Title: DEVICE FOR ANCHORING FLOATING CAGES FOR FISH, FISH POTS AND CAGES

Abstract: An operation unit (1) mounted so as to move along and be attached to a centre unit (2). The centre unit (2) is situated between a mooring device (3) and a surface unit (4). The operation unit (1) can be operated from the surface through devices such as tubes and image transmission through the centre unit (2). The operation unit (1) can be a fish cage for raising fish or other species, or can be a trapping device or the like.
DEVICE FOR ANCHORING FLOATING CAGES FOR FISH, FISH POTS AND CAGES

The present invention relates to a system for use with submersible fish farming cages, for cages, fish pots and the like, involving a mooring device, operation and recovery of these with the help of a centrally placed unit.

Fish farming and farming of various marine species are about to become a major industry. The main volume of farming and the largest revenues come today from the farming of pelagic species in need of a flat base, such as flat fishes, cat fish etc., molluscs such as squid and others and crustacea (shrimps and prawns, lobster, crayfish, crab and the like). The largest volume of fish farming involves today the raising of fish in fish cages moored offshore. The conventional type of fish cage is a net pen attached to a floating ring and anchored to the bottom with stays and mooring or ballast blocks. With such an arrangement, the fish cage resembles a baggy net which is best suited for pelagic species and unfit for species which normally live on or close to the sea bed, such as flat fishes, catfish, crustacea, shellfish, molluscs, etc. The conventional "bag-type" fish cage is not suitable for farming species which live mostly on the sea bed, such as flat fishes, catfish, crustacea, molluscs, and so forth. Norwegian patent no. 303.313 describes a new type of fish cage where the net pen rests on a flat base or comprises such a base and which, as opposed to the conventional fish cage, opens for new possibilities for farming fresh-water and salt-water demersal species.

The requirements to location of the fish cages are largely dictated by wind, waves and currents, with a view to effective renewal of water for optimal fish growth and for the removal of waste and food remains. These requirements often entail a location which may expose the fish cage to rough weather conditions. The meteorological impact is normally confined to the surface and the upper layers of water and the potential damage caused by extreme weather is reduced by technical devices permanently or temporarily located under the surface.
Norwegian patent no. 173.481 offers a solution where the part of the fish cage which is normally floating at surface level can be submerged when the impact of currents and wind increases. This reduces the potential damage to the fish cage. Further types of fish-farming units which are kept submerged on a more permanent basis are described in Swedish patent application no. 8307005.

A conventional fish cage is normally floating at surface level and moored with the help of a mooring system which extends far beyond the space of the net pen itself. Due to this, a fish farm occupies a significant amount of space at its mooring location, with consequent restrictions for free passage at sea.

A device based on the present invention localises such functions as mooring, fixing point, contact point and vertical displacement to the centre of the device, according to the so-called centered principle. The device is either permanently fastened to the central arrangement, or can slide, be lifted and lowered and re-attached along said arrangement.

The object of the present invention is to provide a system offering the following characteristics:

- fish farming on the surface if so desired,
- a submersible device for operation on a permanent and/or on a temporary basis,
- a submersible device used as a trapping device,
- an easy mooring system,
- when in use, the device can be operated from the surface.

This is achieved with the help of a centre unit equipped with a mooring device placed on the sea bed and a surface unit on the surface of the water, and to which an operation unit can be attached while remaining vertically mobile.

Further details of the invention appear from the following description of a preferred embodiment of the invention with reference to the illustrations.

Figure 1 illustrates the device of the invention, a centrally positioned submersible operation unit 1 equipped with a mooring system.
Figure 2 shows a second version of the device of the invention.

An operation unit 1 is provided around a centre unit 2 and is either permanently fixed to said unit or is moveable and can be mounted at any required vertical position between a mooring device 3 and a surface unit 4.

The operation unit 1 can be a fish cage unit as known from Norwegian patent no. 303.313 or from Norwegian patent application no. 19990660. This can be a structure (such as a fish cage, a cage, a fish pot or the like) with a base 5 and a cover 6 with an intermediate device where the fish is kept. The intermediate device between the base 5 and the cover 6 is not illustrated on the figure. Between the base 5 and the cover 6, a stay 7 may be provided. The operation unit 1 is provided with an air-regulated ballast block 8 which may be a tank filled with a combination of air, water and weights, regulated by filling in and letting out air through a supply hose 9 from the surface 10, for lifting and lowering the operation unit 1. The air-regulated ballast block 8 can be an arrangement as described in Norwegian patent application no. 19990660, or in an arrangement as shown on fig. 1. The cover 6 is fitted to a central device 11. The central device 11 may be a buoyant body such as a bladder, tank, cork, or the like, and/or an air-regulated ballast block similar to the air-regulated ballast block 8.

The centre unit 2 which is linked to the mooring device 3 and to the surface unit 4 constitutes the centre of the operation unit 1. With the help of the centre unit 2, the operation unit 1 may be moored, positioned to a required vertical position between the sea bed and the surface 10, and has lifting, lowering and parking facilities.

The operation unit 1 is maintained at a buoyancy equilibrium relative to its specific weight and to the mass of its living contents by distribution of the buoyancy function between the central device 11 and the air-regulated ballast block 8 as well as buoyancy elements 12 (which may be air-filled tubes or other floating materials (polystyrene), cork, floating balls etc.) around the circumference.
The buoyancy elements 12 around the circumference of the operation unit 1 may be tubes, bladders, cork or the like on the base 5 or on the cover 6, or between those, or in a combination of said places. The role of the buoyancy elements 12 is to balance the buoyancy of the operation unit 1 in conjunction with the air-regulated ballast block 8 and/or 13 and with the central device 11 during lifting or lowering of the operation unit 1. Furthermore, the buoyancy elements 12 function as balancing and stabilizing elements for the operation unit 1 around the centre unit 2. The air-regulated ballast block 8 constitutes the largest part of the weight necessary to lower the operation unit 1 and to counteract the buoyancy.

The species which is being raised in the operation unit 1 may be fed, checked and monitored through the centre unit 2, with the help of adequate systems connecting the interior of the operation unit 1 with the surface 10. These may be supply tubes for feed, image transmission from submerged cameras and measuring instruments for environment parameters such as waste gases, oxygen, light, etc.

In its position at surface level, and with the cover 6 removed, the operation unit 1 may be filled with fry of the species to be raised, and may then be closed again and lowered to the desired depth by letting air out of the air-regulated ballast block 8. In the required vertical position, the operation unit 1 is locked or fastened to the centre unit 2 and the species may be fed, stocked, monitored and raised at a safe distance from waves, not to mention from deadly algae which travel in the surface layers (as they are dependent on UV-light/sunlight).

The operation unit 1 can also be a trapping device for various species, for example a fish pot or a fish trap which must then be equipped with the necessary trapping inlets, as known from such devices. Once the desired species are trapped, the unit may either be raised to the surface 10 or the species may be stocked and fed in the operation unit 1 through the centre unit 2. The operation unit 1 has a large scope of applications connected to trapping alone, to combined trapping and farming or to farming alone in a marine context. The operation unit 1 may also be
used to store non-living material in the cases where such a unit would be considered an appropriate storage place.
Claims

1. Device for positioning, mooring and operating fish cages, fish pots or fish traps under the surface of water which is especially suitable for farming and trapping of animal species, equipped with a mooring device linked to a surface unit, characterized by a centre unit (2) connected to the sea bed through a mooring device (3) and to the surface of the water (10) through a surface unit (4), and where an operation unit (1) is mounted on the centre unit (2) and can be moved vertically along and fastened to said centre unit (2).

2. The device for positioning, mooring and operating fish cages, fish pots or fish traps under the surface of water of claim 1, characterized in that the operation unit (1) is a fish cage equipped with a cover (6).

3. The device for positioning, mooring and operating fish cages, fish pots or fish traps under the surface of the sea of claim 1, characterized in that the operation unit (1) is a flat-bottomed fish cage equipped with a cover (6).

4. The device for positioning, mooring and operating fish cages, fish pots or fish traps under the surface of the sea of claim 1, characterized in that the operation unit (1), instead of being a fish cage, is a closed structure (e.g. a cage, fish pot, fish trap or the like).

5. The device for positioning, mooring and operating fish cages, fish pots or fish traps under the surface of water of the above claims characterized in that the centre unit (2) is equipped with devices which can connect the inside of the operation unit (1) to the surface (10) for the purpose of feeding, monitoring, tending, placing of fry, removal of fish or other required operations.

6. The device for positioning, mooring and operating fish cages, fish pots or fish traps under the surface of water of claim 1, characterized in that the operation unit (1) is equipped with a combined buoyancy and lifting device (4, 8, 11).
7. The device for positioning, mooring and operating fish cages, fish pots or fish traps under the surface of water of claim 1, characterized in that to a base (5) of the operation unit (1) are mounted air-regulated ballast blocks (8) and/or (13) and buoyancy elements (12) mounted to the base (5) and/or to a cover (6).
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: A01K 61/00
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)

IPC7: A01K

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

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<tr>
<td>X</td>
<td>US 5970917 A (KEITH, JR.), 26 October 1999 (26.10.99), column 1, line 35 - line 67, figure 1, abstract</td>
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<td>X</td>
<td>EPOQUE, PAJ, JP63304929 A, FURUNO ELECTRIC CO LTD: &quot;DEVICE FOR ADJUSTING POSITION OF FISH RESERVE&quot;, 19881213, figures 1, 2, abstract</td>
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<td>US 5251571 A (WILLINSKY ET AL.), 12 October 1993 (12.10.93), column 4, line 58 - column 5, line 11, figures 1-3, abstract</td>
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Further documents are listed in the continuation of Box C. See patent family annex.

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