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Declarations under Rule 4.17:

— as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))

Published:

— with international search report (Art. 21(3))  
— before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))

(88) Date of publication of the revised international search report:

27 November 2014

[Continued on next page]

(54) Title: A SEAFLOOR VERTICAL HOISTING SYSTEM AND METHOD

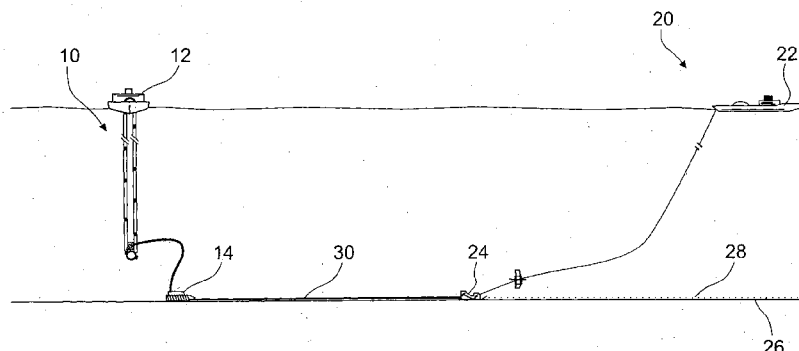


Fig. 1

(57) Abstract: A seafloor vertical hoisting system for hoisting ore from the seafloor, the hoisting system comprising a drive mechanism, at least one line adapted to be driven by the drive mechanism, a plurality of containers adapted to be operatively attached to the at least one line, a first casing adapted to at least partially encase the at least one line and the plurality of containers as they are hoisted relative to the seafloor and a second casing adapted to at least partially encase the at least one line and the plurality of containers as they are lowered towards the seafloor.

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**(15) Information about Correction:**  
see Notice of 27 November 2014

## INTERNATIONAL SEARCH REPORT

International application No.  
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## A. CLASSIFICATION OF SUBJECT MATTER

E02F 7/00 (2006.01) E02F 3/24 (2006.01) E02F 3/14 (2006.01) B65G 17/12 (2006.01) B65G 17/36 (2006.01)  
B65G 17/30 (2006.01) E21C 50/00 (2006.01)

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPI & EPODOC: IPC & CPC: E02F, B65G, E21C50, B63B27/22, B63B27/32, B65G11, B65G13, B65G15, B65G17, B65G21, B65G23/00, B65G23/02/LOW, B65G23/24/LOW, B65G23/38/LOW, B65G23/44, B65G35, B65G37, B65G39, B65G49; and  
KEYWORD SEARCH: KEYWORDS (HOIST, LIFT, UNDERWATER, SUBSEA, CHAIN, LINE, BUCKET, SCOOP, CONTINUOUS, ENDLESS, CONDUIT, COVER, PRESSURE, DRIVE, STAR, WHEEL, PULLEY, MOTOR, CRADLE, CARRIER, LOBE, ECCENTRIC, MODULE, SECTION, ASSEMBLE, CONSTRUCT, MULTIPL, PLURALITY) and like terms. GOOGLE INTERNET: KEYWORDS (HOIST, LIFT, UNDERWATER, SUBSEA, CHAIN, LINE, BUCKET, SCOOP, CONTINUOUS, ENDLESS, CONDUIT, COVER, PRESSURE, DRIVE, STAR, WHEEL, PULLEY, MOTOR, CRADLE, CARRIER, LOBE, ECCENTRIC, MODULE, SECTION, ASSEMBLE, CONSTRUCT, MULTIPL, PLURALITY) and like terms AND AUSPAT & Espacenet Applicant and Inventor Names and variations

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
	Documents are listed in the continuation of Box C	



Further documents are listed in the continuation of Box C



See patent family annex

* Special categories of cited documents:		
"A" document defining the general state of the art which is not considered to be of particular relevance	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention	
"E" earlier application or patent but published on or after the international filing date	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone	
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art	
"O" document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family	
"P" document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search  
10 October 2014Date of mailing of the international search report  
10 October 2014

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**Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)**

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1.  Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:  
the subject matter listed in Rule 39 on which, under Article 17(2)(a)(i), an international search is not required to be carried out, including
2.  Claims Nos.:  
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3.  Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a)

**Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)**

This International Searching Authority found multiple inventions in this international application, as follows:

**See Supplemental Box for Details**

1.  As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2.  As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3.  As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:  
**1-17 & 22-24**
4.  No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

**Remark on Protest**

- The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT		International application No.
C (Continuation).		<b>PCT/SG2014/000147</b>
DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	US 1746649 A (HANCOCK) 12 November 1928 FIG1&2 Itm11-14,16,22 & 24 FIG1&2 Itm11-14,16,22 & 24	1 & 3-12 2 & 13
X Y	SU 1102726 A (TSNIIPROMZERNOPROEKT) 15 July 1984 FIG1&2 Itm1-2,8-9&11-12 FIG1&2 Itm1-2,8-9&11-12	1 & 3-12 2 & 13
Y	EP 0616083 A1 (BAGGERBEDRIJF DE BOER HOLDING B.V.) 21 September 1994 FIG1 & COL5 LN15-18	2, 13 & 29-32
Y	Chung, Jin S. "Deep-ocean Mining Technology: Development II", Proceedings of The Sixth Mining Symposium Changsha, Hunan, China October 9-13, 2005: The International Society of Offshore and Polar Engineers ISBN 1-880653-65-6. Obtained from internet on 28 November 2013: URL <a href="http://www.isopec.org/publications/proceedings/isopec_oms/papers/01.pdf">http://www.isopec.org/publications/proceedings/isopec_oms/papers/01.pdf</a> FIG5 & PG4 COL2 PAR "CRUST MINING"	2 & 13
X	US 3378130 A (WALLACE) 16 April 1968 Col7 Ln44-53, Fig1,9&11	14-17 & 22-24
A	FR 2633261 A1 (MAGNIER EQUIPEMENT S.A.) 29 December 1989 Fig1&11	25-28
Y	US 4155491 A (ISTOSHIN et. al.) 22 May 1979 Fig1,2&6	29-32

**Supplemental Box****Continuation of: Box III**

This International Application does not comply with the requirements of unity of invention because it does not relate to one invention or to a group of inventions so linked as to form a single general inventive concept.

This Authority has found that there are different inventions based on the following features that separate the claims into distinct groups:

- INVENTION I: Claims 1-13 are directed to a seafloor vertical hoisting system comprising a drive mechanism, a line driven by the drive mechanism, a plurality of containers attached to the line, a first casing at least partially encasing the line and the plurality of containers as they are hoisted and a second casing at least partially encasing the line and the plurality of containers as they are lowered.
- 
- The feature of a seafloor vertical hoisting system comprising a second casing at least partially encasing the line and the plurality of containers as they are lowered is specific to this group of claims.
  
- INVENTION II: Claims 14-17 & 22-24 are directed to a spindle for a seafloor vertical hoisting system, the spindle comprising a frame rotatably connected to a support and a plurality of sheaves rotatably connected to the frame and engaging a line connecting a plurality of containers.
- 
- The feature of a spindle for a seafloor vertical hoisting system comprising a frame and a plurality of sheaves rotatably connected to the frame is specific to this group of claims.
  
- INVENTION III: Claims 18-21 & 22-24 are directed to a spindle for a seafloor vertical hoisting system, the spindle comprising a sheave rotatably connected to a support and engaging a line connecting a plurality of containers and a cradle selectively rotating with the sheave and spacing each of the plurality of containers from the sheave as each of the plurality of containers travel around the sheave.
- 
- The feature of a spindle for a seafloor vertical hoisting system comprising a single sheave rotatably connected to a support and a cradle selectively rotating with the sheave and spacing each of the plurality of containers from the sheave as each of the plurality of containers travel around the sheave is specific to this group of claims.
  
- INVENTION IV: Claims 25 to 28 are directed to a method of constructing a seafloor hoisting system, the method including the steps of providing a plurality of conduits, connecting the plurality of conduits to form a casing, lowering the casing towards the seafloor, providing a line connecting a plurality of containers, locating the line within the casing and providing a drive mechanism to drive the line.
- 
- The feature of a method of constructing a seafloor hoisting system comprising a plurality of conduits forming a single casing is specific to this group of claims.
  
- INVENTION V: Claims 29 to 32 are directed toward a method of hoisting ore from the seafloor, the method including the steps of, using an ore recovery apparatus to provide ore from the seafloor to an ore hopper, feeding ore from the ore hopper into a plurality of containers connected by a line located within a single casing and hoisting the plurality of containers towards an ore receiving vessel.
- 
- The feature of a method of hoisting ore from the seafloor, the method including the steps of, using an ore recovery apparatus to provide ore from the seafloor to an ore hopper, a single casing and hoisting the plurality of containers towards an ore receiving vessel is specific to this group of claims.

**Supplemental Box**

PCT Rule 13.2, first sentence, states that unity of invention is only fulfilled when there is a technical relationship among the claimed inventions involving one or more of the same or corresponding special technical features. PCT Rule 13.2, second sentence, defines a special technical feature as a feature which makes a contribution over the prior art.

When there is no special technical feature common to all the claimed inventions there is no unity of invention.

The person skilled in the art would not consider a **line**, a **plurality of containers**, a **casing** and a **sheave** individually or in combination special technical features in the technical field of seabed mining or the related field of dredging. When there is no special technical feature common to all the claimed inventions there is no unity of invention.

In the above groups of claims, the identified features may have the potential to make a contribution over the prior art but are not common to all the claimed inventions and therefore cannot provide the required technical relationship. Therefore there is no special technical feature common to all the claimed inventions and the requirements for unity of invention are consequently not satisfied *a priori*.

**NOTE:** In response to the invitation to pay additional fees the applicant has under protest paid additional fees for claims 1-17 & 22-24, **INVENTIONS I & II** only. The original search and opinion was therefore only established on **INVENTIONS I & II**. The protest has been considered and the decision was that the invitation for **INVENTIONS I & II** was valid. However it was also found that the invitation to pay additional fees for **INVENTIONS III-V** was not valid and that those inventions should have been searched with **INVENTIONS I & II**. This corrected search and opinion therefore covers all claims 1-32, **INVENTIONS I-V**.

**INTERNATIONAL SEARCH REPORT**

Information on patent family members

International application No.

**PCT/SG2014/000147**

This Annex lists known patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

<b>Patent Document/s Cited in Search Report</b>		<b>Patent Family Member/s</b>	
<b>Publication Number</b>	<b>Publication Date</b>	<b>Publication Number</b>	<b>Publication Date</b>
US 1746649 A	12 November 1928	None	
SU 1102726 A	15 July 1984	None	
EP 0616083 A1	21 September 1994	EP 0616083 B1	04 Jun 1997
		NL 9300481 A	17 Oct 1994
US 3378130 A	16 April 1968	CH 473722 A	15 Jun 1969
		DE 1556311 A1	22 Jan 1970
		FR 1576360 A	01 Aug 1969
		GB 1174966 A	17 Dec 1969
		NL 6713887 A	16 Apr 1968
		NL 158756 B	15 Dec 1978
		NO 127494 B	02 Jul 1973
		NO 128399 B	12 Nov 1973
		SE 341542 B	27 Dec 1971
FR 2633261 A1	29 December 1989	FR 2633261 B1	12 Mar 1993
US 4155491 A	22 May 1979	None	

**End of Annex**