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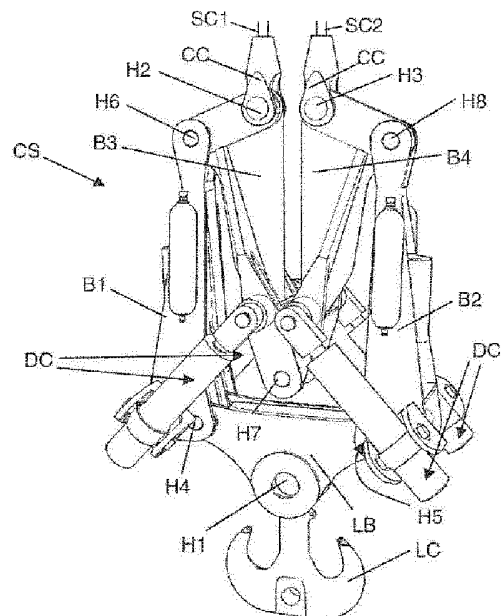
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Ir. H.V. Mertens c.s. te Rijswijk.(54) **A load spreader, marine load raising and lowering system and a method for raising and lowering a load from a vessel**

(57) The invention relates to a load spreader comprising:

- two cable connectors, wherein each cable connector is configured to connect a respective suspension cable to the spreader;
- a load connector configured to connect a load to the spreader; and
- a passive actuator system configured to move the two cable connectors between a first and second position,

wherein, in use, the horizontal distance between the two cable connectors is larger in the second position than in the first position, and wherein the passive actuator system is operable by water pressure, such that the spreader automatically moves the two cable connectors towards the second position when the spreader is lowered into a water body and moves the two cable connectors towards the first position when the spreader is raised. The invention further relates to a marine load raising and lowering system comprising such a load spreader and a method for raising and lowering a load into a body of water.



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Dit octrooi is verleend ongeacht het bijgevoegde resultaat van het onderzoek naar de stand van de techniek en schriftelijke opinie. Het octrooischrift komt overeen met de oorspronkelijk ingediende stukken.

A load spreader, marine load raising and lowering system and a method for raising and lowering a load from a vessel

The invention relates to a load spreader, to a marine load raising and lowering system for use on a vessel including such a load spreader, and to a method for raising and lowering a load from a vessel.

- 5 A marine load raising and lowering system is well-known, for example on vessels used for laying pipelines. The system is then used in particular to abandon and recover a pipeline, which system and method are respectively referred to as an A&R system and an A&R method. During pipelaying it is sometimes necessary to abandon a pipeline and recover it later. For example, a pipeline might need to be abandoned due to weather conditions or
10 alternatively for the vessel to be loaded with pipeline, e.g. on a reel. Conventionally, such A&R method is carried out by connecting an A&R head to the end of the laid pipeline; connecting a suspension cable to this head; transferring pipeline tension from a pipeline tensioning arrangement on the vessel that is used during pipelaying to a winch via the suspension cable; and laying the pipeline and the head on the bottom of the sea by
15 controlled lowering of the suspension cable via driving means of the winch.

A marine load raising and lowering system may also be used to place other components on the bottom of the sea, e.g. a canister, manifold or any other kind of object.

- 20 US 7,182,550 discloses an A&R system and method using a single winch, suspension cable and associated driving means for lowering and raising the laid pipeline. The use of this system in deep water, e.g. several hundred metres or even more than one kilometre causes several problems. The suspension cable associated with the winch must have a very high tensile strength to support a heavy load. This requirement leads to a heavy suspension cable
25 with the result that the weight of the suspension cable itself becomes a further factor. Thus an even higher load capacity of the winch will be required.

- One way to solve the abovementioned issue is to use more than one suspension cable. An example of this solution is shown in international publication WO 2009/002142 of the
30 applicant. Two suspension cable portions are used and interconnected at the lower ends via

a rotatable sheave arrangement that ensures that the tension in both suspension cable portion is equal.

A disadvantage of the system according to WO 2009/002142 is that especially for deep
5 water purposes the load connector may rotate/twist about a vertical oriented axis, thereby entangling the two suspension cable portions.

It is therefore an object of the invention to provide a marine load raising and lowering system in which the chance of entanglement of the two suspension cable portions is reduced.

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This object is achieved by providing a load spreader comprising:

- two cable connectors, wherein each cable connector is configured to connect a respective suspension cable to the spreader;
- a load connector configured to connect a load to the spreader; and
- 15 - a passive actuator system configured to move the two cable connectors between a first and second position,

wherein, in use, the horizontal distance between the two cable connectors is larger in the second position than in the first position,

and wherein the passive actuator system is operable by water pressure, such that the
20 spreader automatically moves the two cable connectors towards the second position when the spreader is lowered into a water body and moves the two cable connectors towards the first position when the spreader is raised.

An advantage of using this spreader is that by increasing the distance between the two cable
25 connectors when the spreader is lowered into the water body, the chance of entanglement of the suspension cables connected to the two cable connectors is reduced and possibly prevented at all depending on the distance between the two cable connectors in the second position and the depth to which the load spreader is lowered.

30 Another advantage is that by using a passive actuator system that is operable by water pressure, no active components and complex control have to be used in order to obtain the same result. Using active components would require the use of umbilical lines to the load spreader which is a disadvantage especially for deepwater purposes.

35 In an embodiment, the load spreader comprises a foldable mechanism to which the two cable connectors are mounted, said foldable mechanism having a collapsed state associated with the first position of the two cable connectors and an unfolded state associated with the

associated with the second position of the two cable connectors, and wherein the passive actuator system is configured to move the two cable connectors between the first and second position by folding or unfolding of the foldable mechanism.

- 5 An advantage of the foldable mechanism may be that the space occupied by the load spreader in the collapsed state is much smaller than in the unfolded state so that above water, the spreader is easy to handle, may pass openings that can not be passed in the unfolded state and can be stored using minimal space.
- 10 Preferably, the foldable mechanism is a bar linkage with at least four bars that are pivotable relative to each other by respective hinges.

In an embodiment, the passive actuator system comprises a drive cylinder having:

- 15 • a cylinder sleeve with a cylinder bottom and cylinder head arranged set axially apart from each other;
- a piston/piston rod assembly which can move axially back and forth, with a piston rod which protrudes outwards through an associated bore in the cylinder head and with a piston which is securely attached to one end of the piston rod and which is displaceable over an axial stroke between the cylinder
20 bottom and the cylinder head; and
- a fluid seal on the piston for providing a seal with an inner surface of the cylinder sleeve, so that the piston delimits in the drive cylinder between the piston and the cylinder head a variable head-side chamber and further delimits between the piston and the cylinder bottom a variable bottom-side
25 chamber;

wherein the head-side chamber or the bottom-side chamber is filled with a compressible first medium that exerts a pressure on the piston that urges the piston/piston rod assembly towards a position associated with the first position of the two cable connectors, and wherein the pressure in the other one of the head-side chamber or the bottom-side chamber that
30 urges the piston/piston rod assembly towards a position associated with the second position of the two cable connectors is determined by water pressure.

The water pressure may be directly applied to the piston, such that the other one of the head-side chamber or the bottom-side chamber is filled with water when the spreader
35 submerges to exert a pressure on the piston that urges the piston/piston rod assembly towards a position associated with the second position of the two cable connectors.

Alternatively, the water pressure may be indirectly applied, for instance using an embodiment wherein the other one of the head-side chamber or the bottom-side chamber is in fluid communication with a bellow filled with a second medium, and wherein the bellow is
5 collapsible so that the surrounding water pressure can be transmitted via the bellow and the second medium to the piston to urge the piston/piston rod assembly towards a position associated with the second position of the two cable connectors.

In an embodiment, the passive actuator system comprises a buoyant member to provide a
10 buoyancy force to the spreader when the spreader is lowered into the water body to move the cable connectors towards the second position.

In an embodiment, the passive actuator comprises both a buoyant member and a drive cylinder as described above. The buoyant member then provides a buoyancy force that is
15 able to move the cable connectors partially towards the second position and the drive cylinder provides a further force depending on the depth to which the spreader is lowered to move the cable connectors further towards the second position.

In an embodiment, the passive actuator system is configured as a bi-stable actuator system
20 in which both the first and second position of the cable connectors correspond to a stable position of the actuator position, but wherein the actuator system jumps from the first position to the second position when a certain predetermined first depth is reached during lowering and jumps from the second position to the first position when a predetermined
second depth is reached during raising of the spreader. The first and second depth may be
25 the same, but this is not necessary and the actuator system may have a hysteresis-like behavior.

The invention also relates to a marine load raising and lowering system for use on a vessel, preferably a vessel for laying an offshore pipeline, which system comprises:

- 30
- i. a first winch comprising first driving means for raising or lowering a first suspension cable from the first winch;
 - ii. a second winch comprising second driving means for raising or lowering a second suspension cable from the second winch;
 - iii. operating means connected to the first and second driving means of
35 respectively the first and second winch for synchronising the driving means so as to perform synchronous raising or lowering of the first and second suspension cable; and

- iv. a load spreader according to one or more of the preceding claims, wherein the first and second suspension cable are connected with a terminal end thereof to a respective cable connector of the load spreader, and wherein the system further comprises a tension equalizing mechanism adapted to
- 5 equalize the tension in the first and second suspension cables.

The invention further relates to a method for raising and lowering a load from a vessel using a load connector that is suspended by two suspension cables, said method comprising the following steps:

- 10 b) connecting a load to the load connector;
 c) lowering the suspension cables;
 d) increasing the horizontal distance between the two suspension cables while the suspension cables are lowered;
 e) raising the suspension cables;
- 15 f) decreasing the horizontal distance between the two suspension cables while the suspension cables are raised.

In an embodiment, the steps d) and f) are performed automatically as a result of changing water pressure.

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In an embodiment, the horizontal distance between the two suspension cables is increased and decreased at the location where the two suspension cables are directly or indirectly connected to the load connector.

- 25 In an embodiment, use is made of a load spreader according to the invention.

The invention will now be described with reference to the accompanying drawings in which like parts are indicated by like reference numerals, and in which:

- Fig. 1 depicts a schematic view of a load spreader according to an embodiment of
- 30 the invention;

Fig. 2 depicts the load spreader of Fig. 1 in another position;

Fig. 3 depicts a drive cylinder suitable for a passive actuator system of a load spreader according to the invention;

- Fig. 4 depicts a load spreader according to another embodiment of the invention in
- 35 collapsed state;

Fig. 5 depicts the load spreader of Fig. 4 in an unfolded state;

Fig. 6A-6G depict in a simplified way the unfolding process of the load spreader of Fig. 4 and 5 from the position as shown in Fig. 4 to the position as shown in Fig. 5;

Fig. 7 depicts schematically a marine load raising and lowering system according to an embodiment of the invention;

5 Fig. 8 and 9 depict schematically a load spreader according to a further embodiment of the invention.

Figs. 1 and 2 schematically depict a load spreader CS according to an embodiment of the invention. The load spreader CS comprises a load connector LC to connect a load LO to the
10 spreader CS, in this case via a cable CA, and two cable connectors CC to respectively connect a first suspension cable SC1 and a second suspension cable SC2 to the load spreader CS.

The load spreader CS is further equipped with a passive actuator system, here indicated by
15 arrow PAS, to move the cable connectors CC between a first position as shown in Fig. 1 to a second position as shown in Fig. 2. As can be seen by comparing the two figures, the horizontal distance between the two cable connectors CC is larger in the second position (see Fig. 2) than in the first position (see Fig. 1). As a result of that the distance between the first suspension cable SC1 and the second suspension cable SC2 increases when moving
20 from the first position towards the second position, thereby reducing the chance of entanglement, i.e. twisting, of the two suspension cables SC1, SC2.

The passive actuator system PAS is configured to be operable by water pressure, such that when the spreader is submerged under water and lowered, the increased water pressure
25 moves the cable connectors automatically towards the second position so that with increased suspension cable length, the distance between the two suspension cables is increased as well. When the spreader is raised again, the opposite occurs, such that the decreased water pressure automatically results in movement of the cable connectors towards the first position until the spreader resurfaces.

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In Figs. 1 and 2, the cable connectors CC are moveable along a beam BE which is configured to guide said movement, wherein the load connector LC is fixed to that beam BE.

The passive actuator system PAS may comprise a drive cylinder directly arranged between
35 the two cable connectors CC. Alternatively, the passive actuator system may comprise a drive cylinder per cable connector, wherein each drive cylinder is arranged between the respective cable connector and the beam BE.

An example of a suitable drive cylinder DC that is operable by water pressure is depicted in Fig. 3 in cross-sectional view. The drive cylinder DC of Fig. 3 comprises a cylinder sleeve 100 with a cylinder bottom 101 and a cylinder head 103 arranged axially apart from each other.

Inside the cylinder sleeve 100, a piston/piston rod assembly is provided which can move axially back and forth, wherein the piston/piston rod assembly includes a piston rod 105 which protrudes outwards through an associated bore BO in the cylinder head 103 and with a piston 107 which is securely attached to one end of the piston rod 105 and which is displaceable over an axial stroke between the cylinder bottom 101 and the cylinder head 103.

A fluid seal 109 is provided on the piston 107 for providing a seal with an inner surface of the cylinder sleeve 100, so that the piston 107 delimits in the drive cylinder DC between the piston 107 and the cylinder head 103 a variable head-side chamber 111 and further delimits between the piston 107 and the cylinder bottom 101 a variable bottom-side chamber 113.

In the embodiment of Fig. 3, the head-side chamber 111 is a closed chamber filled with a compressible medium. Alternatively, the head-side chamber 11 may be in fluid communication with an external chamber, wherein both chambers are filled with a compressible medium. The pressure exerted on the piston 107 by the compressible medium urges the piston towards the cylinder bottom 107. To be suitable for a load spreader according to the invention, this should correspond to movement of the cable connectors towards the first position.

In the embodiment of Fig. 3, the bottom-side chamber 113 is in fluid communication with the surroundings via openings 115 in the cylinder bottom 101. When the drive cylinder, i.e. the load spreader, submerges under water, water is able to fill the bottom-side chamber 113 via the openings 115 (see arrows A1), so that the water pressure surrounding the drive cylinder can be applied to the piston 107 which urges the piston to move towards the cylinder head 103. This should correspond to movement of the cable connectors towards the second position.

In another embodiment, the bottom-side chamber is filled with compressible medium and the head-side chamber is filled with water, so that consequently movement of the piston towards

the cylinder head corresponds to movement towards the first position and movement of the piston towards the cylinder bottom corresponds to movement towards the second position.

In yet another embodiment, the pressure inside the bottom-side chamber is induced by water pressure, but not directly. For example, the bottom-side chamber may be in fluid communication with a bellow instead of the surrounding, wherein the bellow and the bottom-side chamber are filled with a second medium. The bellow is collapsible so that it is able to transmit the water pressure exerted on the bellow to the piston via the second medium in the bellow and the bottom-side chamber. When the operation of the drive cylinder is reversed as described in the previous paragraph, it will be apparent that the same principle of the bellow can be applied, but that this now relates to the head-side chamber.

The drive cylinder is further provided with hinge connections HC to connect the drive cylinder to a cable connector and/or a beam BE as described with reference to Figs. 1 and 2.

Fig. 4 and 5 depict a load spreader CS according to another embodiment of the invention. The load spreader CS comprises two cable connectors CC to connect the load spreader respectively to a first suspension cable SC1 and a second suspension cable SC2.

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The load spreader CS further comprises a load connector LC to which a load can be connected. The load connector LC and the cable connectors CC are hingably connected to a bar linkage via respectively hinges H1, H2, and H3. The bar linkage includes a load bar LB to which the load connector is attached, and four bars B1-B4 which together with the load bar LB form a five-bar linkage. The bars B1 and B2 are hingably mounted to the load bar LB via respectively hinges H4 and H5. Bar B3 is hingably connected to bar B1 via hinge H6 and hingably connected to bar B4 via hinge H7. Bar B4 in turn is hingeably connected to bar B2 via hinge H8.

30 The five bar linkage forms a foldable mechanism having a collapsed state as shown in Fig. 4 which is associated with a first position of the cable connectors CC. In the first position, the horizontal distance between the cable connectors is small such that the distance between the first and second suspension cables is small. The foldable mechanism also has an unfolded state as shown in Fig. 5 which is associated with a second position of the cable connectors CC. In the second position, the horizontal distance between the cable connectors is larger than in the first position, preferably the distance in the second position is maximal. As a result, the distance between the first and second suspension cables in the second

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second position is larger than in the first position, thereby reducing the risk of entanglement of the first and second suspension cables when lowering a load into a water body.

The load spreader comprises a passive actuator system including four drive cylinders DC.

5 Two of the drive cylinders DC are arranged between bar B1 and bar B3. The other two drive cylinders DC are arranged between bar B2 and bar B4. As a result, the drive cylinders are able to actuate the five bar linkage to move between the collapsed state of Fig. 4 and the unfolded state of Fig. 5 as will be explained with reference to the Figs. 6A-6G.

10 Fig. 6A depicts the load spreader of Figs. 4 and 5 in a simplified way. For example, the suspension cables, load connector and drive cylinders are omitted to clearly depict the five bar linkage. Fig. 6A depicts the five bar linkage in the collapsed state of Fig. 4. In this state, the drive cylinders are fully retracted and the bars B1-B4 are substantially parallel to each other, such that the width W of the five bar linkage is minimal. This state is also associated
15 with the absence of any load to the load connector.

When the five bar linkage is unfolded, the bars B1 and B2 are pivoted sideways thereby increasing the distance between the hinges H2 and H3 to which the cable connectors are connected. This is shown in Figs. 6B – 6G. The sideways movement of the bars B1 and B2
20 continues until the bars B3 and B4 reach a substantially horizontal orientation corresponding to the maximum distance between the hinges H2 and H3 as shown in Fig. 6G.

The drive cylinders of the load spreader are in this embodiment of the type of Fig. 3. The head-side chamber of each drive cylinder is filled with a compressible first medium under
25 pressure that exerts a pressure on the piston urging the piston rod to retract inside the cylinder sleeve. In the absence of any significant counter pressure in the bottom-side chamber or loads, the drive cylinder will be in the retracted position as shown in Fig. 4 and corresponding to the state of Fig. 6A.

30 When a significant load is connected to the load connector, this may result in an initial unfolding of the five bar linkage as the load is providing a force to the drive cylinders that pulls the piston rod out of the cylinder sleeve until the pressure in the head-side chamber has risen to such an extent that it is able to withstand the gravitational force of the load. By connecting the load to the load connector, the spreader may unfold for instance towards one
35 of the positions as depicted in Figs. 6B-6D depending on the size of the load. When the spreader including load is lowered into the water, the pressure in the bottom-side chamber will automatically rise depending on the depth to which the spreader is lowered. This water

pressure in the drive cylinders will urge the piston to move towards the cylinder head and thus to further unfold the mechanism, e.g. towards a position as depicted in one of the Figs. 6D-6F. When a depth, i.e. a water pressure, has been reached in which the drive cylinder is fully extended, the position of Fig. 6G is reached and no further movement is possible upon
5 further lowering the spreader.

When the spreader is raised, the opposite movement will occur. An advantage of a spreader according to this embodiment is that when the spreader is in the collapsed state, the width W is small and the spreader is able to pass small openings compared to the size of an opening
10 required if the spreader has to pass in the unfolded state.

Fig. 7 schematically depicts a marine load raising and lowering system 1 for use on a vessel, preferably a vessel for laying an offshore pipeline, which system comprises a first winch 2 with first driving means 3 for raising and lowering a first suspension cable SC1 from the first
15 winch 2, and a second winch 5 with second driving means 6 for raising and lowering a second suspension cable SC2 from the second winch 5. The first and second driving means 3, 6 can be synchronized by operating means 8 connected to the first and second driving means so as to perform synchronous raising and lowering of the first and second suspension cable. The operating means are in this embodiment electronic operating means.
20

The first and second suspension cable SC1, SC2 will in practice be very long, but represented here short for reasons of clarity. The first and second driving means are electronically and/or mechanically connected to the respective first and second winch 2, 5. The driving means may include any type of motor. The first suspension cable SC1 is
25 suspended via a sheave 9 from the first winch 2. Similarly the second suspension cable SC2 is suspended via a sheave 10 from the second winch 5.

The first and second suspension cable SC1, SC2 are connected to a load spreader CS according to the invention with a respective terminal end 4c, 7c of the first and second
30 suspension cable SC1, SC2. The load spreader CS comprises a load connector which is or can be coupled to a load 12. The load spreader is able to vary the distance between the terminal ends 4c, 7c of the first and second suspension cable thereby enabling a large distance when the load is lowered into a water body to minimize or prevent entanglement of the first and second suspension cable. The load spreader may be of one of the types as
35 shown with reference to the Figs. 1-6G.

Between the load spreader and the sheaves 9, 10, a first tension equalizing mechanism 13 is provided through which the first and second suspension cable SC1, SC2 pass. The first tension equalizing mechanism is not shown in detail in Fig. 1, but ensures that the load is suspended by both the first and second suspension cable and no overload in one of the
5 suspension cables occurs due to e.g. non-synchronous lowering or raising of the cables.

Fig. 8 and 9 depict a load spreader CS according to another embodiment of the invention, wherein said load spreader includes a four bar linkage with four bars B1-B4. The four bar linkage forms a foldable mechanism having a collapsed state as shown in Fig. 8 and an
10 unfolded state as shown in Fig. 9. The four bars are linked together via respective hinges H10-H13. Not shown, but a load connector is provided at hinge H10 and two cable connectors are provided at hinges H11 and H13 respectively to connect a first and second suspension cable SC1, SC2 to the spreader.

15 The load spreader further comprises a passive actuator system comprising springs SP that urge the mechanism towards its collapsed state and a buoyant member BM that urges the mechanism towards its unfolded state when the spreader including buoyant member are lowered into the water. The operation of the load spreader is similar to the one described in relationship to Figs. 4-6G.

20

CONCLUSIES

1. Een lastverspreider omvattende:

- twee kabel aansluitingen, waarbij elke kabel aansluiting is ingericht om een respectieve hijskabel te verbinden met de verspreider;
- een last aansluiting ingericht om een last te koppelen aan de verspreider;
- een passief actuatiesysteem ingericht om de twee kabel aansluitingen te bewegen tussen een eerste en tweede positie,

waarbij, tijdens gebruik, de horizontale afstand tussen de twee kabel aansluitingen

groter is in de tweede positie dan in de eerste positie,

en waarbij het passieve actuatiesysteem bedienbaar is door middel van waterdruk,

zodat de verspreider de twee kabel aansluitingen automatisch richting de tweede

positie beweegt wanneer de verspreider in een water lichaam wordt neergelaten

en de twee kabel aansluitingen richting de eerste positie beweegt wanneer de

verspreider opgehesen wordt.

2. De lastverspreider volgens conclusie 1, omvattende een opvouwbaar mechanisme

waar de twee kabel aansluitingen op aangebracht zijn, waarbij het opvouwbare

mechanisme een opgevouwen toestand heeft behorende bij de eerste positie van

de twee kabel aansluitingen en een uitgevouwen toestand behorende bij de tweede

positie van de twee kabel aansluitingen, en waarbij het passieve actuatiesysteem is

ingericht om de twee kabel aansluitingen te bewegen tussen de eerste en tweede

positie door middel van het opvouwen en uitvouwen van het opvouwbaar

mechanisme.

3. De lastverspreider volgens conclusie 2, waarbij het opvouwbaar mechanisme een

stangenmechanisme is met ten minste vier stangen die scharnierbaar zijn ten

opzichte van elkaar door respectieve scharnieren.

4. De lastverspreider volgens conclusie 1, waarbij het passieve actuatiesysteem een aandrijfcilinder omvat met:

- een cilinderkoker met een cilinderbodem en een cilinderkop die in axiale richting op een afstand van elkaar zijn aangebracht;

- een zuiger/zuigerstang samenstel dat in axiale richting heen en weer kan bewegen, omvattende een zuigerstang die uitsteekt door een bijbehorende boring in de cilinderkop en een zuiger die vastgemaakt is aan een uiteinde van de zuigerstang en die verplaatsbaar is over een axiale slag tussen de cilinderbodem en de cilinderkop; en

- een vloeistofafsluiting op de zuiger voor het verschaffen van een afsluiting met een binnenoppervlak van de cilinderkoker, zodat de zuiger in de aandrijfcilinder een variabele kopzijde kamer begrensd tussen de zuiger en de cilinderkop en

verder een variabele bodemzijde kamer begrensd tussen de zuiger en de cilinderbodem;

waarbij de kopzijde kamer of de bodemzijde kamer gevuld is met een comprimeerbaar eerste medium dat een druk uitoefent op de zuiger die het zuiger/zuigerstangsamenstel richting een positie drukt die hoort bij de eerste positie van de twee kabelaansluitingen, en waarbij de druk in de andere van de kopzijde kamer of de bodemzijde kamer die het zuiger/zuigersamenstel richting een positie drukt die hoort bij de tweede positie van de twee kabelaansluitingen bepaald wordt door waterdruk.

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5. De lastverspreider volgens conclusie 4, waarbij de andere van de kopzijde kamer of de bodemzijde kamer gevuld is met water wanneer de verspreider onder water zakt om een druk uit te oefenen op de zuiger die het zuiger/zuigersamenstel richting een positie drukt die hoort bij de tweede positie van de twee kabelaansluitingen.

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6. De lastverspreider volgens conclusie 4, waarbij de andere van de kopzijde kamer of de bodemzijde kamer in vloeistofcommunicatie staat met een balg die gevuld is met een tweede medium, en waarbij de balg indrukbaar is zodat de omringende waterdruk via de balg en het tweede medium doorgegeven kan worden aan de zuiger om het zuiger/zuigersamenstel richting een positie te drukken die behoort bij de tweede positie van de twee kabelaansluitingen.

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7. De lastverspreider volgens conclusie 1, waarbij het passieve actuatiesysteem een drijvend lichaam omvat voor het verschaffen van drijfkracht aan de verspreider wanneer de verspreider neergelaten wordt in het waterlichaam om de kabelaansluitingen richting de tweede positie te bewegen.

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8. Een marien lasthijs- en neerlaatsysteem voor gebruik op een vaartuig, bij voorkeur een vaartuig voor het leggen van een offshore pijplijn, welk systeem omvat:

- i. een eerste lier met eerste aandrijfmiddelen voor het ophijzen en laten zakken van een eerste hijskabel vanaf de eerste lier;
- ii. een tweede lier met tweede aandrijfmiddelen voor het ophijzen en laten zakken van een tweede hijskabel vanaf de tweede lier;
- iii. regelmiddelen verbonden met de eerste en tweede aandrijfmiddelen van respectievelijk de eerste en tweede lier voor het synchroniseren van de aandrijfmiddelen om het ophijzen en laten zakken van de eerste en tweede hijskabel synchroon uit te voeren; en
- iv. een lastverspreider volgens een of meer van de voorgaande conclusies,

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waarbij de eerste en twee hijskabel met een uiteinde daarvan zijn vastgemaakt aan een respectieve kabelaansluiting van de lastverspreider, en waarbij het systeem verder een spanningsgelijkmakingsmechanisme omvat voor het gelijkmaken van de spanning in de eerste en tweede hijskabels.

- 5 9. Een werkwijze voor het ophijzen en neerlaten van een last vanaf een vaartuig waarbij gebruik wordt gemaakt van een lastaansluiting die gehangen is aan twee hijskabels, en waarbij de werkwijze de volgende stappen omvat:
- a. het vastmaken van de last aan de lastaansluiting;
 - b. het laten zakken van de hijskabels;
 - 10 c. het vergroten van de horizontale afstand tussen de twee hijskabels wanneer de hijskabels neergelaten worden;
 - d. het ophijzen van de hijskabels;
 - e. het verkleinen van de horizontale afstand tussen de twee hijskabels wanneer de hijskabels opgehesen worden.
- 15 10. De werkwijze volgens conclusie 9, waarbij de stappen c. en e. automatisch uitgevoerd worden als gevolg van een veranderende waterdruk.
11. De werkwijze volgens conclusie 9, waarbij de horizontale afstand tussen de twee hijskabels wordt vergroot en verkleind op een plaats waar de twee hijskabels direct of indirect zijn verbonden met de lastaansluiting.
- 20 12. De werkwijze volgens conclusie 9, waarbij gebruik wordt gemaakt van een lastverspreider volgens een of meer van de conclusie 1-7.

FIG 1

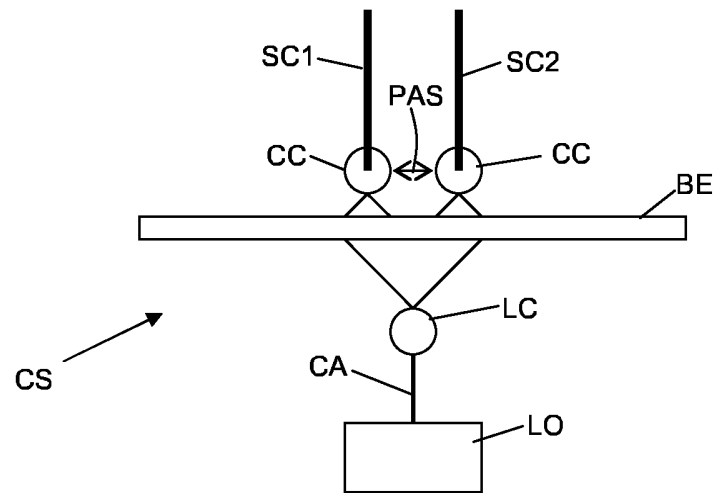


FIG 2

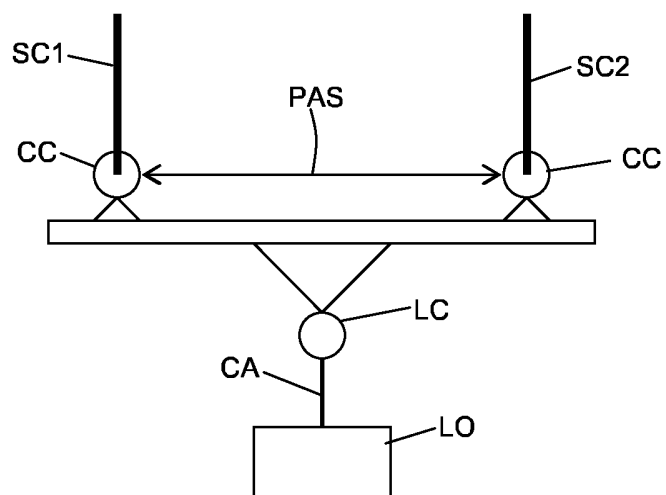


FIG 3

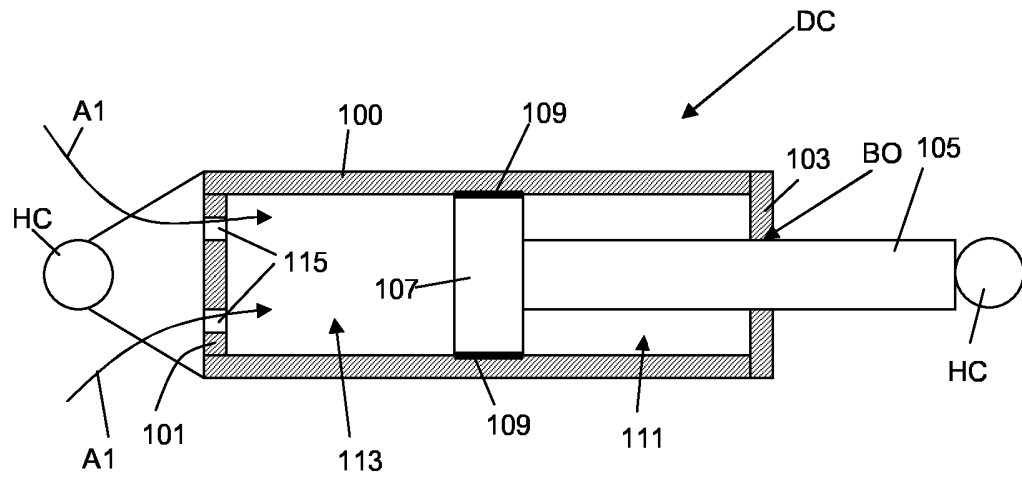


FIG 4

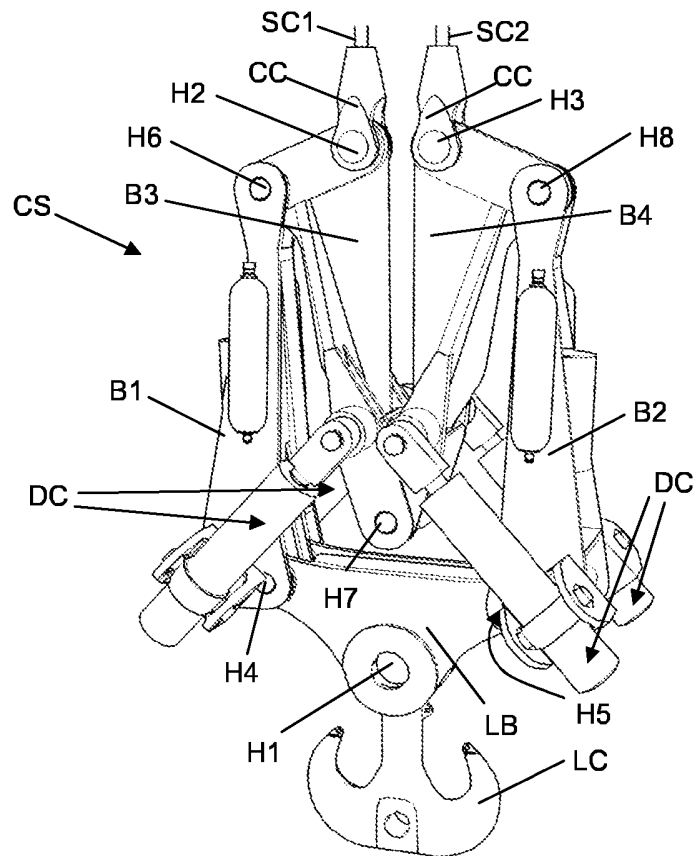


FIG 5

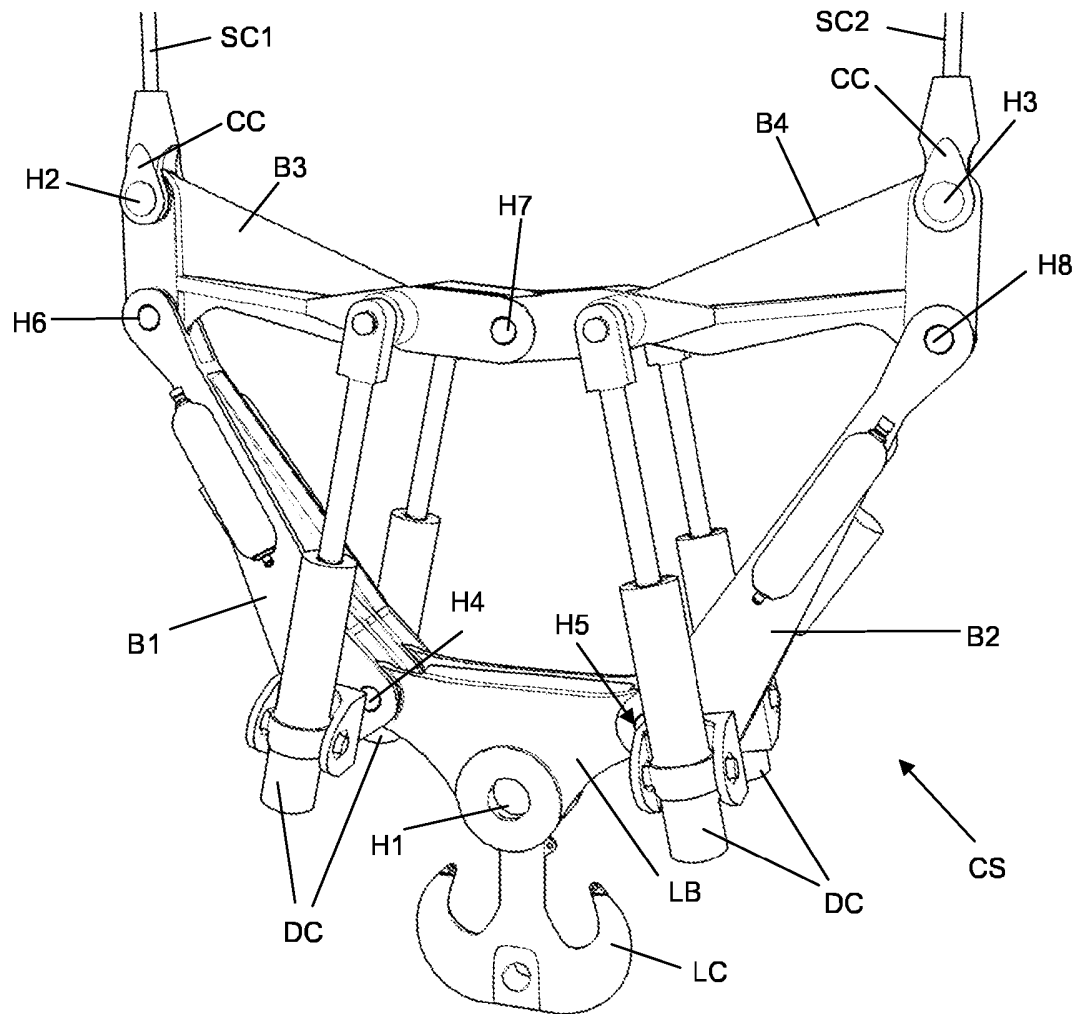


FIG 6A

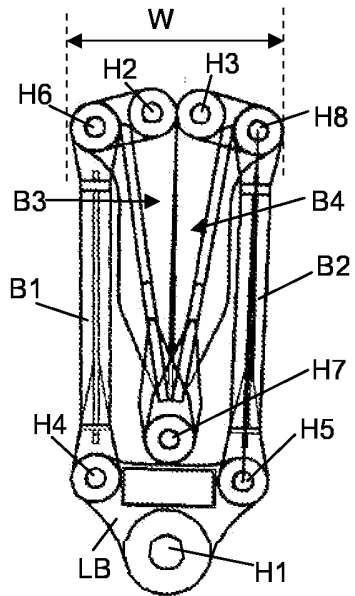


FIG 6B

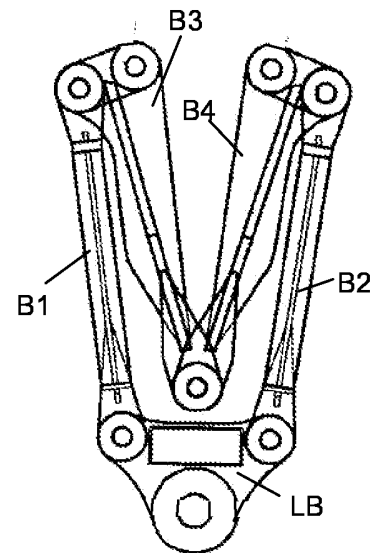


FIG 6C

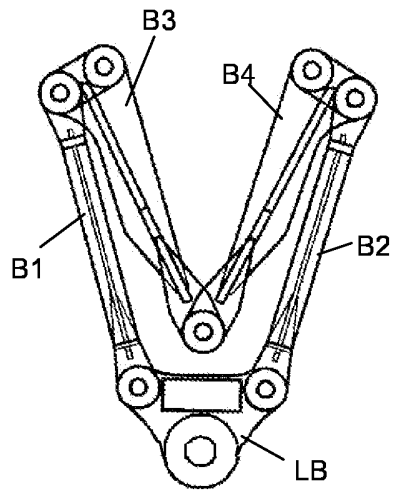


FIG 6D

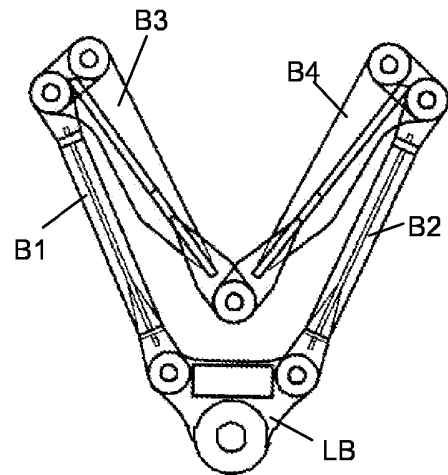


FIG 6E

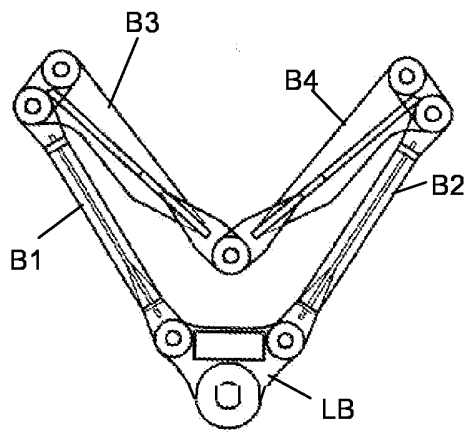


FIG 6F

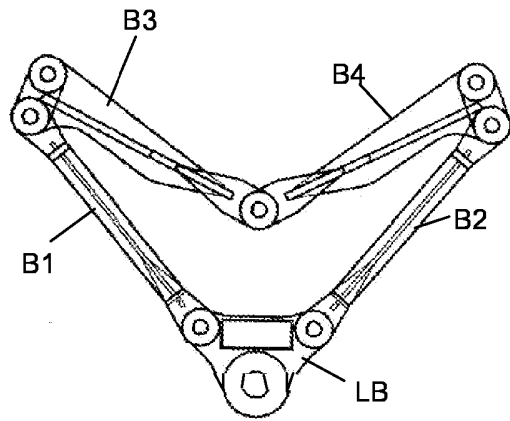


FIG 6G

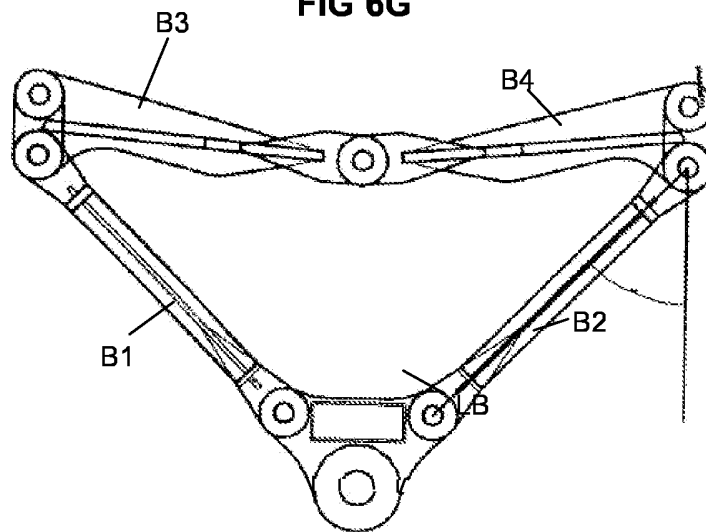


FIG 7

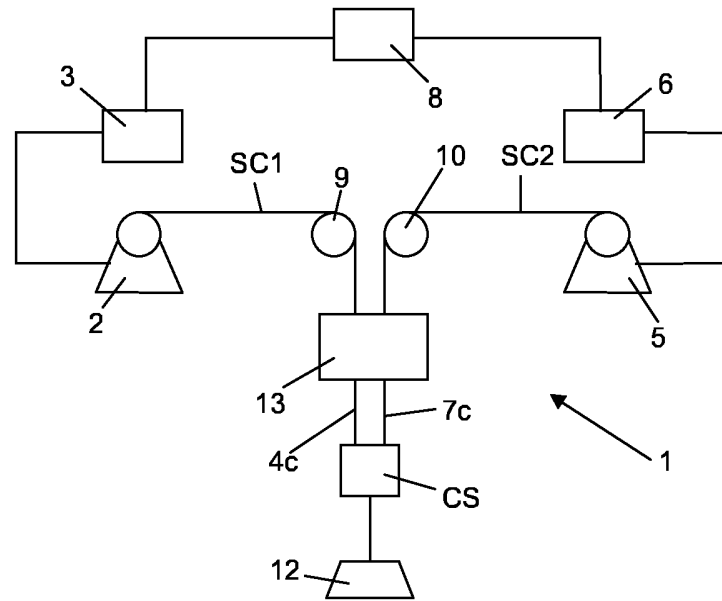


FIG 8

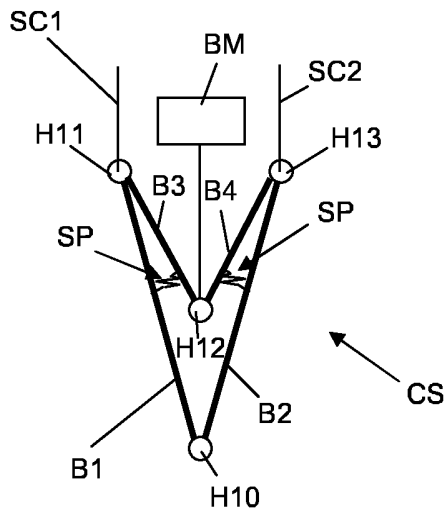
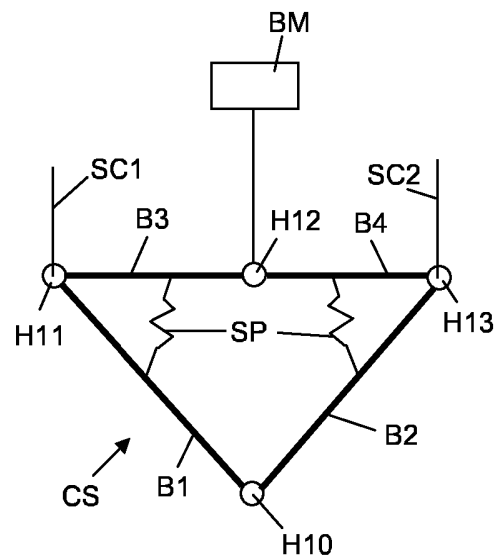


FIG 9



SAMENWERKINGSVERDRAG (PCT)

RAPPORT BETREFFENDE NIEUWHEIDSONDERZOEK VAN INTERNATIONAAL TYPE

IDENTIFICATIE VAN DE NATIONALE AANVRAGE	KENMERK VAN DE AANVRAGER OF VAN DE GEMACHTIGDE P30715NL00/MVE
Nederlands aanvraag nr. 2007131	Indieningsdatum 18-07-2011
	Ingeroepen voorrangsdatum
Aanvrager (Naam) Itrec BV	
Datum van het verzoek voor een onderzoek van internationaal type 08-10-2011	Door de Instantie voor Internationaal Onderzoek aan het verzoek voor een onderzoek van internationaal type toegekend nr. SN 57012
I. CLASSIFICATIE VAN HET ONDERWERP (bij toepassing van verschillende classificaties, alle classificatiesymbolen opgeven)	
Volgens de internationale classificatie (IPC) B66C13/04 B66C23/52	
II. ONDERZOCHE GEBIEDEN VAN DE TECHNIEK	
Onderzochte minimumdocumentatie	
Classificatiesysteem	Classificatiesymbolen
IPC8	B66C B63B
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 2007131

A. CLASSIFICATIE VAN HET ONDERWERP

INV. B66C13/04 B66C23/52
ADD. B63B35/03

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)

B66C B63B

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)

EPO-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.
A	EP 2 008 959 A1 (KALMAR IND B V [NL]) 31 december 2008 (2008-12-31) * samenvatting * * alinea [0002] - alinea [0003] * * alinea [0009] - alinea [0011] * * figuren *	1,8,9
A	JP 2003 246582 A (ISHIKAWAJIMA HARIMA HEAVY IND) 2 september 2003 (2003-09-02) * samenvatting * * figuren 1-4,8 * ----- -/-	1,9

☒ 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

"&" lid van dezelfde octrooifamilie of overeenkomstige octrooipublicatie

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

2 maart 2012

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

Naam en adres van de instantie

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040,
Fax: (+31-70) 340-3016

De bevoegde ambtenaar

Cabral Matos, A

**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 2007131

C.(Vervolg). VAN BELANG GEACHTE DOCUMENTEN

Categorie °	Geciteerde documenten, eventueel met aanduiding van speciaal van belang zijnde passages	Van belang voor conclusie nr.
A	WO 2006/013053 A1 (TEREX DEMAG GMBH & CO KG [DE]; NOESKE INGO [DE]; WECKBECKER ALFONS [DE] 9 februari 2006 (2006-02-09) * samenvatting * * bladzijde 6, regel 19 - bladzijde 7, regel 7 * * figuren 1,3-5 * -----	1,9
A	US 5 951 227 A (CALKINS DENNIS EARL [US] ET AL) 14 september 1999 (1999-09-14) * samenvatting * * kolom 3, regel 43 - regel 50 * * figuur 4 *	1,9
A,D	WO 2009/002142 A1 (ITREC BV [NL]; ROODENBURG JOOP [NL]; VEHMEIJER TERENCE WILLEM AUGUS [N] 31 december 2008 (2008-12-31) in de aanvraag genoemd * samenvatting * * figuren *	1,8,9
A,D	US 2005/265788 A1 (RENKEMA DOUWE [NL]) 1 december 2005 (2005-12-01) in de aanvraag genoemd * samenvatting * * figuren *	1,8,9
A	JP 2009 085966 A (MITSUBISHI HEAVY IND LTD) 23 april 2009 (2009-04-23) * samenvatting * * figuren 21A, 21B * -----	1,9

**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 2007131

In het rapport genoemd octrooigeschrift	Datum van publicatie	Overeenkomend(e) geschrift(en)	Datum van publicatie
EP 2008959	A1	31-12-2008	AR 067186 A1 30-09-2009
			BR PI0803021 A2 20-10-2009
			CA 2635527 A1 27-12-2008
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			EP 2008959 A1 31-12-2008
			JP 2009007170 A 15-01-2009
			US 2009001040 A1 01-01-2009

JP 2003246582	A	02-09-2003	GEEN

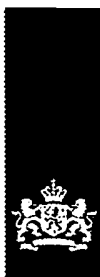
WO 2006013053	A1	09-02-2006	AT 495998 T 15-02-2011
			EP 1773706 A1 18-04-2007
			US 2007290182 A1 20-12-2007
			WO 2006013053 A1 09-02-2006

US 5951227	A	14-09-1999	AR 019708 A1 13-03-2002
			AU 719196 B2 04-05-2000
			AU 3676299 A 16-03-2000
			BG 63294 B1 28-09-2001
			BG 103483 A 31-01-2000
			BR 9902471 A 21-03-2000
			CA 2273645 A1 28-01-2000
			CN 1243083 A 02-02-2000
			CO 5040232 A1 29-05-2001
			DE 69911867 D1 13-11-2003
			EG 22452 A 26-02-2003
			EP 0976676 A1 02-02-2000
			GE P20022674 B 10-01-2002
			ID 23216 A 30-03-2000
			JP 3057085 B2 26-06-2000
			JP 2000079896 A 21-03-2000
			KR 20000011317 A 25-02-2000
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			OA 11134 A 22-04-2003
			PA 8476801 A1 24-05-2000
			PL 334121 A1 31-01-2000
			RU 2182883 C2 27-05-2002
			SG 71931 A1 18-04-2000
			TR 9901806 A2 21-07-2000
			TW 438699 B 07-06-2001
			US 5951227 A 14-09-1999
			ZA 9903971 A 11-12-2000

WO 2009002142	A1	31-12-2008	AT 508091 T 15-05-2011
			EP 2158150 A1 03-03-2010
			US 2010266371 A1 21-10-2010
			WO 2009002142 A1 31-12-2008

US 2005265788	A1	01-12-2005	GEEN

JP 2009085966	A	23-04-2009	JP 4533952 B2 01-09-2010
			JP 2009085966 A 23-04-2009



Agentschap NL
Ministerie van Economische Zaken,
Landbouw en Innovatie

WRITTEN OPINION

File No. SN57012	Filing date (day/month/year) 18.07.2011	Priority date (day/month/year)	Application No. NL2007131
International Patent Classification (IPC) INV. B66C13/04 B66C23/52 ADD. B63B35/03			
Applicant Itrec 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 Cabral Matos, A
--	-----------------------------

WRITTEN OPINION

Application number
NL2007131

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 II Priority

This opinion has been established as if the claimed priority date were valid, unless indicated otherwise on the **separate sheet**

WRITTEN OPINION

Application number
NL2007131

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	1-12
	No: Claims	
Inventive step	Yes: Claims	1-12
	No: Claims	
Industrial applicability	Yes: Claims	1-12
	No: Claims	

2. Citations and explanations

see separate sheet

Box No. VII Certain defects in the application

see separate sheet

Re Item V

1 Reference is made to the following documents:

- D1 EP 2 008 959 A1 (KALMAR IND B V [NL]) 31 december 2008 (2008-12-31)
- D2 JP 2003 246582 A (ISHIKAWAJIMA HARIMA HEAVY IND) 2 september 2003 (2003-09-02)
- D3 WO 2006/013053 A1 (TEREX DEMAG GMBH & CO KG [DE]; NOESKE INGO [DE]; WECKBECKER ALFONS [DE]) 9 februari 2006 (2006-02-09)
- D4 US 5 951 227 A (CALKINS DENNIS EARL [US] ET AL) 14 september 1999 (1999-09-14)

2 Novelty and Inventive step

2.1 Apparatus claim 1

2.1.1 D1 is regarded as being the prior art closest to the subject-matter of claim 1, and discloses (cf. figures 2, 4):

A load spreader comprising:

- two cable connectors (5), wherein each cable connector is configured to connect a respective suspension cable (6) to the spreader;
- a load connector (2,3,7) configured to connect a load to the spreader; and
- a (passive) actuator system (12) configured to move the two cable connectors between a first and second position;
- wherein in use, the horizontal distance between the two cable connectors is larger in the second position than in the first position (cf. figures 2, 3).

2.1.2 The subject-matter of claim 1 therefore differs from this known load spreader in that, the passive actuator system is operable by water pressure, such that the spreader automatically moves the two cable connectors towards the second position when the spreader is lowered into a water body and moves the two cable connectors towards the first position when the spreader is raised,
and is therefore new.

2.1.3 The problem to be solved by the present invention may be regarded as to provide an simpler actuator system, in particular for a marine load raising and lowering system such that the risk of entanglement of the two suspension cables is reduced.

2.1.4 The solution to this problem proposed in claim 1 of the present application is considered as involving an inventive step for the following reasons:

a passive actuator that is operable by water pressure makes active components and complex control systems dispensable. The actuator is activated automatically when the load spreader is lowered into a water body such that the distance between the cable connectors is increased. The chance of entanglement of the suspension cables connected to the two cable connectors is reduced.

D1 is neither concerned with lowering a load spreader into a water body nor with avoiding entanglement of the suspension cables. D1 refers to container cranes and suggests a mechanism for increasing the distance between the cable connectors in order to increase the stability when handling two containers instead of one. Therefore, D1 does not provide a hint to the solution of claim 1.

Also D2 discloses the a mechanism for increasing the distance between the cable connectors (cf. figures 2, 3), but there is no hint to a passive actuator operable by water pressure.

D3 (cf. page 6, line 19 - page, line 7) and D4 (column 3, lines 43-50) address the issue of twisting of the suspension cables but provide other solutions than the invention.

In conclusion, the prior art does not disclose nor hint at the claimed solution.

2.2 Method claim 9

2.2.1 D1 is regarded as being the prior art closest to the subject-matter of claim 9, and discloses:

A method for raising and lowering a load from a vessel using a load connector that is suspended by two suspension cables, said method comprising the following steps:

- a) connecting a load to the load connector;
- b) lowering the suspension cables.

2.2.2 The method of claim 9 therefore differs from this known method by

c) increasing the horizontal distance between the two suspension cables while the suspension cables are lowered;

d) raising the suspension cables;

e) decreasing the horizontal distance between the two suspension cables while the suspension cables are raised,

and is therefore new.

2.2.3 The problem to be solved by the present invention may be regarded as to provide method for raising and lowering a load from a vessel, whereby the risk of entanglement of the two suspension cables is reduced.

2.2.4 The solution to this problem proposed in claim 9 of the present application is considered as involving an inventive step for the following reasons:

D1 and D2 disclose increasing the horizontal distance between the cable connectors in order to increase stability. However, none of the documents cited neither disclose nor suggest to increase/decrease the horizontal distance **while** the suspension cables are lowered/raised.

2.3 Claims 2-8, 10-12 are dependent on one independent claims whose subject-matter is considered as being new and inventive, as discussed above, and as such said dependent claims also meet the requirements of novelty and inventive step.

Re Item VII

Certain defects in the application

3 The features of the claims are not provided with reference signs placed in parentheses.