(19) DANMARK

(10) **DK/EP 2922748 T3**

(12) Oversættelse af europæisk patentskrift

Patent- og Varemærkestyrelsen

(51) Int.Cl.: ***B 63 B 35/00 (2006.01)*** ***B 63 B 3/08 (2006.01)*** ***B 63 H 7/02 (2006.01)***

(45) Oversættelsen bekendtgjort den: **2017-03-27**

(80) Dato for Den Europæiske Patentmyndigheds bekendtgørelse om meddelelse af patentet: **2016-12-14**

(86) Europæisk ansøgning nr.: **13808099.9**

(86) Europæisk indleveringsdag: **2013-11-22**

(87) Den europæiske ansøgnings publiceringsdag: **2015-09-30**

(86) International ansøgning nr.: **FR2013052835**

(87) Internationalt publikationsnr.: **WO2014080143**

(30) Prioritet: **2012-11-23 FR 1261183**

(84) Designerede stater: **AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR**

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(54) Benævnelse: **FLYDENDE INDRETNING TIL AT INDSAMLE VÆSKEFORMIGE PRØVER**

(56) Fremdragne publikationer:
DE-B- 1 251 176
US-A- 5 218 918
US-B1- 6 536 272

FLOATING VESSEL FOR TAKING LIQUID SAMPLES

This invention concerns a floating vessel for taking liquid samples.

In the area of biological or chemical research, it is useful to take samples in aquatic environments, to later make, for example, DNA analyses.

During the sampling, it is absolutely critical to not disturb and contaminate the environment in which the sample is taken. It is understood that contaminated samples have no scientific value.

Document US 6 536 272 is considered as the closest state of the art to the object of claim 1 and describes all the technical characteristics of its preamble.

Yet, current sampling means, like for example, the vessel shown by document US 6 536 272 does not enable to guarantee that the vessel, even from a sample, does not contaminate the environment in which the sample is taken.

In this technical context, there is consequently a need for an aquatic vessel enabling samples to be taken without leading to the environment being contaminated.

This invention concerns a floating vessel for taking liquid samples, comprising a hull presenting a hull intended to be immersed in a liquid environment below the waterline and a superstructure located above the waterline, the vessel comprising air propulsion means and means for taking and storing samples and means for remotely controlling the air propulsion means and sampling means, the vessel additionally comprising a secondary removable hull equipped with fixing means on the vessel hull covering at least the hull of the vessel.

The invention consequently supplies an independent vessel, able to move over a body of water or over a watercourse to take samples, on which a secondary hull is placed at each new sampling campaign. In other words, the invention offers a vessel which guarantees there to be no contamination of the environment, in which samples will be taken.

According to several characteristics of the invention which could be implemented independently or in a combined way:

- the hull presents a peripheral rib and in that the secondary hull has a peripheral return designed to snap on the rib of the hull.

- the vessel comprises a peristaltic pump comprising a roller assembly pressing an elastic tube located outside of the hull.

- the superstructure has a removable cover, in which at least one cell, designed for accommodating a container in which a sampling may be stored.

- the cover comprises a transparent bubble located above a cell.

- the vessel comprises at least one camera powered with respect to at least one vertical axis Z of the vessel.

- the camera is positioned adjacent to the transparent bubble.

- the hull has at its bow a transparent panel.

- the camera is movable and is powered about a transverse axis Y of the vessel, so as to pivot from a position, in which the camera is positioned facing the transparent bubble and a position in which the camera is positioned facing the transparent panel.

- the secondary hull is made of a transparent material.

- the vessel comprises at least one propeller positioned at the end of a mast extending from the superstructure of the vessel, the propeller being driven by an electric motor placed at the top of the mast.

- the vessel comprises two masts connected by a drive belt allowing synchronising the orientation of the propellers.

- the vessel loads one or more batteries supplying the motors driving at least one of the equipments of the group comprising the pump, the camera(s), the propeller(s).

To be well understood, the invention is described referring to the appended figures, representing as a non-exhaustive example, an embodiment of an aquatic vessel according to the invention.

Figure 1 is a front-perspective three-quarter view of the aquatic vessel according to the invention.

Figure 2 is a rear-perspective three-quarter view.

Figure 3 is a front-perspective three-quarter view of the immersed section of the vessel.

Figure 4 is a similar view to figure 1, on which a cover is taken off.

By first referring to figure 1, the aquatic vessel according to this invention, in its illustrated embodiment, a general trapeze form. The vessel includes a hull 2, of which a section known as the bottom 3 is intended to be immersed in a liquid, in which a sample and a superstructure section 4 forming the bridge are to be taken. The hull 2 and the superstructure 4 can be made, for example, from carbon fibre.

Figure 3 shows an important positioning of the invention, which is that the bottom 3 presents no surpassing section. In other words, as can be seen in this figure, the bottom 3 has no element or accessory forming any roughness apart from two derivatives XX which contribute to the manoeuvrability of the vessel.

Further on, it will be seen that this positioning is important in the framework of this invention.

By referring to figure 2, it can be seen that the superstructure 4 presents two masts 5, each which support an electric motor 7. The electric motor 7 positioned at the end of two masts drive a propeller 9. The propeller 9 is embedded in a cowling 8. The two propellers 9 are positioned on the rear section of the bridge.

The front section of the bridge is equipped with two cells 10 which, in this case, are positioned in tandem.

The two cells 10 are conserved in a removable cover 12.

Figure 4 shows the vessel in a configuration, in which the cover 12 is removed.

The front cell 10 is equipped with a transparent bubble 13 and protects a camera 15. It can be seen that the camera 15 is positioned on an axis Z, which enables it to turn around a 360° angle.

The movement of the camera 15 is controlled by an electric motor.

It is specified that in a variant of the invention, the panel 16 which is positioned in the bow area of the vessel can itself be transparent. This positioning enables a submarine viewing area to be had. This submarine viewing area can be utilised by tilting the camera in such a way that instead of having an aerial view through the transparent bubble 13, this is positioned opposite the transparent panel 16 from the bow area and has a submarine view.

In this embodiment, the camera 15 is movable according to two axes. It is movable around a vertical axis to give a view of up to 360° around the vessel and it is movable about a transverse axis Y, in a way to tilt an aerial position, in which the camera is positioned inside the transparent bubble 13 to a submarine position, in which the camera is opposite the transparent panel 16.

The cell which is located behind the cell provided from the camera presents a diameter which enables it to hold a container which is not represented on the figures.

The presence of two lateral flaps 21 is also noted.

The two masts 5 are connected by a connecting body, such as a belt 23 or a chain which itself is driven by a roller 24 or a teethed wheel connected to an electric motor.

Thus, when the motor connected to the roller 24 is put in motion, each one of the masts 5 and therefore each one of the propellers 9 turn synchronically. This enables the movement of the vessel to be controlled, with there being no rudder immersed.

Although this does not appear in the figures, the internal cavity which is defined by the hull 2 and by the superstructure 4, holds batteries which enable the different motors to be supplied, that have been described previously.

The two lateral windows 21 can be used to enable access to the batteries in view of recharging them. These batteries can be lead, lithium ion or lithium polymer.

In the example shown in figures 1 to 4, it can also be seen that two air intakes 18 are positioned laterally on both sides of the two cells. These two air intakes 18 act with an extractor 20 located in the rear section of the vessel. An air flow is produced, which enables extraction of heat released by the batteries and electric motor to be ensured.

Figure 3 also shows one of the important elements of the invention, which is the presence of a pump 30 fixed on the rear section of the vessel. The pump is preferably a peristaltic type pump 30. The peristaltic pump 30 comprising a roller assembly pressing an elastic tube is located at the end of the hull 2. A tube connected to the pump 30 immerses into the aquatic environment and supplies a container of samples positioned in the aquatic vessel.

Control electronics are also provided, which control all aforementioned motors. In a conventional way, the control electronics include wireless communication means with a remote terminal, which enables all equipment held in the vessel to be controlled remotely, in other words the motors, the pump, the camera, as well as the motor(s) which control its movement.

One of the important points of the invention is the presence of a secondary hull 32, which is used on the hull 2 of the vessel.

This secondary hull 32 is preferably made of plastic and presents a peripheral return 33, which enables its snapping onto a rib 34 formed in the illustrated case by the connecting edge between the hull 2 and the superstructure 4.

The secondary hull 32 is used by making it bend in a way that it is deviated to snap onto the rib 34 of the hull. The secondary hull 32, for this, is equipped with the peripheral return 35 which ensures the snapping with the rib 34.

Thus, before a sampling campaign is started, a secondary hull 32, which presents conditions of sterility, is used on the vessel. The vessel can then be put into the water in the environment in question. The propellers 9 enables the vessel to be directed over the body of water.

The presence of the camera 15 enables, when the vessel is no longer in the operator's view, participation in driving the vessel.

The sampling campaign being started, the vessel is removed from the body of water. The secondary hull 32 is taken off the vessel to be, depending on the case, discarded, recycled or sterilised.

The elastic tubes, which have enabled samples to be taken, are also removed from the vessel, in the same way, to be discarded, recycled or sterilised.

The container in which the liquid sample is stored is removed from the vessel to be analysed.

Using a peristaltic pump 30 in addition enables the guarantee that no exchange happens with the internal sections of the vessel.

It is specified that the vessel enables two types of samples to be taken. On the one hand, the vessel enables liquid samples in a container to be taken; on the other hand, the vessel can be equipped with a filtration capsule positioned below the pump. In this case, the filtrates are collected to be analysed.

The invention therefore supplies a solution to take samples in an aquatic environment in a completely sterile way, since the vessel has a secondary hull, single-use, which guarantees there being no contamination of the environment.

Of course, the invention is not limited to the embodiment described above, but on the contrary, it includes all embodiments. Thus, instead of the two synchronous propellers, it can be considered in a smaller-sized vessel, to equip it with one single, fixed aerial propeller with, in tandem, a rudder, powered and controlled remotely. It is also considered to equip the vessel with several pumps and/or several air cells, enabling it to hold several containers, in which several samples can be stored.

Moreover, the secondary hull could also be fixed on the hull of the vessel by screw-nut type connection means, magnetic inserts, textile areas with loop fastener technology.

Patentkrav

1. Flydende indretning til at indsamle væskeformige prøver omfattende et skrog (2) med en bund (3), der er beregnet til at blive nedsænket i et væskeformigt medium under en vandlinje, og en overbygning (4), der er beliggende over vandlinjen, hvilken indretning omfatter fremdriftsorganer, organer til indsamling og opbevaring af prøver og organer til fjernbetjening af fremdriftsorganerne og indsamlingsorganerne, **kendetegnet ved at** fremdriftsorganerne er luftfremdriftsorganer, og **ved at** indretningen omfatter et sekundært aftageligt skrog (32), der er forsynet med organer til fastgørelse på indretningens skrog (2), og som i det mindste dækker bunden (3) af indretningen.

2. Flydende indretning ifølge krav 1, **kendetegnet ved at** skroget (2) har en omløbende ribbe (34), og **ved at** det sekundære skrog (32) har en omløbende holdeanordning (33), der er indrettet til at klikke fast på skrogets ribbe (34).

3. Flydende indretning ifølge krav 1 eller krav 2, **kendetegnet ved at** indretningen omfatter en peristaltisk pumpe (30), der omfatter en trykrulleindretning, der presser på et elastisk rør lokaliseret uden for skroget.

4. Flydende indretning ifølge et hvilket som helst af kravene 1 til 3, **kendetegnet ved at** overbygningen (4) har et aftageligt dække (12), i hvilket der er indrettet mindst et rum (10) til at optage en beholder, i hvilken en prøveudtagning kan opbevares.

5. Flydende indretning ifølge krav 4, **kendetegnet ved at** dækket (12) omfatter en transparent blære (13) lokaliseret over et rum (10).

6. Flydende indretning ifølge et hvilket som helst af kravene 1 til 5, **kendetegnet ved at** indretningen omfatter mindst et kamera (15), der er motordrevet i forhold til mindst en vertikal akse Z hos indretningen.

7. Flydende indretning ifølge krav 5 og krav 6, **kendetegnet ved at** kameraet (15) er positioneret til højre for den transparente blære (10).

8. Flydende indretning ifølge et hvilket som helst af kravene 1 til 7, **kendetegnet ved at** skroget (2) i sin forstævn har en transparent plade (16).

9. Flydende indretning ifølge et hvilket som helst af kravene 6 til 8, **kendetegnet ved at** kameraet (15) er bevægeligt og er motordrevet omkring en tværgående akse Y hos indretningen til at dreje fra en position, i hvilken kameraet er positioneret vendende mod den transparente blære (13), til en position, i hvilken kameraet er positioneret vendende mod den transparente plade (16).

10. Flydende indretning ifølge et hvilket som helst af kravene 1 til 9, **kendetegnet ved at** det sekundære skrog (32) er fremstillet af et transparent materiale.

11. Flydende indretning ifølge et hvilket som helst af kravene 1 til 10, **kendetegnet ved at** indretningen omfatter mindst en propel (9), der er positioneret for enden af en mast (5), der strækker sig fra overbygningen (4) af indretningen, hvor propellen (9) drives af en elektromotor (7) placeret i toppen af masten.

12. Flydende indretning ifølge krav 11, **kendetegnet ved at** indretningen omfatter to master (5), der er forbundet med en drivrem (23), der tillader synkronisering af propellernes orientering.

13. Flydende indretning ifølge et hvilket som helst af kravene 1 til 12, **kendetegnet ved at** indretningen indskiber et eller flere batterier, der forsyner de motorer, der driver mindst et af udstyrene fra gruppen omfattende pumpen (30), det ene eller flere kameraer (15), den ene eller flere propeller (9).

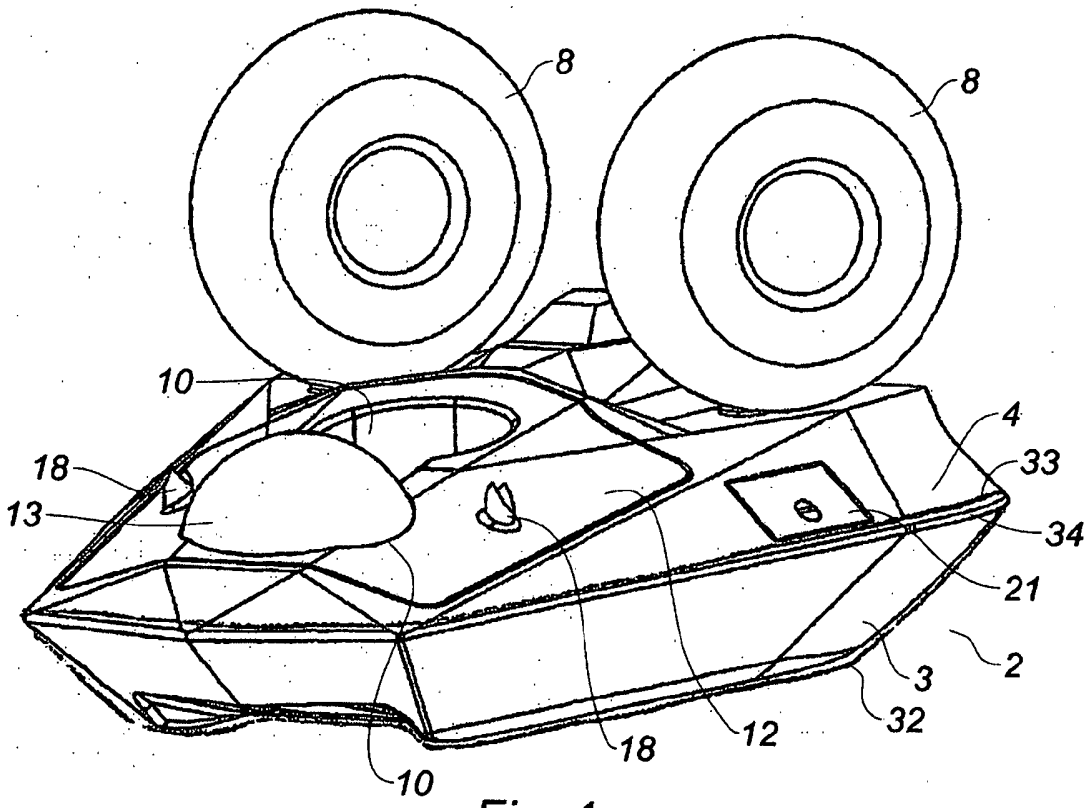
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Fig. 1

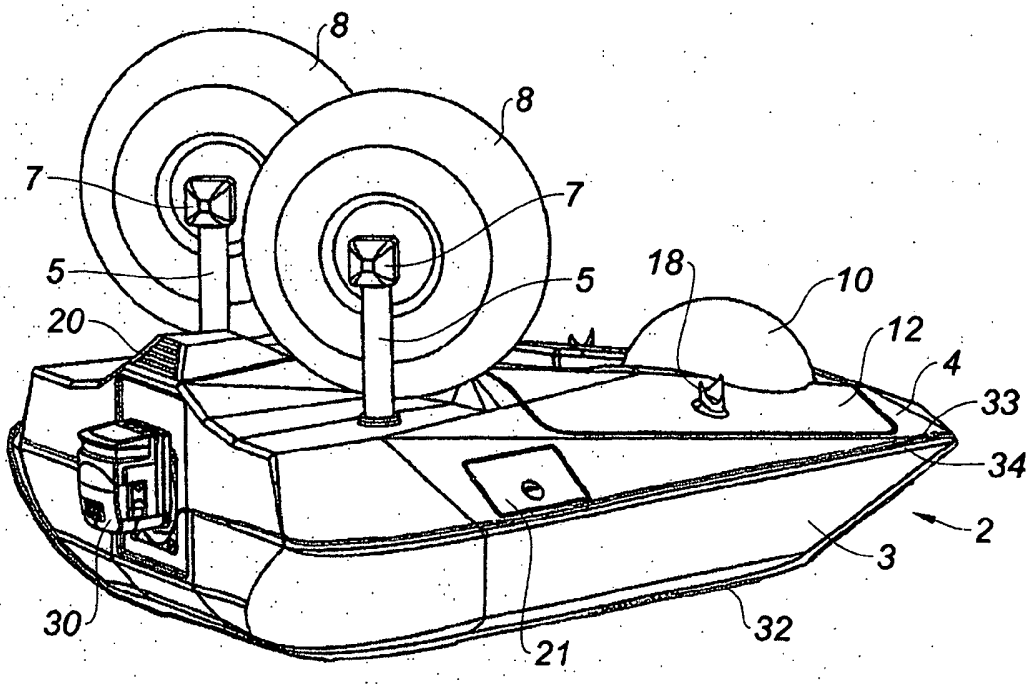
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Fig. 2

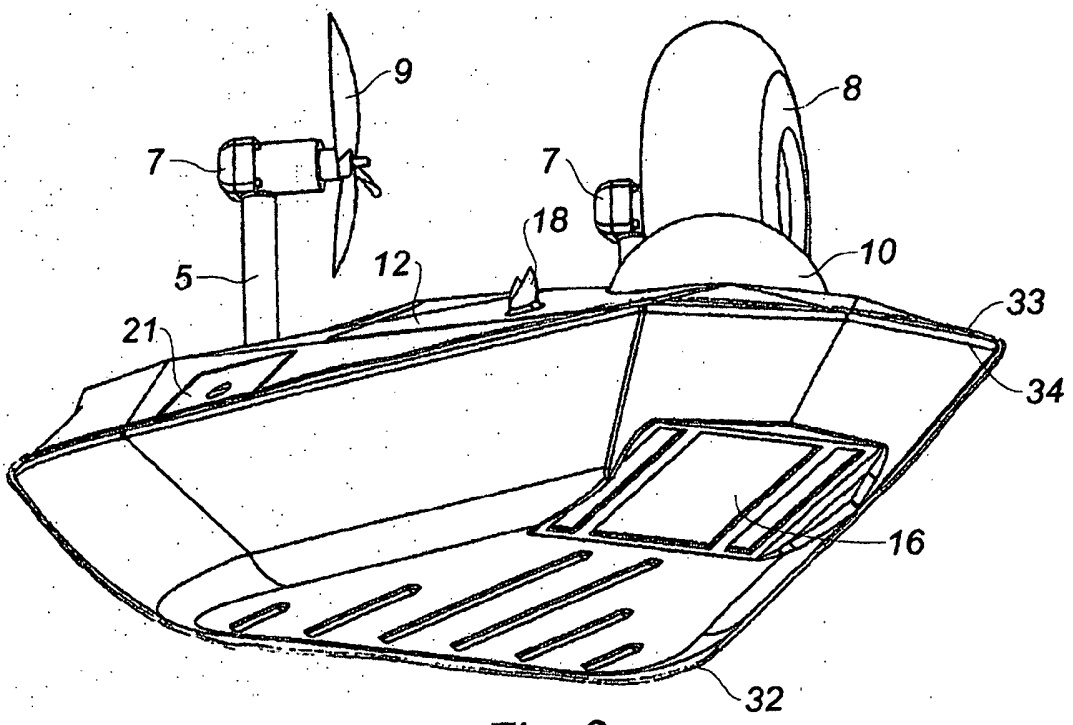

Fig. 3

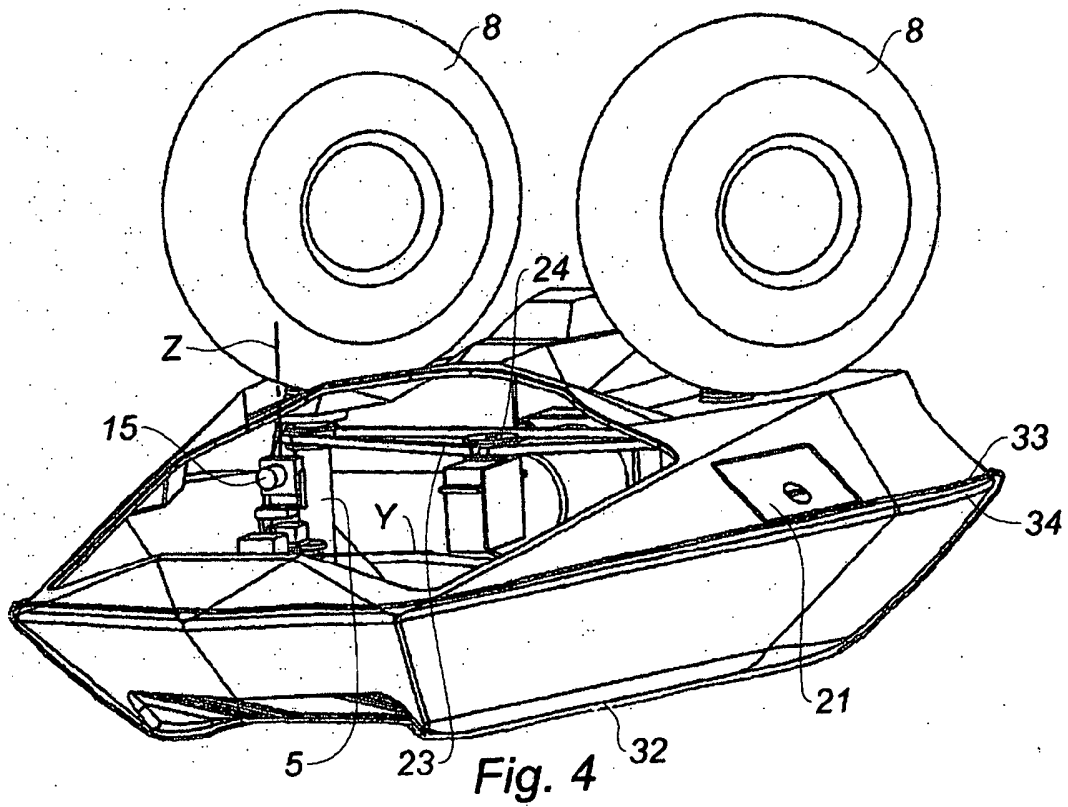

Fig. 4