**Spud carrier system.**

The invention relates to a spud system for a dredging vessel with a longitudinal direction, which spud system comprises:
- a spud carrier for mounting a spud therein in a vertical stance and which spud carrier is mounted for limited rotation around a horizontal transverse axis and is moveable with respect to the dredging vessel in a longitudinal direction for advancing the dredging vessel, and a
- spud carrier drive system coupled with the dredging vessel and the spud carrier for driving the spud carrier with respect to the dredging vessel.
Spud carrier system

Background

The present invention relates to a spud system for a dredging vessel with a longitudinal direction, which spud system has wire suspension system coupled with a spud carrier for resiliently forcing said spud in a vertical stance.

In general a cutter suction dredgers is fitted with a spud carrier that allows the dredger to be pushed forward when the working spud mounted in the spud carrier has penetrated into the bottom.

For long times dredgers have been equipped with a wire suspension system to keep the spud carrier upright. This way torsion between spud carrier and dredging vessel is avoided and cutter production can be enhanced.

In circumstances where large external forces are exerted on the dredger due to sea currents, waves, swell or other causes, overloading of the spud and/or the spud carrier cylinder, which drives the spud carrier, must be prevented by allowing the spud carrier to give way to the load from a neutral position. The neutral position refers to the carrier and the spud wherein the spud takes a vertical stance.

However in view of production capacity of the cutter suction dredger, it is important that the neutral position of the spud carrier is a) well defined and that, b) after removal of the overload condition, the spud carrier quickly returns to that neutral position.

It is known for spud carriers that are held in vertical position by means of a wire system, the overload protection can be realized by allowing at least one of the sheaves to move. As a result the spud carrier will rotate and give way to the overload. Simply connecting a gas spring (accumulator) to this wire system prevents overloading to occur but has as a consequence that there is no well-defined fixed position of the spud before and after overload. Such a spud carrier system is known from WO2006130934 wherein an apparatus is disclosed for accommodating a substantially vertical spud of a dredging vessel with a longitudinal direction, comprising a spud carriage which is mounted for limited rotation around a horizontal transverse axis, wherein at least a first and a second spring means is arranged under bias between vessel and spud in the
longitudinal direction for the purpose of absorbing a moment on the spud carriage, which first and second spring means compensate each other in the non-loaded situation of the spud; and—at least one spring means is provided with a spring force limiting means for limiting the tension in said spring element from a determined maximum moment on the spud carriage.

**Summary of the invention**

The invention aims to provide a spud system wherein the neutral position of the carrier is better defined and the return to said neutral position is facilitated.

Yet another object of the invention is to provide a spud system wherein a problem associated with known spud system is at least partly solved.

Yet a further object of the invention is to provide an alternative spud system.

According to a first aspect of the invention this is realized with a spud system for a dredging vessel with a longitudinal direction, which spud system comprises;

— a spud carrier for mounting a spud therein in a vertical stance and which spud carrier is mounted for limited rotation around a horizontal transverse axis and is moveable with respect to the dredging vessel in a longitudinal direction for advancing the dredging vessel,

— a spud carrier drive system coupled with the dredging vessel and the spud carrier for driving the spud carrier with respect to the dredging vessel,

— a wire suspension system coupled with the spud carrier for resiliently forcing said spud in a vertical stance, the wire suspension system comprising at least a first and second wire, each of the first and second wire extending on both sides of the spud carrier and having an aft end and a fore end coupled with the dredging vessel,

— a spud centring system operationally coupled with the spud carrier through the wire suspension system for maintaining a vertical stance of said spud which is mounted in the spud carrier,

wherein the spud centring system comprises a centring cylinder having a central rod which is forced towards a central position by prestressing means exerting a
centring force on the central rod, and wherein the first wire and the second wire are
coupled with the central rod in such a way that the central rod is driven by a
difference in tension between the first and second wire and the spud is allowed to
cant when the difference in tension exceeds the centring force.

Coupling the first and second wire through the central rod of a centring cylinder
facilitates to define a central position for the spud and allows a quick return to said
central position after removal of the overload condition. In addition, no pump capacity
is required for the spud to return to its central position. Instead, the return of the spud to
its neutral position is a passive action. Also, driving the central rod by a difference in
tension between the first and second wire enables to adjust the tension in the wires and
the centring force independently.

In an embodiment of the spud system, the first wire is in fluid connection with the
one end of the central rod. Such a fluid connection may be realised through hydraulic
cylinders coupled with a fluid conduit.

In an embodiment of the spud system, the second wire is in fluid connection with
the opposite end of the central rod.

In an embodiment of the spud system the wire tensioning system comprises a first
wire tensioning cylinder coupled with the first wire for tensioning the first wire, and the
first wire is in fluid connection with one end of the central rod through the first wire
tensioning cylinder.

In an embodiment of the spud system, the wire tensioning system comprises a
second wire tensioning cylinder coupled with the second wire for tensioning the second
wire, and the second wire is in fluid connection with an opposite end of the central rod
through the second wire tensioning cylinder.

In an embodiment of the spud system the one end and the opposite end of the
central rod each end in a respective first centring fluid chamber and second centring
fluid chamber, the first wire tensioning cylinder is in fluid connection with the first
centring fluid chamber, and the second wire tensioning cylinder is in fluid connection with the second centring fluid chamber. A respective wire is in fluid connection with the central rod through the respective wire tensioning cylinder and the respective centring fluid chamber. A force on the spud influences the pressure in the first centring fluid chamber and second centring fluid chamber.

In an embodiment of the spud system, the spud system comprises a wire tensioning device coupled with the first and second wire for tensioning these, wherein the tensioning device comprises a hydraulic system coupled with the first wire tensioning cylinder and the second wire tensioning cylinder for pressurizing these in an equal way such that the first and second wire are equally stretched. The wire tensioning device ensures that no slack wires situation occurs during operation. The wire tensioning device in conjunction with the actual load on the spud determines the pressure in the in the first centring fluid chamber and second centring fluid chamber.

In an embodiment of the spud system, the tensioning device comprises a piston, a piston chamber, a source of pressure coupled with the piston chamber for pressurizing the piston chamber, a piston rod extending in a first fluid chamber fluidly coupled with the first wire tensioning cylinder and a second fluid chamber fluidly coupled with the second wire tensioning cylinder, wherein the tensioning device is configured such that an equal amount of fluid is displaced from or into the first and second fluid chamber upon moving the piston rod such that the first and second wire are equally stretched.

In an embodiment of the spud system, the prestressing means comprise a pair of opposite pressurized fluid chambers, the central rod is provided with a central flange arranged such that the opposite pressurized fluid chambers exert the centring force on the central rod. Preferably, the pair of opposite pressurized fluid chambers are in fluid connection with a common source of pressure. Preferably, the common source of pressure comprises an accumulator with an adjustable gas pressure in order to be able to adjust the centring force. It is also conceivable that the accumulator has an adjustable force vs displacement characteristic.
In an embodiment of the spud system, the central rod is provided with a free piston and the centring force is exerted through said free piston.

In an embodiment of the spud system, the central rod is provided with a pair of opposite free pistons arranged at opposite sides of the central flange and the centring force is exerted through said pair of pistons.

The invention further relates to a dredger comprising the spud system according to the invention.

The invention further relates to a device comprising one or more of the characterising features described in the description and/or shown in the attached drawings.

The invention further relates to a method comprising one or more of the characterising features described in the description and/or shown in the attached drawings.

The various aspects discussed in this patent can be combined in order to provide additional advantageous advantages.

**Description of the drawings**

The invention will be further elucidated referring to the following drawings wherein shown in:

Fig. 1 in schematic side view a prior art spud system;

fig. 2 a graph of the relation between spud force and spud angle for a prior art spud system of fig. 1;

fig. 3 an embodiment of a spud system according to the invention;

fig. 4 a graph of the relation between spud force and spud angle for the spud system of fig. 3;

fig. 5 spud system of fig. 3 in overload condition; and

fig. 6 a further embodiment of a spud system according to the invention.
Detailed description of embodiments

In fig. 1 shows a prior art spud system 1. The spud system 1 comprises a spud carrier 2 for mounting a spud 3 therein in a vertical stance. The spud carrier 2 is mounted for limited rotation \( \alpha \) around a virtual horizontal transverse axis 32 which limited rotation allows to accommodate overload conditions. The spud system 1 comprises a spud carrier drive system 4 coupled with the dredging vessel and the spud carrier 2 for driving the spud carrier 2. The spud system 1 has a first 6 and second 7 wire. Each of the first 6 and second 7 wire extend on both sides of the spud carrier 2 and is coupled with the dredging vessel with both cable ends. The spud system 1 has a first wire tensioning cylinder 14 coupled with the first wire 6 for tensioning the first wire. The spud system 1 has a second wire tensioning cylinder 13 coupled with the second wire 7 for tensioning the second wire. The first wire tensioning cylinder 14 is coupled with an accumulator 21 and the second wire tensioning cylinder 13 is coupled with an accumulator 28 for pressurizing the cylinder.

Now turning to fig. 2 wherein is shown a graph of the relation between spud force versus spud angle for the prior art spud system of fig. 1. The prior art spud system 1 suffers in that the position of the spud is not well defined and the forces on the spud are not adequately limited.

In fig. 3 shows an embodiment of a spud system 1 according to the invention. The spud system 1 comprises a spud carrier 2 for mounting a spud 3 therein in a vertical stance. The spud carrier 2 is mounted for limited rotation \( \alpha \) around a horizontal transverse axis 32 which limited rotation allows to accommodate overload conditions. The “mounted for limited rotation” refers to the assembly of the spud 3 and the spud carrier, it is however conceivable that the spud 3 itself is mounted in the spud carrier 2 for limited rotation while the spud carrier 2 itself may not rotate.

The spud carrier 2 is moveable with respect to the dredging vessel (not shown) in a longitudinal direction for advancing the dredging vessel. Therefore, the spud system 1 comprises a spud carrier drive system 4 coupled with the dredging vessel and the spud carrier 2 for driving the spud carrier 2 with respect to the dredging vessel.
The spud system 1 comprises a wire suspension system 5 coupled with the spud carrier 2. The wire suspension system 5 is configured for resiliently forcing said spud 3 in a vertical stance, which vertical stance is also referred to with “neutral position”. The wire suspension system 5 comprising at least a first 6 and second 7 wire. Each of the first 6 and second 7 wire extends on both sides of the spud carrier 2 and have an aft end 6a, 7a and a fore end 6f, 7f coupled with the dredging vessel. The first 6 and second 7 wire are coupled with the spud carrier 2 through a number of sheaves or cable pulleys in a manner known per se and not further described. Different numbers of sheaves are conceivable as long as the wires 6, 7 are capable to force the spud in the vertical stance as shown in fig. 3.

The wire suspension system 5 is configured such that a load on the spud 3 leads to a difference in tension between the first wire 6 and the second wire 7.

The spud system 1 comprises a spud centring system 8 for maintaining a vertical stance of said spud 3 which is mounted in the spud carrier 2. The spud centring system 8 is operationally coupled with the spud carrier 2 through the wire suspension system 5. The spud centring system 8 comprises a centring cylinder 9. A centring cylinder is known per se.

The centring cylinder 9 has a central rod 10 which is forced towards a central position as shown in fig. 3. The central rod 10 is forced towards its central position by prestressing means 25-30 exerting a centring force F on the central rod 10.

The prestressing means comprise a pair of opposite pressurized fluid chambers 25, 26. The central rod is provided with a central flange 27. The flange 27 is arranged such that the opposite pressurized fluid chambers 25, 26 exert the centring force on the central rod 10. The central rod 10 is provided with a pair of opposite free pistons 29, 30. These pistons 29, 30 are arranged at opposite sides of the central flange 27. The centring force is exerted through said pair of pistons 29, 30. The centring force drives the pistons towards the flange 27. The centring cylinder 9 is provided with a central stop 33 for defining a central position of the central rod 10. The stop 33 may be circumferential.

During operations, the spud system functions as follows. The wire tensioning device 17 tensions the first 6 and second 7 wire to prevent a slack wire. The centring force drives the pistons 29, 30 towards the stop 33. In normal conditions, the pistons
29, 30 abut against, in other words contact, the stop 33 on opposite sides of the stop 33, resulting in a space for receiving the flange 27. In normal conditions, the flange 27 is locked between the opposite pistons 29, 30. A load on the spud causes the spud 3 to tilt over an angle $\alpha$ and causes a difference in tension between the first 6 and second 7 wire. Now when the difference in tension between the first wire 6 and the second wire 7 exceeds the centring force exerted on the free pistons 29, 30, the central rod 10 will move away from its central position, as shown in fig. 5. When moving out of its central position, the flange 27 abuts one of the pistons 29, 30 and moves therewith in unity. The movement of the central rod 10 cause displacement from fluid in the first centring fluid chamber 15 and the second centring fluid chamber 16. Through the fluid coupling of these chambers 15, 16 with the wire tensioning cylinders 13, 14 the wires 6, 7 are paid out or hauled in such that the spud 3 may tilt and loads between the spud and vessel are decreased as shown in fig. 4.

Here, the pair of opposite pressurized fluid chambers 25, 26 are in fluid connection with a common source of pressure, the accumulator 28. Expelled liquid from one of the opposite pressurized fluid chambers 25, 26 will be accommodated in the accumulator 28. The pressure in the accumulator can be adjusted by adjustment means (not shown) to adjust the centring force.

As mentioned, the spud centring system 8 is operationally coupled with the spud carrier 2 through the wire suspension system 5. Therefore, the first wire 6 of the wire suspension system 5 is coupled with one end 11 of the central rod 10. The second wire 7 of the wire suspension system 5 is coupled with an opposite end 12 of the central rod 10.

The spud 1 comprise comprises a wire tensioning device 17 coupled with the wire suspension system 5, more precisely, the first 6 and second 7 wire thereof for tensioning these wires 6, 7. This wire tensioning device 17 is important to prevent slack wires which may come off from pulleys and sheave or prevent the wire suspension system 5 from functioning otherwise. With respect to the wire suspension system 5, reference is made to fig. 1 and its description. The wire tensioning device 17 comprises a hydraulic system 18 coupled with the first wire tensioning cylinder and the second wire tensioning cylinder for pressurizing these both in an equal way such that the first
and second wire are equally stretched. Therefore, the tensioning device 17 comprises a first fluid chamber 23 fluidly coupled with the first wire tensioning cylinder 14 and a second fluid chamber 24 fluidly coupled with the second wire tensioning cylinder 13. The wire tensioning device 17 is configured such that an equal amount of fluid is displaced from or into the first and second fluid chamber upon moving a piston rod 22 such that the first and second wire are equally stretched.

For displacing fluid, the tensioning device comprises a piston 19, the piston rod 22, a piston chamber 20, and a source of pressure 21 coupled with the piston chamber for pressurizing the piston chamber. The piston rod 22 extends in the first fluid chamber 23 and the second fluid chamber 24, wherein the tensioning device is configured such that an equal amount of fluid is displaced from or into the first and second fluid chamber upon moving the piston rod 22 such that the first and second wire are equally stretched.

The central rod 10 is driven by a difference in tension between the first 6 and second 7 wire. When the difference in tension exceeds the centring force \( F \), the spud 3 is allowed to cant to protect the spud. This can be seen in fig. 4 in the first and third quadrant wherein the almost horizontal section makes clear that the force on the spud 3 is limited.

Fig 6 shows a part of an embodiment of the spud system according to the invention. A different wire tensioning device 17 is used wherein the rod 22 is hollow. The diameters \( D_c \), \( D_r \) and \( D_i \) are chosen such an equal amount of fluid is displaced from or into the first 23 and second 24 fluid chamber upon moving the piston rod 22 such that the first and second wire are equally stretched. In addition, an optional spring device 34 is shown in parallel with the centring system 8. The configuration of the spring device 34 is similar to that of the centring system 8 however the stop 33 and the free pistons 29, 30 are not provided, and also the flange is replace by a piston 31. The function of the spring device 34 is to adjust the stiffness of the wire suspension system.

In fig. 4, this lower stiffness results in a less steep middle section of the graph.

It will also be obvious after the above description and drawings are included to illustrate some embodiments of the invention, and not to limit the scope of protection.
Starting from this disclosure, many more embodiments will be evident to a skilled person which are within the scope of protection and the essence of this invention and which are obvious combinations of prior art techniques and the disclosure of this patent.
Claims

1. A spud system (1) for a dredging vessel with a longitudinal direction, which spud system comprises;
   - a spud carrier (2) for mounting a spud (3) therein in a vertical stance and which spud carrier is mounted for limited rotation around a horizontal transverse axis and is moveable with respect to the dredging vessel in a longitudinal direction for advancing the dredging vessel,
   - a spud carrier drive system (4) coupled with the dredging vessel and the spud carrier for driving the spud carrier with respect to the dredging vessel,
   - a wire suspension system (5) coupled with the spud carrier for resiliently forcing said spud in a vertical stance, the wire suspension system comprising at least a first (6) and second (7) wire, each of the first and second wire extending on both sides of the spud carrier and having an aft end (6a, 7a) and a fore end (6f, 7f) coupled with the dredging vessel,
   - a spud centring system (8) operationally coupled with the spud carrier through the wire suspension system for maintaining a vertical stance of said spud which is mounted in the spud carrier,
   wherein the spud centring system comprises a centring cylinder (9) having a central rod (10) which is forced towards a central position (fig. 1) by prestressing means exerting a centring force on the central rod, and wherein the first wire and the second wire are coupled with the central rod (10) in such a way that the central rod is driven by a difference in tension between the first and second wire, and the spud is allowed to cant when the difference in tension exceeds the centring force.

2. A spud system according to claim 1, wherein the first wire is in fluid connection with the one end of the central rod.

3. A spud system according to claim 1 or 2, wherein the second wire is in fluid connection with the opposite end of the central rod.
4. A spud system according to claim 2, wherein the wire tensioning system comprises a first wire tensioning cylinder (13) coupled with the first wire for tensioning the first wire, and the first wire is in fluid connection with one end of the central rod through the first wire tensioning cylinder.

5. A spud system according to claim 3 or 4, wherein the wire tensioning system comprises a second wire tensioning cylinder (14) coupled with the second wire for tensioning the second wire, and the second wire is in fluid connection with an opposite end of the central rod through the second wire tensioning cylinder.

6. A spud system according to a preceding claim, wherein the one end and the opposite end of the central rod each end in a respective first centring fluid chamber (15) and second centring fluid chamber (16), the first wire tensioning cylinder is in fluid connection with the first centring fluid chamber, and the second wire tensioning cylinder is in fluid connection with the second centring fluid chamber.

7. A spud system according to a preceding claim, comprising a wire tensioning device (17) coupled with the first and second wire for tensioning these, wherein the tensioning device comprises a hydraulic system (18) coupled with the first wire tensioning cylinder and the second wire tensioning cylinder for pressurizing these in an equal way such that the first and second wire are equally stretched.

8. A spud system according to claim 7, wherein the tensioning device comprises a piston (19), a piston chamber (20), a source of pressure (21) coupled with the piston chamber for pressurizing the piston chamber, a piston rod (22) extending in a first fluid chamber (23) fluidly coupled with the first wire tensioning cylinder and a second fluid chamber (24) fluidly coupled with the second wire tensioning cylinder, wherein the tensioning device is configured such that an equal amount of fluid is displaced from or into the first and second fluid chamber upon moving the piston rod such that the first and second wire are equally stretched.
9. A spud system according to a preceding claim, wherein the prestressing means comprise a pair of opposite pressurized fluid chambers (25, 26), the central rod is provided with a central flange (27) arranged such that the opposite pressurized fluid chambers exert the centring force on the central rod.

10. A spud system according to claim 9, wherein the pair of opposite pressurized fluid chambers are in fluid connection with a common source of pressure (28).

11. A spud system according to claim 10, wherein the common source of pressure comprises an accumulator with an adjustable gas pressure in order to be able to adjust the centring force.

12. A spud system according to a preceding claim, wherein the central rod is provided with a free piston (29) and the centring force is exerted through said free piston.

13. A spud system according to claim 12, wherein the central rod is provided with a pair of opposite free pistons (29, 30) arranged at opposite sides of the central flange and the centring force is exerted through said pair of pistons.

14. A dredger comprising the spud system (1) of any one of the preceding claims.
Fig. 2

- Spud forward under external load
- Spud tilt backward under external load

Pushing force

Pulling force
Fig. 4

- Spud forward under external load
- Spud tilt backward under external load
- Pushing force
- Pulling force
Abstract

The invention relates to a spud system for a dredging vessel with a longitudinal direction, which spud system comprises;

- a spud carrier for mounting a spud therein in a vertical stance and which spud carrier is mounted for limited rotation around a horizontal transverse axis and is moveable with respect to the dredging vessel in a longitudinal direction for advancing the dredging vessel, and a

- spud carrier drive system coupled with the dredging vessel and the spud carrier for driving the spud carrier with respect to the dredging vessel
### SAMENWERKINGSVERDRAG (PCT)

**RAPPORT BETREFFENDE NIEUWHEIDSONDERZOEK VAN INTERNATIONAAL TYPE**

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Aanvrager (Naam)

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### I. CLASSIFICATIE VAN HET ONDERWERP (bij toepassing van verschillende classificaties, alle classificatiesymbolen opgeven)

Volgens de internationale classificatie (IPC)

**E02F9/06**

### II. ONDERZOCHTE GEBIEDEN VAN DE TECHNIEK

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### III. GEEN ONDERZOEK MOGELIJK VOOR BEPAALDE CONCLUSIES (opmerkingen op aanvullingsblad)

### IV. GEBREK AAN EENHEID VAN UITVINDING (opmerkingen op aanvullingsblad)

Form PCT/ISA 201 A (11/2000)
ONDERZOEKSRAPPORT BETREFFENDE HET RESULTAAT VAN HET ONDERZOEK NAAR DE STAND VAN DE TECHNIK VAN HET INTERNATIONALE TYPE

A. CLASSIFICATIE VAN HET ONDERWERP

INV. E02F9/06
ADD.

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

B. ONDERZOEkte GEBIEDEN VAN DE TECHNIK

Onderzochte minimum documentatie (classificatie gevolgd door classificatiesymbolen)
B63H E02F B63B

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

EPO-Internal, WPI Data

C. VAN BELANG GEACHTE DOCUMENTEN

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☐ 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 octroï(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 bezwaarlijk 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

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

15 januari 2015

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

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

Formuleer PCT/RSA201 (tweedde blad) (Januari 2004)

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

NL 2012825

Laurer, Michael
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WRITTEN OPINION

File No. SN62374
Filing date (day/month/year) 16.05.2014
Priority date (day/month/year)
Application No. NL2012825

International Patent Classification (IPC)
INV. E02F9/06

Applicant IHC Holland IE 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
Laurer, Michael

Form NL237A (Dekblad) (July 2006)
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 1-14
   No: Claims

   Inventive step
   Yes: Claims 1-14
   No: Claims

   Industrial applicability
   Yes: Claims 1-14
   No: Claims

2. Citations and explanations
   see separate sheet

NL237B (July 2006)
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 Novelty and inventive step

1.1 In the terms of independent claim 1, US-A1-2009/0126237 (=D1) discloses:
ea spudsysteem (figure 3) voor een baggervaartuig met een langsrichting, waarbij het spudsysteem omvat;
- een paalwagen (6) voor het daarin monteren van een spud (3) in een verticale stand en welke paalwagen (6) gemonteerd is voor beperkte rotatie om een horizontale dwars-as (7) en beweegbaar (see actuator 13) is ten opzichte van het baggerschip in langsrichting voor het voortbewegen van het baggervaartuig,
- een paalwagenaandrijfsysteem (13) verbonden met het baggervaartuig en de paalwagen (6) voor het aandrijven van de paalwagen (6) ten opzichte van het baggervaartuig,
- een draadophangsysteem (figure 3) verbonden met de paalwagen (6) voor het veerkrachtig dwingen van de spud in een verticale stand, waarbij het draadophangsysteem ten minste een eerste (40) en tweede (41) draad omvat, en elk van de eerste en tweede draad zich uitstrekt aan weerszijden van de paalwagen (6) en met een achteruiteinde (42, 45) en een vooruindo (43, 44) verbonden is met het baggervaartuig,
- een spudcentreersysteem (32, 33) operationeel verbonden met de paalwagen middels het draadophangsysteem voor het handhaven van een verticale stand van de in de paalwagen gemonteerde spud (3).
Thus, the claimed subject-matter of claim 1 is novel over the available prior art.

1.2 The distinguishing technical features over D1 are:
waarbij het spudcentreersysteem een centreercilinder (9) omvat met een centrale stang (10) die naar een centrale positie (fig. 1) wordt gedwongen middels voorspanmiddelen die een centreerkracht uitoefenen op de centrale stang, en waarbij de eerste draad en de tweede draad zodanig met de centrale stang (10) zijn verbonden dat de centrale stang wordt aangedreven door een spanningsverschil tussen de eerste en tweede draad, en de spud kan kantelen wanneer het verschil in spanning de centreerkracht overschrijdt.

1.3 The thereto associated technical effect may be summarised as:
The spud is held in a desired upright position until a load acting on the spud exerts a predetermined limit.
1.4 The objective technical problem to solve may be formulated:
Avoid overloading of a spud in dredging operations.

1.5 None of the available prior art shows or hints to the solution according to the
above distinguishing technical features.
Thus, the claimed subject-matter is regarded inventive over the available prior
art.

Re Item VII

Certain defects in the application

2 Claim 1 (line 21) contains a reference to the drawings. The claims should not
contain such references except where absolutely necessary, which is not the
case here.

3 Independent claim 1 is not in the two-part form, which in the present case
would be appropriate, with those features known in combination from the prior
art being placed in the preamble and the remaining features being included in
the characterising portion.

4 In the present case, the features under paragraph 1.1 are known in combina-
tion from 1 and belong in the preamble of such a claim followed by "characte-
rised in that..." and the distinguishing technical features as in paragraph 1.2..

Re Item VIII

Certain observations on the application

5 The vague and imprecise statement in the description on the last page "within
the scope of protection and the essence... and the disclosure of this patent"
implies that the subject-matter for which protection is sought may be different
to that defined by the claims, thereby resulting in lack of clarity when used to
interpret them.