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APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/372,291	02/03/2015	8945256	2200-011 US	1699

27522 7590 01/14/2015  
GOODWIN LAW  
222-602 12 AVE S.W.  
CALGARY, AB T2R 1J3  
CANADA

## ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

### **Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)** (application filed on or after May 29, 2000)

The Patent Term Adjustment is 367 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (<http://pair.uspto.gov>).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Data Management (ODM) at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site <http://pair.uspto.gov> for additional applicants):

Christopher A HEMSTOCK, Calgary, CANADA;

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Receipt date: 07/30/2014

Doc code: IDS

Doc description: Information Disclosure Statement (IDS) Filed

13372291 - GAIL: 1772

P10/05/08a (07-18)

Approved for use through 07/31/2012. OMB 0651-0031

U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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<b>INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b> ( Not for submission under 37 CFR 1.99)	Application Number		13372291	
	Filing Date		2012-02-13	
	First Named Inventor	Christopher A. HEMSTOCK		
	Art Unit	1772		
	Examiner Name	BUI, DUNG H		
	Attorney Docket Number	2200-011 US		

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Examiner Initial*	Cite No	Patent Number	Kind Code <sup>1</sup>	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear		
Change(s) applied to document, /B.G./ 10/29/2014	1	8308959	B2	2012-11-13	Noles, Jr. <del>Express Energy Operating LP</del>			
	2	7429332	B2	2008-09-30	Surjaatmadja, et al. <del>Haliburton Energy Services, Inc.</del>			
If you wish to add additional U.S. Patent citation information please click the Add button.							Add	
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<b>Receipt date: 05/28/2013</b>  <b>INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b> <b>( Not for submission under 37 CFR 1.99)</b>	Application Number		13372291	13372291 - GAU: 1772
	Filing Date		2012-02-13	
	First Named Inventor	Christopher A. HEMSTOCK		
	Art Unit	1774		
	Examiner Name	TBD		
	Attorney Docket Number	2200-011 US		

Change(s) applied

to document,							
/B.G./	4	2002070101	WO		09/2002	Binsfield, B. et al.	<input type="checkbox"/>
10/29/2014							

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Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T <sup>5</sup>
	1	PCT/CA2012/050915 - International Search Report 2012	<input type="checkbox"/>

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**EXAMINER SIGNATURE**

Examiner Signature	/Dung Bui/ (12/30/2013)	Date Considered	
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\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

<sup>1</sup> See Kind Codes of USPTO Patent Documents at [www.USPTO.GOV](http://www.USPTO.GOV) or MPEP 901.04. <sup>2</sup> Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). <sup>3</sup> For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. <sup>4</sup> Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. <sup>5</sup> Applicant is to place a check mark here if English language translation is attached.

Receipt date: 05/28/2013

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Doc description: Information Disclosure Statement (IDS) Filed

13372291 - GAIL: 1772

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Examiner Initial*	Cite No	Foreign Document Number <sup>3</sup>	Country Code <sup>2</sup> j	Kind Code <sup>4</sup>	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T <sup>5</sup>
	1	2433741	CA		10/2003	Hemstock, C. et al.		<input type="checkbox"/>
	2	773096	GB		04/1957	Laird, A.		<input type="checkbox"/>
	3	2041479	CA		10/1992	Martin, R.		<input type="checkbox"/>

Change(s) applied  
to document,  
/D.B./  
10/29/2014

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(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/372,291	02/13/2012	Christopher A HEMSTOCK	2200-011 US	1699

TITLE OF INVENTION: DESANDING APPARATUS AND SYSTEM

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	\$480	\$0	\$0	\$480	12/15/2014
EXAMINER		ART UNIT	CLASS-SUBCLASS			
BUI, DUNG H		1772	055-319000			

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

- ☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
- ☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

- (1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
- (2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 **Sean W Goodwin**

2 \_\_\_\_\_

3 \_\_\_\_\_

## 3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

**SPECIALIZED DESANDERS INC. CALGARY, CANADA**

Please check the appropriate assignee category or categories (will not be printed on the patent): ☐ Individual ☒ Corporation or other private group entity ☐ Government

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- ☒ Publication Fee (No small entity discount permitted)
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- ☐ Applicant certifying micro entity status. See 37 CFR 1.29
- ☐ Applicant asserting small entity status. See 37 CFR 1.27
- ☒ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature *Sean W Goodwin*  
Typed or printed name **SEAN W GOODWIN**

Date **Dec 5/14**  
Registration No. **39568**

## Electronic Patent Application Fee Transmittal

<b>Application Number:</b>	13372291			
<b>Filing Date:</b>	13-Feb-2012			
<b>Title of Invention:</b>	DESANDING APPARATUS AND SYSTEM			
<b>First Named Inventor/Applicant Name:</b>	Christopher A HEMSTOCK			
<b>Filer:</b>	Sean Goodwin/Nancy Kent Rempel			
<b>Attorney Docket Number:</b>	2200-011 US			
Filed as Large Entity				
<b>Filing Fees for    Utility under 35 USC 111(a)</b>				
<b>Description</b>	<b>Fee Code</b>	<b>Quantity</b>	<b>Amount</b>	<b>Sub-Total in USD(\$)</b>
<b>Basic Filing:</b>				
<b>Pages:</b>				
<b>Claims:</b>				
<b>Miscellaneous-Filing:</b>				
<b>Petition:</b>				
<b>Patent-Appeals-and-Interference:</b>				
<b>Post-Allowance-and-Post-Issuance:</b>				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Reissue issue fee	1511	1	960	960
Publ. Fee- Early, Voluntary, or Normal	1504	1	0	0
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				960

## Electronic Acknowledgement Receipt

<b>EFS ID:</b>	20937281
<b>Application Number:</b>	13372291
<b>International Application Number:</b>	
<b>Confirmation Number:</b>	1699
<b>Title of Invention:</b>	DESANDING APPARATUS AND SYSTEM
<b>First Named Inventor/Applicant Name:</b>	Christopher A HEMSTOCK
<b>Customer Number:</b>	27522
<b>Filer:</b>	Sean Goodwin/Nancy Kent Rempel
<b>Filer Authorized By:</b>	Sean Goodwin
<b>Attorney Docket Number:</b>	2200-011 US
<b>Receipt Date:</b>	11-DEC-2014
<b>Filing Date:</b>	13-FEB-2012
<b>Time Stamp:</b>	16:18:35
<b>Application Type:</b>	Utility under 35 USC 111(a)

### Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	\$960
RAM confirmation Number	3115
Deposit Account	
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The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

<b>File Listing:</b>					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Issue Fee Payment (PTO-85B)	PTOL_85_Issue_Fee.pdf	96311	no	1
			7dacd4767ed19ce3bdea1887c919d371a808caba		
<b>Warnings:</b>					
<b>Information:</b>					
2	Fee Worksheet (SB06)	fee-info.pdf	32403	no	2
			7567e87cad874478667db564283b2029ced44146		
<b>Warnings:</b>					
<b>Information:</b>					
<b>Total Files Size (in bytes):</b>			128714		
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	ART UNIT	CLASS-SUBCLASS
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2 \_\_\_\_\_

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Date

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Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
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Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				960

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<b>EFS ID:</b>	20936924
<b>Application Number:</b>	13372291
<b>International Application Number:</b>	
<b>Confirmation Number:</b>	1699
<b>Title of Invention:</b>	DESANDING APPARATUS AND SYSTEM
<b>First Named Inventor/Applicant Name:</b>	Christopher A HEMSTOCK
<b>Customer Number:</b>	27522
<b>Filer:</b>	Sean Goodwin/Nancy Kent Rempel
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<b>Attorney Docket Number:</b>	2200-011 US
<b>Receipt Date:</b>	11-DEC-2014
<b>Filing Date:</b>	13-FEB-2012
<b>Time Stamp:</b>	16:05:40
<b>Application Type:</b>	Utility under 35 USC 111(a)

### Payment information:

Submitted with Payment	no
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### File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Issue Fee Payment (PTO-85B)	PTOL_85_Issue_Fee.pdf	96311 7dacd4767ed19ce3bdea1887c919d371a808caba	no	1

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### Information:

2	Fee Worksheet (SB06)	fee-info.pdf	32403 dcbde0e3e1187862853289fd969070a3949bde11	no	2
<b>Warnings:</b>					
<b>Information:</b>					
<b>Total Files Size (in bytes):</b>				128714	
<p><b>This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.</b></p> <p><b><u>New Applications Under 35 U.S.C. 111</u></b>  <b>If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.</b></p> <p><b><u>National Stage of an International Application under 35 U.S.C. 371</u></b>  <b>If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.</b></p> <p><b><u>New International Application Filed with the USPTO as a Receiving Office</u></b>  <b>If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.</b></p>					

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 GOODWIN McKAY  
 222-602 12 AVE S.W.  
 CALGARY, AB T2R 1J3  
 CANADA



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**Certificate of Mailing or Transmission**  
 I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/372,291	02/13/2012	Christopher A HEMSTOCK	2200-011 US	1699

TITLE OF INVENTION: DESANDING APPARATUS AND SYSTEM

12/12/2014 HVUONG2 00000037 13372291

01 FC:1501

960.00 0P

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	\$480	\$0	\$0	\$480	12/15/2014

EXAMINER	ART UNIT	CLASS-SUBCLASS
BUI, DUNG H	1772	055-319000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).  
☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.  
☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. Use of a Customer Number is required.

2. For printing on the patent front page, list  
 (1) The names of up to 3 registered patent attorneys or agents OR, alternatively,  
 (2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 Sean W Goodwin  
 2  
 3

## 3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY AND STATE OR COUNTRY)

SPECIALIZED DESANDERS INC. CALGARY, CANADA

Please check the appropriate assignee category or categories (will not be printed on the patent): ☐ Individual ☒ Corporation or other private group entity ☐ Government

## 4a. The following fee(s) are submitted:

- ☒ Issue Fee  
☒ Publication Fee (No small entity discount permitted)  
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- ☐ A check is enclosed.  
☐ Payment by credit card. Form PTO-2038 is attached.  
☐ The Director is hereby authorized to charge the required fee(s), any deficiency, or credits any overpayment, to Deposit Account Number \_\_\_\_\_ (enclose an extra copy of this form).

## 5. Change in Entity Status (from status indicated above)

- ☐ Applicant certifying micro entity status. See 37 CFR 1.29  
☐ Applicant asserting small entity status. See 37 CFR 1.27  
☒ Applicant changing to regular undiscounted fee status.

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NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature Sean W Goodwin  
 Typed or printed name SEAN W GOODWIN

Date Dec 5/14  
 Registration No. 39568

Void date: 12/12/2014 HVUONG2

12/12/2014 INTEFSW 00003115 13372291

01 FC:1511

-960.00 0P

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE PATENT**

In re patent application of:

**Christopher A HEMSTOCK**

**Att. Docket No.: 2200-011 US**

**Serial No.: 13/372,291**

**Examiner: BUI, DUNG H**

**Conf No: 1699**

**Filed: February 13, 2012**

**Group Art Unit: 1772**

**Title: DESANDING APPARATUS AND SYSTEM**

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

OK TO ENTER: /D.B./ (11/14/2014)

**Via EFS -WEB**

**VOLUNTARY AMENDMENT AFTER NOTICE OF ALLOWANCE**

This correspondence is the submission of voluntary amendment to the claims after Notice of Allowance to correct a grammatical issue in claim 1. Several telephone conversations with the Examiner have been made in resolving this issue.

After amendment, there are 16 total claims and two independent claims. Accordingly, Applicant believes no excess claim fees are required.



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
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P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/372,291	02/13/2012	Christopher A HEMSTOCK	2200-011 US	1699
27522	7590	11/18/2014		
GOODWIN McKAY 222-602 12 AVE S.W. CALGARY, AB T2R 1J3 CANADA			EXAMINER BUI, DUNG H	
			ART UNIT	PAPER NUMBER
			1772	
			MAIL DATE	DELIVERY MODE
			11/18/2014	PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Response to Rule 312 Communication</b>	<b>Application No.</b> 13/372,291	<b>Applicant(s)</b> HEMSTOCK, CHRISTOPHER A
	<b>Examiner</b> DUNG H. BUI	<b>Art Unit</b> 1772
<p align="center"><b>-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --</b></p> <p>1. <input checked="" type="checkbox"/> The amendment filed on <u>31 October 2014</u> under 37 CFR 1.312 has been considered, and has been:</p> <p>a) <input checked="" type="checkbox"/> entered.</p> <p>b) <input type="checkbox"/> entered as directed to matters of form not affecting the scope of the invention.</p> <p>c) <input type="checkbox"/> disapproved because the amendment was filed after the payment of the issue fee.  Any amendment filed after the date the issue fee is paid must be accompanied by a petition under 37 CFR 1.313(c)(1) and the required fee to withdraw the application from issue.</p> <p>d) <input type="checkbox"/> disapproved. See explanation below.</p> <p>e) <input type="checkbox"/> entered in part. See explanation below.</p>		
		/DUNG H BUI/ Examiner, Art Unit 1772

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE PATENT**

In re patent application of:

**Christopher A HEMSTOCK**

**Att. Docket No.: 2200-011 US**

**Serial No.: 13/372,291**

**Examiner: BUI, DUNG H**

**Conf No: 1699**

**Filed: February 13, 2012**

**Group Art Unit: 1772**

**Title: DESANDING APPARATUS AND SYSTEM**

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

**Via EFS -WEB**

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After amendment, there are 16 total claims and two independent claims. Accordingly, Applicant believes no excess claim fees are required.

**IN THE CLAIMS**

Please replace the claims currently on file with the following claims:

1. (Currently Amended) A desanding system for receiving a gas stream containing entrained liquid and particulates comprising:

a vessel elongated along a longitudinal axis and having a fluid inlet adjacent a first end of the vessel and a fluid outlet spaced along the longitudinal axis from the fluid inlet towards a second end of the vessel, said vessel being inclined from a horizontal at a non-zero inclination angle ~~entire-at all times~~ of-during operation such that the fluid outlet is lower than the fluid inlet, the fluid inlet discharging the gas stream into the vessel at an inlet velocity, the gas stream travelling down the inclined vessel to the fluid outlet, the vessel having:

a gas/liquid interface formed at the fluid outlet having a belly storage portion formed therebelow and a freeboard portion formed adjacent an upper portion of the vessel above the interface, the freeboard portion having a freeboard cross-sectional area which diminishes along the inclined vessel from the fluid inlet to the fluid outlet; and

the freeboard portion at the fluid inlet causing the gas stream to have a freeboard velocity adjacent the fluid inlet which is less than the velocity of the fluid in the inlet, wherein

the freeboard velocity is such that the entrained liquids and particulates fall out of the gas stream and collect in the belly storage portion, and

wherein a desanded gas/liquid stream flows out of the freeboard portion and out the fluid outlet, being free of a substantial portion of the particulates, and

particulates accumulate in the belly portion for flowing downvessel towards said second end.

2. (Original) The desanding system of claim 1 wherein fluid inlet has a discharge end, the discharge end oriented for discharging the gas stream into the freeboard portion.

3. (Original) The desanding system of claim 1 wherein discharge end of the fluid inlet directs the gas stream into the freeboard portion and parallel to the longitudinal axis.

4. (Original) The desanding system of claim 1 wherein the fluid inlet further comprises a replaceable nozzle having a discharge end oriented for discharging the gas stream into the freeboard portion.

5. (Previously Presented) The desanding system of claim 4 wherein the replaceable nozzle is connected to the fluid inlet at a flange.

6. (Original) The desanding system of claim 1 wherein the gas stream emanates from a wellhead and the fluid inlet further comprises:

a discharge end for directing the gas stream into the freeboard portion and parallel to the longitudinal axis;

a receiving end for receiving the gas stream and orthogonal to the

wellhead.

7. (Original) The desanding system of claim 1 further comprising:

a conduit for conducting a fluid stream containing entrained particulates from a wellhead, the conduit having a desander end; and

wherein the fluid inlet further comprises a discharge end for directing the fluid stream into the freeboard portion and oriented parallel to the longitudinal axis, and a receiving end for receiving the gas stream and oriented orthogonal to the desander end.

8. (Original) The desanding system of claim 1 wherein the inclination angle is variable for varying fluid stream conditions.

9. (Previously Presented) A method for desanding a fluid stream emanating from a wellhead, the fluid stream containing gas, entrained liquid and particulates, the method comprising:

providing an elongated vessel having a longitudinal axis, a fluid inlet adjacent a first end of the vessel and a fluid outlet spaced along the longitudinal axis from the fluid inlet;

inclining the vessel at angle from horizontal at a non-zero inclination angle so that the fluid outlet is lower than the fluid inlet for forming a freeboard above the fluid outlet;

discharging the fluid stream from the fluid inlet, into the inclined vessel and substantially parallel to the longitudinal axis for

establishing a liquid interface in a belly portion of the vessel, the belly portion being formed below the fluid outlet, and

directing the liquid and particulates along a trajectory in the freeboard portion of the vessel to intercept a substantial portion of the particulates at the liquid interface for storage in the belly portion; and

recovering a desanded gas stream at the fluid outlet which is substantially free of particulates.

10. (Previously Presented) The desanding system of claim 1 wherein said gas/liquid interface is formed during operation, the gas/liquid interface extending horizontally from about the fluid outlet.

11. (Previously Presented) The desanding system of claim 1 wherein said the cross-section area of the freeboard portion is at its greatest adjacent the fluid inlet.

12. (Previously Presented) The desanding system of claim 1 wherein said inclination angle is between about 2 degrees and about 20 degrees.

13. (Previously Presented) The desanding system of claim 1 further comprising: an access closure at said second end for removal of accumulated particulates.

14. (Previously Presented) The desanding system of claim 1 wherein said vessel has a smaller diameter downstream of the fluid outlet than the diameter of other portion of the vessel.

15. (Previously Presented) The desanding system of claim 14 wherein second end of the vessel is an eccentric end.

16. (Previously Presented) The method of claim 9 further comprising:  
accumulating particulates in said belly portion; and  
periodically removing accumulated particulates.

**REMARKS**

In telephone messages and a telephone conversation, it was agreed that the grammatical issue could be resolved.

Applicant thus has amended claim 1 for that set forth in Examiner's Amendment.

Applicant believes that the above amendment to the claims is for grammatical correction in nature. The above amendment to the claims does not introduce any new subject matter, nor changes the scope of the allowed claims.

Applicant respectfully requests that the amendments be entered into the application as filed. Continued allowance of amended claims 1-16 is respectfully requested.

**Examiner's Amendment**

**The Examiner's amendment entered on Sep. 15, 2014 inserts "entire at all time of" after "a non-zero inclination angle" in Claim 1, line 6 (See page 2 of Examiner initiated interview summary (PTOL-413B) dated Sep. 15, 2014). Claim 1 then reads:**

1. A desanding system for receiving a gas stream containing entrained liquid and particulates comprising:

a vessel elongated along a longitudinal axis and having a fluid inlet adjacent a first end of the vessel and a fluid outlet spaced along the longitudinal axis from the fluid inlet towards a second end of the vessel, said vessel being inclined from a horizontal at a non-zero inclination angle entire at all time of during operation such that the fluid outlet is lower than the fluid inlet, the fluid inlet discharging the gas stream into the vessel at an inlet velocity, the gas stream travelling down the inclined vessel to the fluid outlet, the vessel having: ...

[Emphasis added; the rest of claim 1 is omitted here]

Applicant noticed that the amended phrase underlined above was grammatically incorrect. Applicant therefore submits amendment, i.e., replacing “entire at all time of during operation” with “at all times during operation”, as follows:

1. A desanding system for receiving a gas stream containing entrained liquid and particulates comprising:

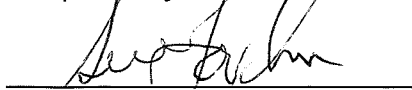
a vessel elongated along a longitudinal axis and having a fluid inlet adjacent a first end of the vessel and a fluid outlet spaced along the longitudinal axis from the fluid inlet towards a second end of the vessel, said vessel being inclined from a horizontal at a non-zero inclination angle ~~entire-at all times of~~ during operation such that the fluid outlet is lower than the fluid inlet, the fluid inlet discharging the gas stream into the vessel at an inlet velocity, the gas stream travelling down the inclined vessel to the fluid outlet, the vessel having: ...

[Emphasis added; the rest of claim 1 is omitted here, and is the same as the corresponding portion of the previously presented claim 1.]

Applicant respectfully submits that the amendment only corrects a grammatical issue, and does not change the scope of the claim. The amended claim 1 is still within the scope of the Examiner's statement of reasons for allowance.

Continued allowance of claims 1-16 is therefore respectfully requested.

Respectfully submitted,



Sean W. Goodwin, #39568

Cust. No. **27522**

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222-602 12 AVE SW  
Calgary, Alberta, T2R 1J3, Canada  
Phone (403) 203-0107- Facsimile (403) 203-0403  
[sean@patentfile.com](mailto:sean@patentfile.com)

Date: October 31, 2014

## Electronic Acknowledgement Receipt

<b>EFS ID:</b>	20574261
<b>Application Number:</b>	13372291
<b>International Application Number:</b>	
<b>Confirmation Number:</b>	1699
<b>Title of Invention:</b>	DESANDING APPARATUS AND SYSTEM
<b>First Named Inventor/Applicant Name:</b>	Christopher A HEMSTOCK
<b>Customer Number:</b>	27522
<b>Filer:</b>	Sean Goodwin/Luqing Wang
<b>Filer Authorized By:</b>	Sean Goodwin
<b>Attorney Docket Number:</b>	2200-011 US
<b>Receipt Date:</b>	31-OCT-2014
<b>Filing Date:</b>	13-FEB-2012
<b>Time Stamp:</b>	13:35:25
<b>Application Type:</b>	Utility under 35 USC 111(a)

### Payment information:

Submitted with Payment	no
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### File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Amendment after Notice of Allowance (Rule 312)	Voluntary_Amendment.pdf	251327 7bf5d63ed49f669ef1e9aea5cc014a970b608a48	no	8

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If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

**National Stage of an International Application under 35 U.S.C. 371**

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

**New International Application Filed with the USPTO as a Receiving Office**

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.



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## NOTICE OF ALLOWANCE AND FEE(S) DUE

27522 7590 09/15/2014  
GOODWIN McKAY  
222-602 12 AVE S.W.  
CALGARY, AB T2R 1J3  
CANADA

EXAMINER

BUI, DUNG H

ART UNIT

PAPER NUMBER

1772

DATE MAILED: 09/15/2014

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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13/372,291

02/13/2012

Christopher A HEMSTOCK

2200-011 US

1699

TITLE OF INVENTION: DESANDING APPARATUS AND SYSTEM

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	\$480	\$0	\$0	\$480	12/15/2014

**THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.**

**THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.**

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If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

**IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.**

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Complete and send this form, together with applicable fee(s), to: **Mail** **Mail Stop ISSUE FEE**  
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**P.O. Box 1450**  
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**or Fax (571)-273-2885**

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

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Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

27522 7590 09/15/2014  
**GOODWIN McKAY**  
**222-602 12 AVE S.W.**  
**CALGARY, AB T2R 1J3**  
**CANADA**

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I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/372,291	02/13/2012	Christopher A HEMSTOCK	2200-011 US	1699

TITLE OF INVENTION: DESANDING APPARATUS AND SYSTEM

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EXAMINER	ART UNIT	CLASS-SUBCLASS
BUI, DUNG H	1772	055-319000

<p>1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).</p> <p><input type="checkbox"/> Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.</p> <p><input type="checkbox"/> "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. <b>Use of a Customer Number is required.</b></p>	<p>2. For printing on the patent front page, list</p> <p>(1) The names of up to 3 registered patent attorneys or agents OR, alternatively, 1 _____</p> <p>(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed. 2 _____</p> <p>3 _____</p>
---	---

## 3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

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(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ☐ Individual ☐ Corporation or other private group entity ☐ Government

<p>4a. The following fee(s) are submitted:</p> <p><input type="checkbox"/> Issue Fee</p> <p><input type="checkbox"/> Publication Fee (No small entity discount permitted)</p> <p><input type="checkbox"/> Advance Order - # of Copies _____</p>	<p>4b. Payment of Fee(s): (Please first reapply any previously paid issue fee shown above)</p> <p><input type="checkbox"/> A check is enclosed.</p> <p><input type="checkbox"/> Payment by credit card. Form PTO-2038 is attached.</p> <p><input type="checkbox"/> The Director is hereby authorized to charge the required fee(s), any deficiency, or credits any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).</p>
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☐ Applicant certifying micro entity status. See 37 CFR 1.29

☐ Applicant asserting small entity status. See 37 CFR 1.27

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Authorized Signature \_\_\_\_\_ Date \_\_\_\_\_

Typed or printed name \_\_\_\_\_ Registration No. \_\_\_\_\_



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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/372,291	02/13/2012	Christopher A HEMSTOCK	2200-011 US	1699

27522 7590 09/15/2014  
GOODWIN McKAY  
222-602 12 AVE S.W.  
CALGARY, AB T2R 1J3  
CANADA

EXAMINER
----------

BUI, DUNG H

ART UNIT	PAPER NUMBER
----------	--------------

1772

DATE MAILED: 09/15/2014

## Determination of Patent Term Adjustment under 35 U.S.C. 154 (b) (Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

## OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

### Privacy Act Statement

**The Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.



<b>Notice of Allowability</b>	<b>Application No.</b> 13/372,291	<b>Applicant(s)</b> HEMSTOCK, CHRISTOPHER A	
	<b>Examiner</b> DUNG H. BUI	<b>Art Unit</b> 1772	<b>AIA (First Inventor to File) Status</b> No

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--**

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to 07/28/14.  
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on \_\_\_\_\_.
2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on \_\_\_\_\_; the restriction requirement and election have been incorporated into this action.
3. ☒ The allowed claim(s) is/are 1-16. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see [http://www.uspto.gov/patents/init\\_events/pph/index.jsp](http://www.uspto.gov/patents/init_events/pph/index.jsp) or send an inquiry to [PPHfeedback@uspto.gov](mailto:PPHfeedback@uspto.gov).
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

**Certified copies:**

- a) ☐ All    b) ☐ Some    \*c) ☐ None of the:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

\* Certified copies not received: \_\_\_\_\_.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

5. ☐ CORRECTED DRAWINGS ( as "replacement sheets") must be submitted.  
☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date \_\_\_\_\_.  
**Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).**
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

**Attachment(s)**

- |  |  |
|--|--|
| 1. <input type="checkbox"/> Notice of References Cited (PTO-892)   | 5. <input checked="" type="checkbox"/> Examiner's Amendment/Comment                  |
| 2. <input checked="" type="checkbox"/> Information Disclosure Statements (PTO/SB/08),<br>Paper No./Mail Date <u>07/30/14</u> | 6. <input checked="" type="checkbox"/> Examiner's Statement of Reasons for Allowance |
| 3. <input type="checkbox"/> Examiner's Comment Regarding Requirement for Deposit<br>of Biological Material                   | 7. <input type="checkbox"/> Other _____.   |
| 4. <input checked="" type="checkbox"/> Interview Summary (PTO-413),<br>Paper No./Mail Date <u>09/12/14</u> .                 |  |

## DETAILED ACTION

### ***Notice of Pre-AIA or AIA Status***

1. The present application is being examined under the pre-AIA first to invent provisions.

### EXAMINER'S AMENDMENT

2. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Sean W. Goodwin on 09/12/2014.

The application has been amended as follows:

- In Claim 1, line 6, after "a non-zero inclination angle" --entire at all time of-- has been inserted.

3. The following is an examiner's statement of reasons for allowance:

Claim 1 recites "a desanding system for receiving a gas stream containing entrained liquid and particulates comprising: a vessel elongated along a longitudinal axis and having a fluid inlet adjacent a first end of the vessel and a fluid outlet spaced along the longitudinal axis from the fluid inlet towards a second end of the vessel, said vessel being inclined from a horizontal at a non-zero inclination angle during entire at all time of operation such that the fluid outlet is lower than the fluid inlet, the fluid inlet discharging the gas stream into the vessel at an inlet velocity, the gas stream travelling

Art Unit: 1772

down the inclined vessel to the fluid outlet, the vessel having: a gas/liquid interface at the fluid outlet having a belly storage portion formed therebelow and a freeboard portion formed adjacent an upper portion of the vessel above the interface, the freeboard portion having a freeboard cross-sectional area which diminishes along the inclined vessel from the fluid inlet to the fluid outlet; and the freeboard portion at the fluid inlet causing the gas stream to have a freeboard velocity adjacent the fluid inlet which is less than the velocity of the fluid in the inlet, wherein the freeboard velocity is such that the entrained liquids and particulates fall out of the gas stream and collect in the belly storage portion, and wherein a desanded gas/liquid stream flows out of the freeboard portion and out the fluid outlet, being free of a substantial portion of the particulates, and particulates accumulate in the belly portion for flowing down vessel towards said second end.”

Lowrie discloses a single, horizontally extended cylinder that receives at one end a mixture of produced fluids from an oil well. Baffles within the shell control the liquids of the production during pitch and roll to prevent agitation of the separating liquids.

Lowrie does not teach or suggest a vessel elongated along a longitudinal axis and having a fluid inlet adjacent a first end of the vessel and a fluid outlet spaced along the longitudinal axis from the fluid inlet towards a second end of the vessel, said vessel being inclined from a horizontal at a non-zero inclination angle during entire at all time of operation such that the fluid outlet is lower than the fluid inlet, the fluid inlet discharging the gas stream into the vessel at an inlet velocity, the gas stream travelling down the inclined vessel to the fluid outlet, the vessel having: a gas/liquid interface at the fluid

Art Unit: 1772

outlet having a belly storage portion formed therebelow and a freeboard portion formed adjacent an upper portion of the vessel above the interface, the freeboard portion having a freeboard cross-sectional area which diminishes along the inclined vessel from the fluid inlet to the fluid outlet; and the freeboard portion at the fluid inlet causing the gas stream to have a freeboard velocity adjacent the fluid inlet which is less than the velocity of the fluid in the inlet, wherein the freeboard velocity is such that the entrained liquids and particulates fall out of the gas stream and collect in the belly storage portion, and wherein a desanded gas/liquid stream flows out of the freeboard portion and out the fluid outlet, being free of a substantial portion of the particulates, and particulates accumulate in the belly portion for flowing down vessel towards said second end.

Claims 1-8 and 10-15 depend on claim 1; and hence are also allowed.

Claim 9 is also allowed because Lowrie discloses mechanical containment, or restraining movement, of separating oil field fluids to minimize disruption of the separation process during pitch and roll of the separation unit instead of a process for desanding a fluid stream emanating from a wellhead. Claim 16 depends on claim 9; and hence is also allowed.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

***Conclusion***


Any inquiry concerning this communication or earlier communications from the examiner should be directed to DUNG H. BUI whose telephone number is (571)270-7077. The examiner can normally be reached on Mon. - Thurs., 7:30 a.m.-5 p.m., EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bullock Insuk can be reached on (571)272-5954. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/DUNG H BUI/  
Examiner, Art Unit 1772



<b>Search Notes</b>  	<b>Application/Control No.</b>  13372291	<b>Applicant(s)/Patent Under Reexamination</b>  HEMSTOCK, CHRISTOPHER A
	<b>Examiner</b>  DUNG H BUI	<b>Art Unit</b>  1772

CPC- SEARCHED		
Symbol	Date	Examiner

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
55	319	4/27/2014	db
210	519,539,540,541,532.1,537	4/27/2014	db
95	253	4/27/2014	db
96	182,183,184	4/27/2014	db


SEARCH NOTES		
Search Notes	Date	Examiner
Inventor and Text search - see search history in EAST	4/27/2014	db
Updated search	9/9/2014	db

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner
55	319	9/12/2014	db
95	253	9/12/2014	db
96	182,183,184	9/12/2014	db
210	519,539,540,541,532.1,537	9/12/2014	db

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<b>Issue Classification</b> 	<b>Application/Control No.</b> 13372291	<b>Applicant(s)/Patent Under Reexamination</b> HEMSTOCK, CHRISTOPHER A
	<b>Examiner</b> DUNG H BUI	<b>Art Unit</b> 1772

<input type="checkbox"/> Claims renumbered in the same order as presented by applicant															
<input type="checkbox"/> CPA															
<input type="checkbox"/> T.D.															
<input type="checkbox"/> R.1.47															
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		<b>Total Claims Allowed:</b>	
(Assistant Examiner)		16	
(Date)			
/DUNG H BUI/ Examiner.Art Unit 1772		O.G. Print Claim(s)	O.G. Print Figure
09/12/2014		1	2
(Primary Examiner)		(Date)	

Receipt date: 07/30/2014

Doc code: IDS

Doc description: Information Disclosure Statement (IDS) Filed

13372291 - GAI: 1772

Approved for use through 07/31/2012. OMB 0651-0031

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<b>INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b> ( Not for submission under 37 CFR 1.99)	Application Number		13372291	
	Filing Date		2012-02-13	
	First Named Inventor	Christopher A. HEMSTOCK		
	Art Unit	1772		
	Examiner Name	BUI, DUNG H		
	Attorney Docket Number	2200-011 US		

U.S.PATENTS						Remove
Examiner Initial*	Cite No	Patent Number	Kind Code <sup>1</sup>	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	8308959	B2	2012-11-13	Express Energy Operating LP	
	2	7429332	B2	2008-09-30	Halliburton Energy Services, Inc.	

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<b>Receipt date: 07/30/2014</b>  <b>INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b> <b>( Not for submission under 37 CFR 1.99)</b>	Application Number		13372291	13372291 - GAU: 1772
	Filing Date		2012-02-13	
	First Named Inventor	Christopher A. HEMSTOCK		
	Art Unit	1772		
	Examiner Name	BUI, DUNG H		
	Attorney Docket Number	2200-011 US		

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T <sup>5</sup>
	1		<input type="checkbox"/>

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#### EXAMINER SIGNATURE

Examiner Signature	/Dung Bui/ (08/31/2014)	Date Considered	
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\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

<sup>1</sup> See Kind Codes of USPTO Patent Documents at [www.USPTO.GOV](http://www.USPTO.GOV) or MPEP 901.04. <sup>2</sup> Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). <sup>3</sup> For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. <sup>4</sup> Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. <sup>5</sup> Applicant is to place a check mark here if English language translation is attached.

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L5	11	((sand or desand) same ((vessel or tank or shell) with inclin\$6) and (separating or separator or separation)).clm.	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2014/09/12 14:25
S27	2	("7429332"   "8308959").PN.	US-PGPUB; USPAT	OR	ON	2014/09/09 23:09
S28	1475	vessel with eccentric	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2014/09/10 01:01
S29	4786	(210/519,539,540,541,532.1,537 or 95/253 or 96/182,183,184).ccls.	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2014/09/10 01:02
S30	5	S28 and S29	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2014/09/10 01:02
S31	153	(vessel with eccentric) same (outlet or outflow)	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2014/09/10 01:04
S32	73	(vessel with eccentric) with (outlet or outflow)	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2014/09/10 01:07
S33	15610	bui.xa. or bui.xp.	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2014/09/10 01:15
S34	268589	("55"/\$ or "95"/\$ or "96"/\$ or "210"/\$).ccls.	US-PGPUB; USPAT; USOCR; EPO;	OR	ON	2014/09/10 01:15

			JPO			
S35	476	S33 and S34	US- PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2014/09/10 01:16
S36	3654	55/428,429-433.ccls.	US- PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2014/09/10 01:24
S37	1	S28 and S36	US- PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2014/09/10 01:24
S38	239	vessel and S36	US- PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2014/09/10 01:25
S39	7	("1095463"   "20080105616"   "4539023"   "5064448"   "6709500"   "7654397").PN. OR ("8657896").URPN.	US- PGPUB; USPAT; USOCR	OR	ON	2014/09/10 01:32
S40	48	("2368443"   "2874798"   "3574303"   "3593500"   "3656281"   "3667430"   "3712272"   "3713278"   "3744459"   "3745978"   "3750371"   "3863608"   "3923008"   "3923009"   "3923010"   "3996897"   "4007518"   "4015562"   "4016835"   "4019881"   "4047506"   "4114684"   "4136734"   "4143619"   "4156403"   "4248181"   "4302227"   "4312303"   "4386583"   "4485069"   "4522156"   "4528946"   "4530814"   "4589893"   "4607689"   "4671214"   "4675963"   "4685511"   "4702308"   "4708093"   "4714054"   "4717400"   "4856461"   "4898123"   "4905631"   "6773492").PN. OR ("7993426").URPN.	US- PGPUB; USPAT; USOCR	OR	ON	2014/09/10 01:34
S41	73	("0205201"   "0331785"   "1359547"   "1458005"   "1817338"   "1914147"   "1960657"   "1989206"   "2213233"   "2876862"   "2943460"   "2980204"   "3102014"   "3186551"   "3228174"   "3280979"   "3307335"   "3454129"   "3470979"   "3483678"   "3519024"   "3599398"   "3633343"   "3742680").PN. OR ("4297116").URPN.	US- PGPUB; USPAT; USOCR	OR	ON	2014/09/10 01:36
S42	915	(maintenance or cleaning or changing) with (access) with (enclosure or door or cover or lid or opening) with (vessel or tank)	US- PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2014/09/10 01:40
S43	154	S42 and S34	US-	OR	ON	2014/09/10

			PGPUB; USPAT; USOCR; EPO; JPO			01:40
S44	15753	(maintenance or cleaning or changing) with (access) with (enclosure or door or cover or lid or opening)	US- PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2014/09/10 01:44
S45	101192	("55"/\$ or "95"/\$ or "96"/\$).ccls.	US- PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2014/09/10 01:44
S46	532	S44 and S45	US- PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2014/09/10 01:44
S47	55	vessel and S46	US- PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2014/09/10 01:45
S48	15507	(maintenance or cleaning or changing) with (access) with (closure or door or cover or lid or opening)	US- PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2014/09/10 01:49
S49	1566	vessel and S48	US- PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2014/09/10 01:49
S50	55	S49 and S45	US- PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2014/09/10 01:50
S51	553	vessel same S48	US- PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2014/09/10 01:51
S52	52	S51 and S34	US- PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2014/09/10 01:51
S53	5948	(sand or desand) same (vessel or tank or	US-	OR	ON	2014/09/11

		shell) same (separating or separator or separation)	PGPUB; USPAT; USOCR; EPO; JPO			14:54
S54	489	(sand or desand) same (vessel or tank or shell) same (separating or separator or separation) same inclin\$5	US- PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2014/09/11 14:55
S55	222	(sand or desand) same ((vessel or tank or shell) with inclin\$6) same (separating or separator or separation)	US- PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2014/09/11 15:00

**EAST Search History (I nterference)**

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**9/ 12/ 2014 2:26:48 PM**  
**C:\ Users\ dbui1\ Documents\ EAST\ Workspaces\ 13372291.wsp**

<b>INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b> ( Not for submission under 37 CFR 1.99)	Application Number		13372291
	Filing Date		2012-02-13
	First Named Inventor	Christopher A. HEMSTOCK	
	Art Unit	1772	
	Examiner Name	BUI, DUNG H	
	Attorney Docket Number	2200-011 US	

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<b>INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b> ( Not for submission under 37 CFR 1.99)	Application Number		13372291
	Filing Date		2012-02-13
	First Named Inventor	Christopher A. HEMSTOCK	
	Art Unit	1772	
	Examiner Name	BUI, DUNG H	
	Attorney Docket Number	2200-011 US	

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T <sup>5</sup>
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**INFORMATION DISCLOSURE  
STATEMENT BY APPLICANT**  
( Not for submission under 37 CFR 1.99)

Application Number	13372291
Filing Date	2012-02-13
First Named Inventor	Christopher A. HEMSTOCK
Art Unit	1772
Examiner Name	BUI, DUNG H
Attorney Docket Number	2200-011 US

**CERTIFICATION STATEMENT**

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

**OR**

☒ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

- ☐ See attached certification statement.
- ☐ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.
- ☐ A certification statement is not submitted herewith.

**SIGNATURE**

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/seanwgoodwin/	Date (YYYY-MM-DD)	2014-07-30
Name/Print	Sean W. Goodwin	Registration Number	39568

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<b>EFS ID:</b>	19731848
<b>Application Number:</b>	13372291
<b>International Application Number:</b>	
<b>Confirmation Number:</b>	1699
<b>Title of Invention:</b>	DESANDING APPARATUS AND SYSTEM
<b>First Named Inventor/Applicant Name:</b>	Christopher A HEMSTOCK
<b>Customer Number:</b>	27522
<b>Filer:</b>	Sean Goodwin/Luqing Wang
<b>Filer Authorized By:</b>	Sean Goodwin
<b>Attorney Docket Number:</b>	2200-011 US
<b>Receipt Date:</b>	30-JUL-2014
<b>Filing Date:</b>	13-FEB-2012
<b>Time Stamp:</b>	17:06:00
<b>Application Type:</b>	Utility under 35 USC 111(a)

### Payment information:

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### File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	updated_IDS.pdf	612245 23c755e05bbeaf1b47f135398cbe368b9c6f04e9	no	4

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**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE PATENT**

In re patent application of:

**Christopher A HEMSTOCK**

**Att. Docket No.: 2200-011 US**

**Serial No.: 13/372,291**

**Examiner: BUI, DUNG H**

**Conf No: 1699**

**Filed: February 13, 2012**

**Group Art Unit: 1772**

**Title: DESANDING APPARATUS AND SYSTEM**

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

**Via EFS -WEB**

**RESPONSE AND AMENDMENT**

This response is responsive to the Examiner's OFFICE ACTION dated May 06, 2014 and due August 06, 2014, without penalty.

This response also includes request of voluntary amendment to the description and claims.

After amendment, there are 16 total claims and two independent claims. Accordingly, Applicant believes no excess claim fees are required.

**IN THE DESCRIPTION**

Applicant respectfully requests the following amendment to the description. Markups in the replacement paragraphs are shown for indicating the amendment.

Paragraph [0002]:

Please replace paragraph [0002] with the following replacement paragraph:

“Production from wells, in the oil and gas industry, often contains ~~contain~~ particulates such as sand. These particulates could be part of the formation from which the hydrocarbon is being produced, introduced particulates from hydraulic fracturing or fluid, loss material from drilling mud or fracturing fluids, or from a phase change of produced hydrocarbons caused by changing conditions at the wellbore (~~asphalt~~ Asphalt or wax formation). As the particulates are produced, problems occur due to abrasion, and plugging of production equipment. In a typical startup, after stimulating a well by fracturing, the stimulated well may produce sand until the well has stabilized, often up to several months after production commences. Other wells may require extended use of a desander.”

Paragraph [0003]:

Please replace paragraph [0003] with the following replacement paragraph:

“Erosion of the production equipment is severe enough to cause catastrophic failure. High fluid stream velocities are typical and are even purposefully designed for elutriating particles up the well and to the surface. An erosive failure of this nature can become a serious safety and environmental issue for the well operator. A failure, such as a

breach of high pressure piping or equipment, releases uncontrolled high velocity flow of fluid which is hazardous to service personnel. ~~Release~~Releasing such fluid to the environment is damaging to the environment resulting in expensive cleanup and loss of production. Repair costs are also high.”

Paragraph [0006]:

Please replace paragraph [0006] with the following replacement paragraph:

“An alternate, known prior art system includes employing filters to remove particulates. A common design is to have a number of fiber-mesh filter bags placed inside a pressure vessel. The density of the filter bag fiber-mesh is matched to the anticipated size of the particulates. However, filter bags are generally not effective in the removal of particulates in a multiphase condition~~conditions~~. Usually, multiphase flow in the oil and gas operations is unstable. Large slugs of fluid followed by a gas mist ~~is~~are common. In these cases, the fiber bags become a cause for a pressure drop and often fail due to the liquid flow therethrough. Due to the high chance of failure, filter bags may not be trusted to remove particulates in critical applications or where the flow parameters of a well are unknown. An additional problem with filter bags in most jurisdictions, is the cost associated with disposal. The fiber-mesh filter bags are considered to be contaminated with hydrocarbons and must be disposed of in accordance to local environmental regulation.”

Paragraph [0007]:

Please replace paragraph [0007] with the following replacement paragraph:

"In Canadian Patent Number 2,433,741, issued Feb. 3, 2004 and in Canadian Patent Number 2,407,554, issued Jun. 20, 2006, both assigned to the Applicant, a desander is disclosed having an elongate, horizontal vessel having an inlet at one end and an outlet at another, the other end, the outlet separated from the inlet by a downcomer flow barrier, such as a weir ~~weri~~, adjacent the vessel's outlet or exit. The weir forms, and maintains, an upper freeboard portion having a cross-sectional area which is greater than that of the field piping from whence the fluid stream emanates for encouraging water and particulates to fall out of the freeboard portion. Water and particulates accumulate along a belly portion. The accumulation of particulates is along a substantial length of the elongate vessel increasing the difficulty of periodic manual removal of such accumulating using scraper rods and the like."

Paragraph [0009]:

Please replace paragraph [0009] with the following replacement paragraph:

"Desanding apparatus is provided which is placed adjacent to a well's wellhead for intercepting a fluid stream flow before prior to entry to equipment including piping, separators, valves, chokes and downstream equipment. The fluid stream can contain a variety of phases including liquid, gas and solids. In one embodiment, a pressure vessel is inserted in the ~~flowstream~~ flowstream by insertion into high velocity field piping extending from the wellhead. The vessel contains an upper freeboard portion having a cross-sectional area which is greater than that of the field piping from whence the fluid stream emanates. As a result, fluid stream velocity drops and particulates cannot be maintained in suspension. The freeboard portion is maintained through control of the angle of the desander, obviating the need for a downcomer of Applicant's own prior art horizontal desanders."

Paragraph [0024]:

Please replace paragraph [0024] with the following replacement paragraph:

“As shown in FIGS. 2 through 7, embodiments of an inclined desander 20 are free of the prior art flow barrier and, through tilting or inclination of the vessel, maximize freeboard upon entry of the flow stream, and reduce liquid flow rates for maximizing settling conditions therein and retention of captured particulates S. Variability of the inclination angle  $\alpha$  enables a measure of variability between the respective freeboard to and liquid-storing belly portion for adjusting performance.”

Paragraph [0025]:

Please replace paragraph [0025] with the following replacement paragraph:

“As shown in FIG. 2, the desander 20 comprises a vessel 22 having an axis A oriented at an angle  $\alpha$  to the horizontal H. The desander 20 has a fluid inlet 24 at an upper end 25 for receiving a fluid stream F typically comprising a variety of phases including gas G, some liquid L and entrained particulates such as sand S. In this embodiment, the fluid inlet 24 is oriented parallel to a longitudinal axis A of the vessel 22. A fluid outlet 26 is located along a top 28 of the vessel 22, and spaced from the fluid inlet 24. In an operating state, a ~~gas-liquid~~ gas/liquid interface 32 forms extending horizontally from about the fluid outlet 26. A belly portion 40 is formed below the interface 32 for containing liquid L and particulates S. A freeboard portion 44 is formed above the interface 32. The fluid inlet 24 discharges into the freeboard 44. Particulate trajectory can be manipulated by positioning and orienting a discharge end 29 of the fluid inlet 24. In one embodiment, the discharge 29 of the inlet 24 can be aligned parallel to the vessel axis A. The inlet 24 or discharge 29 can be oriented in other orientations including above the inclined axis A, or below the axis A.”

Paragraph [0026]:

Please replace paragraph [0026] with the following replacement paragraph:

“The interface 32 is a generally obround, gas/liquid interface between the belly and freeboard portions 40,44. The obround interface 32 has a ~~has~~ distal end 33 adjacent the fluid outlet 26 and a proximal end 34, the location of which is intermediate the fluid outlet 26 and fluid inlet 24 and varies with liquid level and inclination angle  $\alpha$ . As a result of the desander 20 inclination, the trajectory of the fluid stream F, from inlet 24, converges with the interface 32. The trajectory for dropping sand S and liquid L into the belly portion 40 is foreshortened, reducing drop out time. The vessel 22 is long enough to space the fluid inlet 24 sufficiently from the interface 32 to minimize turbulence of the liquid L in the belly portion 40, that spacing being dependent upon various design factors including vessel inclination angle  $\alpha$ , inlet fluid stream velocity and characteristics.”

Paragraph [0034]:

Please replace paragraph [0034] with the following replacement paragraph:

“With reference to FIGS. 4 and 5, the fluid inlet 24, exposed to entrained particulates S in the fluid stream, is subject to greatest risk of erosion. While the inlet 24 can be integrated with the vessel 22, one can also provide an inlet 24 or discharge 29 that is replaceable for ease of maintenance. Options include accepting eventual wear and shutdown of the desander 20 for replacement of an integrated inlet 24; modifying the material or configuration of the inlet 24 to prolong service life, or using replaceable discharge of nozzle for minimizing turnaround time. As stated, one approach is to make

the discharge 29 replaceable including incorporating features of a replaceable nozzle as set forth in Applicant's Canadian Patent CA-Number 2,535,215 issued May 8, 2008. A replaceable nozzle 50 can be fit to a compatible coupling at the upper end 25 of the vessel 22. One form of replaceable nozzle 50 comprises the discharge 29, and a threaded connection or nozzle flange 29i, for connection to a compatible threaded connection or flange 24i at the inlet 24 of the vessel 22. The orientation of the discharge is dependent on the coupling 24i,29i and arrangement of the discharge relative thereto. The replaceable nozzle 50 includes a connecting piping coupling, such as a connective flange 47i for connecting to the piping 47."

**IN THE CLAIMS**

Please replace the claims currently on file with the following claims:

1. (Currently Amended) A desanding system for receiving a gas stream containing entrained liquid and particulates comprising:

a vessel ~~which is elongated~~ along a longitudinal axis and having a fluid inlet adjacent a first end of the vessel and a fluid outlet spaced along the longitudinal axis from the fluid inlet towards a second end of the vessel, said vessel being that is inclined from a horizontal at a non-zero inclination angle during operation such that the fluid outlet is lower than the fluid inlet, the vessel ~~further having a fluid inlet adjacent an upper end of the vessel for discharging the gas stream into the vessel at an inlet velocity, the gas stream travelling down the inclined vessel to a the fluid outlet spaced along the longitudinal axis from, and lower than, the fluid inlet,~~ the vessel having:

a gas/liquid interface formed at the fluid outlet having a belly storage portion formed therebelow and a freeboard portion formed adjacent an upper portion of the vessel above the interface, the freeboard portion having a freeboard cross-sectional area which diminishes along the inclined vessel from the fluid inlet to the fluid outlet; and

~~wherein the freeboard portion at the fluid inlet causing the gas stream to~~ have a freeboard velocity adjacent the fluid inlet which is less than the inlet velocity of the fluid in the inlet, and wherein

the freeboard velocity ~~being is~~ being such that the entrained liquids and particulates fall out of the gas stream and collect in the belly storage portion, and

wherein a desanded gas/liquid stream flows out of the freeboard portion and out the fluid outlet, being free of a substantial portion of the particulates, and particulates accumulate in the belly portion for flowing downvessel towards said second end.

2. (Original) The desanding system of claim 1 wherein fluid inlet has a discharge end, the discharge end oriented for discharging the gas stream into the freeboard portion.

3. (Original) The desanding system of claim 1 wherein discharge end of the fluid inlet directs the gas stream into the freeboard portion and parallel to the longitudinal axis.

4. (Original) The desanding system of claim 1 wherein the fluid inlet further comprises a replaceable nozzle having a discharge end oriented for discharging the gas stream into the freeboard portion.

5. (Currently Amended) The desanding system of claim ~~4~~4 wherein the replaceable nozzle is connected to the fluid inlet at a flange.

6. (Original) The desanding system of claim 1 wherein the gas stream emanates from a wellhead and the fluid inlet further comprises:

a discharge end for directing the gas stream into the freeboard portion and

parallel to the longitudinal axis;

a receiving end for receiving the gas stream and orthogonal to the wellhead.

7. (Original) The desanding system of claim 1 further comprising:

a conduit for conducting a fluid stream containing entrained particulates from a wellhead, the conduit having a desander end; and

wherein the fluid inlet further comprises a discharge end for directing the fluid stream into the freeboard portion and oriented parallel to the longitudinal axis, and a receiving end for receiving the gas stream and oriented orthogonal to the desander end.

8. (Original) The desanding system of claim 1 wherein the inclination angle is variable for varying fluid stream conditions.

9. (Currently Amended) A method for desanding a fluid stream emanating from a wellhead, the fluid stream containing gas, entrained liquid and particulates, the method comprising:

providing an elongated vessel having a longitudinal axis, a fluid inlet adjacent ~~an~~ a first end of the vessel and a fluid outlet spaced along the longitudinal axis from the fluid inlet;

inclining the vessel at angle from horizontal at a non-zero inclination angle so that the fluid outlet is lower ~~that~~ than the fluid inlet for forming a freeboard above the

fluid outlet;

discharging the fluid stream from the fluid inlet, into the inclined vessel and substantially parallel to the longitudinal axis for

establishing a liquid interface in a belly portion of the vessel, the belly portion ~~and~~ being formed below the fluid outlet, and

directing the liquid and particulates along a trajectory in the freeboard portion of the vessel to intercept a substantial portion of the particulates at the liquid interface for storage in the belly portion; and

recovering a desanded gas stream at the fluid outlet which is substantially free of particulates.

10. (New) The desanding system of claim 1 wherein said gas/liquid interface is formed during operation, the gas/liquid interface extending horizontally from about the fluid outlet.

11. (New) The desanding system of claim 1 wherein said the cross-section area of the freeboard portion is at its greatest adjacent the fluid inlet.

12. (New) The desanding system of claim 1 wherein said inclination angle is between about 2 degrees and about 20 degrees.

13. (New) The desanding system of claim 1 further comprising: an access closure at said second end for removal of accumulated particulates.

14. (New) The desanding system of claim 1 wherein said vessel has a smaller diameter downstream of the fluid outlet than the diameter of other portion of the vessel.

15. (New) The desanding system of claim 14 wherein second end of the vessel is an eccentric end.

16. (New) The method of claim 9 further comprising:  
accumulating particulates in said belly portion; and  
periodically removing accumulated particulates.

**REMARKS**

Applicant has amended claims 1, 5 and 9.

Applicant has also added new claims 10-15 directly/indirectly dependent from claim 1 and new claim 16 dependent from claim 9.

Applicant has also amended the description for correcting clerical errors.

Applicant believes that the above amendment to the description and claims does not introduce any new subject matter.

Applicant respectfully requests that the amendments be entered into the application as filed. Allowance of amended claims 1-16 is respectfully requested.

**Claim Rejections - 35 USC § 112**

**[Examiner] Claim 5 is rejected under 35 U.S.C. 112(b) or 35 U.S.C. 112 (pre-AIA), second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the inventor or a joint inventor, or for pre-AIA the applicant regards as the invention.**

**Claim 5 recites the limitation "the replaceable nozzle" in lines 1-2. There is insufficient antecedent basis for this limitation in the claim.**

The amended claim 5 is now dependent from claim 4, which first introduces therein the limitation "replaceable nozzle". Applicant believes that the rejection is now resolved.

**Claim Rejections - 35 USC § 102**

**[Examiner] Claims 1-3 and 8 are rejected under pre-AIA 35 U.S.C. 102(b) as being anticipated by Lowrie (US 4073734).**

Independent claim 1

Independent claim 1 recites, among other aspects, a desanding system having a vessel for receiving a gas stream containing entrained liquid and particulates. The vessel is elongated along a longitudinal axis and has a fluid inlet adjacent a first end of the vessel and a fluid outlet spaced along the longitudinal axis from the fluid inlet towards a second end of the vessel. The vessel is inclined from a horizontal at a non-zero inclination angle during operation such that the fluid outlet is lower than the fluid inlet. The gas stream is discharged from the fluid inlet into the vessel at an inlet velocity, and travels down the vessel to the fluid outlet. A gas/liquid interface forms at the fluid outlet having a belly storage portion formed therebelow and a freeboard portion formed adjacent an upper portion of the vessel above the interface.

As a result of the inclined vessel, the freeboard portion has a freeboard cross-sectional area which diminishes from the fluid inlet to the fluid outlet. The vessel causes the fluid to have a freeboard velocity adjacent the fluid inlet which is less than the velocity of the fluid in the inlet, wherein the freeboard velocity is such that the entrained liquids and particulates fall out of the gas stream and collect in the belly storage portion, and wherein a desanded gas stream flows out of the freeboard portion and out the fluid outlet, being free of a substantial portion of the particulates, and particulates accumulate in the belly portion and flow downvessel towards said second end.

Lowrie discloses a single, horizontally extended cylinder that receives at one end a mixture of produced fluids from an oil well. Baffles within the shell control the liquids of the production during pitch and roll to prevent agitation of the separating liquids.

Examiner argues that Lowrie discloses and thus anticipates the claimed invention. Applicant respectfully disagrees. Lowrie does not anticipate Applicant's claim 1 nor renders it obvious.

Lowrie discloses a device of a different use

Lowrie does not disclose a **desanding** system for receiving a **gas stream** containing entrained liquid and **particulates**. Rather, Lowrie relates to **liquid separation units** mounted on marine installations. More specifically, Lowrie relates to mechanical containment, or restraining movement, of **separating heavy and light liquid (e.g., water and oil)** (e.g., Col. 1, Lines 6-11; Col. 1, Line 67 to Col. 2, Line 36; Col. 2, Lines 48-51; Col. 3, Lines 60-65). **The fluid injected into the shell 1 of Lowrie does not contain particulates or sand. Separating particulates from the injected fluid is not contemplated in Lowrie, nor possible without failure.** Lowrie's vessel has no means for particulate removal and has a bottom that traps particulates within.

Therefore, Applicant respectfully submits that as apparatus disclosed in Lowrie is for a different use than Applicant's invention as claimed in claim 1, Lowrie does not anticipate Applicant's claim 1 nor renders it obvious.

Lowrie does not disclose all elements of Applicant's claim 1

*A. inclined vessel*

Lowrie does not teach a vessel which is elongated along a longitudinal axis and that is inclined from a horizontal at a non-zero inclination angle during operation. Referring to Fig. 1, Lowrie indeed teaches a **horizontally extended cylindrical shell 1** (Figs. 1 and 2, Col. 2, Lines 20-23; Col. 2, Lines 48-51; Col. 3, Lines 6-7).

Examiner cites Lowrie, Fig. 7 as teaching an inclined vessel. Applicant respectfully disagrees. Lowrie discloses a solution for solving the problems associated with pitch and roll. According to Lowrie, the shell 1 is contemplated for marine installations, which bring in the problem of pitch and roll (Col. 1, Lines 6-11; Col. 1,

Lines 42-43; Col. 5, Lines 25-39). Figs. 6 and 7 show the shell 1 in two extremes of pitch caused by the marine water movement (Col. 2, Line 67 to Col. 3, Line 2; Col. 6, Lines 16-18; Col. 6, Lines 63-66), and thus are **illustrations for showing the problem that Lowrie tries to solve**. As acknowledged in Lowrie, Col. 6, Lines 33-35, "FIGS. 6 and 7 set the scope of the analysis by disclosing the shell of the separator at each extreme of pitch." However, **Applicant's claimed invention considers the inclined vessel as an advantage, and important for establishing the outlet below the inlet and a gas/liquid interface from the fluid outlet**.

Therefore, Lowrie teaches a horizontally extended cylindrical shell 1 that may pitch and roll to two extremes as shown in Figs. 6 and 7, which causes **a problem of agitating the liquids and disrupting the separating process** (Col. 3, Lines 29-40). Lowrie's solution requires the plate 7 as an essential element (Col. 3, Line 29). Lowrie does not establish the claimed gas/liquid interface from the fluid outlet.

*B. Fluid outlet for desanded gas/liquid stream*

Lowrie does not teach a fluid outlet for desanded gas/liquid stream. Referring to Fig. 1, Lowrie's shell 1 comprises four outlets, a GAS OUT outlet 5 at the top thereof, two WATER OUT outlets 4 at the bottom thereof, and an OIL OUT outlet 3 at the bottom thereof. None of these outlets is for desanded gas/liquid stream. As particulates were not considered in Lowrie, the person skilled in the art would not understand which outlet should be used for discharging desanded gas/liquid stream. As Lowrie's shell 1 pitches and rolls, there is no establishment of a gas/liquid interface for forming the belly portion and the freeboard portion diminishing from the fluid inlet to the fluid outlet.

*C. Fluid outlet lower than fluid inlet in operation*

Lowrie does not teach that the vessel is inclined from a horizontal at a non-zero inclination angle **during operation** such that **the fluid outlet is lower than the fluid inlet**.

Referring to Fig. 1, the outlet of Lowrie's device is designed to be horizontally oriented. In the desired horizontal orientation, Lowrie's GAS OUT outlet 5 is **higher** than the inlet 2. The WATER OUT outlets 4 and the OIL OUT outlet 3 are lower than the inlet 2. However, they would quickly be plugged by the particulates in the injected stream and fail if the injected stream comprises particulates.

Although Fig. 7 shows that Lowrie's shell 1 may be inclined by the environmental force such that the GAS OUT outlet 5 be lower than the inlet 2, that is only temporary and in fact is reversible, and thus inoperative at least half of the time. Lowrie considers "inclination" as a problem to be solved, rather than a desired configuration. As Figs. 6 and 7 are the extreme cases, Lowrie's shell 1 is more likely in a generally horizontal orientation with a small inclination angle such that the GAS OUT outlet 5 remains higher than the inlet 2. Moreover, even if Lowrie's shell 1 may be tilted by environmental force to the extremely inclined orientation as in Fig. 7, it is equally likely that shell 1 is tilted to the extremely inclined orientation as in Fig. 6, in which case the GAS OUT outlet 5 is much higher than the inlet 2.

Therefore, Lowrie discloses a device desired to be horizontally oriented but may be tilted with equally possible extremes as shown in Figs. 6 and 7, e.g., being in one extreme in one moment and the other in the next moment. On the other hand, Applicant's claim 1 recites "said vessel being inclined from a horizontal at a non-zero inclination angle **during operation** such that **the fluid outlet is lower than the fluid inlet**", which is not disclosed in Lowrie.

*D. the freeboard portion having a freeboard cross-sectional area which diminishes from the fluid inlet to the fluid outlet*

Lowrie does not disclose "the freeboard portion having a freeboard cross-sectional area which diminishes from the fluid inlet to the fluid outlet". In fact, as Lowrie's shell 1 may alternate between the two extremes of Figs. 6 and 7, Lowrie's shell 1 cannot maintain a freeboard portion having a freeboard cross-sectional area which diminishes from the fluid inlet to the fluid outlet.

*E. the freeboard velocity being such that the entrained liquids and particulates fall out of the gas stream and collect in the belly storage portion*

Applicant further respectfully submits that, as Lowrie teaches a device for separating heavy and light liquid rather than for removing particulates from a gas stream, Lowrie neither requires nor teaches the freeboard velocity being such that the entrained liquids and particulates fall out of the gas stream and collect in the belly storage portion, as recited in Applicant's claim 1.

Separating particulates from the gas stream involves physical principles specific to particulates. Applicant's invention, as claimed, leverages the particulate-specific physical principles and requires the freeboard velocity being such that the entrained liquids and particulates fall out of the gas stream and collect in the belly storage portion. In contrary, Lowrie does not address any particulate-related aspects, nor applies any requirement to the freeboard velocity.

*F. particulates accumulating in the belly portion and flowing downvessel towards said second end*

Lowrie's shell 1 is desirably horizontally oriented but may be tilted with equally possible extremes as shown in Figs. 6 and 7. Pitch and roll would cause turbulence to the liquid and particulates in shell 1, and particulates accumulated in shell 1 would not flowing downvessel towards a second end. For example, when shell 1 is in the inclined condition as in Fig. 6, particulates would flow towards the first end, i.e., the end of shell 1 adjacent the inlet 2. In fact, pitch and roll would make the liquid and particulates turbulent in shell 1 and the stream discharged from any of the four outlets would unavoidably comprise a substantial portion of particulates.

Therefore, as Lowrie does not disclose all elements of Applicant's claim 1, Lowrie does not anticipate Applicant's claim 1 nor renders it obvious.

Lowrie's device would not function as a desanding device

Applicant further submits that Lowrie would not function as a desanding device. Lowrie discloses a single horizontal three phase marine separator designed to handle the pitch and roll of a ship; the three phases being gas (see Fig. 1, gas outlet 5), oil (see Fig. 1, oil outlet 3) and water (see Fig. 1, water outlet 4); see Col. 3, Lines. 8-28. **The introduction of a fourth phase such as sand is not contemplated by Lowrie.**

As discussed above, Lowrie discloses a device that is intended to be operational when horizontally oriented but may be tilted with equally possible extremes as shown in Figs. 6 and 7, e.g., being in one extreme in one moment and the other in the next moment. Such a dynamic operation condition would cause turbulence to the liquid and particulates in shell 1. The stream discharged from any of the four outlets would unavoidably comprise a substantial portion of particulates. In other words, Lowrie's system would fail.

Moreover, referring to Fig. 1 of Lowrie, if Lowrie's shell 1 were to receive a fluid stream having particulates, particulates therein would accumulate on the plate 7 and ultimately migrate to the lower chamber below the plate 7. The water outlet 4 is not designed to remove the particulates and no method of sand removal is disclosed. Sand in this lower chamber, once accumulated and trapped therein, would cause shell 1 to fail. As well, without a removal method, shell 1 would require to be taken out of service for cleaning the particulates, including removal of plate 7 or flushing it, and for repairing.

Also, the baffles 13 and 14 and stilling wells 10 and 25 used to control the function of the vessel during pitch and role (Col. 6, Lines 63-67) would not perform as expected with the introduction of a fourth phase of particulates; the movable baffles 13, 13A, 14 and 14A would become plugged with sand causing the baffles to cease operation.

Referring to Fig. 2, the stilling wells 10 and 25, used for the floats and controls of shell 1, are not suitable for sand or particulate service. The Applicant has found that any device that uses a float or some level control mechanism inside a vessel handling particulates is prone to failure due to sand plugging. Therefore, Applicant's

claimed desanding device disclosed in the instant application has no internal moving parts to control the gas/liquid interface.

In Applicant's experience, any valves that may be exposed to particulates have also to consider the impact of those particulates on production. However, in Lowrie, the water out valve 24 (see Fig. 2) and the oil out valve 27 (see Fig. 2) are not given consideration to anything other than liquid service, and are not exposed to the damaging erosive operation with particulates.

Therefore, Applicant's desanding system as in claim 1 allows particulates to be removed without a float or a baffle but, instead, uses the tilted angle of the vessel in a novel and inventive way to assure the internal phase separation. Applicant's desanding system as in claim 1 works in a static environment, rather than in a dynamic, pitch and roll condition.

However, Lowrie discloses a device that allows a three phase separator to function while the separator is in a pitch and roll motion. Control of the device is handled through floats and baffles. The floats assure phase separation, and the baffles prevent remixing of the liquids once separated. As analyzed above, Lowrie's device would not function when the fluid stream injected into the device comprises particulates.

Although Fig. 7 of Lowrie shows shell 1 in an inclined position, looking similar to Applicant's desander, Fig. 7 indeed shows the shell 1 in an extreme of pitch caused by the marine water movement (Col. 2, Line 67 to Col. 3, Line 2; Col. 6, Lines 16-18; Col. 6, Lines 63-66), rather than a purposely designed orientation (more discussion later). The shell 1 can equally possible to pitch to another extreme as shown in Fig. 6, at which position the inlet becomes lower than the outlet, and using shell 1 for removing particulates would fail.

Therefore, Lowrie does not anticipate Applicant's claim 1.

Lowrie, alone or in view of Hemstock (US 20040074838), does not render Applicant's claim 1 obvious.

Because Lowrie teaches a device for separating heavy and light liquid, which is a different use than removing particulates, the skilled person in the art would not combine Lowrie with Hemstock (US 20040074838) to arrive at a desander having an inclined vessel as in Applicant's claim 1.

Even the skilled person in the art seeking a solution for removing particulates would likely look into a different field, he/she would not use Lowrie because Lowrie's device would fail in the injected stream comprises particulates. As analyzed above, Lowrie requires that the fluid stream injected into the shell 1 must have no particulates. Also, removal of the stilling wells 10 and 25 to adapt to Hemstock would render Lowrie inoperative for pitch and roll operation, failing for both Lowrie's purpose and Hemstock's purpose.

Moreover, Lowrie requires the plate 7 as an essential element. If the fluid stream contains particulates, the particulates therein will quickly accumulate on top of and below the plate 7 and cause shell 1 to fail. The diverter structure 6 will cause particulates to accumulate at the end adjacent the inlet 2, which would accelerate the failure of shell 1.

The skilled person in the art reading Lowrie would learn from Lowrie that shell 1 shall be horizontally oriented, and Figs. 6 and 7 are problematic orientations undesirably caused by marine forces. The skilled person in the art thus would not consider it as a suitable solution for removing particulates, nor try to combine it with Hemstock (US 20040074838) to arrive at Applicant's claim 1.

Even Lowrie and Hemstock are combinable, the combination thereof would either give rise to a desanding device as in Hemstock and in a static, horizontally-oriented configuration, or give rise to a desanding device as in Hemstock but in a dynamic configuration that may be oriented horizontally as in Lowrie's Fig. 1 or tilted as in Lowrie's Figs. 6 and 7. In any case, the combination of Lowrie and Hemstock, even if combinable, would not arrive at a desanding device inclined in operation such that the the fluid outlet is lower than the fluid inlet.

Therefore, Applicant respectfully submits that the independent claim 1 and claims 2-3 and 8 dependent therefrom are not anticipated by Lowrie, nor obvious in view of Lowrie and Hemstock (US 20040074838), alone or in combination. Allowance of these claims is respectfully requested.

### **Claim Rejections - 35 USC § 103**

#### Dependent claims 4-7

**[Examiner] Claims 4-7 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Lowrie (US 4073734) as applied to claim 1 above, and further in view of Hemstock et al (US 20040074838).**

As discussed above, Lowrie teaches a separator with a use different to Applicant's claimed invention. Lowrie does not teach operation depending upon an inclined vessel or shell. Rather, Lowrie considers an inclined shell as a problematic result of pitch and roll.

Hemstock (US 20040074838) does not teach an inclined vessel either. Rather, Hemstock teaches a horizontally oriented vessel (Fig. 3). As Hemstock's vessel is horizontal, it requires a weir to establish a freeboard portion. In fact, Applicant's claimed invention is an improvement over Hemstock (US 20040074838) (paras [0007]-[0008]) to obviate a need for the weir and also to urge particulates downvessel.

As discussed above, the skilled person in the art would not combine Lowrie with Hemstock, and, even if Lowrie and Hemstock are combinable, the combination thereof would not arrive at Applicant's claimed desanding system of a static, inclined vessel, absent a weir and forming a gas/liquid interface from the fluid outlet for particulate separation.

Therefore, Applicant respectfully submits that claims 4-7 are not obvious over Lowrie in view of Hemstock (US 20040074838), and are in condition for allowance.

Independent claim 9

**[Examiner] Claim 9 is rejected under pre-AIA 35 U.S.C. 1 03(a) as being unpatentable over Hemstock et al (US 20040074838) in view of Lowrie (US 4073734).**

Applicant respectfully submits that the independent claim 9 is not obvious over Hemstock (US 20040074838) in view of Lowrie for the same reasons as described above, and is in condition for allowance.

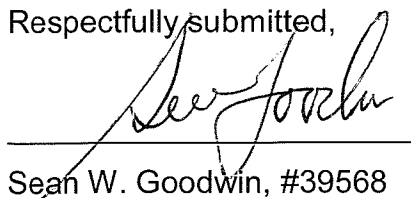
**New claims 10-16**

The new claims 10-15 are directly/indirectly dependent from claim 1, and the new claim 16 is dependent from claim 9.

Support for claim 10 can be found in paragraph [0025], support for claim 11 can be found in paragraph [0029], support for claim 12 can be found in paragraph [0033], support for claim 13 can be found in paragraph [0040], support for claims 14-15 can be found in paragraph [0041], and support for claim 16 can be found in paragraph [0040]. No new subject matter is introduced.

Allowance of claims 1-16 is therefore respectfully requested.

Respectfully submitted,



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Date: July 24, 2014

## Electronic Acknowledgement Receipt

<b>EFS ID:</b>	19697829
<b>Application Number:</b>	13372291
<b>International Application Number:</b>	
<b>Confirmation Number:</b>	1699
<b>Title of Invention:</b>	DESANDING APPARATUS AND SYSTEM
<b>First Named Inventor/Applicant Name:</b>	Christopher A HEMSTOCK
<b>Customer Number:</b>	27522
<b>Filer:</b>	Sean Goodwin/Luqing Wang
<b>Filer Authorized By:</b>	Sean Goodwin
<b>Attorney Docket Number:</b>	2200-011 US
<b>Receipt Date:</b>	28-JUL-2014
<b>Filing Date:</b>	13-FEB-2012
<b>Time Stamp:</b>	13:17:25
<b>Application Type:</b>	Utility under 35 USC 111(a)

### Payment information:

Submitted with Payment	no
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### File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Amendment/Req. Reconsideration-After Non-Final Reject	Response_to_OA.pdf	926716 a92e7742df6450ea113060620d252692d055582a	no	23

### Warnings:

### Information:

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

**New Applications Under 35 U.S.C. 111**

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

**National Stage of an International Application under 35 U.S.C. 371**

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

**New International Application Filed with the USPTO as a Receiving Office**

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

<b>PATENT APPLICATION FEE DETERMINATION RECORD</b> Substitute for Form PTO-875	Application or Docket Number <b>13/372,291</b>	Filing Date <b>02/13/2012</b>	<input type="checkbox"/> To be Mailed
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ENTITY: ☐ LARGE ☒ SMALL ☐ MICRO**APPLICATION AS FILED – PART I**

(Column 1)

(Column 2)

FOR	NUMBER FILED	NUMBER EXTRA	RATE (\$)	FEE (\$)
<input type="checkbox"/> BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	
<input type="checkbox"/> SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	
<input type="checkbox"/> EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X \$ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X \$ =	
<input type="checkbox"/> APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			
<input type="checkbox"/> MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	

**APPLICATION AS AMENDED – PART II**

(Column 1)

(Column 2)

(Column 3)

AMENDMENT	07/28/2014	CLAIMS REMAINING AFTER AMENDMENT	Minus	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)	ADDITIONAL FEE (\$)
	Total (37 CFR 1.16(i))	* 16	Minus	** 20	= 0	x \$40 =	0
	Independent (37 CFR 1.16(h))	* 2	Minus	*** 3	= 0	x \$210 =	0
	<input type="checkbox"/> Application Size Fee (37 CFR 1.16(s))						
	<input type="checkbox"/> FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
TOTAL ADD'L FEE						<b>0</b>	

(Column 1)

(Column 2)

(Column 3)

AMENDMENT	CLAIMS REMAINING AFTER AMENDMENT	Minus	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)	ADDITIONAL FEE (\$)
	Total (37 CFR 1.16(i))	*	Minus	**	=	X \$ =
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X \$ =
	<input type="checkbox"/> Application Size Fee (37 CFR 1.16(s))					
	<input type="checkbox"/> FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))					
TOTAL ADD'L FEE						

\* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

\*\* If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

\*\*\* If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

LIE  
/TAMMY d. MCBETH BROWN/

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/372,291	02/13/2012	Christopher A HEMSTOCK	2200-011 US	1699
27522	7590	05/06/2014		
SEAN W. GOODWIN 222 PARKSIDE PLACE 602-12 AVENUE S.W. CALGARY, AB T2R 1J3 CANADA			EXAMINER BUI, DUNG H	
			ART UNIT 1772	PAPER NUMBER
			MAIL DATE 05/06/2014	DELIVERY MODE PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 13/372,291	<b>Applicant(s)</b> HEMSTOCK, CHRISTOPHER A	
	<b>Examiner</b> DUNG H. BUI	<b>Art Unit</b> 1772	<b>AIA (First Inventor to File) Status</b> No

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_\_.  
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on \_\_\_\_\_.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on \_\_\_\_\_; the restriction requirement and election have been incorporated into this action.
- 4) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims\*

- 5) ☒ Claim(s) 1-9 is/are pending in the application.  
5a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 6) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 7) ☒ Claim(s) 1-9 is/are rejected.
- 8) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 9) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

\* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see [http://www.uspto.gov/patents/init\\_events/pph/index.jsp](http://www.uspto.gov/patents/init_events/pph/index.jsp) or send an inquiry to [PPHfeedback@uspto.gov](mailto:PPHfeedback@uspto.gov).

### Application Papers

- 10) ☐ The specification is objected to by the Examiner.
- 11) ☒ The drawing(s) filed on 02/13/12 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

#### Certified copies:

- a) ☒ All    b) ☐ Some\*\*    c) ☐ None of the:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\*\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 3) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b)<br>Paper No(s)/Mail Date <u>5/28/13</u> | 4) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

### ***Notice of Pre-AIA or AIA Status***

1. The present application is being examined under the pre-AIA first to invent provisions.

### ***Claim Rejections - 35 USC § 112***

2. The following is a quotation of 35 U.S.C. 112(b):  
(b) CONCLUSION.—The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the inventor or a joint inventor regards as the invention.

The following is a quotation of 35 U.S.C. 112 (pre-AIA), second paragraph:  
The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claim 5 is rejected under 35 U.S.C. 112(b) or 35 U.S.C. 112 (pre-AIA), second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the inventor or a joint inventor, or for pre-AIA the applicant regards as the invention.
4. Claim 5 recites the limitation "the replaceable nozzle" in lines 1-2. There is insufficient antecedent basis for this limitation in the claim.

### ***Claim Rejections - 35 USC § 102***

5. In the event the determination of the status of the application as subject to AIA 35 U.S.C. 102 and 103 (or as subject to pre-AIA 35 U.S.C. 102 and 103) is incorrect, any correction of the statutory basis for the rejection will not be considered a new ground of rejection if the prior art relied upon, and the rationale supporting the rejection, would be the same under either status.

Art Unit: 1772

6. The following is a quotation of the appropriate paragraphs of pre-AIA 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

7. Claims 1-3 and 8 are rejected under pre-AIA 35 U.S.C. 102(b) as being anticipated by Lowrie (US 4073734).

As regarding claim 1, Lowrie discloses the claimed invention for a desanding system for receiving a gas stream containing entrained liquid and particulates comprising: a vessel (1) which is elongated along a longitudinal axis and that is inclined from a horizontal at a non-zero inclination angle (fig. 7), the vessel further having a fluid inlet (2) adjacent an upper end (fig. 7) of the vessel for discharging the gas stream into the vessel at an inlet velocity, the gas stream travelling down the vessel to a fluid outlet (5) spaced along the longitudinal axis from, and lower than, the fluid inlet (2), the vessel having a gas/liquid interface (22) at the fluid outlet having a belly storage portion (below 22) formed therebelow and a freeboard portion (above 22) formed adjacent an upper portion of the vessel above the interface, the freeboard portion (above 22) having a freeboard cross-sectional area which diminishes from the fluid inlet to the fluid outlet and wherein a freeboard velocity adjacent the fluid inlet is less than the inlet velocity, and wherein the freeboard velocity being such that the entrained liquids and particulates fall out of the gas stream and collect in the belly storage portion, and wherein a desanded gas stream flows out of the freeboard portion and out the fluid outlet (5), being free of a substantial portion of the particulates.

As regarding claim 2, Lowrie discloses all of limitations as set forth above.

Lowrie discloses the claimed invention for wherein fluid inlet (2) has a discharge end (6), the discharge end oriented for discharging the gas stream into the freeboard portion (above 22).

As regarding claim 3, Lowrie discloses all of limitations as set forth above.

Lowrie discloses the claimed invention for wherein discharge end (6) of the fluid inlet (2) directs the gas stream into the freeboard portion (above 22) and parallel to the longitudinal axis.

As regarding claim 8, Lowrie discloses all of limitations as set forth above.

Lowrie discloses the claimed invention for wherein the inclination angle is variable for varying fluid stream conditions (fig. 7).

***Claim Rejections - 35 USC § 103***

8. In the event the determination of the status of the application as subject to AIA 35 U.S.C. 102 and 103 (or as subject to pre-AIA 35 U.S.C. 102 and 103) is incorrect, any correction of the statutory basis for the rejection will not be considered a new ground of rejection if the prior art relied upon, and the rationale supporting the rejection, would be the same under either status.

9. The following is a quotation of pre-AIA 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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10. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under pre-AIA 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

11. Claims 4-7 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Lowrie (US 4073734) as applied to claim 1 above, and further in view of Hemstock et al (US 20040074838).

As regarding claim 4, Lowrie discloses all of limitations as set forth above. Lowrie discloses the claimed invention except for wherein the fluid inlet further comprises a replaceable nozzle having a discharge end oriented for discharging the gas stream into the freeboard portion. Hemstock teaches wherein the fluid inlet further comprises a replaceable nozzle (21) having a discharge end oriented for discharging the gas stream into the freeboard portion. It would have been obvious to one having ordinary skill in the art at the time of the invention was made to have wherein the fluid inlet further comprises a replaceable nozzle having a discharge end oriented for discharging the gas stream into the freeboard portion as taught by Hemstock in order to replace the erosion's nozzle.

As regarding claim 5, Lowrie discloses all of limitations as set forth above.

Lowrie discloses the claimed invention for wherein the replaceable nozzle (Hemstock - 21) is connected to the fluid inlet at a flange (Hemstock – figs. 2a and 2b).

As regarding claim 6, Lowrie discloses all of limitations as set forth above.

Lowrie discloses the claimed invention except for wherein the gas stream emanates from a wellhead and the fluid inlet further comprises: a discharge end for directing the gas stream into the freeboard portion and parallel to the longitudinal axis; a receiving end for receiving the gas stream and orthogonal to the wellhead. Hemstock teaches wherein the gas stream emanates from a wellhead (claim 17) and the fluid inlet further comprises: a discharge end for directing the gas stream into the freeboard portion and parallel to the longitudinal axis; a receiving end for receiving the gas stream and orthogonal to the wellhead. It would have been obvious to one having ordinary skill in the art at the time of the invention was made to have wherein the gas stream emanates from a wellhead and the fluid inlet further comprises: a discharge end for directing the gas stream into the freeboard portion and parallel to the longitudinal axis; a receiving end for receiving the gas stream and orthogonal to the wellhead as taught by Hemstock in order to enhance desanding system performance.

As regarding claim 7, Lowrie discloses all of limitations as set forth above.

Lowrie discloses the claimed invention except for a conduit for conducting a fluid stream containing entrained particulates from a wellhead, the conduit having a desander end; and wherein the fluid inlet further comprises a discharge end for directing the fluid stream into the freeboard portion and oriented parallel to the longitudinal axis, and a

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receiving end for receiving the gas stream and oriented orthogonal to the desander end. Hemstock teaches a conduit for conducting a fluid stream containing entrained particulates from a wellhead (claim 17), the conduit having a desander end; and wherein the fluid inlet further comprises a discharge end for directing the fluid stream into the freeboard portion and oriented parallel to the longitudinal axis, and a receiving end for receiving the gas stream and oriented orthogonal to the desander end. It would have been obvious to one having ordinary skill in the art at the time of the invention was made to have a conduit for conducting a fluid stream containing entrained particulates from a wellhead, the conduit having a desander end; and wherein the fluid inlet further comprises a discharge end for directing the fluid stream into the freeboard portion and oriented parallel to the longitudinal axis, and a receiving end for receiving the gas stream and oriented orthogonal to the desander end as taught by Hemstock in order to enhance desanding system performance.

12. Claim 9 is rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Hemstock et al (US 20040074838) in view of Lowrie (US 4073734).

Hemstock discloses the claimed invention for a method for desanding a fluid stream emanating from a wellhead, the fluid stream containing gas, entrained liquid and particulates, the method comprising: providing an elongated vessel having a longitudinal axis, a fluid inlet adjacent an first end of the vessel.

Hemstock does not disclose a fluid outlet spaced along the longitudinal axis from the fluid inlet inclining the vessel at angle from horizontal at a non-zero inclination angle so that the fluid outlet is lower than the fluid inlet for forming a freeboard above the fluid

outlet; discharging the fluid stream from the fluid inlet, into the vessel and substantially parallel to the longitudinal axis for establishing a liquid interface in a belly portion of the vessel, the belly portion and being formed below the fluid outlet, and directing the liquid and particulates along a trajectory in the freeboard portion of the vessel to intercept a substantial portion of the particulates at the liquid interface for storage in the belly portion; and recovering a desanded gas stream at the fluid outlet which is substantially free of particulates.

Lowrie teaches a fluid outlet spaced along the longitudinal axis from the fluid inlet inclining the vessel at angle from horizontal at a non-zero inclination angle (fig. 7) so that the fluid outlet is lower than the fluid inlet for forming a freeboard above the fluid outlet; discharging the fluid stream from the fluid inlet, into the vessel and substantially parallel to the longitudinal axis for establishing a liquid interface in a belly portion of the vessel, the belly portion and being formed below the fluid outlet, and directing the liquid and particulates along a trajectory in the freeboard portion of the vessel to intercept a substantial portion of the particulates at the liquid interface for storage in the belly portion; and recovering a desanded gas stream at the fluid outlet which is substantially free of particulates.

It would have been obvious to one having ordinary skill in the art at the time of the invention was made to have a fluid outlet spaced along the longitudinal axis from the fluid inlet inclining the vessel at angle from horizontal at a non-zero inclination angle so that the fluid outlet is lower than the fluid inlet for forming a freeboard above the fluid outlet; discharging the fluid stream from the fluid inlet, into the vessel and substantially

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parallel to the longitudinal axis for establishing a liquid interface in a belly portion of the vessel, the belly portion and being formed below the fluid outlet, and directing the liquid and particulates along a trajectory in the freeboard portion of the vessel to intercept a substantial portion of the particulates at the liquid interface for storage in the belly portion; and recovering a desanded gas stream at the fluid outlet which is substantially free of particulates as taught by Lowrie in order to enhance desanding system performance.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DUNG H. BUI whose telephone number is (571)270-7077. The examiner can normally be reached on Mon. - Thurs., 7:30 a.m.-5 p.m., EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bullock Insuk can be reached on (571)272-5954. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 1772

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/D. H. B./  
Examiner, Art Unit 1772

<b>Notice of References Cited</b>	Application/Control No. 13/372,291	Applicant(s)/Patent Under Reexamination HEMSTOCK, CHRISTOPHER A	
	Examiner DUNG H. BUI	Art Unit 1772	Page 1 of 1

**U.S. PATENT DOCUMENTS**

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-4,073,734 A	02-1978	Lowrie, Neely E.	96/184
*	B	US-2004/0074838 A1	04-2004	Hemstock et al.	210/513
	C	US-			
	D	US-			
	E	US-			
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

**FOREIGN PATENT DOCUMENTS**

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
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	Q					
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	T					

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Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Receipt date: 05/28/2013

Doc code: IDS

Doc description: Information Disclosure Statement (IDS) Filed

13372291 - GAIL: 1772

Approved for use through 07/31/2012. OMB 0651-0031

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<b>INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b> ( Not for submission under 37 CFR 1.99)	Application Number		13372291	
	Filing Date		2012-02-13	
	First Named Inventor	Christopher A. HEMSTOCK		
	Art Unit	1774		
	Examiner Name	TBD		
	Attorney Docket Number	2200-011 US		

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	1	2433741	CA			Hemstock, C. et al.		<input type="checkbox"/>
	2	773096	GB			Laird, A.		<input type="checkbox"/>
	3	2041479	CA			Martin, R.		<input type="checkbox"/>

<b>Receipt date: 05/28/2013</b>  <b>INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b> <b>( Not for submission under 37 CFR 1.99)</b>	Application Number		13372291	13372291 - GAU: 1772
	Filing Date		2012-02-13	
	First Named Inventor	Christopher A. HEMSTOCK		
	Art Unit	1774		
	Examiner Name	TBD		
	Attorney Docket Number	2200-011 US		

	4	2002070101	WO			Binsfield, B. et al.		<input type="checkbox"/>
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Examiner Signature	/Dung Bui/ (12/30/2013)	Date Considered	
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EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	2	(desand or desalt) same (incline or inclination or inclined) with (separation or separator or separating) with vessel	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2014/04/26 22:20
L2	1714	(incline or inclination or inclined or tilt or slant or pitch or angle) with (separation or separator or separating) with (vessel or shell)	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2014/04/26 22:33
L3	266252	("55"/\$ or "95"/\$ or "96"/\$ or "210"/\$).ccls.	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2014/04/26 22:33
L4	429	2 and 3	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2014/04/26 22:34
L7	27	("1864511"   "2783854"   "2825422"   "2868312"   "2868313"   "3884815").PN. OR ("4073734").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2014/04/26 23:18
L9	82	("1043364"   "1268359"   "1601611"   "1702612"   "1851030"   "1947201"   "20040184976"   "2049068"   "2058044"   "2228401"   "2547190"   "2610697"   "2664963"   "2706531"   "2751998"   "3192967"   "3255571"   "3273318"   "3310109"   "3331188"   "3396512"   "3426904"   "3553940"   "3574096"   "3852192"   "4073734"   "4122009"   "4208196"   "4238333"   "4257895"   "4539023"   "4617031"   "4673500"   "4721565"   "4778494"   "4975205"   "5064448"   "5173194"   "5245057"   "5295537"   "5333917"   "5500039"   "5522999"   "5582271"   "5599507"   "5827357"   "5900137"   "5928519"   "6099743"   "6119779"   "6158512"   "6189617"   "6214092"   "6214220"   "6269880"   "6409808"   "6419730"   "6537458"   "6783683").PN. OR ("7383958").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2014/04/27 00:01
L10	4757	(210/519,539,540,541,532.1,537 or 95/253 or 96/182,183,184).ccls.	US-PGPUB;	OR	ON	2014/04/27 00:58

			USPAT; USOCR; EPO; JPO			
L11	3	(desand or desalt) same (separation or separating or separator) same (inclination or inclined)	US- PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2014/04/27 00:58
L12	61626	(separation or separating or separator) same (inclination or inclined)	US- PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2014/04/27 00:58
L13	398	10 and 12	US- PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2014/04/27 00:58
L14	4100	(separation or separating or separator) same (inclination or inclined) same (vessel or shell)	US- PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2014/04/27 00:59
L15	105	10 and 14	US- PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2014/04/27 00:59
L16	578	55/319.ccls.	US- PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2014/04/27 01:01
L17	3	16 and 14	US- PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2014/04/27 01:01
S1	4	((Christopher) near2 (HEMSTOCK)).INV.	US- PGPUB; USPAT	OR	ON	2014/04/23 22:44
S2	1	("6533929").PN.	US- PGPUB; USPAT; USOCR; EPO; JPO	OR	OFF	2014/04/23 22:50
S3	49	("0909733"   "1494670"   "2179137"   "2206835"   "2375590"   "2422555"   "2613811"   "2726729"   "2825422"   "3425913"   "4115279"   "4120796"   "4132651"   "4257895"   "4604196"	US- PGPUB; USPAT; USOCR	OR	ON	2014/04/23 23:07

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S5	1051	(desand or separation or separating or separator) same (inclination or inclined) same sand and (water or liquid)	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2014/04/23 23:14
S6	266194	("55"/\$ or "95"/\$ or "96"/\$ or "210"/\$).ccls.	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2014/04/23 23:15
S7	273109	5and S6	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2014/04/23 23:15
S8	280	S5 and S6	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2014/04/23 23:15
S9	878	(desand or separation or separating or separator) same (inclination or inclined) same (sand and (water or liquid))	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2014/04/23 23:15
S10	257	S9 and S6	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2014/04/23 23:15
S11	2	desand same (incline or inclination or inclined) with (separation or separator or separating) with vessel	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2014/04/24 11:08
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	"5204000"	"5240617"	"5326474"				
	"5414776"	"5415776"	"5837152"				
	"5865992"	"6099742").PN.	OR				
	("6533929").URPN.						

**EAST Search History (Interference)**

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**4/ 27/ 2014 1:03:54 AM**

**C:\ Users\ dbui1\ Documents\ EAST\ Workspaces\ 13372291.wsp**

<p align="center"><b><i>Index of Claims</i></b></p> 	<b>Application/Control No.</b> 13372291	<b>Applicant(s)/Patent Under Reexamination</b> HEMSTOCK, CHRISTOPHER A
	<b>Examiner</b> DUNG H BUI	<b>Art Unit</b> 1772

✓	<b>Rejected</b>	-	<b>Cancelled</b>	N	<b>Non-Elected</b>	A	<b>Appeal</b>
=	<b>Allowed</b>	÷	<b>Restricted</b>	I	<b>Interference</b>	O	<b>Objected</b>

<input type="checkbox"/> Claims renumbered in the same order as presented by applicant <input type="checkbox"/> CPA <input type="checkbox"/> T.D. <input type="checkbox"/> R.1.47										
CLAIM		DATE								
Final	Original	04/27/2014								
	1	✓								
	2	✓								
	3	✓								
	4	✓								
	5	✓								
	6	✓								
	7	✓								
	8	✓								
	9	✓								

<b>Search Notes</b>  	<b>Application/Control No.</b>  13372291	<b>Applicant(s)/Patent Under Reexamination</b>  HEMSTOCK, CHRISTOPHER A
	<b>Examiner</b>  DUNG H BUI	<b>Art Unit</b>  1772

CPC- SEARCHED		
Symbol	Date	Examiner

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
55	319	4/27/2014	db
210	519,539,540,541,532.1,537	4/27/2014	db
95	253	4/27/2014	db
96	182,183,184	4/27/2014	db

SEARCH NOTES		
Search Notes	Date	Examiner
Inventor and Text search - see search history in EAST	4/27/2014	db

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner

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## BIB DATA SHEET

CONFIRMATION NO. 1699

<b>SERIAL NUMBER</b> 13/372,291	<b>FILING or 371(c) DATE</b> 02/13/2012 <b>RULE</b>	<b>CLASS</b> 055	<b>GROUP ART UNIT</b> 1772	<b>ATTORNEY DOCKET NO.</b> 2200-011 US	
<b>APPLICANTS</b> <b>INVENTORS</b> Christopher A HEMSTOCK, Calgary, CANADA; <b>** CONTINUING DATA *****</b> <b>** FOREIGN APPLICATIONS *****</b> <b>** IF REQUIRED, FOREIGN FILING LICENSE GRANTED *** SMALL ENTITY **</b> 02/24/2012					
Foreign Priority claimed <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No 35 USC 119(a-d) conditions met <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Verified and Acknowledged <u>/DUNG H BUI/</u> Examiner's Signature	<input type="checkbox"/> Met after Allowance Initials	<b>STATE OR COUNTRY</b> CANADA	<b>SHEETS DRAWINGS</b> 5	<b>TOTAL CLAIMS</b> 9	<b>INDEPENDENT CLAIMS</b> 2
<b>ADDRESS</b> SEAN W. GOODWIN 222 PARKSIDE PLACE 602-12 AVENUE S.W. CALGARY, AB T2R 1J3 CANADA					
<b>TITLE</b> DESANDING APPARATUS AND SYSTEM					
<b>FILING FEE RECEIVED</b> 595	FEES: Authority has been given in Paper No. _____ to charge/credit DEPOSIT ACCOUNT No. _____ for following:		<input type="checkbox"/> All Fees <input type="checkbox"/> 1.16 Fees (Filing) <input type="checkbox"/> 1.17 Fees (Processing Ext. of time) <input type="checkbox"/> 1.18 Fees (Issue) <input type="checkbox"/> Other _____ <input type="checkbox"/> Credit		

# PATENT ASSIGNMENT COVER SHEET

Electronic Version v1.1  
 Stylesheet Version v1.2

EPAS ID: PAT2609759

<b>SUBMISSION TYPE:</b>	NEW ASSIGNMENT
<b>NATURE OF CONVEYANCE:</b>	SECURITY AGREEMENT
<b>CONVEYING PARTY DATA</b>	
<b>Name</b>	<b>Execution Date</b>
SPECIALIZED TECH INC.	09/13/2013
<b>RECEIVING PARTY DATA</b>	
<b>Name:</b>	PNC BANK CANADA BRANCH
<b>Street Address:</b>	130 KING STREET WEST
<b>Internal Address:</b>	SUITE 2140
<b>City:</b>	TORONTO
<b>State/Country:</b>	CANADA
<b>Postal Code:</b>	M5X 1EF
<b>PROPERTY NUMBERS Total: 4</b>	
<b>Property Type</b>	<b>Number</b>
Patent Number:	6983852
Patent Number:	7383958
Application Number:	13372291
Application Number:	13720554
<b>CORRESPONDENCE DATA</b>	
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<b>Phone:</b>	215-569-5619
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<i>Correspondence will be sent via US Mail when the email attempt is unsuccessful.</i>	
<b>Correspondent Name:</b>	TIMOTHY D. PECSENYE
<b>Address Line 1:</b>	ONE LOGAN SQUARE
<b>Address Line 2:</b>	8TH FLOOR
<b>Address Line 4:</b>	PHILADELPHIA, PENNSYLVANIA 19103-6998
<b>ATTORNEY DOCKET NUMBER:</b>	074658-13060
<b>NAME OF SUBMITTER:</b>	TIMOTHY D. PECSENYE

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Signature:	/Timothy D. Pecsentye/
Date:	11/11/2013
	This document serves as an Oath/Declaration (37 CFR 1.63).
<p><b>Total Attachments: 9</b></p> <p>source=IP Security Agreement pdf - Adobe Acrobat Pro#page1.tif</p> <p>source=IP Security Agreement pdf - Adobe Acrobat Pro#page2.tif</p> <p>source=IP Security Agreement pdf - Adobe Acrobat Pro#page3.tif</p> <p>source=IP Security Agreement pdf - Adobe Acrobat Pro#page4.tif</p> <p>source=IP Security Agreement pdf - Adobe Acrobat Pro#page5.tif</p> <p>source=IP Security Agreement pdf - Adobe Acrobat Pro#page6.tif</p> <p>source=IP Security Agreement pdf - Adobe Acrobat Pro#page7.tif</p> <p>source=IP Security Agreement pdf - Adobe Acrobat Pro#page8.tif</p> <p>source=IP Security Agreement pdf - Adobe Acrobat Pro#page9.tif</p>	

## PATENT AND TRADEMARK SECURITY AGREEMENT

**THIS PATENT AND TRADEMARK SECURITY AGREEMENT** (as amended, restated, supplemented or replaced from time to time, this “**Agreement**”) is dated with effect as of the 13th day of September 2013 and executed and delivered by **Specialized Tech Inc.** (the “**Debtor**”) to and in favour of **PNC Bank Canada Branch**, in its capacity as Lender and agent for the benefit of itself, the Issuer and the other Lenders under the Credit and Security Agreement (as defined below) (in such capacity, the “**Agent**”).

### RECITALS

- A. The Debtor is or is about to become indebted to the Agent and the Lenders pursuant to a certain revolving credit, term loan and security agreement among, *inter alios*, the Debtor, the Agent and the Lenders dated with effect as of the date hereof (as amended, supplemented, replaced or restated from time to time, the “**Credit and Security Agreement**”);
- B. To secure the payment and performance of all of the Obligations under the Credit and Security Agreement, the Debtor has entered into, *inter alia*, a general security agreement in favour of the Agent and the Lenders dated with effect as of the date hereof (as amended, supplemented, replaced or restated from time to time, the “**General Security Agreement**”); and
- C. As a condition to extending credit to or for the account of the Debtor, the Agent and the Lenders have required the execution and delivery of this Agreement by the Debtor.

**NOW THEREFORE** in consideration of the extension of credit by the Agent and Lenders to the Debtor and other good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged by the Debtor, the Debtor hereby covenants and agrees to and in favour of the Agent and the Lenders as follows:

#### 1. Definitions

Except as otherwise expressly provided herein, capitalized terms used in this Agreement (including in the Recitals hereof) but not defined herein shall have the meanings assigned to such terms in the Credit and Security Agreement. In addition, in this Agreement, unless the context expressly or by necessary implication otherwise required, the following terms shall have the meanings set forth below:

- (a) “**Patents**” means all of each Debtor’s right, title and interest in and to patents or applications for patents, industrial designs or applications for industrial designs, fees or royalties with respect to each, and including without limitation the right to sue for past infringement and damages therefor, and licenses thereunder, all as presently existing or hereafter arising or acquired, including without limitation the patents and patent applications listed on **Exhibit A**.
- (b) “**Security Interest**” shall have the meaning ascribed thereto in Section 2.
- (c) “**Trademark**” and “**Trademarks**” means all of the Debtor’s right, title and interest in and to: (i) trademarks, service marks, collective membership marks, registrations and applications for registration for each, and the respective goodwill

associated with each, (ii) licenses, fees or royalties with respect to each, (iii) the right to sue for past, present and future infringement, dilution and damages therefor, and (iv) licenses thereunder, all as presently existing or hereafter arising or acquired, including, without limitation, the marks listed on **Exhibit B**.

2. **Security Interest.** The Debtor hereby irrevocably pledges and assigns to, and grants the Agent and the Lenders a security interest (the “**Security Interest**”) with power of sale to the extent permitted by law, in the Patents and in the Trademarks to secure payment of the Obligations. As set forth in the Credit and Security Agreement and in the General Security Agreement, the Security Interest is coupled with a security interest in substantially all of the personal property of the Debtor. This Agreement grants only the Security Interest herein described, is not intended to and does not affect any present transfer of title of any trademark registration or application and makes no assignment and grants no right to assign or perform any other action with respect to any intent to use trademark application, unless such action is permitted under applicable law. The Debtor hereby authorizes and requests that the Canadian Intellectual Property Office, the United States Patent and Trademark Office or any similar office or agency of any foreign country, and any other applicable governmental body record this Agreement.
3. **Attachment.** The Debtor, the Agent and the Lenders intend that the security interest created hereby attaches to the Patents and to the Trademarks upon the execution of this Agreement and that the security interest will attach to the Patents and to the Trademarks acquired after the date of execution of this Agreement at the time that the Debtor acquires rights in same. The Debtor, the Agent and the Lenders agree that value has been given. The Debtor represents and warrants that it has rights in the Patents and in the Trademarks.
4. **Representations, Warranties and Agreements.** The Debtor represents, warrants and agrees as follows:
  - (a) **Existence; Authority.** The Debtor is a corporation duly organized, validly existing and in good standing under the laws of its jurisdiction of incorporation, and this Agreement has been duly and validly authorized by all necessary corporate action on the part of the Debtor.
  - (b) **Patents. Exhibit A** accurately lists all Patents owned or controlled by the Debtor as of the date hereof, or to which the Debtor has a right as of the date hereof to have assigned to it, and accurately reflects the existence and status of applications and letters patent pertaining to the Patents as of the date hereof. If after the date hereof, the Debtor owns, controls or has a right to have assigned to it any Patents not listed on **Exhibit A**, or if **Exhibit A** ceases to accurately reflect the existence and status of applications and letters patent pertaining to the Patents, then the Debtor shall within 30 days provide written notice to the Agent with a replacement **Exhibit A**, which upon acceptance by the Agent shall become part of this Agreement.
  - (c) **Trademarks. Exhibit B** accurately lists all Trademarks owned or controlled by the Debtor as of the date hereof and accurately reflects the existence and status of Trademarks and all applications and registrations pertaining thereto as of the date

hereof; provided, however, that **Exhibit B** need not list common law marks (i.e., Trademarks for which there are no applications or registrations) which are not material to the Debtor's or any Affiliate's business(es). If after the date hereof, the Debtor owns or controls any Trademarks not listed on **Exhibit B** (other than common law marks which are not material to the Debtor's or any Affiliate's business(es)), or if **Exhibit B** ceases to accurately reflect the existence and status of applications and registrations pertaining to the Trademarks, then the Debtor shall promptly provide written notice to the Agent with a replacement **Exhibit B**, which upon acceptance by the Agent shall become part of this Agreement.

- (d) **Affiliates.** If after the date hereof any Affiliate owns, controls, or has a right to have assigned to it any Patents or Trade-marks, then the Debtor shall promptly notify the Agent of such item(s) and cause such Affiliate to execute and deliver to the Agent a patent and trade-mark security agreement substantially in the form of this Agreement.
- (e) **Title.** The Debtor has absolute title to each Patent and each Trademark listed on **Exhibits A and B**, free and clear of all Liens except Permitted Encumbrances. The Debtor (i) will have, at the time the Debtor acquires any rights in Patents or Trademarks hereafter arising, absolute title to each such Patent or Trademark free and clear of all Liens except Permitted Encumbrances, and (ii) will keep all Patents and Trademarks free and clear of all Liens except Permitted Encumbrances.
- (f) **No Sale.** Except as permitted in the Credit and Security Agreement or the General Security Agreement, the Debtor will not assign, transfer, encumber or otherwise dispose of the Patents or Trademarks, or any interest therein, without the prior written consent of the Agent.
- (g) **Defense.** The Debtor will, at its own expense and using commercially reasonable efforts, protect and defend the Patents and Trademarks against all claims or demands of all Persons other than those holding Permitted Encumbrances.
- (h) **Maintenance.** The Debtor will at its own expense maintain the Patents and the Trademarks to the extent reasonably advisable in its business including, but not limited to, filing all applications to obtain letters patent or trademark registrations and all affidavits, maintenance fees, annuities, and renewals possible with respect to letters patent, trademark registrations and applications therefor. The Debtor covenants that it will not abandon nor fail to pay any maintenance fee or annuity due and payable on any Patent or Trademark, nor fail to file any required affidavit or renewal in support thereof, without first providing the Agent: (i) sufficient written notice, of at least 30 days, to allow the Agent to timely pay any such maintenance fees or annuities which may become due on any Patents or Trademarks, or to file any affidavit or renewal with respect thereto, and (ii) a separate written power of attorney or other authorization to pay such maintenance fees or annuities, or to file such affidavit or renewal, should such be necessary or desirable.

- (i) **The Agent's Right to Take Action.** If the Debtor fails to perform or observe any of its covenants or agreements set forth in this Section 4, and if such failure continues for a period of 10 calendar days after the Agent gives the Debtor written notice thereof (or, in the case of the agreements contained in subsection (h), immediately upon the occurrence of such failure, without notice or lapse of time), or if the Debtor notifies the Agent that it intends to abandon a Patent or Trademark, the Agent may (but need not) perform or observe such covenant or agreement or take steps to prevent such intended abandonment on behalf and in the name, place and stead of the Debtor (or, at the Agent's option, in the Agent's own name) and may (but need not) take any and all other actions which the Agent may reasonably deem necessary to cure or correct such failure or prevent such intended abandonment.
  - (j) **Costs and Expenses.** Except to the extent that the effect of such payment would be to render any loan or forbearance of money usurious or otherwise illegal under any Applicable Law, the Debtor shall pay the Agent on demand the amount of all moneys expended and all costs and expenses (including lawyers' fees and disbursements) incurred by the Agent in connection with or as a result of the Agent's taking action under subsection (i) or exercising its rights under Section 6, together with interest thereon from the date expended or incurred by the Agent at the Default Rate.
  - (k) **Power of Attorney.** To facilitate the Agent's taking action under subsection (i) and exercising its rights under Section 7, the Debtor hereby irrevocably appoints (which appointment is coupled with an interest) the Agent, or its delegate, as the attorney-in-fact of the Debtor with the right (but not the duty) from time to time to create, prepare, complete, execute, deliver, endorse or file, in the name and on behalf of the Debtor, any and all instruments, documents, applications, financing statements, and other agreements and writings required to be obtained, executed, delivered or endorsed by the Debtor under this Section 4, or, necessary for the Agent, after an Event of Default which is not waived in writing by the Agent, to enforce or use the Patents or Trademarks or to grant or issue any exclusive or non-exclusive license under the Patents or Trademarks to any third party, or to sell, assign, transfer, pledge, encumber or otherwise transfer title in or dispose of the Patents or Trademarks to any third party. The Debtor hereby ratifies all that such attorney shall lawfully do or cause to be done by virtue hereof. The power of attorney granted herein shall terminate upon the termination of the Credit and Security Agreement as provided therein and the indefeasible payment in full in cash and performance of all Obligations.
5. **The Debtor's Use of the Patents and Trademarks.** The Debtor shall be permitted to control and manage the Patents and Trademarks, including the right to exclude others from making, using or selling items covered by the Patents and Trademarks and any licenses thereunder, in the same manner and with the same effect as if this Agreement had not been entered into, so long as no Event of Default occurs and is continuing, which has not been waived in writing by the Agent.

6. **Events of Default.** Any Event of Default (as defined in the Credit and Security Agreement), which has not been waived in writing by the Agent, shall constitute an event of default under this Agreement (herein called “**Event of Default**”).
7. **Remedies.** Upon the occurrence of a continuing Event of Default, and at any time thereafter, the Agent may, at its option, take any or all of the following actions:
  - (a) exercise any or all remedies available under the Credit and Security Agreement, General Security Agreement and any Other Documents, and all rights and remedies of a secured party provided at Applicable Law;
  - (b) sell, assign, transfer, pledge, encumber or otherwise dispose of the Patents and Trademarks; and/or
  - (c) enforce the Patents and Trademarks and any licenses thereunder, and if the Agent shall commence any suit for such enforcement, the Debtor shall, at the request of the Agent do any and all lawful acts and execute any and all proper documents reasonably required in aid of such enforcement.
8. **Miscellaneous.** This Agreement can be waived, modified, amended, terminated or discharged, and the Security Interest can be released, only explicitly in a writing signed by the Agent and the Lenders. A waiver signed by the Agent shall be effective only in the specific instance and for the specific purpose given. Mere delay or failure to act shall not preclude the exercise or enforcement of any of the Agent’s or the Lenders’ rights or remedies. All rights and remedies of the Agent and the Lenders shall be cumulative and may be exercised singularly or concurrently, at the Agent’s and the Lenders’ option, and the exercise or enforcement of any one such right or remedy shall neither be a condition to nor bar the exercise or enforcement of any other. All notices to be given to the Debtor under this Agreement shall be given in the manner and with the effect provided in the Credit and Security Agreement. The Agent and the Lenders shall not be obligated to preserve any rights the Debtor may have against prior parties, to realize on the Patents and Trademarks at all or in any particular manner or order, or to apply any cash proceeds of Patents and Trademarks in any particular order of application. This Agreement shall be binding upon and inure to the benefit of the Debtor, the Agent and the Lenders and their respective participants, successors and assigns and shall take effect when signed by the Debtor and delivered to the Agent and the Lenders, and the Debtor waives notice of the Agent’s acceptance hereof. The Agent and the Lenders may execute this Agreement if appropriate for the purpose of filing, but the failure of the Agent and/or the Lenders to execute this Agreement shall not affect or impair the validity or effectiveness of this Agreement. Subject to the immediately preceding sentence, this Agreement may be executed in any number of counterparts and delivered by facsimile or other electronic transmission, each of which when executed and delivered shall be deemed to be an original and all of which when taken together, shall constitute one and the same document. A carbon, photographic or other reproduction of this Agreement signed by the Debtor or of any financing statement authorized by the Debtor shall have the same force and effect as the original for all purposes of a financing statement. If any provision or application of this Agreement is held unlawful or unenforceable in any respect, such illegality or unenforceability shall not affect other provisions or applications which can be given effect and this Agreement shall be construed as if the unlawful or unenforceable

provision or application had never been contained herein or prescribed hereby. All representations and warranties contained in this Agreement shall survive the execution, delivery and performance of this Agreement and the creation and payment of the Obligations.

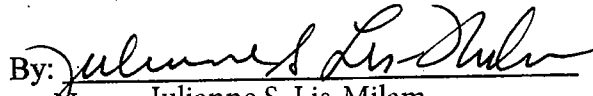
9. **Governing Law.** This Agreement is to be exclusively construed in accordance with and governed by the internal laws of the Province of Alberta and the federal laws of Canada applicable therein without giving effect to any choice of law rule or principle that would cause the application of the laws of any jurisdiction other than the internal laws of the Province of Alberta and the federal laws of Canada applicable therein to the rights and duties of the Debtor and the Agent.
10. **Paramountcy.** In the event of any conflict or inconsistency with the provisions hereof and the provisions of the Credit and Security Agreement, the provisions of the Credit and Security Agreement shall prevail and govern but only to the extent of such conflict or inconsistency.

*[Signature Pages Follows]*

IN WITNESS WHEREOF, Grantor has caused this Agreement to be executed and delivered by its duly authorized officer as of the date first set forth above.

GRANTOR:

SPECIALIZED TECH

By:   
Name: Julianne S. Lis-Milam  
Title: President


# **EXHIBIT A PATENTS**

<b>Patent No.</b>	<b>Description</b>	<b>Country</b>	<b>Filing Date</b>	<b>Owner</b>
2,407,554	Method and Apparatus for Desanding Wellhead Production ( <b>Weir</b> )	Canada	Oct. 10, 2002	STI
2,433,741	Desanding Apparatus and System ( <b>Flow Outlet</b> )	Canada	June 27, 2003	STI
6,983,852	Desanding Apparatus and System ( <b>Flow Outlet and Weir</b> )	United States	Sept. 24, 2003	STI
2,535,215	Desanding Apparatus and System ( <b>Nozzle</b> )	Canada	Oct. 10, 2002	STI
7,383,958	Desanding Apparatus and System ( <b>Nozzle</b> )	United States	Sept. 24, 2003	STI

## **PATENT APPLICATIONS**

<b>Patent No.</b>	<b>Description</b>	<b>Country</b>	<b>Filing Date</b>	<b>Owner</b>
2,799,278	Desanding Apparatus and System ( <b>Tilt desander</b> )	Canada	Dec. 19, 2012	STI
13/372,291	Desanding Apparatus and System ( <b>Tilt desander</b> )	United States	Feb. 13, 2012	STI
PCT/CA2012/050915	Desanding Apparatus and System ( <b>Tilt desander</b> )	PCT	Dec. 19, 2012	STI
13/720,554	Erosion Resistant Flow Conduit	United States	Dec. 19, 2012	STI

**EXHIBIT B  
TRADEMARKS**

TRADEMARK	APP NUMBER	REG. NUMBER	STATUS	COUNTR Y	OWNER
SPECIALIZED TECH INC.	N/A	N/A	UNREGISTER ED	N/A	STI
GAS WELL DESANDING SERVICES	N/A	N/A	UNREGISTER ED	N/A	STI
	N/A	N/A	UNREGISTER ED	N/A	STI

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# UNITED STATES PATENT AND TRADEMARK OFFICE

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
13/372,291	02/13/2012	Christopher A HEMSTOCK	2200-011 US

**CONFIRMATION NO. 1699**

## PUBLICATION NOTICE



\*OC000000063254441\*

27522  
SEAN W. GOODWIN  
222 PARKSIDE PLACE  
602-12 AVENUE S.W.  
CALGARY, AB T2R 1J3  
CANADA

**Title:**DESANDING APPARATUS AND SYSTEM

**Publication No.**US-2013-0206007-A1

**Publication Date:**08/15/2013

## NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

The publication may be accessed through the USPTO's publically available Searchable Databases via the Internet at [www.uspto.gov](http://www.uspto.gov). The direct link to access the publication is currently <http://www.uspto.gov/patft/>.

The publication process established by the Office does not provide for mailing a copy of the publication to applicant. A copy of the publication may be obtained from the Office upon payment of the appropriate fee set forth in 37 CFR 1.19(a)(1). Orders for copies of patent application publications are handled by the USPTO's Office of Public Records. The Office of Public Records can be reached by telephone at (703) 308-9726 or (800) 972-6382, by facsimile at (703) 305-8759, by mail addressed to the United States Patent and Trademark Office, Office of Public Records, Alexandria, VA 22313-1450 or via the Internet.

In addition, information on the status of the application, including the mailing date of Office actions and the dates of receipt of correspondence filed in the Office, may also be accessed via the Internet through the Patent Electronic Business Center at [www.uspto.gov](http://www.uspto.gov) using the public side of the Patent Application Information and Retrieval (PAIR) system. The direct link to access this status information is currently <http://pair.uspto.gov/>. Prior to publication, such status information is confidential and may only be obtained by applicant using the private side of PAIR.

Further assistance in electronically accessing the publication, or about PAIR, is available by calling the Patent Electronic Business Center at 1-866-217-9197.

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

<b>INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b> ( Not for submission under 37 CFR 1.99)	Application Number		13372291	
	Filing Date		2012-02-13	
	First Named Inventor	Christopher A. HEMSTOCK		
	Art Unit	1774		
	Examiner Name	TBD		
	Attorney Docket Number	2200-011 US		

U.S.PATENTS						Remove
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Examiner Initial*	Cite No	Foreign Document Number <sup>3</sup>	Country Code <sup>2</sup> j	Kind Code <sup>4</sup>	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T <sup>5</sup>
	1	2433741	CA			Hemstock, C. et al.		<input type="checkbox"/>
	2	773096	GB			Laird, A.		<input type="checkbox"/>
	3	2041479	CA			Martin, R.		<input type="checkbox"/>

<b>INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b> ( Not for submission under 37 CFR 1.99)	Application Number		13372291	
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	Art Unit	1774		
	Examiner Name	TBD		
	Attorney Docket Number	2200-011 US		

	4	2002070101	WO			Binsfield, B. et al.		<input type="checkbox"/>
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Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T <sup>5</sup>
	1	PCT/CA2012/050915 - International Search Report	<input type="checkbox"/>

If you wish to add additional non-patent literature document citation information please click the Add button **Add**

<b>EXAMINER SIGNATURE</b>			
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Examiner Signature		Date Considered	
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\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

<sup>1</sup> See Kind Codes of USPTO Patent Documents at [www.USPTO.GOV](http://www.USPTO.GOV) or MPEP 901.04. <sup>2</sup> Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). <sup>3</sup> For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. <sup>4</sup> Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. <sup>5</sup> Applicant is to place a check mark here if English language translation is attached.

**INFORMATION DISCLOSURE  
STATEMENT BY APPLICANT**  
( Not for submission under 37 CFR 1.99)

Application Number	13372291
Filing Date	2012-02-13
First Named Inventor	Christopher A. HEMSTOCK
Art Unit	1774
Examiner Name	TBD
Attorney Docket Number	2200-011 US

**CERTIFICATION STATEMENT**

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

**OR**

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ See attached certification statement.

☐ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

**SIGNATURE**

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/seanwgoodwin/	Date (YYYY-MM-DD)	
Name/Print	Sean W. Goodwin	Registration Number	39568

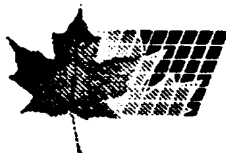
This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

## Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.



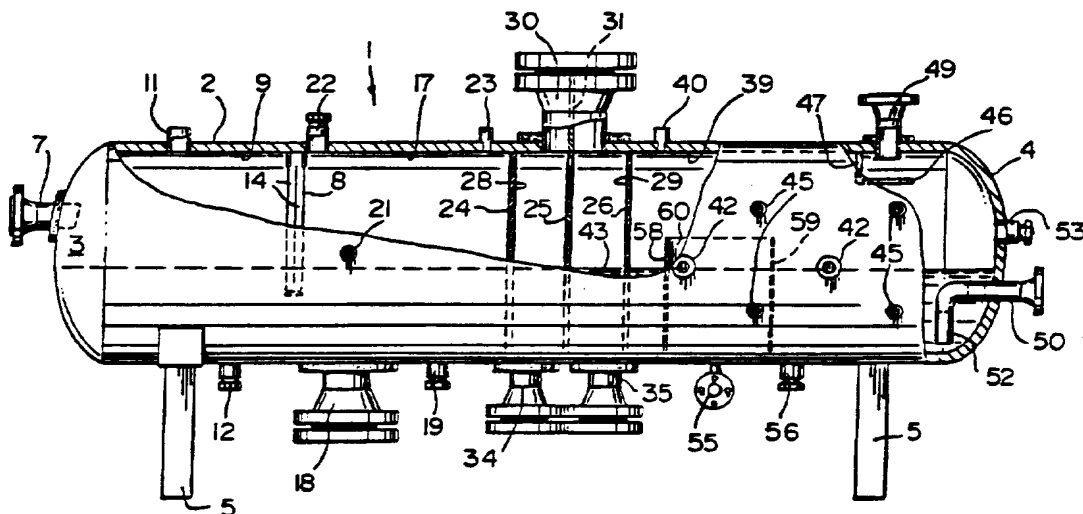
(72) Martin, Robert Lynden, CA

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(51) Int. Cl.<sup>6</sup> B01D 21/02, B01D 17/028

(54) **APPAREIL DE SEPARATION DES SOLIDES DANS LES  
FLUIDES DE PUIT**

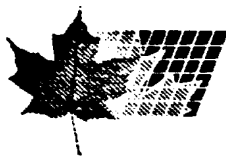
(54) **APPARATUS FOR SEPARATING SOLIDS FROM WELL FLUIDS**



(57) Règle générale, les séparateurs actuellement utilisés pour traiter les effluents des puits de pétrole et de gaz sont des appareils à basse pression d'une grande capacité qui font habituellement appel à la gravité pour séparer les solides des fluides produits dans les puits. Un simple séparateur des solides et de liquides des effluents de puits de pétrole et de gaz, capable de fonctionner à haute pression, comprend un réservoir horizontal, de forme allongée avec une entrée à une extrémité pour la réception des effluents de puits, des orifices de régulation du niveau pratiqués dans un côté du réservoir, afin de maintenir le niveau du réservoir à un niveau prédéterminé sous la ligne centrale longitudinale, un déflecteur à fentes s'avancant vers le bas, depuis la partie supérieure du réservoir, près de l'extrémité du point d'entrée afin de définir une chambre d'entrée permettant l'expansion rapide de l'effluent et favorisant la séparation des solides. Cette chambre est suivie d'une chambre de séparation par gravité facilitant la séparation des solides, de plusieurs plaques perforées placées en aval du déflecteur et définissant des chambres de

(57) In general, presently existing separators for the effluents of gas and oil wells are large volume, low pressure devices, which usually rely on gravity for the separation of solids from produced well fluids. A simple separator for separating solids and liquids from oil or gas well effluents capable of operating at high pressures includes an elongated, horizontal tank with an inlet in one end thereof for receiving well effluent, level control ports in a side of the tank for maintaining liquid in the tank at a predetermined level below the longitudinal center of the tank, a slotted baffle extending downwardly from the top of the tank near the inlet end for defining an inlet chamber permitting rapid expansion of the effluent and promoting solids separation, the inlet chamber being followed by a gravity chamber facilitating gravity separation of solids, a plurality of perforated plates downstream of the baffle defining aggregate chambers containing particulate material for promoting additional solids separation and coalescence of hydrocarbon liquids and water in the liquid portion of the effluent, and an outlet chamber downstream of the aggregate chambers





(11)(21)(C) **2,041,479**  
(22) 1991/04/30  
(43) 1992/10/31  
(45) 1998/04/21

réception des agrégats contenant des matières particulières pour favoriser la séparation de solides additionnels et la coalescence de liquides d'hydrocarbures et d'eau dans la partie liquide de l'effluent et d'une chambre de sortie en aval des chambres de réception des agrégats comprenant un orifice d'évacuation des gaz pratiqué dans la partie supérieure pour libérer les gaz du réservoir, des cloisons définissant un bassin de sortie dans lequel passent les liquides d'hydrocarbures pour sortir du réservoir et un orifice d'évacuation de l'eau à l'autre extrémité du réservoir, sous le niveau normal du liquide afin d'évacuer l'eau du réservoir.

with a gas outlet in the top thereof for discharging gas from the tank, partitions defining a hydrocarbon discharge basin into which hydrocarbon liquids overflow for discharge from the tank, and a water outlet in the other end of the tank beneath the normal operating liquid level for discharging water from the tank.



This invention relates to a separator, and in particular to a separator for the effluents of gas and oil wells.

5        Formation fines (sand) from unconsolidated sandstone  
reservoirs and artificially introduced sand proppants from  
hydraulic fracturing are the primary sources of erosion of  
gas and oil well surface production equipment. Wells which  
produce sand, for either of the above-mentioned reasons,  
are not only dangerous, but usually very costly to  
10        produce. For example, a well having a surface flowing  
pressure of 7 MPa, perforated at a depth of 1,000 meters  
and producing 5 liters of sand and 30,000 cubic meters of  
natural gas per day through 60 mm tubing effectively  
becomes a one kilometer long high pressure sand blaster.  
15        Such a quantity of minimum sand production can easily cut  
through surface piping and facilities in relatively short  
order. Of course, the high pressure rupturing of piping by  
erosive materials constitutes a real danger to oil field  
workers. The danger is even greater when the well contains  
20        hydrogen sulphide. Often, the problem of erosion is so  
acute that wells are shut down indefinitely.

As more and more oil and gas reserves are exploited,  
the hydraulic fracturing of wells will undoubtedly become  
more common. After a well has been fractured, it is  
25        normally flowed to clean up and is subsequently tested for

production. Solid returns are at a maximum during the clean up flow, the purpose of which is to recover any of the proppants which have not "healed" into the formation. Other than actual solids, partial solids such as asphaltenes constitute a source of production difficulty. Production of this type of solid creates a problem, because the substances tend to become gasified and migrate to the top of the separator and into the scrubbed gas stream. Consequently, the glycol used in dehydrators at the well head can become contaminated, the controls in oil well production facilities can become blocked or production chokes become clogged.

Examples of separators for use with oil and gas wells are disclosed by Canadian Patents Nos. 806,472, issued to R.E. McMinn on February 18, 1969; 923,826, issued to E.H. Piner Jr. on April 3, 1973; 933,471, issued to F.L. Murdock Sr., on September 11, 1973; 1,024,903, issued to F.L. Murdock Sr., on January 24, 1978 and 1,188,613<sup>31</sup>, issued to J. Pielkenrood on June 11, 1985, and U.S. Patents Nos. 2,601,903, issued to R.W. Erwin on July 1, 1952 and 4,673,500, issued to R.A. Hoofnagle et al on June 16, 1987.

Without discussing the specifics of this patent literature, at present, the only available surface erosion control devices are the so-called "surge-tank" or "knock-out" vessels. Such devices usually rely on gravity

and large capacity tanks for separating solids from produced well fluids. The principle difficulty with such devices is the low operating pressures of the vessels, and poor or inadequate internal designs. The separators in question are effective for low pressure wells, because the vessels used have typical operating pressures below 700 kPa. Moreover, low pressure tanks cannot readily be incorporated into permanent production facilities.

The object of the present invention is to provide a solution of the above identified erosion problems in the form of a relatively simple separator for effectively separating solids from well fluid effluents, even under high pressures.

Accordingly, the present invention relates to a separator for separating solids and liquids from oil or gas well effluents comprising elongated, horizontal tank means; first inlet means in one end of said tank means for introducing well effluent into said tank means; level control means in said tank means for maintaining the liquid in said tank at a predetermined level below the longitudinal center of the tank means; slotted baffle means extending downwardly from the top of said tank means near said one end, said baffle means extending downwardly beyond the predetermined level for defining an inlet chamber permitting rapid expansion of the effluent and promoting

solids separation; a plurality of perforated plates means  
in said tank means downstream of the baffle means defining  
a gravity separation chamber with said baffle means for  
promoting additional solids separation; solids outlet means  
5 in tank means at the bottom of said gravity separation  
chamber, said perforate plate means defining at least one  
aggregate chamber for receiving particulate material  
adapted to promote additional solids separation, the last  
said perforate plate means and the other end of said tank  
10 means defining an outlet chamber downstream of said last  
plate means; gas outlet means in the top of said tank means  
for discharging gas from said outlet chamber; partition  
means in said outlet chamber defining a liquid by  
hydrocarbon discharge basin for receiving liquid  
15 hydrocarbons overflowing said partition means; hydrocarbon  
outlet means in said tank means for discharging liquid  
hydrocarbons from said basin, and water outlet means in  
said other end of said tank means beneath said  
predetermined liquid level for discharging water from said  
20 outlet chamber.

The invention will be described in greater detail with  
reference to the accompanying drawings, which illustrate a  
preferred embodiment of the invention, and wherein:

Figure 1 is a schematic, partly sectioned, side  
25 elevational view of a separator in accordance with the  
present invention;

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Figure 2 and 3 are partly sectioned, end views of the separator of Fig. 1, as seen from the left and right, respectively of Fig. 1;

5 Figure 4 is a front view of a solids baffle used in the separator of Figs. 1 to 3;

Figure 5 is a cross section taken generally along line V-V of Fig. 4; and

Figure 6 is a front view of an aggregate retainer plate used in the separator of Figs. 1 to 3.

10 With reference to the drawing, the separator of the present invention includes an elongated, horizontal tank generally indicated at 1 defined by a cylinder 2 with closed convex ends 3 and 4. The tank 1 is supported by a pair of legs 5. Well effluent is introduced into the tank  
15 1 through an inlet pipe 7 in the end 3. A baffle 8 suspended from the top of the cylinder 2 defines the trailing or downstream end of an inlet chamber 9. A pressure relief vent 11 containing a pressure relief valve (not shown) is provided at the top of the inlet chamber 9,  
20 and a solids cleanout pipe 12 is provided in the bottom of the cylinder 2.

As shown in Figs. 4 and 5, the baffle 8 is defined by a pair of parallel rows of vertical bars in the form of small diameter tubes 14 extending between brackets defined  
25 by parallel, arcuate to plates 15 and a straight,

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horizontal bottom plate 16. The tubes 14 in one row are staggered with respect to the tubes 14 in the other row.

5 The inlet chamber 9 is followed in the direction of material flow by a gravity chamber 17, the bottom of which contains a principal solids outlet 8 and a second solids cleanout pipe 19. A port 21 for a temperature probe (not shown) is provided in the side of the gravity chamber 17, and a cleanout port 22 and differential pressure gauge port 23 are provided in the top thereof. The trailing or  
10 downstream end of the gravity chamber 17 is defined by a perforate disc or plate 24, which is followed by two additional plates 25 and 26. The plates 24, 25 and 26 are parallel and spaced apart, defining chambers 28 and 29 for  
15 receiving particulate material or aggregate (not shown) which is loaded into the chambers via a top inlet pipe 30. A rectangular projection 31 (Figs. 1 and 6) on the top center of the disc 25 divides the inlet pipe 30 into two passages. Solids can be removed from the chambers 28 and  
20 29 through outlets 33 and 34 in the bottom of the cylinder 2.

Each of the plates 24, 25 and 26 includes an annular mounting rim 36 (Fig. 6), and a plurality of concentric circular rows of openings 37. The first plate 24 contains  
25 openings 37 which are relatively large in diameter (9.55 mm).

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The second and third plates 25 and 26 contain smaller openings (6.4 mm diameter). The number of openings 37 in the upper ends of the plates 24, 25 and 26 is greater than the number in the lower ends of the plates. The plates 24, 5 25 and 26 also promote the coalescing of oil droplets, and the separation of sand from the liquids flowing therethrough. The particle size of the aggregate in the first aggregate chamber 28 is larger than the particle size of the aggregate in the chamber 29. Preferably the 10 aggregate or particulate material in the chambers 28 and 29 is granite stucco stones.

The plate 26 defines the upstream end of a final gravity separation and outlet chamber 39, which contains a differential pressure gauge port 40 in the top thereof. 15 Liquid level control outlets 42 are provided in one side of the cylinder for maintaining the operational level of the liquid indicated by line 43 (Figs. 1 to 3) below the center of the tank, but above the bottom of the baffle 8. Four gauge column ports 45 are also provided in one side of the 20 tank, for the attachment of site glasses. Gas is discharged from the chamber 39 via a mist pad 46 suspended from the top of the tank a holder 47, and an outlet pipe 49. Water is discharged from the end 4 of the tank via an L-shaped outlet pipe 50, one arm 52 of which extends 25 downwardly in the tank close to the bottom thereof. A

alternative water dump controller and cleanout pipe 53 is provided in the end 4 above the pipe 50. Hydrocarbon liquid is discharged from the chamber 39 through a bottom outlet 55. A third solids cleanout pipe 56 is provided in the bottom of the cylinder 2 downstream of the hydrocarbon outlet 55.

A pair of transversely extending partitions 58 and 59 (Figs. 2 and 3, respectively) and a longitudinally extending partition 60 define three walls of a hydrocarbon basin 62. A notch 63 (Fig. 3) is provided in the partition 59, so that the latter acts as a weir, permitting the overflow of hydrocarbon liquids from the outlet chamber into the basin 62. As mentioned above, the hydrocarbon liquids are discharged via the bottom outlet 55.

Because the tank 1 is designed to operate under high pressures (of 10 MPa and higher), reinforcing pads are provided around the principal inlets and outlets.

In operation, well effluent enters the inlet chamber 9 via the inlet pipe 7. The sudden expansion of the well effluent reduces flow velocity and initiates the sand drop-out process. Moreover, by reducing the flow velocity, the erosive effect of the sand is reduced, and both sand and liquid descend in the tank 1. The effluent encounters the baffle 8 which absorbs some of the erosive shock of well debris, and changes the flow direction which promotes

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phase separation. The baffle 8 also causes separation of a large volume of sand. During passage through the baffle 8, oil droplets are coalesced. Following passage of the well effluent through the baffle 8, additional gravity separation of sand occurs in the chamber 17.

The effluent, containing a reduced sand concentration passes through the particulate material in the aggregate chambers 28 and 29. Impingement of the effluent upon the particulate material in the chambers facilitates solid separation. Moreover, because of the large surface area of the materials in the chambers 28 and 29, coalescence occurs, promoting separation, hydrocarbon liquids and water phases. Additional aggregate chambers can be provided, the number of chambers being dictated by flow volume, solids content and the required fluid separation capabilities. It is worth noting that trapped grains of sand in the chambers 28 and 29 enhance rather than impede sand separation. The particular material can be removed from the chambers 28 and 29 through the outlets 34 and 35 for cleaning or replacement.

Material entering the outlet chamber 39 is further separated when hydrocarbon liquids flow into the basin defined by the partitions 58, 59 and 60. Gases are discharged through the outlet pipe 49, hydrocarbon liquids are discharged through the outlet pipe 5 and water is

discharged through outlet pipe 50 to complete the separation process.

Operation under relatively high working pressures reduces the need for choking of the effluent upstream of the tank 1, thereby reducing hydrate difficulties created by the cooling effects from the pressure drop due to choking. Hydrate difficulties are further reduced by operating the tank at pressures close to well head production pressures.

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE  
PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. A separator for separating solids and liquids from oil or gas well effluent comprising elongated, horizontal tank means; first inlet means in one end of said tank means for introducing well effluent into said tank means; level control means in said tank means for maintaining the liquid in said tank at a predetermined level below the longitudinal center of the tank means; slotted baffle means extending downwardly from the top of said tank means near said one end, said baffle means extending downwardly beyond the predetermined level for defining an inlet chamber permitting rapid expansion of the effluent and promoting solids separation; a plurality of perforate plate means in said tank means downstream of the baffle means defining a gravity separation chamber with said baffle means for promoting additional solids separation; solids outlet means in said tank means at the bottom of said gravity separation chamber, said perforate plate means defining at least one aggregate chamber for receiving particulate material adapted to promote additional solids separation, the last said perforate plate means and the other end of said tank means defining an outlet chamber downstream of said last plate means; gas outlet means in the top of said tank means

for discharging gas from said outlet chamber; partition means in said outlet chamber defining a liquid hydrocarbon discharge basin for receiving liquid hydrocarbons overflowing said partition means; hydrocarbon outlet means in said tank means for discharging liquid hydrocarbons from said basin; and water outlet means in said other end of said tank means beneath said predetermined liquid level for discharging water from said outlet chamber.

2. A separator according to claim 1, wherein said baffle means includes a plurality of rows of vertically extending bar means, the bar means in one row being staggered with respect to the bar means in any adjacent row, whereby separation of solids, liquids and gases is promoted.

3. A separator according to claim 2, wherein said baffle means includes upper bracket means for suspending said bar means from the top of said tank means; lower bracket means retaining the bottom ends of said bar means; and two parallel rows of said bar means, the bar means in one row being staggered with respect to the bar means in the other said row.

4. A separator according to claim 2, wherein each said perforate plate means includes a plurality of concentric circular rows of holes.

5. A separator according to claim 4, wherein the number of holes in each said perforate plate means is greater above than below said predetermined level.

6. A separator according to claim 4, including three said spaced apart, perforate plate means defining a pair of aggregate chambers, the openings in the first said plate means being larger than the openings in the other said plate means.

7. A separator according to claim 6, wherein said partition means includes first and second parallel, spaced apart partitions extending transversely outwardly from one side of said tank means; a third, longitudinally extending partition interconnecting the other ends of said first and second partitions, each said partition extending upwardly beyond said predetermined level; and a notch in one said partition permitting the overflow of hydrocarbon liquid into said basin 2.

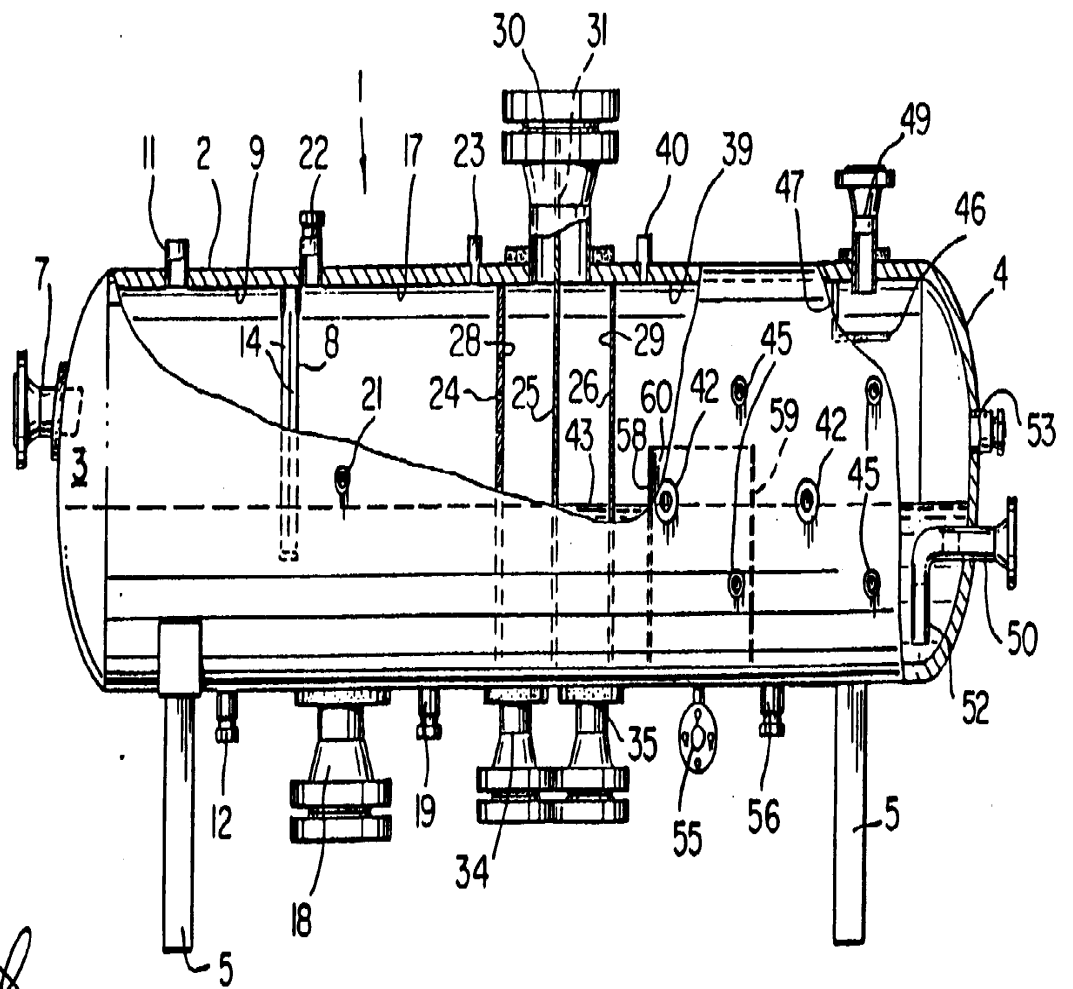
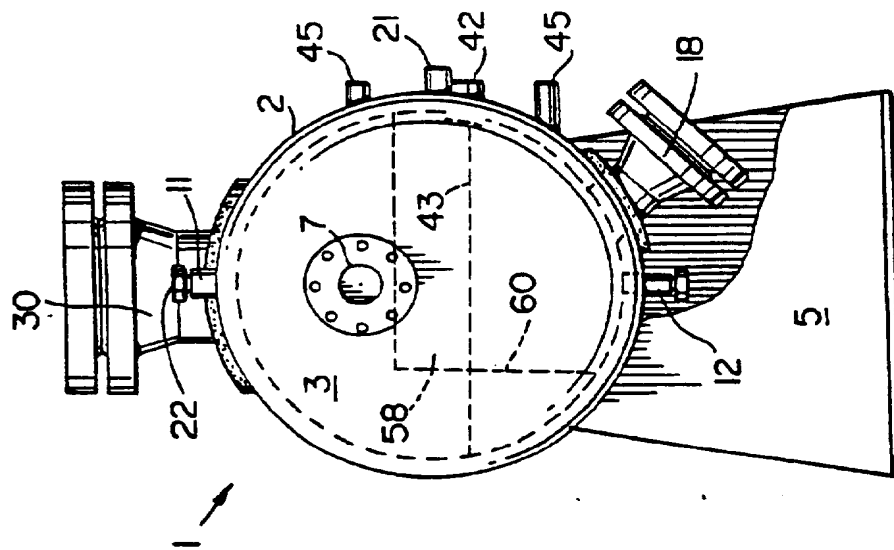
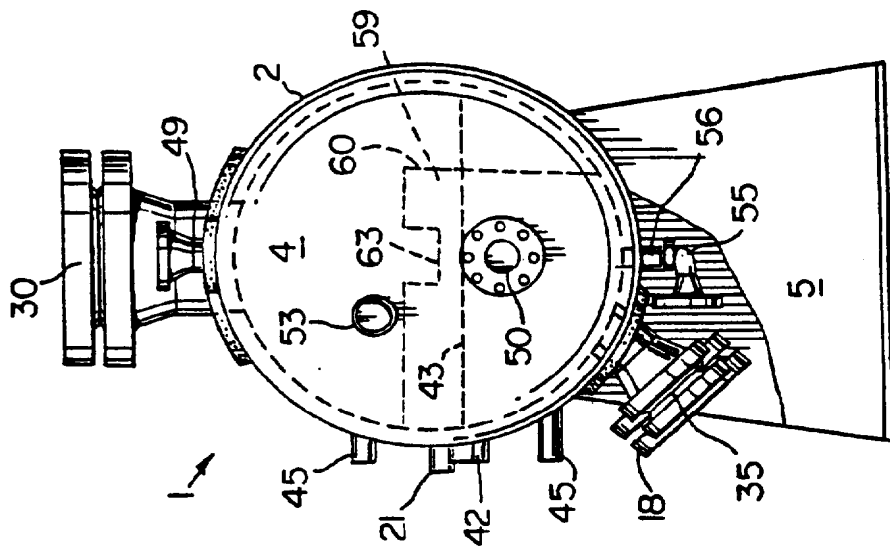


FIG. 1

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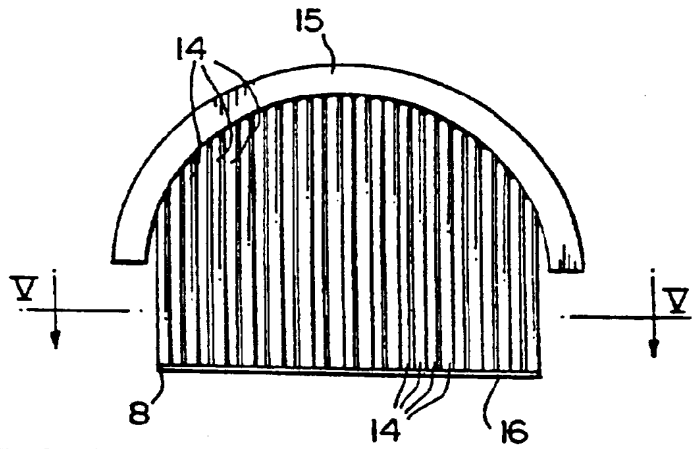


FIG. 4

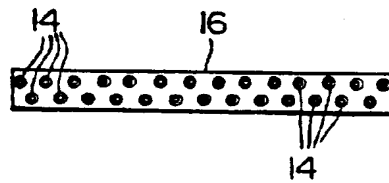


FIG. 5

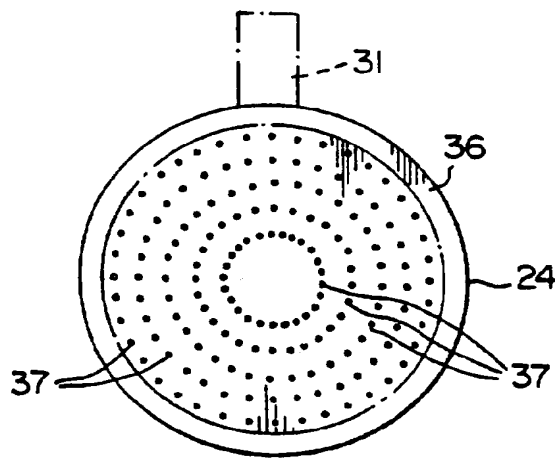


FIG. 6

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P. H. C. H.



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(21) 2 433 741

(22) 27.06.2003

(51) Int. Cl.<sup>7</sup>: **E21B 43/34**, B01D 21/00,  
E21B 43/02, E21B 43/12,  
E21B 43/38

(30)	2,407,554	CA	10.10.2002
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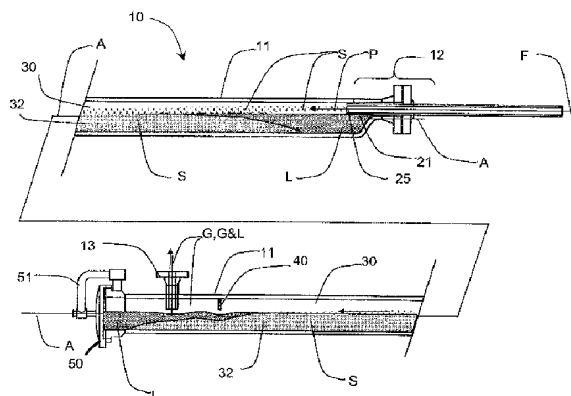
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(54) DISPOSITIF ET SYSTEME DE DESSABLAGE

(54) DESANDING APPARATUS AND SYSTEM

(57)

A desanding vessel is inserted in a high velocity fluid stream containing entrained particulates. The vessel comprises an upper freeboard portion having a large cross-sectional wherein the fluid stream velocity drops and particulates fall from suspension. Preferably the fluid stream is introduced offset upwardly from an axis of a horizontally oriented cylindrical vessel, released particulates falling to accumulate in a lower belly portion. The freeboard portion is maintained using a depending flow barrier adjacent the vessel's outlet which sets the depth of accumulation in the belly portion. A cleanout enables periodic removal of accumulations.





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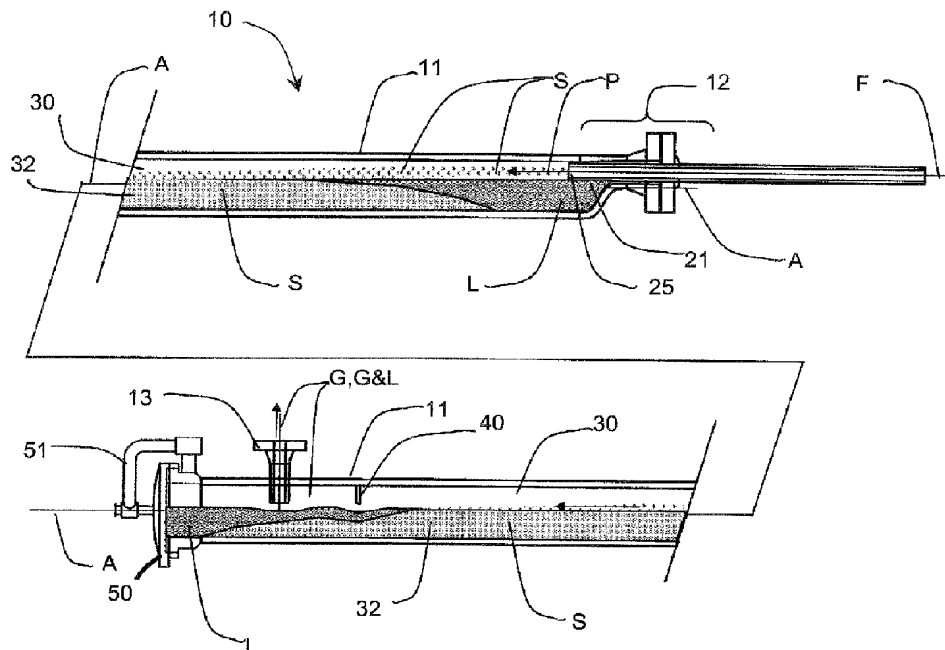
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(54) **Titre : DISPOSITIF ET SYSTEME DE DESSABLAGE**

(54) **Title: DESANDING APPARATUS AND SYSTEM**



(57) **Abrégé/Abstract:**

A desanding vessel is inserted in a high velocity fluid stream containing entrained particulates. The vessel comprises an upper freeboard portion having a large cross-sectional wherein the fluid stream velocity drops and particulates fall from suspension. Preferably the fluid stream is introduced offset upwardly from an axis of a horizontally oriented cylindrical vessel, released particulates falling to accumulate in a lower belly portion. The freeboard portion is maintained using a depending flow barrier adjacent the vessel's outlet which sets the depth of accumulation in the belly portion. A cleanout enables periodic removal of accumulations.



**ABSTRACT OF THE INVENTION**

1  
2           A desanding vessel is inserted in a high velocity fluid stream  
3 containing entrained particulates. The vessel comprises an upper freeboard  
4 portion having a large cross-sectional wherein the fluid stream velocity drops and  
5 particulates fall from suspension. Preferably the fluid stream is introduced offset  
6 upwardly from an axis of a horizontally oriented cylindrical vessel, released  
7 particulates falling to accumulate in a lower belly portion. The freeboard portion  
8 is maintained using a depending flow barrier adjacent the vessel's outlet which  
9 sets the depth of accumulation in the belly portion. A cleanout enables periodic  
10 removal of accumulations.

1                   **"DESANDING APPARATUS AND SYSTEM"**  
2

3                   FIELD OF THE INVENTION

4                   The present invention relates to a system and apparatus for the  
5 removal of particulates such as sand from fluid streams produced from a well  
6 while minimizing abrasion of the involved equipment.  
7

8                   BACKGROUND OF THE INVENTION

9                   Production from wells in the oil and gas industry often contain  
10 particulates such as sand. These particulates could be part of the formation from  
11 which the hydrocarbon is being produced, introduced particulates from hydraulic  
12 fracturing or fluid loss material from drilling mud or fracturing fluids or from a  
13 phase change of produced hydrocarbons caused by changing conditions at the  
14 wellbore (Asphalt or wax formation). As the particulates are produced, problems  
15 occur due to abrasion, and plugging of production equipment. In a typical startup  
16 after stimulating a well by fracturing, the stimulated well may produce sand until  
17 the well has stabilized, often up to a month after production commences. Other  
18 wells may require extended use of the desander 10.

19                  In the case of gas wells, fluid velocities can be high enough that the  
20 erosion of the production equipment is severe enough to cause catastrophic  
21 failure. High fluid stream velocities are typical and are even purposefully  
22 designed for elutriating particles up the well and to the surface. An erosive failure  
23 of this nature can become a serious safety and environmental issue for the well  
24 operator. A failure such as a breach of high pressure piping or equipment  
25 releases uncontrolled high velocity flow of fluid which is hazardous to service

1 personnel. Release to the environment is damaging to the environment resulting  
2 in expensive cleanup and loss of production. Repair costs are also high.

3 In all cases, retention of particulates contaminates both surface  
4 equipment and the produced fluids and impairs the normal operation of the oil  
5 and gas gathering systems and process facilities.

6 In one prior art system, a pressurized tank ("P-Tank") is placed on  
7 the wellsite and the well is allowed to produce fluid and particulates. The fluid  
8 stream is produced from a wellhead and into a P-Tank until sand production  
9 ceases. The large size of the P-Tank usually restricts the maximum operating  
10 pressure of the vessel to something in the order of 1,000 – 2,100 kPa. In the  
11 case of a gas well, this requires some pressure control to be placed on the well to  
12 protect the P-Tank. Further, for a gas well, a pressure reduction usually is  
13 associated with an increase in gas velocity which in turn makes sand-laden  
14 wellhead effluent much more abrasive. Another problem associated with this  
15 type of desanding technique is that it is only a temporary solution. If the well  
16 continues to make sand, the solution becomes prohibitively expensive. In most  
17 situations with this kind of temporary solution, the gas vapors are not conserved  
18 and sold as a commercial product.

19 An alternate known prior art system includes employing filters to  
20 remove particulates. A common design is to have a number of fiber-mesh filter  
21 bags placed inside a pressure vessel. The density of the filter bag fiber-mesh is  
22 matched to the anticipated size of the particulates. Filter bags are generally not  
23 effective in the removal of particulates in a multiphase conditions. Usually  
24 multiphase flow in the oil and gas operations is unstable. Large slugs of fluid  
25 followed by a gas mist is common. In these cases, the fiber bags become a

1 cause a pressure drop and often fail due to the liquid flow therethrough. Due to  
2 the high chance of failure, filter bags may not be trusted to remove particulates in  
3 critical applications or where the flow parameters of a well are unknown. An  
4 additional problem with filter bags in most jurisdictions is the cost associated with  
5 disposal. The fiber-mesh filter bags are considered to be contaminated with  
6 hydrocarbons and must be disposed of in accordance to local environmental  
7 regulation.

8                   Clearly there is a need for more versatile and cost effective system  
9 of particulate handling.

10

#### 11                   SUMMARY OF THE INVENTION

12                   Desanding apparatus is provided which is placed adjacent to a  
13 well's wellhead for intercepting a fluid stream flow before prior to entry to  
14 equipment including piping, separators, valves, chokes and downstream  
15 equipment. The fluid stream can contain a variety of phases including liquid, gas  
16 and solids.

17                   In one embodiment, a pressure vessel is inserted in the flowstream  
18 by insertion into high velocity field piping extending from the wellhead. The  
19 vessel contains an upper freeboard portion having a cross-sectional area which is  
20 greater that of the field piping from whence the fluid stream emanates. As a  
21 result, fluid stream velocity drops and particulates cannot be maintained in  
22 suspension. A cross-sectional area of the freeboard portion is maintained  
23 through a downcomer flow barrier adjacent the vessel's exit.

24                   In a broad aspect, desanding apparatus vessel for removal of  
25 particulates from a fluid stream containing particulates comprises: a fluid inlet

1 adjacent a first end of the vessel and adapted for receiving the fluid stream, the  
2 fluid inlet discharging the fluid stream at an inlet velocity into a freeboard portion  
3 at a top of the vessel, the fluid stream in the freeboard portion having an  
4 elutriation velocity less than the inlet velocity and such that contained particulates  
5 have a fall trajectory; a fluid outlet from the vessel, the outlet being spaced  
6 horizontally from the inlet; and a flow barrier depending from the top of the vessel  
7 and having a lower edge so as to direct the fluid stream below the barrier before  
8 discharge from the outlet port for maintaining the freeboard portion above the  
9 lower edge and forming a belly storage portion below the lower edge, the flow  
10 barrier being positioned between the fluid inlet and fluid outlet and the flow barrier  
11 being spaced from the fluid inlet so as to enable the fall trajectory of a substantial  
12 amount of the particulates to intersect the belly portion so as accumulate  
13 particulates in the belly portion prior to the flow barrier wherein the fluid stream at  
14 the fluid outlet is substantially free of particulates.

15 Preferably, the flow barrier is a depending weir independent of the  
16 outlet, or could be formed by the outlet itself. A cleanout port is preferably  
17 included for periodic removal of accumulations of particulates.

18 More preferably, a vessel of an embodiment of the present  
19 invention is incorporated in a desanding system to replace existing prior  
20 connective piping, the vessel being supported using structure to align the vessel  
21 with the wellhead piping and downstream equipment.

1                    BRIEF DESCRIPTION OF THE DRAWINGS

2                    Figure 1a is a schematic arrangement of connective wellsite piping  
3 of the prior art;

4                    Figure 1b is a schematic arrangement of one embodiment of the  
5 invention having been installed in place of the prior connective wellsite piping of  
6 Fig. 1a;

7                    Figure 2a is an exploded view of the inlet to one embodiment of the  
8 vessel of the invention which illustrates a nozzle arrangement in an eccentric  
9 vessel inlet;

10                  Figure 2b is an exploded view of the inlet to one embodiment of the  
11 vessel of the invention which illustrates a nozzle arrangement adapted to a blind  
12 flange;

13                  Figure 3 is a cross-sectional side view of one embodiment of the  
14 invention illustrating fluid streams, falling trajectory of particulates, and  
15 accumulations of separated liquid, particulates and particulate-free fluid  
16 discharge;

17                  Figures 4a through 4c illustrate a variety of optional flow barriers  
18 applied at the fluid outlet; and

19                  Figure 5 is a performance graph of the achievable gas throughout  
20 rates at various pressures while still achieving particulate removal for a  
21 pessimistic case of a fluid stream containing fine 100 mesh sand.

22

23

1                    DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

2                    As shown in Figs. 1b and 3, a desander 10 comprises a  
3 substantially horizontal, cylindrical pressure vessel 11 having a first fluid inlet end  
4 12 adapted for connection to a fluid stream F such as from wellhead piping 9 and  
5 a fluid outlet 13 connected to downstream equipment 14 such as multiphase  
6 separators. The fluid stream F typically comprises a variety of phases including  
7 gas G, some liquid L and entrained particulates such as sand S. The fluid stream  
8 emanating from the fluid outlet 13 is typically liquid L and gas G, with a  
9 substantial portion of the particulates S being captured by the desander 10. As a  
10 system, the desander 10 is typically inserted as a replacement for existing piping  
11 15 (shown in Fig. 1a). The desander 10 is preferably supported with structure 16  
12 such as elevation adjustable jacks to align the desander 10 relative to the existing  
13 wellhead piping 9 and downstream equipment 14.

14                    With reference to Figs. 2a and 2b, the inlet 12 is fitted with a first  
15 connector or inlet flange 20 so as to better facilitate installation, to allow easy  
16 inspection for wear, to minimize equipment erosion and to simplify replacement  
17 when erosion has reduced material thicknesses to acceptable minimums. A  
18 nozzle 21 and a second connector or a nozzle flange 22 are adapted for  
19 complementary and sealed connection to the inlet flange 20. Typically, the  
20 nozzle 21 has a threaded inlet 23 which is adapted for threaded connection to an  
21 existing coupling 24 from the wellhead piping 9. The nozzle inlet 23 is threaded  
22 onto the coupling 24 and the vessel and inlet 12 is positioned over the nozzle 21  
23 and the flanges 20,22 are connected.

24                    In greater detail as shown in Figs. 2a,2b and 3, the nozzle 21 has a  
25 protruding discharge portion 25 which extends adjacent the top of the vessel 11.

1 The inlet 12 is offset upwardly from an axis A of the vessel 11 and extends into  
2 an upper freeboard portion 30. Preferably, as shown in Fig. 2a, an eccentric  
3 fitting 31 is applied to the inlet 12. When coupled with the inlet flange 20 on the  
4 eccentric fitting 31, the nozzle 21 is shifted upwardly from an axis A of the vessel  
5 11. Similarly, as shown in Fig. 2b, the nozzle 21 can extend through a large  
6 blind inlet flange 20 fit directly to the vessel 11 positioned so as to be shifted  
7 upwardly from an axis A of the vessel 11. The nozzle 21 discharges the fluid  
8 stream F along the nozzle's axis, a path P, substantially parallel to the vessel's  
9 axis A. The nozzle inlet 23 is typically formed of heavy-wall piping to extend its  
10 operational life in the abrasive environment of the particulate laden fluid stream F.  
11 Further, the nozzle's discharge 25 protrudes into the vessel 11 sufficiently to  
12 extend beyond the inlet 12 and into the freeboard portion 30, thereby aiding in  
13 minimizing localized wear on the less easily replaced inlet 12, or eccentric fitting  
14 31, of the vessel 11

15 In Fig. 3, the desander 10 further comprises belly portion 32,  
16 formed below the freeboard portion 30, for receiving and temporarily storing  
17 liquids L and sand S which separate from the fluid stream F. The fluid stream F  
18 containing sand S enters through the inlet 12 and is received by a larger cross-  
19 sectional area and substantially gas-phase volume of the freeboard portion 30.  
20 Accordingly, the velocity of the fluid stream F slows to a point below the  
21 entrainment or elutriation velocity of at least a portion of the particulates S in the  
22 fluid stream. Those of skill in the art are able to determine and apply the  
23 parameters of the fluid stream F, fluid stream velocity and those of the  
24 particulates S so as to determine the elutriation characteristics. As the area of  
25 the freeboard portion 30 increases, the velocity of the fluid stream F slows and a

1 lesser fraction of the particulates remain entrained; a greater fraction of  
2 particulates S falling out of suspension from the fluid stream F. The particulates  
3 S are discharged horizontally from the nozzle 21 along path P, and as they fall  
4 from suspension, they adopt a downwardly curved trajectory under the influence  
5 of gravity. Preferably, to avoid impingement-type erosion, the length of the  
6 vessel is sufficient to permit the particulates to fall out of suspension before  
7 impinging internals of the vessel 11. Given sufficient horizontal distance without  
8 interference, the particulates S eventually fall from the freeboard portion 30 and  
9 the trajectory intersects with the belly portion 32. The particulates S deposit and  
10 accumulate over time in the belly portion 32. Typically, liquids L from the fluid  
11 stream also collect in the vessel's belly portion 32.

12           The freeboard portion 30 is maintained using means such as a  
13 depending flow barrier 40 to ensure that the collected liquids L and particulates S  
14 only reach a maximum depth in the belly portion 32 of the vessel 11. A minimum  
15 cross-section area of the freeboard portion and preferred length of the freeboard  
16 portion 30 are determinable based on the elutriation characteristics and are  
17 established so as to maximize release of the particulates S before they reach the  
18 outlet 13. The greater the length or spacing between the inlet 12 and the flow  
19 barrier 40, the greater is the opportunity to drop and release entrained  
20 particulates S.

21           Typically, liquid L out of the fluid stream F accumulates in the belly  
22 portion 32 to a steady state level and then is re-entrained for discharge with fluids  
23 exiting the outlet 13 without affecting the capability of the vessel 11 and belly  
24 portion 32 to continue to accumulate particulates S. Regardless of dropout of  
25 liquids L from gas G and collection of liquid L in the vessel 11, this upper

1 freeboard portion 30 remains substantially gas-filled. However, should a  
2 maximum depth of particulates S be reached during operation and encroach on  
3 the freeboard portion 30, operations may yet continue as if the vessel 11 were  
4 not even installed; both incoming liquid L and particulates S being temporarily re-  
5 entrained with the fluid stream flowing from the vessel outlet 13 until the earliest  
6 opportunity to perform maintenance. Typically the belly portion 32 vessel 11 is  
7 periodically cleaned out or emptied of accumulated particulates and liquid at  
8 sufficient intervals to ensure that the maximum accumulated depth does not  
9 encroach on the freeboard portion 30. Maintenance and operations personnel  
10 are further able to physically view sand production volumes during the cleanout  
11 and inspection.

12           The flow barrier 40 depends downwardly from the top of the vessel  
13 11. The flow barrier 40 has a lower edge 41 which sets the maximum depth of  
14 the belly portion 32. As discussed above, the flow barrier 40 is preferably spaced  
15 sufficiently from the inlet 11 to enable the fall trajectory of the particles to intersect  
16 the belly portion 32 before impinging on the flow barrier 40 itself.

17           As shown in Figs. 4a-4c, the flow barrier 40 can comprise a discrete  
18 or separate plate 40a,40b as shown in Figs. 4a and 4b, spaced from the outlet  
19 13, or as shown in Fig. 4c, a flow barrier 40c can be formed by the outlet 13 itself.  
20 All of the various flow barriers 40,40a,40b,40c have a lower edge 41 which forces  
21 the fluid stream S thereunder before discharging from the vessel 11 at outlet 13.  
22 Accumulated levels L,S encroaching above the lower edge 41 will result in high  
23 velocities and re-entrainment of liquids L and particulates S from the area about  
24 the flow barrier 40, inherently resulting in a steady state maximum level of  
25 accumulation of the belly portion 32.

1 In the embodiment shown in some detail in Fig. 4c, the outlet 13 itself acts as the  
2 flow barrier 40, which incorporates a tubular portion 43 protruding downwardly  
3 and depending through the freeboard portion 30. The tubular portion 43 also has  
4 a lower edge 41 spaced from the top of the vessel 11 which forces the fluid  
5 stream F to exit from a point nearer the vessel axis A. Particulate-free fluid,  
6 typically being gas G and some liquid L, is collected about the axis A for  
7 discharge through the discharge tubing 40 and outlet 13. An advantage of  
8 providing a separate flow barrier 40,40a,40b is that any abrasion and erosion is  
9 borne by the barrier 40 and not by the outlet's 13 tubular portion 43.

10 As shown in Figs 4a,4c, the outlet 13 for the vessel 10 is preferably  
11 arranged perpendicular to the axis A of the vessel 10 for further inertial rejection  
12 of re-entrained particulates S.

13 Referring once again to Fig. 3, a quick release pressure-vessel  
14 compatible cleanout 50 is provided for access to the vessel 11 for cleanout of the  
15 accumulated particulates. The vessel must be depressurized before opening and  
16 cleaning out particulates. Typically, mechanically-interlocked safety means 51  
17 are provided so that the vessel must be de-pressurized before the cleanout can  
18 be opened. For de-pressurization, the vessel is isolated from the fluid stream F  
19 and pressure is bled off from the freeboard portion 30 until the cleanout 50 be  
20 removed. As shown in Fig. 1b, a catch basin 52 or other suitable collection  
21 means is provided for accepting the collected liquid L and particulates S. Manual  
22 cleanout is performed although automated cleanout could be incorporated  
23 without diverging from the intent of the invention.

1    EXAMPLES

2                   A typical vessel according to the present invention, and for  
3   reference are roughly approximated by the proportions of Fig. 3, can be a 6" or  
4   an 8" diameter. Using an 8" diameter, schedule 160 shell for the vessel 11 can  
5   result in a fluid stream capacity of about 8 million cubic feet of gas per day. A 2"  
6   schedule 160 inlet nozzle extends about 1" beyond an eccentric inlet 12 and into  
7   the vessel 11. With a flow barrier 40 placed about 8 feet from the nozzle  
8   discharge 25, the desander 10 achieved a corresponding and typical collection  
9   rate of 1.5 gallons of sand particulates per day, determined in a worst case  
10   scenario of particles of about 100 mesh. Applied to problem wells in several  
11   exceptional cases, using no vessel at all, one prior art wellhead, piping and  
12   equipment experienced four breaches and in another case, seven breaches.  
13   After installation of a preferred vessel of the present invention, no further  
14   breaches were experienced. In one case, the resulting collection of particulates,  
15   as sand, was about 5 liters per day.

16                  Further, as shown in Fig. 5, the throughput capability of 8 inch and  
17   10 inch diameter desanding vessels are illustrated for a variety of fluid pressures.

18                  A system incorporating a desanding apparatus according to one of  
19   the embodiments disclosed herein will benefit from advantages including: As a  
20   desander 10 is more cost effective than a "P Tank", the desander can be  
21   economically placed on a wellsite for long term sand protection (substantially  
22   permanent as required); with a pressure rating that allows the vessel to operate  
23   at the wellhead conditions, minimal pressure drop is experienced across the  
24   vessel; the desander is designed to exceed ASME code for pressure vessels;  
25   sand is removed from the fluid stream without erosive effects on the operator's

1 downstream equipment and; as the vessel is passive, having no moving parts,  
2 plugging from particulates is not an issue; sand can be removed simply and  
3 mechanically from the vessel at regular intervals; by removing the sand prior to it  
4 entering the producing system, contamination of equipment and produced fluids  
5 is avoided; and the desander is capable of handling multiphase production and  
6 has demonstrated an ability to remove sand from both gas and oil streams. This  
7 results in a wider application than prior art filter methods.

**THE EMBODIMENTS OF THE INVENTION FOR WHICH AN  
EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS  
FOLLOWS:**

**1. A desanding vessel for removal of particulates from a fluid  
stream containing particulates, comprising:**

**a fluid inlet adjacent a first end of the vessel and adapted for  
receiving the fluid stream, the fluid inlet discharging the fluid stream at an inlet  
velocity into a freeboard portion at a top of the vessel, the fluid stream in the  
freeboard portion having an elutriation velocity less than the inlet velocity and  
such that contained particulates have a fall trajectory;**

**a fluid outlet from the vessel, the outlet being spaced horizontally  
from the inlet; and**

**a flow barrier depending from the top of the vessel and having a  
lower edge so as to direct the fluid stream below the barrier before discharge  
from the outlet port for maintaining the freeboard portion above the lower edge  
and forming a belly storage portion below the lower edge, the flow barrier being  
positioned between the fluid inlet and fluid outlet and the flow barrier being  
spaced from the fluid inlet so as to enable the fall trajectory of a substantial  
amount of the particulates to intersect the belly portion so as to accumulate  
particulates in the belly portion prior to the flow barrier wherein the fluid stream at  
the fluid outlet is substantially free of particulates.**

**2. The desanding vessel of claim 1 further comprising a cleanout  
port for periodically accessing and removing particles accumulated in the belly  
portion.**

1                   **3. The desanding vessel of claim 1 or 2 wherein the flow barrier is**  
2 spaced from the fluid outlet.

3

4                   **4. The desanding vessel in any one of claims 1 to 3 wherein the**  
5 flow barrier further comprises a plate having a substantially horizontal lower edge  
6 and the fluid outlet is located in the freeboard volume adjacent to the flow barrier  
7 opposite the fluid inlet.

8

9                   **5. The desanding vessel in any one of claims 1 to 4 wherein the**  
10 flow barrier is formed by the fluid outlet, the fluid outlet further comprising a  
11 tubular portion extending downwardly through the freeboard portion for forming  
12 the flow barrier and terminating at the lower edge.

13

14                   **6. The desanding vessel in any one of claims 1 to 5 wherein the**  
15 vessel is cylindrical having a substantially horizontal axis, a top wall and a bottom  
16 wall.

17

18                   **7. The desanding vessel of claim 6 wherein the cylindrical vessel**  
19 has a first end and a second end, and wherein the inlet port is located at the first  
20 end and discharges the fluid stream into the freeboard portion along a fluid path  
21 which is substantially parallel to the vessel's axis.

22

23                   **8. The desanding vessel of claim 7 wherein the inlet port is offset**  
24 above the vessel's axis.

1                   **9.** The desanding vessel of claim 7 wherein the inlet port further  
2 comprises:

3                   an inlet flange;

4                   a nozzle forming the fluid inlet; and

5                   a nozzle flange for releasably connecting to the inlet flange.

6

7                   **10.** The desanding vessel of claim 7 wherein the inlet port further  
8 comprises an eccentric fitting positioned between the vessel and the inlet flange  
9 for aligning the nozzle offset above the vessel's axis.

10

11                   **11.** The desanding vessel in any one of claims 7 to 10 wherein  
12 lower edge of the flow barrier depends below the inlet port.

13

14                   **12.** The desanding vessel of claim 7 wherein the inlet port further  
15 comprises:

16                   a first connection at the first end of the vessel,

17                   a second connection adapted for releasably and sealingly  
18 connecting to the first connection, the second connection further comprising a  
19 nozzle extending through the second connection, the nozzle having

20                   a first end adapted for connection to the source of the fluid stream,

21 and

22                   a second end protruding into the vessel for discharging the fluid  
23 stream and particulates into the freeboard portion spaced inwardly from the first  
24 end.

25

1                   **13.**The desanding vessel of claim 12 wherein lower edge of the  
2 flow barrier depends below the inlet port.

3

4                   **14.**The desanding vessel in any one of claims 7 to 13 further  
5 comprising a cleanout port for periodically accessing and removing particles  
6 accumulated in the belly portion further comprising:

7                   a cleanout connection at the second end of the vessel and aligned  
8 with the belly portion; and

9                   a cleanout cover for coupling with the cleanout connection and  
10 operable between a sealed position and an open position for permitting removal  
11 of particulates from the belly portion.

12

13                   **15.**The desanding vessel of claim 2 or 14 further comprising  
14 means for isolating the vessel from the fluid stream and de-  
15 pressurizing the vessel before opening the cleanout port.

16

17                   **16.**The desanding vessel in any one of claims 2, 14 or 15 further  
18 comprising:

19                   means for de-pressurizing the vessel before opening the cleanout  
20 port.

21

1           **17.A** desanding system for adaptation to an existing wellhead  
2   having a fluid stream flowing to downstream equipment and for the removal of  
3   particulates from the fluid stream, comprising:

4           a vessel positioned between the wellhead and the downstream  
5   equipment for intercepting the fluid stream;

6           a structure for supporting the vessel relative to the wellhead and  
7   downstream equipment, wherein

8           the vessel comprises a fluid inlet adjacent a first end of the vessel  
9   and adapted for receiving the fluid stream, the fluid inlet discharging the fluid  
10   stream at an inlet velocity into a freeboard portion at a top of the vessel, the fluid  
11   stream in the freeboard portion having an elutriation velocity less than the inlet  
12   velocity and such that contained particulates have a fall trajectory, a fluid outlet  
13   from the vessel, the outlet being spaced horizontally from the inlet; and a flow  
14   barrier depending from the top of the vessel and having a lower edge so as to  
15   direct the fluid stream below the barrier before discharge from the outlet port for  
16   maintaining the freeboard portion above the lower edge and forming a belly  
17   storage portion below the lower edge, the flow barrier being positioned between  
18   the fluid inlet and fluid outlet and the flow barrier being spaced from the fluid inlet  
19   so as to enable the fall trajectory of a substantial amount of the particulates to  
20   intersect the belly portion so as to accumulate particulates in the belly portion  
21   prior to the flow barrier wherein the fluid stream at the fluid outlet is substantially  
22   free of particulates.

23

1                   **18.**The desanding system of claim 17 wherein the vessel is  
2 cylindrical and further comprises

3                   a substantially horizontal axis, a top wall and a bottom wall;

4                   a first end and a second end, and wherein the inlet port is located at  
5 the first end and discharges the fluid stream into the freeboard portion along a  
6 fluid path which is substantially parallel to the vessel's axis and offset above the  
7 vessel's axis.

8

9                   **19.**The desanding system of claim 17 or 18 wherein the inlet port  
10 further comprises an eccentric fitting positioned between the vessel and the inlet  
11 flange for aligning the nozzle offset above the vessel's axis.

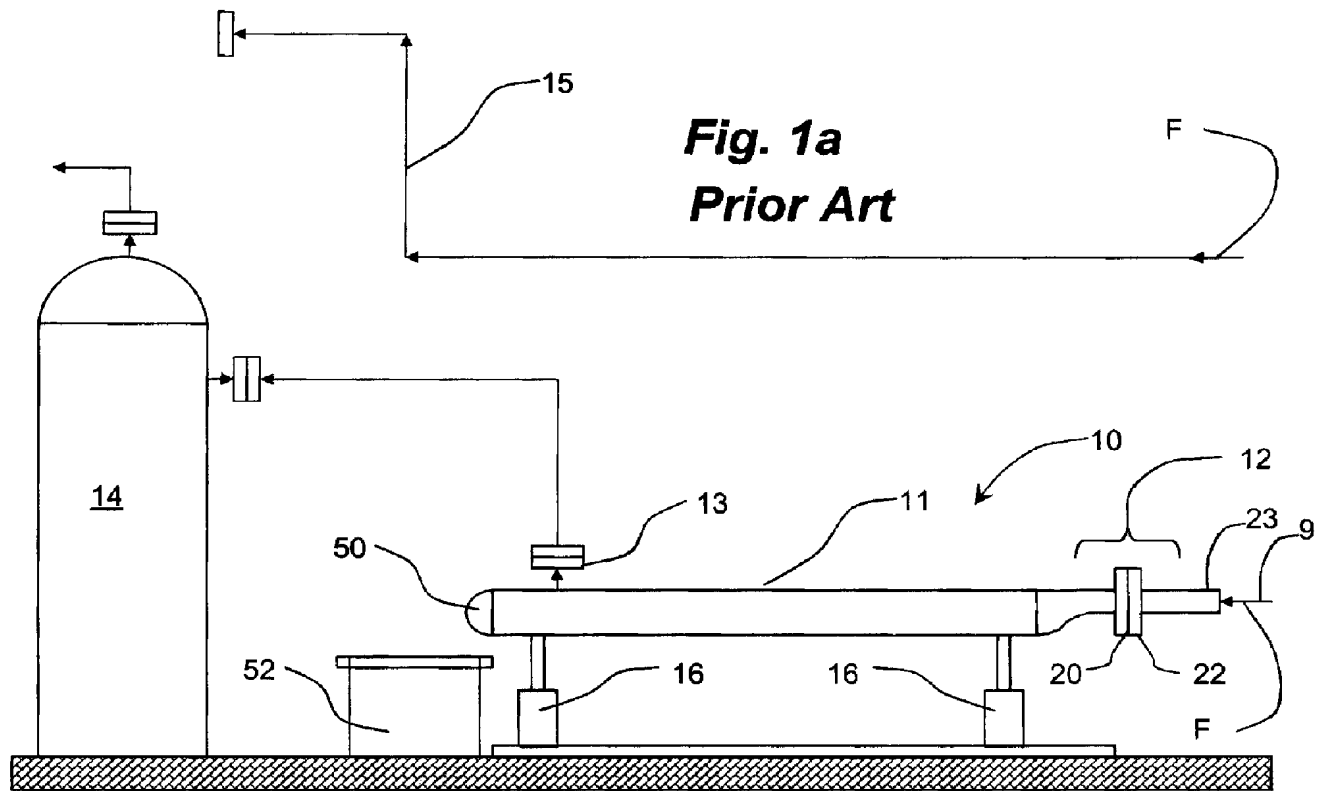
12

13                   **20.**The desanding system in any one of claims 17 to 19 further  
14 comprising a cleanout port for periodically accessing and removing particles  
15 accumulated in the belly portion further comprising:

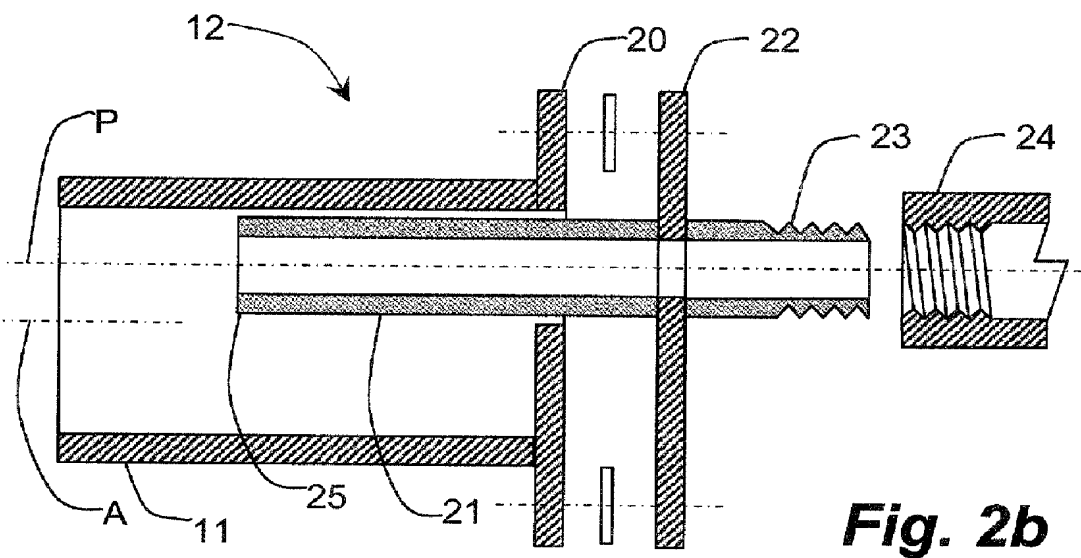
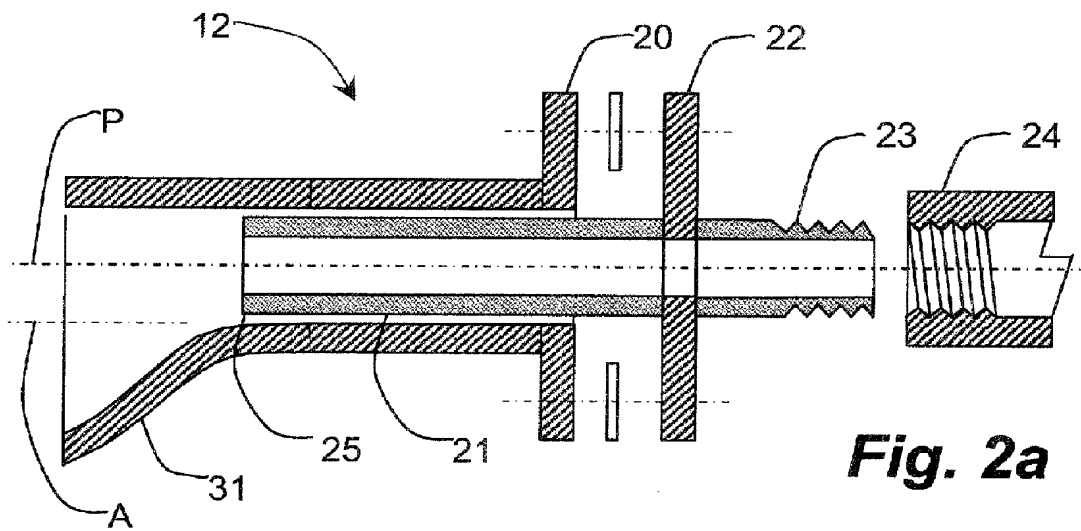
16                   a cleanout connection at the second end of the vessel and aligned  
17 with the belly portion; and

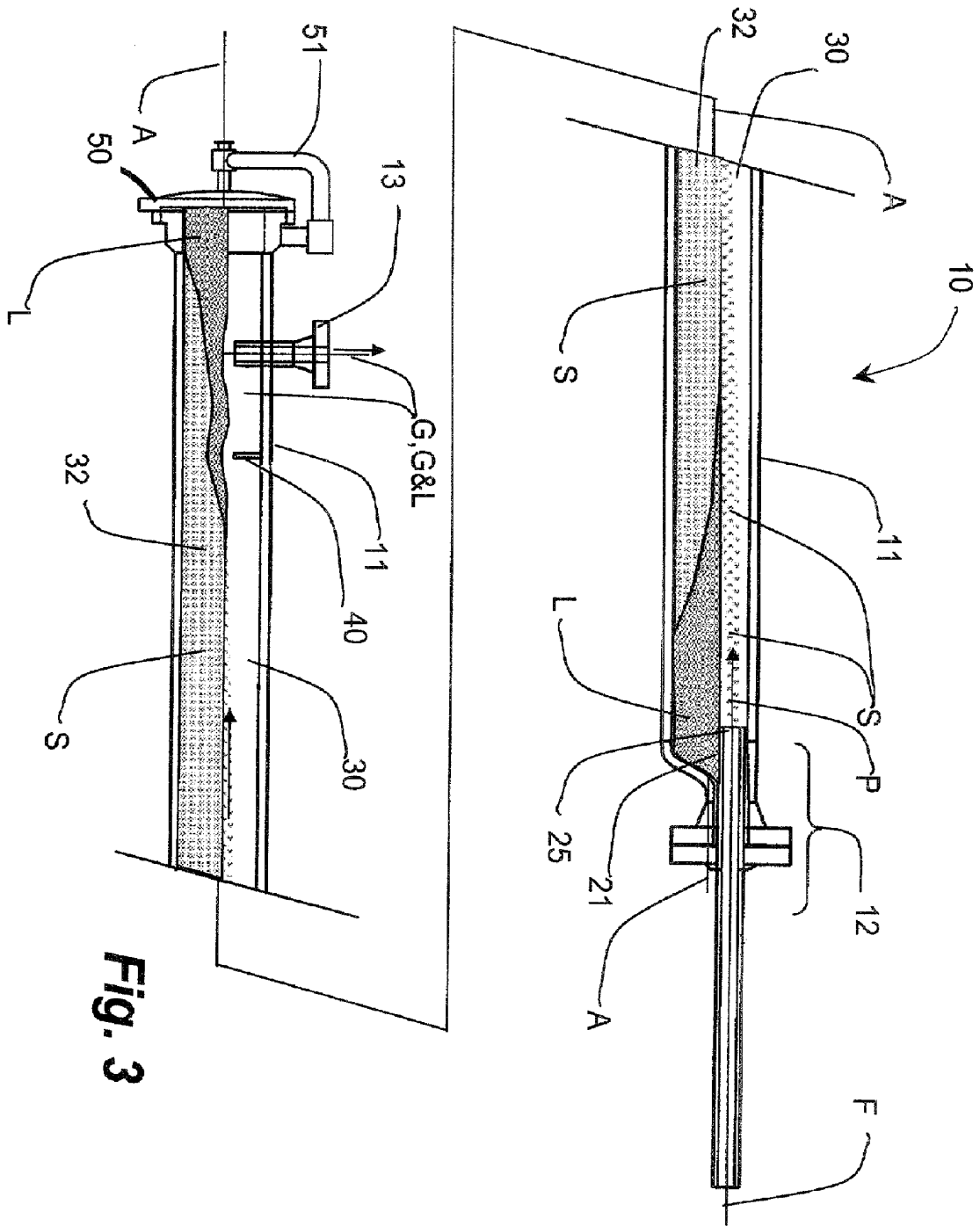
18                   a cleanout cover for coupling with the cleanout connection and  
19 operable between a sealed position and an open position for permitting removal  
20 of particulates from the belly portion.

21

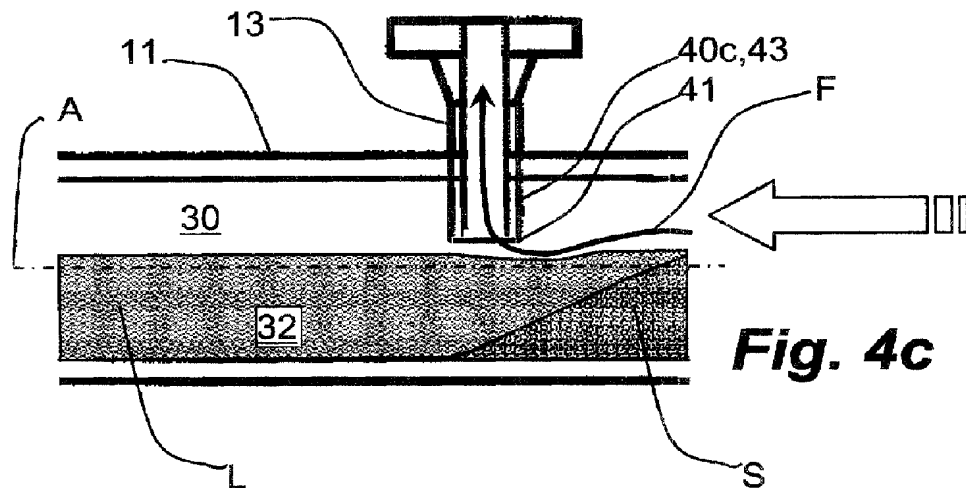
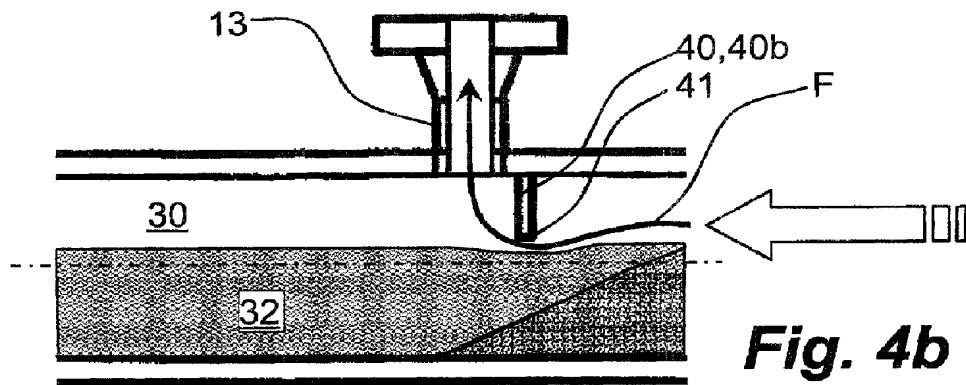
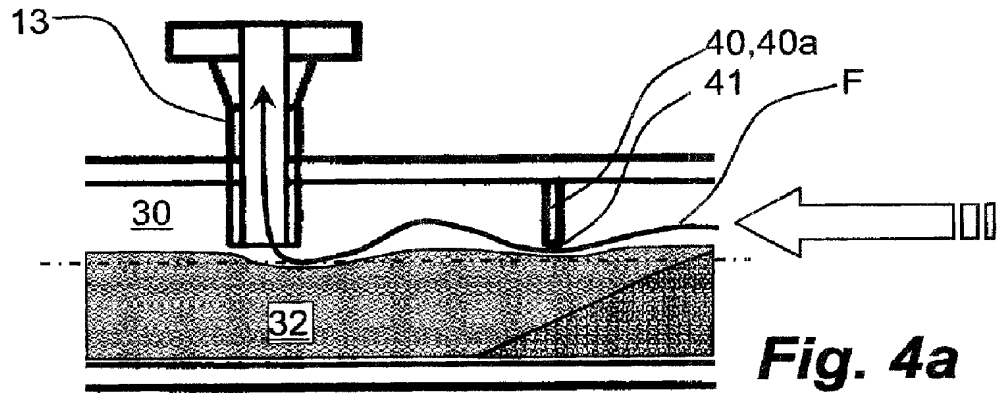


**Fig. 1b**





**Fig. 3**



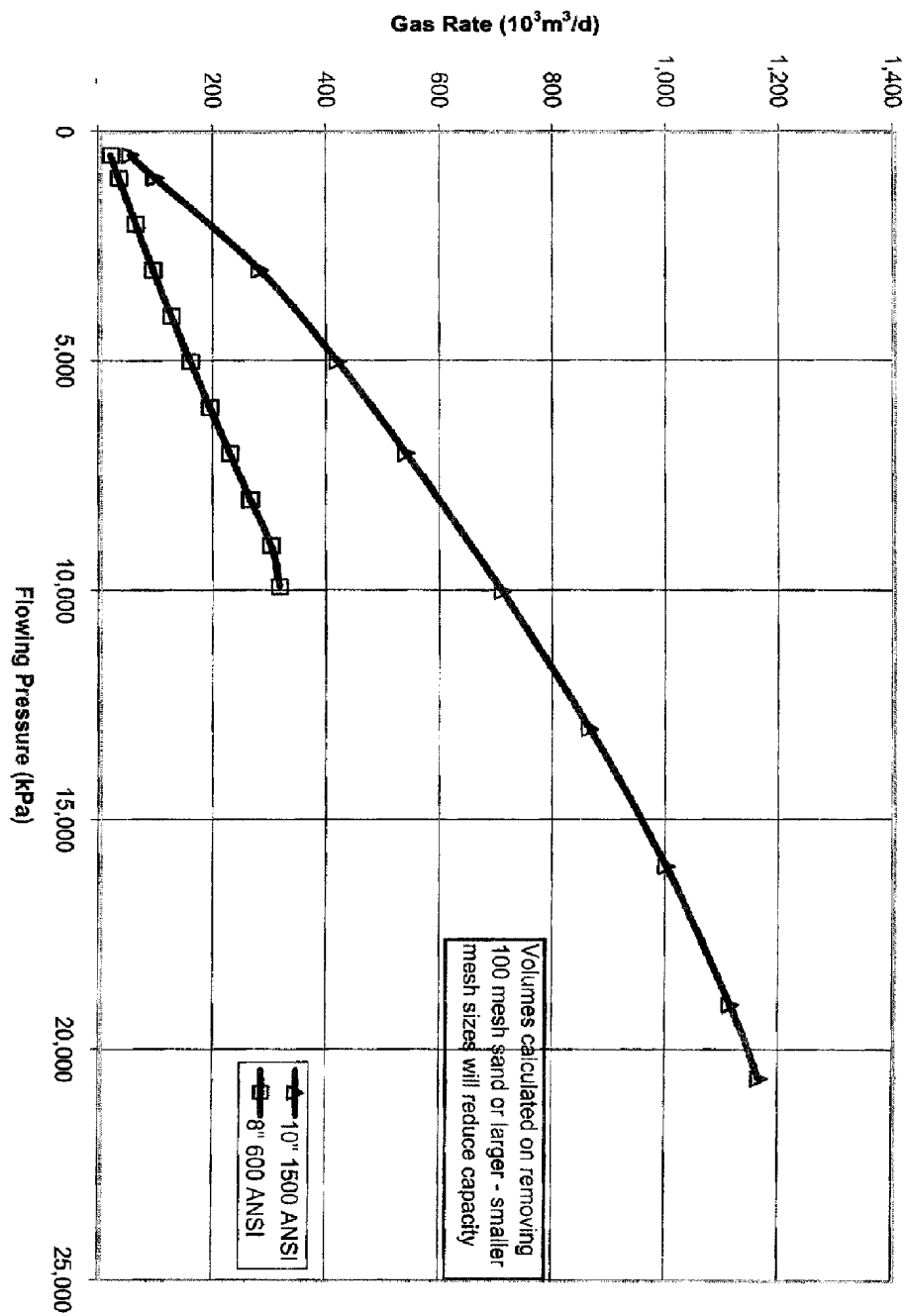


FIG. 5

# PATENT SPECIFICATION



773,096

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Index at acceptance:—Class 1(1), M.

International Classification:—B01d.

## COMPLETE SPECIFICATION

### Improvements relating to Gas/Oil Separators

We, THE BRITISH PETROLEUM COMPANY LIMITED, of Britannic House, Finsbury Circus, London, E.C.2, a British Joint-Stock Corporation and ALBERT LAIRD, of Kirk-  
5 lington Hall, near Newark, Nottinghamshire, and of British Nationality, do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed to be particularly  
10 described in and by the following statement:—

This invention relates to well-head gas/oil separators for crude oil from high pressure oilfields.

15 Crude oil contained in underground reservoirs is almost invariably associated with light hydrocarbon gases which appear in varying quantities at surface together with the oil when production is drawn. The gas  
20 must be separated from the oil before the latter can be conveniently handled on its way to a refinery and a wide variety of equipment, has been devised for this purpose. In some cases small quantities of oil may be carried  
25 forward as a mist in very large quantities of gas and some form of mist extractor is employed to achieve the required separation. Where the oil in the reservoir is at a pressure  
30 above atmospheric pressure the oil invariably contains gas in solution which is evolved from the oil when the pressure is reduced at the surface of the ground. Relatively stable  
foams are formed by the gases evolved, and such foams present difficulties in separating  
35 the gas from the oil. The present invention is particularly concerned with separating equipment which reduces these difficulties.

One simple known form of separator consists of a long vessel mounted in a horizontal  
40 or sloping position, with an inlet for oil containing gas in solution at or near one extremity and separate outlets for oil and gas at or near the other extremity. This invention is concerned with separators of this type.  
45 The vessel is usually a few feet in diameter

[Price 3/6]

and twenty to thirty diameters long. Oil, under pressure, containing gas in solution is fed in at one end and the foam produced due to the fall in pressure travels relatively slowly towards the exit end, above the level of the  
5 separated oil, quietly breaking as it moves along. The residence time for the foam may be of the order of one to two minutes at the limiting throughput of the separator which is reached when the foam just persists up to  
55 the point of offtake of the separated gas. The separated oil, which is allowed to accumulate until the level is high enough to prevent exit of free gas with the oil, occupies space which would otherwise be available for  
60 foam breaking. By installing the separator sloping at a small angle towards the oil outlet end, the space occupied by the separated oil can be reduced whilst maintaining a  
reasonable head above the oil outlet. 65

We have now devised a well-head separator for crude oil which shows an improvement in foam breaking capacity over the separators referred to above and which therefore is capable of giving an increased throughput. 70

According to the invention, a separator, of the type hereinbefore described, for separating gas from crude oil issuing under pressure from an oil well, is provided with an element adapted to be heated in such a position that  
75 the foam produced in the separator when the pressure on the oil is reduced comes into contact with the element.

The said element may consist of a wire grid adapted to be heated electrically, or a  
80 pipe or pipes through which hot fluid may be circulated.

The temperature of the element when the separator is operating is not critical and can be adjusted in practice to give a satisfactory  
85 degree of foam breaking. It is seldom necessary for the temperature of the element to exceed 300°C.

According to a further feature of the invention, the foam entering the separator may be 90

Price 4s 6d

forced through a nozzle and the resulting jet of foam caused to impinge on a plate.

The invention will now be described by way of example with reference to the accompanying drawings in which:—

Fig. 1 is a longitudinal section through a crude oil separator;

Fig. 2 is a section along the line A—A of Fig. 1; and

Fig. 3 is a section along the line B—B of Fig. 1.

The separator vessel 10 is of conventional shape, i.e. cylindrical, about twenty to thirty times longer than its diameter and supported at an angle as shown. Crude oil from a high-pressure oil well is supplied to the vessel 10 via pipe 12 and inlet valve 14. The drop in pressure on the oil as it passes through valve 14 causes dissolved gases to come out of solution. The resulting foam is forced through a nozzle 16 and a jet of foam is caused to impinge on a plate 18. Partial separation of oil from the foam occurs at this point and the remaining foam passes along the vessel 10 until it reaches an electrically heated wire grid 20 secured across the upper half of the vessel 10 out of contact with the separated oil, about two diameters from the oil outlet end. The effect of the heated grid 20 is to cause substantially the whole of the foam reaching it to break. The separated oil and gas are removed from the vessel 10 by outlet pipes 22 and 24 respectively.

Where the oil is initially at a very high pressure, e.g. 1,500 lb./sq. in., as is usually the case in Middle Eastern oilfields, several stages of separation are normally used. In a unit employing seven separators as described, the operating pressures might for example be 850, 400, 145, 67, 37, 23 and 14.7 lb./sq. in. absolute.

A number of experiments were carried out using nozzles (16) of various sizes. It was found that the separator capacity, as compared with a separator not having the arrangement of nozzle 16 and plate 18, could be improved by a factor of three as the jet

velocity was increased to about 12 feet per second.

Further experiments were carried out to determine the effect of the heated grid 20 on the throughput. When the grid 20 was electrically heated to a temperature of 250°C. and crude oil supplied via line 12 and valve 14, the foam produced moved forward as the throughput was increased until it came into contact with the grid 20 whereupon violent disruption of the oil and gas bubbles took place. Foam at a substantial distance from the grid was also affected, behaving as if a disruptive wave were being propagated. The supply of oil was further increased but eventually the grid was completely overwhelmed and cooled down, and the foam then passed over into the gas outlet. Just before this stage was reached, however, the measured throughput was about four times that obtainable without the heating current.

What we claim is:—

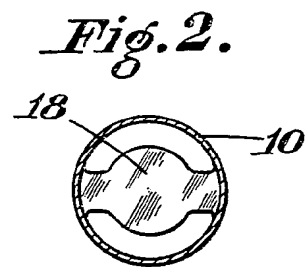
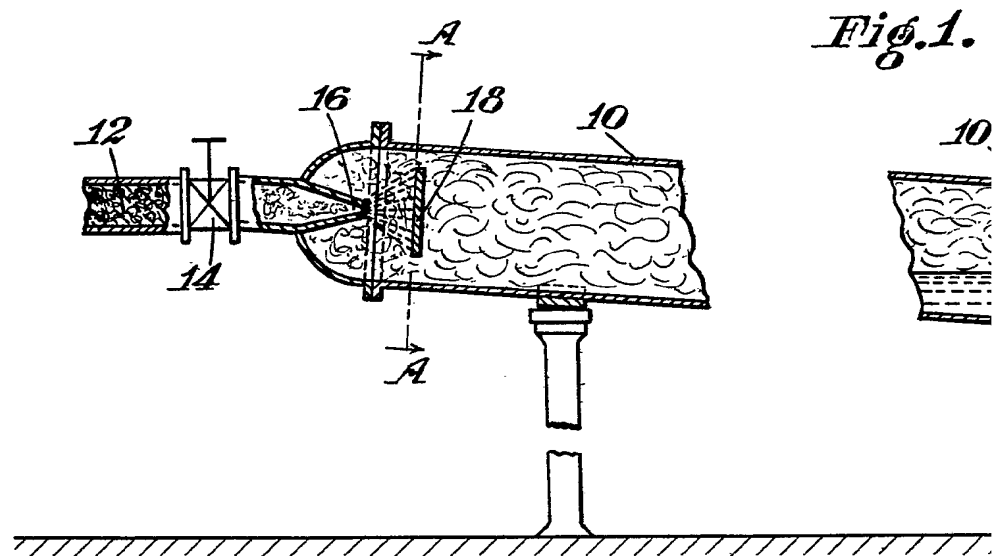
1. A separator, of the type hereinbefore described, for separating gas from crude oil issuing under pressure from an oil well, in which an element adapted to be heated is provided in the separator in such a position that the foam produced in the separator when the pressure on the oil is reduced comes into contact with the element.

2. A separator according to Claim 1, in which the said element consists of a wire grid adapted to be heated electrically, or a pipe or pipes through which hot fluid may be circulated.

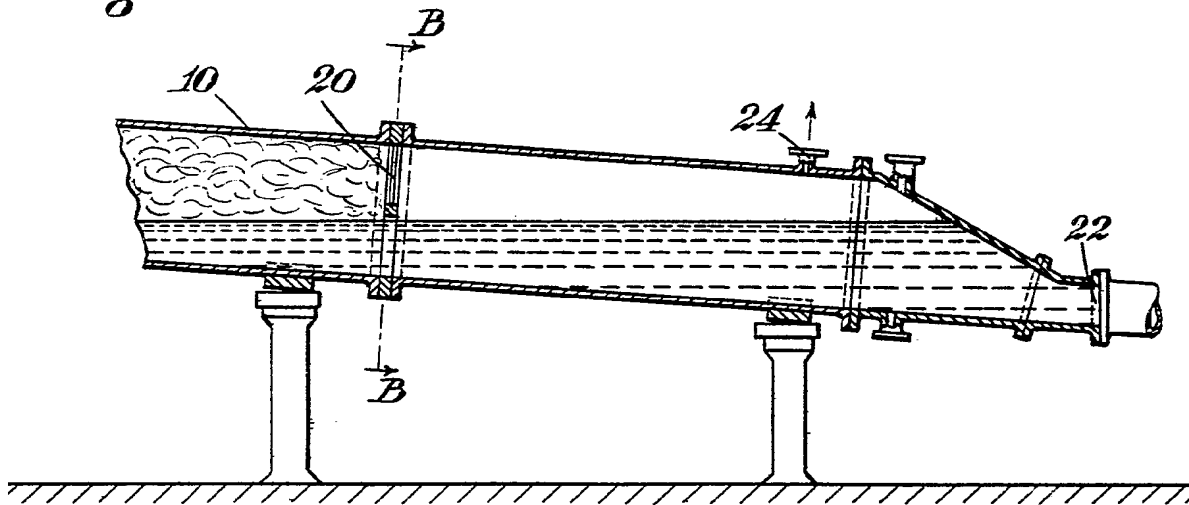
3. A separator according to Claim 1 or Claim 2, in which a nozzle is provided through which the foam entering the separator is forced so as to impinge on a plate.

4. A separator for separating gas from crude oil issuing under pressure from an oil well, substantially as hereinbefore particularly described with reference to the accompanying drawings.

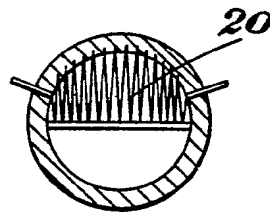
T. MACDONALD,  
For the Applicants.



*Fig.1.*



*Fig.3.*



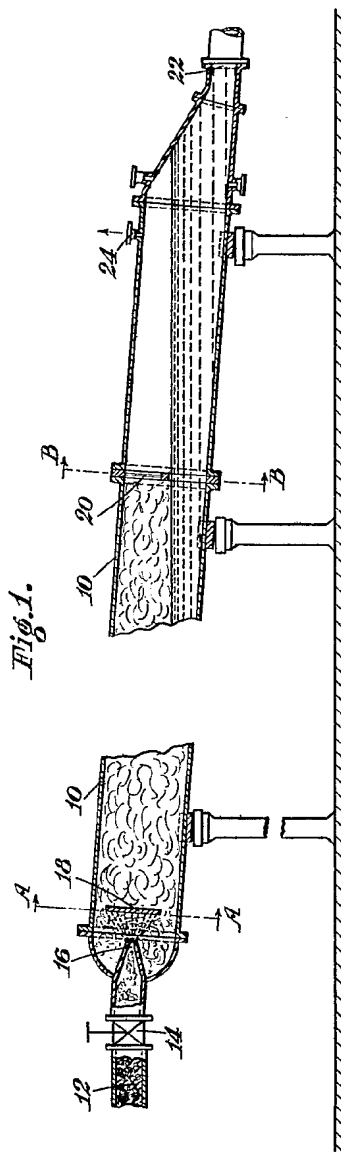


Fig. 1.

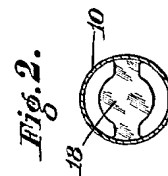


Fig. 2.

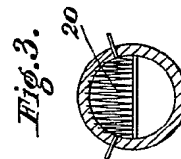


Fig. 3.

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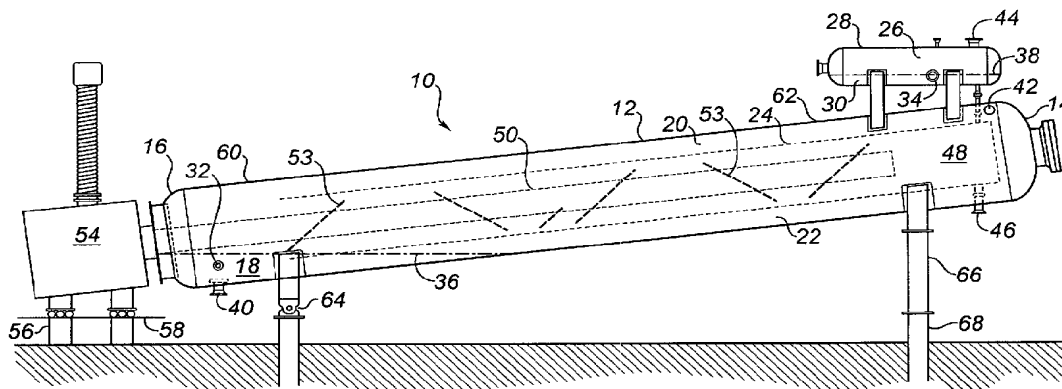
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(54) Title: HEATED INCLINED SEPARATION PRESSURE VESSEL



(57) Abstract: A heated inclined separation pressure vessel for receiving an oil emulsion. A shell is supported at an oblique angle to horizontal, thereby defining an upper and lower end. An elongated sleeve extends coaxially through the vessel. A heat pipe bundle extends coaxially through the lower vessel end and sleeve, terminating at an intermediate position within the sleeve. A furnace is provided for heating the heat pipe bundle. An inlet, adjacent to the upper end, admits emulsion to the elongated sleeve. Gas liberated from the oil is allowed to flow to the upper end of the sleeve and into a gas separator located above the upper end of the vessel. Emulsified water falls towards the lower end of the sleeve and exits the vessel via a water outlet adjacent to the lower vessel head. An oil outlet, adjacent to the upper vessel head removes clean oil from the pressure vessel.

**TITLE OF THE INVENTION:**

Heated Inclined Separation Pressure Vessel

**FIELD OF THE INVENTION**

5           The present invention relates to a high efficiency heated inclined separation pressure vessel used in the separation of oil emulsions.

**BACKGROUND OF THE INVENTION**

10           Crude oil is product of an extractions process. Extensive geological and geophysical analysis identifies an oil bearing reservoir within the earth's crust. Reservoir fluids are brought to surface and the components of the reservoir fluids are separated. Oil  
15 companies must produce a crude oil product that will be acceptable to the refineries. Most oil bearing reservoirs contain oil, gas, water, and solid particulate. Free water is easily removed from the reservoir effluent using a vessel commonly called a Free  
20 Water Knock Out (FWKO). Free gas is easily removed from the reservoir effluent using a vessel commonly called an Inlet Separator. However, some water, gas and solids remain bound up with the crude oil, known as emulsion. These emulsions are usually unacceptable to the  
25 refineries and therefore impurities in the oil must be removed. This final polishing process is achieved by various means; heated atmospheric tanks, heated pressure vessels known as emulsion treaters, hydrocyclones and centrifuges.

30           Once the free water and free gas is removed, the remaining emulsion is an oil continuous phase dispersed with water droplets, gas bubbles and solid particulate. Separation of water, gas and solids from the oil  
35 continuous phase is achieved utilizing the difference in densities of the individual components. The general relationship governing this process is expressed in

Stoke's Law.

$$V = \frac{d^2 (p_c - p_o)}{18\eta_o} g$$

5      Where:      V = settling velocity  
                     d = droplet/bubble/solid diameter of impurity  
                     p<sub>c</sub> = density of of impurity  
                     p<sub>o</sub> = density of oil continuous phase  
                     η = viscosity of oil continuous phase  
 10                  g = gravitational acceleration

                    Obviously the factors that influence the separation  
                     are: water droplet diameter, solid particulate diameter,  
                     gas bubble diameter, density of water, density of solids,  
 15                  density of gas, density of oil, viscosity of oil, heat,  
                     settling distance, retention time and the force field the  
                     process is subjected to. Chemicals may also enhance the  
                     separation efficiency of an emulsion. Once the emulsion  
                     is contain within a closed conduit, the volumetric flow  
 20                  rate must remain within the laminar regime.

                    Heated atmospheric tanks are most commonly used for  
                     single well production for various reasons including;  
                     minimum capital expenditure and low flow rates. Refinery  
 25                  acceptable crude oil is easily achieved. Atmospheric  
                     tanks are limited by throughput (flow rate) and maximum  
                     process temperature.

                    Conventional heated treaters are most commonly used  
 30                  at central processing facilities for various reasons  
                     including; greater throughput and higher maximum  
                     processing temperatures. Conventional treaters usually  
                     fall into two broad categories; horizontal and vertical,  
                     each having its own advantages and disadvantages. The  
 35                  most significant disadvantage of conventional treaters is  
                     the method of heating. The heat source for conventional  
                     treaters has been the fire tube; consisting of a burner

outside the vessel, pipe looped inside the vessel and a flue stack outside the vessel. The heat generated from combustion gases transfers to the emulsion by passing the combustion gas through the looped pipe inside the vessel.

5 This heat transfer process is very inefficient due to combustion efficiency of the burner, loss of heat up the flue stack and gunge (consisting of coked hydrocarbon and solid particulate) that builds up on the outside of the fire tube (looped pipe) immediately after start up. A

10 second disadvantage of the conventional treater is the channelling effect. It is well known that fluids will take the path of least resistance. The channel effect is well documented in various SPE papers. The third disadvantage of convention treaters is somewhat of a

15 "catch 22". In the attempt to increase retention time and throughput industry has increased the diameter of the conventional horizontal treaters. Increasing the diameter increases the likelihood of channelling and increases the settling distance. One gains efficiency in retention but

20 losses efficiency with channelling and distance travelled to clearly separate.

Canadian Patent 924256 describes an oblique elongate pressure vessel. The heat source is a fire tube runs

25 coaxially the length of the entire vessel penetrating the pressure vessels upper and lower ends. Canadian Patent 911369 is similar to Canadian patent 924256, except that an electrostatic grid is used as the heat source. Canadian Patent 926342 describes a pressure vessel,

30 generally horizontal, which has both a heat source and an electrostatic grid. United States Patent 6,099,742 is similar to Canadian patent 924256, in that it also utilizes a fire tube. In United States Patent 6,099,742 the burner is located at the upper end instead of the

35 lower end of the pressure vessel and the flow paths are different. The United States patent 6,099,742 also adds a second vessel for the liberated solution gas. United

States Patent 5,837,152 (Canadian Patent Application 2202210) describes an oblique elongated pressure vessel.

5     SUMMARY OF THE INVENTION

What is required is a more efficient configuration of heated inclined separation pressure vessel.

10     According to the present invention there is provided a heated inclined separation pressure vessel which consists of an oblique elongate pressure vessel. The pressure vessel is closed at both ends with conventional pressure vessel heads, for receiving emulsion where the water, gas and solids are entrained within the continuous  
15     oil phase. The present invention incorporates a high efficiency heating transfer assembly, composed of a furnace and heat tubes, to decrease the viscosity of the continuous oil phase, providing a higher settling velocity. The heat tubes penetrate the lower pressure  
20     vessel head, run coaxially and concentrically through the vessel, terminated adjacent the upper end of the vessel. Heat transfer to the tubes, for evaporation of the heat tube fluid, is accomplished in the furnace adjacent to lower vessel end.

25

Although beneficial results may be obtained through use of the heated inclined separation pressure vessel, as described above, it is preferred that an elongated sleeve be positioned coaxially and concentrically through the  
30     vessel, enclosing the heat tube bundle. The lower end of the sleeve is open to vessel, while the upper end of the sleeve is closed with conventional pressure vessel heads. The sleeve has several advantages including; providing a chamber for efficient heat transfer from the heat tubes  
35     to the emulsion, decreasing the settling distance for impurities. The top half acts as a collector trough for the liberated gas, while guiding the gas to the gas

separator. The bottom half acts as a collector trough for the liberated water and solid particulate, while guiding the impurities to the lower end of the vessel for removal.

5

Although beneficial results may be obtained through use of the heated inclined separation pressure vessel, as described above, it is preferred that a gas separator be located above the vessel adjacent the upper vessel end. The gas separator is defined as an elongated cylindrical pressure vessel, closed at both ends with conventional pressure vessel heads. Gas liberated from the sleeve chamber directed to the gas separator by the trough created by upper surface of the sleeve.

10  
15

The present invention also includes various mechanical components which will hereinafter be further described including; roller assembly, pivot joint and removable support for timely cost effective maintenance overhauls.

20

#### **BRIEF DESCRIPTION OF THE DRAWINGS**

These and other features of the invention will become more apparent from the following description in which reference is made to the appended drawings, the drawings are for the purpose of illustration only and are not intended to in any way limit the scope of the invention to the particular embodiment or embodiments shown, wherein:

25  
30

**FIGURE 1** is a side elevation view, in section, of a heated inclined separation pressure vessel fabricated in accordance with the teachings of the present invention.

**FIGURE 2** is an end elevation view, in section, of the heated inclined separation pressure vessel illustrated in **FIGURE 1**.

35

**FIGURE 3** is a detailed side elevation view, in

section, of a single heat tube of the heat tube bundle for the heated inclined separation pressure vessel illustrated in **FIGURE 1**.

5     **DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT**

The preferred embodiment, a heated inclined separation pressure vessel generally identified by reference numeral 10, will now be described with reference to **FIGURES 1** through 3.

10

Structure and Relationship of Parts:

Referring to **FIGURE 1**, pressure vessel 10 includes an elongated oblique cylindrical shell or tank 12, closed at both ends by conventional pressure vessel heads 14 and 16. Shell 12 provides for a water zone 18 at its lower end, while an oil zone 20 comprises the remaining volume of an annulus 22 between a sleeve 24 and shell 12. Separated gas forms a gas zone 26 which is captured by a gas separator 28, which maintains a fluid level 30.

20

Pressure vessel 10 includes water and gas level controls 32 and 34 for controlling the levels of the interfaces 36 and 38, respectively. More particularly, the water level controls 32 prevent oil-water interface 36 from rising above a predetermined upper level, and gas level controls 34 prevent gas-liquid interface 38 from falling below a predetermined level. The water level control 32 may consist of, but is not limited to, an interface probe that actuates a control valve downstream of the water outlet 40. The gas level control 34 may consist of, but is not limited to, a level float that actuates a control valve downstream of the oil outlet 42. A back pressure control valve is located downstream of the gas outlet 44, communicating with the gas zone 26 to maintain a constant pressure on pressure vessel 10.

35

Referring to **FIGURE 1**, a heat tube bundle 50 extends

into shell 12 and is positioned within sleeve 24. Referring to **FIGURE 2**, heat tube bundle 50 consists of a plurality of heat tubes 52. Baffles 53 extend between heat tubes in heat tube bundle 50 and sleeve 24 to maintain the straightness of heat tubes 52 and create a tortuous flow path, as will hereinafter be described in relation with operation. The heat source for heat tubes 52 is an external furnace/boiler 54 complete with an internal evaporator reservoir and condensate return line. Referring to **FIGURE 1**, support structure 56 for furnace/boiler 54 is equipped with a locking roller assembly 58. Shell 12 has a first or lower end 60 and a second or upper end 62. At first or lower end 60 shell 12 is supported by a pivot joint 64. At second or upper end 62 shell 12 is supported by a removable support column or spool 66 having an underlying load cell 68.

#### Operation:

The use and operation of heated inclined separation pressure vessel 10 will now be described with reference to **FIGURE 1**. Emulsion, a continuous crude oil phase dispersed with various impurities including; water, gas and solid particulate, enters the heat transfer chamber 48, defined by the elongated coaxial concentric sleeve 24, through the emulsion inlet 46 which penetrates the shell 12 adjacent the upper vessel end 62 and penetrates the sleeve 24, without communication with the oil zone 20. Water tends to accumulate in water zone 18 at lower end of pressure vessel 10. Oil float on the surface of the water in annulus 22 between a sleeve 24 and shell 12. Separated gas rises and forms a gas zone 26 which is captured by gas separator 28. Referring to **FIGURE 3**, heat is input to water within furnace/boiler 54 causing a phase change of the water to steam. Steam vapour expands and rises up heat tubes 52, as indicated by arrows 70. A first portion 72 of heat tubes 52 serves as an evaporator section in which water turns to steam. A

second portion 73 serves as a heat transfer (heat rejection) section in which a heat transfer occurs. A third portion 74 of heat tubes 52 serves as a condensation section, where the steam condenses back to water. The liquid water droplets then flow along the incline of heat tubes 52 back into furnace/boiler 54 as indicated by arrows 76. Referring to **FIGURE 1**, the heat transfer coefficient between the steam within the heat tubes 52 and oil flowing outside of heat tubes 52 is enhanced by integrating a plurality of baffles 53 within heat tube bundle 50 around heat tubes 52 to increase the effect of forced convection guiding the fluid through the most torturous path possible through sleeve portion 24 of shell 12. During use sand and particulate accumulates will inevitably accumulate within shell 12. Such accumulations cause the weight of shell 12 to increase. Load cell 68 is set to provide a warning when cleaning is required and is preferably integrated into an automatic desand system. When repairs are required, shell 12 has been designed to facilitate servicing. Should furnace/boiler 54 malfunction, support structure 56 for furnace/boiler 54 is equipped with locking roller assembly 58. The lock on roller assembly 58 is released and furnace/boiler 54 is roller off support structure 56, with another furnace/boiler 54 being rapidly substituted. If shell 12 must be removed, removable support column 66 is removed to enable second or upper end 62 to be lowered. The lowering of shell 12 is facilitated by pivot joint 64. From the lowered position, shell 12 can be either inspected, serviced or replaced.

#### MAIN ASSEMBLY AND GENERAL GEOMETRY

##### Technical Achievements;

- 1) High L/d Ratio
- 2) High A/V Ratio
- 3) Slug Control

- 4) Decrease in slop generation
- 5) Lower manufacturing costs due to small diameter
- 6) Lower transportation costs due to small diameter

5           The main vessel, sleeve and heat pipe inclination  
with respect to the horizontal provides high efficient  
separation characteristics. The inclination creates a  
virtual interface much higher than conventional  
horizontal heated separation pressure vessel, therefore  
10 decreasing the average settling distance. The inclination  
also reduces the size of the actual interface between the  
oil and water, therefore decreasing the area for slop oil  
generation. The sleeve located coaxial with in the  
elongated cylindrical shell enhances the separation  
15 efficiency further, utilizing the annulus as the main  
separation zone further reducing the settling distance.  
The sleeve also forces the emulsion to make two complete  
passes through, thereby providing more time for the  
smaller diameter droplets/particles to settle out.  
20 These, improvements are manifest within two geometric  
ratios. One is the length to diameter ratio ( $L/d$ ) and the  
other is the separation surface area to total volume  
ratio ( $A_{ss}/V_t$ ). Both the  $L/d$  and the  $A/V$  are approximately  
four times greater than conventional horizontal heated  
25 separation pressure vessel of equivalent volumetric  
throughput. The addition of the gas separator increases  
retention time of liquids as volume within elongated  
cylindrical shell is not occupied by gas. Gas separator  
also provides an excellent means of gas slug control.

30

#### HEAT SOURCE ASSEMBLY

##### Technical Achievements;

- 1) No 'hot spot', therefore reduced koching
- 35       2) Constant temperature of entire surface equals  
higher heat transfer coefficient
- 3) Increased surface area of bundle equals higher

heat transfer coefficient

4) High pressure, high insulation furnace results in reduced fuel gas consumption

5) Reduced fuel gas consumption equals reduced emissions

6) Need for angle eases integration

7) Reduces the number of challenging joints from four to one

8) Extend physical limitations associated with U-Tube

9) Increase in force convection with baffling

10) Increase safety due to separation of heat source and flammable fluids

Heat is required to maximize the settling velocity as defined by Stoke's Law. As the temperature of the emulsion increases, the viscosity and density of the oil decreases and therefore the settling velocity of containments throughout the oil is increased. The normal heat source for all heated separation pressure vessels is the natural gas fired burner tube. Consisting of a single high temperature heat source and single U-tube and stack. Fuel gas is burned at a high ratio of gas to air, increasing required minimum fuel gas consumption for efficient heat transfer. A hot spot is created on the fire tube at the heat source and large temperature gradient exists throughout the length of the fire tube, decreasing the ability for efficient heat transfer and therefore increased fuel gas consumption. Also, the build up of a koching solids around the fire tube hot spot decreases the heat transfer coefficient. The fire tube is usually located in a vertical or quasi-horizontal position allowing for natural flow of hot combustion gases. The intake and exhaust of the U-Tube fire tube penetrate the pressure vessel head or shell adjacent each other. These conventional configurations of fire tube assemblies presented physical limitations on size. These

limitations on size were overcome in prior art CA 924,256 and US 6,099,742 with the straight through fire tube. However, the straight through fire tube presents its own thermal limitations, theoretically overcome by each prior art in their own specific designs. CA 924.256 provides a packing gland style joint for penetration of lower pressure vessel head by fire tube intake and an expansion style joint for penetration of upper vessel head by fire tube exhaust. US 6,099,742 has designed around the thermal limitations of the straight through fire tube with expansion style joints at both ends. Interestingly, US 6,099,742 has reversed the flow of combustion gases (going against natural convection) and added a blower to assist with flow.

The heat tube technology incorporated into separation pressure vessel 10 overcomes all of the above limitations with the fire tube, both U-Tube and straight, while reducing the amount of emissions released during heat energy generation.

The heat tube heat source is the most efficient heat transfer assembly for several reasons; constant temperature of entire length of tube, increase surface area of multi-tube bundle and high efficiency (well insulated) natural gas furnace reduces fuel gas consumption. In addition, heat tubes work best when located at an oblique angle to horizon easing the integration of heat assembly and main vessel assembly. In fact, both the angles of the main vessel assembly and heat assembly can be set to match each other exactly. A third advantage of the heat tube technology is lack of penetration of upper sleeve and upper vessel head end and ease of penetration of the lower sleeve end. This advantage eliminates the need for expansion type and packing gland type joints as required by CA 924,256 and US 6,099,742. Separation pressure vessel 10 also increases the heat transfer coefficient by integrating a

plurality of baffles within and around the heat tube bundle to increase the effect of forced convection guiding the fluid through the most torturous path possible through the sleeve portion of the vessel. (See  
5 Baffle Assembly for more detail).

### DESAND ASSEMBLY

#### Technical Achievements;

- 10 1) Minimum disturbance
- 2) Maximum coverage
- 3) Desand Indicator

Conventional horizontal heated pressure vessels have  
15 designed their systems based on a primitive desand philosophy, hoping all the sand falls to the bottom of the vessel where a high pressure, and therefore highly disruptive, water jetting system attempts to push the sand to outlet nozzles. The sand that does not settle to  
20 the bottom of the vessel is left to accumulate within the vessel for a year or two until the next turn around. The frequency of the desanding operation is determined in theory off unreliable pro-rated production data which ultimately leads to trial and error. Separation pressure  
25 vessel 10 overcomes all of the above.

Inclination of separation pressure vessel 10 increases the ability of desanding with minimum disturbance. Coupled with a high volume water injection  
30 system, the sand bed that accumulates along the trough of the sleeve and within the tube bundle gently fluidizes and flows downhill to the sand outlet. The high volume water injection is placed liberally throughout the heat tube bundle and trough area of the  
35 sleeve. Solid contaminants are usually bound up in the viscous low temperature oil emulsion, as the temperature rises smaller and smaller particulate is liberated from

13

the oil. Solid particulate is potentially found everywhere with in the sleeve.

A load cell is placed within the structural frame of separation pressure vessel 10. As sand and particulate accumulates in the vessel the weight of the vessel increases proportionately. The load cell can be set to provide an indicator light or integrated into an automatic desand system.

#### BAFFLE ASSEMBLY

##### Technical Achievements;

- 1) Most torturous path for maximum heat transfer coefficient
- 2) Maintain straightness of heat pipes
- 3) Provide for flow of liberated gas
- 4) Provide for flow of fluidized particles
- 5) Preferential heating of oil

Baffles have been a common feature of most separation pressure vessel for some time now. Separation pressure vessel 10 has a specific baffle assembly providing one primary function and several auxiliary functions. The baffle assembly has been coupled with the heat tube bundle to ensure straightness of elongated heat tubes and to work as a guide to ease assembly when inserting tube bundle within the sleeve. The baffles contain an elliptical type opening in both the top and bottom. The baffles guide the emulsion through a torturous path while providing a means at the top for liberated gas to escape to the gas separator and a means at the bottom for liberated water and fluidized particulate to escape to the lower pressure vessel end. The size of the elliptical type openings will depend of the flow rate of individual components. The baffle assembly and heat tube bundle are coupled to

14

preferentially heat the oil in the emulsion verse the water. Upon sleeve inlet the water is immediately directed to the trough of the sleeve.

5     **STRUCTURAL ASSEMBLY**

Technical Achievements;

- 1) Facilitate expedient turnaround
- 2) Eliminate welding during installation
- 10     3) Detect amount of solid particulate

The structural frame assembly on conventional horizontal and vertical pressure vessels is typically only designed for stationary structural support. Little  
15     to no attention is paid to the difficulties with turn around and installation. To increase the ease of turnaround the furnace support structure has been equipped with a roller assembly and locking device. The lower pressure vessel end is supported by a pivot joint  
20     and the upper pressure vessel end is supported by a removable spool and load cell.

**GAS SEPARATOR ASSEMBLY**

25

Technical Achievements;

- 1) Reduce affect of gas slugs
- 2) Immediate liberation of free gas
- 3) Maximize gas liberation
- 30     4) Integration with inclined heated pressure vessel
- 5) Reliable level control
- 6) Reduced foaming

Separating and effectively overcoming the challenges  
35     of any amount of gas from slightly entrained to severe slugging. Separator pressure vessel 10 is able to meet these challenges. The gas separator is a pressure vessel

15

located above the upper pressure vessel head end where the gas naturally accumulates. The size of the gas separator will be optimally selected to reflect the particular slugging profile. In order to reduce the effect of gas slugging the inlet has be located in the head of the gas separator, eliminating the agitation effect of gas flowing through liquid . The inlet is also equipped with cyclone degasser, instantly liberating gas via centrifugal force. The cyclone degasser combined with the accurately sized volume container effectively eliminates adverse affects of gas slugging. Gas accumulated within the annulus between the elongated cylindrical shell and internal sleeve is released to gas separator via an entrained gas loop. This feature allows for all gas to escape to the gas separator. The gas separator also provides and effective reliable means for level control. With the foaming challenge overcome, a simple float level controller will easily and reliable maintain level control while approaching a steady state operation.

#### NOZZLE LOCATIONS

##### Technical Achievements;

- 1) Wet in gas separator
- 2) Water Outlet in cleanest water
- 3) Oil outlet in cleanest oil
- 4) Separate Sand Outlet
- 5) Optional inlet for sand service

30

Pressure vessels have been equipped with nozzle since the first vessel was fabricated. The location and internal characteristics of separation pressure vessel make its nozzles unique. The inlet nozzle is in the head of the gas separator verses the main pressure vessel as in most prior art. The inlet nozzle is also equipped with a cyclone degasser. The oil and water outlet contain

35

risers terminating in the cleanest oil and water. As an option, for applications where sand is encountered, an alternative inlet nozzle is offered c/w inlet deflector baffle. This option minimizes and even eliminates the sand carry over to the gas separator.

#### LOWER END HEAD ASSEMBLY

##### Technical Achievements;

- 1) Maintain ASME Code Specifications
- 2) Provide for penetration of heat tube bundle
- 3) Provide for penetration of desand inlet piping
- 4) Provide for removal of sleeve

The greatest challenge in conventional pressure vessel head design is provide a throat for penetration of U-Tube fire tube. The design of the lower pressure vessel head presented a challenge for exceeding any fire tube penetration. The lower pressure vessel head had to allow for penetration of heat tubes, desand water piping, removal of internal sleeve and still remain safe enough to meet or accede AMSE Section VIII Certification. The challenges above were overcome with a standard 2:1 elliptical head customized for several functions. First, a circular man-way type opening was fabricated at the center of the head. The flange designed to mate with the opening contained several threaded holes provide for the tube bundle and desand water piping. The throat side of the elliptical head was equipped with RFSO Flange. The mating flange was installed on the elongated cylindrical shell. This flange provided the means to completely open the lower pressure vessel end to facilitate removal of the internal sleeve.

In this patent document, the word "comprising" is used in its non-limiting sense to mean that items following the word are included, but items not

specifically mentioned are not excluded. A reference to an element by the indefinite article "a" does not exclude the possibility that more than one of the element is present, unless the context clearly requires that there  
5 be one and only one of the elements.

It will be apparent to one skilled in the art that modifications may be made to the illustrated embodiment without departing from the spirit and scope of the  
10 invention as hereinafter defined in the Claims.

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE  
PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

- 5        1.        A heated inclined separation pressure vessel,  
         comprising:  
             a shell having a longitudinal axis for receiving oil  
             in which water is emulsified, gas is entrained and solid  
             particulate is present, for the purpose of separating the  
10        water, gas and solid particulate from the oil;  
             means for supporting said shell such that the axis  
             is at an oblique angle to the horizontal, whereby the  
             shell has an upper and a lower end;  
             a lower head closing the lower end;  
15        an upper head closing the upper end;  
             an elongated sleeve extending coaxially into the  
             shell, the sleeve being closed at the upper end with a  
             head and having an open lower end located at an  
             intermediate position between the ends of the shell;  
20        an emulsion nozzle adjacent to the upper end for  
             admitting emulsion to the elongated sleeve;  
             a water nozzle adjacent to the lower end to purge  
             water from the shell;  
             a gas nozzle adjacent to the upper end to remove gas  
25        from the oil;  
             an oil nozzle adjacent to the upper end to remove  
             the clean oil from the shell;  
             a heat source comprising:  
                 an elongated heat tube bundle extending  
30        coaxially through the sleeve, the heat tube bundle having  
             a plurality of heat tubes, the bundle having a lower end  
             and an upper end, the lower end being an evaporator  
             section and the upper end being a condenser section;  
             a furnace wherein heat pipe fluids are  
35        evaporated.

2.        The heated inclined separation pressure vessel as  
         defined in Claim 1, wherein a gas separator is located

above the upper end of the shell and is in fluid communication with substantially the highest location within the elongated sleeve.

5

3. The heated inclined separation pressure vessel as defined in Claim 1, wherein the shell and sleeve are substantially cylindrical and coaxial.

10

4. The heated inclined separation pressure vessel as defined in Claim 1, wherein the furnace is supported by a roller assembly.

15

5. The heated inclined separation pressure vessel as defined in Claim 1, wherein the shell is supported by a pivot joint and removable column support.

20

6. The heated inclined separation pressure vessel as defined in Claim 1, wherein baffles extend between the heat tubes of the bundle and the sleeve, the baffles supporting the heat tubes and defining a tortuous flow path for fluids being separated.

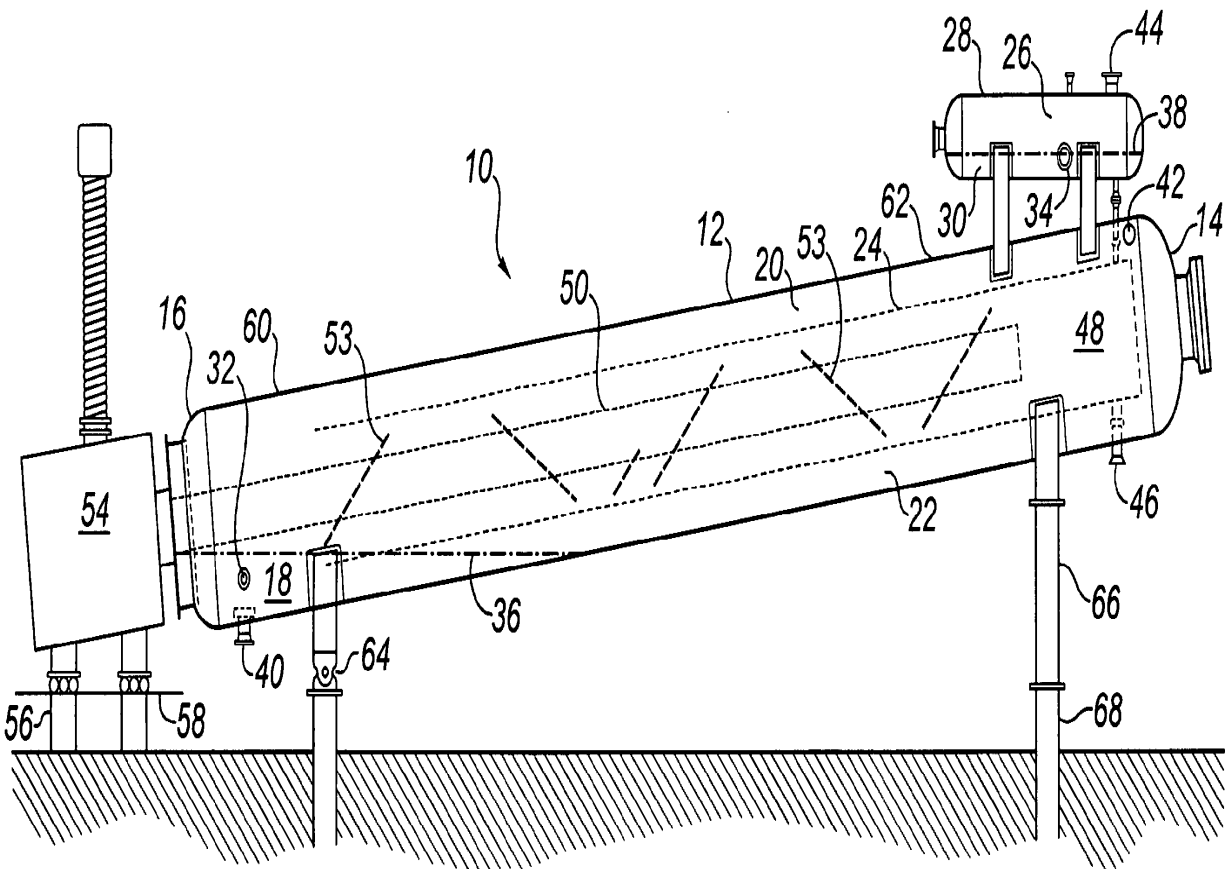


FIG. 1

2/3

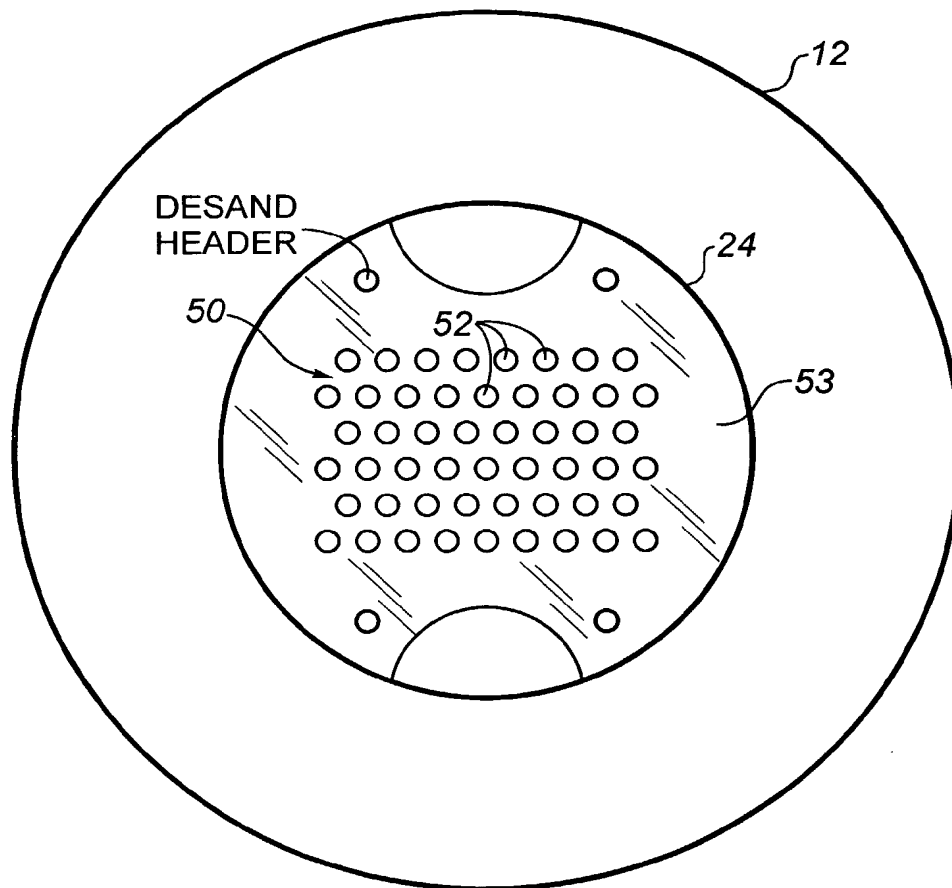


FIG. 2

3/3

SUBSTITUTE SHEET (RULE 26)

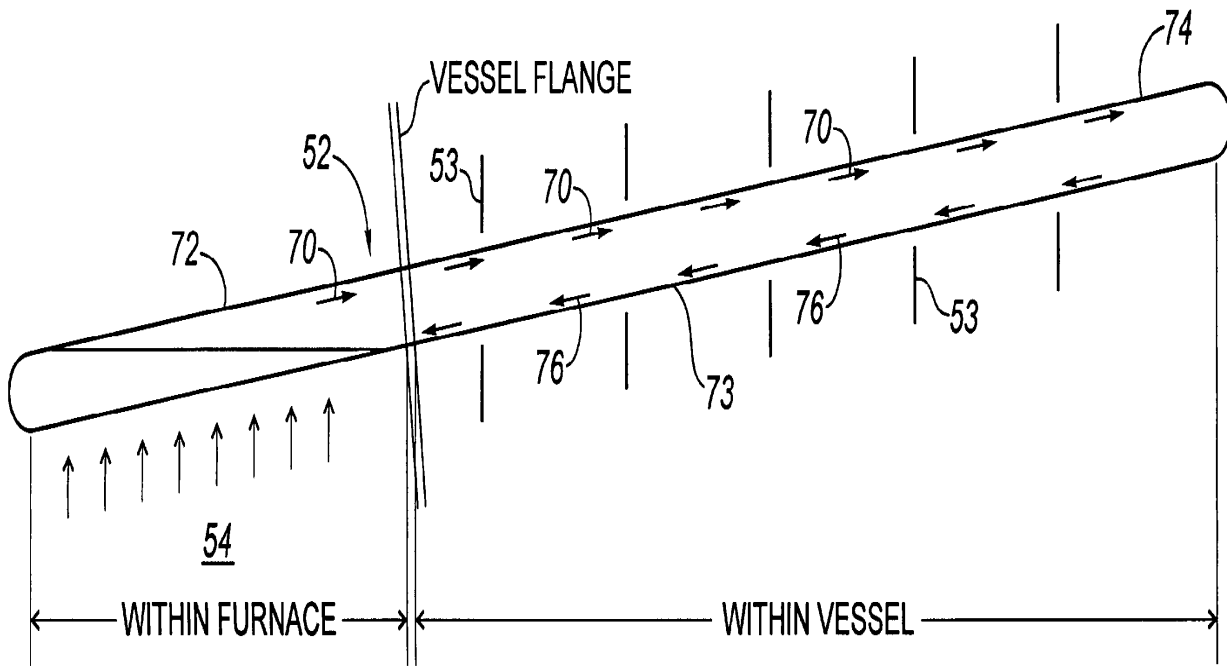


FIG. 3

GOODWIN MURRAY

FEB 28 2013

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PATENT COOPERATION TREATY  
**PCT**  
 INTERNATIONAL SEARCH REPORT  
 (PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference <b>2200-011PCT</b>	<b>FOR FURTHER ACTION</b> see Form PCT/ISA/220 as well as, where applicable, item 5 below	
International application No. <b>PCT/CA2012/050915</b>	International filing date ( <i>day/month/year</i> ) 19 December 2012 (19-12-2012)	(Earliest) Priority date ( <i>day/month/year</i> ) 13 February 2012 (13-02-2012)
Applicant <b>SPECIALIZED TECH INC.</b>		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 3 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

CLASSIFICATION		ROUTING	
PRIMARY	REPORT		
EXAMINED	ADJUST		
CHECKED	FILE		
OTHER			

1. **Basis of the report**

a. With regard to the **language**, the international search was carried out on the basis of:

☒ the international application in the language in which it was filed

☐ a translation of the international application into \_\_\_\_\_, which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b))

b. ☐ This international search report has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43.6bis(a)).

c. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I

2. ☐ **Certain claims were found unsearchable** (see Box No. II)

3. ☐ **Unity of invention is lacking** (see Box No. III)

4. With regard to the **title**,

☒ the text is approved as submitted by the applicant

☐ the text has been established by this Authority to read as follows :

5. With regard to the **abstract**,

☒ the text is approved as submitted by the applicant

☐ the text has been established, according to Rule 38.2, by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority

6. With regard to the **drawings**,

a. the figure of the **drawings** to be published with the abstract is Figure No. 2

☒ as suggested by the applicant

☐ as selected by this Authority, because the applicant failed to suggest a figure

☐ as selected by this Authority, because this figure better characterizes the invention

b. ☐ none of the figures is to be published with the abstract

## A. CLASSIFICATION OF SUBJECT MATTER

IPC: **B01D 45/02** (2006.01) , **E21B 21/01** (2006.01) , **E21B 21/07** (2006.01) , **E21B 43/34** (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)

IPC: B01D 45/02 (2006.01) , E21B 21/01 (2006.01) , E21B 21/07 (2006.01) , E21B 43/34 (2006.01)

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

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

EPODOC and EPOQUE full text english databases with search terms pitch, angle, incline, tilt, slant, interface, freeboard, liquid level, sand, particle, particulate, solids, fines, sediment, desand, remove, oil, entrain, high pressure separator, well, horizontal, and gas.

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CA2433741 A1 (HEMSTOCK, C. et al.) 07 October 2003 (07-10-2003) * Cited by applicant * * Entire document *	1-11
A	GB773096 A (LAIRD, A.) 24 April 1957 (24-04-1957) * Entire document *	
A	CA2041479 A1 (MARTIN, R.) 31 October 1992 (31-10-1992) * Entire document *	
A	WO02070101 A2 (BINSFIELD, B. et al.) 12 September 2002 (12-09-2002) * Entire document *	

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents :	"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
"A" document defining the general state of the art which is not considered to be of particular relevance	"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
"E" earlier application or patent but published on or after the international filing date	"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
"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)	"&" document member of the same patent family
"O" document referring to an oral disclosure, use, exhibition or other means	
"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

22 February 2013 (22-02-2013)

Date of mailing of the international search report

25 February 2013 (25-02-2013)

Name and mailing address of the ISA/CA  
 Canadian Intellectual Property Office  
 Place du Portage I, C114 - 1st Floor, Box PCT  
 50 Victoria Street  
 Gatineau, Quebec K1A 0C9  
 Facsimile No.: 001-819-953-2476

Authorized officer

Guillaume White-Rolland (819) 994-0475

**INTERNATIONAL SEARCH REPORT**  
Information on patent family members

International application No.  
PCT/CA2012/050915

Patent document Cited in Search report	Publication Date	Patent Family Member(s)	Publication Date
CA2433741 A1	07-10-2003	-	-
GB773096 A	24-04-1957	-	-
CA2041479 A1	31-10-1992	-	-
WO02070101 A2	12-09-2002	AU2002242508 A1	19-09-2002
		US2002157997 A1	31-10-2002
		US6533929 B2	18-03-2003
		CA2339590 C	12-03-2002

## Electronic Acknowledgement Receipt

<b>EFS ID:</b>	15875341
<b>Application Number:</b>	13372291
<b>International Application Number:</b>	
<b>Confirmation Number:</b>	1699
<b>Title of Invention:</b>	DESANDING APPARATUS AND SYSTEM
<b>First Named Inventor/Applicant Name:</b>	Christopher A HEMSTOCK
<b>Customer Number:</b>	27522
<b>Filer:</b>	Sean Goodwin/Seong-Cheol Son
<b>Filer Authorized By:</b>	Sean Goodwin
<b>Attorney Docket Number:</b>	2200-011 US
<b>Receipt Date:</b>	28-MAY-2013
<b>Filing Date:</b>	13-FEB-2012
<b>Time Stamp:</b>	10:36:52
<b>Application Type:</b>	Utility under 35 USC 111(a)

### Payment information:

Submitted with Payment	no
------------------------	----

### File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	updated_IDS.pdf	612312 f8255b14ad9227dfdb1d4c52802f3c027a235e0f	no	4

### Warnings:

### Information:

A U.S. Patent Number Citation or a U.S. Publication Number Citation is required in the Information Disclosure Statement (IDS) form for autoloading of data into USPTO systems. You may remove the form to add the required data in order to correct the Informational Message if you are citing U.S. References. If you chose not to include U.S. References, the image of the form will be processed and be made available within the Image File Wrapper (IFW) system. However, no data will be extracted from this form. Any additional data such as Foreign Patent Documents or Non Patent Literature will be manually reviewed and keyed into USPTO systems.

2	Foreign Reference	CA2041479A1.pdf	525398 8a79ca6c1a762403a7864fed799fb7f5c7abc48	no	18
<b>Warnings:</b>					
<b>Information:</b>					
3	Foreign Reference	CA2433741A1.pdf	878537 8e19558402218a3b34af83d92e4640c38e2772f2	no	26
<b>Warnings:</b>					
<b>Information:</b>					
4	Foreign Reference	GB773096A.pdf	231785 438b3d19a0d4212a88f5f52d6dbca2b9df50899	no	5
<b>Warnings:</b>					
<b>Information:</b>					
5	Foreign Reference	WO02070101A2.pdf	897906 f674802fd4735fb1f349b70d692b9e5813485c31	no	23
<b>Warnings:</b>					
<b>Information:</b>					
6	Other Reference-Patent/App/Search documents	ISR.pdf	153532 9bccfa7dc9e136485aab6384a38eca707d9a1da5	no	3
<b>Warnings:</b>					
<b>Information:</b>					
<b>Total Files Size (in bytes):</b>			3299470		

**This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.**

**New Applications Under 35 U.S.C. 111**

**If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.**

**National Stage of an International Application under 35 U.S.C. 371**

**If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.**

**New International Application Filed with the USPTO as a Receiving Office**

**If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.**



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www.uspto.gov

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO	TOT CLAIMS	IND CLAIMS
13/372,291	02/13/2012	1774	595	2200-011 US	9	2

**CONFIRMATION NO. 1699**

## UPDATED FILING RECEIPT



\*OC000000057533211\*

27522  
SEAN W. GOODWIN  
222 PARKSIDE PLACE  
602-12 AVENUE S.W.  
CALGARY, AB T2R 1J3  
CANADA

Date Mailed: 11/13/2012

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

### Inventor(s)

Christopher A HEMSTOCK, Calgary, CANADA;

### Applicant(s)

Christopher A HEMSTOCK, Calgary, CANADA;

### Assignment For Published Patent Application

SPECIALIZED TECH INC., Calgary, CANADA

**Power of Attorney:** The patent practitioners associated with Customer Number 27522

### Domestic Priority data as claimed by applicant

**Foreign Applications** (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see <http://www.uspto.gov> for more information.)

**If Required, Foreign Filing License Granted:** 02/24/2012

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 13/372,291**

**Projected Publication Date:** 08/15/2013

**Non-Publication Request:** No

**Early Publication Request:** No

**\*\* SMALL ENTITY \*\***

**Title**

DESANDING APPARATUS AND SYSTEM

**Preliminary Class**

422

**PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES**

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at <http://www.uspto.gov/web/offices/pac/doc/general/index.html>.

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<b>PATENT APPLICATION FEE DETERMINATION RECORD</b> Substitute for Form PTO-875						Application or Docket Number 13/372,291	
<b>APPLICATION AS FILED - PART I</b>							
(Column 1)		(Column 2)		SMALL ENTITY		OTHER THAN SMALL ENTITY	
FOR	NUMBER FILED	NUMBER EXTRA	RATE(\$)	FEE(\$)		RATE(\$)	FEE(\$)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	98		N/A	
SEARCH FEE (37 CFR 1.16(k), (l), or (m))	N/A	N/A	N/A	310		N/A	
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	125		N/A	
TOTAL CLAIMS (37 CFR 1.16(j))	9	minus 20 = *	x 31	= 0.00	OR		
INDEPENDENT CLAIMS (37 CFR 1.16(h))	2	minus 3 = *	x 125	= 0.00			
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			0.00			
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				0.00			
			TOTAL	533		TOTAL	
* If the difference in column 1 is less than zero, enter "0" in column 2.							
<b>APPLICATION AS AMENDED - PART II</b>							
(Column 1)		(Column 2)		(Column 3)		SMALL ENTITY	
AMENDMENT A	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)		RATE(\$)
	Total (37 CFR 1.16(i))	*	Minus **	=	x	=	OR
	Independent (37 CFR 1.16(h))	*	Minus ***	=	x	=	OR
	Application Size Fee (37 CFR 1.16(s))						OR
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						OR
			TOTAL ADD'L FEE			OR	TOTAL ADD'L FEE
(Column 1)		(Column 2)		(Column 3)		SMALL ENTITY	
AMENDMENT B	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)		RATE(\$)
	Total (37 CFR 1.16(i))	*	Minus **	=	x	=	OR
	Independent (37 CFR 1.16(h))	*	Minus ***	=	x	=	OR
	Application Size Fee (37 CFR 1.16(s))						OR
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						OR
			TOTAL ADD'L FEE			OR	TOTAL ADD'L FEE
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3. ** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20". *** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3". The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.							



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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
13/372,291	02/13/2012	Christopher A HEMSTOCK	2200-011 US

27522  
SEAN W. GOODWIN  
222 PARKSIDE PLACE  
602-12 AVENUE S.W.  
CALGARY, AB T2R 1J3  
CANADA

**CONFIRMATION NO. 1699**  
**POA ACCEPTANCE LETTER**



Date Mailed: 11/13/2012

## NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 03/20/2012.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

/twoldeyes/

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**POWER OF ATTORNEY  
OR  
REVOCATION OF POWER OF ATTORNEY  
WITH A NEW POWER OF ATTORNEY  
AND  
CHANGE OF CORRESPONDENCE ADDRESS**

Application Number	13/372,291
Filing Date	February 13, 2012
First Named Inventor	HEMSTOCK, Christopher A.
Title	DESANDING APPARATUS AND SYSTEM
Art Unit	
Examiner Name	Not Yet Assigned
Attorney Docket Number	2200-011 US Reg

I hereby revoke all previous powers of attorney given in the above-identified application.

☐ A Power of Attorney is submitted herewith.

OR

☒ I hereby appoint Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s) to prosecute the application identified above, and to transact all business in the United States Patent and Trademark Office connected therewith:

27522

OR

☐ I hereby appoint Practitioner(s) named below as my/our attorney(s) or agent(s) to prosecute the application identified above, and to transact all business in the United States Patent and Trademark Office connected therewith:

Practitioner(s) Name	Registration Number

Please recognize or change the correspondence address for the above-identified application to:

☒ The address associated with the above-mentioned Customer Number.

OR

☐ The address associated with Customer Number:

OR

☐ Firm or  
Individual Name

Address

City

State

Zip

Country

Telephone

Email

I am the:


☒ Applicant/Inventor.

OR

☐ Assignee of record of the entire interest. See 37 CFR 3.71.

Statement under 37 CFR 3.73(b) (Form PTO/SB/96) submitted herewith or filed on \_\_\_\_\_.

**SIGNATURE of Applicant or Assignee of Record**

Signature		Date	MAR 14 2012
Name	Christopher A. HEMSTOCK	Telephone	(403) 233 2010
Title and Company	President, Specialized Tech Inc.		

**NOTE:** Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required. Submit multiple forms if more than one signature is required, see below\*.☐ \*Total of \_\_\_\_\_ forms are submitted.

This collection of information is required by 37 CFR 1.31, 1.32 and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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## Electronic Patent Application Fee Transmittal

<b>Application Number:</b>	13372291			
<b>Filing Date:</b>	13-Feb-2012			
<b>Title of Invention:</b>	DESANDING APPARATUS AND SYSTEM			
<b>First Named Inventor/Applicant Name:</b>	Christopher A HEMSTOCK			
<b>Filer:</b>	Sean Goodwin/Prita Madan			
<b>Attorney Docket Number:</b>	2200-011 US			
Filed as Small Entity				
<b>Utility under 35 USC 111(a) Filing Fees</b>				
<b>Description</b>	<b>Fee Code</b>	<b>Quantity</b>	<b>Amount</b>	<b>Sub-Total in USD(\$)</b>
<b>Basic Filing:</b>				
<b>Pages:</b>				
<b>Claims:</b>				
<b>Miscellaneous-Filing:</b>				
Late filing fee for oath or declaration	2051	1	65	65
<b>Petition:</b>				
<b>Patent-Appeals-and-Interference:</b>				
<b>Post-Allowance-and-Post-Issuance:</b>				
<b>Extension-of-Time:</b>				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Miscellaneous:				
Total in USD (\$)				65

## Electronic Acknowledgement Receipt

<b>EFS ID:</b>	12350601
<b>Application Number:</b>	13372291
<b>International Application Number:</b>	
<b>Confirmation Number:</b>	1699
<b>Title of Invention:</b>	DESANDING APPARATUS AND SYSTEM
<b>First Named Inventor/Applicant Name:</b>	Christopher A HEMSTOCK
<b>Customer Number:</b>	27522
<b>Filer:</b>	Sean Goodwin/Prita Madan
<b>Filer Authorized By:</b>	Sean Goodwin
<b>Attorney Docket Number:</b>	2200-011 US
<b>Receipt Date:</b>	20-MAR-2012
<b>Filing Date:</b>	13-FEB-2012
<b>Time Stamp:</b>	17:33:19
<b>Application Type:</b>	Utility under 35 USC 111(a)

### Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	\$65
RAM confirmation Number	4678
Deposit Account	504818
Authorized User	GOODWIN,SEAN W.

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

Charge any Additional Fees required under 37 C.F.R. Section 1.16 (National application filing, search, and examination fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.17 (Patent application and reexamination processing fees)

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## File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Miscellaneous Incoming Letter	Response.pdf	28291	no	1
			e203f64214a81e75f711e70054bc4ea4bd6fd88f		

### Warnings:

### Information:

2	Oath or Declaration filed	Decalaration.pdf	122062	no	1
			9551d4b88f754b6bc41e16930ee18297a2f8547a		

### Warnings:

### Information:

3	Power of Attorney	POA.pdf	99448	no	1
			9631629e5e1bea6227bf3c60919717905d6ae314		

### Warnings:

### Information:

4	Fee Worksheet (SB06)	fee-info.pdf	30161	no	2
			0a78ef9b0fc2e2483358617b0745cdbaa6f02b98		

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### Information:

<b>Total Files Size (in bytes):</b>	279962
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#### **New Applications Under 35 U.S.C. 111**

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

#### **National Stage of an International Application under 35 U.S.C. 371**

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

#### **New International Application Filed with the USPTO as a Receiving Office**

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In re patent application of:

**HEMSTOCK, Christopher A.**

**Att. Docket No.: 2200-011 US**

**Serial No.: 13/372,291**

**Group Art Unit: 1774**

**Filed: February 13, 2012**

**Examiner: Not yet assigned**

**Title: DESANDING APPARATUS AND SYSTEM**

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

**Via EFS -WEB**

Sir:

**RESPONSE TO NOTICE TO FILE MISSING PARTS OF NONPROVISIONAL  
APPLICATION**

**RESPONSE TO FILE MISSING PARTS**

Please find enclosed the signed Declaration and Power of Attorney in compliance with 37 CFR 1.63.

The surcharge for late submission of the Declaration and Power of Attorney as set forth in 37 CFR 1.16(f) in the amount of \$65.00 is enclosed herewith.

Respectfully Submitted,

Date: March 20/12

  
\_\_\_\_\_  
Sean W. Goodwin  
Registration No. 39,568  
Customer No. 27522

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

**DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN  
APPLICATION DATA SHEET (37 CFR 1.76)****Title of  
Invention****DESANDING APPARATUS AND SYSTEM**

As the below named inventor(s), I/we declare that:

This declaration is directed to: ☒ The attached application, or  
☐ United States application or PCT international application number \_\_\_\_\_  
 filed on \_\_\_\_\_  
☐ As amended on \_\_\_\_\_ (if applicable);

I/we believe that I/we am/are the original and first inventor(s) of the subject matter which is claimed and for which a patent is sought;

I/we have reviewed and understand the contents of the above-identified application, including the claims, as amended by any amendment specifically referred to above;

I/we acknowledge the duty to disclose to the United States Patent and Trademark Office all information known to me/us to be material to patentability as defined in 37 CFR 1.56, including for continuation-in-part applications, material information which became available between the filing date of the prior application and the national or PCT International filing date of the continuation-in-part application.

**WARNING:**

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

All statements made herein of my/our own knowledge are true, all statements made herein on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001, and may jeopardize the validity of the application or any patent issuing thereon.

**FULL NAME OF INVENTOR(S)**Inventor one: HEMSTOCK, Christopher A. Date: Mar 14 2012Signature: [Signature] Citizen of: CA

Inventor two: \_\_\_\_\_ Date: \_\_\_\_\_

Signature: \_\_\_\_\_ Citizen of: \_\_\_\_\_

☐ Additional inventors or a legal representative are being named on \_\_\_\_\_ additional form(s) attached hereto.

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 1 minute to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.



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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO	TOT CLAIMS	IND CLAIMS
13/372,291	02/13/2012	1774	530	2200-011 US	9	2

CONFIRMATION NO. 1699

27522  
SEAN W. GOODWIN  
222 PARKSIDE PLACE  
602-12 AVENUE S.W.  
CALGARY, AB T2R 1J3  
CANADA

FILING RECEIPT



\*OC000000052783146\*

Date Mailed: 02/29/2012

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

**Applicant(s)**

Christopher A HEMSTOCK, Calgary, CANADA;

**Assignment For Published Patent Application**

SPECIALIZED TECH INC., Calgary, CANADA

**Power of Attorney:** None

**Domestic Priority data as claimed by applicant**

**Foreign Applications** (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see <http://www.uspto.gov> for more information.)

**If Required, Foreign Filing License Granted:** 02/24/2012

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 13/372,291**

**Projected Publication Date:** To Be Determined - pending completion of Missing Parts

**Non-Publication Request:** No

**Early Publication Request:** No

**\*\* SMALL ENTITY \*\***

**Title**

DESANDING APPARATUS AND SYSTEM

**Preliminary Class**

422

**PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES**

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at <http://www.uspto.gov/web/offices/pac/doc/general/index.html>.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, <http://www.stopfakes.gov>. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4158).

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<b>PATENT APPLICATION FEE DETERMINATION RECORD</b> Substitute for Form PTO-875						Application or Docket Number 13/372,291				
<b>APPLICATION AS FILED - PART I</b>										
(Column 1)		(Column 2)		SMALL ENTITY		OTHER THAN SMALL ENTITY				
FOR	NUMBER FILED	NUMBER EXTRA	RATE(\$)	FEE(\$)		RATE(\$)	FEE(\$)			
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	95		N/A				
SEARCH FEE (37 CFR 1.16(k), (l), or (m))	N/A	N/A	N/A	310		N/A				
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	125		N/A				
TOTAL CLAIMS (37 CFR 1.16(j))	9	minus 20 = *	x 30 =	0.00	OR					
INDEPENDENT CLAIMS (37 CFR 1.16(h))	2	minus 3 = *	x 125 =	0.00						
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			0.00						
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				0.00						
			TOTAL	530		TOTAL				
* If the difference in column 1 is less than zero, enter "0" in column 2.										
<b>APPLICATION AS AMENDED - PART II</b>										
(Column 1)		(Column 2)		(Column 3)		SMALL ENTITY		OTHER THAN SMALL ENTITY		
AMENDMENT A		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)		RATE(\$)	ADDITIONAL FEE(\$)
	Total (37 CFR 1.16(i))	*	Minus	**	=	x	=	OR	x	=
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x	=	OR	x	=
	Application Size Fee (37 CFR 1.16(s))							OR		
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	
AMENDMENT B		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)		RATE(\$)	ADDITIONAL FEE(\$)
	Total (37 CFR 1.16(i))	*	Minus	**	=	x	=	OR	x	=
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x	=	OR	x	=
	Application Size Fee (37 CFR 1.16(s))							OR		
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3. ** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20". *** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3". The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.										



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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
13/372,291	02/13/2012	Christopher A HEMSTOCK	2200-011 US

CONFIRMATION NO. 1699

FORMALITIES LETTER



\*OC000000052783147\*

27522  
SEAN W. GOODWIN  
222 PARKSIDE PLACE  
602-12 AVENUE S.W.  
CALGARY, AB T2R 1J3  
CANADA

Date Mailed: 02/29/2012

NOTICE TO FILE MISSING PARTS OF NONPROVISIONAL APPLICATION

FILED UNDER 37 CFR 1.53(b)

*Filing Date Granted*

**Items Required To Avoid Abandonment:**

An application number and filing date have been accorded to this application. The item(s) indicated below, however, are missing. Applicant is given **TWO MONTHS** from the date of this Notice within which to file all required items below to avoid abandonment. Extensions of time may be obtained by filing a petition accompanied by the extension fee under the provisions of 37 CFR 1.136(a).

- The oath or declaration is missing.

*A properly signed oath or declaration in compliance with 37 CFR 1.63, identifying the application by the above Application Number and Filing Date, is required.*

*Note: If a petition under 37 CFR 1.47 is being filed, an oath or declaration in compliance with 37 CFR 1.63 signed by all available joint inventors, or if no inventor is available by a party with sufficient proprietary interest, is required.*

The applicant needs to satisfy supplemental fees problems indicated below.

The required item(s) identified below must be timely submitted to avoid abandonment:

- A surcharge (for late submission of filing fee, search fee, examination fee or oath or declaration) as set forth in 37 CFR 1.16(f) of \$65 for a small entity in compliance with 37 CFR 1.27, must be submitted.

**SUMMARY OF FEES DUE:**

Total fee(s) required within **TWO MONTHS** from the date of this Notice is \$65 for a small entity

- \$65 Surcharge.

Replies should be mailed to:

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P.O. Box 1450  
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<https://sportal.uspto.gov/authenticate/AuthenticateUserLocalEPF.html>

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/ldvan/

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Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

1  
2 **“DESANDING APPARATUS AND SYSTEM”**  
3

4 FIELD OF THE INVENTION

5 The present invention relates to a system and apparatus for the  
6 removal of particulates, such as sand, from fluid streams produced from a well,  
7 while minimizing abrasion of the involved equipment.  
8

9 BACKGROUND OF THE INVENTION

10 Production from wells, in the oil and gas industry, often contain  
11 particulates such as sand. These particulates could be part of the formation from  
12 which the hydrocarbon is being produced, introduced particulates from hydraulic  
13 fracturing or fluid, loss material from drilling mud or fracturing fluids, or from a  
14 phase change of produced hydrocarbons caused by changing conditions at the  
15 wellbore (asphalt or wax formation). As the particulates are produced, problems  
16 occur due to abrasion, and plugging of production equipment. In a typical  
17 startup, after stimulating a well by fracturing, the stimulated well may produce  
18 sand until the well has stabilized, often up to several months after production  
19 commences. Other wells may require extended use of a desander.

20 Erosion of the production equipment is severe enough to cause  
21 catastrophic failure. High fluid stream velocities are typical and are even  
22 purposefully designed for elutriating particles up the well and to the surface. An  
23 erosive failure of this nature can become a serious safety and environmental  
24 issue for the well operator. A failure, such as a breach of high pressure piping or  
25 equipment, releases uncontrolled high velocity flow of fluid which is hazardous to  
26 service personnel. Release to the environment is damaging to the environment

1 resulting in expensive cleanup and loss of production. Repair costs are also  
2 high.

3 In all cases, retention of particulates contaminates surface  
4 equipment and the produced fluids, and impairs the normal operation of the oil  
5 and gas gathering systems and process facilities.

6 In one prior art system, a pressurized tank ("P-Tank") is placed on  
7 the wellsite and the well is allowed to produce fluid and particulates. The fluid  
8 stream is produced from a wellhead and into a P-Tank until sand production  
9 ceases. The large size of the P-Tank usually restricts the maximum operating  
10 pressure of the vessel to something in the order of 1,000 – 2,100 kPa. In the  
11 case of a gas well, this requires some pressure control to be placed on the well to  
12 protect the P-Tank. Further, for a gas well, a pressure reduction usually is  
13 associated with an increase in gas velocity which in turn makes sand-laden  
14 wellhead effluent much more abrasive. Another problem associated with this  
15 type of desanding technique is that it is only a temporary solution. If the well  
16 continues to make sand, the solution becomes prohibitively expensive. In most  
17 situations with this kind of temporary solution, the gas vapors are not conserved  
18 and sold as a commercial product.

19 An alternate, known prior art system includes employing filters to  
20 remove particulates. A common design is to have a number of fiber-mesh filter  
21 bags placed inside a pressure vessel. The density of the filter bag fiber-mesh is  
22 matched to the anticipated size of the particulates. However, filter bags are  
23 generally not effective in the removal of particulates in a multiphase conditions.  
24 Usually, multiphase flow in the oil and gas operations is unstable. Large slugs of  
25 fluid followed by a gas mist is common. In these cases, the fiber bags become a

1 cause for a pressure drop and often fail due to the liquid flow therethrough. Due  
2 to the high chance of failure, filter bags may not be trusted to remove particulates  
3 in critical applications or where the flow parameters of a well are unknown. An  
4 additional problem with filter bags in most jurisdictions, is the cost associated with  
5 disposal. The fiber-mesh filter bags are considered to be contaminated with  
6 hydrocarbons and must be disposed of in accordance to local environmental  
7 regulation.

8           In Canadian Patent 2,433,741, issued February 3, 2004 and in  
9 Canadian Patent 2,407,554, issued June 20, 2006, both to Applicant, a desander  
10 is disclosed having an elongate, horizontal vessel having an inlet at one end and  
11 an outlet at another, the outlet separated from the inlet by a downcomer flow  
12 barrier, such as a weir, adjacent the vessel's outlet or exit. The weir forms, and  
13 maintains, an upper freeboard portion having a cross-sectional area which is  
14 greater than that of the field piping from whence the fluid stream emanates for  
15 encouraging water and particulates to fall out of the freeboard portion. Water and  
16 particulates accumulate along a belly portion. The accumulation of particulates is  
17 along a substantial length of the elongate vessel increasing the difficulty of  
18 periodic manual removal of such accumulating using scraper rods and the like.

19           While Applicant has substantially maintained their elongated  
20 horizontal design virtually unchanged over the past 8 years or so, there has been  
21 a desire to improve the ease with which the vessel can be cleaned and further  
22 improvement in separation efficiency. Further, due to the nature of the gases  
23 handled, including pressure and toxicity, all vessels and pressure piping must be  
24 manufactured and approved by appropriate boiler and pressure vessel safety  
25 authorities.

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SUMMARY OF THE INVENTION

Desanding apparatus is provided which is placed adjacent to a well's wellhead for intercepting a fluid stream flow before prior to entry to equipment including piping, separators, valves, chokes and downstream equipment. The fluid stream can contain a variety of phases including liquid, gas and solids. In one embodiment, a pressure vessel is inserted in the flowstream by insertion into high velocity field piping extending from the wellhead. The vessel contains an upper freeboard portion having a cross-sectional area which is greater that of the field piping from whence the fluid stream emanates. As a result, fluid stream velocity drops and particulates cannot be maintained in suspension. The freeboard portion is maintained through control of the angle of the desander, obviating the need for a downcomer of Applicant's own prior art horizontal desanders.

In a broad aspect, a desanding system receives a gas stream containing entrained liquid and particulates. The system comprises a vessel, elongated along a longitudinal axis and inclined from a horizontal at a non-zero inclination angle. The vessel has a fluid inlet, adjacent an upper end for discharging the gas stream into the vessel at an inlet velocity, and a fluid outlet, spaced along the longitudinal axis from, and lower than, the fluid inlet.

The vessel further has a gas/liquid interface at the fluid outlet, a belly storage portion formed below the interface, and a freeboard portion formed adjacent an upper portion of the vessel above the interface. The freeboard portion has a freeboard cross-sectional area which diminishes from the fluid inlet to the fluid outlet, wherein a freeboard velocity, adjacent the fluid inlet is less than

1 the inlet velocity, the freeboard velocity being such that the entrained liquids and  
2 particulates fall out of the gas stream for collecting in the belly storage portion. A  
3 desanded gas stream flows out of the freeboard portion and out the fluid outlet,  
4 being free of a substantial portion of the particulates.

5 More preferably, a vessel of an embodiment of the present  
6 invention is incorporated in a desanding system to replace existing prior  
7 connective piping for a wellhead, the vessel being supported using structure to  
8 align the vessel with the wellhead piping and downstream equipment. The  
9 desander's fluid inlet and fluid outlet, associated with the inclined world of the  
10 desander, are adapted to connect to the orthogonal world of the connective  
11 piping.

12 In another broad aspect, a method for desanding a fluid stream,  
13 emanating from a wellhead and containing gas and entrained liquid and  
14 particulates, comprises providing an elongated vessel having a longitudinal axis  
15 which is inclined from the horizontal. The vessel has a fluid inlet adjacent an first  
16 end of the vessel and a fluid outlet spaced along the longitudinal axis from the  
17 fluid inlet; inclining the vessel at angle from a horizontal at a non-zero inclination  
18 angle so that the fluid outlet is lower than the fluid inlet for forming a freeboard  
19 portion above the fluid outlet. The fluid stream is discharging from the fluid inlet,  
20 into the vessel and substantially parallel to the longitudinal axis for establishing a  
21 liquid interface in a belly portion of the vessel, the belly portion and being formed  
22 below the fluid outlet. Liquid and particulates are being directed along a  
23 trajectory in the freeboard portion of the vessel to intercept a substantial portion  
24 of the particulates at the liquid interface for storage in the belly portion. A

1 desanded gas stream is recovered at the fluid outlet which is substantially free of  
2 particulates.

3 The inlet can be parallel or non-parallel with the longitudinal axis for  
4 enabling a trajectory to intercept the gas/liquid interface. The fluid stream can be  
5 introduced through a replaceable nozzle. The fluid inlet can be curved to align  
6 the inlet from the inclined desander and orthogonal piping from a wellhead.

7

### 8 BRIEF DESCRIPTION OF THE DRAWINGS

9 Figure 1 is a cross-sectional side view of Applicant's prior art  
10 elongated horizontal desander illustrating downcomer flow barrier, fluid streams,  
11 falling trajectory of particulates, and accumulations of separated liquid,  
12 particulates and particulate-free fluid discharge;

13 Figure 2 is a cross-sectional view of an embodiment of a tilted or  
14 inclined desander;

15 Figures 3A and 3B are perspective representations of the volumes  
16 of the belly portion and freeboard portions of the inclined desander of Fig. 2;

17 Figure 4 is a cross-sectional view of another embodiment of an  
18 inclined desander having a greater inclination angle than that of Fig. 2;

19 Figure 5 is a cross sectional view of a curved fluid inlet, square to  
20 the desander, and having a long radius angular transition elbow between  
21 orthogonal piping and the inclined desander;

22 Figure 6 is a representation of an inclined desander illustrating  
23 parameters for an example 12 inch diameter desander handling 50 m<sup>3</sup>/d of fluid  
24 flow; and

1                    Figure 7 is a representation of an inclined desander illustrating  
2    parameters for an example 36 inch diameter desander having a horizontal fluid  
3    inlet.  
4

1           DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

2           A desander is typically inserted between or as a replacement for  
3 existing piping such as connecting piping between a wellhead and downstream  
4 equipment such as multiphase separators.

5           As shown in Fig. 1, a prior art horizontal desander comprises a  
6 cylindrical pressure vessel 11 having a substantially horizontal axis A, a first fluid  
7 inlet end 12 adapted for connection to the fluid stream F. The fluid stream F  
8 typically comprises a variety of phases including gas G, some liquid L and  
9 entrained particulates such as sand S. The fluid stream F containing sand S  
10 enters through the inlet end 12 and is received by a freeboard portion 13. In the  
11 illustrated prior art vessel, the freeboard area is set by a downcomer flow barrier  
12 14. Accordingly, the velocity of the fluid stream F slows to a point below the  
13 entrainment or elutriation velocity of at least a portion of the particulates S in the  
14 fluid stream. Given sufficient horizontal distance without interference, the  
15 particulates S eventually fall from the freeboard portion 13. Particulates S and  
16 liquids L accumulate over time in the belly portion 15 and are periodically cleaned  
17 out at sufficient intervals to ensure that the maximum accumulated depth does  
18 not encroach on the freeboard portion 13. The desanded fluid stream, typically  
19 liquid L and gas G, emanates from fluid outlet 16.

20           As shown in Figs. 2 through 7, embodiments of an inclined  
21 desander 20 are free of the prior art flow barrier and, through tilting or inclination  
22 of the vessel, maximize freeboard upon entry of the flow stream, and reduce  
23 liquid flow rates for maximizing settling conditions therein and retention of  
24 captured particulates S. Variability of the inclination angle  $\alpha$  enables a measure

1 of variability between the respective freeboard to and liquid-storing belly portion  
2 for adjusting performance.

3 As shown in Fig. 2, the desander 20 comprises a vessel 22 having  
4 an axis A oriented at an angle  $\alpha$  to the horizontal H. The desander 20 has a fluid  
5 inlet 24 at an upper end 25 for receiving a fluid stream F typically comprising a  
6 variety of phases including gas G, some liquid L and entrained particulates such  
7 as sand S. In this embodiment, the fluid inlet 24 is oriented parallel to a  
8 longitudinal axis A of the vessel 22. A fluid outlet 26 is located along a top 28 of  
9 the vessel 22, and spaced from the fluid inlet 24. In an operating state, a  
10 gas\liquid interface 32 forms extending horizontally from about the fluid outlet 26.  
11 A belly portion 40 is formed below the interface 32 for containing liquid L and  
12 particulates S. A freeboard portion 44 is formed above the interface 32. The fluid  
13 inlet 24 discharges into the freeboard 44. Particulate trajectory can be  
14 manipulated by positioning and orienting a discharge end 29 of the fluid inlet 24.  
15 In one embodiment, the discharge 29 of the inlet 24 can be aligned parallel to the  
16 vessel axis A. The inlet 24 or discharge 29 can be oriented in other orientations  
17 including above the inclined axis A, or below the axis A.

18 The interface 32 is a generally obround, gas/liquid interface  
19 between the belly and freeboard portions 40,44. The obround interface 32 has a  
20 has distal end 33 adjacent the fluid outlet 26 and a proximal end 34, the location  
21 of which is intermediate the fluid outlet 26 and fluid inlet 24 and varies with liquid  
22 level and inclination angle  $\alpha$ . As a result of the desander 20 inclination, the  
23 trajectory of the fluid stream F, from inlet 24, converges with the interface 32.  
24 The trajectory for dropping sand S and liquid L into the belly portion 40 is  
25 foreshortened, reducing drop out time. The vessel 22 is long enough to space

1 the fluid inlet 24 sufficiently from the interface 32 to minimize turbulence of the  
2 liquid L in the belly portion 40, that spacing being dependent upon various design  
3 factors including vessel inclination angle  $\alpha$ , inlet fluid stream velocity and  
4 characteristics.

5 At a steady state, the maximum level of the interface 32, is  
6 controlled at the distal end 33, set by eventual liquid entrainment and discharge  
7 at the fluid outlet 26. Gas G discharges at the fluid outlet 26. At steady state,  
8 when the liquid level reaches the fluid outlet 26, any oil and other liquids are re-  
9 entrained with the gas G exiting at fluid outlet 26. Particulates S continue to be  
10 captured in the belly portion 40 until its volumetric capacity is reached.

11 Connective piping 46, between conventional wellhead and  
12 downstream equipment, is typically in rectilinear or orthogonal arrangements.  
13 Thus, the angle  $\alpha$  of the desander 20 introduces coupling or connection  
14 challenges. The connective piping 46 is generally horizontal or vertical and  
15 incorporation of the inclined desander 20 requires an adjustment made at the  
16 fluid inlet 24 and fluid outlet 26. In many scenarios, with a small inclination angle  
17  $\alpha$ , the fluid outlet 26 can be fit to the top 28 of the vessel 22 at angle  $\alpha$ , orienting  
18 the outlet 26 vertically and thereby obviating the need for an angular transition.

19 Turning to Figs. 3A and 3B, the desander 20 is shown  
20 diagrammatically split at the interface 32 for illustrating the incrementally  
21 increasing volume of the belly portion 40 below and the incrementally decreasing  
22 volume of freeboard portion 44, increasing and decreasing as referenced to the  
23 feed stream F. The freeboard portion 44 demonstrates a cross-sectional area  
24 which diminishes from the fluid inlet 24 to the fluid outlet 26. As shown in Figs. 2  
25 and 4, a freeboard velocity at the fluid inlet 24 is such that the entrained liquids L

1 and particulates S fall out of the fluid stream F and collect in the storage belly  
2 portion 40. The cross-sectional area of the freeboard portion 44, adjacent the  
3 fluid inlet 24, is at its greatest for achieving the lowest average inlet velocity for  
4 maximum drop out efficiency for particulates S and liquids L. As the freeboard  
5 cross-sectional area adjacent the fluid inlet 24 is large and relatively unimpeded  
6 by the belly portion 40, the velocity reduction upon discharge is significantly  
7 greater than that of Applicant's prior art horizontal desander. Particulate removal  
8 is accomplished while minimizing the portion of the vessel allocated to the  
9 freeboard portion 44, maximizing the efficiency of that freeboard portion for  
10 particulate drop out, and resulting in a greater allocation of the overall portion of  
11 the vessel to the belly portion 40 for storage.

12 Velocity in the freeboard portion 44 increases after a substantial  
13 portion of the particulates S have already deposited in the belly portion 40. The  
14 cross-sectional area of the belly portion 40 increases towards the fluid outlet 26  
15 and the velocity of liquids accumulating therein diminishes.

16 With reference again to Fig. 2 and to Fig. 4, in the belly portion,  
17 particulates accumulate and flow downvessel at an angle of repose. The  
18 accumulation of liquid L and particulates S establishes a downward flow in the  
19 belly portion, and as the particulates accumulate and limit the free flow of the  
20 liquid L in the belly portion 40, the liquid velocity begins to increase, drawing  
21 more particulates S downvessel.

22 With reference to Fig. 4, the inclination angle  $\alpha$  can be adjusted,  
23 shown here as an increased angle over that of Fig. 2. At increasing angles  $\alpha$  the  
24 trajectory of the feed stream impinges the interface 32 at less acute angle,

1 impinges the interface 32 sooner and enables selection of shorter vessels 22 and  
2 greater particulate removal efficiency.

3           Inclination angles  $\alpha$  can be adjusted, for a given length of vessel 22,  
4 between fluid inlet 24 and fluid outlet 26, to accommodate gas G and liquid L  
5 content in the feed fluid stream F. Inclination angles  $\alpha$  would generally be in the  
6 range of about 2 degrees to about 20 degrees. The shallowest operating angle  $\alpha$   
7 is limited by the minimum requirement for a minimum freeboard 44 cross-  
8 sectional area adjacent the inlet 24 once the interface 32 builds to about the fluid  
9 outlet 26. The steepest operating angle  $\alpha$  is limited by the requirement for a  
10 minimum storage capacity in the belly portion 40. The minimum inclination angle  
11 would be the condition where the inlet 24 is entirely in the gas phase of the  
12 freeboard portion 44 and the gas phase at the discharge is of zero height. The  
13 maximum inclination angle would be the condition where the inlet 24 is well  
14 above the gas/liquid interface allowing substantial freeboard to handle slug flow.  
15 Angles above 45 degrees limit the performance of desander considerably since  
16 the residence time of the liquid phase in the belly portion 40 is reduced.

17           With reference to Figs. 4 and 5, the fluid inlet 24, exposed to  
18 entrained particulates S in the fluid stream, is subject to greatest risk of erosion.  
19 While the inlet 24 can be integrated with the vessel 22, one can also provide an  
20 inlet 24 or discharge 29 that is replaceable for ease of maintenance. Options  
21 include accepting eventual wear and shutdown of the desander 20 for  
22 replacement of an integrated inlet 24; modifying the material or configuration of  
23 the inlet 24 to prolong service life, or using replaceable discharge of nozzle for  
24 minimizing turnaround time. As stated, one approach is to make the discharge  
25 29 replaceable including incorporating features of a replaceable nozzle as set

1    forth in Applicant's Patent CA 2,535,215 issued May 8, 2008. A replaceable  
2    nozzle 50 can be fit to a compatible coupling at the upper end 25 of the vessel  
3    22. One form of replaceable nozzle 50 comprises the discharge 29, and a  
4    threaded connection or nozzle flange 29i, for connection to a compatible  
5    threaded connection or flange 24i at the inlet 24 of the vessel 22. The orientation  
6    of the discharge is dependent on the coupling 24i,29i and arrangement of the  
7    discharge relative thereto. The replaceable nozzle 50 includes a connecting  
8    piping coupling, such as a connective flange 47i for connecting to the piping 47.

9                    To maximize service life, the nozzle 50 can incorporate a curved  
10    portion 51, such as a long radius elbow, transition between the orthogonal world  
11    of the connecting piping and the inclined axis A of the vessel 22. That curved  
12    portion 51 can be integrated with the inlet 24, nozzle 50 or located in advance  
13    thereof, such as in a transition pup joint.

14                  In operation, various sizes of desanders are employed in the prior  
15    art for differing operational conditions. Prior art desanders 10, such as that  
16    described in US 6,983,852 to Applicant, for different feed fluid streams F, might  
17    include one typical standard vessel 11 having a nominal 0.3 m (12 inch) diameter  
18    by 3.048 m (10 feet) long and another vessel 11 having 0.3 m (12 inch) diameter  
19    by 6.096 m (20 feet) long, both of which are fitted with a downcomer weir to set  
20    the freeboard portion.

21                  Herein, in the inclined desander 20, the prior art downcomer flow  
22    barrier, such as a weir, can be eliminated by providing similar 0.3 m (12 inch)  
23    diameter vessels 22 and tilting the upper end 30 of the new desander 20 at about  
24    twice the prior art weir height so as to form the interface 32 at the fluid outlet 26.  
25    To mimic the minimum operating performance of the 3.048 m (10 feet) and

1 6.096 m (20 feet) prior art desanders, a 20 foot long inclined vessel 22 would only  
2 need to be inclined about  $\frac{1}{2}$  the angle  $\alpha$  of the 10 foot long inclined vessel 22.  
3 Performance can be adjusted by varying the angle.

4 As shown in Fig. 6, an example of an inclined desander 20 can  
5 receive a fluid stream F of 50 m<sup>3</sup>/d, bearing particulates S having an average size  
6 of 150  $\mu$ m. The fluid stream F can be discharged to vessel 22, having a 0.3 m (1  
7 foot) diameter and 3.048 m (10 feet) long. A typical pressure of the fluid stream F  
8 is about 7000 kPa (1015 psia). At an inclination angle  $\alpha$  of 4.9 degrees, the  
9 freeboard volume is 0.10 m<sup>3</sup> and the belly portion is 0.486 m<sup>3</sup>. The resulting belly  
10 portion capacity is about 502 kg of sand particulates.

11 As shown in Fig. 7, another embodiment of an inclined desander 20  
12 illustrates some additional optional characteristics including a fluid inlet 24  
13 oriented horizontally, the inlet being directly connectable to orthogonal connection  
14 piping. The discharge 29 is oriented at an angle to the longitudinal axis A, in this  
15 case in a generally horizontal plane, which is angled upwardly from axis A. The  
16 initially horizontal trajectory of a substantial portion of the feed stream falls off  
17 before engaging the vessel 22. In part, the inlet 24 can be square to the  
18 connective pipe as, in this embodiment, the vessel 22 is of sufficient diameter,  
19 such as 36 inches, to permit inlet placement in the freeboard 44 while the  
20 trajectory is such that it minimizes or avoids vessel wall involvement. As shown,  
21 a horizontal spacing between the inlet 24 and inside wall of the vessel 22 is about  
22 1.5 feet.

23 Removal of accumulated particulates is conducted periodically with  
24 the vessel 22 shut in, adjacent the inlet 24 and outlet 26, and depressurized.  
25 Conveniently, access can be through a pressure-rated access closure and port at

1 the lower end 42, as the angle of repose and flow in the belly portion carries  
2 particulates thereto. A suitable closure is shown in Fig. 1 of the prior art and in  
3 Fig. 7 as adapted to the inclined desander 20. The vessel 22 is supported  
4 sufficiently high of the ground or otherwise positioned for angular access thereto,  
5 such as with scrapers and the like. A pressure vessel, hemispherical head-form  
6 of closure 60 can be pivoted from the vessel 22 and counterweighted to close  
7 flush to the inclined cylindrical end of the vessel 22. A gantry 62 assists in  
8 manipulation of the head for access to the belly portion 40.

9 Further, the illustrated vessel 22 includes an eccentric end 64 at the  
10 lower end 42, to reduce the diameter of the vessel 22 downstream of the fluid  
11 outlet 26. Advantages of reducing the vessel diameter at the lower end 42  
12 include adapting to a smaller, more easily manageable or standard form of clean  
13 out. As shown the cleanout is a pressure-rated closure 60 supported upon gantry  
14 62. In this embodiment, a 36 inch vessel, having 33 inch internal diameter, is  
15 inclined at 4 degrees. The cylindrical portion of the vessel is about 20 feet long  
16 with a 3 foot long eccentric portion, reducing the diameter from 3 to about 18  
17 inches for fitting an 18 inch clean out.

18 Conventional pressure safety valves and other gas phase related  
19 devices and instrumentation, not shown, are reliably located in the freeboard  
20 portion 44 between the fluid outlet 26 and the upper end 25.

21

1                   **THE EMBODIMENTS OF THE INVENTION FOR WHICH AN**  
2 **EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS**  
3 **FOLLOWS:**  
4

5                   1.     A desanding system for receiving a gas stream containing  
6 entrained liquid and particulates comprising:

7                   a vessel which is elongated along a longitudinal axis and that is  
8 inclined from a horizontal at a non-zero inclination angle, the vessel further  
9 having a fluid inlet adjacent an upper end of the vessel for discharging the gas  
10 stream into the vessel at an inlet velocity, the gas stream travelling down the  
11 vessel to a fluid outlet spaced along the longitudinal axis from, and lower than,  
12 the fluid inlet, the vessel having

13                  a gas/liquid interface at the fluid outlet having a belly storage  
14 portion formed therebelow and a freeboard portion formed adjacent an upper  
15 portion of the vessel above the interface, the freeboard portion having a  
16 freeboard cross-sectional area which diminishes from the fluid inlet to the fluid  
17 outlet and wherein a freeboard velocity adjacent the fluid inlet is less than the  
18 inlet velocity, and wherein

19                  the freeboard velocity being such that the entrained liquids and  
20 particulates fall out of the gas stream and collect in the belly storage portion, and

21                  wherein a desanded gas stream flows out of the freeboard portion  
22 and out the fluid outlet, being free of a substantial portion of the particulates.

23  
24                  2.     The desanding system of claim 1 wherein fluid inlet has a  
25 discharge end, the discharge end oriented for discharging the gas stream into the  
26 freeboard portion.

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3. The desanding system of claim 1 wherein discharge end of the fluid inlet directs the gas stream into the freeboard portion and parallel to the longitudinal axis.
4. The desanding system of claim 1 wherein the fluid inlet further comprises a replaceable nozzle having a discharge end oriented for discharging the gas stream into the freeboard portion.
5. The desanding system of claim 1 wherein the replaceable nozzle is connected to the fluid inlet at a flange.
6. The desanding system of claim 1 wherein the gas stream emanates from a wellhead and the fluid inlet further comprises:
- a discharge end for directing the gas stream into the freeboard portion and parallel to the longitudinal axis;
  - a receiving end for receiving the gas stream and orthogonal to the wellhead.
7. The desanding system of claim 1 further comprising:
- a conduit for conducting a fluid stream containing entrained particulates from a wellhead, the conduit having a desander end; and
  - wherein the fluid inlet further comprises a discharge end for directing the fluid stream into the freeboard portion and oriented parallel to the longitudinal axis, and a receiving end for receiving the gas stream and oriented

1 orthogonal to the desander end.

2

3 8. The desanding system of claim 1 wherein the inclination  
4 angle is variable for varying fluid stream conditions.

5

6 9. A method for desanding a fluid stream emanating from a  
7 wellhead, the fluid stream containing gas, entrained liquid and particulates, the  
8 method comprising:

9 providing an elongated vessel having a longitudinal axis, a fluid inlet  
10 adjacent an first end of the vessel and a fluid outlet spaced along the longitudinal  
11 axis from the fluid inlet

12 inclining the vessel at angle from horizontal at a non-zero inclination  
13 angle so that the fluid outlet is lower than the fluid inlet for forming a freeboard  
14 above the fluid outlet;

15 discharging the fluid stream from the fluid inlet, into the vessel and  
16 substantially parallel to the longitudinal axis for

17 establishing a liquid interface in a belly portion of the vessel,  
18 the belly portion and being formed below the fluid outlet, and

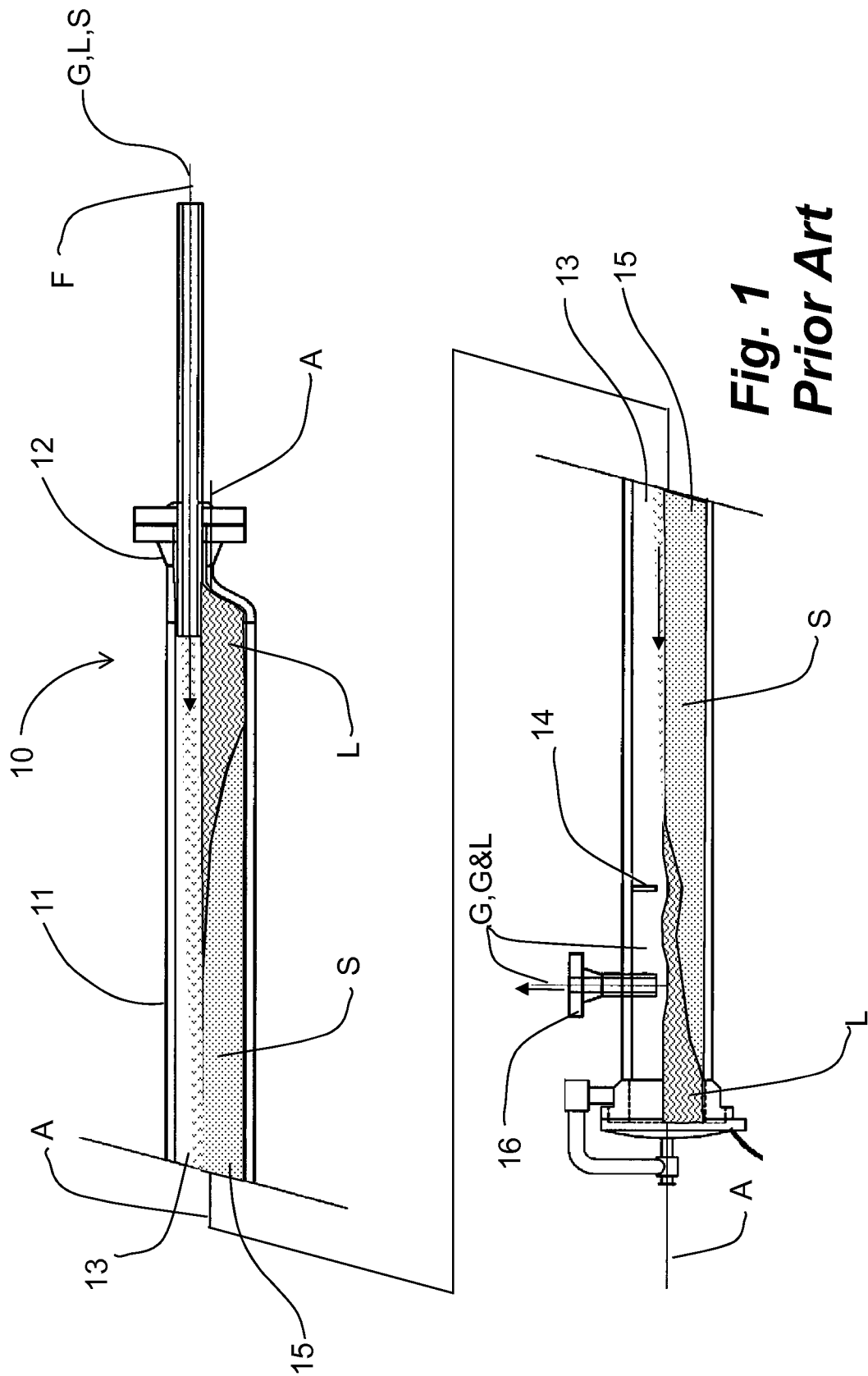
19 directing the liquid and particulates along a trajectory in the  
20 freeboard portion of the vessel to intercept a substantial portion of the  
21 particulates at the liquid interface for storage in the belly portion; and

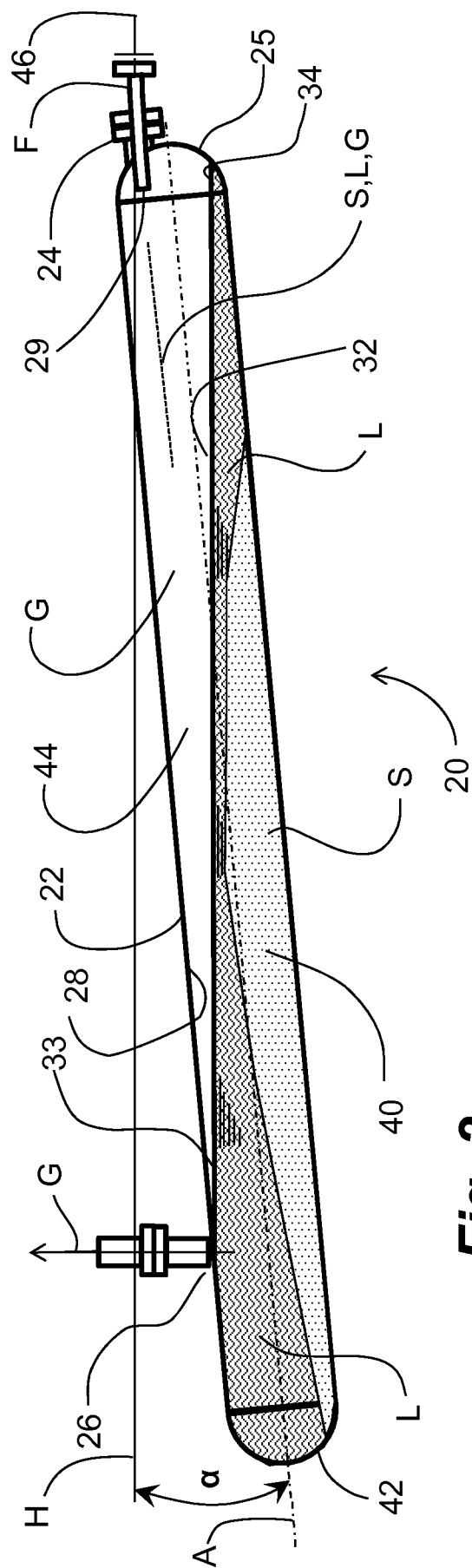
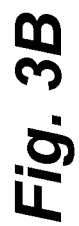
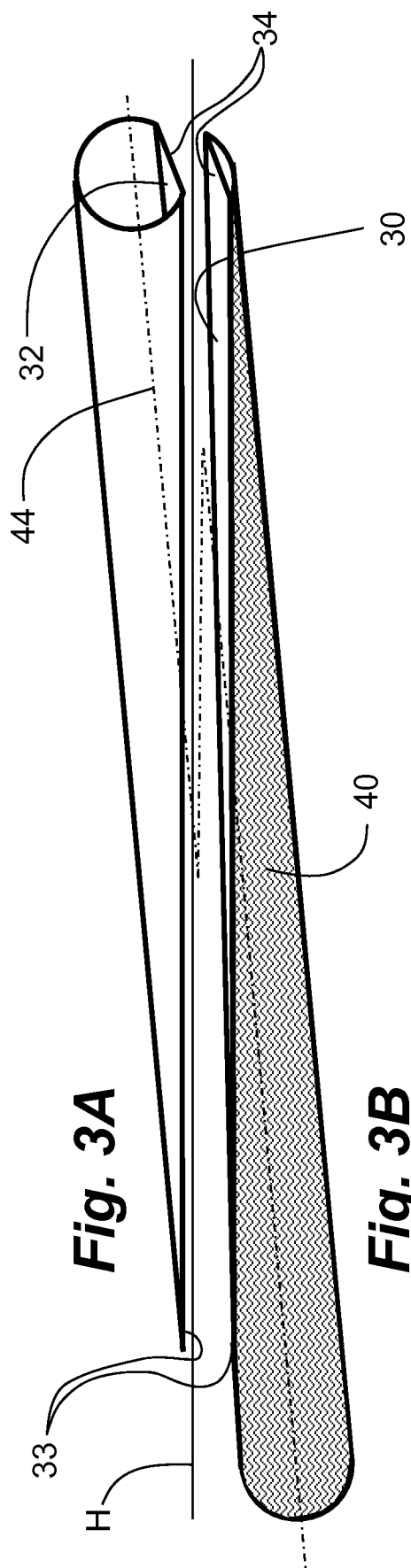
22 recovering a desanded gas stream at the fluid outlet which is  
23 substantially free of particulates.

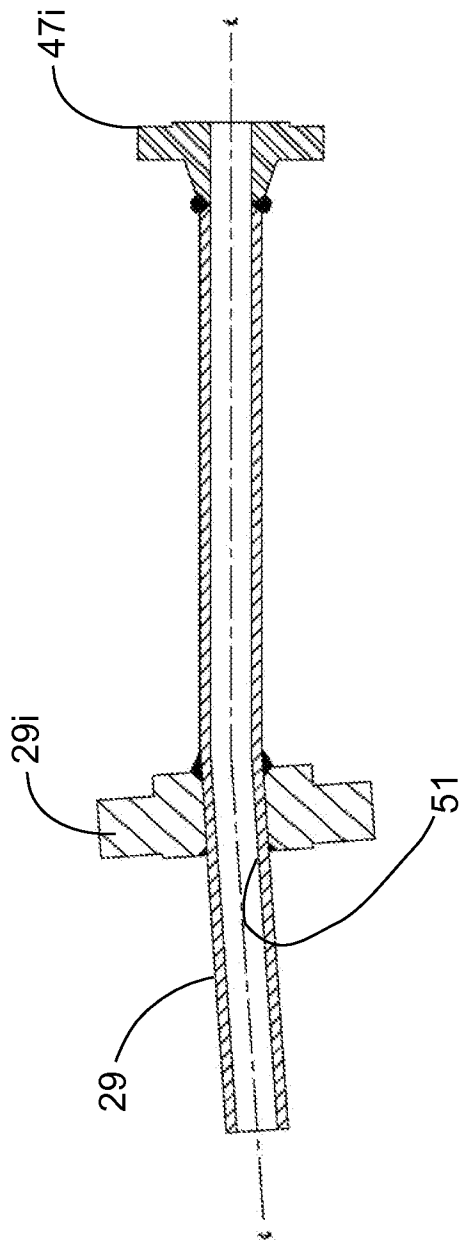
24

## **ABSTRACT**

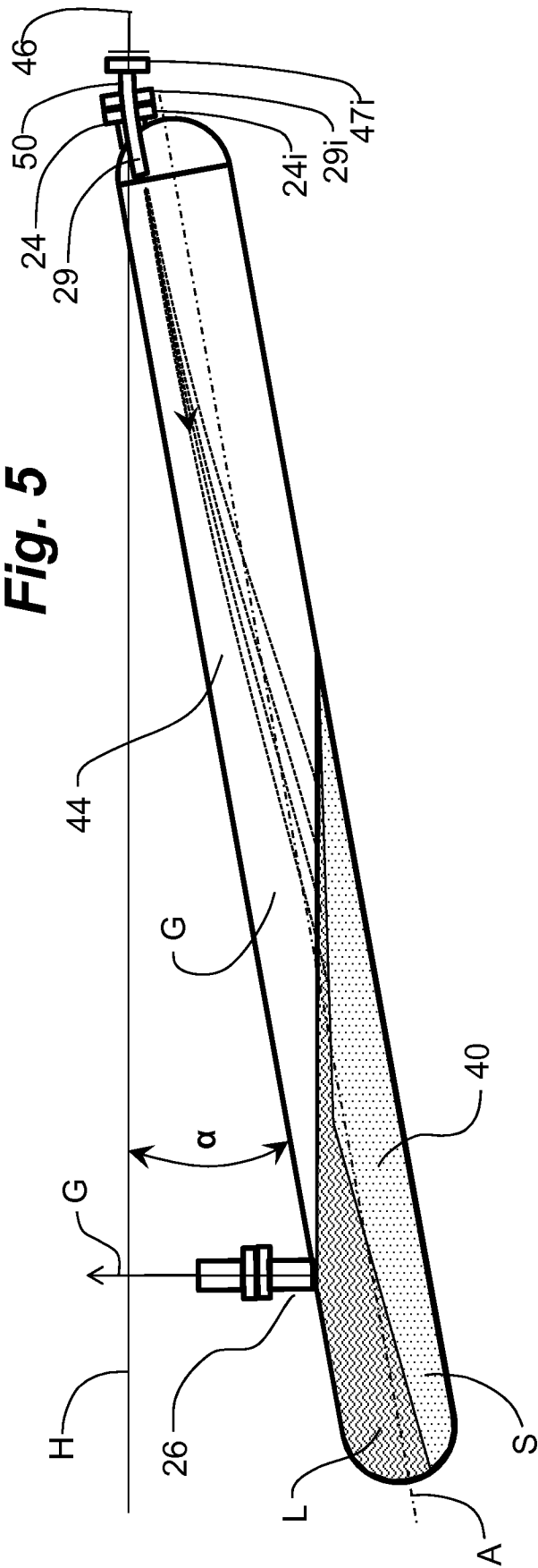
1  
2           A desanding system has an elongated vessel that is tilted at a non-  
3 zero inclination angle. A fluid inlet at the vessel's upper end discharges a gas  
4 stream having entrained liquids and particulates and a fluid outlet into a freeboard  
5 portion formed adjacent an upper portion of the vessel above a gas/liquid  
6 interface formed below the fluid outlet. A belly storage portion is formed below  
7 the interface. The freeboard portion of the vessel has a freeboard cross-sectional  
8 area that diminishes along the interface from the fluid inlet to a fluid outlet spaced  
9 away from and lower than the fluid inlet. The cross-sectional are of the freeboard  
10 portion causes precipitation of the entrained liquids and particulates therefrom  
11 and collect in the belly portion of the vessel. A desanded gas stream, being free  
12 of a substantial portion of the particulates is removed from the vessel through the  
13 fluid outlet.



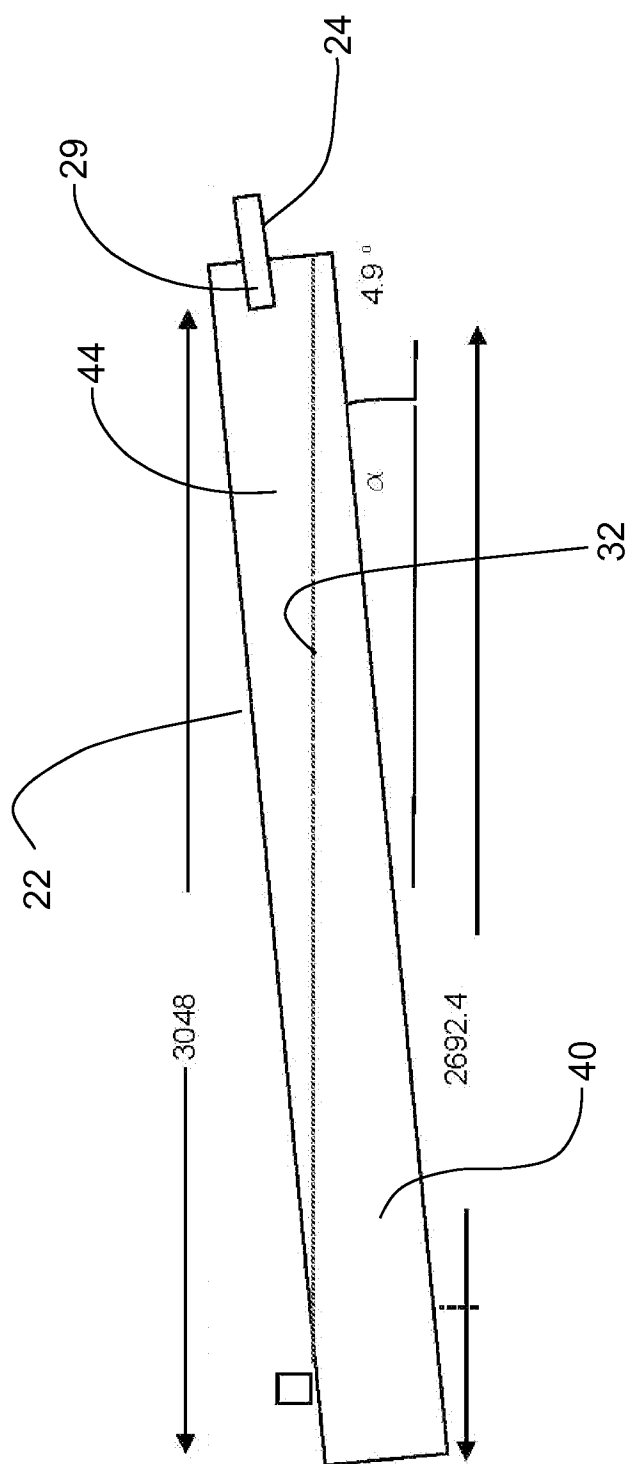




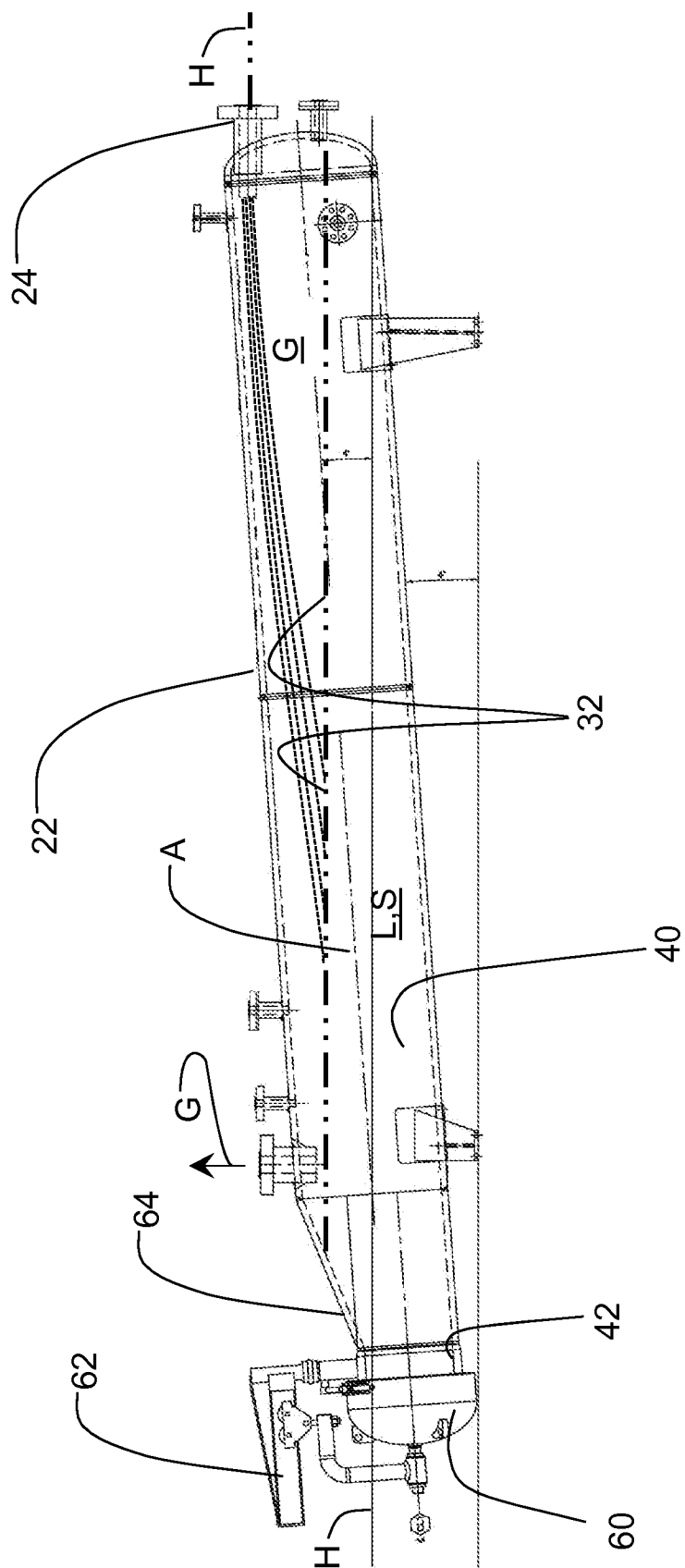
**Fig. 5**



**Fig. 4**



**Fig. 6**



**Fig. 7**

## Electronic Patent Application Fee Transmittal

<b>Application Number:</b>				
<b>Filing Date:</b>				
<b>Title of Invention:</b>	DESANDING APPARATUS AND SYSTEM			
<b>First Named Inventor/Applicant Name:</b>	Christopher A HEMSTOCK			
<b>Filer:</b>	Sean Goodwin/Seong-Cheol Son			
<b>Attorney Docket Number:</b>	2200-011 US			
Filed as Small Entity				
<b>Utility under 35 USC 111(a) Filing Fees</b>				
<b>Description</b>	<b>Fee Code</b>	<b>Quantity</b>	<b>Amount</b>	<b>Sub-Total in USD(\$)</b>
<b>Basic Filing:</b>				
Utility filing Fee (Electronic filing)	4011	1	95	95
Utility Search Fee	2111	1	310	310
Utility Examination Fee	2311	1	125	125
<b>Pages:</b>				
<b>Claims:</b>				
<b>Miscellaneous-Filing:</b>				
<b>Petition:</b>				
<b>Patent-Appeals-and-Interference:</b>				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				530

## Electronic Acknowledgement Receipt

<b>EFS ID:</b>	12065910
<b>Application Number:</b>	13372291
<b>International Application Number:</b>	
<b>Confirmation Number:</b>	1699
<b>Title of Invention:</b>	DESANDING APPARATUS AND SYSTEM
<b>First Named Inventor/Applicant Name:</b>	Christopher A HEMSTOCK
<b>Customer Number:</b>	27522
<b>Filer:</b>	Sean Goodwin/Seong-Cheol Son
<b>Filer Authorized By:</b>	Sean Goodwin
<b>Attorney Docket Number:</b>	2200-011 US
<b>Receipt Date:</b>	13-FEB-2012
<b>Filing Date:</b>	
<b>Time Stamp:</b>	18:39:43
<b>Application Type:</b>	Utility under 35 USC 111(a)

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Deposit Account	504818
Authorized User	GOODWIN,SEAN W.

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

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Charge any Additional Fees required under 37 C.F.R. Section 1.19 (Document supply fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.20 (Post Issuance fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.21 (Miscellaneous fees and charges)

## File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		PatentAppln.pdf	118231	yes	19
			c6b654388aa5db4adc1d3236afb19e59b540de13		
	Multipart Description/PDF files in .zip description				
	Document Description		Start	End	
	Specification		1	15	
	Claims		16	18	
	Abstract		19	19	
Warnings:					
Information:					
2	Drawings-only black and white line drawings	Figs1to7.pdf	424315	no	5
			8ddff53736e6afbcb05d2cd9275a718f63db352ce		
Warnings:					
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3	Fee Worksheet (SB06)	fee-info.pdf	32821	no	2
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Warnings:					
Information:					
Total Files Size (in bytes):			575367		

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**New Applications Under 35 U.S.C. 111**

**If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.**

**National Stage of an International Application under 35 U.S.C. 371**

**If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.**

**New International Application Filed with the USPTO as a Receiving Office**

**If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.**

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

<b>Application Data Sheet 37 CFR 1.76</b>		Attorney Docket Number	2200-011 US
		Application Number	
Title of Invention	DESANDING APPARATUS AND SYSTEM		
<p>The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76. This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.</p>			

## Secrecy Order 37 CFR 5.2

- ☐ Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)

## Applicant Information:

Applicant 1					<a href="#">Remove</a>
Applicant Authority <input checked="" type="radio"/> Inventor		<input type="radio"/> Legal Representative under 35 U.S.C. 117		<input type="radio"/> Party of Interest under 35 U.S.C. 118	
Prefix	Given Name	Middle Name	Family Name	Suffix	
	Christopher	A	HEMSTOCK		
Residence Information (Select One) <input type="radio"/> US Residency <input checked="" type="radio"/> Non US Residency <input type="radio"/> Active US Military Service					
City	Calgary	Country Of Residence <sup>i</sup>	CA		
Citizenship under 37 CFR 1.41(b) <sup>i</sup>		CA			
Mailing Address of Applicant:					
Address 1		434 Deercross Road S.E.			
Address 2					
City	Calgary	State/Province	AB		
Postal Code	T2J 6B9	Country <sup>i</sup>	CA		
All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the <b>Add</b> button.					

## Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below. For further information see 37 CFR 1.33(a).			
<input type="checkbox"/> An Address is being provided for the correspondence Information of this application.			
Customer Number	27522		
Email Address	sean@patentfile.com	<a href="#">Add Email</a>	<a href="#">Remove Email</a>

## Application Information:

Title of the Invention	DESANDING APPARATUS AND SYSTEM		
Attorney Docket Number	2200-011 US	Small Entity Status Claimed	<input checked="" type="checkbox"/>
Application Type	Nonprovisional		
Subject Matter	Utility		
Suggested Class (if any)		Sub Class (if any)	
Suggested Technology Center (if any)			
Total Number of Drawing Sheets (if any)	5	Suggested Figure for Publication (if any)	2

<b>Application Data Sheet 37 CFR 1.76</b>		Attorney Docket Number	2200-011 US
		Application Number	
Title of Invention	DESANDING APPARATUS AND SYSTEM		

**Publication Information:**

<input type="checkbox"/>	Request Early Publication (Fee required at time of Request 37 CFR 1.219)
<input type="checkbox"/>	<b>Request Not to Publish.</b> I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application <b>has not and will not</b> be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

**Representative Information:**

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32). Enter either Customer Number or complete the Representative Name section below. If both sections are completed the Customer Number will be used for the Representative Information during processing.			
Please Select One:	<input checked="" type="radio"/> Customer Number	<input type="radio"/> US Patent Practitioner	<input type="radio"/> Limited Recognition (37 CFR 11.9)
Customer Number	27522		

**Domestic Benefit/National Stage Information:**

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, or 365(c) or indicate National Stage entry from a PCT application. Providing this information in the application data sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78(a)(2) or CFR 1.78(a)(4), and need not otherwise be made part of the specification.			
Prior Application Status		<a href="#">Remove</a>	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the <b>Add</b> button.			<a href="#">Add</a>

**Foreign Priority Information:**

This section allows for the applicant to claim benefit of foreign priority and to identify any prior foreign application for which priority is not claimed. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55(a).			
			<a href="#">Remove</a>
Application Number	Country i	Parent Filing Date (YYYY-MM-DD)	Priority Claimed
			<input type="radio"/> Yes <input checked="" type="radio"/> No
Additional Foreign Priority Data may be generated within this form by selecting the <b>Add</b> button.			<a href="#">Add</a>

**Assignee Information:**

Providing this information in the application data sheet does not substitute for compliance with any requirement of part 3 of Title 37 of the CFR to have an assignment recorded in the Office.	
Assignee 1	<a href="#">Remove</a>

<b>Application Data Sheet 37 CFR 1.76</b>		Attorney Docket Number	2200-011 US
		Application Number	
Title of Invention	DESANDING APPARATUS AND SYSTEM		

If the Assignee is an Organization check here. <input checked="" type="checkbox"/>			
Organization Name	SPECIALIZED TECH INC.		
<b>Mailing Address Information:</b>			
Address 1	#106, 10615 - 48th Street S.E.		
Address 2			
City	Calgary	State/Province	AB
Country i	CA	Postal Code	T2C 2B7
Phone Number		Fax Number	
Email Address			
Additional Assignee Data may be generated within this form by selecting the <b>Add</b> button.			<input type="button" value="Add"/>

**Signature:**

A signature of the applicant or representative is required in accordance with 37 CFR 1.33 and 10.18. Please see 37 CFR 1.4(d) for the form of the signature.					
Signature	/seanwgoodwin/			Date (YYYY-MM-DD)	2012-02-13
First Name	Sean	Last Name	Goodwin	Registration Number	39568

This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

## Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

## Electronic Acknowledgement Receipt

<b>EFS ID:</b>	12066161
<b>Application Number:</b>	13372291
<b>International Application Number:</b>	
<b>Confirmation Number:</b>	1699
<b>Title of Invention:</b>	DESANDING APPARATUS AND SYSTEM
<b>First Named Inventor/Applicant Name:</b>	Christopher A HEMSTOCK
<b>Customer Number:</b>	27522
<b>Filer:</b>	Sean Goodwin
<b>Filer Authorized By:</b>	
<b>Attorney Docket Number:</b>	2200-011 US
<b>Receipt Date:</b>	13-FEB-2012
<b>Filing Date:</b>	
<b>Time Stamp:</b>	19:01:56
<b>Application Type:</b>	Utility under 35 USC 111(a)

### Payment information:

Submitted with Payment	no
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### File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Application Data Sheet	sb0014.pdf	895308 394cd161324fa92cd5ac39e436050ec035743b29	no	4

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