

Subsurface mining vehicle and method for collecting mineral deposits from a sea bed at great depths and transporting said deposits to a floating vessel

BACKGROUND OF THE INVENTION

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The present invention relates to a subsurface mining vehicle for collecting mineral deposits from a sea bed at great depths and transporting them to a floating vessel. The invention further relates to a method for collecting mineral deposits from a sea bed at great depths and transporting them to a floating vessel.

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Deep sea mining involves collecting mineral deposits, such as polymetallic nodules, diamonds, gold, and rare soils from (below) the sea floor 4,000 - 6,000 m. Polymetallic nodules may for instance comprise nickel, copper, cobalt and manganese nodules. In deep sea mining, the sea floor may be a distance of up to 5000 m and more away from the sea surface, and developing equipment for deep sea mining imposes many challenges.

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Deep sea mining vessels need to bring subsurface mining equipment to the sea floor and recover the same from the sea floor after termination of a mining operation. Typical vessels thereto comprise some type of launching and docking device that is operated from a docking well. Such docking well passes through and is enclosed by the vessel hull, and opens to the sea at its bottom side defining a so-called splash zone of the docking well. The docking well may be closable across the bottom by movable gates if desired. A deep sea mining vessel further typically comprises pumping equipment for bringing mined mineral deposits from the sea floor to a vessel storage hold through a transport pipe system. A riser string extends from the vessel to the mining equipment to convey the mined mineral nodules towards the sea surface. A lift system is usually operational in raising and launching the riser string.

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In launching subsurface mining equipment, the maximum environmental circumstances are often limited to certain wave heights, and considerable time is lost while waiting for a weather window for deploying or recovering the equipment. Further, most damages to subsea mining equipment occur during launching and recovery. Given the size, complexity and cost of a mining vehicle, this is unacceptable.

The above described disadvantages occur to an even higher extent in launching and recovering subsurface mining equipment. Indeed, deep sea mining equipment preferably has a relatively low weight, which makes it difficult to control such equipment when suddenly contacting a moving mass of water. The risk for collision with parts of the vessel or other structures is high.

Therefore, an aim of the present invention is to provide a device and method for launching subsurface mining equipment into a water mass from a docking well of a floating vessel, and recover said equipment from the water mass in a more controlled manner.

BRIEF SUMMARY OF THE INVENTION

The invention thereto provides a subsurface mining vehicle for collecting mineral deposits from a sea bed at great depths and transporting said deposits to a floating vessel, the vehicle comprising a load-bearing structure provided with means for advancing the vehicle on the sea bed, and with a pick-up unit for the deposits, the vehicle further comprising a lifting frame that is at one end provided with a suspension connector to connect to a suspension means provided between the floating vessel and the vehicle, and at another end connected to the load-bearing structure by a hinged connection, that is actuated by actuating means such that the angular position of the load-bearing structure relative to the lifting frame can be fixed in different angular positions. By providing the vehicle in accordance with the invention with a lifting frame that allows to rotate the load-bearing structure around a substantially horizontal axis (an axis about parallel to the sea bed) and fixate it in substantially any angular position while it is hanging in a suspension cable, it becomes possible to launch and recover a mining vehicle in about any angular position, and preferably in a substantially vertical position. This has proven to increase the controllability of the launching and recovery operation.

A useful embodiment of the invention provides an embodiment of the device further comprising a connector for connecting to a deposit transporting system provided between the vehicle and the floating vessel.

In another embodiment of the invention, a device is provided wherein the lifting frame is equipped with transporting means for picked-up deposits, which transporting means is at one end provided with the connector and at another end connects to the pick-up
5 device. The transporting means provided on the lifting frame may for instance comprise a rigid conveying tube that is attached to a frame member of the lifting frame, and connects with the deposit transporting system through the connector.

In an embodiment of the invention, a subsurface mining vehicle is provided wherein the
10 actuating means comprise hydraulic cylinders extending between the frame and the load-bearing structure.

Yet another embodiment of the invention provides a subsurface mining vehicle wherein the vehicle has a center of gravity and the hinged connection is positioned such that a
15 pivot line between the frame and the load-bearing structure runs substantially through the center of gravity when the vehicle is totally submerged. The wording ‘substantially’ in the context of the present application means within 1.5 m, more preferably within 1 m, and most preferably within 0,5 m.

20 According to another embodiment of the invention, a subsurface mining vehicle is provided comprising buoyancy means, preferably in the form of a plurality of buoyancy elements, most preferably arranged onto parts of the vehicle. Suitable buoyancy elements need to be able to withstand the high pressures at a sea bottom, preferably more than 500 bar.

25 Another embodiment of the invention provides a subsurface mining vehicle wherein the load-bearing structure and/or the lifting frame are substantially planar.

In a particular embodiment of the subsurface mining vehicle according to the invention,
30 the load-bearing structure comprises a fork-shaped frame of longitudinal beam members, and transverse beam members spanning the distance between the longitudinal beam members at a distance from a root of the fork-shaped frame.

A useful embodiment of the subsurface mining vehicle is characterized in that a transverse member is pivotally connected to the root of the fork-shaped frame.

Another embodiment of the subsurface mining vehicle according to the invention
5 comprises at least one propelling means at each side of the vehicle.

The propelling means may be any means known in the art but in a preferred embodiment comprise a track assembly.

10 Another particularly useful embodiment of the subsurface mining vehicle according to the invention comprises a suspension connector for the suspension means, that is adapted to allow free rotation of the vehicle when suspended from the suspension means around an axis parallel to a suspension means axis. Suitable suspension means comprise a suspension cable.

15 According to another embodiment of the invention, the suspension connector of the subsurface mining vehicle comprises a slewing ring that is attachable to the suspension means and comprises a turning gland.

20 The invention further relates to a method for collecting mineral deposits from a sea bed at great depths and transporting said deposits to a floating vessel. The method in accordance with the invention comprises providing a subsurface mining vehicle in accordance with the invention, connecting the lifting frame of said mining vehicle to a suspension cable provided between the floating vessel and the vehicle, lowering the
25 vehicle towards a sea bed with the load-bearing structure in a first angular position, actuate the hinged connection between the lifting frame and the load-bearing structure to fixate the load-bearing structure in a second angular position that differs from the first angular position of the load-bearing structure relative to the lifting frame, position the vehicle on the sea bed and advance the vehicle on the sea bed to pick-up the mineral
30 deposits.

The mining vehicle is in an embodiment connected to a deposit transporting system provided between the vehicle and a floating vessel. The deposit transporting system may be configured in accordance with any system known in the art and preferably

comprises a riser string of interconnected rigid pipe sections, provided between the vehicle and the floating vessel.

5 A particularly preferred embodiment of the method is characterized in that the first angular position is parallel to the vertical direction. More preferably, the second angular position makes an angle of 90° or more with respect to the vertical direction.

In yet another embodiment of the method according to the invention, the second angular position makes an angle of more than 90° with respect to the vertical direction, such that
10 the vehicle contacts the sea bed first with a rear end thereof.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will now be elucidated in more detail with reference to the accompanying
15 figures, without otherwise being limited thereto. In the figures:

Fig. 1 is a perspective view of an embodiment of a subsurface mining vehicle of the present invention;

Fig. 2 is a perspective view of an assembly of the subsurface mining vehicle of figure 1 and a flexible riser to which it is attached;

20 Fig. 3 is a perspective view of a vehicle showing the load-bearing structure and the lifting frame in disconnected state in accordance with an embodiment of the invention;

Fig. 4 is a perspective view of the load-bearing structure provided with propelling means of the vehicle of figure 1;

25 Fig. 5 is a top view of the load-bearing structure provided with propelling means and lifting frame of the vehicle of figure 1;

Fig. 6 is a perspective view of a ; and

Fig. 7A, 7B and 7C are transverse views of a vehicle in accordance with an embodiment of the invention in different angular positions.

30 DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

A general arrangement of an embodiment of a mining vehicle 1 that is readily launchable and recoverably by a docking device on a floating vessel is shown in figure 1. The mining vehicle 1 comprises on a front side thereof a collector 2. The “hydraulic”

collector 2 of the embodiment shown is only one example of a suitable collector and other collectors may be used as well within the scope of the invention. The vehicle 1 further comprises a load-bearing structure 3 (see figure 3) provided with propelling means in the form of four track assemblies 4. A pair of track assemblies 4 moves
 5 independently from each other at one side of the vehicle 1, while another pair of track assemblies 4 moves at an opposite side of the vehicle 1. Rotating the track assemblies 4 will advance the vehicle 1 over a sea bed 5.

The load-bearing structure 3 further accommodates pumps, electrical equipment,
 10 hydraulic equipment and the like, and a hinged lifting frame 6 that connects the vehicle 1 to an interconnection hose assembly 7 of a riser. Four vehicle guiding brackets 8 are mounted on each side of the vehicle 1 and are intended to guide the vehicle 1 through guiding rails (not shown) provided in a docking device on a vessel during deployment. The brackets 8 are mounted on the foundations of the track assemblies 4, two per track
 15 assembly.

In order to reduce the submerged weight of the vehicle 1 and the soil bearing force of the track assemblies 4, is added in one embodiment in the form of pressure resistant buoyancy elements (not shown) with a density of around 300- 700 kg/m³. The
 20 buoyancy is preferably equally distributed on the vehicle 1 and reduces the adherent water in the main load-bearing structure 3. The collector 2 on the front of the vehicle 1 may be neutrally compensated by buoyancy elements placed around it. Adequate positioning of a number of buoyancy elements provides a center of gravity of the complete vehicle 1 that is almost in the middle of the vehicle 1. All buoyancy elements
 25 or blocks are preferably positioned on or at a beam of the load-bearing structure 3.

The interconnection hose assembly 7 to which the vehicle 1 connects is schematically shown in figure 2. The assembly 7 comprises a flexible submarine hose 70 that is adapted to transport mineral nodules collected by the vehicle 1 to a rigid riser 8. The
 30 flexible hose 70 itself comprises a plurality of hose units of 10-15 m long for instance, interconnected by bolted flanges. When the mining vehicle 1 is not operational, the complete hose 70 is preferably stored on a reel provided on the floating vessel.

- In an embodiment, a number of buoyancy elements or blocks 71 is divided over one or more hoses 70, over an equivalent length of about 50 m for instance. Each buoyancy block preferably weighs between 500 and 1000 kg, or even higher, may have a height of about 1 m and a diameter of about 1.6 m. The total length of the flexible hose 70 may be
- 5 chosen within a large range and may for instance be around 150 m, and shaped like a lazy-S to decouple both vertical movements of the end of the riser 8 (due to heave for instance) as well as horizontal movements of the vehicle 1. Buoyancy blocks 71 generating an upward force in a part of the hose 70 may be used to create the S-shape.
- 10 In order to support the vehicle 1 during launching or recovery, steel lifting cables, preferably two separate lifting wires 72, are attached to the vehicle 1 to create sufficient longitudinal strength and provide lifting capacity. The steel lifting wires 72 are running along the hose 70 and are designed to be slightly shorter than the hose 70 itself, to ensure that they take most of the longitudinal stresses. The steel wires 72 are preferably
- 15 not fixed to the hose 70, but are bundled with the hose 70 into a package. Hose clamps 73 or buoyancy blocks 71 take care of the bundling. The steel wires 72 are at one end connected to a top flange of the interconnection hose 70, the flange being suitable to transfer the large forces.
- 20 An umbilical wire is provided along the interconnection hose 70 to provide power and transmit signals between a floating vessel and electronic equipment installed on the vehicle 1. It is conveniently part of the package and held by the clamps 73. The required power is generally generated on the floating mining vessel and conducted through the umbilical wire to the vehicle. Moreover, fibre optic elements (for PLC's) and wires for
- 25 survey equipment (submerged cameras, sensors, lighting...) may also be included in the umbilical wire.
- A flange or coupling is also provided on the lower end of the riser 8, to which the interconnection hose assembly 70 may be connected. A waterproof junction of
- 30 umbilicals is also provided for connecting the relatively short umbilical wire of the interconnecting hose assembly 70 to the relatively long (for instance 2000-5000 m) umbilical wire that is attached to the riser string 8 and leads to the vessel.

A shown in figure 3 (exploded view), steel box beam elements out of high tensile steel (e.g. RQT701) are used in an embodiment to build up a substantially planar load-bearing structure 3 of the mining vehicle 1. Alternatively the structural elements could be fabricated out of carbon fibre reinforced composites. The load-bearing structure 3 has a fork-like shape with two longitudinal beams (3a, 3b) and two transversal beams (3c, 3d) running in between and rigidly connected to the longitudinal beams (3a, 3b). The transversal beams (3c, 3d) carry the collector 2.

The load-bearing structure 3 further carries transverse beams (8a, 8b) to which aft and fore track assemblies 4 can be mounted respectively. The transverse beam 8a at the back of the vehicle 1 is pivotable around pivot 30. Pivot part 30 at the back of the vehicle 1 is connected by flanges 31 to the load-bearing structure, which offers a relatively easy exchange of components in case of failure or damage.

The lifting frame 9 is a steel structure that is connected to the main load bearing structure 3 via two hinge connections (90a, 90b). While deploying or recovering the vehicle 1, it will be suspended from the lifting frame 9. The flexible hose 70 and steel cable 72 assembly that interconnects the riser 8 with the vehicle 1 is thereto connected to the lifting frame 9. The lifting frame 9 in the embodiment shown guides piping 91 that connects the flexible hose 70 to the nodule collector 2.

While on deck or during launch and recovery, the lifting frame 9 preferably extends parallel to the substantially planar main load-bearing chassis 3 (figure 7A). When the vehicle 1 is relatively close to the seafloor 5, two hydraulic cylinders 92 (see figure 1) in a preferred embodiment lift the frame 9 to an angle θ of up to 105° for instance (figure 7B), such that the vehicle lands on its rear part on the seafloor 5. After landing on the seafloor 5, the frame 9 is preferably kept upright at an angle θ of about 90° to the main chassis 3 (figure 7C).

Referring to figure 4, suitable propelling means comprise an undercarriage provided with four separate track drives 4, which are preferably independently speed controlled. As shown in figure 5, such propelling means 4 offer improved manoeuvrability and higher tractive effort compared to conventional track systems. A number of independent tracks 4 may also offer advantages in case of inhomogeneous soils. A benefit of the

propelling means of the present embodiment is that its four independent tracks 4 allow to use a steering mechanism, thereby avoiding additional soil disturbance. A pivot point at the back of the vehicle 1 (see figure 5) allows for smooth steering and minimizes disturbance of the soft seafloor. A turning radius of about 160 m and less may be achieved. In the embodiment shown, the articulation is actuated by two hydraulic cylinders 40, that are equipped with an internal spring in order to automatically reposition the steering beam to the center if a mechanical failure would occur. The pivot point is located at the back rather than in the middle of the vehicle, as it simplifies the vehicle lay-out, and has no adverse consequences on steering. The steering capacity of the vehicle is sufficient because the inertia of the vessel and riser do not allow for fast direction changes and the vehicle will typically run in long straight lanes. A steady state turn may be performed by imposing a speed difference on the left and right side of the undercarriage. Due to the long rectangular shape of the vehicle, high lateral forces may be created on the track chain and a bulldozer effect may occur.

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With reference to figure 6, a top end of the lifting frame 9 in a preferred embodiment comprises a connection 11 comprising a turning gland 110 with a slewing ring 111 provided around it. This combination allows rotational freedom of the vehicle 1 around a substantially vertical axis 112. The turning gland 110 provides a connection between the rigid piping 91 on the lifting frame 9 and the flexible interconnection hose 70 which has full rotational freedom. The lifting frame 9 is connected to the steel wires 72 by ear pieces 112 provided on the slewing ring 111. In this way, the forces can be guided through the slewing ring 111 instead of through the turning gland 110.

25 The slewing ring is based on slide bearing between steel on steel or plastic on steel surfaces. The slewing ring can be mechanically coupled to the turning gland to ensure parallel rotations of both. Such an arrangement may avoid entangling of umbilical and lifting wire. The flexible hose further preferably has a flanged connection to the turning gland. In this embodiment, the total rotational freedom is limited to 270° due to the umbilical that runs alongside the flexible interconnection hose.

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The invention is not limited to the embodiments described and represented hereinbefore and various modifications can be made thereto without passing beyond the scope of the invention.

CONCLUSIES

1. Onderwater mijnbouwvoertuig voor het op grote dieptes verzamelen van minerale afzettingen op een zeebodem en het transporteren van genoemde afzettingen
5 naar een drijvend tuig, waarbij het voertuig een lastdragende structuur omvat, voorzien van middelen om het voertuig op de zeebodem voort te bewegen en van een opneembaarheid voor de afzettingen, waarbij het voertuig verder een hefframe omvat dat aan een uiteinde is voorzien van een ophangverbindingsstuk voor bevestiging aan een tussen het drijvende vaartuig en het voertuig voorzien ophangmiddel, en aan een ander
10 uiteinde is verbonden met de lastdragende structuur door middel van een scharnierende verbinding, die door een bedieningsmiddel wordt bediend en wel dusdanig dat de hoekpositie van de lastdragende structuur ten opzichte van het hefframe in verschillende hoekposities kan worden gefixeerd.
- 15 2. Inrichting volgens conclusie 1, verder omvattende een connector voor het verbinden met een tussen het voertuig en het drijvend tuig voorzien transportsysteem voor de afzettingen.
- 20 3. Inrichting volgens conclusie 2, waarin het hefframe is uitgerust met transportmiddelen voor opgenomen afzettingen, welke transportmiddelen aan een uiteinde zijn voorzien van de connector en aan een ander uiteinde is verbonden met de opneembaarheid.
- 25 4. Onderwater mijnbouw voertuig volgens één der conclusies 1-3, waarin het bedieningsmiddel hydraulische cilinders omvat die zich uitstrekken tussen het frame en de lastdragende structuur.
- 30 5. Onderwater mijnbouw voertuig volgens één der conclusies 1-4, waarin het voertuig een zwaartepunt heeft en de scharnierende verbinding dusdanig is gepositioneerd dat een scharnierlijn tussen het frame en de lastdragende structuur in hoofdzaak door het zwaartepunt verloopt wanneer het voertuig geheel is ondergedompeld.

6. Onderwater mijnbouwvoertuig volgens één der voorgaande conclusies, omvattende drijfmiddelen.
7. Onderwater mijnbouwvoertuig volgens conclusie 6, waarin de drijfmiddelen een
5 hoeveelheid drijfelementen omvatten.
8. Onderwater mijnbouwvoertuig volgens één der voorgaande conclusies, waarin de lastdragende structuur en/of het hefframe in hoofdzaak vlak zijn.
- 10 9. Onderwater mijnbouwvoertuig volgens conclusie 8, waarin de lastdragende structuur een vorkvormig frame omvat van longitudinale balkelementen en transversale balkelementen, die de afstand tussen de longitudinale balkelementen overspannen op afstand van een voet van het vorkvormige frame.
- 15 10. Onderwater mijnbouwvoertuig volgens conclusie 9, waarin een transversaal element scharnierbaar is verbonden met de voet van het vorkvormige frame.
11. Onderwater mijnbouwvoertuig volgens één der voorgaande conclusies, omvattende ten minste één voortbewegingsmiddel aan elke zijde van het voertuig.
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12. Onderwater mijnbouwvoertuig volgens één der voorgaande conclusies, waarin de voortbewegingsmiddelen een rupsbandsamenstel omvatten.
13. Onderwater mijnbouwvoertuig volgens één der voorgaande conclusies, waarin
25 het ophangverbindingsstuk voor de ophangkabel is ingericht om vrije rotatie van het aan de ophangmiddelen opgehangen voertuig toe te laten rond een as die evenwijdig verloopt aan een ophangmiddel-as.
14. Onderwater mijnbouwvoertuig volgens conclusie 13, waarin het
30 ophangverbindingsstuk een zwenkkrans omvat die verbindbaar is met het ophangmiddel en een draaiende pakkingbus.
15. Werkwijze voor het op grote dieptes verzamelen van minerale afzettingen op een zeebodem en het transporteren van genoemde afzettingen naar een drijvend tuig, de

werkwijze omvattende het verschaffen van een onderwater mijnbouwvoertuig volgens één der voorgaande conclusies, het verbinden van het hefframe van genoemd mijnbouwvoertuig aan een tussen het drijvend tuig en het voertuig voorziene ophangkabel, het neerlaten van het voertuig in de richting van een zeebodem met de

5 lastdragende structuur in een eerste hoekpositie, het bedienen van de scharnierende verbinding tussen het hefframe en de lastdragende structuur zodat de lastdragende structuur ten opzichte van het hefframe in een tweede, van de eerste hoekpositie van de lastdragende structuur verschillende, hoekpositie wordt gefixeerd, het positioneren van het voertuig op de zeebodem en het voortbewegen van het voertuig op de zeebodem om

10 de minerale afzettingen op te nemen.

16. Werkwijze volgens conclusie 15, waarin de eerste hoekpositie evenwijdig verloopt aan de verticale richting.

15 17. Werkwijze volgens conclusie 15 of 16, waarin de tweede hoekpositie een hoek van 90° of meer maakt met de verticale richting.

18. Werkwijze volgens conclusie 17, waarin de tweede hoekpositie een hoek van meer dan 90° maakt met de verticale richting, en wel dusdanig dat het voertuig het eerst

20 met een achterzijde ervan in contact komt met de zeebodem.

19. Werkwijze volgens één der conclusies 15-18, waarin het mijnbouwvoertuig is verbonden met een tussen het voertuig en een drijvend tuig voorzien transportsysteem voor de afzettingen.

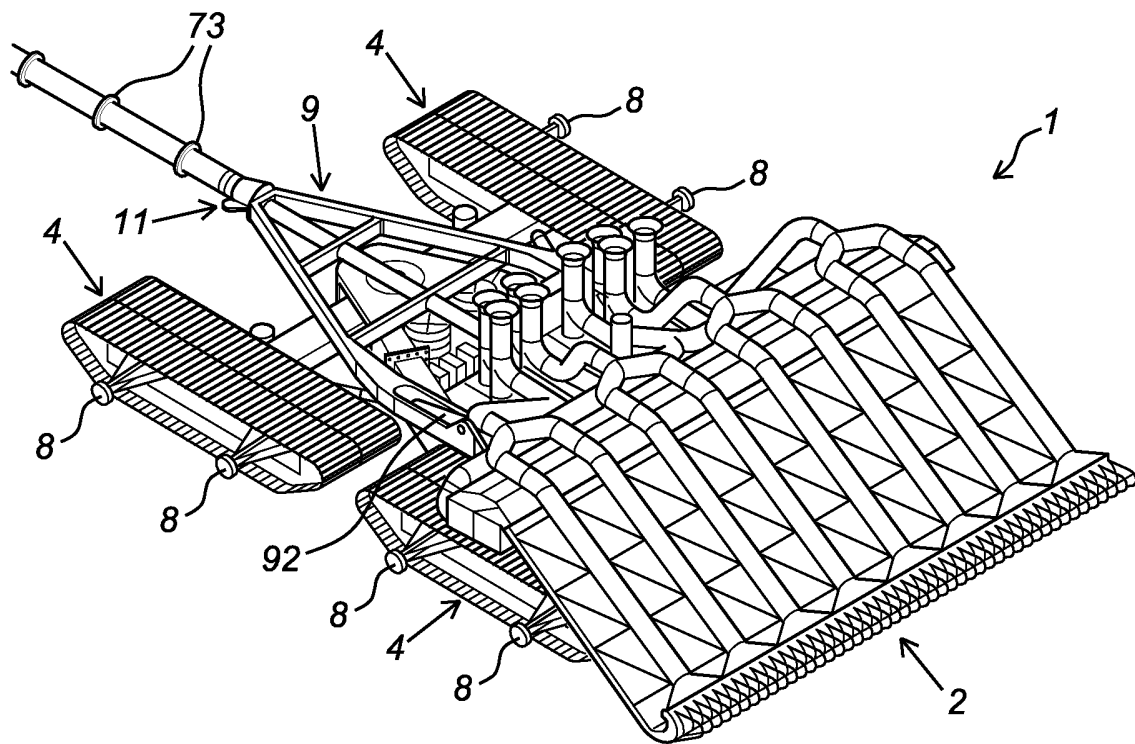


Fig. 1

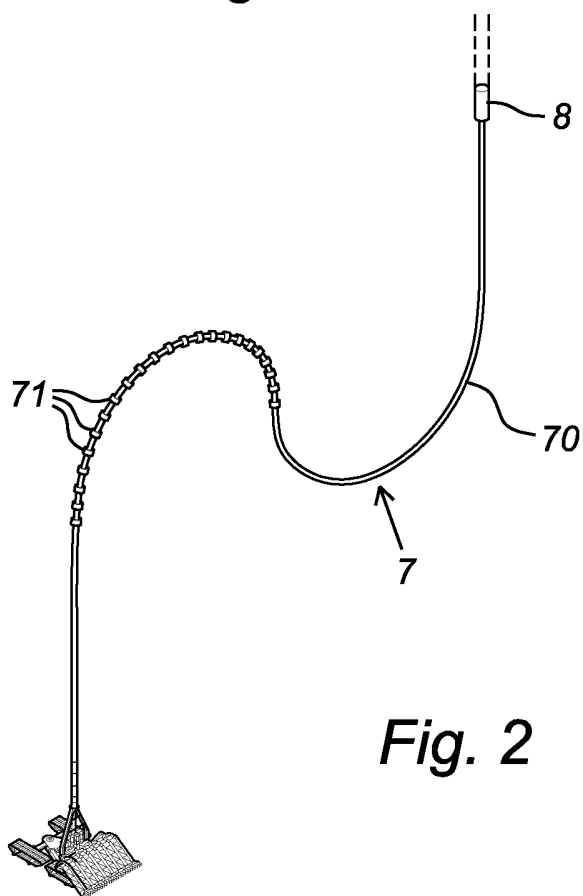


Fig. 2

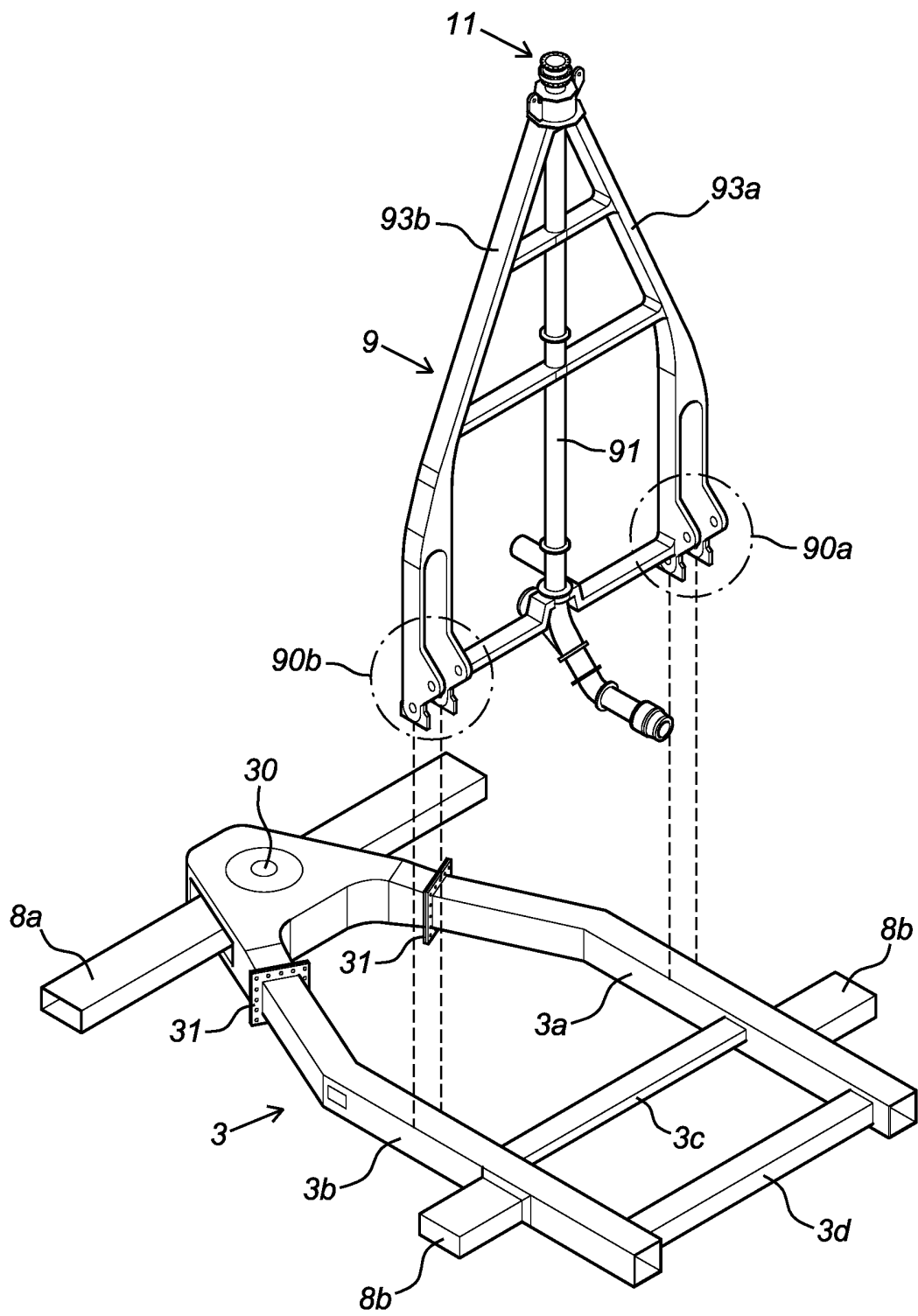


Fig. 3

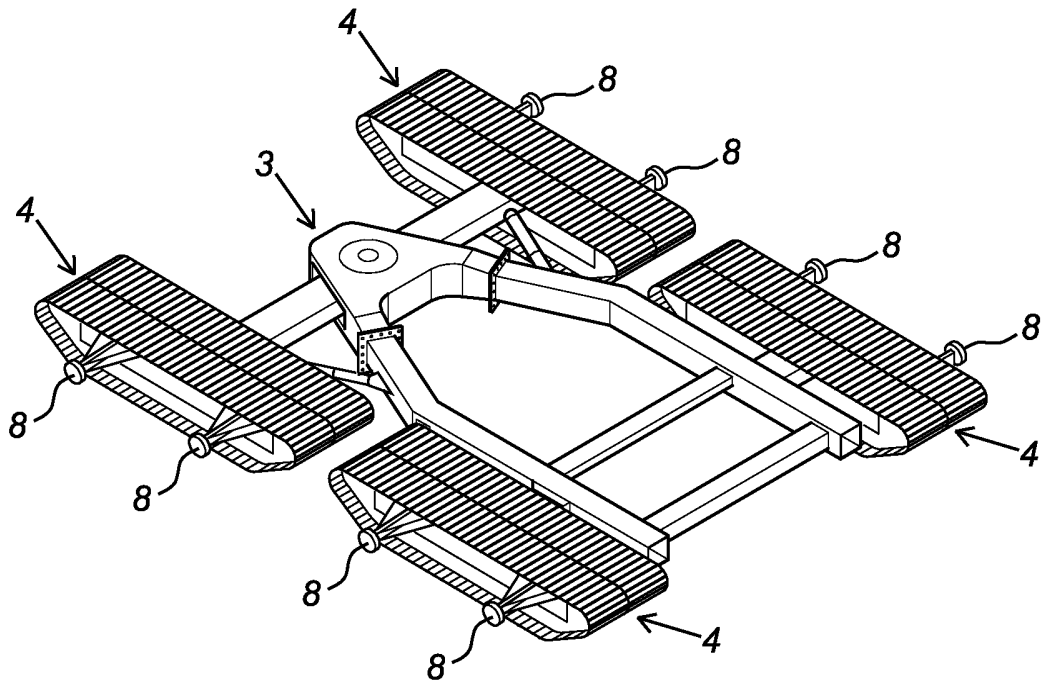


Fig. 4

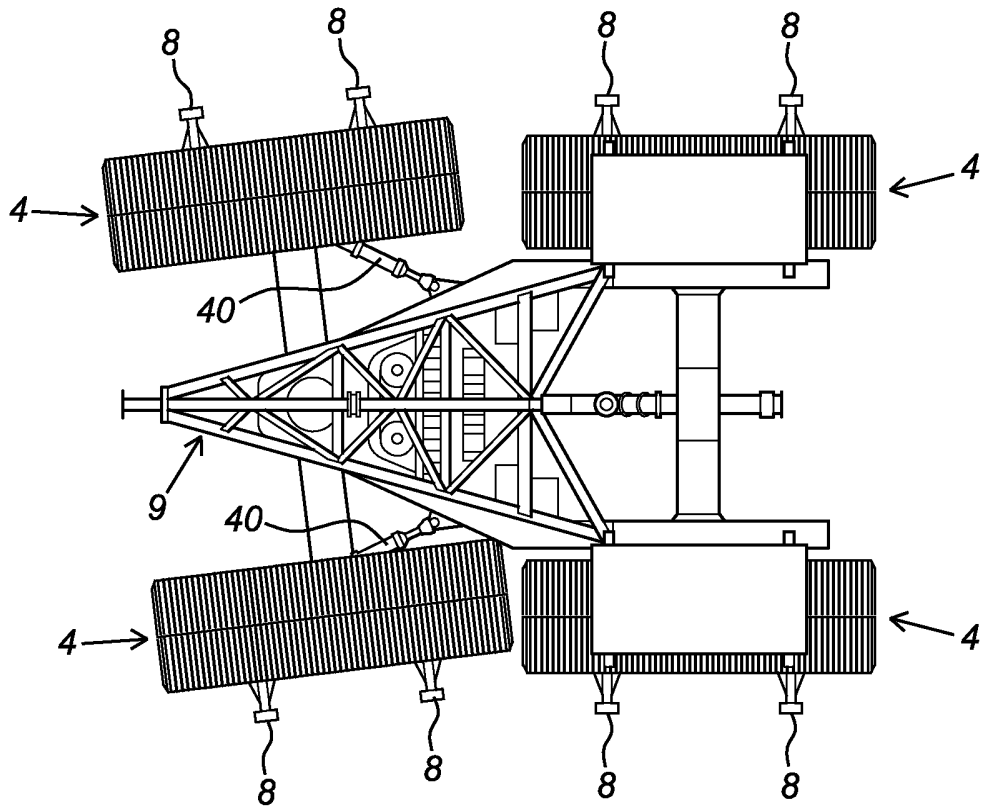


Fig. 5

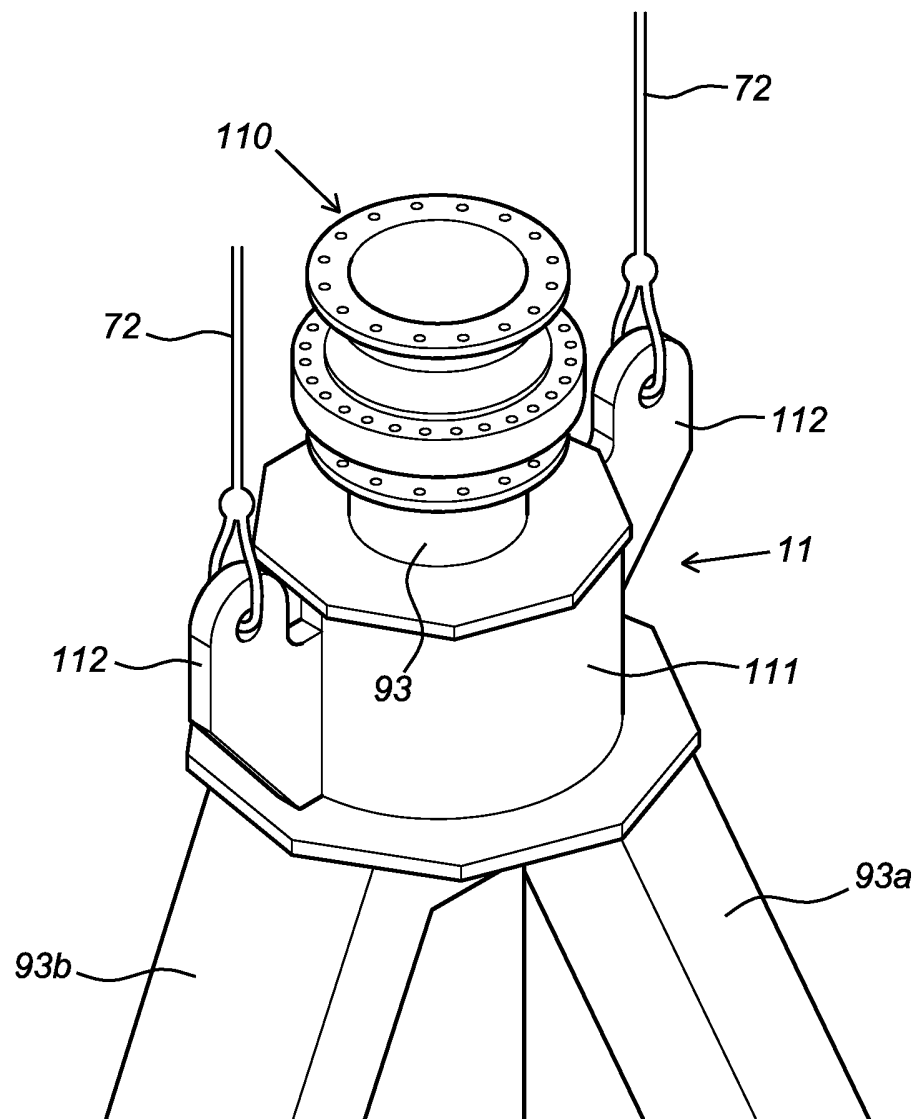


Fig. 6

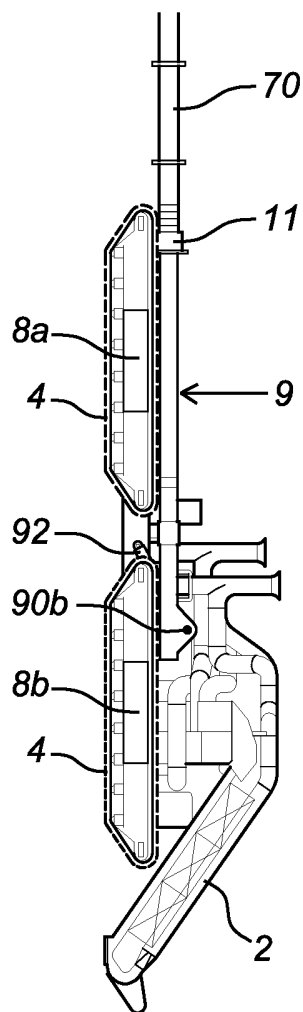


Fig. 7A

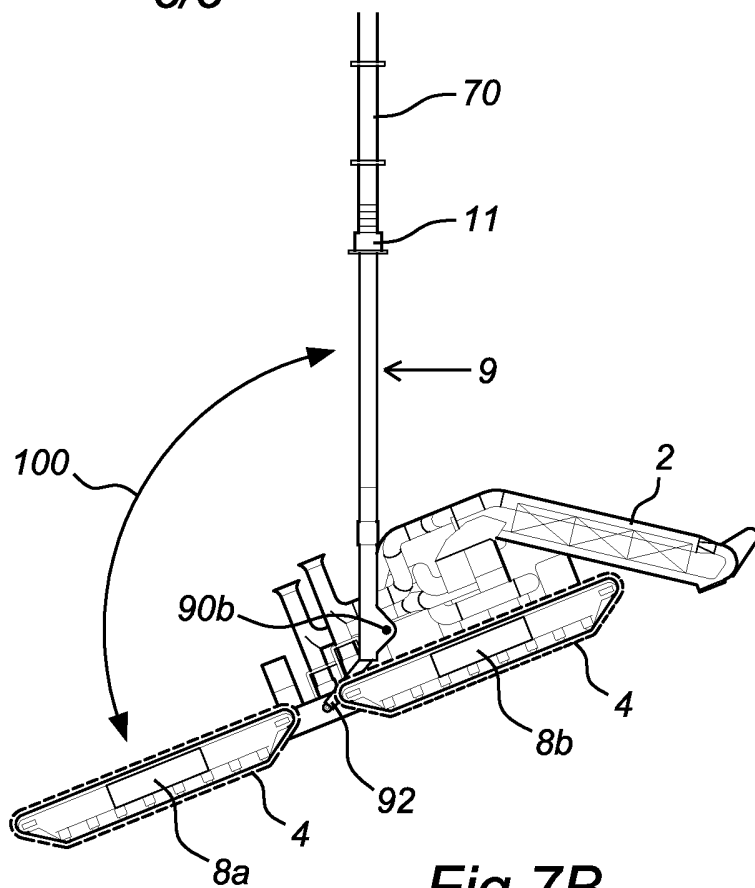


Fig. 7B

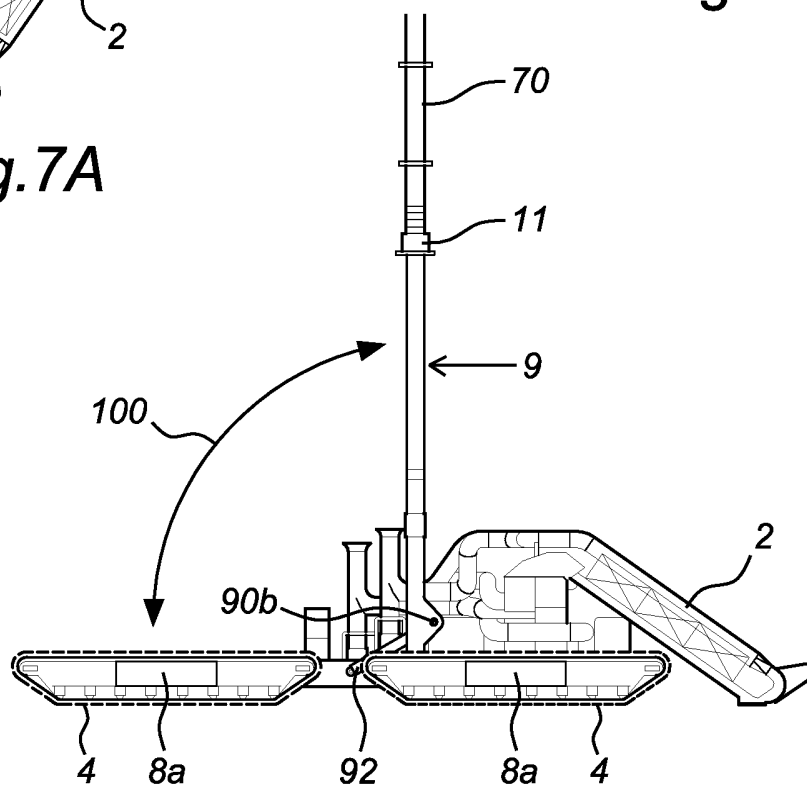


Fig. 7C

SAMENWERKINGSVERDRAG (PCT)

RAPPORT BETREFFENDE NIEUWHEIDSONDERZOEK VAN INTERNATIONAAL TYPE

IDENTIFICATIE VAN DE NATIONALE AANVRAGE		KENMERK VAN DE AANVRAGER OF VAN DE GEMACHTIGDE	
		4Q/2PZ65/145 NL	
Nederlands aanvraag nr.		Indieningsdatum	
2012579		07-04-2014	
		Ingeroepen voorrangsdatum	
		02-12-2013	
Aanvrager (Naam)			
OceanfLORE B.V.			
Datum van het verzoek voor een onderzoek van internationaal type		Door de Instantie voor Internationaal Onderzoek aan het verzoek voor een onderzoek van internationaal type toegekend nr.	
14-06-2014		SN 62163	
I. CLASSIFICATIE VAN HET ONDERWERP (bij toepassing van verschillende classificaties, alle classificatiesymbolen opgeven)			
Volgens de internationale classificatie (IPC)			
E02F3/88		E21C50/00	
II. ONDERZOCHETE GEBIEDEN VAN DE TECHNIEK			
Onderzochte minimumdocumentatie			
Classificatiesysteem	Classificatiesymbolen		
IPC	E02F	E21C	
Onderzochte andere documentatie dan de minimum documentatie, voor zover dergelijke documenten in de onderzochte gebieden zijn opgenomen			
III.	☐	GEEN ONDERZOEK MOGELIJK VOOR BEPAALDE CONCLUSIES (opmerkingen op aanvullingsblad)	
IV.	☐	GEBREK AAN EENHEID VAN UITVINDING (opmerkingen op aanvullingsblad)	

**ONDERZOEKSRAPPORT BETREFFENDE HET
RESULTAAT VAN HET ONDERZOEK NAAR DE STAND
VAN DE TECHNIEK VAN HET INTERNATIONALE TYPE**

Nummer van het verzoek om een onderzoek naar
de stand van de techniek
NL 2012579

A. CLASSIFICATIE VAN HET ONDERWERP
INV. E02F3/88 E21C50/00
ADD.

Volgens de Internationale Classificatie van octrooien (IPC) of zowel volgens de nationale classificatie als volgens de IPC.

B. ONDERZOCHE GEBIEDEN VAN DE TECHNIEK

Onderzochte minimum documentatie (classificatie gevolgd door classificatiesymbolen)
E02F E21C

Onderzochte andere documentatie dan de minimum documentatie, voor dergelijke documenten, voor zover dergelijke documenten in de onderzochte gebieden zijn opgenomen

Tijdens het onderzoek geraadpleegde elektronische gegevensbestanden (naam van de gegevensbestanden en, waar uitvoerbaar, gebruikte trefwoorden)

EP0-Internal, WPI Data

C. VAN BELANG GEACHTE DOCUMENTEN

Categorie °	Geciteerde documenten, eventueel met aanduiding van speciaal van belang zijnde passages	Van belang voor conclusie nr.
X	US 4 232 903 A (WELLING CONRAD G ET AL) 11 november 1980 (1980-11-11) * kolom 9, regels 51-53 * * figuren 1-7,27-32 * -----	1,3-8, 11,12, 15,19
X	WO 2012/134275 A2 (IHC HOLLAND IE BV [NL]; VAN BLOOIS JAN WILLEM [NL]; DE LANG EDWIN PETR) 4 oktober 2012 (2012-10-04) * bladzijde 14, regel 30 - bladzijde 15, regel 14 * * figuren 1a,1b,1c * -----	1,3-5,8, 11,13
A	WO 2012/158028 A1 (IHC HOLLAND IE BV [NL]; RUPERT EMILE ARTHUR HENRI MARIE [NL]; LUCIEER) 22 november 2012 (2012-11-22) * samenvatting * * figuren 1-3 * -----	1-19

☐ Verdere documenten worden vermeld in het vervolg van vak C.

☒ Leden van dezelfde octrooifamilie zijn vermeld in een bijlage

° Speciale categorieën van aangehaalde documenten

A niet tot de categorie X of Y behorende literatuur die de stand van de techniek beschrijft

D in de octrooiaanvraag vermeld

E eerdere octrooi(aanvraag), gepubliceerd op of na de indieningsdatum, waarin dezelfde uitvinding wordt beschreven

L om andere redenen vermelde literatuur

O niet-schriftelijke stand van de techniek

P tussen de voorrangsdatum en de indieningsdatum gepubliceerde literatuur

T na de indieningsdatum of de voorrangsdatum gepubliceerde literatuur die niet bezwarend is voor de octrooiaanvraag, maar wordt vermeld ter verheldering van de theorie of het principe dat ten grondslag ligt aan de uitvinding

X de conclusie wordt als niet nieuw of niet inventief beschouwd ten opzichte van deze literatuur

Y de conclusie wordt als niet inventief beschouwd ten opzichte van de combinatie van deze literatuur met andere geciteerde literatuur van dezelfde categorie, waarbij de combinatie voor de vakman voor de hand liggend wordt geacht

Z lid van dezelfde octrooifamilie of overeenkomstige octrooipublicatie

Datum waarop het onderzoek naar de stand van de techniek van internationaal type werd voltooid

9 oktober 2014

Verzenddatum van het rapport van het onderzoek naar de stand van de techniek van internationaal type

Naam en adres van de instantie

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De bevoegde ambtenaar

Schouten, Adri

**ONDERZOEKSRAPPORT BETREFFENDE HET
RESULTAAT VAN HET ONDERZOEK NAAR DE STAND
VAN DE TECHNIEK VAN HET INTERNATIONALE TYPE**

Informatie over leden van dezelfde octrooifamilie

Nummer van het verzoek om een onderzoek naar
de stand van de techniek

NL 2012579

In het rapport genoemd octrooigescrift	Datum van publicatie	Overeenkomend(e) geschrift(en)	Datum van publicatie
US 4232903	A	11-11-1980	BE 880900 A1 27-06-1980
			CA 1120503 A1 23-03-1982
			DD 148805 A5 10-06-1981
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			CN 103649420 A 19-03-2014
			EP 2707548 A1 19-03-2014
			WO 2012158028 A1 22-11-2012

WRITTEN OPINION

File No. SN62163	Filing date (day/month/year) 07.04.2014	Priority date (day/month/year) 02.12.2013	Application No. NL2012579
International Patent Classification (IPC) INV. E02F3/88 E21C50/00			
Applicant OceanfLORE B.V.			

This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☒ Box No. VII Certain defects in the application
- ☒ Box No. VIII Certain observations on the application

	Examiner Schouten, Adri
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WRITTEN OPINION

Application number
NL2012579

Box No. I Basis of this opinion

1. This opinion has been established on the basis of the latest set of claims filed before the start of the search.
2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the application and necessary to the claimed invention, this opinion has been established on the basis of:
 - a. type of material:
 - ☐ a sequence listing
 - ☐ table(s) related to the sequence listing
 - b. format of material:
 - ☐ on paper
 - ☐ in electronic form
 - c. time of filing/furnishing:
 - ☐ contained in the application as filed.
 - ☐ filed together with the application in electronic form.
 - ☐ furnished subsequently for the purposes of search.
3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

Box No. V Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty	Yes: Claims	2, 9, 10, 12, 14, 16-18
	No: Claims	1, 3-8, 11, 13, 15, 19
Inventive step	Yes: Claims	2, 9, 10, 14, 16-18
	No: Claims	1, 3-8, 11-13, 15, 19
Industrial applicability	Yes: Claims	1-19
	No: Claims	

2. Citations and explanations

see separate sheet

WRITTEN OPINION

Application number
NL2012579

Box No. VII Certain defects in the application

see separate sheet

Box No. VIII Certain observations on the application

see separate sheet

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1 Reference is made to the following documents:

D1 US 4 232 903 A (WELLING CONRAD G ET AL) 11 november 1980 (1980-11-11)

D2 WO 2012/134275 A2 (IHC HOLLAND IE BV [NL]; VAN BLOOIS JAN WILLEM [NL]; DE LANG EDWIN PETR) 4 oktober 2012 (2012-10-04)

2 INDEPENDENT CLAIM 1

2.1 The present application does not meet the criteria of patentability, because the subject-matter of independent apparatus claim 1 is not new.

D1 discloses in column 9, lines 51-53 and in figures 1-7,27-32 (the references in parentheses applying to this document) an:

Onderwater mijnbouwvoertuig (57) voor het op grote dieptes verzamelen van minerale afzettingen op een zeebodem (68) en het transporteren van genoemde afzettingen naar een drijvend tuig (63), waarbij het voertuig (57) een lastdragende structuur (71,73) omvat, voorzien van middelen (113) om het voertuig (57) op de zeebodem (68) voort te bewegen en van een opneemeenheid (132) voor de afzettingen, waarbij het voertuig (57) verder een hefframe (75) omvat dat aan een uiteinde is voorzien van een ophangverbindingstuk (81,83) voor bevestiging aan een tussen het drijvende vaartuig (63) en het voertuig (57) voorzien ophangmiddel (61,353), en aan een ander uiteinde is verbonden met de lastdragende structuur (71,73) door middel van een scharnierende verbinding (77), die door een bedieningsmiddel (79) wordt bediend en wel dusdanig dat de hoekpositie van de lastdragende structuur (71,73) ten opzichte van het hefframe (75) in verschillende hoekposities (see figures 30-32) kan worden gefixeerd.

3 INDEPENDENT CLAIM 15

3.1 The same reasoning applies, mutatis mutandis, to the subject-matter of the corresponding independent method claim 15, which therefore is also considered not new (see especially figures 30-32 of D1).

Furthermore it is noted that according to the wording of claim 15, the steps of claim 15 can be executed in any arbitrary order.

4 DEPENDENT CLAIMS 3-8,11-13,19

4.1 Dependent claims 3-8,11,13,19 do not contain any features which, in combination with the features of any claim to which they refer, meet the requirements in respect of novelty and/or inventive step, for the following reasons:

- claims 3-8,11,13,19: see documents D1 and D2 and the corresponding passages cited in the search report.
- claim 12: the features of claim 12 is merely one of several straightforward possibilities from which the skilled person would select, in accordance with circumstances, without the exercise of inventive skill, in order to solve the problem posed.

Re Item VII

Certain defects in the application

- The relevant background art disclosed in D1 is not mentioned in the description, nor is this document identified therein.
- Independent claims 1 and 15 are not in the two-part form, which in the present case would be appropriate, with those features known in combination from the prior art document D1 being placed in the preamble and the remaining features being included in the characterising part.
- The features of claims 1-19 are not provided with reference signs placed in parentheses.

Re Item VIII

Certain observations on the application

The term "een/de voet van het vorkvormige frame" used in claims 9 and 10 is vague and unclear and leaves the reader in doubt as to the meaning of the technical feature to which it refers, thereby rendering the definition of the subject-matter of said claims unclear.