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- 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))

[Continued on next page]

(54) Title: A WAVE POWERED WATER-BORNE VESSEL

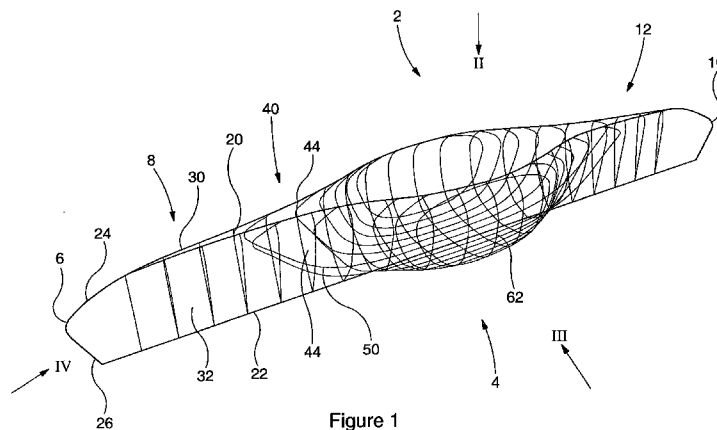


Figure 1

(57) Abstract: A water-borne vessel for propulsion by incident waves is provided, the vessel comprising a hull, the hull of the vessel comprising an elongate bow portion having a length greater than its width at its widest point; an elongate stern portion having a length greater than its width at its widest point; and a central portion between the bow portion and a stern portion, the central portion having a width greater than the widths of the bow and stern portions, the central portion comprising a first flared region at the junction with the bow portion, the first flared portion having a width greater than the width of the adjacent region of the bow portion, and a second flared region at the junction with the stern portion, the second flared region having a width greater than the width of the adjacent region of the stern portion, the central portion having its widest point between the first and second flared regions and greater than the widths of the first and second flared regions; wherein the bow and stern portions act to cut through an incident wave; and wherein the central portion acts to induce the hull to pitch and roll under the action of an incident wave; the vessel further comprising a foil assembly for generating movement of the vessel through the water under the action of an incident wave. A foil assembly for a wave-powered, water-borne craft is also provided, the foil assembly comprising a substantially rigid leading edge assembly having a first end and a second end; a flexible foil extending from the leading edge assembly, the flexible foil having an inner edge and a trailing edge; and a tensioning assembly for tensioning the flexible foil, the tensioning assembly applying a tension to the flexible foil in the direction away from the leading edge assembly and towards the trailing edge of the flexible foil, the tension being provided to the flexible foil at an angle between the inner edge and the trailing edge of the flexible foil.



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1 May 2014

INTERNATIONAL SEARCH REPORT

International application No PCT/GB2013/000298

A. CLASSIFICATION OF SUBJECT MATTER				
INV. B63H19/02	B63B1/04	B63H1/37		
ADD.		B63H1/30		
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) B63H B63B				
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) EPO-Internal				
C. DOCUMENTS CONSIDERED TO BE RELEVANT				
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.		
X	GB 1 176 559 A (GAUSE JOSEPH ARNOST [CA]) 7 January 1970 (1970-01-07) cited in the application page 2, line 21 - page 4, line 67; figures 1-4	1-3,5-8, 10-29, 31-40, 42-48		
X	JP 2002 220082 A (UNIV TOKAI) 6 August 2002 (2002-08-06) cited in the application abstract	1-3,5-8, 10-19		
----- -/--				
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.				
* Special categories of cited documents : <table style="width: 100%; border: none;"> <tr> <td style="width: 50%; border: none; vertical-align: top;"> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier application or patent but published on or after the international filing date</p> <p>"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)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> </td> <td style="width: 50%; border: none; vertical-align: top;"> <p>"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</p> <p>"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</p> <p>"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</p> <p>"&" document member of the same patent family</p> </td> </tr> </table>			<p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier application or patent but published on or after the international filing date</p> <p>"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)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p>	<p>"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</p> <p>"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</p> <p>"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</p> <p>"&" document member of the same patent family</p>
<p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier application or patent but published on or after the international filing date</p> <p>"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)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p>	<p>"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</p> <p>"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</p> <p>"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</p> <p>"&" document member of the same patent family</p>			
Date of the actual completion of the international search	Date of mailing of the international search report			
4 March 2014	11/03/2014			
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer Brumer, Alexandre			

INTERNATIONAL SEARCH REPORT

 International application No
 PCT/GB2013/000298

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	FR 1 440 839 A (LIBERATI, LUC JACK GREGOIRE) 3 June 1966 (1966-06-03) page 1; figures 1-4 -----	1-3, 5-15, 18-22, 26-29, 31-33, 36-38, 45-48
Y	FR 1 540 022 A (GAUSE JOSEPH ARNOST [CA]) 20 September 1968 (1968-09-20) page 2, paragraph 7 - page 3, line 5; figures 1-4 -----	1-3, 5-15, 18-22, 26-29, 31-33, 36-38, 45-48
X	WO 97/49603 A1 (POLLASTRI GIUSEPPE [IT]) 31 December 1997 (1997-12-31) page 3 - page 5; figures 1-10 -----	20,21, 26-29
A	WO 97/48599 A1 (HORRIGAN DAVID J P [US]) 24 December 1997 (1997-12-24) page 5, line 19 - page 8, line 31; figures 1-9 -----	20-44
A	US 2004/195440 A1 (LIU PENGFEI [CA]) 7 October 2004 (2004-10-07) paragraphs [0020] - [0027]; figures 1-5 -----	20-44

INTERNATIONAL SEARCH REPORT

International application No.
PCT/GB2013/000298

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:

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 additional sheet

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 an 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.:
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.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-19

Water-borne vessel hull for propulsion by incident waves.

2. claims: 20-48

Flexible foil assembly for a wave powered water-borne craft.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No PCT/GB2013/000298

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB 1176559 A	07-01-1970	DE 1531748 A1 GB 1176559 A	08-01-1970 07-01-1970

JP 2002220082 A	06-08-2002	JP 4831384 B2 JP 2002220082 A	07-12-2011 06-08-2002

FR 1440839 A	03-06-1966	NONE	

FR 1540022 A	20-09-1968	NONE	

WO 9749603 A1	31-12-1997	EP 0844964 A1 WO 9749603 A1	03-06-1998 31-12-1997

WO 9748599 A1	24-12-1997	AU 3390997 A WO 9748599 A1	07-01-1998 24-12-1997

US 2004195440 A1	07-10-2004	NONE	
