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(54) Abstract Title**: Coupling a buoyant data acquisition module to an ocean bottom seismometer by means of a retractable tether line**

(57) A module 10 for connecting with an ocean bottom seismometer anchored A on the seafloor comprises a watertight enclosure 11 containing an electronic device for recording the signals acquired by the seismometer. The signals may be recorded on hard disk or flash memory. The enclosure 11 also includes electrical power supply means, such as a battery. A connector C2 is provided for connecting said acquisition device to a corresponding connector C1 on the anchor A. The module includes a winder 14 (e.g. drum, spool, reel) which receives a connection line LG, the free end of which is tethered to the anchor A. The line is wound up in order to move the module down to the seafloor, preferably by a robotic device M attached to vessel B via an umbilical O. A buoyancy member 12 causes the module to float back to the surface when a control signal (e.g. acoustic signal) releases a lock on the winder 14.

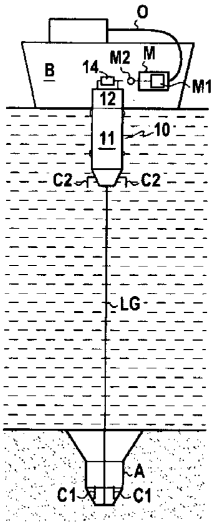

FIG.2A

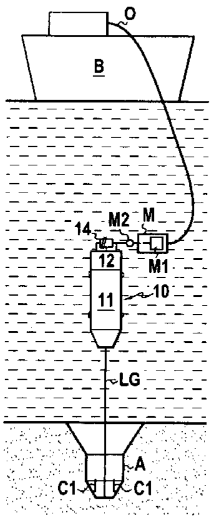

FIG.2B

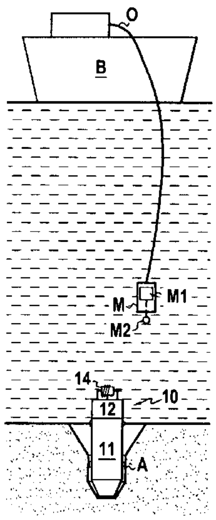

FIG.2C

GB 2 449 351 A

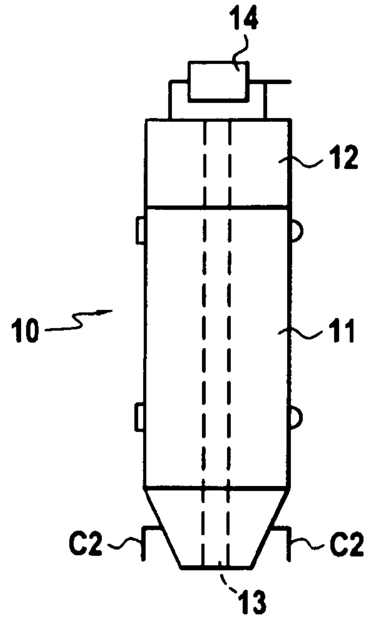

FIG.1

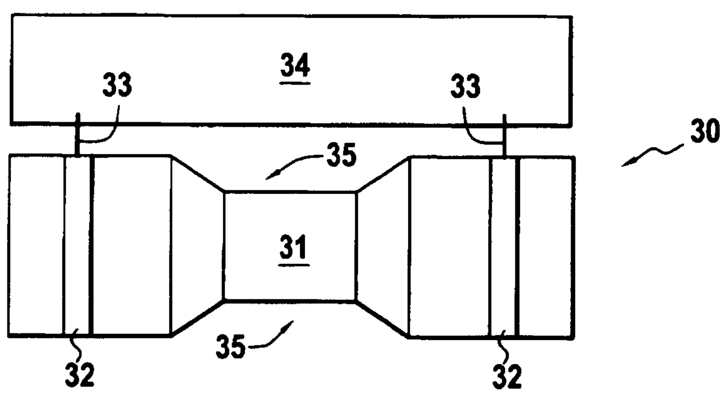

FIG.3

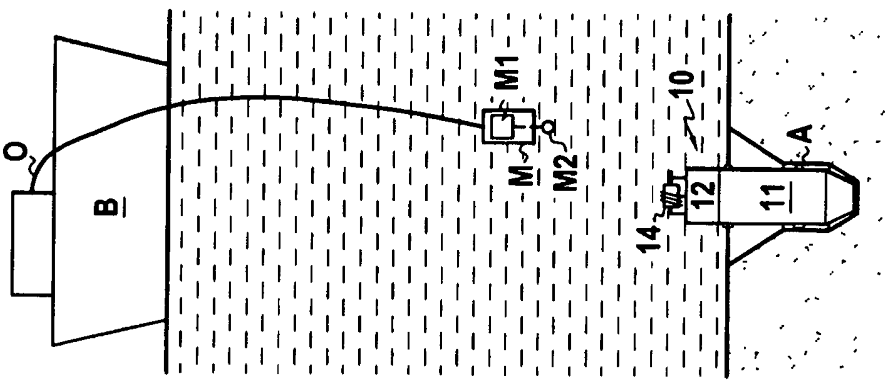

FIG.2C

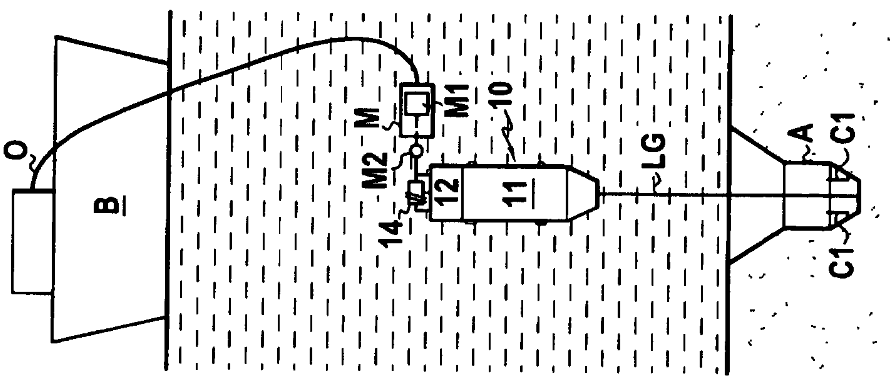

FIG.2B

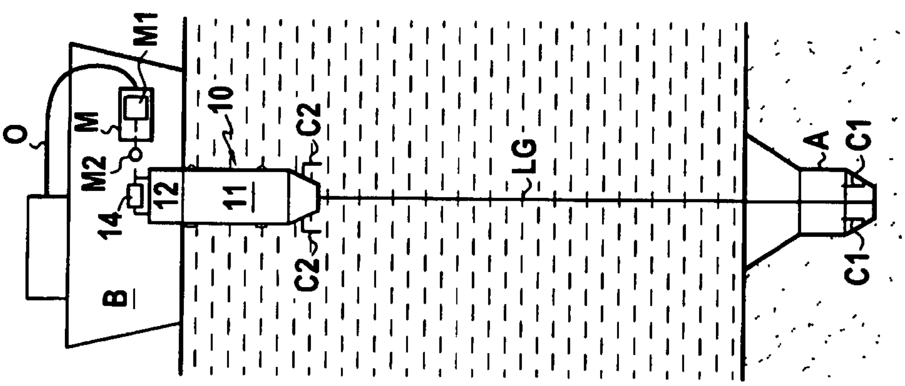

FIG.2A

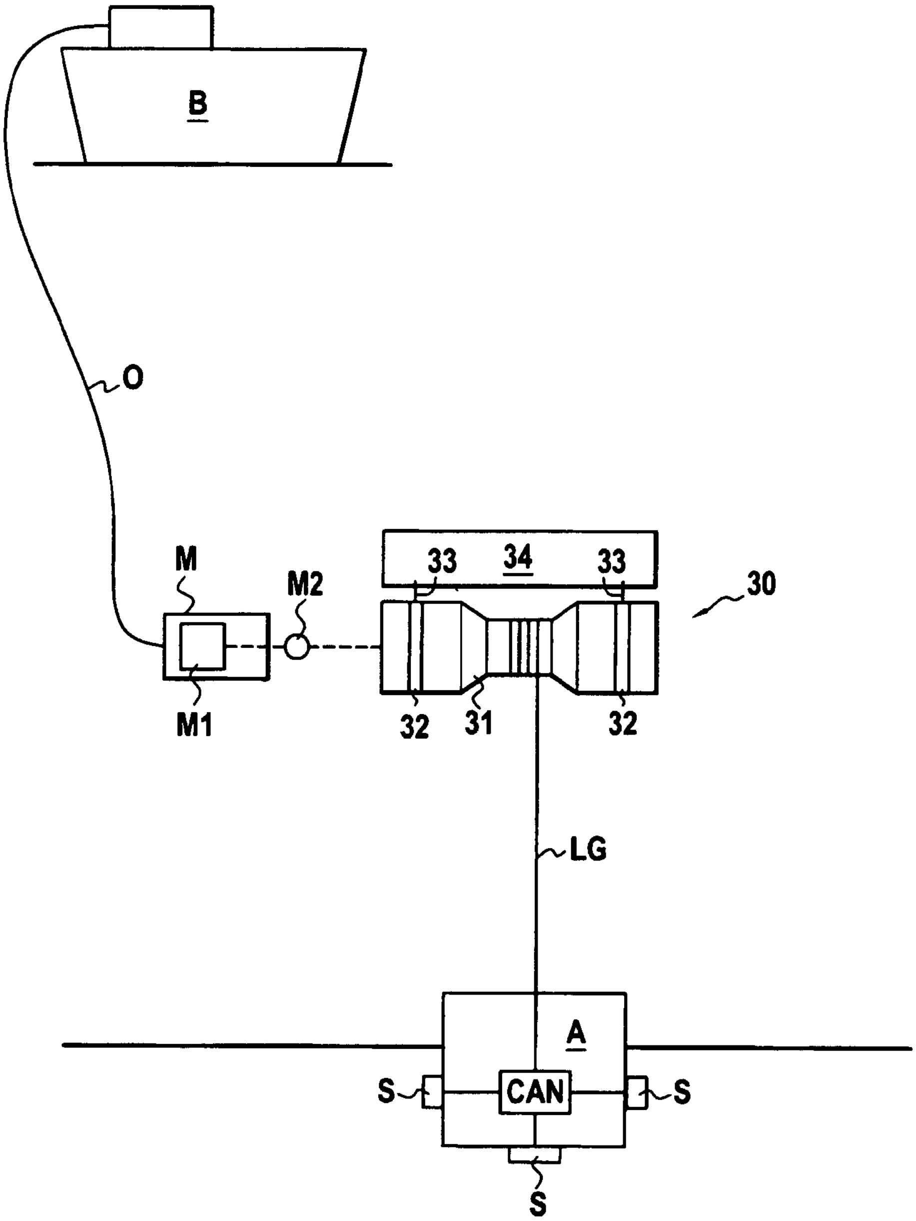

FIG.4

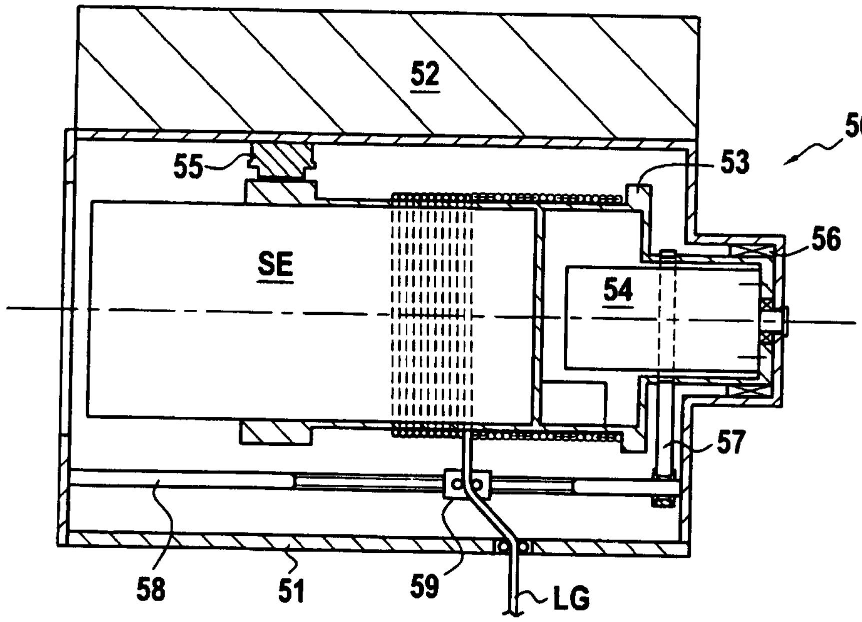

FIG.5

A SEISMIC DATA ACQUISITION MODULE, A SEISMIC PROSPECTION SYSTEM INCLUDING SUCH A MODULE, AND A METHOD OF INSTALLING SUCH A SYSTEM

The present invention relates to a data acquisition module for connection to a sensor placed on the seafloor. The invention also relates to a seismic prospection system including such a module, and to a method of installing such a system at the sea bottom.

The invention relates to the field of marine seismic exploration by means of receivers placed on the seafloor .

This technique consists in implanting or directly laying electronic acquisition stations (known as ocean bottom seismometers (OBS)) on the seafloor. These stations have no contact or physical connection with the surface of the sea. Each station comprises one or more seismic receivers, typically a hydrophone and a geophone, together with an associated acquisition module including means for recording the seismic signals produced by the receivers, and also comprising an electrical battery.

To illustrate this technique, reference can be made to the following documents: FR 2 865 23 A1; FR 2 872 705 A1; EP-A-1 217 390; EP-A-1 593 987; US 4 422 164; and US 4 692 906.

Such systems are adapted in particular to 4D seismic surveys (seismic acquisition campaigns that are repeated at regular intervals in order to study how the characteristics of a reservoir vary over time) or for continuous monitoring of the reservoir. In such a context it is necessary to periodically bring the modules up to the surface in order to recover the data recorded by the modules and to change/recharge the batteries, and then lower the modules back down to the bottom.

The manner of performing these operations is dependent on the water depth. Thus, in shallow water, e.g. with a depth of not more than 100 meters (m), it is too expensive to use remotely-controlled self-propelled vehicles, commonly known as remotely-operated vehicles (ROVs), such as described in particular in FR 2 865 283 A1 and FR 2 874 705 A1.

The use of simple cables, each fitted with a grab at one end for lowering and raising modules to and from the seafloor, as suggested in EP–A–1 593 987, appears impractical, in particular when the number of seismic receivers to be put in place, and thus the number of modules is large - for example, several hundreds or even several thousands of receivers can be necessary to adequately cover the subsurface area to be explored.

Finally, seismic data acquisition systems of the type described in document FR 2 843 805 A1 are known that include passive stations for receiving seismic signals, which stations are fitted with sensors and are implanted permanently in determined zones of the seafloor and are capable of intermittent connection through cables to active seismic data acquisition and recording stations positioned close to the passive stations.

Nevertheless, the placement of active acquisition stations and their connection to passive stations installed on the seafloor likewise requires the use of a robotic vehicle (ROV), or the use of divers when the depths are sufficiently shallow, for positioning the active stations and connecting them by means of connectors to the passive stations, thereby lengthening operations and leading to large exploration costs.

The invention is aimed at providing a data acquisition module for connection to a seismic receiver placed on the seafloor, which module is simple and can be quickly installed on the seafloor and brought up to the surface.

In a first aspect, the invention provides a seismic signal acquisition module for connection with a seismic receiver placed on the seafloor, comprising :

· a watertight enclosure containing an electronic device for acquiring seismic signals, which acquisition device includes means for recording said seismic signals, and also includes electrical power supply means;

· connection means for connecting said acquisition device to the receiver;

· a buoyancy member adapted to cause said module to float after it has been immersed in the sea; and

· a winder member adapted to receive a connection line connected to a point on the seafloor and to wind it in to cause the module to move to the seafloor, or to wind it out under action from the buoyancy means to allow said module to rise to the surface.

The invention also provides a system for seafloor seismic prospection, comprising:

· a seismic receiver placed in a determined position on the seafloor;

· at least one seismic signal acquisition module as defined above, connected to said seismic receiver; and

· at least one connection line fastened at a first end to a point on the seafloor and at its other end to said winder member of said module.

The invention also provides a method of installing a seismic prospection system as defined above, comprising the following steps:

a) placing at least one seismic receiver in a determined position on the seafloor;

b) deploying a first end of a connection line on the seafloor in the proximity of said receiver; and

c) fastening a second end of the connection line to said winder member of said acquisition module; and

d) actuating said winder member of said module in such a manner as to move said module down by winding said connection line onto said winder member; and

e) locking said winder member to hold said module in position at the seafloor.

Other particular and advantageous characteristics of the invention appear more clearly on reading the following detailed description of the invention, given with reference to the accompanying figures, in which:

· Figure 1 is a diagram of an immersible seismic signal acquisition module according to the present invention, in a first particular embodiment;

· Figures 2A to 2C are diagrams showing steps for the installation on the seafloor of a seismic prospection system of the invention in an implementation of the system that includes a measurement module as shown in Figure 1;

· Figure 3 is a diagram of a seismic data acquisition module of the invention in a second particular embodiment;

· Figure 4 is a diagram showing a prospection system of the invention in a modified embodiment, the system including a module as shown in Figure 3; and

· Figure 5 shows a seismic data acquisition module of the invention in a third particular embodiment, in which said module incorporates a self-propelled winder device.

Figure 1 shows an immersible acquisition module 10 in accordance with a first embodiment. The module 10 comprises a watertight enclosure 11 in which an electronic device is installed (not shown) for acquiring and recording seismic signals (also referred to in the present application by the common term "seismic data"), together with batteries for powering the electronic device. Said acquisition device may in particular include communications means suitable for receiving seismic signals transmitted by sensors implanted in the seafloor, and memory means for storing these signals, which memory means may be of the hard disk drive type or of the so-called "flash" memory type.

The module 10 is fitted in its top portion with a buoyancy block 12 secured to the enclosure 11 and ensuring that the module 10 as a whole presents density less than that of water, thereby enabling it to float to the surface when it is free in the water.

The module 10 has a through passage 13, typically of circular section, extending along the longitudinal axis ZZ' of the module. The passage 13 is for receiving a connection line LG enabling the immersed module 10 to move down to the seafloor and up towards the surface pursuant to a process that is described below. It thus contributes to guiding the module during these movements.

The buoyancy block 12 has a winder member 14 fastened thereto. The winder member 14 may be constituted by any suitable means such as a drum, a spool, or a reel, and it is designed to enable a connection line to be wound in, in order to move the module 10 down to the seafloor.

In the embodiment shown in Figure 1, the winder member 14 does not have a motor or any other specific drive means. Nevertheless, such drive means could be associated with said winder member 14 without any constructional difficulties.

In addition, a rotary lock means (not shown in the figures) engage said winder member. This rotary lock means operates in only one direction of rotation of the winder member 14, which direction is selected to be the unwinding direction.

Thus, the lock means allows the winder member 14 to turn in one direction only.

In addition, the lock means includes remote actuator means, preferably acoustically controlled means. This acoustic actuator means is used in particular for releasing the winder member 14 and thus allowing the same to rotate in either direction.

The module 10 is designed for installation on the seafloor and for retrieval using the method described below with reference to Figures 2A to 2C, in the context of its use in a seismic prospection system in accordance with the present invention.

In the example shown in Figures 2A to 2C, and in addition to the module 10, the seismic prospection system of the invention advantageously includes both a connection line LG for the module 10, which line is secured to a point on the seafloor and to the winder member 14 of the module 10, and actuator means M for actuating said winder member 14, which actuator means are independent of the winder member.

The system of the invention also includes an anchor member A for anchoring the module 10, such as a pile implanted in the seafloor. In its walls, the pile A includes seismic sensors or receivers S, typically at least one three-axis geophone and a hydrophone, together with a connector C1 situated at the bottom of the pile A and adapted to engage a complementary connector C2 situated at the bottom end of the module 10 once it has moved down to the bottom of the pile A in order to fasten said module in the pile. The connectors C1, C2 enable analog measurement data from the sensors S to be transferred to the electronic acquisition and recording device situated in the enclosure 11 of the module 10. Connected to the pile A, the system may also include sensors other than seismic sensors, such as sensors responsive to temperature, hydrostatic pressure, etc., where such data can be useful in the context of processing marine seismic data.

During a measurement campaign, the module is anchored at the bottom of the pile A and it communicates via the electronics incorporated in its enclosure 11 with the sensors S situated in the walls of the pile A, and it acquires measurement data from these sensors and records said data on hard disks.

In order to move the module 10 down to the measurement pile A, the first end of a connection line LG is initially attached to the pile A, where the line is constituted for example by a cable or a wire. Thereafter, the free second end of the connection line is passed through the passage 13 in the module 10. Once the connection line LG is positioned in the passage 13 of the module, the free end of said connection line is fastened onto the winder member 14 of the module 10, e.g. by nipping.

Thereafter, the pile A is anchored in the seafloor using known techniques.

A robotic drive device M is then coupled to the shaft of said winder member 14 by suitable coupling means.

The robotic device M contains a motor M1 having a drive shaft M2, itself fitted at its free end with said coupling means for coupling to the winder member 14 of the module 10, and is connected via a power supply umbilical connection O to a power supply device situated on the surface in a boat B.

The winder member 14 of the module is then driven in rotation by said robotic device in order to wind the connection line LG onto said winder member 14. This action causes the module to move down to the pile A at the water bottom.

When the module reaches the bottom of the pile A, it connects to the connector C1 thereat. The motor M1 of the robotic drive device M then starts straining, since the module can no longer advance nor can the connection line LG be wound in any more. The resulting sudden increase in motor torque gives rise, upon reaching a determined torque threshold value, to the motor shaft M2 of the robotic device decoupling from the winder member 14 of the module.

The module 10 is then locked to the bottom of the pile A. After the robotic device M has decoupled from the winder member 14 of the module, the lock means of said winder member prevents the connection line LG from unwinding.

The robotic drive device M is then raised to the boat B using its umbilical connection O. The module 10 is anchored in the pile A, ready for a seismic prospection campaign.

The seismic prospection campaign involves the generation of seismic waves, or "shots", close to the surface of the water, and at short intervals, by means of a device such as an airgun array towed by a boat. A large number of seismic sensors such as those described above are put into place on the seafloor. The transmitted seismic waves propagate into the subsurface after travelling through the water column, and they produce reflections on the interfaces between geological strata which travel through the subsurface towards the seafloor. The reflections are detected by the seismic sensors and the data they produce are recorded in the acquisition modules respectively associated with the sensors.

In order to retrieve the results of a measurement campaign and/or to recharge the power supply batteries of the electronic acquisition and recording device located in the enclosure 11 of the module, it is then necessary to retrieve each of the modules 10, and to replace them for a subsequent measurement campaign.

Module retrieval operations take place as follows.

Initially, the winder member 14 of the module 10 is unlocked. This unlocking is performed by sending a control signal into the sea from the boat B, for example, which control signal may be an acoustic signal, for example. The signal is received by the acoustic receiver means of the lock means of said winder member 14 for winding the connection line LG on the module 10.

On receiving this control signal, said lock means releases the winder member 14 to rotate in the direction for unwinding the connection line LG, and since the module is lighter than water, because of the buoyancy block 12 it carries on its enclosure 11, it rises to the surface of the water, with the connection line LG unwinding naturally from the winder member as the module rises.

This one-off unlocking operation requires very little energy, and likewise very little energy is needed to enable the module to rise to the surface, since that takes place only because of its buoyancy.

When the module 10 reaches the surface, it is retrieved by the boat. For this purpose, it is advantageous to fit the module with geolocation means, in particular using GPS (Global Positioning System). The connection line LG is then removed from the winder member and the module is disengaged. The module 10 containing the measurement results is retrieved and replaced by another module placed around the connection line LG.

In order to lower the new module 10 down to the measurement pile A at the water bottom, the robotic drive device M is coupled to the axis of the winder member of the new module and it is taken down to its destination pile A in the manner described above.

Figure 3 shows a particular modified embodiment of a module 30 of the invention. The module 30 comprises a watertight enclosure 31 that is shaped so as to constitute a winder member for a connection line LG secured to the seafloor at an anchor means A placed on or implanted in the seafloor as described below with reference to Figure 4.

In order to enable the enclosure 31 of the module 30 to revolve during the stages of moving the module 30 down and up, said enclosure 31 is mounted to rotate freely in two rings 32 that are interconnected by a structure that may be in the form of a bar, or that is preferably in the form of at least two bars 33, or in a variant, in the form of a plate, and that supports a buoyancy block 34 giving the module 30 a large amount of buoyancy enabling it to rise to the surface when there is no force holding it under water. In addition, remotely-actuatable lock means (not shown) are also disposed on the enclosure, preferably at said rings 32, so as to prevent said enclosure 31 from rotating in order to prevent rotation of the enclosure 31 in the unwinding direction and thus prevent the module 30 from rising after it has been immersed for a measurement campaign.

The enclosure 31 of the module as shown is cylindrical in shape and is provided with a central recessed portion 35 giving it the general shape of a reel or drum, making for guided winding of a cable or connection line LG onto the enclosure 31 when it is driven in rotation.

Like the module 10 shown in Figure 1, the module 30 of Figure 3 encloses in its watertight enclosure 31 an electronic device for acquiring and recording seismic measurement data picked up by sensors S connected to an anchor means A for anchoring the module 30 on the seafloor. The enclosure 31 also advantageously contains batteries for powering the electronic device, together with acoustic control means for controlling the means for locking rotation of the enclosure 31.

In a variant (not shown) of the Figure 3 module, said enclosure 31 may be constituted by a plurality of individual modules, each enclosing in watertight arrangement a part of the electronic components included in the enclosure, said modules being connectable to one another by watertight connection means. This particular configuration is particularly advantageous for performing so-called 4D seismic measurement campaigns, i.e. campaigns that are spaced apart in time, so as to be compared with one another in order to monitor variation in the characteristics of oil or natural gas fields over time.

The module 30 of Figure 3 can be used in a prospection system identical to that shown in Figures 2A to 2C, replacing the module 10.

Under such circumstances, the module 30 is lowered to the seafloor by winding a connection line LG that is fastened to an anchor means A placed or implanted in the seafloor and carrying seismic sensors or receivers S, by means of a robotic winder device M connected by coupling means M2 to the axis of the enclosure 31 of the module 30 and powered by an umbilical O.

When the module 30 reaches the seafloor, it connects via electrical connectors C1, C2 to the anchor means A so as to receive and record the seismic data produced by the sensors S, and the robotic drive device M uncouples automatically from the enclosure 31 of the module 30, with the module 30 then remaining locked in position by the rotary lock means at the rings 32. To bring the module up to surface, it then suffices to send an acoustic control signal from the surface, and upon said signal being received by the acoustic control means incorporated in the enclosure 31, the control means causes the rotary lock means to automatically release the enclosure 31 and the connectors C1, C2 from the anchor means. The module 30 then rises under action of the buoyancy block 34. Like the module 10 of Figure 1, the module 30 may be fitted with geolocation means, in particular with GPS for making its retrieval easier once it has reached the surface.

The module 30 of Figure 3 can also be used in a modified prospection system using a method described below with reference to Figure 4.

This modified prospection system comprises a module 30 as described above, a connection line LG for lowering said module to the seafloor, and anchor means A for anchoring the module 30 and the connection line LG to the sea bottom.

Said anchor means A in the shown embodiment comprises a mass provided on its bottom and side faces with seismic sensors S. The connection line LG is fastened directly to the anchor means A via one end, and to the enclosure 31 of the module 30 at its other end. In this system, the module 30 and the anchor means A do not include electrical connectors for transferring data from the sensors to the electronic acquisition and recording device confined within the enclosure 31 of the module 30; here it is the connection line LG that acts directly as a cable for transferring said data from the sensors. It is thus connected electrically at one end to the sensors S of the anchor means A, and at its other end to the electronic acquisition device inside the enclosure 31 o the module 30.

In this configuration, it is no longer necessary for the module to be lowered right down to the seafloor in order to connect to the anchor means. This presents the advantage that connectors can be dispensed with.

Since transferring the analog data produced by the sensors over the connection line can lead to disturbances and to losses, it is provided in this configuration an analog-to-digital converter ADC placed in the anchor means A to convert the measurement data from the sensors S into digital form prior to sending the data over the connection line LG for acquisition and recording by the electronic device incorporated in the enclosure 31 of the module.

The module 30 in this configuration of the prospection system is installed in the same manner as that described above with reference to Figures 2A to 2C, for the module of Figure 1, by winding the connection line LG onto the enclosure 31 by means of an auxiliary robotic drive device M powered via an umbilical O and after installing said anchor means A on the sea bottom.

Similarly, the module 30 is retrieved as in the above-described embodiment by sending an acoustic signal to release the rotary lock means of the enclosure 31 and to allow the module to rise buoyantly owing to the buoyancy block 34.

In another variant shown in Figure 5, the acquisition module 50 has a watertight enclosure 51 surmounted by a buoyancy block 52. The enclosure 51 contains an electronic system SE for acquiring and recording data, housed in a winding drum 53 for winding a connection line LG of the module 50 via which said data are transmitted to the electronic system SE as described above with reference to Figure 4. The acquisition and recording device SE may in particular include communication means adapted to receive the seismic signals produced by the sensors S implanted on the seafloor and memory means for recording these signals, which may be of the hard disk type or of the so-called "flash" memory type.

A motor 54 for driving the drum 53 is housed in an end compartment of the drum 53. The stator of the motor 54 is embedded in a tubular portion of the drum 53 while its rotor is rigidly connected to the enclosure 51. Thus, when said motor 54 is actuated, it is its stator that rotates the drum 53 inside the enclosure 51.

The operation of the motor 54 is controlled by an acoustic or electromagnetic remote control and locking modem C housed in the same compartment as the drum 53. In addition to actuating the motor 54 to wind the connection line LG onto or out of the drum 53, this modem also controls the electrical measurement system SE of the module so as to achieve optimal control over the electrical energy from the batteries of said electrical system, which batteries also serve to power the motor 54.

The drum 53 is guided in rotation within the enclosure by rollers 55, 56 placed between the enclosure 51 and the outside surface of the drum 53. In addition, said drum 53 is also rotatable with guide means 58, 59 for guiding the winding of the guide line LG by means of a belt 57. The belt 57 rotates a wormscrew 58 that in turn drives rollers 59 in translation to guide the guide line LG along the drum 53 as the drum rotates while the line is being wound in or out.

Furthermore, the buoyancy block 52 and the enclosure 51 are designed in such a manner that the module 50 does not revolve while the drum 53 is rotating inside the enclosure.

The module 50 of Figure 5 is intended for use in place of module 30 of Figure 4. During installation, the module 50 is lowered to the seafloor for a measurement campaign by winding a connection line LG onto the drum 53 under drive from the motor 54, which line is fastened to anchor means fitted with sensors and resting on the seafloor. In order to bring the module 50 up after the measurement campaign, the motor 54 is actuated remotely by controlling the control modem C, e.g. acoustically or electromagnetically, so as to cause the motor to turn in the direction for unwinding the connection line LG; the module then rises to the surface of the sea under the effect of the buoyancy provided by the buoyancy block 52 of the module. As with the modules 10 and 30 of Figures 1 and 3, the module 50 can be fitted with geolocation means, in particular GPS to make its retrieval easier once it has reached the surface.

The prospection system described above is particularly adapted to low water depths, of about 100 m or less. The simplicity and rapidity of the operations needed to put the acquisition modules in place on the seafloor and bring them up to the surface are significant advantages when the number of seismic sensors and thus the number of acquisition modules is large.

In the present application, the term "seafloor" is not to be interpreted narrowly and it can also designate the bottom of any body of water such as a lake, a lagoon, or a delta.

CLAIMS

1. A seismic signal acquisition module for connecting with a seismic receiver placed on the seafloor, comprising:

· a watertight enclosure containing an electronic device for acquiring seismic signals, which acquisition device includes means for recording said seismic signals, and also includes electrical power supply means;

· connection means for connecting said acquisition device to the receiver;

· a buoyancy member adapted to cause said module to float after it has been immersed in the sea; and

· winder member adapted to receive a connection line (LG) connected to a point on the seafloor and to wind it in to cause the module to move to the seafloor, or to wind it out under action of the buoyancy member to allow said module to rise to the surface.

2. A module according to claim 1, including guide means for guiding the module along said connection line.

3. A module according to claim 1 or claim 2, including lock means for locking said winder member.

4. A module according to claim 3, including remote acoustically or electromagnetically controlled actuator means for said lock means, adapted to actuate said lock means upon receiving a control signal transmitted into or over the water.

5. A module according to any one of claims 2 to 4, wherein said guide means is shaped to enable said module to be threaded in the longitudinal direction onto a connection line.

6. A module according to any one of claims 1 to 5, wherein said enclosure includes a cylindrical passage

opening out at both ends of the module along the longitudinal axis of the module, said cylindrical passage forming said guide means.

7. A module according to any one of claims 1 to 5, wherein said winder member of the module is formed by the enclosure of the module, which enclosure can be driven to rotate about its own axis.

8. A module according to any one of claims 1 to 4, wherein said winder member is a drum containing said electronic device for acquiring and recording data, said drum itself being housed in said enclosure of the module.

9. A module according to claim 8, wherein a motor for driving the drum is housed in an end compartment of the drum, the stator of said motor being embedded in a tubular portion of the drum, while its rotor is rigidly connected to the enclosure.

10. A module according to claim 8 or claim 9, also including a modem for remotely controlling and locking said motor, the modem being housed in the same compartment of the drum as said motor.

11. A module according to any one of claims 8 to 10, including rollers for guiding the drum in rotation inside the enclosure.

12. A module according to any one of claims 8 to 11, in which said drum is rotatably coupled by means of a belt to guide means for guiding the winding of a said connection line.

13. A system for seismic prospection at the sea bottom, the system comprising:

· at least one seismic receiver placed in a determined position on the seafloor;

· at least one seismic signal acquisition module according to any one of claims 1 to 12, connected to said seismic receiver; and

· at least one connection line fastened at a first end to a point on the seafloor and at its other end to said winder member of said module.

14. A seismic prospection system according to claim 13, including anchor means for anchoring said acquisition module to the seafloor, secured to the receiver, said anchor means including at least one means for fastening said first end of the connection line.

15. A seismic prospection system according to claim 14, wherein said anchor means is a pile pressed into the ground at the seafloor.

16. A seismic prospection system according to any one of claims 13 to 15, wherein the connection line of the module comprises at least one cable for transferring data between the seismic receiver and the electronic acquisition device of said acquisition module.

17. A seismic prospection system according to any one of claims 13 to 16, further comprising an immersible motor drive device connected by coupling means to said winder member of said acquisition means , adapted to be remotely actuated to drive said module downwards by winding said connection line onto said winder member of said module.

18. A seismic prospection system according to claim 17, wherein said motor drive device is connected to an electrical power supply device.

19. A seismic prospection system according to claim 17 or claim 18, wherein said motor drive device is connected to an electrical power supply device located at the surface via a power supply umbilical.

20. A system according to claim 13, having a plurality of seismic receivers (S) placed at different positions on the seafloor so as to cover a subsurface area to be explored, and a plurality of acquisition modules and connection lines respectively associated with the receivers.

21. A method of installing a seismic prospection system according to any one of claims 13 to 20 at the seafloor, comprising the steps of :

a) placing at least one seismic receiver in a predetermined position at the seafloor;

b) deploying and fastening a first end of a connection line on the seafloor in the proximity of said receiver; and

c) fastening a second end of the connection line to said winder member of said acquisition module; and

d) actuating said winder member of said module so as to move said module down by winding said connection line onto said winder member; and

e) locking said winder member to hold said module in position at the seafloor.

22. A method according to claim 21, wherein in step d), said winder member of the module is locked to rotate in one direction only.

23. A method according to claim 21 or claim 22, wherein said connection line is wound onto said winder member of the module and said module is connected to said receiver.

30. A seismic signal acquisition module substantially as hereinbefore described with reference to the accompanying drawings.

31. A method of installing a seismic prospection system substantially as hereinbefore described with reference to the accompanying drawings.

Application No:	GB0808879.1	**Examiner:**	Stephen Jennings
Claims searched:	1-31	**Date of search:**	16 September 2008

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
A,E	-	WO 2008/093289 A1 [Armscor Business]
A	-	JP 10287293 A [Mitsubishi Heavy Ind Ltd]

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art
Y	Document indicating lack of inventive step if combined with one or more other documents of same category	P	Document published on or after the declared priority date but before the filing date of this invention
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^{X} :

Worldwide search of patent documents classified in the following areas of the IPC

B63B; G01V

The following online and other databases have been used in the preparation of this search report

WPI, EPODOC, TXTE

International Classification:

Subclass	Subgroup	Valid From
G01V	0001/38	01/01/2006
B63B	0022/06	01/01/2006