-35. The upper portion 30'' of the trawl opening of the trawl bag 30 is equipped with a plurality of floats 36, and tension lines 37, 38 connecting respective

outer ends of the upper portion 30'' with respective outer portions of the hydrofoil 32 will expediently be present. The lowermost 31 of the trawl bags is fastened at an upper portion 31' of the trawl opening to the hydrofoil 32 at at least three points 39-41. The lower portion 31'' of the trawl opening of the trawl bag 31 is equipped at its outer ends with a respective lead weight or respective weight 42, 43, and tension lines 44, 45 connecting respective outer ends of the lower portion 31'' with respective outer portions of the hydrofoil 32 will expediently be present. The hydrofoil 32 with the trawl bags 30, 31 fastened thereto is towed by means of a tow line 46 from a trawl vessel 47, the tow line 46 running down to the centre of the hydrofoil 32 and having branches 46', 46'' to the outer ends of the hydrofoil 32.

Suction hoses or conveying hoses 49, 50 are, preferably together, run down from the trawl vessel 47 and underneath the lowest 31 of the trawl bags, the hose 49 running to the downstream end 30''' of the upper trawl bag 30 whilst the hose 50 is connected to the downstream end 31''' of the lower trawl bag 31. Injectors 51, 52 are connected in a rising portion of the hoses 49, 50 to effect pumping of the catch on board the trawl vessel 47.

One advantage of the solution shown in Figs. 5 and 6 is that a change of the trawling direction can be made somewhat faster than with two juxtaposed trawls, and only one common hydrofoil is needed, which with regard to possible limited storage space on board the trawl vessel 47 may be advantageous.

The location of the attachment points 33-35 and 39-41 on the hydrofoil for the trawl 30 and 31, respectively, may be instrumental in how the hydrofoil will move in the sea when towed, i.e., has a tendency to move upwards, endeavours to remain at one level, or seeks to move downwards.

By using just this one hydrofoil 32, it is thus possible to spread open the openings of two trawls simultaneously, the weights 42, 43 causing the lower transverse length of the lower trawl 31 opening to be kept at approximately the correct size, and similarly the floats 36 and the tension lines 37, 38 causing the upper transverse length of the upper trawl opening to be kept at approximately the correct and desired size.

Patent claims

1.
A trawl device for towing at least one trawl after a trawl vessel, the trawl cooperating with a means for spreading open the opening of the trawl, characterised in that said means is comprised of an elongate hydrofoil to which the trawl, by its upper transverse length of the trawl opening, is attached, and is also comprised of a weight or weights attached to at least one position in the lower part of the trawl opening, for example, the two lower corners of the trawl opening.

2.
A device as disclosed in claim 1, characterised in that the hydrofoil is connected to the trawl vessel via at least one tow line.

3.
A device as disclosed in claim 2, characterised in that the tow line is connected to the hydrofoil via at least two branches from the tow line.

4.
A device as disclosed in claim 2 or 3, characterised in that the tow line extends from a cantilevered boom on the vessel.

5.
A device as disclosed in claim 1, characterised in that each weight is suspended from a line that extends from an end area of the hydrofoil.

6.
A device as disclosed in one or more of the preceding claims, characterised in that the hydrofoil is equipped with at least one upright wing that serves as a rudder for lateral steering and stabilisation of the hydrofoil.

7.
A device as disclosed in any one of the preceding claims, characterised in that the hydrofoil, in its upper or lower surface, is equipped with adjustable flaps that are upwardly tiltable for adjusting the lifting power of the hydrofoil in water during the towing of the hydrofoil and the trawl.

8.
A device as disclosed in claim 1, characterised in that the trawl is attached to the hydrofoil at at least three locations.

9.
A device as disclosed in claim 1, characterised in that the trawl is attached at discrete points or continuously along the whole of the length of the hydrofoil.

10.
A device as disclosed in claim 1, 8 or 9, characterised in that the trawl is attached to the hydrofoil at its rear area, its underside or its forward area.

11.
A device as disclosed in any one of the preceding claims, characterised in that in a known way per se there is arranged a conveying hose for conveying the seafood/ biomass from the rear portion of the trawl to the vessel, fluid, e.g., seawater, being injectable into the conveying hose via an injector which is connected to a fluid supply hose from the vessel in order, by ejector effect, to bring the seafood/biomass up to the vessel, and where the injector, which is, for example, depth-adjustable, is in an upper area of the conveying hose which has a marked gradient towards the sea surface.

12.
A device as disclosed in any one of the preceding claims, characterised in that on the upper side of the hydrofoil and located above the trawl attached to the hydrofoil there is arranged an additional trawl, the lower transverse length of the trawl opening of the additional trawl being attached to the hydrofoil, and that the upper transverse length of the trawl opening of this additional trawl is provided with a plurality of floats.

13.
A device as disclosed in claim 12, characterised in that from each end of the hydrofoil a tension line is extended to a respective outer end of said upper transverse length of the trawl opening of the additional trawl.

14.
A device as disclosed in any one of claims 1 – 11, characterised in that the trawl vessel is arranged to tow at least two trawls, each of which is equipped with hydrofoil and associated weight or weights.

15.

A device as disclosed in claim 14, characterised in that the trawls are mutually independent as regards at least one of the following parameters: the size of each trawl, the distance of the trawls from one another transverse to the direction of travel of the trawl vessel, the distance between the trawl mouth and the stern of the trawl vessel, the depth of the trawls and the mesh size of the trawls

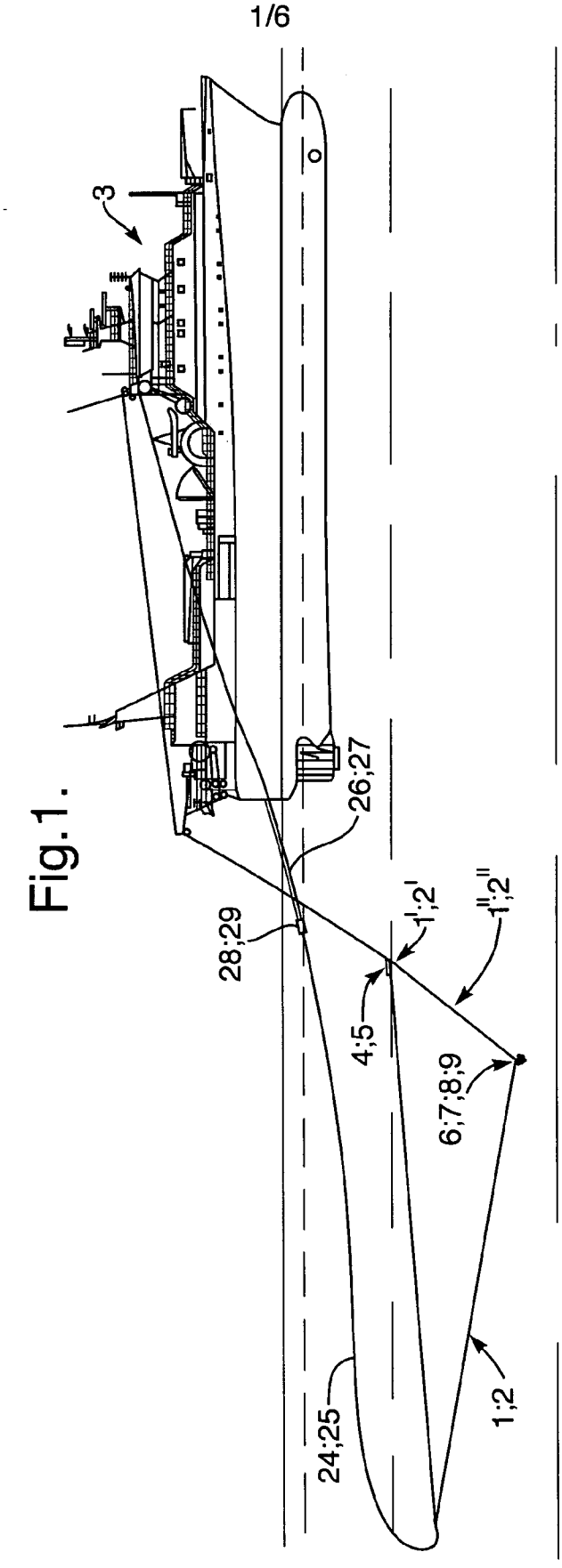


Fig.1.

Fig.2.

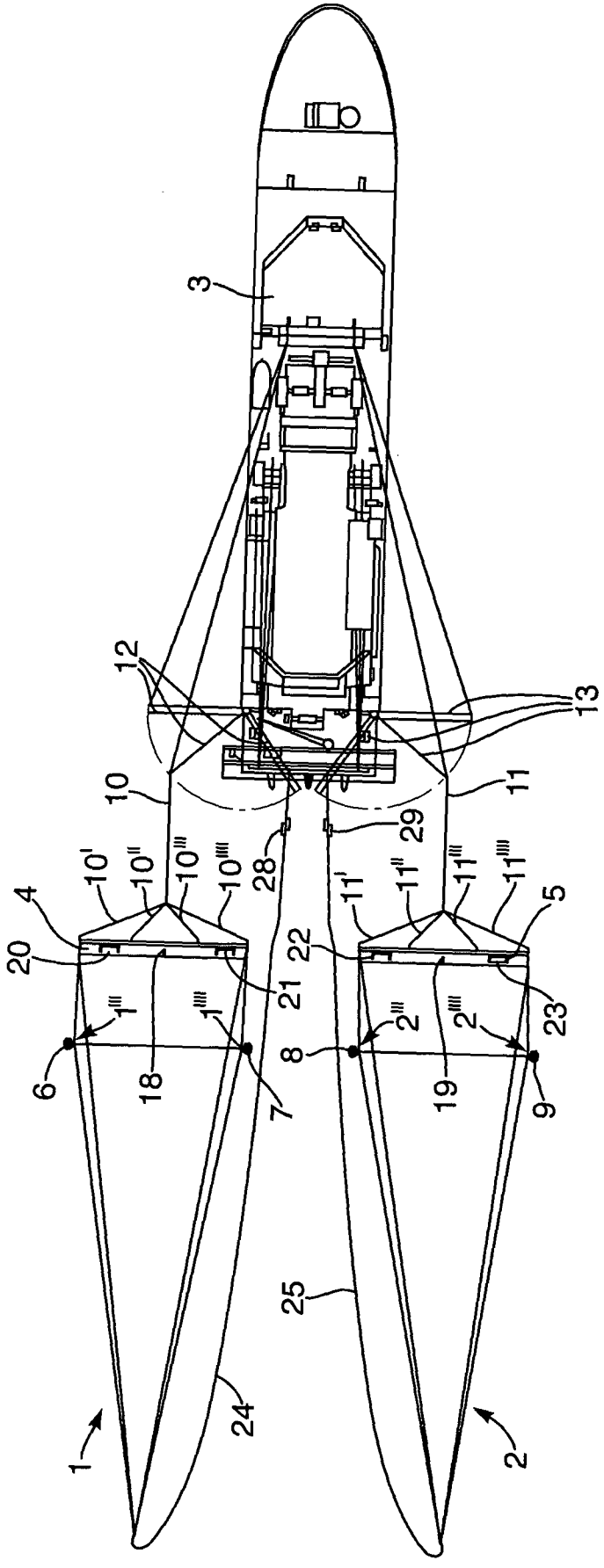
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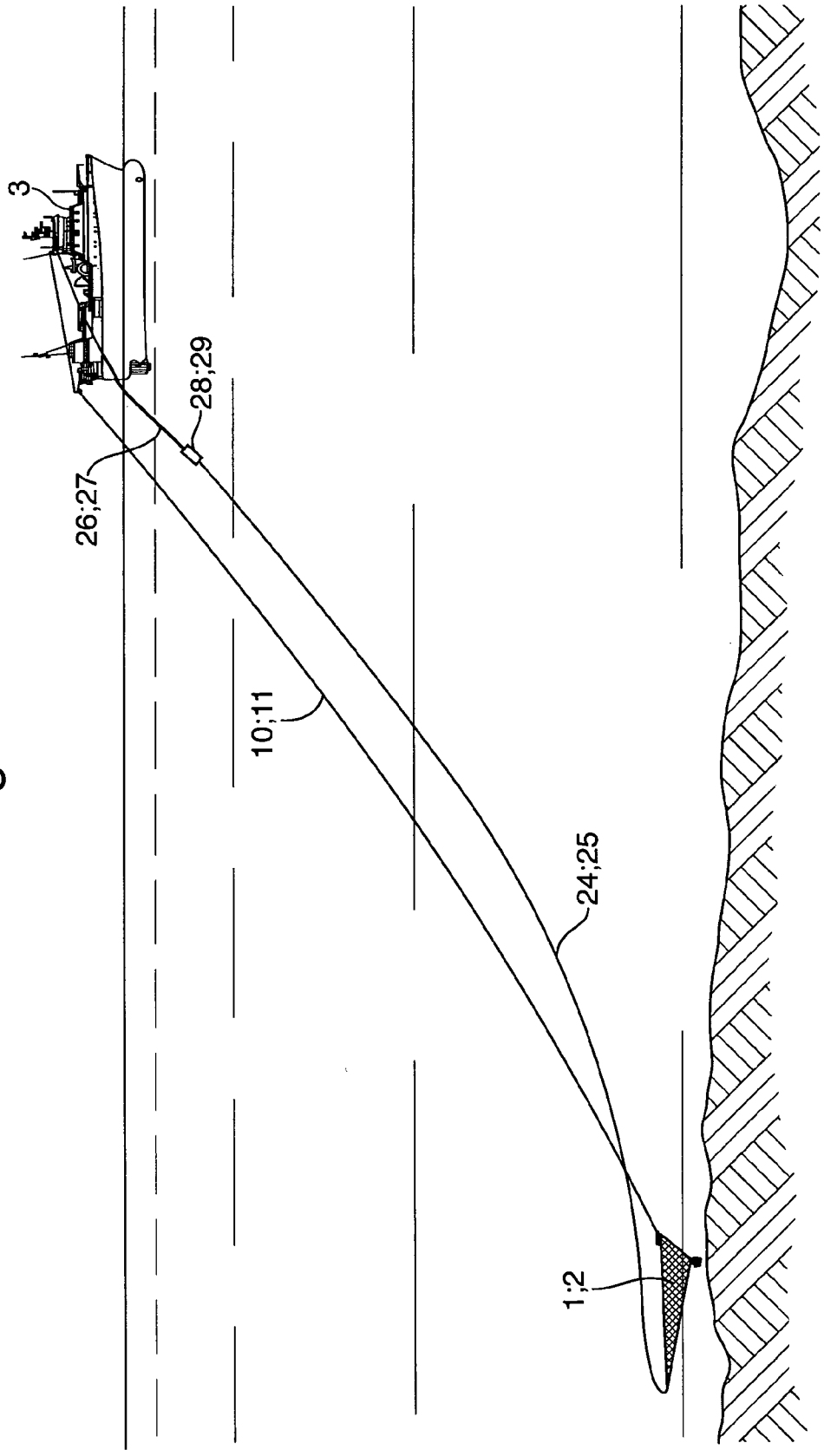
Fig.3.



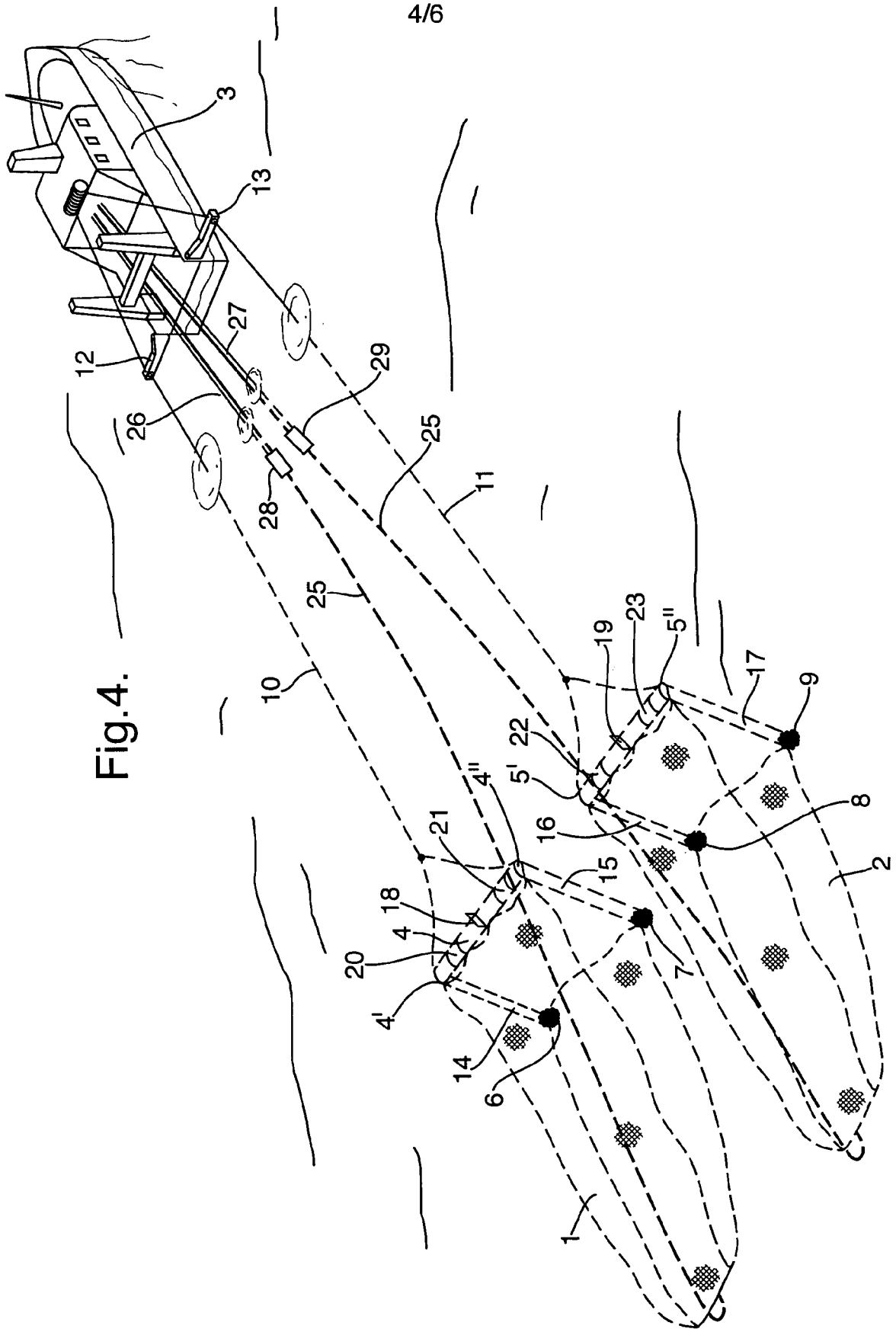

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Fig.4.

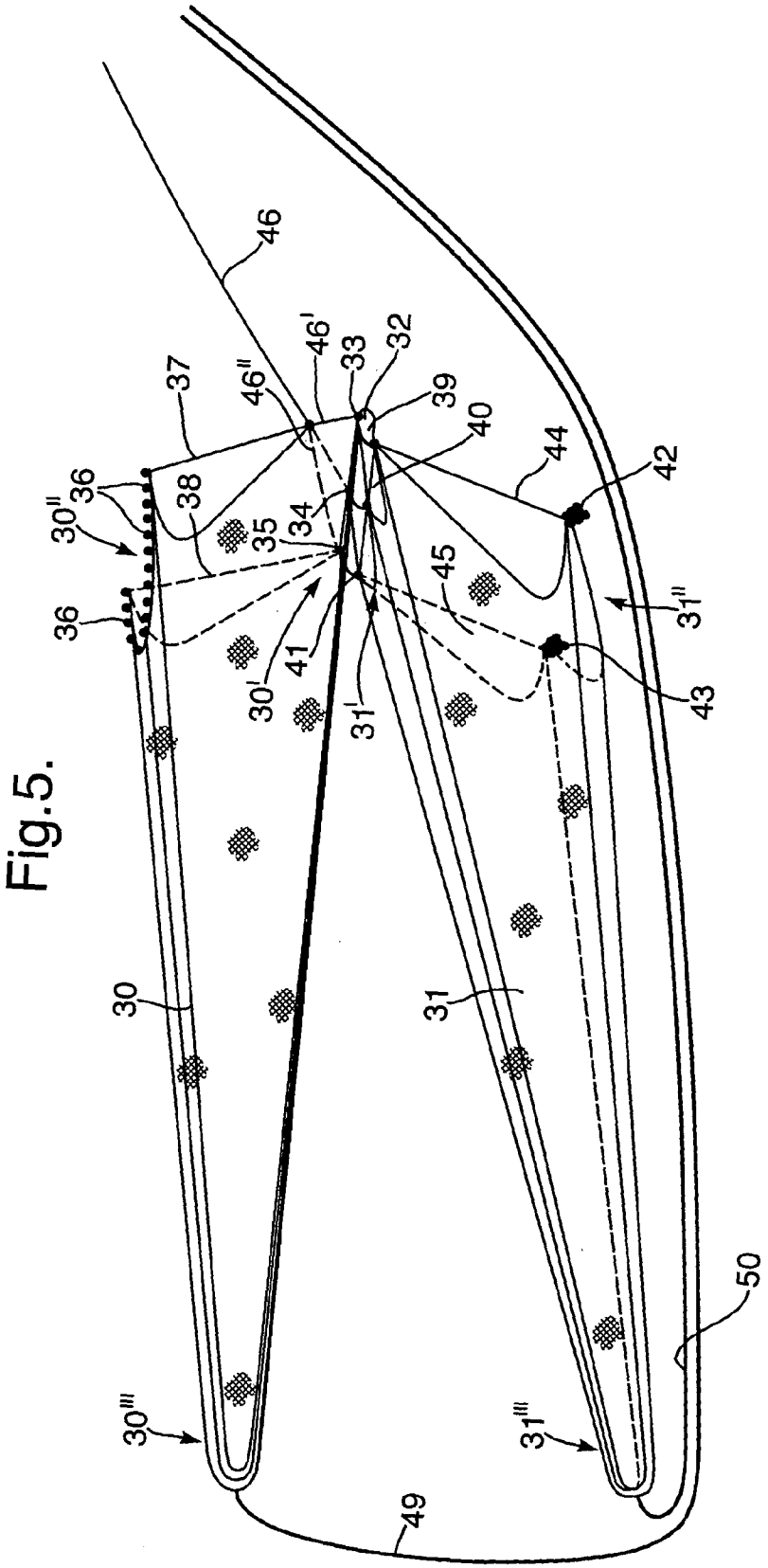
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Fig.5.

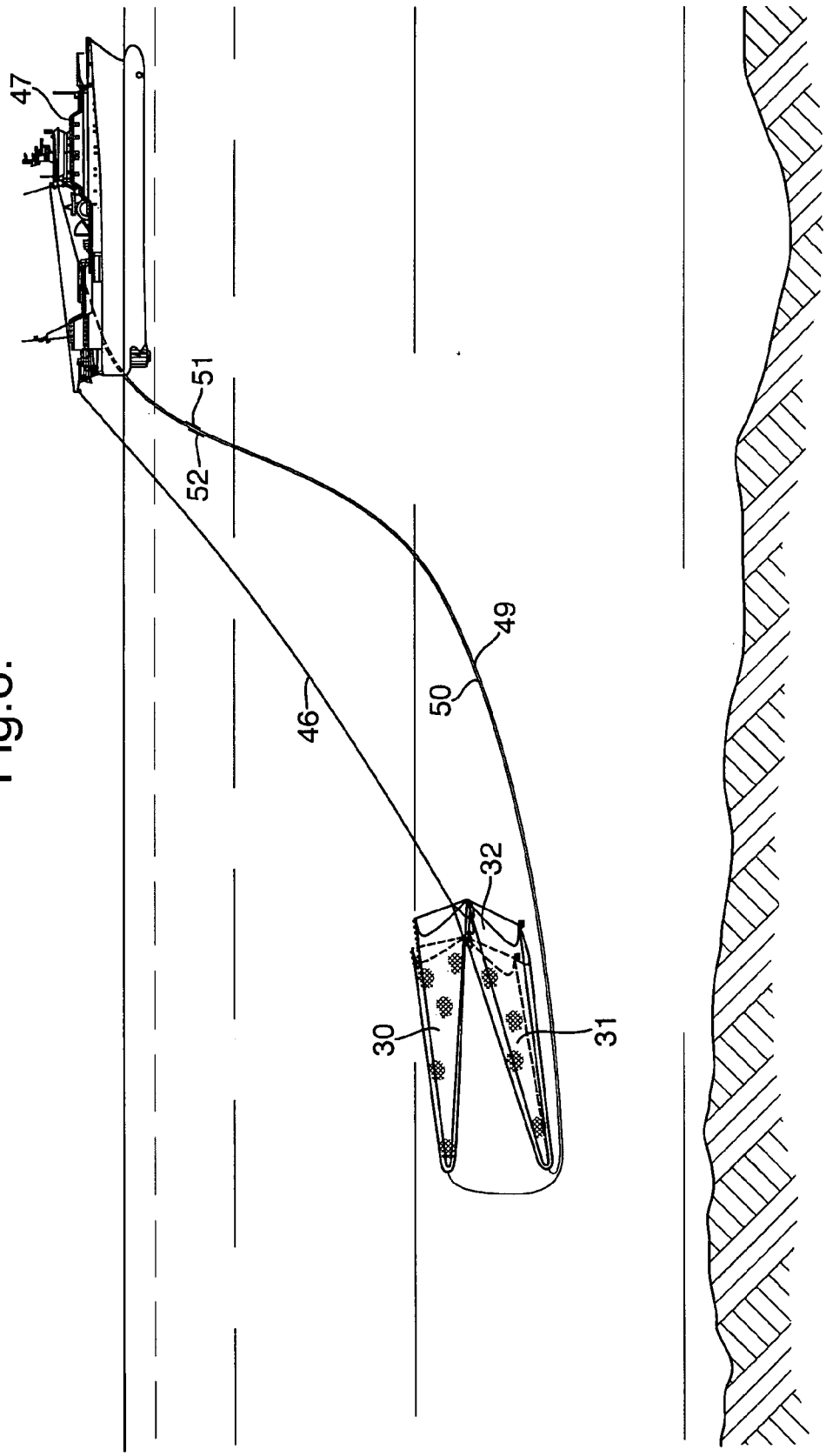


Fig.6.

# INTERNATIONAL SEARCH REPORT

International application No.
PCT/NO2007/000111

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

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IPC: A01K

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

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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

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[X] Further documents are listed in the continuation of Box C. [X] 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 |
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| 1 June 2007 | 05 -06- 2007 |
| Name and mailing address of the ISA/<br>Swedish Patent Office<br>Box 5055, S-102 42 STOCKHOLM<br>Facsimile No. +46 8 666 02 86 | Authorized officer<br>Hans Nordström/EK<br>Telephone No. +46 8 782 25 00 |

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INTERNATIONAL SEARCH REPORT

International application No.
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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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**International patent classification (IPC)**
***A01K 73/04*** (2006.01)

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