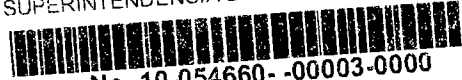


Señores
DIVISIÓN DE NUEVAS CREACIONES
SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO
Bogotá, D.C.

SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO



No. 10-054660-00003-0000

Fecha: 2010-08-03 14:38:08 Dep. 2020 DIR.NUEVASCR
Tra. 2 PATENTES Eve: 1 REGDEPOSITO
Act. 444 RESPUESTAREQUE Folios: 182

Re.: Código 02-01-4
Expediente No.
Fase nacional de Solicitud
de Patente PCT
SCHLUMBERGER TECHNOLOGY
B.V.

En relación con el expediente de la referencia y dando cumplimiento a la última providencia recaída sobre este asunto por medio del presente escrito me permito manifestarles lo siguiente:

1. Siguiendo precisas instrucciones de mi representada modifíco el título de esta solicitud como sigue:

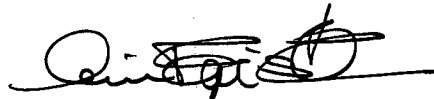
**UNA HERRAMIENTA SACANÚCLEOS DE LA PARED LATERAL DE UN POZO
QUE COMPRENDE UN TUBO SELLADO DE CAPTACIÓN DE NÚCLEOS**

2. Acompaño los documentos que acreditan la cesión de los inventores Lennox E. REID, Jr. - Carsten SONNE a la sociedad solicitante, debidamente legalizados y oficialmente traducidos.
3. Adjunto las copias certificadas de las solicitudes de patente estadounidenses Nos. 61/176,574 - 61/187,126 - 12/773,105, legalizadas por Apostilla.
4. Adjunto el comprobante de pago por concepto de reivindicaciones adicionales en exceso a las 10 primeras por valor de \$ 130.000.00, recibo No. 62,866
5. Igualmente acompaño, debidamente corregidos, la carátula, el formulario petitorio y el extracto.



Renuncio al término faltante de traslado, y les solicito ordenar la publicación en la Gaceta de la Propiedad Industrial.

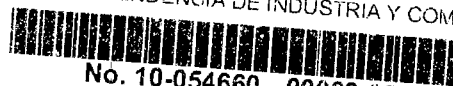
De Ustedes Atentamente,



LUIS FELIPE CASTILLO GIBSONÉ
T.P. No. 68.995 del C.S.J.

SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO

SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO



No. 10-054660-00003-0000

Fecha: 2010-08-03 14:38:08 Dep. 2020 DIR.NUEVASCR
Tra. 2 PATENTES Eve: 1 REGDEPOSITO
Act. 444 RESPUESTAREQUE Folios: 182

NIT : 800176089-2

CERTIFICACION DE EXCEDENTE : 10 - 62,866
FECHA : AGOSTO 3 DE 2010

***** CONSIGNACION *****

DEPOSITANTE	TIPO PAGO	BANCO	CUENTA	No. PAGO	FECHA PGO	Vr. PAGO
CASTILLO GRAU Y ASOCIADOS	CONSIGNACION	BANCO DE BOGOTA	062754327	378933715	03/08/2010	130,000.00

***** CONCEPTO *****

CANT.	RENTISTICO	CONCEPTO	TOTAL CONCEPTO
1	50005-01-09	OTROS SERVICIOS DE PROPIEDAD I	
		99 OTROS SERVICIOS ADMINISTRATIVOS	130,000.00
		TOTAL :	\$ 130,000.00

SON: CIENTO TREINTA MIL PESOS

RESPONSABLE :

RECIBO DE CAJA APLICADO AL EXPEDIENTE No. _____

ESTA CERTIFICACION DE EXCEDENTE DE PAGO SOLO PODRA SER UTILIZADA
COMO PARTE DE LA CANCELACION DE UNA TARIFA VIGENTE Y NO PODRA SER
SUSTITUIDA POR NINGUN RECIBO.

APOSTILLE

(Convention de La Haye du 5 octobre 1961)

4

1. Country: United States of America

This public document

2. has been signed by M. Tarver

3. acting in the capacity of Certifying Officer

4. bears the seal/stamp of Patent and Trademark Office

Certified

5. at Washington, D.C.

6. the sixth of July, 2010

7. by Assistant Authentication Officer, United States Department of State

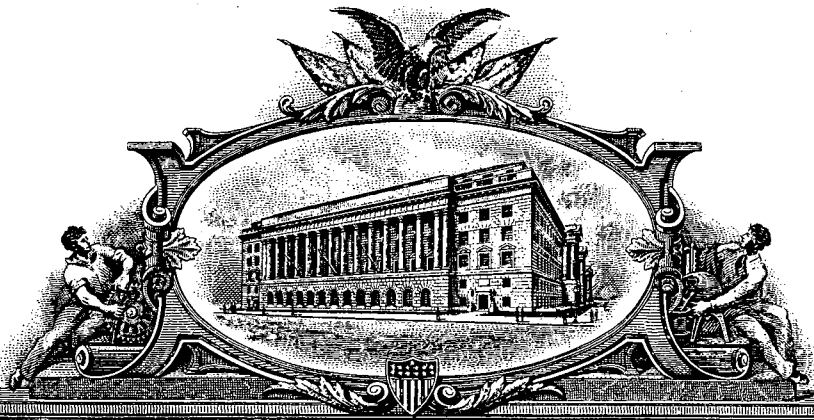
8. No. 0033298-11

9. Seal/Stamp:

10. Signature:

Sonya N. Johnson

A 7243059



THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

**UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office**

June 07, 2010

**THIS IS TO CERTIFY THAT ANNEXED IS A TRUE COPY FROM THE
RECORDS OF THIS OFFICE OF A DOCUMENT RECORDED ON
MAY 28, 2010.**

**By Authority of the
Under Secretary of Commerce for Intellectual Property
and Director of the United States Patent and Trademark Office**



**M. TARVER
Certifying Officer**

PATENT ASSIGNMENT

Electronic Version v1.1
 Stylesheet Version v1.1

SUBMISSION TYPE:	NEW ASSIGNMENT
NATURE OF CONVEYANCE:	ASSIGNMENT
CONVEYING PARTY DATA	
Name	Execution Date
Lennox E. Reid Jr.	05/10/2010
Carsten Sonne	05/25/2010
RECEIVING PARTY DATA	
Name:	Schlumberger Technology Corporation
Street Address:	200 Gillingham Lane
Internal Address:	MD200-2
City:	Sugar Land
State/Country:	TEXAS
Postal Code:	77478
PROPERTY NUMBERS Total: 1	
Property Type	Number
Application Number:	61176574
CORRESPONDENCE DATA	
Fax Number:	(281)285-8821
<i>Correspondence will be sent via US Mail when the fax attempt is unsuccessful.</i>	
Phone:	2812858500
Email:	kmorris2@slb.com
Correspondent Name:	Schlumberger Technology Corporation
Address Line 1:	200 Gillingham Lane
Address Line 2:	MD200-2
Address Line 4:	Sugar Land, TEXAS 77478
ATTORNEY DOCKET NUMBER:	20.3215PROV
NAME OF SUBMITTER:	Dave R. Hofman
Total Attachments: 5 source=203215prov_Assign#page1.tif	

CH \$40.00 61176574

501190303

PATENT
REEL: 024457 FRAME: 0307

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source=203215prov_Assign#page3.tif
source=203215prov_Assign#page4.tif
source=203215prov_Assign#page5.tif

7

PATENT
REEL: 024457 FRAME: 0308

ASSIGNMENT

WHEREAS, the undersigned inventors hereinafter referred to as the "Inventors" each said Inventor's address being listed below

Lennox E. Reld, Jr., citizen of the USA, whose post office address is 14915 LITTLE LEAF COURT,
HOUSTON, TEXAS 77082 USA; and

Carsten Sonne, citizen of Denmark, whose post office address is 616 Memorial Height Drive, #11220,
Houston, Texas 77007 USA

Has/have invented certain new and useful improvements in

SEALED CORE

as described and set forth in an application for Letters Patent of the United States of America, filed May 8, 2009 (20.3215)

WHEREAS each of the undersigned persons warrants that no person other than these undersigned persons are inventors of the above-described invention;

AND WHEREAS, the "COMPANIES", listed in Schedule A, are desirous of acquiring or confirming their acquisition of the entire right, title and interest in and to said invention, inventions or improvements, and in and to said application, and in and to any and all patents, both of the United States and of all foreign countries, that may be obtained therefore as outlined in Schedule A;

NOW, THEREFORE, TO ALL WHOM IT MAY CONCERN, BE IT KNOWN, that the undersigned Inventors, for good and valuable considerations, the receipt and sufficiency of which hereby acknowledge, have sold, assigned, transferred and conveyed, and by this assignment do sell, assign, transfer and convey, unto said COMPANIES, their successors and assigns, the entire right, title and interest throughout the world, in and to the above-described invention, inventions or improvements described or set forth in said application, in any form or embodiment thereof, and in and to said application, and in and to any applications filed in any foreign country based thereon, including the right to file foreign applications under the provisions of any convention or treaty; and in and to any confirmation, divisional, continuation, continuation-in-part, or substitute application which may be filed on said invention, inventions or improvements in the United States or in any foreign country; and in and to any and all patents, certificates, utility models, reissues, extensions, additions or confirmations thereof which may be granted in the United States or in any foreign country upon said invention, inventions or improvements,

TO HAVE AND TO HOLD the same to the full end of the term or terms for which any and all such United States and foreign patents and grants may be issued on said invention, inventions or improvements.

AND said Inventors do hereby authorize and request the issuing authority to issue any and all of said United States and foreign patents on said application or applications to said COMPANIES, their successors and assigns, as the assignee of the entire right, title and interest in and to the same, for the sole use and benefit of said COMPANIES, their successors and assigns.

AND said Inventors do hereby covenant and warrant that said Inventors have full right to convey the entire right, title and interest herein assigned free and clear of all licenses, encumbrances and liens whatsoever, and that no said Inventors has executed and will execute any instruments in conflict herewith.

AND said Inventors, for the conditions aforesaid, do hereby covenant and agree to and with the said COMPANIES, their successors and assigns, that each Inventor, his or her executors, administrators, or other personal representatives, shall and will do all lawful acts and things, make all rightful oaths, and make, execute

and deliver any and all other instruments in writing, and any and all further applications, papers, powers, affidavits, assignments, disclaimers and other documents, which in the opinion of counsel for said COMPANIES, their successors and assigns, may be required or necessary in this or in any foreign country more effectually to secure to and vest in said COMPANIES, their successors and assigns, the entire right, title and interest in and to said invention, inventions or improvements, application or applications, patents, rights, titles, benefits, privileges, and advantages hereby sold, assigned, confirmed, transferred and conveyed.

ASSIGNMENT

SCHEDULE A
"COMPANIES"

SCHLUMBERGER CANADA LIMITED

Corporation of: Canada

Located at: 525-3rd Avenue S.W., Calgary, Alberta, CA T2P 0G4

Assignee for applications in: Canada

SCHLUMBERGER TECHNOLOGY CORPORATION

Corporation of: USA

Located at: 300 Schlumberger Drive, Sugar Land, TX 77478 US

Assignee for applications in: USA

SERVICES PETROLIERS SCHLUMBERGER

Corporation of: France

Located at: 42 rue Saint Dominique, 75007 Paris, FR

Assignee for applications in: France

SCHLUMBERGER HOLDINGS LIMITED

Corporation of: British Virgin Islands

Located at: PO Box 71, Craigmuir Chambers, Road Town, Tortola, BVI

Assignee for applications in: Japan, The Netherlands, Saudi Arabia, United Kingdom

SCHLUMBERGER TECHNOLOGY B.V.

Corporation of: the Netherlands

Located at: Parkstraat 83-89, 2514 JG The Hague, The Netherlands

Assignee for applications in: Albania, Argentina, Australia, Azarbaijan, Brunei, Bulgaria, Colombia, Czech Republic, Denmark, Faroe Islands, Germany, Greece, Hungary, Indonesia, Ireland, Israel, Italy, Kazakhstan, Korea, Kuwait, Lithuania, Malaysia, Mexico, New Zealand, Norway, Oman, Pakistan, Poland, Qatar, Romania, Russia, Slovakia, Slovenia, South Africa, Thailand, Trinidad, Tunisia, Turkey, Turkmenistan, Ukraine, Uzbekistan, Venezuela

PRAD RESEARCH AND DEVELOPMENT LIMITED

Corporation of: British Virgin Islands

Located at: PO Box 71, Craigmuir Chambers, Road Town, Tortola, BVI

Assignee for applications in: the GCC Patent Office and Countries not Otherwise Listed

IN WITNESS WHEREOF, I, **Lennox E. Reid, Jr.**, have hereunto set my hand and seal this 10 day of May, 2010.

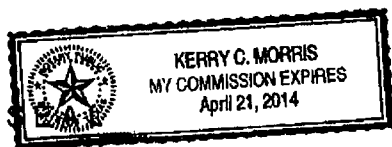
(signature of Inventor)

(L. S.)

State of _Texas)

County of Fort Bend

BEFORE ME this 10 day of May, 2010, personally appeared **Lennox E. Reid, Jr.**, to me known to be the person who is described in and who executed the foregoing assignment instrument and acknowledged to me that he executed the same of his own free will for the purpose therein expressed.



Kerry C. Morris
Notary Public

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IN WITNESS WHEREOF, I, Carsten Sonne, have hereunto set my hand and seal this 25 day of May, 2010.

[Signature]
(signature of inventor)

WITNESSED:

BE IT KNOWN that Carsten Sonne is to me known to be the individual described in the foregoing assignment, that on this 25 day of MAY, 2010, I was personally present and did see him sign and execute the foregoing assignment; and, that he did acknowledge to me that he executed the same as his free act and deed for the uses and purposes therein set forth.

Ali Beyers
Witness

[Signature]
10-2-3, AKTAN
KAZAKHSTAN

Inke Himmelbach
Witness

[Signature]
Vierhaumer Heide 9
47495 Rheinberg
Germany

13

TRADUCCIÓN OFICIAL NO. 11.782 DE UN DOCUMENTO ESCRITO EN INGLES, hecha por Maria Mercedes Uricoechea, traductora/intérprete oficial según Res. 10607 del 31 de diciembre de 1981, expedida por el Ministerio de Justicia. Bogotá, 26 de julio de 2010.

Documento de CESIÓN de **(INVENTORES) A SCHLUMBERGER TECHNOLOGY CORPORATION.** Legalizaciones subsiguientes.

CESION

Los suscritos inventores referidos en adelante como los "Inventores" cada uno con las respectivas direcciones que se indican abajo:

Lennox E. Reid, Jr. de nacionalidad estadounidense, cuya dirección postal es: 14915 LITTLE LEAF COURT, HOUSTON, TEXAS 77082, EE.UU.,

Carsten Sonne, de nacionalidad danesa, cuya dirección postal es: 616 Memorial Height Drive, #11220, Houston, Texas 77007 EE.UU.

hemos inventado ciertas mejoras nuevas y útiles en

NÚCLEO SELLADO HERMÉTICAMENTE

[SEALED CORE]

según se describe en una solicitud de Certificación de Patentes de los Estados Unidos de América, radicada el 8 de mayo de 2009 (20.3215);

POR CUANTO cada una de las personas suscritas declara y garantiza que ninguna otra persona aparte de los suscritos son los inventores de la invención arriba descrita;

Y POR CUANTO, las "COMPAÑÍAS" que figuran en la lista del Anexo A desean adquirir o confirmar su adquisición del total derecho, título e interés en dicha invención, invenciones o mejoras, y en dicha solicitud, y en todas las patentes, tanto de los Estados unidos como de todos los países en el exterior, que puedan obtenerse para ellas según figuran en el Anexo A;

María Mercedes Uricoechea T.
Traductora Juramentada
Resolución 10607/81 Minjusticia

14

POR CONSIGUIENTE, HÁGASE SABER A TODOS A QUIENES LLEGUE EL PRESENTE, que los suscritos Inventores, por pago bueno y oneroso, cuyo recibo y suficiencia se acusa aquí, hemos vendido, cedido, transferido y traspasado, y mediante este cesión, vendemos cedemos, transferimos y traspasamos a dichas COMPAÑÍAS, a sus sucesores y cesionarios, todo el derecho, título e interés en todo el mundo, en la Invención, invenciones o mejoras que se describen en dicha solicitud, en cualquier realización de las mismas, y en dicha solicitud y en todas y cualesquiera solicitudes que se radiquen en cualquier país, incluido el derecho de presentar solicitudes extranjeras bajo las disposiciones de cualquier convención o tratado; y en cualquier confirmación, división, continuación, continuación en parte o solicitud sustituta que se pueda presentar sobre esa Invención en Colombia; y en todas las patentes, certificados, modelos de utilidad, re-expediciones, prórrogas, adiciones o confirmaciones de lo mismo que se puedan otorgar en los Estados Unidos o en cualquier otro país sobre dicha Invención, invenciones o mejoras.

PARA QUE TENGAN Y MANTENGAN las mismas hasta el término de la vigencia o vigencias para las que dichas patentes y adjudicaciones en los Estados Unidos se puedan expedir sobre dicha invención, invenciones o mejoras.

Y por la presente, dichos inventores autorizamos y solicitamos a la autoridad expedidora expedir todas dichas patentes estadounidenses y extranjeras sobre dicha solicitud o solicitudes a dichas COMPAÑÍAS, a sus sucesores y cesionarios, como las cesionarias de todo el derecho, título e interés en las mismas, para único uso y provecho de dichas COMPAÑÍAS, sus sucesores y cesionarios.

Y dichos Inventores por el presente, convenimos y declaramos que tenemos el pleno derecho para traspasar todo el derecho, título e interés que se cede en este traspaso, libre y neto de toda licencia, gravamen y prenda, y que ninguno de dichos inventores ha firmado ningún instrumento que entre en conflicto con el presente.

Y por las condiciones arriba mencionadas, por la presente, dichos Inventores convenimos y acordamos con dichas COMPAÑÍAS, sus sucesores y cesionarios

 **María Mercedes Uricoechea T.**
Traductora Juramentada
Resolución 10607/81 Minjusticia

que cada uno de nosotros, nuestros administradores u otros representantes personales, haremos todos los actos y cosas, haremos los juramentos requeridos y haremos, firmaremos y entregaremos cualquier otro instrumento escrito, y cualquier otra solicitud, documento, poder, declaración, cesión, renuncia y demás documentos que, a juicio de los abogados de dichas COMPAÑÍAS, sus sucesores y cesionarios, puedan requerirse o sean necesarios en Colombia para garantizar e invertir con mayor validez en dichas COMPAÑÍAS, sus sucesores y cesionarios, todo el derecho, título e interés en la Invención y en cualquier solicitud o solicitudes relacionadas, patentes, derechos, títulos beneficios, privilegios y ventajas que por el presente se venden, ceden, confirman transfieren o traspasan.

En TESTIMONIO DE LO CUAL, Yo, **Lennox E. Reid, Jr.**, firmo hoy 10 de mayo de 2010.

(Firma) **Lennox E. Reid, Jr.**

RECONOCIMIENTO NOTARIAL

Estado de Texas

Condado de FORT BEND

ANTE MI, hoy 10 de MAYO de 2010 compareció personalmente **Lennox E. Reid, Jr.**, quien sé que es la persona descrita y quien firmó el anterior documento de cesión y reconoció ante mí que firmó el mismo de su propia voluntad para los fines que se expresan allí.

(FIRMA Y SELLO SECO) Kerry C. Morris. Notario Público Mi comisión vence el 21 de abril de 2014.

En TESTIMONIO DE LO CUAL, Yo, **Carsten Sonne**, firmo hoy 25 de mayo de 2010.

(Firma) **Carsten Sonne**

TESTIMONIO:

HÁGASE SABER que **Carsten Sonne** quien sé que es la persona que se describe en la cesión anterior, que hoy 25 de mayo de 2010 presencié y lo

 **María Mercedes Uricoechea T.**
Traductora Juramentada
Resolución 10607/81 Minjusticia

vi firmar la anterior cesión y que reconoció ante mí haber firmado la misma como su acto libre y voluntario para los propósitos que allí se indican.

(Firma Testigo)

llegible

(Firma Testigo)

llegible

 **María Mercedes Uricoechea T.**
Traductora Juramentada
Resolución 10607/81 Minjusticia

ANEXO A

"COMPAÑÍAS

SCHLUMBERGER CANADA LIMITED

Compañía de Canadá

Situada en: 525-3rd Avenue S.W. Calgary, Alberta, CA T2P 0G4

Cesionaria de solicitudes en: Canadá.

SCHLUMBERGER TECHNOLOGY CORPORATION

Compañía de Estados Unidos

Situada en: 110 Schlumberger Drive, Sugar Land, TX 77478 US

Cesionaria de solicitudes en: Estados Unidos

SERVICES PETROLIERS SCHLUMBERGER

Compañía de Francia

Situada en: 42 rue Saint Dominique, 75007, Paris, FR.

Cesionaria de solicitudes en: Francia.

SCHLUMBERGER HOLDINGS LIMITED

Compañía de Holanda

Situada en: PO Box 71, Craigmuir Chambers, Road Town, Tortola, BVI

Cesionaria de solicitudes en: Japón, Holanda, Saudi Arabia, Reino Unido

SCHLUMBERGER TECHNOLOGY B.V.

Compañía de Holanda

Situada en: Parkstraat 83-89, 2514 JG La Haya, Holanda

Cesionaria de solicitudes en: Albania, Argentina, Australia, Azarbaijan, Brunei, Bulgaria, Colombia, República Checa, Dinamarca, Islas Faroe, Alemania, Grecia, Hungría, Indonesia, Irlanda, Israel, Italia, Kazakhstan, Corea, Kuwait, Lituania, Malasia, México, Nueva Zelanda, Noruega, Oman, Paquistán, Polonia Qatar, Rumania, Rusia, Eslovaquia, Eslovenia, Sud Africa, Tailandia, Trinidad, Tunez, Turquía, Turkmenistán, Ucrania, Uzbekistan, Venezuela.

PRAD RESEARCH AND DEVELOPMENT LIMITED

Compañía de Antillas Holandesas

Situada en: POBox 71, Craigmuir Chambers, Toad Town, Tortola, BVI.

Cesionaria de solicitudes en: Algeria, Angola, Brasil, China, Ecuador, Egipto, Eurasia, Gulf Cooperation Council, India, Nigeria, Singapur, Ucrania, Emiratos Árabes Unidos y Resto del Mundo.

 **María Mercedes Uricoechea T.**
Traductora Juramentada
Resolución 10607/81 Minjusticia

18

CESION DE PATENTE

Versión Electrónica v1.1

Versión en hoja v1.1

TIPO DE ENTREGA NUEVA CESIÓN

NATURALEZA DEL TRASPASO CESIÓN

INFORMACIÓN DE LOS CEDENTES:

Nombre	Fecha
Lennox E. Reid Jr	05/10/2010
Carsten Sonne	05/25/2010

CESIONARIA (PARTE RECEPTORA):

NOMBRE.	SCHLUMBERGER TECHNOLOGY CORPORATION
DIRECCION	200 Gillingham Lane
	MD200-2
CIUDAD	Sugar Land
ESTADO	TEXAS
CODIGO POSTAL	77478

NÚMEROS DE PROPIEDAD: 1

SOLICITUD No. 61176574

INFORMACIÓN PARA CORRESPONDENCIA

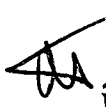
No. de FAX (281)285-8821

La correspondencia será enviada por correo cuando no se pueda hacer por fax.

Teléfono:	281-285-8500
e-mail	kmorris@slb.com
Nombre	Schlumberger Technology Corporation
Dirección	200 Gillingham Lane
	MD200-2
	Sugar Land, TEXAS 77478.

Número Exp. Abogado 22.3215PROV

Nombre del remitente: Dave R. Holman

 **María Mercedes Uricoechea T.**
Traductora Juramentada
Resolución 10607/81 Minjusticia

Adjuntos: 5

19

LEGALIZACIONES

ESTADOS UNIDOS DE AMERICA

A TODOS A QUIENES LLEGUE EL PRESENTE
Oficina de Marcas y Patentes de los Estados Unidos

07 de junio de 2010.

LA PRESENTE CERTIFICA QUE LA ADJUNTA ES UNA COPIA FIEL TOMADA DE LOS
REGISTROS DE ESTA OFICINA DE UN DOCUMENTO REGISTRADO EL 28 DE MAYO
2010.

Por Autoridad del
Sub-Secretario de Comercio de Propiedad Intelectual
Y Director de la Oficina de Marcas y Patentes de los
Estados Unidos.

(Firma) M. TARVER- Funcionario de Certificaciones

(SELLO DE OBLEA)

* * * * *

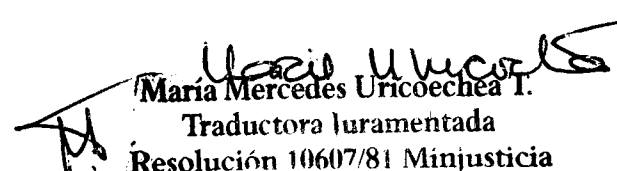
APOSTILLE

(Convention de La Haye du 5 Octobre 1961)

1. País: Estados Unidos de América
Este documento público
2. fue suscrito por M. Tarver
3. quien actúa en capacidad de Funcionario de Certificaciones
4. lleva el sello de la Oficina de Marcas y Patentes de los Estados Unidos

Certificado

4. en Washington, D.C..
6. hoy 06 de julio de 2010


Maria Mercedes Uricechea I.
Traductora juramentada
Resolución 10607/81 Minjusticia

7. por el Funcionario asistente de Autenticaciones, Departamento de Estado de los Estados Unidos

8. No. 10033298-11 ✓

9. Sello

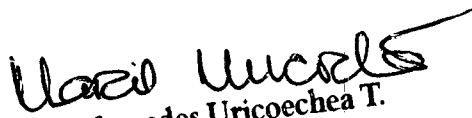
10. Firma

Sonya N. Johnson

LA ANTERIOR ES UNA TRADUCCIÓN FIEL Y COMPLETA DE LA CUAL SE DEJA COPIA EN LOS ARCHIVOS DE LA CALLE 84 NO. 18-38 (OF. 201) PARA SU CONFRONTACIÓN. TEL. 218 1007 - 623 3301

MARIA MERCEDES URICOECHEA T.
C.C. 41.319.274 BOGOTÁ
TRADUCTORA/INTÉRPRETE OFICIAL
RES. 10607 DEL 31 DE DBRE/81, MINJUSTICIA

FIN DE LA TRADUCCIÓN NO. 11.782


María Mercedes Uricoechea T.
Traductora Juramentada
Resolución 10607/81 Minjusticia

APOSTILLE

(Convention de La Haye du 5 octobre 1961)

23

1. Country: United States of America

This public document

2. has been signed by T. Wallace

3. acting in the capacity of Certifying Officer

4. bears the seal/stamp of Patent and Trademark Office

Certified

5. at Washington, D.C.

6. the sixth of July, 2010

7. by Assistant Authentication Officer, United States Department of State

8. No. 10033298-8

9. Seal/Stamp:

10. Signature:

Sonya N. Johnson

A 7245668

THE UNITED STATES OF

TO ALL TO WHOM THESE PRESENTS SHALL COME

UNITED STATES DEPARTMENT OF COMMERCE

United States Patent and Trademark Office

June 23, 2010

**THIS IS TO CERTIFY THAT ANNEXED IS A TRUE COPY FROM THE
RECORDS OF THIS OFFICE OF A DOCUMENT RECORDED ON
MARCH 02, 2010.**

**By Authority of the
Under Secretary of Commerce for Intellectual Property
and Director of the United States Patent and Trademark Office**



T. Wallace
T. WALLACE

Certifying Officer

20.3215CO
apostille

25

PATENT ASSIGNMENT

Electronic Version v1.1
Stylesheet Version v1.1

SUBMISSION TYPE:	NEW ASSIGNMENT												
NATURE OF CONVEYANCE:	ASSIGNMENT												
CONVEYING PARTY DATA													
<table border="1"><thead><tr><th>Name</th><th>Execution Date</th></tr></thead><tbody><tr><td>Lennox E. Reid Jr.</td><td>03/02/2010</td></tr><tr><td>Carsten Sonne</td><td>06/22/2009</td></tr></tbody></table>		Name	Execution Date	Lennox E. Reid Jr.	03/02/2010	Carsten Sonne	06/22/2009						
Name	Execution Date												
Lennox E. Reid Jr.	03/02/2010												
Carsten Sonne	06/22/2009												
RECEIVING PARTY DATA													
<table border="1"><tr><td>Name:</td><td>Schlumberger Technology Corporation</td></tr><tr><td>Street Address:</td><td>200 Gillingham Lane</td></tr><tr><td>Internal Address:</td><td>MD200-2</td></tr><tr><td>City:</td><td>Sugar Land</td></tr><tr><td>State/Country:</td><td>TEXAS</td></tr><tr><td>Postal Code:</td><td>77478</td></tr></table>		Name:	Schlumberger Technology Corporation	Street Address:	200 Gillingham Lane	Internal Address:	MD200-2	City:	Sugar Land	State/Country:	TEXAS	Postal Code:	77478
Name:	Schlumberger Technology Corporation												
Street Address:	200 Gillingham Lane												
Internal Address:	MD200-2												
City:	Sugar Land												
State/Country:	TEXAS												
Postal Code:	77478												
PROPERTY NUMBERS Total: 1													
<table border="1"><thead><tr><th>Property Type</th><th>Number</th></tr></thead><tbody><tr><td>Application Number:</td><td>61187126</td></tr></tbody></table>		Property Type	Number	Application Number:	61187126								
Property Type	Number												
Application Number:	61187126												
CORRESPONDENCE DATA													
Fax Number: (281)285-8821 <i>Correspondence will be sent via US Mail when the fax attempt is unsuccessful.</i>													
Phone: 281-285-8500													
Email: kmorris2@slb.com													
Correspondent Name: SCHLUMBERGER OILFIELD SERVICES													
Address Line 1: 200 GILLINGHAM LANE													
Address Line 2: MD 200-9													
Address Line 4: SUGAR LAND, TEXAS 77478													
ATTORNEY DOCKET NUMBER:	20.3215PSP1												
NAME OF SUBMITTER:	Dave R.Hofman												
Total Attachments: 5 source=203215PSP1_prov_Assign#page1.tif													

CH \$40.00 61187126

501107072

PATENT
REEL: 024015 FRAME: 0430

26

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source=203215PSP1_prov_Assign#page5.tif

27

A S S I G N M E N T

WHEREAS, the undersigned inventors hereinafter referred to as the "Inventors" each said Inventor's address being listed below

Lennox E. Reid, Jr., citizen of the U.S.A., whose post office address is 14915 Little Leaf Court, Houston, Texas 77082 USA

Carsten Sonne, citizen of Denmark, whose post office address is 616 Memorial Height Drive, #11220, Houston, Texas 77007 USA

Has/have invented certain new and useful improvements in

SEALED CORE

as described and set forth in an application for Letters Patent of the United States of America, filed on the 15th day of June, 2009 (20.3215PSP1).

WHEREAS each of the undersigned persons warrants that no person other than these undersigned persons are inventors of the above-described invention;

AND WHEREAS, the "COMPANIES", listed in Schedule A, are desirous of acquiring or confirming their acquisition of the entire right, title and interest in and to said invention, inventions or improvements, and in and to said application, and in and to any and all patents, both of the United States and of all foreign countries, that may be obtained therefore as outlined in Schedule A;

NOW, THEREFORE, TO ALL WHOM IT MAY CONCERN, BE IT KNOWN, that the undersigned Inventors, for good and valuable considerations, the receipt and sufficiency of which hereby acknowledge, have sold, assigned, transferred and conveyed, and by this assignment do sell, assign, transfer and convey, unto said COMPANIES, their successors and assigns, the entire right, title and interest throughout the world, in and to the above-described invention, inventions or improvements described or set forth in said application, in any form or embodiment thereof, and in and to said application, and in and to any applications filed in any foreign country based thereon, including the right to file foreign applications under the provisions of any convention or treaty; and in and to any confirmation, divisional, continuation-in-part, or substitute application which may be filed on said invention, inventions or improvements in the United States or in any foreign country; and in and to any and all patents, certificates, utility models, reissues, extensions, additions or confirmations thereof which may be granted in the United States or in any foreign country upon said invention, inventions or improvements,

TO HAVE AND TO HOLD the same to the full end of the term or terms for which any and all such United States and foreign patents and grants may be issued on said invention, inventions or improvements.

AND said Inventors do hereby authorize and request the issuing authority to issue any and all of said United States and foreign patents on said application or applications to said COMPANIES, their successors and assigns, as the assignee of the entire right, title and interest in and to the same, for the sole use and benefit of said COMPANIES, their successors and assigns.

AND said Inventors do hereby covenant and warrant that said Inventors have full right to convey the entire right, title and interest herein assigned free and clear of all licenses, encumbrances and liens whatsoever, and that no said Inventors has executed and will execute any instruments in conflict herewith.

AND said Inventors, for the conditions aforesaid, do hereby covenant and agree to and with the said COMPANIES, their successors and assigns, that each Inventor, his or her executors, administrators, or other personal representatives, shall and will do all lawful acts and things, make all rightful oaths, and make, execute and deliver any and all other instruments in writing, and any and all further applications, papers,

power, affidavits, assignments, disclaimers and other documents, which in the opinion of counsel for said COMPANIES, their successors and assigns, may be required or necessary in this or in any foreign country more effectually to secure to and vest in said COMPANIES, their successors and assigns, the entire right, title and interest in and to said invention, inventions or improvements, application or applications, patents, rights, titles, benefits, privileges, and advantages hereby sold, assigned, confirmed, transferred and conveyed.

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SCHEDULE A
"COMPANIES"

29

SCHLUMBERGER CANADA LIMITED

Corporation of: Canada

Located at: 525-3rd Avenue S.W., Calgary, Alberta, CA T2P 0G4

Assignee for applications in: Canada

SCHLUMBERGER TECHNOLOGY CORPORATION

Corporation of: USA

Located at: 110 Schlumberger Drive, Sugar Land, TX 77478 US

Assignee for applications in: USA

SERVICES PETROLIERS SCHLUMBERGER

Corporation of: France

Located at: 42 rue Saint Dominique, 75007 Paris, FR

Assignee for applications in: France

SCHLUMBERGER HOLDINGS LIMITED

Corporation of: British Virgin Islands

Located at: PO Box 71, Craigmuir Chambers, Road Town, Tortola, BVI

Assignee for applications in: Japan, the Netherlands, Saudi Arabia, United Kingdom

SCHLUMBERGER TECHNOLOGY B.V.

Corporation of: the Netherlands

Located at: Parkstraat 83-89, 2514 JG The Hague, The Netherlands

Assignee for applications in: Albania, Argentina, Australia, Azarbaijan, Brunei, Bulgaria, Colombia, Czech Republic, Denmark, Faroe Islands, Germany, Greece, Hungary, Indonesia, Ireland, Israel, Italy, Kazakhstan, Korea, Kuwait, Lithuania, Malaysia, Mexico, New Zealand, Norway, Oman, Pakistan, Poland, Qatar, Romania, Russia, Slovakia, Slovenia, South Africa, Thailand, Trinidad, Tunisia, Turkey, Turkmenistan, Ukraine, Uzbekistan, Venezuela

PRAD RESEARCH AND DEVELOPMENT LIMITED

Corporation of: British Virgin Islands

Located at: PO Box 71, Craigmuir Chambers, Road Town, Tortola, BVI

Assignee for applications in: the GCC Patent Office and Countries not Otherwise Listed

IN WITNESS WHEREOF, I, Lennox E. Reid Jr., have hereunto set my hand and seal this 2 day of March, 200th 10 km

[Signature]
(signature of Inventor)

30

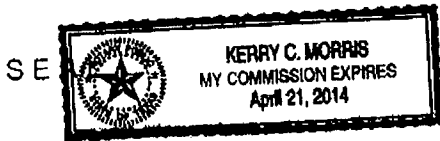
(L. S.)

State of _Texas)

County of _Fort Bend)

BEFORE ME this 2 day of March, 200th 10 km, personally appeared Lennox E. Reid Jr. to me known to be the person who is described in and who executed the foregoing assignment instrument and acknowledged to me that he executed the same of his own free will for the purpose therein expressed.

Kerry C. Morris
Notary Public



IN WITNESS WHEREOF, I, **Carsten Sonne**, have hereunto set my hand and seal this 22 day of June, 2009.



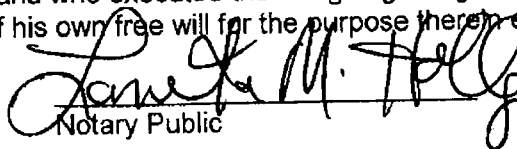
(signature of Inventor)

(L. S.)

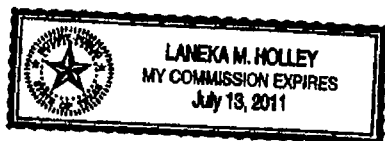
State of Texas)

County of Fort Bend)

BEFORE ME this 22 day of June, 2009, personally appeared **Carsten Sonne Jr.**, to me known to be the person who is described in and who executed the foregoing assignment instrument and acknowledged to me that he executed the same of his own free will for the purpose therein expressed.


Notary Public

SEAL



32
TRADUCCIÓN OFICIAL NO. 11.784 DE UN DOCUMENTO ESCRITO EN INGLES,
hecha por Maria Mercedes Uricoechea, traductora/intérprete oficial según
Res. 10607 del 31 de diciembre de 1981, expedida por el Ministerio de
Justicia. Bogotá, 26 de julio de 2010.

Documento de CESIÓN de **(INVENTORES) A SCHLUMBERGER TECHNOLOGY
CORORATION**. Legalizaciones subsiguientes.

CESION

Los suscritos inventores referidos en adelante como los "Inventores" cada uno con
las respectivas direcciones que se indican abajo:

Lennox E. Reid, Jr. de nacionalidad estadounidense, cuya dirección postal es:
14915 LITTLE LEAF COURT, HOUSTON, TEXAS 77082, EE.UU.,

Carsten Sonne, de nacionalidad danesa, cuya dirección postal es: 616 Memorial
Height Drive, #11220, Houston, Texas 77007 EE.UU.

hemos inventado ciertas mejoras nuevas y útiles en

NÚCLEO SELLADO HERMÉTICAMENTE

[SEALED CORE]

según se describe en una solicitud de Certificación de Patentes de los Estados
Unidos de América, radicada el 15 de junio de 2009 (20.3215PSP1);

POR CUANTO cada una de las personas suscritas declara y garantiza que
ninguna otra persona aparte de los suscritos son los inventores de la invención
arriba descrita;

Y POR CUANTO, las "COMPAÑÍAS" que figuran en la lista del Anexo A desean
adquirir o confirmar su adquisición del total derecho, título e interés en dicha
invención, invenciones o mejoras, y en dicha solicitud, y en todas las patentes,
tanto de los Estados unidos como de todos los países en el exterior, que puedan
obtenerse para ellas según figuran en el Anexo A;


María Mercedes Uricoechea T
Traductora Juramentada
Resolución 10607/81 Minjusticia

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POR CONSIGUIENTE, HÁGASE SABER A TODOS A QUIENES LLÉGUE EL PRESENTE, que los suscritos Inventores, por pago bueno y oneroso, cuyo recibo y suficiencia se acusa aquí, hemos vendido, cedido, transferido y traspasado, y mediante esta cesión, vendemos cedemos, transferimos y traspasamos a dichas COMPAÑÍAS, a sus sucesores y cesionarios, todo el derecho, título e interés en todo el mundo, en la Invención, invenciones o mejoras que se describen en dicha solicitud, en cualquier realización de las mismas, y en dicha solicitud y en todas y cualesquiera solicitudes que se radiquen en cualquier país, incluido el derecho de presentar solicitudes extranjeras bajo las disposiciones de cualquier convención o tratado; y en cualquier confirmación, división, continuación, continuación en parte o solicitud sustituta que se pueda presentar sobre esa Invención en Colombia; y en todas las patentes, certificados, modelos de utilidad, re-expediciones, prórrogas, adiciones o confirmaciones de lo mismo que se puedan otorgar en los Estados Unidos o en cualquier otro país sobre dicha Invención, invenciones o mejoras.

PARA QUE TENGAN Y MANTENGAN las mismas hasta el término de la vigencia o vigencias para las que dichas patentes y adjudicaciones en los Estados Unidos se puedan expedir sobre dicha invención, invenciones o mejoras.

Y por la presente, dichos inventores autorizamos y solicitamos a la autoridad expedidora expedir todas dichas patentes estadounidenses y extranjeras sobre dicha solicitud o solicitudes a dichas COMPAÑÍAS, a sus sucesores y cesionarios, como las cesionarias de todo el derecho, título e interés en las mismas, para único uso y provecho de dichas COMPAÑÍAS, sus sucesores y cesionarios.

Y dichos Inventores por el presente, convenimos y declaramos que tenemos el pleno derecho para traspasar todo el derecho, título e interés que se cede en este traspaso, libre y neto de toda licencia, gravamen y prenda, y que ninguno de dichos inventores ha firmado ningún instrumento que entre en conflicto con el presente.

Y por las condiciones arriba mencionadas, por la presente, dichos Inventores convenimos y acordamos con dichas COMPAÑÍAS, sus sucesores y cesionarios

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que cada uno de nosotros, nuestros administradores u otros representantes personales, haremos todos los actos y cosas, haremos los juramentos requeridos y haremos, firmaremos y entregaremos cualquier otro instrumento escrito, y cualquier otra solicitud, documento, poder, declaración, cesión, renuncia y demás documentos que, a juicio de los abogados de dichas COMPAÑÍAS, sus sucesores y cesionarios, puedan requerirse o sean necesarios en Colombia para garantizar e invertir con mayor validez en dichas COMPAÑÍAS, sus sucesores y cesionarios, todo el derecho, título e interés en la Invención y en cualquier solicitud o solicitudes relacionadas, patentes, derechos, títulos beneficios, privilegios y ventajas que por el presente se venden, ceden, confirman transfieren o traspasan.

En TESTIMONIO DE LO CUAL, Yo, **Lennox E. Reid, Jr.**, firmo hoy 2 de marzo de 2010.

(Firma) **Lennox E. Reid, Jr.**

RECONOCIMIENTO NOTARIAL

Estado de Texas

Condado de FORT BEND

ANTE MI, hoy 2 de marzo de 2010 compareció personalmente **Lennox E. Reid, Jr.**, quien sé que es la persona descrita y quien firmó el anterior documento de cesión y reconoció ante mí que firmó el mismo de su propia voluntad para los fines que se expresan allí.

(FIRMA Y SELLO SECO) Kerry C. Morris. Notario Público Mi comisión vence el 21 de abril de 2014.

En TESTIMONIO DE LO CUAL, Yo, **Carsten Sonne**, firmo hoy 22 de junio de 2009.

(Firma) **Carsten Sonne**

RECONOCIMIENTO NOTARIAL

Estado de Texas

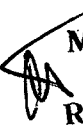
Condado de FORT BEND

ANTE MI, hoy 2 de marzo de 2010 compareció personalmente **Lennox E. Reid, Jr.**, quien sé que es la persona descrita y quien firmó el anterior

 **María Mercedes Uricoechea T**
Traductora Juramentada
Resolución 10607/81 Minjusticia

documento de cesión y reconoció ante mí que firmó el mismo de su propia voluntad para los fines que se expresan allí.

(FIRMA Y SELLO SECO) Laneka M. Holley. Notaria Pública Mi comisión vence el 13 de julio de 2011.

 **María Mercedes Uricoechea T**
Traductora Juramentada
Resolución 10607/81 Minjusticia

36

ANEXO A

"COMPAÑÍAS

SCHLUMBERGER CANADA LIMITED

Compañía de Canadá

Situada en: 525-3rd Avenue S.W. Calgary, Alberta, CA T2P 0G4

Cesionaria de solicitudes en: Canadá.

SCHLUMBERGER TECHNOLOGY CORPORATION

Compañía de Estados Unidos

Situada en: 110 Schlumberger Drive, Sugar Land, TX 77478 US

Cesionaria de solicitudes en: Estados Unidos

SERVICES PETROLIERS SCHLUMBERGER

Compañía de Francia

Situada en: 42 rue Saint Dominique, 75007, Paris, FR.

Cesionaria de solicitudes en: Francia.

SCHLUMBERGER HOLDINGS LIMITED

Compañía de Holanda

Situada en: PO Box 71, Craigmuir Chambers, Road Town, Tortola, BVI

Cesionaria de solicitudes en: Japón, Holanda, Saudi Arabia, Reino Unido

SCHLUMBERGER TECHNOLOGY B.V.

Compañía de Holanda

Situada en: Parkstraat 83-89, 2514 JG La Haya, Holanda

Cesionaria de solicitudes en: Albania, Argentina, Australia, Azarbaijan, Brunei, Bulgaria, Colombia, República Checa, Dinamarca, Islas Faroe, Alemania, Grecia, Hungría, Indonesia, Irlanda, Israel, Italia, Kazakhstan, Corea, Kuwait, Lituania, Malasia, México, Nueva Zelanda, Noruega, Oman, Paquistán, Polonia Qatar, Rumania, Rusia, Eslovaquia, Eslovenia, Sud Africa, Tailandia, Trinidad, Tunez, Turquía, Turkmenistán, Ucrania, Uzbekistan, Venezuela.

PRAD RESEARCH AND DEVELOPMENT LIMITED

Compañía de Antillas Holandesas

Situada en: POBox 71, Craigmuir Chambers, Toad Town, Tortola, BVI.

Cesionaria de solicitudes en: Algeria, Angola, Brasil, China, Ecuador, Egipto, Eurasia, Gulf Cooperation Council, India, Nigeria, Singapur, Ucrania, Emiratos Árabes Unidos y Resto del Mundo.

María Mercedes Uricoechea T.
Traductora Juramentada
Resolución 10607/81 Minjusticia

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CESION DE PATENTE

Versión Electrónica v1.1

Versión en hoja v1.1

TIPO DE ENTREGA

NUEVA CESIÓN

NATURALEZA DEL TRASPASO CESIÓN

INFORMACIÓN DE LOS CEDENTES:

Nombre
Lennox E. Reid Jr
Carsten Sonne

Fecha
03/02/2010
06/22/2010

CESIONARIA (PARTE RECEPTORA):

NOMBRE. SCHLUMBERGER TECHNOLOGY CORPORATION
DIRECCION 200 Gillingham Lane
MD200-2
CIUDAD Sugar Land
ESTADO TEXAS
CODIGO POSTAL 77478

NÚMEROS DE PROPIEDAD: 1

SOLICITUD No. 61187126

INFORMACIÓN PARA CORRESPONDENCIA

No. de FAX (281)285-8821

La correspondencia será enviada por correo cuando no se pueda hacer por fax.

Teléfono: 281-285-8500

e-mail kmorris@slb.com

Nombre Schlumberger Oilfield Services

Dirección 200 Gillingham Lane

MD200-9

Sugar Land, TEXAS 77478.

Número Exp. Abogado 22.3215PSP1

 **María Mercedes Uricoechea T**
Traductora Juramentada
Resolución 10607/81 Minjusticia

Nombre del remitente: Dave R. Holman

Adjuntos: 5

LEGALIZACIONES

ESTADOS UNIDOS DE AMERICA

A TODOS A QUIENES LLEGUE EL PRESENTE

Oficina de Marcas y Patentes de los Estados Unidos

23 de junio de 2010.

LA PRESENTE CERTIFICA QUE LA ADJUNTA ES UNA COPIA FIEL TOMADA DE LOS REGISTROS DE ESTA OFICINA DE UN DOCUMENTO REGISTRADO EL 2 DE MARZO DE 2010.

Por Autoridad del
Sub-Secretario de Comercio de Propiedad Intelectual
Y Director de la Oficina de Marcas y Patentes de los
Estados Unidos.

(Firma) T. WALLACE- Funcionario de Certificaciones

(SELLO DE OBLEA)

* * * * *

APOSTILLE

(Convention de La Haye du 5 Octobre 1961)

1. País: Estados Unidos de América

Este documento público

2. fue suscrito por T. Wallace

3. quien actúa en capacidad de Funcionario de Certificaciones

4. lleva el sello de la Oficina de Marcas y Patentes de los Estados Unidos

Certificado

4. en Washington, D.C..

6. hoy 06 de julio de 2010

María Mercedes Uricoechea T
Traductora Juramentada
Resolución 10607/81 Minjusticia

[Handwritten signature]

7. por el Funcionario asistente de Autenticaciones, Departamento de Estado de los Estados Unidos

8. No. 10033298-8 ✓

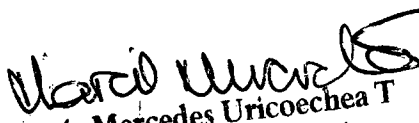
9. Sello

10. Firma
Sonya N. Johnson

LA ANTERIOR ES UNA TRADUCCIÓN FIEL Y COMPLETA DE LA CUAL SE DEJA COPIA EN LOS ARCHIVOS DE LA CALLE 84 NO. 18-38 (OF. 201) PARA SU CONFRONTACIÓN. TEL. 218 1007 - 623 3301

MARIA MERCEDES URICOECHEA T.
C.C. 41.319.274 BOGOTÁ
TRADUCTORA/INTÉRPRETE OFICIAL
RES. 10607 DEL 31 DE DBRE/81, MINJUSTICIA

FIN DE LA TRADUCCIÓN NO. 11.784


María Mercedes Uricoechea T.
Traductora Juramentada
Resolución 10607/81 Minjusticia

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APOSTILLE

(Convention de La Haye du 5 octobre 1961)

1. Country: United States of America

This public document

2. has been signed by M. Tarver

3. acting in the capacity of Certifying Officer

4. bears the seal/stamp of Patent and Trademark Office

Certified

5. at Washington, D.C.

6. the sixth of July, 2010

7. by Assistant Authentication Officer, United States Department of State

8. No. 10033298-12

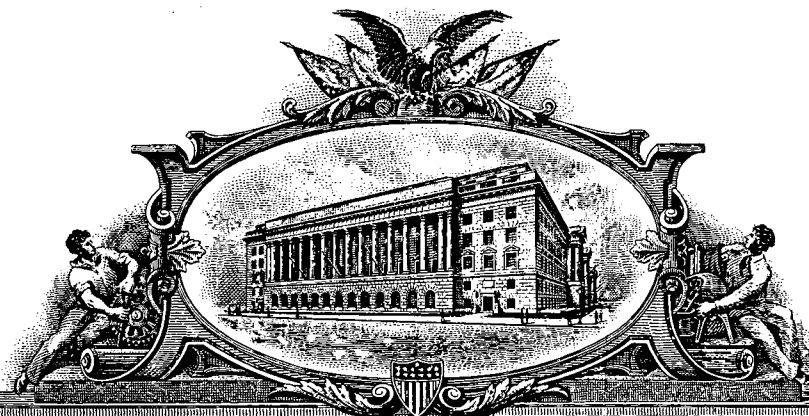
9. Seal/Stamp:

10. Signature:

Sonya N. Johnson

28

A 7243059



THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

**UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office**

June 07, 2010

**THIS IS TO CERTIFY THAT ANNEXED IS A TRUE COPY FROM THE
RECORDS OF THIS OFFICE OF A DOCUMENT RECORDED ON
MAY 28, 2010.**

**By Authority of the
Under Secretary of Commerce for Intellectual Property
and Director of the United States Patent and Trademark Office**



**M. TARVER
Certifying Officer**

44

PATENT ASSIGNMENT

Electronic Version v1.1
 Stylesheet Version v1.1

SUBMISSION TYPE:	NEW ASSIGNMENT												
NATURE OF CONVEYANCE:	ASSIGNMENT												
CONVEYING PARTY DATA													
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Carsten Sonne	05/25/2010												
RECEIVING PARTY DATA													
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Application Number:	12773105												
CORRESPONDENCE DATA													
Fax Number: (281)285-8821 <i>Correspondence will be sent via US Mail when the fax attempt is unsuccessful.</i> Phone: 281-285-8500 Email: kmorris2@slb.com Correspondent Name: Schlumberger Technology Corporation, HPS Address Line 1: 200 Gillingham Lane Address Line 2: MD200-2 Address Line 4: Sugar Land, TEXAS 77478													
ATTORNEY DOCKET NUMBER:	20.3215												
NAME OF SUBMITTER:	Dave R. Hofman												
Total Attachments: 5 source=203215NP_Assignment#page1.tif													

CH \$40.00 12773105

501190294

PATENT
 REEL: 024457 FRAME: 0257

45

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source=203215NP_Assignment#page5.tif

PATENT
REEL: 024457 FRAME: 0258

46

A S S I G N M E N T

WHEREAS, the undersigned inventors hereinafter referred to as the "Inventors" each said Inventor's address being listed below

Lennox E. Reid, Jr., citizen of the USA, whose post office address is 14915 LITTLE LEAF COURT, HOUSTON, TEXAS 77082 USA; and

Carsten Sonne, citizen of Denmark, whose post office address is 616 Memorial Height Drive, #11220, Houston, Texas 77007 USA

Has/have invented certain new and useful improvements in

SEALED CORE

as described and set forth in an application for Letters Patent of the United States of America, filed May 4, 2010 (20.3215)

WHEREAS each of the undersigned persons warrants that no person other than these undersigned persons are inventors of the above-described invention;

AND WHEREAS, the "COMPANIES", listed in Schedule A, are desirous of acquiring or confirming their acquisition of the entire right, title and interest in and to said invention, inventions or improvements, and in and to said application, and in and to any and all patents, both of the United States and of all foreign countries, that may be obtained therefore as outlined in Schedule A;

NOW, THEREFORE, TO ALL WHOM IT MAY CONCERN, BE IT KNOWN, that the undersigned Inventors, for good and valuable considerations, the receipt and sufficiency of which hereby acknowledge, have sold, assigned, transferred and conveyed, and by this assignment do sell, assign, transfer and convey, unto said COMPANIES, their successors and assigns, the entire right, title and interest throughout the world, in and to the above-described invention, inventions or improvements described or set forth in said application, in any form or embodiment thereof, and in and to said application, and in and to any applications filed in any foreign country based thereon, including the right to file foreign applications under the provisions of any convention or treaty; and in and to any confirmation, divisional, continuation, continuation-in-part, or substitute application which may be filed on said invention, inventions or improvements in the United States or in any foreign country; and in and to any and all patents, certificates, utility models, reissues, extensions, additions or confirmations thereof which may be granted in the United States or in any foreign country upon said invention, inventions or improvements,

TO HAVE AND TO HOLD the same to the full end of the term or terms for which any and all such United States and foreign patents and grants may be issued on said invention, inventions or improvements.

AND said Inventors do hereby authorize and request the issuing authority to issue any and all of said United States and foreign patents on said application or applications to said COMPANIES, their successors and assigns, as the assignee of the entire right, title and interest in and to the same, for the sole use and benefit of said COMPANIES, their successors and assigns.

AND said Inventors do hereby covenant and warrant that said Inventors have full right to convey the entire right, title and interest herein assigned free and clear of all licenses, encumbrances and liens whatsoever, and that no said Inventors has executed and will execute any instruments in conflict herewith.

AND said Inventors, for the conditions aforesaid, do hereby covenant and agree to and with the said COMPANIES, their successors and assigns, that each Inventor, his or her executors, administrators, or other personal representatives, shall and will do all lawful acts and things, make all rightful oaths, and make, execute

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and deliver any and all other instruments in writing, and any and all further applications, papers, powers, affidavits, assignments, disclaimers and other documents, which in the opinion of counsel for said COMPANIES, their successors and assigns, may be required or necessary in this or in any foreign country more effectually to secure to and vest in said COMPANIES, their successors and assigns, the entire right, title and interest in and to said invention, inventions or improvements, application or applications, patents, rights, titles, benefits, privileges, and advantages hereby sold, assigned, confirmed, transferred and conveyed.

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ASSIGNMENT

SCHEDULE A
"COMPANIES"

SCHLUMBERGER CANADA LIMITED

Corporation of: Canada

Located at: 525-3rd Avenue S.W., Calgary, Alberta, CA T2P 0G4

Assignee for applications in: Canada

SCHLUMBERGER TECHNOLOGY CORPORATION

Corporation of: USA

Located at: 300 Schlumberger Drive, Sugar Land, TX 77478 US

Assignee for applications in: USA

SERVICES PETROLIERS SCHLUMBERGER

Corporation of: France

Located at: 42 rue Saint Dominique, 75007 Paris, FR

Assignee for applications in: France

SCHLUMBERGER HOLDINGS LIMITED

Corporation of: British Virgin Islands

Located at: PO Box 71, Craigmuir Chambers, Road Town, Tortola, BVI

Assignee for applications in: Japan, The Netherlands, Saudi Arabia, United Kingdom

SCHLUMBERGER TECHNOLOGY B.V.

Corporation of: the Netherlands

Located at: Parkstraat 83-89, 2514 JG The Hague, The Netherlands

Assignee for applications in: Albania, Argentina, Australia, Azarbaijan, Brunei, Bulgaria, Colombia, Czech Republic, Denmark, Faroe Islands, Germany, Greece, Hungary, Indonesia, Ireland, Israel, Italy, Kazakhstan, Korea, Kuwait, Lithuania, Malaysia, Mexico, New Zealand, Norway, Oman, Pakistan, Poland, Qatar, Romania, Russia, Slovakia, Slovenia, South Africa, Thailand, Trinidad, Tunisia, Turkey, Turkmenistan, Ukraine, Uzbekistan, Venezuela

PRAD RESEARCH AND DEVELOPMENT LIMITED

Corporation of: British Virgin Islands

Located at: PO Box 71, Craigmuir Chambers, Road Town, Tortola, BVI

Assignee for applications in: the GCC Patent Office and Countries not Otherwise Listed

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IN WITNESS WHEREOF, I, **Lennox E. Reid, Jr.**, have hereunto set my hand and seal this 10th day of May, 2010.

[Signature]
(signature of Inventor)

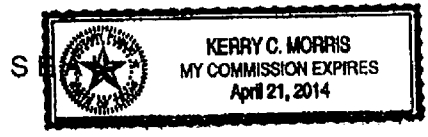
(L. S.)

State of Texas)

County of Fort Bend)

BEFORE ME this 10 day of May, 2010, personally appeared **Lennox E. Reid, Jr.**, to me known to be the person who is described in and who executed the foregoing assignment instrument and acknowledged to me that he executed the same of his own free will for the purpose therein expressed.

Kerry C. Morris
Notary Public



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IN WITNESS WHEREOF, I, Carsten Sonne, have hereunto set my hand and seal this 25 day of May, 2010.

[Signature]
(signature of Inventor)

WITNESSED:

BE IT KNOWN that Carsten Sonne is to me known to be the individual described in the foregoing assignment, that on this 25 day of MAY, 2010, I was personally present and did see him sign and execute the foregoing assignment; and, that he did acknowledge to me that he executed the same as his free act and deed for the uses and purposes therein set forth.

[Signature]
Witness

[Signature]
10-9-3, AKTAN
KAZAKHSTAN.

[Signature]
Witness

[Signature]
Vierbaumer Heide 9
47495 Rheinberg
Germany

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TRADUCCIÓN OFICIAL NO. 11.783 DE UN DOCUMENTO ESCRITO EN INGLES,
hecha por Maria Mercedes Uricoechea, traductora/intérprete oficial según
Res. 10607 del 31 de diciembre de 1981, expedida por el Ministerio de
Justicia. Bogotá, 26 de julio de 2010.

Documento de CESIÓN de **(INVENTORES) A SCHLUMBERGER TECHNOLOGY
CORORATION**. Legalizaciones subsiguientes.

CESION

Los suscritos inventores referidos en adelante como los "Inventores" cada uno con
las respectivas direcciones que se indican abajo:

Lennox E. Reid, Jr. de nacionalidad estadounidense, cuya dirección postal es:
14915 LITTLE LEAF COURT, HOUSTON, TEXAS 77082, EE.UU.,

Carsten Sonne, de nacionalidad danesa, cuya dirección postal es: 616 Memorial
Height Drive, #11220, Houston, Texas 77007 EE.UU.

hemos inventado ciertas mejoras nuevas y útiles en

NÚCLEO SELLADO HERMÉTICAMENTE

[SEALED CORE]

según se describe en una solicitud de Certificación de Patentes de los Estados
Unidos de América, radicada el 4 de mayo de 2009 (20.3215);

POR CUANTO cada una de las personas suscritas declara y garantiza que
ninguna otra persona aparte de los suscritos son los inventores de la invención
arriba descrita;

Y POR CUANTO, las "COMPAÑÍAS" que figuran en la lista del Anexo A desean
adquirir o confirmar su adquisición del total derecho, título e interés en dicha
invención, invenciones o mejoras, y en dicha solicitud, y en todas las patentes,
tanto de los Estados unidos como de todos los países en ele exterior, que puedan
obtenerse para ellas según figuran en el Anexo A;


Maria Mercedes Uricoechea T.
Traductora Juramentada
Resolución 10607/81 Minjusticia

POR CONSIGUIENTE, HÁGASE SABER A TODOS A QUIENES LLEGUE EL PRESENTE, que los suscritos Inventores, por pago bueno y oneroso, cuyo recibo y suficiencia se acusa aquí, hemos vendido, cedido, transferido y traspasado, y mediante este cesión, vendemos cedemos, transferimos y traspasamos a dichas COMPAÑÍAS, a sus sucesores y cesionarios, todo el derecho, título e interés en todo el mundo, en la Invención, invenciones o mejoras que se describen en dicha solicitud, en cualquier realización de las mismas, y en dicha solicitud y en todas y cualesquiera solicitudes que se radiquen en cualquier país, incluido el derecho de de presentar solicitudes extranjeras bajo las disposiciones de cualquier convención o tratado; y en cualquier confirmación, división, continuación, continuación en parte o solicitud sustituta que se pueda presentar sobre esa Invención en Colombia; y en todas las patentes, certificados, modelos de utilidad, re-expediciones, prórrogas, adiciones o confirmaciones de lo mismo que se puedan otorgar en los Estados Unidos o en cualquier otro país sobre dicha Invención, invenciones o mejoras.

PARA QUE TENGAN Y MANTENGAN las mismas hasta el término de la vigencia o vigencias para las que dichas patentes y adjudicaciones en los Estados Unidos se puedan expedir sobre dicha invención, invenciones o mejoras.

Y por la presente, dichos inventores autorizamos y solicitamos a la autoridad expedidora expedir todas dichas patentes estadounidenses y extranjeras sobre dicha solicitud o solicitudes a dichas COMPAÑÍAS, a sus sucesores y cesionarios, como las cesionarias de todo el derecho, título e interés en las mismas, para único uso y provecho de dichas COMPAÑÍAS, sus sucesores y cesionarios.

Y dichos Inventores por el presente, convenimos y declaramos que tenemos el pleno derecho para traspasar todo el derecho, título e interés que se cede en este traspaso, libre y neto de toda licencia, gravamen y prenda, y que ninguno de dichos inventores ha firmado ningún instrumento que entre en conflicto con el presente.

Y por las condiciones arriba mencionadas, por la presente, dichos Inventores convenimos y acordamos con dichas COMPAÑÍAS, sus sucesores y cesionarios

 Maria Mercedes Uricoechea I.
Traductora Juramentada
Resolución 10607/81 Minjusticia

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que cada uno de nosotros, nuestros administradores u otros representantes personales, haremos todos los actos y cosas, haremos los juramentos requeridos y haremos, firmaremos y entregaremos cualquier otro instrumento escrito, y cualquier otra solicitud, documento, poder, declaración, cesión, renuncia y demás documentos que, a juicio de los abogados de dichas COMPAÑÍAS, sus sucesores y cesionarios, puedan requerirse o sean necesarios en Colombia para garantizar e invertir con mayor validez en dichas COMPAÑÍAS, sus sucesores y cesionarios, todo el derecho, título e interés en la Invención y en cualquier solicitud o solicitudes relacionadas, patentes, derechos, títulos beneficios, privilegios y ventajas que por el presente se venden, ceden, confirman transfieren o traspasan.

En TESTIMONIO DE LO CUAL, Yo, **Lennox E. Reid, Jr.**, firmo hoy 10 de mayo de 2010.

(Firma) **Lennox E. Reid, Jr.**

RECONOCIMIENTO NOTARIAL

Estado de Texas

Condado de FORT BEND

ANTE MI, hoy 10 de MAYO de 2010 compareció personalmente **Lennox E. Reid, Jr.**, quien sé que es la persona descrita y quien firmó el anterior documento de cesión y reconoció ante mí que firmó el mismo de su propia voluntad para los fines que se expresan allí.

(FIRMA Y SELLO SECO) Kerry C. Morris. Notario Público Mi comisión vence el 21 de abril de 2014.

En TESTIMONIO DE LO CUAL, Yo, **Carsten Sonne**, firmo hoy 25 de mayo de 2010.

(Firma) **Carsten Sonne**

TESTIMONIO:

HÁGASE SABER que **Carsten Sonne** quien sé que es la persona que se describe en la cesión anterior, que hoy 25 de mayo de 2010 presencié y lo

 **María Mercedes Uricoechea T.**
Traductora Juramentada
Resolución 10607/81 Minjusticia

vi firmar la anterior cesión y que reconoció ante mí haber firmado la misma
como su acto libre y voluntario para los propósitos que allí se indican.

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(Firma Testigo)

Ilegible

(Firma Testigo)

Ilegible

 **María Mercedes Uricoechea T.**
Traductora Juramentada
Resolución 10607/81 Minjusticia

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ANEXO A

"COMPAÑÍAS

SCHLUMBERGER CANADA LIMITED

Compañía de Canadá

Situada en: 525-3rd Avenue S.W. Calgary, Alberta, CA T2P 0G4

Cesionaria de solicitudes en: Canadá.

SCHLUMBERGER TECHNOLOGY CORPORATION

Compañía de Estados Unidos

Situada en: 110 Schlumberger Drive, Sugar Land, TX 77478 US

Cesionaria de solicitudes en: Estados Unidos

SERVICES PETROLIERS SCHLUMBERGER

Compañía de Francia

Situada en: 42 rue Saint Dominique, 75007, Paris, FR.

Cesionaria de solicitudes en: Francia.

SCHLUMBERGER HOLDINGS LIMITED

Compañía de Holanda

Situada en: PO Box 71, Craigmuir Chambers, Road Town, Tortola, BVI

Cesionaria de solicitudes en: Japón, Holanda, Saudi Arabia, Reino Unido

SCHLUMBERGER TECHNOLOGY B.V.

Compañía de Holanda

Situada en: Parkstraat 83-89, 2514 JG La Haya, Holanda

Cesionaria de solicitudes en: Albania, Argentina, Australia, Azarbaijan, Brunei, Bulgaria, Colombia, República Checa, Dinamarca, Islas Faroe, Alemania, Grecia, Hungría, Indonesia, Irlanda, Israel, Italia, Kazakhstan, Corea, Kuwait, Lituania, Malasia, México, Nueva Zelanda, Noruega, Oman, Paquistán, Polonia Qatar, Rumania, Rusia, Eslovaquia, Eslovenia, Sud Africa, Tailandia, Trinidad, Tunez, Turquía, Turkmenistán, Ucrania, Uzbekistan, Venezuela.

PRAD RESEARCH AND DEVELOPMENT LIMITED

Compañía de Antillas Holandesas

Situada en: POBox 71, Craigmuir Chambers, Toad Town, Tortola, BVI.

Cesionaria de solicitudes en: Algeria, Angola, Brasil, China, Ecuador, Egipto, Eurasia, Gulf Cooperation Council, India, Nigeria, Singapur, Ucrania, Emiratos Árabes Unidos y Resto del Mundo.

 **María Mercedes Uricoechea T.**
Traductora Juramentada
Resolución 10607/81 Minjusticia

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CESION DE PATENTE

Versión Electrónica v1.1

Versión en hoja v1.1

TIPO DE ENTREGA NUEVA CESIÓN

NATURALEZA DEL TRASPASO CESIÓN

INFORMACIÓN DE LOS CEDENTES:

Nombre	Fecha
Lennox E. Reid Jr	05/10/2010
Carsten Sonne	05/25/2010

CESIONARIA (PARTE RECEPTORA):

NOMBRE.	SCHLUMBERGER TECHNOLOGY CORPORATION
DIRECCION	200 Gillingham Lane MD200-2
CIUDAD	Sugar Land
ESTADO	TEXAS
CODIGO POSTAL	77478

NÚMEROS DE PROPIEDAD: 1

SOLICITUD No. 12773105

INFORMACIÓN PARA CORRESPONDENCIA

No. de FAX (281)285-8821

La correspondencia será enviada por correo cuando no se pueda hacer por fax.

Teléfono: 281-285-8500

e-mail kmorris@slb.com

Nombre Schlumberger Technology Corporation, HPS

Dirección 200 Gillingham Lane
MD200-2
Sugar Land, TEXAS 77478.

Número Exp. Abogado 22.3215

Nombre del remitente: Dave R. Holman.

Adjuntos: 5

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LEGALIZACIONES

ESTADOS UNIDOS DE AMERICA

A TODOS A QUIENES LLEGUE EL PRESENTE
Oficina de Marcas y Patentes de los Estados Unidos

07 de junio de 2010.

LA PRESENTE CERTIFICA QUE LA ADJUNTA ES UNA COPIA FIEL TOMADA DE LOS REGISTROS DE ESTA OFICINA DE UN DOCUMENTO REGISTRADO EL 28 DE MAYO 2010.

Por Autoridad del
Sub-Secretario de Comercio de Propiedad Intelectual
Y Director de la Oficina de Marcas y Patentes de los
Estados Unidos.

(Firma) M. TARVER- Funcionario de Certificaciones

(SELLO DE OBLEA)

* * * * *

APOSTILLE

(Convention de La Haye du 5 Octobre 1961)

1. País: Estados Unidos de América

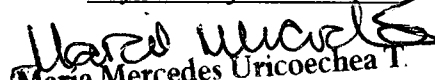
Este documento público

2. fue suscrito por M. Tarver
3. quien actúa en capacidad de Funcionario de Certificaciones
4. lleva el sello de la Oficina de Marcas y Patentes de los Estados Unidos

Certificado

4. en Washington, D.C..

6. hoy 06 de julio de 2010


Maria Mercedes Uricoechea T.
Traductora Juramentada
Resolucion 10607/81 Minjusticia

7. por el Funcionario asistente de Autenticaciones, Departamento de Estado de los Estados Unidos

8. No. 10033298-12

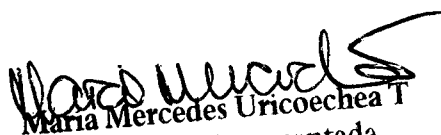
9. Sello

10. Firma
Sonya N. Johnson

LA ANTERIOR ES UNA TRADUCCIÓN FIEL Y COMPLETA DE LA CUAL SE DEJA COPIA EN LOS ARCHIVOS DE LA CALLE 84 NO. 18-38 (OF. 201) PARA SU CONFRONTACIÓN. TEL. 218 1007 - 623 3301

MARIA MERCEDES URICOECHEA T.
C.C. 41.319.274 BOGOTÁ
TRADUCTORA/INTÉRPRETE OFICIAL
RES. 10607 DEL 31 DE DBRE/81, MINJUSTICIA

FIN DE LA TRADUCCIÓN NO. 11.783


Maria Mercedes Uricoechea T.
Traductora Juramentada
Resolución 10607/81 Minjusticia



THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME;

UNITED STATES DEPARTMENT OF COMMERCE

United States Patent and Trademark Office

June 08, 2010

THIS IS TO CERTIFY THAT ANNEXED HERETO IS A TRUE COPY FROM THE RECORDS OF THE UNITED STATES PATENT AND TRADEMARK OFFICE OF THOSE PAPERS OF THE BELOW IDENTIFIED PATENT APPLICATION THAT MET THE REQUIREMENTS TO BE GRANTED A FILING DATE UNDER 35 USC 111.

APPLICATION NUMBER: 61/176,574

FILING DATE: May 08, 2009

THE COUNTRY CODE AND NUMBER OF YOUR PRIORITY APPLICATION, TO BE USED FOR FILING ABROAD UNDER THE PARIS CONVENTION, IS US61/176,574

By Authority of the
Under Secretary of Commerce for Intellectual Property
and Director of the United States Patent and Trademark Office




E. BORNETT
Certifying Officer

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Electronic Acknowledgement Receipt

EFS ID:	5300780
Application Number:	61176574
International Application Number:	
Confirmation Number:	8138
Title of Invention:	SEALED CORE
First Named Inventor/Applicant Name:	Lennox E. Reid, Jr.
Customer Number:	23718
Filer:	Darla Peters Fonseca/Kerry Morris
Filer Authorized By:	Darla Peters Fonseca
Attorney Docket Number:	20.3215
Receipt Date:	08-MAY-2009
Filing Date:	
Time Stamp:	13:01:27
Application Type:	Provisional

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	\$ 220
RAM confirmation Number	7893
Deposit Account	190610
Authorized User	
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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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	Provisional Cover Sheet (SB16)	203215_prov_cover1.pdf	34730 ae14088bf834c436070430778077ee77b5c292be	no	3

Warnings:

This is not a USPTO supplied Provisional Cover Sheet SB16 form.

Information:

2	Specification	203215_prov_appln1.pdf	55384 bac04b25a8f824ba5031df2dedf0d563e67fed5	no	20
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Warnings:

Information:

3	Drawings-only black and white line drawings	203215_prov_drawings1.pdf	438458 108fa9acb749cbde2c1c59c9c62572bf3d3cd293	no	9
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Warnings:

Information:

4	Fee Worksheet (PTO-875)	fee-info.pdf	28937 de24b1a37e4ac678cb75c6ce7f9e1f9ab19cd9d	no	2
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Warnings:

Information:

Total Files Size (in bytes):	557509
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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.

Doc Code: **TR.PROV**

Document Description: Provisional Cover Sheet (SB16)

PTO/SB/16 (04-07)

Approved for use through 06/30/2010 OMB 0651-0032

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

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

Provisional Application for Patent Cover Sheet

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53(c)

Inventor(s)

Inventor 1

Remove

Given Name	Middle Name	Family Name	City	State	Country ;
Lennox	E.	Reid, Jr.	Houston	TX	US

Inventor 2

Remove

Given Name	Middle Name	Family Name	City	State	Country ;
Carsten		Sonne	Birkerod		DK

All Inventors Must Be Listed – Additional Inventor Information blocks may be generated within this form by selecting the **Add** button.

Add

Title of Invention

SEALED CORE

Attorney Docket Number (if applicable)

20.3215

Correspondence Address

Direct all correspondence to (select one):

☒ The address corresponding to Customer Number

☐ Firm or Individual Name

Customer Number

23718

The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.

☒ No.

☐ Yes, the name of the U.S. Government agency and the Government contract number are:

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Entity Status

Applicant claims small entity status under 37 CFR 1.27

- ☐ Yes, applicant qualifies for small entity status under 37 CFR 1.27
☒ No

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 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.

Signature

Please see 37 CFR 1.4(d) for the form of the signature.

Signature	/Dave R. Hofman/			Date (YYYY-MM-DD)	2009-05-08
First Name	Dave R.	Last Name	Hofman	Registration Number (If appropriate)	55272

This collection of information is required by 37 CFR 1.51. 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 8 hours 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. **This form can only be used when in conjunction with EFS-Web. If this form is mailed to the USPTO, it may cause delays in handling the provisional application.**

Privacy Act Statement

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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.

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SEALED CORE

BACKGROUND OF THE DISCLOSURE

[0001] Cores extracted from a formation sidewall may include a portion of formation fluid trapped in the sidewall core. The cores are extracted from the formation at downhole condition (usually at pressure above 1,000 psi, and up to 30,000 psi in some cases), and brought to the surface for analysis, for example, in a surface laboratory. As the cores are brought to the surface, they experience a decompression from downhole pressure to surface pressure. The apparatus and methods of the present disclosure may reduce level of decompression experienced by the cores as they are brought to the surface.

SUMMARY OF THE DISCLOSURE

[0002] A sidewall coring tool comprises a core catching tube for storing one or more formation cores therein, at least a portion of the formation cores containing a formation fluid. The core catching tube includes at least a fluid port configured to evacuate a fluid located in the core catching tube as the one or more cores are introduced therein. The at least one fluid port is sealed downhole. The core catching tube may be provided with a cushion configured to maintain the pressure in the core catching tube once the at least fluid port is sealed. The core may be brought at the surface in the sealed core catching tube. At surface, the formation fluid contained in the at least portion of the formation cores is extracted from the core catching tube. The formation fluid properties may be analyzed.

DETAILED DESCRIPTION

[0003] It is to be understood that the following disclosure provides many different embodiments, or examples, for implementing different features of various embodiments.

Specific examples of components and arrangements are described below to simplify the present disclosure. These are, of course, merely examples and are not intended to be limiting. In addition, the present disclosure may repeat reference numerals and/or letters in the various examples. This repetition is for the purpose of simplicity and clarity and does not in itself dictate a relationship between the various embodiments and/or configurations discussed. Moreover, the formation of a first feature over or on a second feature in the description that follows may include embodiments in which the first and second features are formed in direct contact, and may also include embodiments in which additional features may be formed interposing the first and second features, such that the first and second features may not be in direct contact.

[0004] In U.S Patent No. 7,303,011, a downhole tool positionable in a wellbore penetrating a subterranean formation is disclosed. The downhole tool includes a housing, a coring bit and a sample chamber. The coring bit is disposed in the housing and is extendable therefrom for engaging a wellbore wall. The sample chamber stores at least two formation samples obtained with the coring bit and includes at least two portions for separately storing the formation samples.

[0005] In U.S. Patent Application Pub. No. 2008/0066534, a method of preserving hydrocarbon samples obtained from an underground formation is disclosed. The method includes delivering a coring tool to the formation, obtaining a core sample from the formation, the core sample including a hydrocarbon therein, capturing the core sample in a container, sealing the container downhole with the hydrocarbon contained therein, and storing the sealed container in the tool.

[0006] Aspects of the present disclosure may be used to:

- reduce the risk of explosive decompression of gasses trapped in the core pores,
- limit or prevent the loss of formation fluid trapped in the core pores, and/or

- limit or prevent invasion of the core pores by wellbore fluids.

[0007] The apparatus and methods disclosed herein may be used in both “wireline”, “on pipe”, and “while-drilling” applications.

[0008] FIG. 1 shows a schematic illustration of a wireline apparatus 101 deployed into a wellbore 105 from a rig 100 in accordance with this disclosure. The wireline apparatus 101 includes a coring tool 103. The coring tool 103 is illustrated as having a coring assembly 125 with a coring bit 121 and its associated actuation mechanisms 123, and a storage area 124 for storing core samples. The storage area 124 is configured to receive sample cores. At least one brace arm 122 may be provided to anchor the tool 101 in the borehole (not shown) when the coring bit 121 is functioning.

[0009] The wireline apparatus 101 may further include additional systems for performing other functions. One such additional system is illustrated in FIG. 1 as a formation testing tool 102 that is operatively connected to the coring tool 103 via field joint 104. The formation testing tool 102 may include a probe 111 that is extended from the formation testing tool 102 to be in fluid communication with a formation F. Back up pistons 112 may be included in the tool 101 to assist in pushing the probe 111 into contact with the sidewall of the wellbore and to stabilize the tool 102 in the borehole. The formation testing tool 102 shown in FIG. 1 also includes a pump 114 for pumping the sample fluid through the tool, as well as sample chambers 113 for storing fluid samples. The locations of these components are only schematically shown in FIG. 1, and may be provided in other locations within the tool than as illustrated. Other components may also be included, such as a power module, a hydraulic module, a fluid analyzer module, and other devices.

[0010] The apparatus of FIG. 1 is depicted as having multiple modules operatively connected together. The apparatus, however, may also be partially or completely unitary. For example, as

shown in FIG. 1, the formation testing tool 102 may be unitary, with the coring tool housed in a separate module operatively connected by field joint 104. Alternatively, the coring tool may be unitarily included within the overall housing of the apparatus 101.

[0011] Downhole tools often include several modules (i.e., sections of the tool that perform different functions). Additionally, more than one downhole tool or component may be combined on the same wireline to accomplish multiple downhole tasks in the same wireline run. The modules are typically connected by "field joints," such as the field joint 104 of FIG. 1. For example, one module of a formation testing tool typically has one type of connector at its top end and a second type of connector at its bottom end. The top and bottom connectors are made to operatively mate with each other. By using modules and tools with similar arrangements of connectors, all of the modules and tools may be connected end to end to form the wireline assembly. A field joint may provide an electrical connection, a hydraulic connection, and a flow line connection, depending on the requirements of the tools on the wireline. An electrical connection typically provides both power and communication capabilities.

[0012] In practice, a wireline tool will generally include several different components, some of which may be comprised of two or more modules (e.g., a sample module and a pump out module of a formation testing tool). In this disclosure, "module" is used to describe any of the separate tools or individual tool modules that may be connected in a wireline assembly.

"Module" describes any part of the wireline assembly, whether the module is part of a larger tool or a separate tool by itself. It is also noted that the term "wireline tool" is sometimes used in the art to describe the entire wireline assembly, including all of the individual tools that make up the assembly. In this disclosure, the term "wireline assembly" is used to prevent any confusion with the individual tools that make up the wireline assembly (e.g., a coring tool, a formation testing tool, and a resistivity imaging tool may all be included in a single wireline assembly).

[0013] The coring tool 103 is shown in greater detail in FIGS. 2A and 2B. The coring tool 103 includes a tool housing 150 extending along a longitudinal axis 152. The tool housing 150 defines a coring aperture 154 through which core samples are retrieved from the wellbore sidewall. The coring assembly 125 and storage area 124 are disposed within the tool housing 150.

[0014] The coring assembly 125 may be rotatably coupled to the tool housing 150. The coring bit 121 is mounted within the coring assembly 125 such that it may both slide axially and rotate within the coring assembly 125. A coring motor is also mounted on coring assembly 125 and is operably connected to the coring bit 121 to rotate the bit. The coring motor may be implemented with a hydraulic motor, however, any type of motor or mechanism capable of rotating the coring bit 121 may be used.

[0015] A first or rotation piston 172 is operably coupled to the coring assembly 125 to rotate the coring assembly 125 between the coring position (illustrated in FIG. 2A) and the eject position (illustrated in FIG. 2B). As shown in FIGS 2A and 2B the rotation piston 172 is coupled to the coring assembly 125 by an intermediate link arm 174. As the piston 172 moves from a retracted position shown in FIG. 2A to an extended position shown in FIG. 2B, the coring assembly 125 rotates about rotation link arms from the coring position to the eject position. The intermediate link arm 174 may also provide convenient means for communicating hydraulic fluid from one or more hydraulic flow lines 176 to the coring motor.

[0016] A series of pivotably coupled extension link arms is coupled to a portion, such as the thrust ring, of the coring bit 121 to provide a substantially constant weight on bit. The series of extension link arms may be coupled to a second or extension piston 182. With the series of extension link, movement of the second piston 182 will actuate the coring bit 121 between an extended position as shown in FIG. 2A and a retracted position as shown in FIG. 2B. As the

second piston 182 moves toward an extended position, it drives the coring bit 121 to the extended position. The amount of lost motion in the series of extension link arms may be kept essentially constant to transfer an almost constant percentage of the piston force to the coring bit 121. As a result, the series of extension link arms produces a more constant weight on bit across the entire range of travel of the coring bit 121.

[0017] From the foregoing, it will further be appreciated that extension of the coring bit 121 is substantially decoupled from the rotation of the coring assembly 125. The first piston 172 and intermediate link arm 174 are independent from the second piston 182 and series of extension link arms used to extend the coring bit 121. Accordingly, the first and second pistons 172, 182 may be operated substantially independent of one another, which may allow for additional functionality of the coring tool 103. For example, and notwithstanding any clearance issues with the tool housing 150 or other tool structures, the coring bit 121 may be extended at any time regardless of the position of the bit housing 156. Consequently, core samples may be obtained along a diagonal plane when the coring assembly 125 is held at an orientation somewhere between the eject and coring positions described above. While the first and second pistons 172, 182 may be operated independently, operation of one of the pistons may impact or otherwise require cooperation of the other piston. During rotation of the coring assembly 125, for example, the second piston 182 may be de-energized or controlled in a manner such as by dithering, to minimize any resistance the second piston 182 might exert against such rotation. The primary functions of the rotation of the coring assembly 125 and the extension of the coring bit 121, however, may be achieved independent of one another.

[0018] The coring tool 103 further includes a system for efficiently handling and storing multiple core samples. Accordingly, the storage area 124 may be configured to have at least first and second storage columns 222 and 224, at least one storage column being sized to receive a

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core catching tube 226 adapted to hold core samples 228. In the illustrated embodiment, one core catching tube 226 is shown holding six cores 228, however, the core catching tube may be sized to hold more or less than six cores depending on the dimensions of the storage area 124. For example, each core catching tube may be sized to hold at least ten cores 228.

[0019] Shifters 234, 236 may be provided to move the core catching tube 226, among other components, between the storage columns 222, 224. In the illustrated embodiment, the shifter 234 includes fingers adapted to grip an exterior of the core catching tube 226. The shifter 234 may rotate from a first position in which the core catching tube 226 registers with an axis of the first storage column 222, to a second position (as indicated as 234' in FIG. 2A) in which the core catching tube registers with an axis of the second storage column 224 (as indicated as 226' in FIG. 2A). The other shifter 236 is similarly rotatable between a first position in which the shifter 236 registers with an axis of the second storage column 224 and second position in which it registers with an axis of the first storage column 222 (as indicated as 236' in FIG. 2B). The shifter may be used to register a capture plug (not shown) with an upper throat of the core catching tube 266, as further described hereinafter. While two shifters 234 and 236 are depicted in FIGS 2A and 2B, the coring tool 103, the shifters may be omitted in some embodiments. Further, any number of shifters may be provided in the core storage area 124 for moving core catching tubes or other components such as separation or marking disks, sealing caps, etc.

[0020] A first transporter is provided for advancing cores from the coring bit 121 to the core catching tube 226 as it moves from a retracted position to an extended position. In the illustrated embodiment, the first transporter comprises a handling piston 240, such as a ball screw piston, which is positioned coaxially with respect to the first storage column 222 and is further coaxial with the coring bit 121 when the coring assembly 125 is in the eject position. The handling piston 240 includes a brush 244, and a foot 242 sized to engage a majority of the cross-sectional

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area of a core or an outer diameter of the core. The handling piston 240 may be actuated to an extended position in which it passes through the bit and/or through the shifter 236 and partially into an opening of the core catching tube 226, thereby transporting a recently obtained core from the coring bit 121 to the core catching tube 226 located in the first storage column 222, and cleaning the coring bit inner bore for eventual debris.

[0021] A second transporter, such as lift piston 250, may be provided essentially coaxial with the second storage column 224 and adapted to move from a retracted position to an extended position in which it passes through the shifter 234. As it moves to the extended position, the lift piston 250 may be used to engage sealing caps (not shown) to a core catching tube disposed in the second storage column 224, as further described hereinafter.

[0022] FIG. 3 shows a flow chart 300 of at least a portion of a method according to one or more aspects of the present disclosure. The method 300 may be performed with the wireline tool 103 of FIGS. 1, 2A and 2B. It should be appreciated that the order of execution of the steps depicted in the flow chart 300 may be changed and/or some of the steps described may be combined, divided, rearranged, omitted, eliminated and/or implemented in other ways within the scope of the present disclosure. In some cases, the method 300 may be used to obtain a sample of formation fluid present in the pores of formation core samples that would otherwise be difficult to obtain using a conventional sampling tool. For example, in tight gas reservoirs, or in heavy oil reservoirs, the mobility of the formation fluid may be low and conventional sampling of these reservoirs may be difficult.

[0023] At step 310, at least one core is captured from a wellbore sidewall. For example, the coring tool may be anchored in the wellbore at a location of interest. The coring assembly may be rotated into a coring position, and the coring bit may be extended into the adjacent formation. After the coring pit has penetrated the formation, the coring assembly may be further rotated to

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severe a core from the formation. The coring bit may be retracted into the coring assembly and the coring assembly may then be rotated into an eject position. A handling piston may be used to advance the recently obtained core into a core catching tube, and introduce the core through a throat of the core catching tube. The core catching tube may be filled with wellbore fluid, or may be filled with a gel disposed in the core catching tube prior to lowering the coring tool in the wellbore. As the core is inserted into the core catching tube, the fluid located in the core catching tube is displaced into the wellbore. For example, the core catching tube may include fluid passageways and/or ports to facilitate the evacuation of the fluid. One or more cores may be stored in the core catching tube. For example, an extension and rotation mechanism as described in U.S. Patent Application Pub No.2009/0025941, incorporated herein by reference, may be used to collect a plurality of cores in a single formation layer.

[0024] At step 320, the captured core is sealed downhole, in the core catching tube. More specifically, the ports of the core catching tube may be sealed, for example as further described hereinafter.

[0025] At step 330, the core sealed in the core catching tube is transported to the surface. The pressure in the core catching tube may be maintained, for example by using a cushion. As the core volume changes due to thermal expansion/contraction, and/or as the volume of the core catching tube expands under differential pressure, the pressure in the chamber may be kept at essentially the same level. At surface, the chamber may be detached from the coring tool and may be further secured for handling and/or transportation. For example, the chamber may be disposed in a DOT approved pressure vessel. Alternatively or additionally, breach locks disposed on the catching tube may be further secured by an operator.

[0026] At the well site or in laboratory, properties of the sealed core may be measured at step 340. More specifically, the properties may be measured while the core is still encapsulated in the

core catching tube. For example, at least a portion of the wall of the core catching tube may be configured to permit the transmission of magnetic field, electromagnetic waves, nuclear radiation therethrough. For example, the wall of the core catching tube may be made of polyether etherketone, fiber reinforced resin (e.g., fiber reinforced epoxy). Thus, the properties of the core and/or the positions of separation or marking disks located in the core catching tube may be determined. Example of core evaluation methods and/or suitable materials for core catching tubes may be found in U.S. Patent No. 7,500,388, incorporated herein by reference.

[0027] At the well site or in laboratory, gas and/or liquid may be extracted from the sealed core at step 350. For example, an access port of the core catching tube may be opened and fluidly connected to a bottle. Pressurized gas may then controllably leak into the bottle. In some cases, liquid may also be extracted. For example, the core catching tube may be disposed in a vessel. A piston disposed in the core catching tube may be energized to compress the cores and extract fluid therefrom into the bottle. One example of such technique may be found in PCT Patent Application Pub. No. WO 2008/098359, incorporated herein by reference.

[0028] At step 360, the extracted fluid (gas and/or liquid) may be analyzed to determine, for example, a composition of the fluid. In some cases, gas chromatography may be used to determine the composition of the extracted fluid.

[0029] FIG. 4A shows a core catching tube 430, a capture plug 400, and a lower cap 470 according to one or more aspects of the present disclosure. For example, the core catching tube 430 may be used to implement the core catching tube 226 in FIGS. 2A and 2B.

[0030] The core catching tube 430 comprises a wall, such as a sleeve 450. The sleeve 450 may be made of any material suitable for downhole use, and may be adapted to withstand or bear internal pressure. In some cases, at least a portion of the sleeve 450 may be configured to permit the transmission of magnetic field, electromagnetic waves, nuclear radiation therethrough. For

example, the sleeve 450 may be made of polyether etherketone, fiber reinforced resin (e.g., fiber reinforced epoxy). The sleeve 450 comprises one or more slots 440. The slots 440 may be configured to facilitate the circulation of a fluid (e.g., wellbore fluid, gel) present in the sleeve 450 as cores are advanced in the sleeve 450. The sleeve 450 may also comprise ports 445, configured to facilitate the evacuation of the fluid present in the sleeve 450 as cores are advanced in the sleeve 450 and/or as the capture plug is inserted into the sleeve 450. The fluid may escape the sleeve 450 through at least one of an upper throat 431 of the core catching tube 430 and the ports 445. The core catching tube 430 may further comprise a cushion 465 (e.g., a nitrogen chamber pressurized at surface). The cushion 465 may be configured to reduce shocks to the cores during transportation and handling of the cores, and/or to maintain the pressure in the core catching tube 430 when the tube is sealed. Additionally or alternatively, the cushion 465 may be configured to reduce its volume as the capture plug 400 and/or the lower cap 470 are partially inserted into the core catching tube 430 thereby facilitating the insertion.

[0031] The capture plug 400 comprises a plurality of breach lock pins 410, each configured to engage a guiding J-slot 435 of the sleeve 450. The capture plug 400 also comprises a seal 405 configured to engage a seal surface 436 of the sleeve 450. The seal 405 may be a radial seal, such as a stepped radial seal (as shown), configured to prevent cutting the seal during insertion of the capture plug 400. The seal 405 may also be a corner seal. The capture plug 400 may comprise a formation fluid passageway 415. The passageway 415 may include an access port plug 420, for example a quick connect port. The passageway 415 may be provided with a check valve 425, configured to prevent pressure and/or fluid losses prior to inserting a sampling tube (not shown) in the access port.

[0032] The lower cap 470 comprises a plurality of retaining arms 480 having a protrusion configured engage a crimp guide 445, for example affixed to the core catching tube 430, and to

crimp on a groove 460 of the core catching tube 430. The lower cap 470 also comprises a seal 475, for example an O-ring, or a gasket, configured to seal against an outer surface of the core catching tube 430. Optionally, the lower cap 470 may comprise a formation fluid passageway 485. The passageway 485 may include an access port plug 490, for example a quick connect port. The passageway 485 may be provided with a check valve 495, configured to prevent pressure and/or fluid losses prior to inserting a sampling tube (not shown) in the access port.

[0033] Example operation of the core catching tube 430, the capture plug 400, and the lower cap 470 is now described in reference to FIGS. 2A, 2B, 4A and 4B. The core catching tube 430 may be disposed in the first storage column 222. The capture plug 400 and the lower cap 470 may be disposed respectively at the bottom and top of the second storage column 224. The capture plug 400 and the lower cap 470 may be held in place with a retention device (not shown). The coring tool 103 may be used to acquire a plurality of cores 472, and store the cores in the core catching tube 430.

[0034] When desired, the obtained cores may be sealed in the wellbore. For example, one of the shifters 234 and/or 236 may be actuated to register or align the core catching tube 430 with the capture plug 400 and the lower cap 470 located in the second storage column 224, as indicated by the arrow 433. The lift piston 250 may be actuated to lift the lower cap 470 and the core catching tube 430, as indicated by the arrow 434. Consequently, the capture plug 400 is inserted into the upper throat 431 of the core catching tube 430. The seal 405 engages the sealing surface 436. Fluid in the sleeve 450 may still escape the coring chamber 430 through the ports 445. Also, the breach lock pins 410 are guided in the J-slots 435. In some cases, capture plug 400 is free to rotate with respect to the core catching tube 430. Thus, the breach lock pins 410 may secure the capture plug 400 on top of the core catching tube 430. Alternatively, the core catching tube 430 may be rotated at surface by an operator to insure proper securing of the

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capture plug 400 on the core catching tube 430. Further, the retaining arms 480 engage a clearance between the core catching tube 430 and the crimp guide 455. The retaining arms 480 are crimped and the protrusion at the distal end thereof locks into the groove 460. The seal 475 engages an outer surface of the core catching tube 430, and prevents fluid in the sleeve 450 from escaping through the ports 445. Fluid trapped in the core catching tube may compress the cushion 465, therefore reducing the amount of force needed to move the lower cap 470 against the core catching tube 430. Thus, the cores 472 are sealed in the core catching tube 430.

[0035] The core catching tube 430, the capture plug 400, and the lower cap 470 may be conveyed to the surface by the coring tool 103. During transportation, volume changes may be compensated by the cushion 465, thereby maintaining the pressure in the core catching tube 430.

[0036] At surface, the core catching tube 430, the capture plug 400, and the lower cap 470 may be removed from the coring tool 103 as shown in Fig. 4B. One or more of the access ports 415 and/or 485 may then be open to collect fluid (gas and/or liquid) from the coring chamber 430. The fluid may be collected in a pressurized bottle (not shown), and/or analyzed.

[0037] FIG. 5 shows a horizontal cross section of the sleeve 250 shown in FIGS. 4A and 4B. One example design of the slots 440 is shown in greater details.

[0038] FIG. 6A shows a capture plug 500 and a core catching tube 530 according to one or more aspects of the present disclosure.

[0039] The capture plug 500 may be similar to the capture plug 400 of FIGS. 4A and 4B. In this example however, the capture plug 500 includes a shoulder 521, configured to abut a corresponding shoulder 553 of the core catching tube 530.

[0040] The core catching tube 530 comprises a perforated sleeve 550 and an isolation sleeve 551. The isolation sleeve 551 is configured to reciprocate along the axis of the perforated sleeve 550. Seals, such as O-rings, may be provided therebetween. In a first position (as shown),

apertures of the perforated sleeve 550 substantially align with apertures in the isolation sleeve 551 and cooperate to define ports 545. The ports 545 may be configured to facilitate the evacuation of the fluid located in the sleeve 550 as cores 572 are advanced in the perforated sleeve 550 and/or as the capture plug 500 is inserted into the isolation sleeve 551. The ports 545 may be maintained in an open position, for example using a spring 552. Thus, the ports 545 are in a normally open position.

[0041] Example operation of the core catching tube 530, and the capture plug 500, is now described in reference to FIGS. 2A, 2B, 6A. A plurality of cores 572 are extracted from the formation and inserted in the core catching tube 530. Fluid located in the core catching tube 530 is evacuated through the ports 545. If desired, separation or marking disks 573 may be inserted between the cores. For example, the separation or marking disks 573 may be stored in the second storage column 224, and may be inserted in the core catching tube 530 using the shifter 236. A capture plug 500 may also be stored in the second storage column 224. As indicated by arrow 533, the capture plug 500 is aligned with a throat of the core catching tube 530 using the shifter 236. Then the capture plug 500 is inserted on the core catching tube 530 using the handling piston 240. The distance between the breach lock pins and the shoulder 521 is adapted to lower the surface 533 and the isolation sleeve 551 by a sufficient amount so that the ports 545 close. Thus, the cores 573 are sealed in the core catching tube 530.

[0042] At surface, the location of separation or marking disks 573, among other things may be detected by transmitting one of a magnetic field, an electromagnetic waves, a nuclear radiation through the sleeves 550 and 551, and measuring a transmitted quantity. Also, gas and/or liquid may be extracted from the sealed core catching tube as previously described.

[0043] FIG. 6B shows a capture plug 600 and a core catching tube 630 according to one or more aspects of the present disclosure. The capture plug 600 and the core catching tube 630 may be used in lieu of the capture plug 500 and the core catching tube 530 of FIG. 6A.

[0044] The capture plug 600 is provided with a piston 605 having a seal 610 configured to engage the inner bore of the perforated sleeve 650. The piston 605 is affixed to a ram 620 extending through the length of the capture plug 600. The ram may include a thread 625. A seal 615 is provided between the ram 620 and the body of the capture plug 600.

[0045] The core catching tube 630 is similar to the core catching tube 530 of FIG. 6A. However, the spring 652 is configured to maintain the plurality of ports 645 in a normally closed position. Further, the isolation sleeve 651 is adapted to be recessed, so that an actuating mechanism 621, for example a fork, can be engaged against the shoulder 653. The actuating mechanism 621 may be moved in down direction to open the ports 645. When desired, the ports 645 may be closed by releasing the force applied by the actuating mechanism 621.

[0046] The capture plug 600 and a core catching tube 630 may be used similarly to the capture plug 500 and a core catching tube 530. In addition, the piston 605 may be connected to a force member (not shown) for example via the thread 625. The piston may be used to apply a force on the core samples and mechanically extract liquid and/or gas from the pores of the core samples. In some cases, separation or marking disks 673 may be placed between cores, and more specifically at least between cores extracted from different formations. The separation or marking disks 673 may include a seal 674 configured to engage the inner bore of the core catching tube 630. The location of separation or marking disks 673 may be detected as previously described. The relative position of the separation or marking disks 673 ports 645 may be determined. Thus, liquid and/or gas from cores between two disks 673 may be collected through a corresponding port 645.

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[0047] FIG. 8 shows core holders 735a, 735b, capture plugs 700a, 700b, and lower caps 770a, 770b according to one or more aspects of the present disclosure. The embodiment illustrated in FIG. 8 may be used to store each individual core (such as core 772) in its own pressurized container.

[0048] The core lower caps 770a and 770b include a locking mechanism (not shown), such as a crimping device or a breach lock device, as previously described, configured to engage the core holders 735a and 735b, respectively. Further, the core holders 735a and 735b include a locking mechanism (not shown) configured to engage the capture plugs 700a and 700b, respectively.

[0049] The capture plugs 700a and 700b may include a sealed access port (such as a quick connect port), and an optional actuated check valve as previously described. The core holders 735a and 735b include one or more ports 745 configured to facilitate the evacuation of the fluid present in the core holders 735a and 735b as cores are advanced in the core holders 735a and 735b and/or as the capture plug 700a and 700b are inserted into the core holders 735a and 735b. Further, the walls of the core holders 735a and 735b may include slots, as previously described. The core lower caps 770a and 770b include a cushion 765 for allowing fluid present in the core holders 735a and 735b to flow into a sealed chamber 766 as the capture plug 700a and 700b are inserted into the core holders 735a and 735b, thereby facilitating the insertion of the capture plugs.

[0050] Example operation is now described in reference to FIGS. 2A, 2B, and 8. A plurality of capture plugs, core holders, and lower caps may be stored in the second storage columns 224. As shown, the plurality of capture plugs, core holders, and lower caps may be stored in the second storage columns 224 may be stored in reverse order, thereby preventing interlocking therebetween. First, a lower cap, such as the lower cap 770a is lifted into a position in which it

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engages the shifter 236, for example using a lead screw 720 coupled to an elevator plate 725. As indicated by arrow 733, the shifter 236 is actuated to register the lower cap 770a with the first storage columns 222, and the handling piston 240 is actuated to advance the lower cap 770a into the first storage column 222. Then, a core holder, such as the core holder 735a is lifted into a position in which it engages the shifter 236, using the lead screw 720 and the elevator plate 725. The shifter 236 is actuated to register the core holder 735a with the first storage columns 222. The coring assembly 125 is used to obtain a core 772. The handling piston 240 is extended to dispose the obtained core into the core holder 735a. The handling piston 240 is further extended to lock the lower cap 770a and the core holder 735a. Then, a capture plug, such as the capture plug 700a is lifted into a position in which it engages the shifter 236, using the lead screw 720 and the elevator plate 725. The shifter 236 is actuated to register the capture plug 700a with the first storage columns 222. The handling piston 240 is extended to lock the core holder 735a and the capture plug 700a. During operation, the elevator plate 715 may be lowered as desired, for example using a lead screw 710. More cores may be captured.

[0051] FIG. 9 shows an alternate aspect of the present disclosure. This aspect may be implemented using the coring tool 103 of FIGS. 2A and 2B. Alternatively, this aspect may be implemented using other coring tools, such as the coring tools described in U.S. Patent Nos. 4,714,119 and/or 5,667,025, incorporated herein by reference.

[0052] In this aspect, a pressure bearing core catching tube 5 is provided within a storage section of a coring tool, although some portions may be in the coring section. The core catching tube 5 may be a solid, un-perforated tube, a portion of which having a plurality of slots 3. The lower head of the core catching tube 5 may include a bottom isolation valve 6. The bottom isolation valve 6 may be a ball valve, a gate valve, or any other pressure bearing fluid valve. In open position, the bottom isolation valve 6 may be used to allow mud or other fluid to be ejected

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from the core catching tube 5 as cores are inserted therein. In close position, the bottom isolation valve 6 may be used to hydraulically isolate the core catching tube 5, for example once the tube is filled and/or upon a command to the coring tool initiated by a surface operator. A perforated core support 8 may be installed above the bottom isolation valve 6, for example to insure mechanical integrity of the core samples in the core catching tube 5. Optionally, a spring or fluid cushion 7 may be provided to reduce the mechanical shock seen while acquiring and/or conveying the cores. The spring or fluid cushion 7 may be beneficial to preserve the mechanical integrity of the samples. In addition, separation/marketing disks (not shown) may be inserted in the core catching tube 5 between stored cores. Further, the core catching tube 5 is provided with a throat isolation valve 11. The throat isolation valve 11 may be a large ball valve, or a sliding gate valve. In some cases, the bottom isolation valve 6 and the throat isolation valve 11 are detachably coupled to a valve actuating mechanism (not shown) disposed in the body of the coring tool.

[0053] In operation, the core catching tube 5 is filled with one or more cores. The bottom isolation valve 6 is closed. The upper throat of the core catching tube 5 may also be sealed using the throat isolation valve 11. The core catching tube 5 is brought to the Earth's surface. The core catching tube 5, the bottom isolation valve 6 and the throat isolation valve 11 may be detached from the coring tool. The bottom isolation valve 6 may be coupled to a surface actuating mechanism. The bottom isolation valve 6 may be open and fluid (gas and/or liquid) may be extracted from the core catching tube 5.

[0054] The foregoing outlines features of several embodiments so that those skilled in the art may better understand the aspects of the present disclosure. Those skilled in the art should appreciate that they may readily use the present disclosure as a basis for designing or modifying other processes and structures for carrying out the same purposes and/or achieving the same

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advantages of the embodiments introduced herein. Those skilled in the art should also realize that such equivalent constructions do not depart from the spirit and scope of the present disclosure, and that they may make various changes, substitutions and alterations herein without departing from the spirit and scope of the present disclosure.

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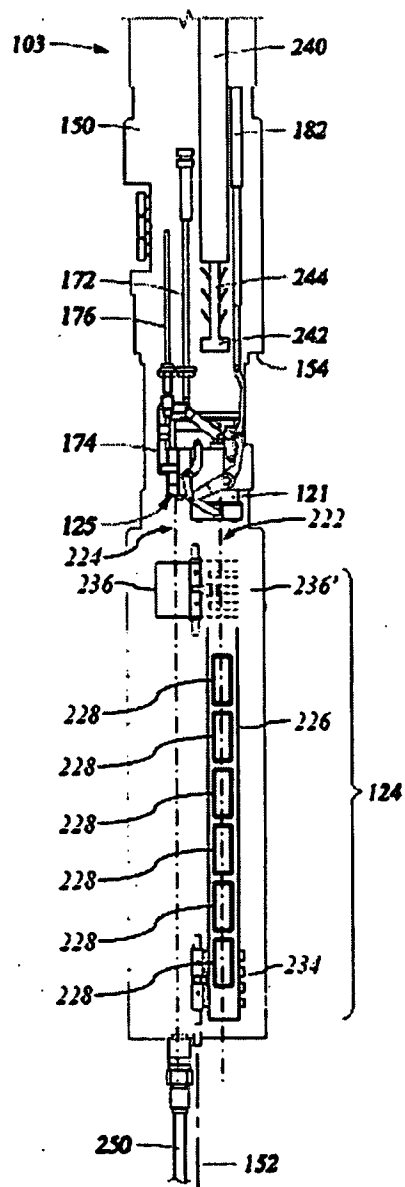
WHAT IS CLAIMED IS:

1. An apparatus according to one or more aspects of the present disclosure.
2. A method or process according to one more aspects of the present disclosure.
3. A program product having recorded thereon instructions for performing one or more steps of a method or process according to one or more aspects of the present disclosure.
4. A system according to one or more aspects of the present disclosure.
5. A device according to one or more aspects of the present disclosure.
6. A component according to one or more aspects of the present disclosure.
7. An assembly according to one or more aspects of the present disclosure.
8. A kit having one or more items according to one or more aspects of the present disclosure.

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Fig. 1 is a schematic diagram of a wellbore system. The upper portion shows a derrick (100) with a hook and cable system. The lower portion shows a wellbore (101) with a tool string (102) and a packer (103). The tool string (102) includes components 111, 112, 113, 114, 121, 122, 123, 124, and 125. The packer (103) is positioned at the bottom of the wellbore.

Fig. 2B



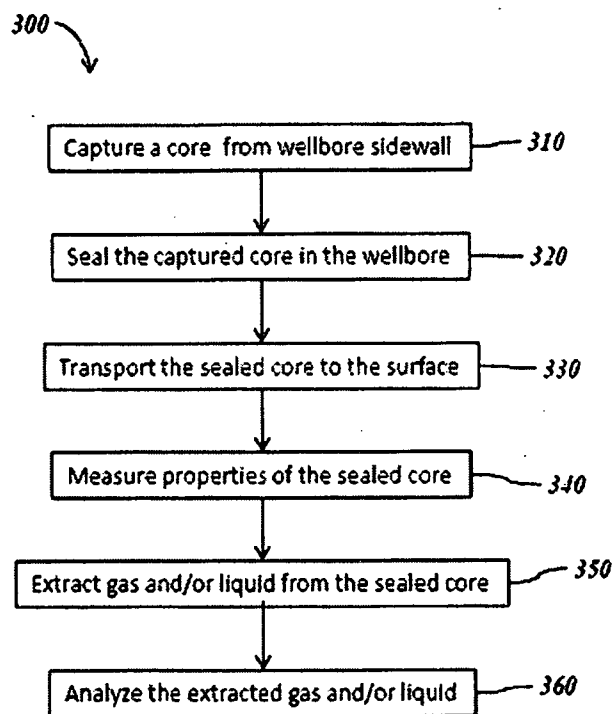
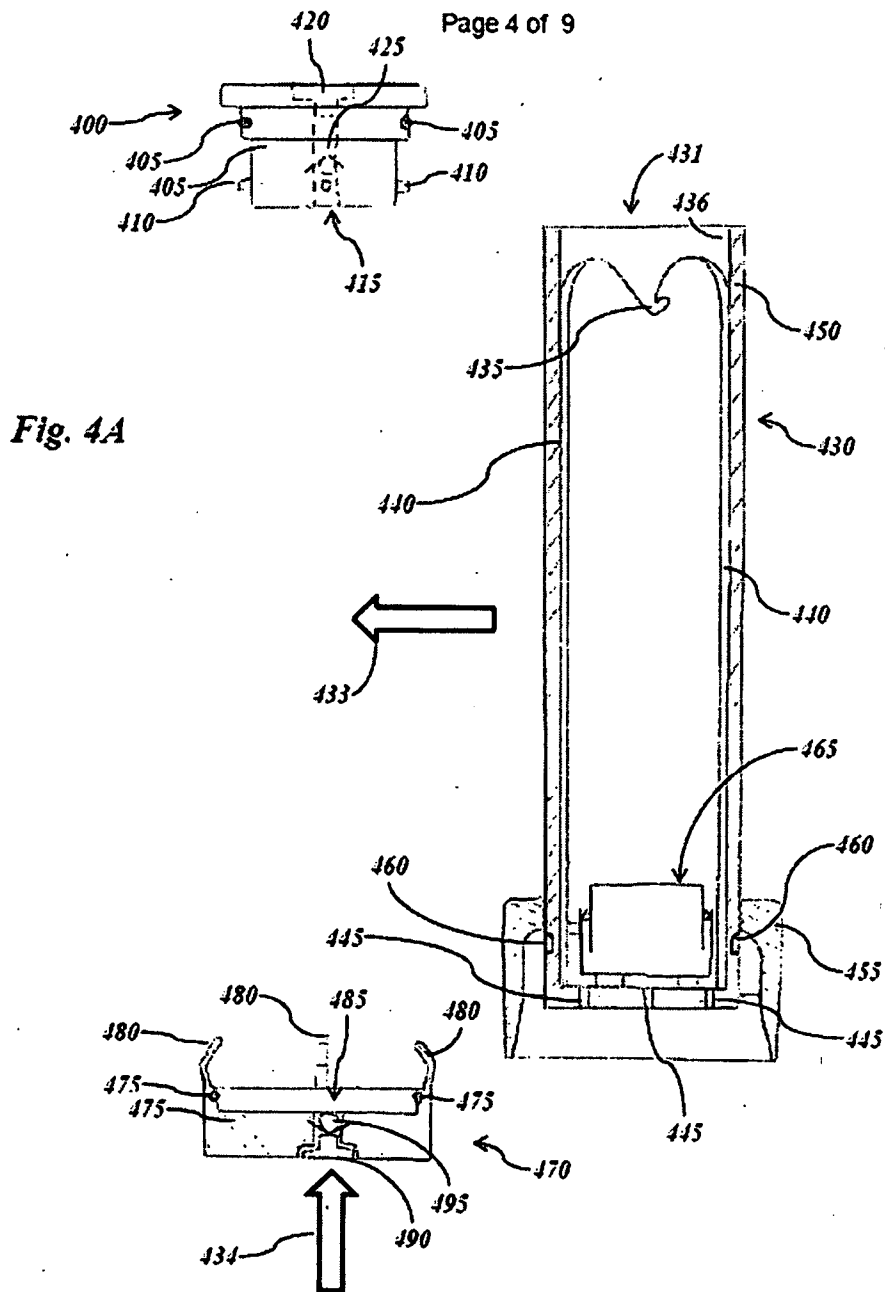


Fig. 3

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Fig. 4B

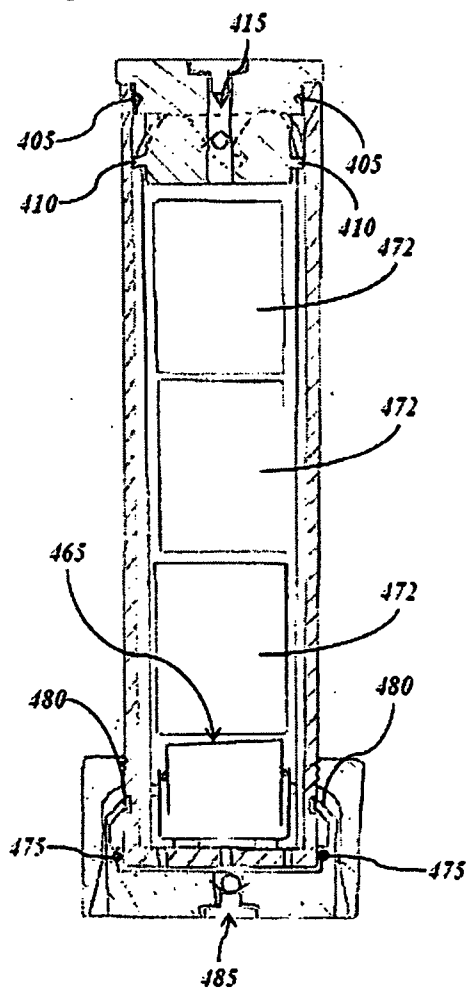
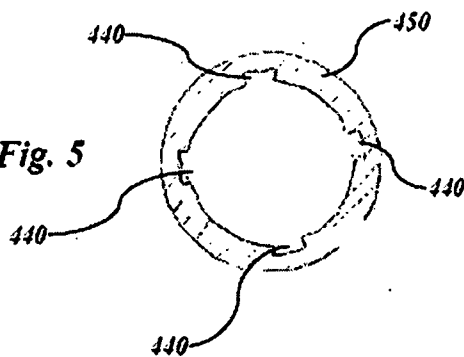
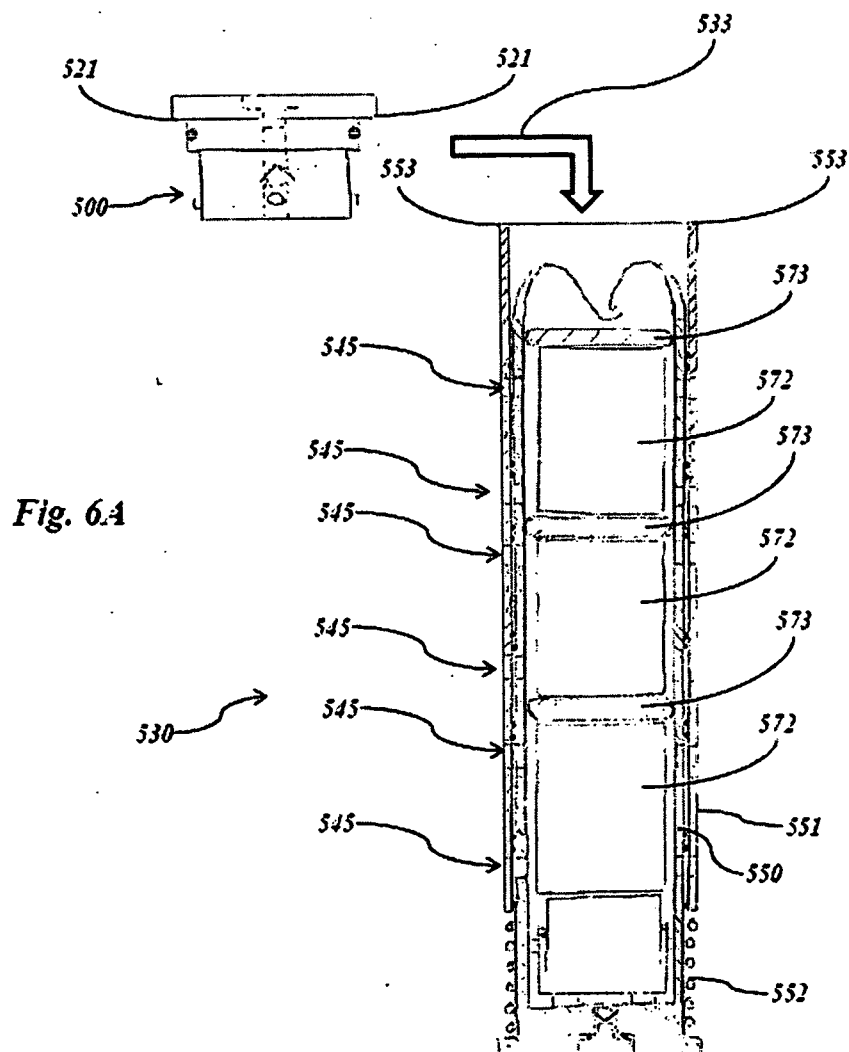


Fig. 5



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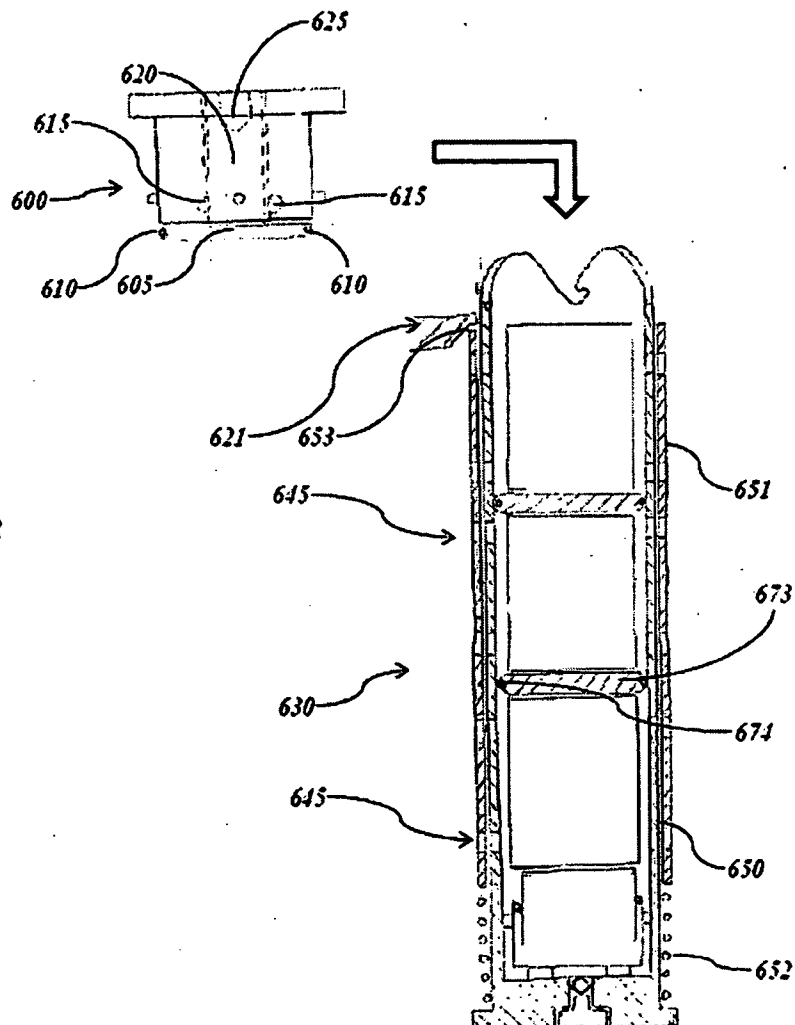
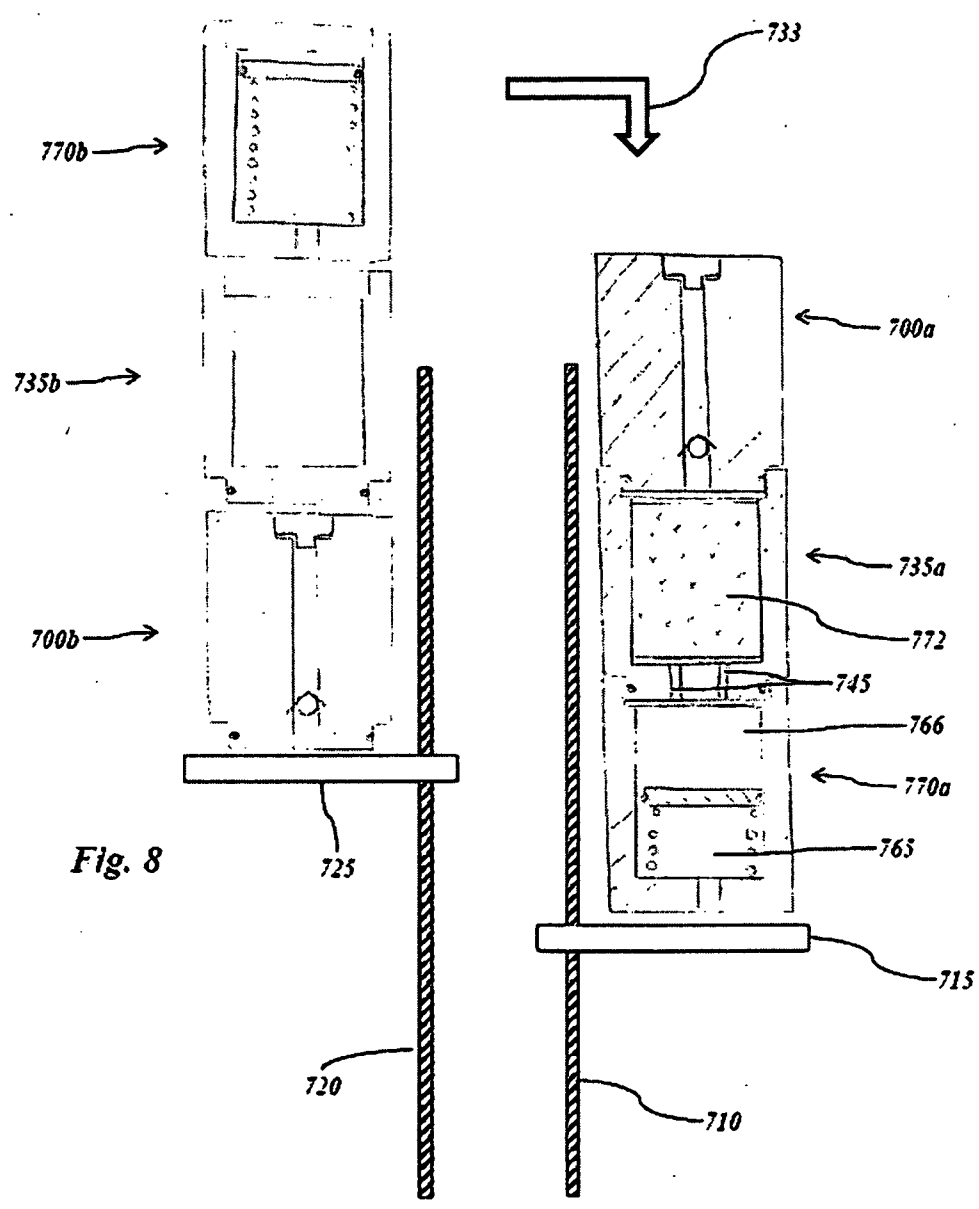


Fig. 6B

off

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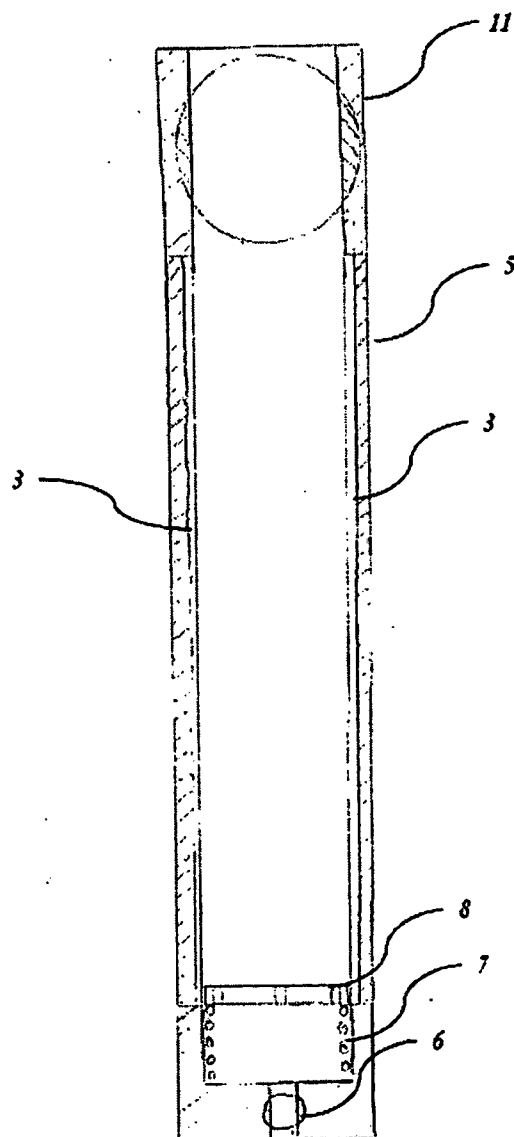


Fig. 9

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June 08, 2010

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APPLICATION NUMBER: 61/187,126

FILING DATE: June 15, 2009

THE COUNTRY CODE AND NUMBER OF YOUR PRIORITY APPLICATION, TO BE USED FOR FILING ABROAD UNDER THE PARIS CONVENTION, IS US61/187,126

By Authority of the
Under Secretary of Commerce for Intellectual Property
and Director of the United States Patent and Trademark Office




E. BORNETT
Certifying Officer

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Electronic Acknowledgement Receipt

EFS ID:	5518629
Application Number:	61187126
International Application Number:	
Confirmation Number:	1952
Title of Invention:	SEALED CORE
First Named Inventor/Applicant Name:	Lennox E. Reid, Jr.
Customer Number:	23718
Filer:	Darla Peters Fonseca/Kerry Morris
Filer Authorized By:	Darla Peters Fonseca
Attorney Docket Number:	20.3215PSP1
Receipt Date:	15-JUN-2009
Filing Date:	
Time Stamp:	17:19:20
Application Type:	Provisional

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	\$220
RAM confirmation Number	3502
Deposit Account	190610
Authorized User	

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126

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Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Provisional Cover Sheet (SB16)	203215PSP1_ProvCover1.pdf	34724	no	3
			d16d41c8d72db23565b510acfedc3ca34805206d		

Warnings:

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Information:

2	Drawings-only black and white line drawings	203215PSP1_drawings1.pdf	444153	no	10
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Warnings:

Information:

3	Specification	203215PSP1_specification1.pdf	55968	no	20
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Warnings:

Information:

4	Fee Worksheet (PTO-875)	fee-info.pdf	28941	no	2
			454ad2f6699b0d27351fde5063cf1295ab71e61d		

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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

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Provisional Application for Patent Cover Sheet

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53(c)

Inventor(s)

Inventor 1

Remove

Given Name	Middle Name	Family Name	City	State	Country ;
Lennox	E.	Reid, Jr.	Houston	TX	US

Inventor 2

Remove

Given Name	Middle Name	Family Name	City	State	Country ;
Carsten		Sonne	Houston	TX	US

All Inventors Must Be Listed – Additional Inventor Information blocks may be generated within this form by selecting the **Add** button.**Add****Title of Invention**

SEALED CORE

Attorney Docket Number (if applicable)

20.3215PSP1

Correspondence Address

Direct all correspondence to (select one):

☒ The address corresponding to Customer Number☐ Firm or Individual Name

Customer Number

23718

The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.

☒ No.☐ Yes, the name of the U.S. Government agency and the Government contract number are:

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Entity Status

Applicant claims small entity status under 37 CFR 1.27

- ☐ Yes, applicant qualifies for small entity status under 37 CFR 1.27
- ☒ No

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Signature

Please see 37 CFR 1.4(d) for the form of the signature.

Signature	/Dave R. Hofman/			Date (YYYY-MM-DD)	2009-06-15
First Name	Dave R.	Last Name	Hofman	Registration Number (If appropriate)	55272

This collection of information is required by 37 CFR 1.51. 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 8 hours 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. **This form can only be used when in conjunction with EFS-Web. If this form is mailed to the USPTO, it may cause delays in handling the provisional application.**

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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:

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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.

SEALED CORE**BACKGROUND OF THE DISCLOSURE**

[0001] Cores extracted from a formation sidewall may include a portion of formation fluid trapped in the sidewall core. The cores are extracted from the formation at downhole condition (usually at pressure above 1,000 psi, and up to 30,000 psi in some cases), and brought to the surface for analysis, for example, in a surface laboratory. As the cores are brought to the surface, they experience a decompression from downhole pressure to surface pressure. The apparatus and methods of the present disclosure may reduce level of decompression experienced by the cores as they are brought to the surface.

SUMMARY OF THE DISCLOSURE

[0002] A sidewall coring tool comprises a core catching tube for storing one or more formation cores therein, at least a portion of the formation cores containing a formation fluid. The core catching tube includes at least a fluid port configured to evacuate a fluid located in the core catching tube as the one or more cores are introduced therein. The at least one fluid port is sealed downhole. The core catching tube may be provided with a cushion configured to maintain the pressure in the core catching tube once the at least fluid port is sealed. The core may be brought at the surface in the sealed core catching tube. At surface, the formation fluid contained in the at least portion of the formation cores is extracted from the core catching tube. The formation fluid properties may be analyzed.

DETAILED DESCRIPTION

[0003] It is to be understood that the following disclosure provides many different embodiments, or examples, for implementing different features of various embodiments.

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Specific examples of components and arrangements are described below to simplify the present disclosure. These are, of course, merely examples and are not intended to be limiting. In addition, the present disclosure may repeat reference numerals and/or letters in the various examples. This repetition is for the purpose of simplicity and clarity and does not in itself dictate a relationship between the various embodiments and/or configurations discussed. Moreover, the formation of a first feature over or on a second feature in the description that follows may include embodiments in which the first and second features are formed in direct contact, and may also include embodiments in which additional features may be formed interposing the first and second features, such that the first and second features may not be in direct contact.

[0004] In U.S. Patent No. 7,303,011, a downhole tool positionable in a wellbore penetrating a subterranean formation is disclosed. The downhole tool includes a housing, a coring bit and a sample chamber. The coring bit is disposed in the housing and is extendable therefrom for engaging a wellbore wall. The sample chamber stores at least two formation samples obtained with the coring bit and includes at least two portions for separately storing the formation samples.

[0005] In U.S. Patent Application Pub. No. 2008/0066534, a method of preserving hydrocarbon samples obtained from an underground formation is disclosed. The method includes delivering a coring tool to the formation, obtaining a core sample from the formation, the core sample including a hydrocarbon therein, capturing the core sample in a container, sealing the container downhole with the hydrocarbon contained therein, and storing the sealed container in the tool.

[0006] Aspects of the present disclosure may be used to:

- reduce the risk of explosive decompression of gasses trapped in the core pores,
- limit or prevent the loss of formation fluid trapped in the core pores, and/or

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- limit or prevent invasion of the core pores by wellbore fluids.

[0007] The apparatus and methods disclosed herein may be used in both “wireline”, “on pipe”, and “while-drilling” applications.

[0008] FIG. 1 shows a schematic illustration of a wireline apparatus 101 deployed into a wellbore 105 from a rig 100 in accordance with this disclosure. The wireline apparatus 101 includes a coring tool 103. The coring tool 103 is illustrated as having a coring assembly 125 with a coring bit 121 and its associated actuation mechanisms 123, and a storage area 124 for storing core samples. The storage area 124 is configured to receive sample cores. At least one brace arm 122 may be provided to anchor the tool 101 in the borehole (not shown) when the coring bit 121 is functioning.

[0009] The wireline apparatus 101 may further include additional systems for performing other functions. One such additional system is illustrated in FIG. 1 as a formation testing tool 102 that is operatively connected to the coring tool 103 via field joint 104. The formation testing tool 102 may include a probe 111 that is extended from the formation testing tool 102 to be in fluid communication with a formation F. Back up pistons 112 may be included in the tool 101 to assist in pushing the probe 111 into contact with the sidewall of the wellbore and to stabilize the tool 102 in the borehole. The formation testing tool 102 shown in FIG. 1 also includes a pump 114 for pumping the sample fluid through the tool, as well as sample chambers 113 for storing fluid samples. The locations of these components are only schematically shown in FIG. 1, and may be provided in other locations within the tool than as illustrated. Other components may also be included, such as a power module, a hydraulic module, a fluid analyzer module, and other devices.

[0010] The apparatus of FIG. 1 is depicted as having multiple modules operatively connected together. The apparatus, however, may also be partially or completely unitary. For example, as

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shown in FIG. 1, the formation testing tool 102 may be unitary, with the coring tool housed in a separate module operatively connected by field joint 104. Alternatively, the coring tool may be unitarily included within the overall housing of the apparatus 101.

[0011] Downhole tools often include several modules (i.e., sections of the tool that perform different functions). Additionally, more than one downhole tool or component may be combined on the same wireline to accomplish multiple downhole tasks in the same wireline run. The modules are typically connected by "field joints," such as the field joint 104 of FIG. 1. For example, one module of a formation testing tool typically has one type of connector at its top end and a second type of connector at its bottom end. The top and bottom connectors are made to operatively mate with each other. By using modules and tools with similar arrangements of connectors, all of the modules and tools may be connected end to end to form the wireline assembly. A field joint may provide an electrical connection, a hydraulic connection, and a flow line connection, depending on the requirements of the tools on the wireline. An electrical connection typically provides both power and communication capabilities.

[0012] In practice, a wireline tool will generally include several different components, some of which may be comprised of two or more modules (e.g., a sample module and a pump out module of a formation testing tool). In this disclosure, "module" is used to describe any of the separate tools or individual tool modules that may be connected in a wireline assembly.

"Module" describes any part of the wireline assembly, whether the module is part of a larger tool or a separate tool by itself. It is also noted that the term "wireline tool" is sometimes used in the art to describe the entire wireline assembly, including all of the individual tools that make up the assembly. In this disclosure, the term "wireline assembly" is used to prevent any confusion with the individual tools that make up the wireline assembly (e.g., a coring tool, a formation testing tool, and a resistivity imaging tool may all be included in a single wireline assembly).

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[0013] The coring tool 103 is shown in greater detail in FIGS. 2A and 2B. The coring tool 103 includes a tool housing 150 extending along a longitudinal axis 152. The tool housing 150 defines a coring aperture 154 through which core samples are retrieved from the wellbore sidewall. The coring assembly 125 and storage area 124 are disposed within the tool housing 150.

[0014] The coring assembly 125 may be rotatably coupled to the tool housing 150. The coring bit 121 is mounted within the coring assembly 125 such that it may both slide axially and rotate within the coring assembly 125. A coring motor is also mounted on coring assembly 125 and is operably connected to the coring bit 121 to rotate the bit. The coring motor may be implemented with a hydraulic motor, however, any type of motor or mechanism capable of rotating the coring bit 121 may be used.

[0015] A first or rotation piston 172 is operably coupled to the coring assembly 125 to rotate the coring assembly 125 between the coring position (illustrated in FIG. 2A) and the eject position (illustrated in FIG. 2B). As shown in FIGS 2A and 2B the rotation piston 172 is coupled to the coring assembly 125 by an intermediate link arm 174. As the piston 172 moves from a retracted position shown in FIG. 2A to an extended position shown in FIG. 2B, the coring assembly 125 rotates about rotation link arms from the coring position to the eject position. The intermediate link arm 174 may also provide convenient means for communicating hydraulic fluid from one or more hydraulic flow lines 176 to the coring motor.

[0016] A series of pivotably coupled extension link arms is coupled to a portion, such as the thrust ring, of the coring bit 121 to provide a substantially constant weight on bit. The series of extension link arms may be coupled to a second or extension piston 182. With the series of extension link, movement of the second piston 182 will actuate the coring bit 121 between an extended position as shown in FIG. 2A and a retracted position as shown in FIG. 2B. As the

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second piston 182 moves toward an extended position, it drives the coring bit 121 to the extended position. The amount of lost motion in the series of extension link arms may be kept essentially constant to transfer an almost constant percentage of the piston force to the coring bit 121. As a result, the series of extension link arms produces a more constant weight on bit across the entire range of travel of the coring bit 121.

[0017] From the foregoing, it will further be appreciated that extension of the coring bit 121 is substantially decoupled from the rotation of the coring assembly 125. The first piston 172 and intermediate link arm 174 are independent from the second piston 182 and series of extension link arms used to extend the coring bit 121. Accordingly, the first and second pistons 172, 182 may be operated substantially independent of one another, which may allow for additional functionality of the coring tool 103. For example, and notwithstanding any clearance issues with the tool housing 150 or other tool structures, the coring bit 121 may be extended at any time regardless of the position of the bit housing 156. Consequently, core samples may be obtained along a diagonal plane when the coring assembly 125 is held at an orientation somewhere between the eject and coring positions described above.

[0018] For example, Figs. 2C-2F illustrated exemplary implementations of the coring tool 103 deployed in a wellbore extending through a formation in which the bedding plane is substantially not normal to the axis of the wellbore. In Fig. 2C, the coring tool 103 is coupled to an orientation sub configured to rotate the coring tool 103 within the wellbore. Consequently, via operation of the orientation sub, the coring tool 103 can be positioned such that the coring direction is in the bedding plane, as shown in Fig. 2D.

[0019] In the additional embodiment shown in Figs. 2E and 2F, no orientation sub may be provided. However, the coring tool 103 has been configured downhole such that the coring bit

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121 is extended obliquely relative to the coring tool 103 and the wellbore, as shown in Fig. 2F.

Consequently, the coring direction is again in the bedding plane.

[0020] While the first and second pistons 172, 182 may be operated independently, operation of one of the pistons may impact or otherwise require cooperation of the other piston. During rotation of the coring assembly 125, for example, the second piston 182 may be de-energized or controlled in a manner such as by dithering, to minimize any resistance the second piston 182 might exert against such rotation. The primary functions of the rotation of the coring assembly 125 and the extension of the coring bit 121, however, may be achieved independent of one another.

[0021] The coring tool 103 further includes a system for efficiently handling and storing multiple core samples. Accordingly, the storage area 124 may be configured to have at least first and second storage columns 222 and 224, at least one storage column being sized to receive a core catching tube 226 adapted to hold core samples 228. In the illustrated embodiment, one core catching tube 226 is shown holding six cores 228, however, the core catching tube may be sized to hold more or less than six cores depending on the dimensions of the storage area 124. For example, each core catching tube may be sized to hold at least ten cores 228.

[0022] Shifters 234, 236 may be provided to move the core catching tube 226, among other components, between the storage columns 222, 224. In the illustrated embodiment, the shifter 234 includes fingers adapted to grip an exterior of the core catching tube 226. The shifter 234 may rotate from a first position in which the core catching tube 226 registers with an axis of the first storage column 222, to a second position (as indicated as 234' in FIG. 2A) in which the core catching tube registers with an axis of the second storage column 224 (as indicated as 226' in FIG. 2A). The other shifter 236 is similarly rotatable between a first position in which the shifter 236 registers with an axis of the second storage column 224 and second position in which it

registers with an axis of the first storage column 222 (as indicated as 236' in FIG. 2B). The shifter may be used to register a capture plug (not shown) with an upper throat of the core catching tube 266, as further described hereinafter. While two shifters 234 and 236 are depicted in FIGS 2A and 2B, the coring tool 103, the shifters may be omitted in some embodiments. Further, any number of shifters may be provided in the core storage area 124 for moving core catching tubes or other components such as separation or marking disks, sealing caps, etc.

[0023] A first transporter is provided for advancing cores from the coring bit 121 to the core catching tube 226 as it moves from a retracted position to an extended position. In the illustrated embodiment, the first transporter comprises a handling piston 240, such as a ball screw piston, which is positioned coaxially with respect to the first storage column 222 and is further coaxial with the coring bit 121 when the coring assembly 125 is in the eject position. The handling piston 240 includes a brush 244, and a foot 242 sized to engage a majority of the cross-sectional area of a core or an outer diameter of the core. The handling piston 240 may be actuated to an extended position in which it passes through the bit and/or through the shifter 236 and partially into an opening of the core catching tube 226, thereby transporting a recently obtained core from the coring bit 121 to the core catching tube 226 located in the first storage column 222, and cleaning the coring bit inner bore for eventual debris.

[0024] A second transporter, such as lift piston 250, may be provided essentially coaxial with the second storage column 224 and adapted to move from a retracted position to an extended position in which it passes through the shifter 234. As it moves to the extended position, the lift piston 250 may be used to engage sealing caps (not shown) to a core catching tube disposed in the second storage column 224, as further described hereinafter.

[0025] FIG. 3 shows a flow chart 300 of at least a portion of a method according to one or more aspects of the present disclosure. The method 300 may be performed with the wireline tool

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103 of FIGS. 1, 2A and 2B. It should be appreciated that the order of execution of the steps depicted in the flow chart 300 may be changed and/or some of the steps described may be combined, divided, rearranged, omitted, eliminated and/or implemented in other ways within the scope of the present disclosure. In some cases, the method 300 may be used to obtain a sample of formation fluid present in the pores of formation core samples that would otherwise be difficult to obtain using a conventional sampling tool. For example, in tight gas reservoirs, or in heavy oil reservoirs, the mobility of the formation fluid may be low and conventional sampling of these reservoirs may be difficult.

[0026] At step 310, at least one core is captured from a wellbore sidewall. For example, the coring tool may be anchored in the wellbore at a location of interest. The coring assembly may be rotated into a coring position, and the coring bit may be extended into the adjacent formation. After the coring pit has penetrated the formation, the coring assembly may be further rotated to sever a core from the formation. The coring bit may be retracted into the coring assembly and the coring assembly may then be rotated into an eject position. A handling piston may be used to advance the recently obtained core into a core catching tube, and introduce the core through a throat of the core catching tube. The core catching tube may be filled with wellbore fluid, or may be filled with a gel disposed in the core catching tube prior to lowering the coring tool in the wellbore. As the core is inserted into the core catching tube, the fluid located in the core catching tube is displaced into the wellbore. For example, the core catching tube may include fluid passageways and/or ports to facilitate the evacuation of the fluid. One or more cores may be stored in the core catching tube. For example, an extension and rotation mechanism as described in U.S. Patent Application Pub. No.2009/0025941, incorporated herein by reference, may be used to collect a plurality of cores in a single formation layer.

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[0027] At step 320, the captured core is sealed downhole, in the core catching tube. More specifically, the ports of the core catching tube may be sealed, for example as further described hereinafter.

[0028] At step 330, the core sealed in the core catching tube is transported to the surface. The pressure in the core catching tube may be maintained, for example by using a cushion. As the core volume changes due to thermal expansion/contraction, and/or as the volume of the core catching tube expands under differential pressure, the pressure in the chamber may be kept at essentially the same level. At surface, the chamber may be detached from the coring tool and may be further secured for handling and/or transportation. For example, the chamber may be disposed in a DOT approved pressure vessel. Alternatively or additionally, breach locks disposed on the catching tube may be further secured by an operator.

[0029] At the well site or in laboratory, properties of the sealed core may be measured at step 340. More specifically, the properties may be measured while the core is still encapsulated in the core catching tube. For example, at least a portion of the wall of the core catching tube may be configured to permit the transmission of magnetic field, electromagnetic waves, nuclear radiation therethrough. For example, the wall of the core catching tube may be made of polyether etherkethone, fiber reinforced resin (e.g., fiber reinforced epoxy). Thus, the properties of the core and/or the positions of separation or marking disks located in the core catching tube may be determined. Example of core evaluation methods and/or suitable materials for core catching tubes may be found in U.S. Patent No. 7,500,388, incorporated herein by reference.

[0030] At the well site or in laboratory, gas and/or liquid may be extracted from the sealed core at step 350. For example, an access port of the core catching tube may be opened and fluidly connected to a bottle. Pressurized gas may then controllably leak into the bottle. In some cases, liquid may also be extracted. For example, the core catching tube may be disposed in a

vessel. A piston disposed in the core catching tube may be energized to compress the cores and extract fluid therefrom into the bottle. One example of such technique may be found in PCT Patent Application Pub. No. WO 2008/098359, incorporated herein by reference.

[0031] At step 360, the extracted fluid (gas and/or liquid) may be analyzed to determine, for example, a composition of the fluid. In some cases, gas chromatography may be used to determine the composition of the extracted fluid.

[0032] FIG. 4A shows a core catching tube 430, a capture plug 400, and a lower cap 470 according to one or more aspects of the present disclosure. For example, the core catching tube 430 may be used to implement the core catching tube 226 in FIGS. 2A and 2B.

[0033] The core catching tube 430 comprises a wall, such as a sleeve 450. The sleeve 450 may be made of any material suitable for downhole use, and may be adapted to withstand or bear internal pressure. In some cases, at least a portion of the sleeve 450 may be configured to permit the transmission of magnetic field, electromagnetic waves, nuclear radiation therethrough. For example, the sleeve 450 may be made of polyether etherkethone, fiber reinforced resin (e.g., fiber reinforced epoxy). The sleeve 450 comprises one or more slots 440. The slots 440 may be configured to facilitate the circulation of a fluid (e.g., wellbore fluid, gel) present in the sleeve 450 as cores are advanced in the sleeve 450. The sleeve 450 may also comprise ports 445, configured to facilitate the evacuation of the fluid present in the sleeve 450 as cores are advanced in the sleeve 450 and/or as the capture plug is inserted into the sleeve 450. The fluid may escape the sleeve 450 through at least one of an upper throat 431 of the core catching tube 430 and the ports 445. The core catching tube 430 may further comprise a cushion 465 (e.g., a nitrogen chamber pressurized at surface). The cushion 465 may be configured to reduce shocks to the cores during transportation and handling of the cores, and/or to maintain the pressure in the core catching tube 430 when the tube is sealed. Additionally or alternatively, the cushion 465 may be

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configured to reduce its volume as the capture plug 400 and/or the lower cap 470 are partially inserted into the core catching tube 430 thereby facilitating the insertion.

[0034] The capture plug 400 comprises a plurality of breach lock pins 410, each configured to engage a guiding J-slot 435 of the sleeve 450. The capture plug 400 also comprises a seal 405 configured to engage a seal surface 436 of the sleeve 450. The seal 405 may be a radial seal, such as a stepped radial seal (as shown), configured to prevent cutting the seal during insertion of the capture plug 400. The seal 405 may also be a corner seal. The capture plug 400 may comprise a formation fluid passageway 415. The passageway 415 may include an access port plug 420, for example a quick connect port. The passageway 415 may be provided with a check valve 425, configured to prevent pressure and/or fluid losses prior to inserting a sampling tube (not shown) in the access port.

[0035] The lower cap 470 comprises a plurality of retaining arms 480 having a protrusion configured engage a crimp guide 445, for example affixed to the core catching tube 430, and to crimp on a groove 460 of the core catching tube 430. The lower cap 470 also comprises a seal 475, for example an O-ring, or a gasket, configured to seal against an outer surface of the core catching tube 430. Optionally, the lower cap 470 may comprise a formation fluid passageway 485. The passageway 485 may include an access port plug 490, for example a quick connect port. The passageway 485 may be provided with a check valve 495, configured to prevent pressure and/or fluid losses prior to inserting a sampling tube (not shown) in the access port.

[0036] Example operation of the core catching tube 430, the capture plug 400, and the lower cap 470 is now described in reference to FIGS. 2A, 2B, 4A and 4B. The core catching tube 430 may be disposed the first storage column 222. The capture plug 400 and the lower cap 470 may be disposed respectively at the bottom and top of the second storage column 224. The capture plug 400 and the lower cap 470 may held in place with a retention device (not shown). The

coring tool 103 may be used to acquire a plurality of cores 472, and store the cores in the core catching tube 430.

[0037] When desired, the obtained cores may be sealed in the wellbore. For example, one of the shifters 234 and/or 236 may be actuated to register or align the core catching tube 430 with the capture plug 400 and the lower cap 470 located in the second storage column 224, as indicated by the arrow 433. The lift piston 250 may be actuated to lift the lower cap 470 and the core catching tube 430, as indicated by the arrow 434. Consequently, the capture plug 400 is inserted into the upper throat 431 of the core catching tube 430. The seal 405 engages the sealing surface 436. Fluid in the sleeve 450 may still escape the coring chamber 430 through the ports 445. Also, the breach lock pins 410 are guided in the J-slots 435. In some cases, capture plug 400 is free to rotate with respect to the core catching tube 430. Thus, the breach lock pins 410 may secure the capture plug 400 on top of the core catching tube 430. Alternatively, the core catching tube 430 may be rotated at surface by an operator to insure proper securing of the capture plug 400 on the core catching tube 430. Further, the retaining arms 480 engage a clearance between the core catching tube 430 and the crimp guide 455. The retaining arms 480 are crimped and the protrusion at the distal end thereof locks into the groove 460. The seal 475 engages an outer surface of the core catching tube 430, and prevents fluid in the sleeve 450 from escaping through the ports 445. Fluid trapped in the core catching tube may compress the cushion 465, therefore reducing the amount of force needed to move the lower cap 470 against the core catching tube 430. Thus, the cores 472 are sealed in the core catching tube 430.

[0038] The core catching tube 430, the capture plug 400, and the lower cap 470 may be conveyed to the surface by the coring tool 103. During transportation, volumes changes may be compensated by the cushion 465, thereby maintaining the pressure in the core catching tube 430.

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[0039] At surface, the core catching tube 430, the capture plug 400, and the lower cap 470 may be removed from the coring tool 103, as shown in Fig. 4B. One or more of the access ports 415 and/or 485 may then be open to collect fluid (gas and/or liquid) from the coring chamber 430. The fluid may be collected in a pressurized bottle (not shown), and/or analyzed.

[0040] FIG. 5 shows a horizontal cross section of the sleeve 250 shown in FIGS. 4A and 4B. On example design of the slots 440 is shown in greater details.

[0041] FIG. 6A shows a capture plug 500 and a core catching tube 530 according to one or more aspects of the present disclosure.

[0042] The capture plug 500 may be similar to the capture plug 400 of FIGS. 4A and 4B. In this example however, the capture plug 500 includes a shoulder 521, configured to abut a corresponding shoulder 553 of the core catching tube 530.

[0043] The core catching tube 530 comprises a perforated sleeve 550 and an isolation sleeve 551. The isolation sleeve 551 is configured to reciprocate along the axis of the perforated sleeve 550. Seals, such as O-rings, may be provided therebetween. In a first position (as shown), apertures of the perforated sleeve 550 substantially align with apertures in the isolation sleeve 551 and cooperate to define ports 545. The ports 545 may be configured to facilitate the evacuation of the fluid located in the sleeve 550 as cores 572 are advanced in the perforated sleeve 550 and/or as the capture plug 500 is inserted into the isolation sleeve 551. The ports 545 may be maintained in an open position, for example using a spring 552. Thus, the ports 545 are in a normally open position.

[0044] Example operation of the core catching tube 530, and the capture plug 500, is now described in reference to FIGS. 2A, 2B, 6A. A plurality of cores 572 are extracted from the formation and inserted in the core catching tube 530. Fluid located in the core catching tube 530 is evacuated through the ports 545. If desired, separation or marking disks 573 may be inserted

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between the cores. For example, the separation or marking disks 573 may be stored in the second storage column 224, and may be inserted in the core catching tube 530 using the shifter 236. A capture plug 500 may also be stored in the second storage column 224. As indicated by arrow 533, the capture plug 500 is aligned with a throat of the core catching tube 530 using the shifter 236. Then the capture plug 500 is inserted on the core catching tube 530 using the handling piston 240. The distance between the breach lock pins and the shoulder 521 is adapted to lower the surface 533 and the isolation sleeve 551 by a sufficient amount so that the ports 545 close. Thus, the cores 573 are sealed in the core catching tube 530.

[0045] At surface, the location of separation or marking disks 573, among other things may be detected by transmitting one of a magnetic field, an electromagnetic waves, a nuclear radiation through the sleeves 550 and 551, and measuring a transmitted quantity. Also, gas and/or liquid may be extracted from the sealed core catching tube as previously described.

[0046] FIG. 6B shows a capture plug 600 and a core catching tube 630 according to one or more aspects of the present disclosure. The capture plug 600 and the core catching tube 630 may be used in lieu of the capture plug 500 and the core catching tube 530 of FIG. 6A.

[0047] The capture plug 600 is provided with a piston 605 having a seal 610 configured to engage the inner bore of the perforated sleeve 650. The piston 605 is affixed to a ram 620 extending through the length of the capture plug 600. The ram may include a thread 625. A seal 615 is provided between the ram 620 and the body of the capture plug 600.

[0048] The core catching tube 630 is similar to the core catching tube 530 of FIG. 6A. However, the spring 652 is configured to maintain the plurality of ports 645 in a normally closed position. Further, the isolation sleeve 651 is adapted to be recessed, so that an actuating mechanism 621, for example a fork, can be engaged against the shoulder 653. The actuating

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mechanism 621 may be moved in down direction to open the ports 645. When desired, the ports 645 may be closed by releasing the force applied by the actuating mechanism 621.

[0049] The capture plug 600 and a core catching tube 630 may be used similarly to the capture plug 500 and a core catching tube 530. In addition, the piston 605 may be connected to a force member (not shown) for example via the thread 625. The piston may be used to apply a force on the core samples and mechanically extract liquid and/or gas from the pores of the core samples. In some cases, separation or marking disks 673 may be placed between cores, and more specifically at least between cores extracted from different formations. The separation or marking disks 673 may include a seal 674 configured to engage the inner bore of the core catching tube 630. The location of separation or marking disks 673 may be detected as previously described. The relative position of the separation or marking disks 673 ports 645 may be determined. Thus, liquid and/or gas from cores between two disks 673 may be collected through a corresponding port 645.

[0050] FIG. 8 shows core holders 735a, 735b, capture plugs 700a, 700b, and lower caps 770a, 770b according to one or more aspects of the present disclosure. The embodiment illustrated in FIG. 8 may be used to store each individual core (such as core 772) in its own pressurized container.

[0051] The core lower caps 770a and 770b include a locking mechanism (not shown), such as a crimping device or a breach lock device, as previously described, configured to engage the core holders 735a and 735b, respectively. Further, the core holders 735a and 735b include a locking mechanism (not shown) configured to engage the capture plugs 700a and 700b, respectively.

[0052] The capture plugs 700a and 700b may include a sealed access port (such as a quick connect port), and an optional actuated check valve as previously described. The core holders

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735a and 735b include one or more ports 745 configured to facilitate the evacuation of the fluid present in the core holders 735a and 735b as cores are advanced in the core holders 735a and 735b and/or as the capture plug 700a and 700b are inserted into the core holders 735a and 735b. Further, the walls of the core holders 735a and 735b may include slots, as previously described. The core lower caps 770a and 770b include a cushion 765 for allowing fluid present in the core holders 735a and 735b to flow into a sealed chamber 766 as the capture plug 700a and 700b are inserted into the core holders 735a and 735b, thereby facilitating the insertion of the capture plugs.

[0053] Example operation is now described in reference to FIGS. 2A, 2B, and 8. A plurality of capture plugs, core holders, and lower caps may be stored in the second storage columns 224. As shown, the plurality of capture plugs, core holders, and lower caps may be stored in the second storage columns 224 may be stored in reverse order, thereby preventing interlocking therebetween. First, a lower cap, such as the lower cap 770a is lifted into a position in which it engages the shifter 236, for example using a lead screw 720 coupled to an elevator plate 725. As indicated by arrow 733, the shifter 236 is actuated to register the lower cap 770a with the first storage columns 222, and the handling piston 240 is actuated to advance the lower cap 770a into the first storage column 222. Then, a core holder, such as the core holder 735a is lifted into a position in which it engages the shifter 236, using the lead screw 720 and the elevator plate 725. The shifter 236 is actuated to register the core holder 735a with the first storage columns 222. The coring assembly 125 is used to obtain a core 772. The handling piston 240 is extended to dispose the obtained core into the core holder 735a. The handling piston 240 is further extended to lock the lower cap 770a and the core holder 735a. Then, a capture plug, such as the capture plug 700a is lifted into a position in which it engages the shifter 236, using the lead screw 720 and the elevator plate 725. The shifter 236 is actuated to register the capture plug 700a with the

first storage columns 222. The handling piston 240 is extended to lock the core holder 735a and the capture plug 700a. During operation, the elevator plate 715 may be lowered as desired, for example using a lead screw 710. More cores may be captured.

[0054] FIG. 9 shows an alternate aspect of the present disclosure. This aspect may be implemented using the coring tool 103 of FIGS. 2A and 2B. Alternatively, this aspect may be implemented using other coring tools, such as the coring tools described in U.S. Patent Nos. 4,714,119 and/or 5,667,025, incorporated herein by reference.

[0055] In this aspect, a pressure bearing core catching tube 5 is provided within a storage section of a coring tool, although some portions may be in the coring section. The core catching tube 5 may be a solid, un-perforated tube, a portion of which having a plurality of slots 3. The lower head of the core catching tube 5 may include a bottom isolation valve 6. The bottom isolation valve 6 may be a ball valve, a gate valve, or any other pressure bearing fluid valve. In open position, the bottom isolation valve 6 may be used to allow mud or other fluid to be ejected from the core catching tube 5 as cores are inserted therein. In close position, the bottom isolation valve 6 may be used to hydraulically isolate the core catching tube 5, for example once the tube is filled and/or upon a command to the coring tool initiated by a surface operator. A perforated core support 8 may be installed above the bottom isolation valve 6, for example to insure mechanical integrity of the core samples in the core catching tube 5. Optionally, a spring or fluid cushion 7 may be provided to reduce the mechanical shock seen while acquiring and/or conveying the cores. The spring or fluid cushion 7 may be beneficial to preserve the mechanical integrity of the samples. In addition, separation/marketing disks (not shown) may be inserted in the core catching tube 5 between stored cores. Further, the core catching tube 5 is provided with a throat isolation valve 11. The throat isolation valve 11 may be a large ball valve, or a sliding gate valve. In some cases, the bottom isolation valve 6 and the throat isolation valve 11 are

detachably coupled to a valve actuating mechanism (not shown) disposed in the body of the coring tool.

[0056] In operation, the core catching tube 5 is filled with one or more cores. The bottom isolation valve 6 is closed. The upper throat of the core catching tube 5 may also be sealed using the throat isolation valve 11. The core catching tube 5 is brought to the Earth's surface. The core catching tube 5, the bottom isolation valve 6 and the throat isolation valve 11 may be detached from the coring tool. The bottom isolation valve 6 may be coupled to a surface actuating mechanism. The bottom isolation valve 6 may be open and fluid (gas and/or liquid) may be extracted from the core catching tube 5.

[0057] The foregoing outlines features of several embodiments so that those skilled in the art may better understand the aspects of the present disclosure. Those skilled in the art should appreciate that they may readily use the present disclosure as a basis for designing or modifying other processes and structures for carrying out the same purposes and/or achieving the same advantages of the embodiments introduced herein. Those skilled in the art should also realize that such equivalent constructions do not depart from the spirit and scope of the present disclosure, and that they may make various changes, substitutions and alterations herein without departing from the spirit and scope of the present disclosure.

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WHAT IS CLAIMED IS:

1. An apparatus according to one or more aspects of the present disclosure.
2. A method or process according to one more aspects of the present disclosure.
3. A program product having recorded thereon instructions for performing one or more steps of a method or process according to one or more aspects of the present disclosure.
4. A system according to one or more aspects of the present disclosure.
5. A device according to one or more aspects of the present disclosure.
6. A component according to one or more aspects of the present disclosure.
7. An assembly according to one or more aspects of the present disclosure.
8. A kit having one or more items according to one or more aspects of the present disclosure.

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Fig. 1

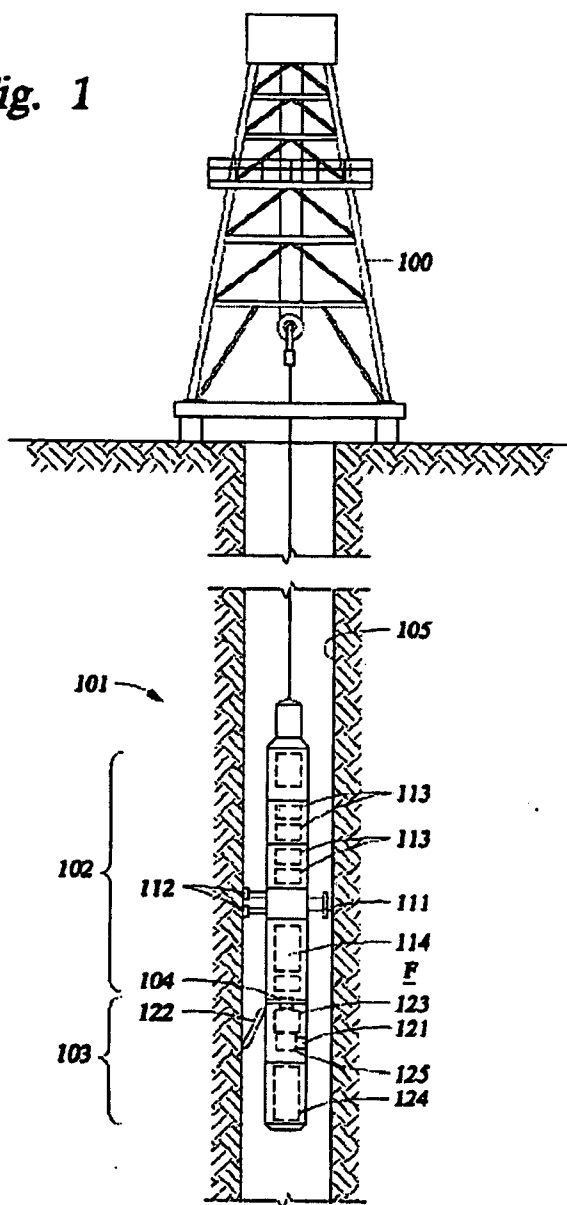
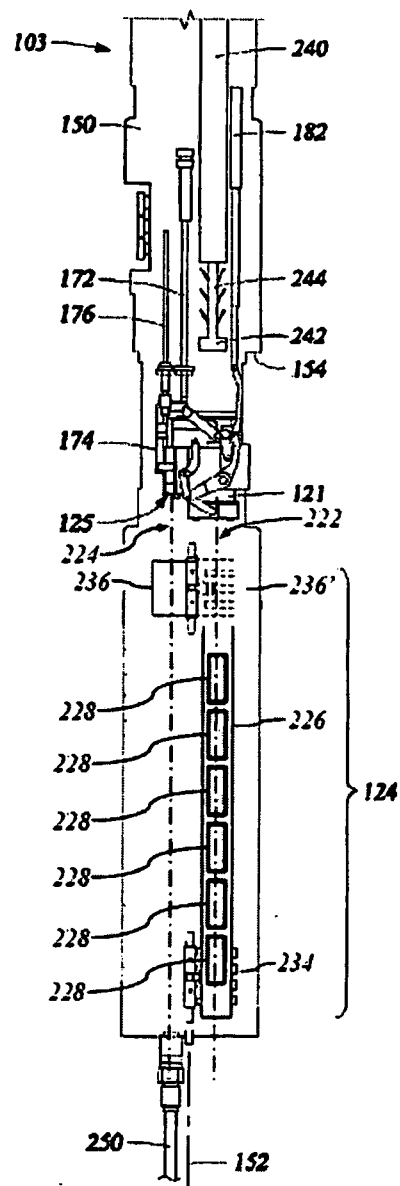


Fig. 2B



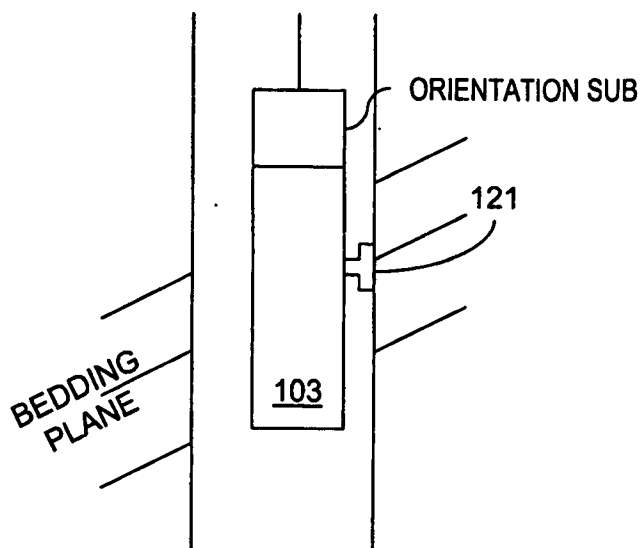


Fig. 2C

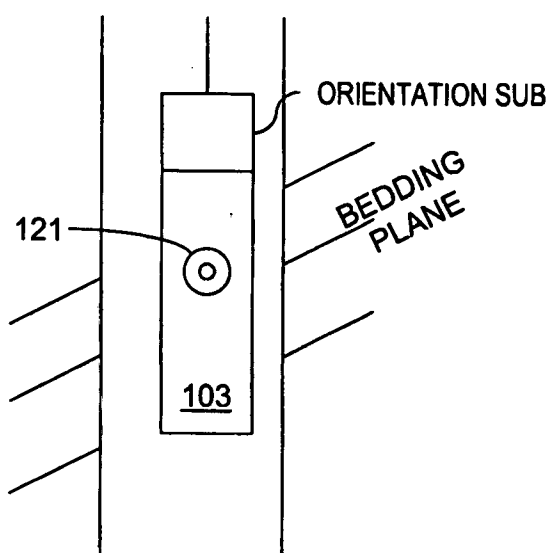


Fig. 2D

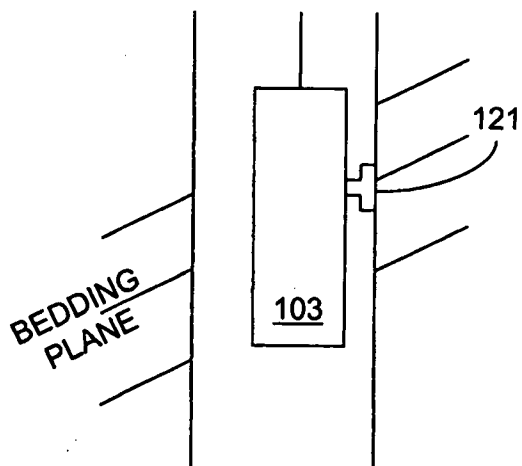


Fig. 2E

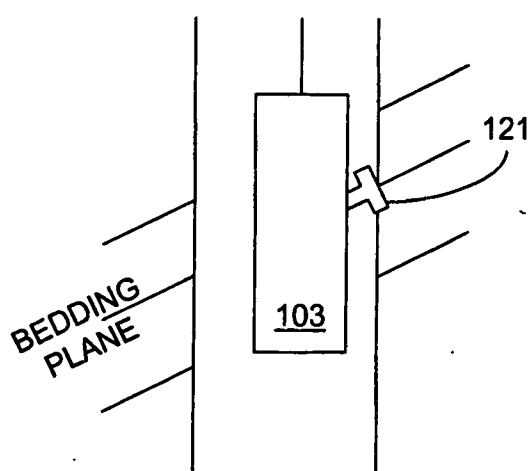


Fig. 2F

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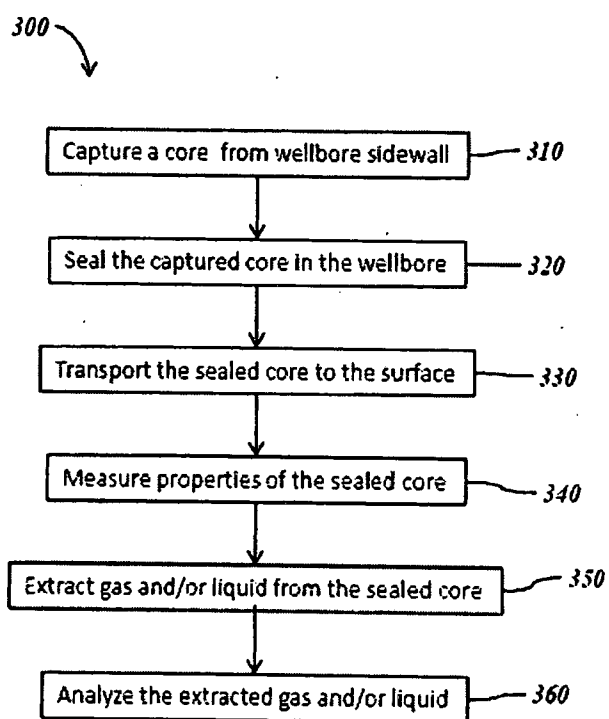
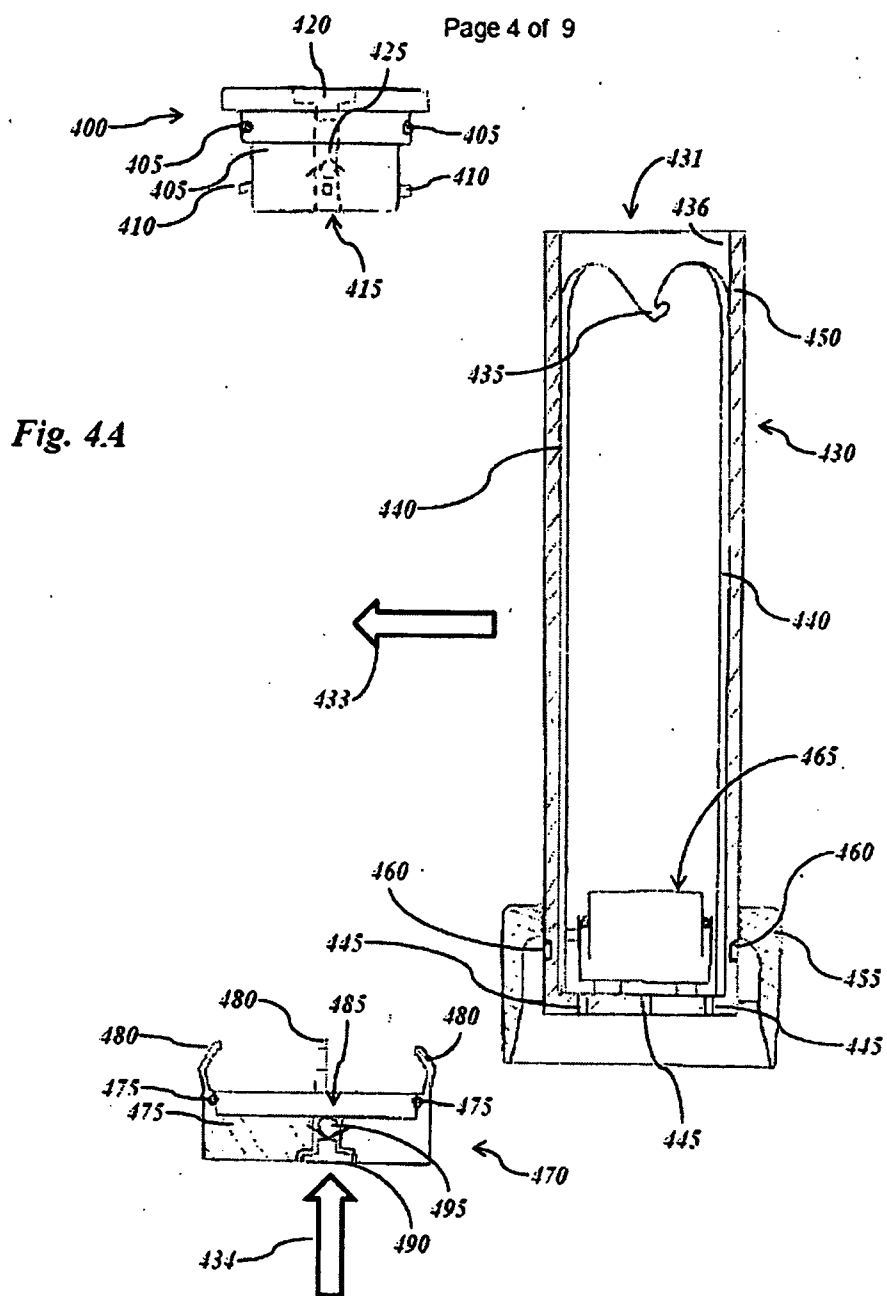


Fig. 3

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Fig. 4B

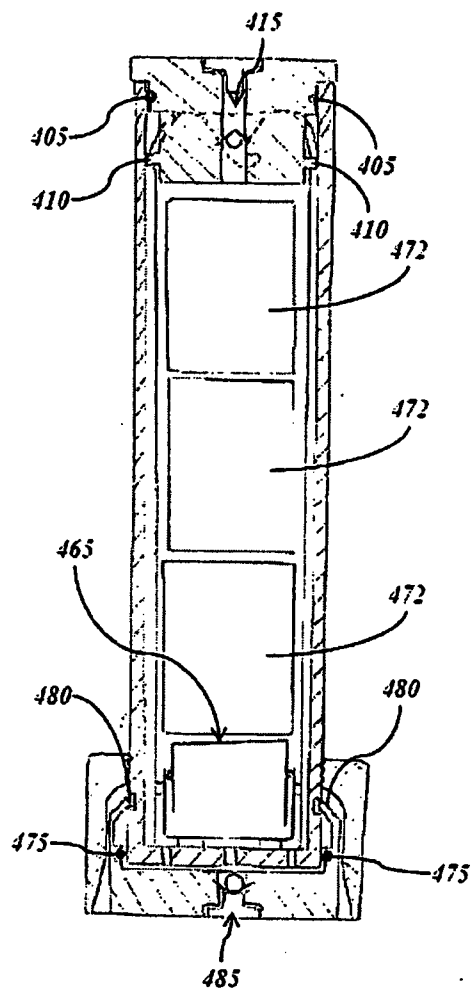
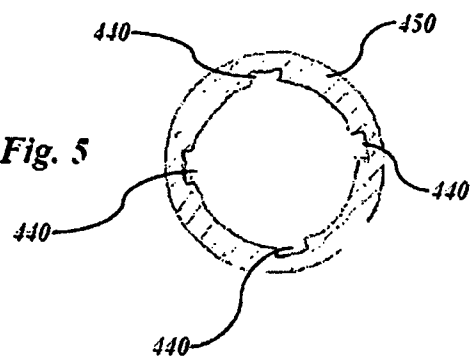
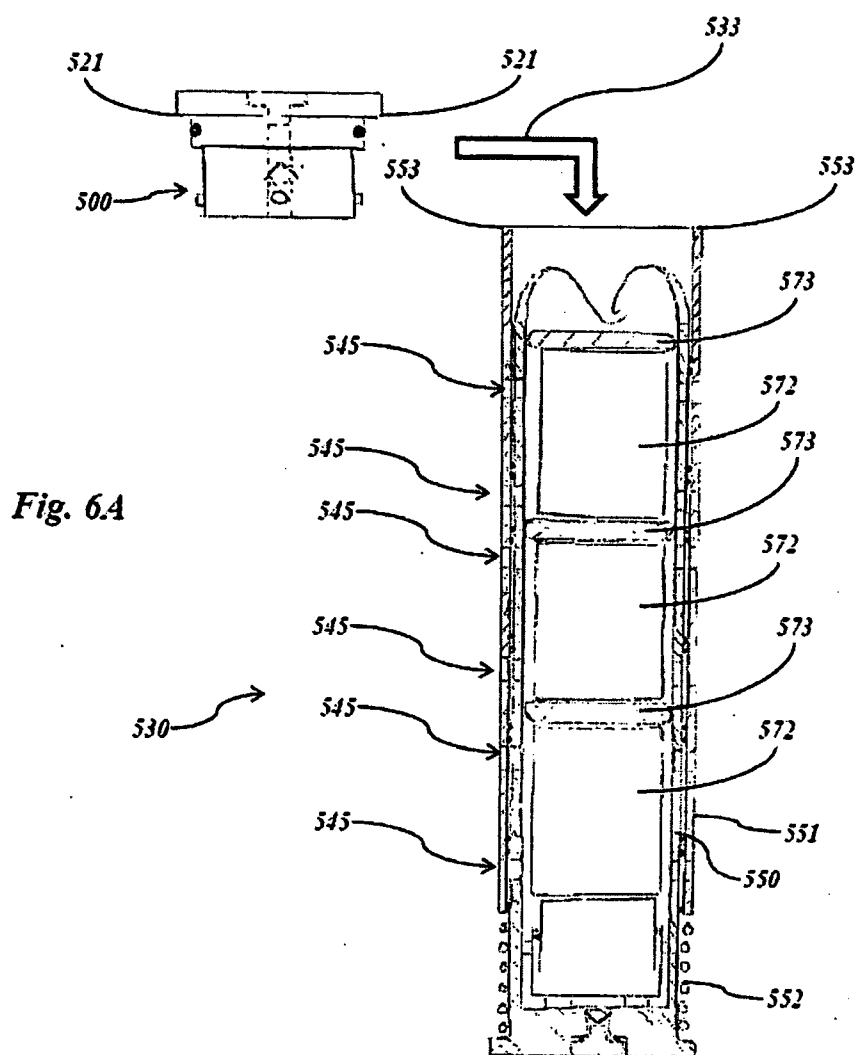


Fig. 5



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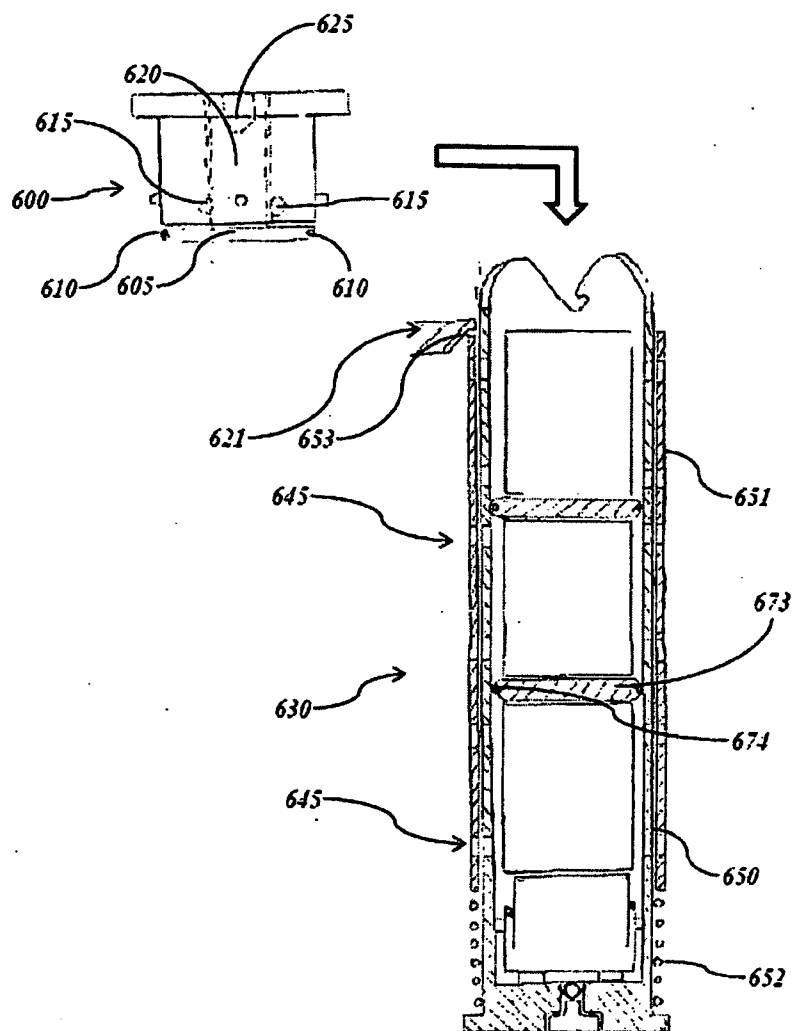
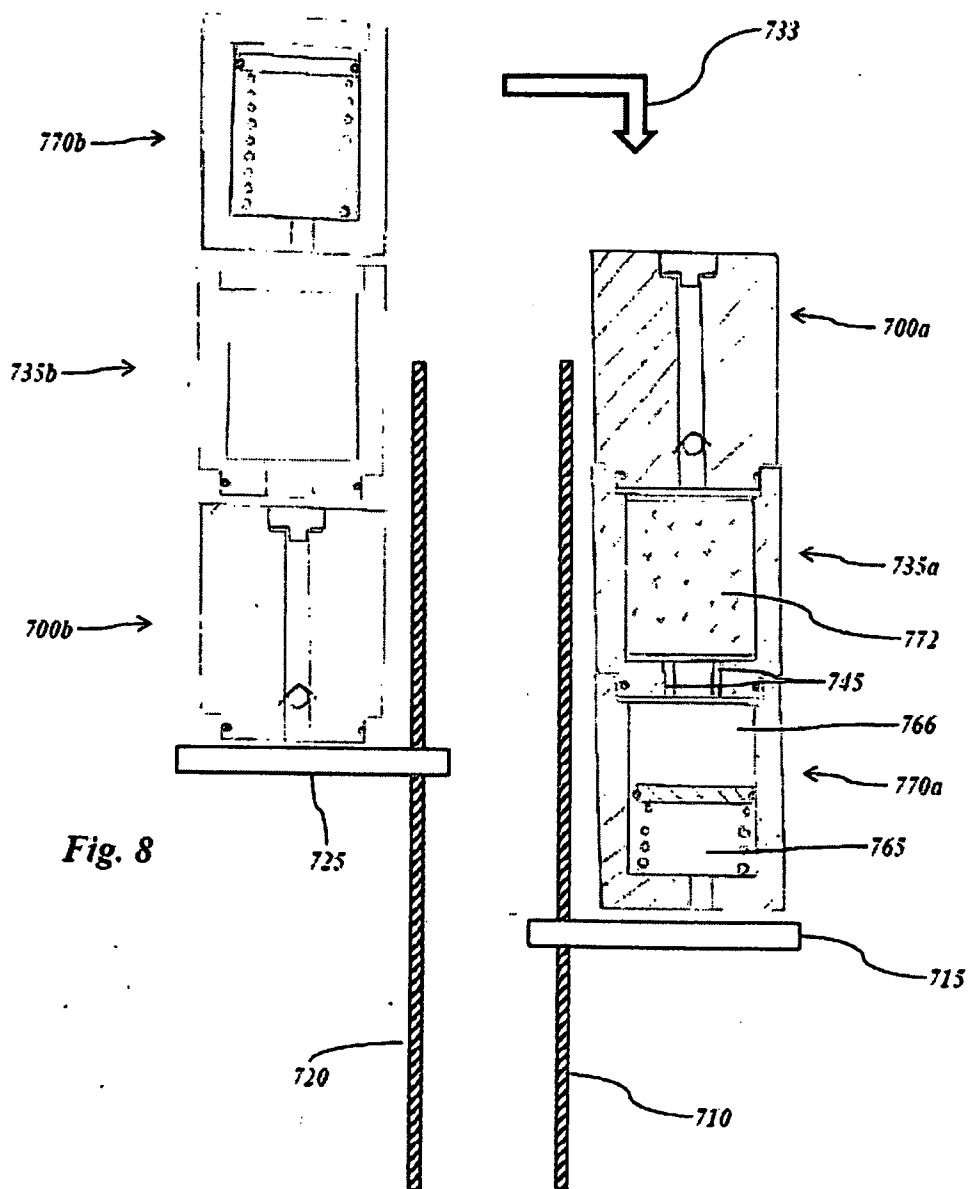


Fig. 6B

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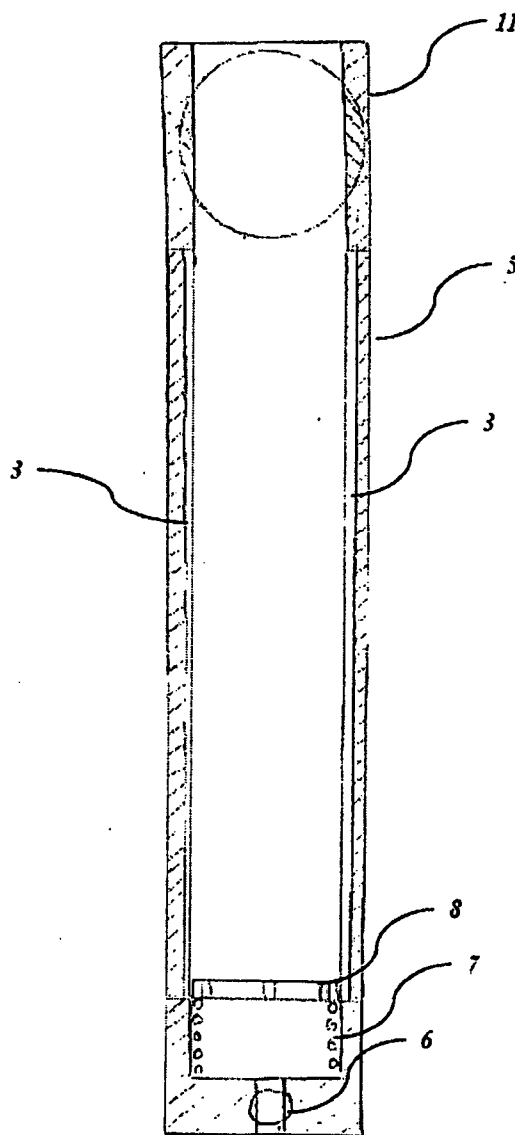
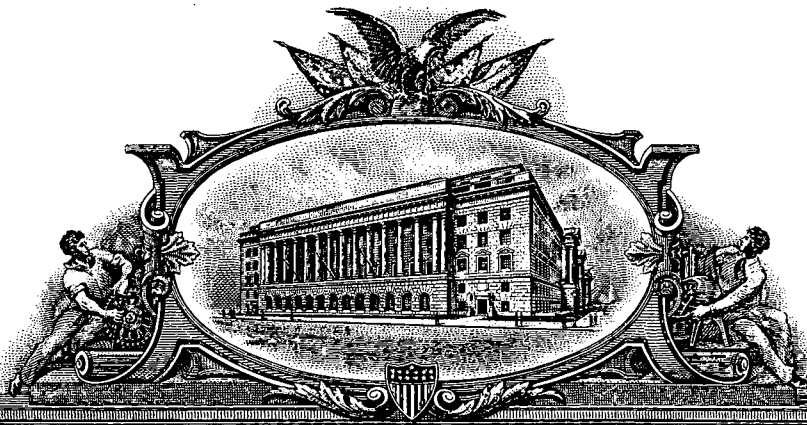


Fig. 9



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UNITED STATES DEPARTMENT OF COMMERCE

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June 09, 2010

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APPLICATION NUMBER: 12/773,105

FILING DATE: May 04, 2010

THE COUNTRY CODE AND NUMBER OF YOUR PRIORITY APPLICATION, TO BE USED FOR FILING ABROAD UNDER THE PARIS CONVENTION, IS US12/773,105

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Under Secretary of Commerce for Intellectual Property
and Director of the United States Patent and Trademark Office**



**M. TARVER
Certifying Officer**

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Electronic Acknowledgement Receipt

EFS ID:	7544343
Application Number:	12773105
International Application Number:	
Confirmation Number:	5262
Title of Invention:	SEALED CORE
First Named Inventor/Applicant Name:	Lennox E. Reid, Jr.
Customer Number:	93083
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Attorney Docket Number:	20.3215
Receipt Date:	04-MAY-2010
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Time Stamp:	11:44:37
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	\$ 1090
RAM confirmation Number	14588
Deposit Account	505149
Authorized User	
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Charge any Additional Fees required under 37 C.F.R. Section 1.19 (Document supply fees)
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1	Application Data Sheet	203215NP_ADS1.pdf	45283 916cefbbab700d294ab9360d0508997377505f928	no	5

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2	Specification	203215NP_specification1.pdf	65501 64be2447864bfbda7208b269292a614502c03b20	no	26
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3	Drawings-only black and white line drawings	203215NP_drawings1.pdf	551528 cd4596ff1bca8563808097b2c1a36f7ede14e0fa	no	9
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4	Fee Worksheet (PTO-875)	fee-info.pdf	32398 5ba5c92a6cfa8e12b0c1478b8c724f5306ee3e6a	no	2
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SEALED CORE**CROSS-REFERENCE/PRIORITY TO RELATED APPLICATIONS**

[0001] This application claims the benefit of U.S. Provisional Application No. 61/176,574, entitled "SEALED CORE," filed May 8, 2009, the entire disclosure of which is hereby incorporated herein by reference.

[0002] This application also claims the benefit of U.S. Provisional Application No. 61/187,126, entitled "SEALED CORE," filed June 15, 2009, the entire disclosure of which is hereby incorporated herein by reference.

BACKGROUND OF THE DISCLOSURE

[0003] Cores extracted from a formation sidewall may include trapped formation fluid. The cores are extracted from the formation at downhole condition (usually at pressures above 1,000 psi, and perhaps up to 30,000 psi), and brought to the surface for analysis, for example, in a surface laboratory. As the cores are brought to the surface, they can experience a decompression from downhole pressure to surface pressure.

BRIEF DESCRIPTION OF THE DRAWINGS

[0004] The present disclosure is best understood from the following detailed description when read with the accompanying figures. It is emphasized that, in accordance with the standard practice in the industry, various features are not drawn to scale. In fact, the dimensions of the various features may be arbitrarily increased or reduced for clarity of discussion.

[0005] Fig. 1 is a schematic view of apparatus according to one or more aspects of the present disclosure.

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[0006] Figs. 2A and 2B are schematic views of apparatus according to one or more aspects of the present disclosure.

[0007] Fig. 3 is a flow-chart diagram of at least a portion of a method according to one or more aspects of the present disclosure.

[0008] Figs. 4A and 4B are schematic views of apparatus according to one or more aspects of the present disclosure.

[0009] Fig. 5 is a schematic view of apparatus according to one or more aspects of the present disclosure.

[0010] Figs. 6A and 6B are schematic views of apparatus according to one or more aspects of the present disclosure.

[0011] Fig. 7 is a schematic view of apparatus according to one or more aspects of the present disclosure.

[0012] Fig. 8 is a schematic view of apparatus according to one or more aspects of the present disclosure.

DETAILED DESCRIPTION

[0013] It is to be understood that the following disclosure provides many different embodiments, or examples, for implementing different features of various embodiments. Specific examples of components and arrangements are described below to simplify the present disclosure. These are, of course, merely examples and are not intended to be limiting. In addition, the present disclosure may repeat reference numerals and/or letters in the various examples. This repetition is for the purpose of simplicity and clarity and does not in itself dictate a relationship between the various embodiments and/or configurations discussed. Moreover, the formation of a first feature over or on a second feature in the description that follows may

include embodiments in which the first and second features are formed in direct contact, and may also include embodiments in which additional features may be formed interposing the first and second features, such that the first and second features may not be in direct contact.

[0014] A downhole tool positionable in a wellbore penetrating a subterranean formation is disclosed in U.S Patent No. 7,303,011, the entirety of which is hereby incorporated herein by reference. The downhole tool includes a housing, a coring bit and a sample chamber. The coring bit is disposed in the housing and is extendable therefrom for engaging a wellbore wall. The sample chamber stores at least two formation samples obtained with the coring bit and includes at least two portions for separately storing the formation samples.

[0015] A method of preserving hydrocarbon samples obtained from an underground formation is disclosed in U.S. Patent Application Pub. No. 2008/0066534, the entirety of which is hereby incorporated herein by reference. The method includes delivering a coring tool to the formation, obtaining from the formation a core sample having a hydrocarbon therein, capturing the core sample in a container, sealing the container downhole with the hydrocarbon contained therein, and storing the sealed container in the tool.

[0016] A sidewall coring tool according to one or more aspects of the present disclosure may comprise a core catching tube for storing one or more formation cores containing a formation fluid. Such core catching tube may comprise at least a fluid port configured to evacuate a fluid located in the core catching tube as the one or more cores are introduced therein. The at least one fluid port may be sealed downhole. The core catching tube may be provided with a cushion configured to maintain the pressure in the core catching tube once the at least one fluid port is sealed. The core may be brought to the surface in the sealed core catching tube. At the surface, the formation fluid contained in the formation cores may be extracted from the core catching tube. Properties of the formation fluid may then be analyzed.

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[0017] One or more aspects of the present disclosure may reduce the risk of explosive decompression of gasses trapped in the cores (e.g., in pores of the cores). One or more aspects of the present disclosure may also or alternatively limit or prevent the loss of formation fluid trapped in the core (e.g., in the pores of the cores). One or more aspects of the present disclosure may also or alternatively limit or prevent invasion of the core pores by wellbore fluids.

[0018] The apparatus and methods disclosed herein may be used in both “wireline”, “on pipe”, and “while-drilling” applications. Thus, while one or more aspects of the present disclosure are described in reference to a wireline implementation, those skilled in the art will readily recognize that one or more of such aspects may also be application or readily adaptable to while-drilling applications, such as measurement-while-drilling (MWD), logging-while-drilling (LWD), and/or wired-drill-pipe (WDP), among others.

[0019] Fig. 1 is a schematic view of an apparatus 101 deployed in a wellbore 105 from a rig 100 according to one or more aspects of the present disclosure. The apparatus 101 comprises a coring tool 103, which itself may comprise a coring assembly 125 with a coring bit 121 and its associated actuation mechanisms 123, and a storage area 124 for storing core samples. The storage area 124 is configured to receive sample cores. At least one brace arm 122 may be provided to anchor the apparatus 101 and/or tool 103 in the borehole when the coring bit 121 is functioning.

[0020] The apparatus 101 may further comprise additional systems for performing other functions. One such additional system is illustrated in Fig. 1 as a formation testing tool 102 that is operatively connected to the coring tool 103 via a field joint 104. The formation testing tool 102 may comprise a probe 111 configured to extend from the formation testing tool 102 to be in fluid communication with the formation F. The formation testing tool 102 and/or other portion of the apparatus 101 may comprise back up pistons 112 configured to assist in urging the probe

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111 into contact with the sidewall of the wellbore and to stabilize the tool 102 in the borehole.

The formation testing tool 102 may comprise a pump 114 configured to pump sampled formation fluid through the tool, as well as sample chambers 113 configured to store such fluid samples.

The locations of these components are only schematically shown in Fig. 1, and may be provided in locations within the tool other than as illustrated. Other components may also be included, such as a power module, a hydraulic module, a fluid analyzer module, and other devices.

[0021] The apparatus of Fig. 1 is depicted as having multiple modules operatively connected together. The apparatus, however, may also be partially or completely unitary. For example, as shown in Fig. 1, the formation testing tool 102 may be unitary, with the coring tool 103 housed in a separate module that is operatively connected to the formation testing tool 102 by the field joint 104. Alternatively, the coring tool may be unitarily included within the overall housing of the apparatus 101.

[0022] Downhole tools often include several modules (e.g., sections of the tool that perform different functions). Additionally, more than one downhole tool or component may be combined on the same tool string to accomplish multiple downhole tasks without requiring removal from the borehole. Such modules may be connected by field joints, such as the field joint 104. For example, one module of a formation testing tool typically has one type of connector at its top end and a second type of connector at its bottom end. The top and bottom connectors are made to operatively mate with similar connectors of adjoining modules. By using modules and tools with similar arrangements of connectors, all of the modules and tools may be connected end to end to form the tool string. A field joint may provide an electrical connection, a hydraulic connection, and/or a flow line connection, depending on the requirements of the tools in the tool string. An electrical connection may provide power and/or communication capabilities.

[0023] In practice, a downhole tool may comprise several different components, some of which may be comprised of two or more modules (e.g., a sample module and a pump out module of a formation testing tool). In this disclosure, “module” is used to describe any of the separate tools or individual tool modules that may be connected in a tool string. “Module” describes any part of the tool string, whether the module is part of a larger tool or a separate tool by itself. In this disclosure, the term “tool string” may be used to prevent any confusion with the individual tools that make up the tool string (e.g., a coring tool, a formation testing tool, and a resistivity imaging tool may all be included in a tool string).

[0024] The coring tool 103 is shown in greater detail in Figs. 2A and 2B. The coring tool 103 comprises a tool housing 150 extending along a longitudinal axis 152. The tool housing 150 comprises a coring aperture 154 through which core samples are retrieved from the sidewall of the wellbore. The coring assembly 125 and storage area 124 are disposed within the tool housing 150.

[0025] The coring assembly 125 may be rotatably coupled to the tool housing 150. The coring bit 121 is mounted within the coring assembly 125 such that it may slide axially and rotate within the coring assembly 125. A coring motor is also mounted on coring assembly 125 and is operably connected to the coring bit 121 to rotate the bit. The coring motor may be implemented with a hydraulic motor, although other types of motor or mechanisms capable of rotating the coring bit 121 may be used.

[0026] A first or rotation piston 172 is operably coupled to the coring assembly 125 to rotate the coring assembly 125 between the coring position (illustrated in Fig. 2A) and the eject position (illustrated in Fig. 2B). As shown in Figs. 2A and 2B, the rotation piston 172 is coupled to the coring assembly 125 by an intermediate link arm 174. As the piston 172 moves from a retracted position shown in Fig. 2A to an extended position shown in Fig. 2B, the coring

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assembly 125 rotates about rotation link arms from the coring position to the eject position. The intermediate link arm 174 may also provide convenient means for communicating hydraulic fluid from one or more hydraulic flow lines 176 to the coring motor.

[0027] A series of pivotably coupled extension link arms is coupled to a portion, such as the thrust ring, of the coring bit 121 to provide a substantially constant weight on bit. The series of extension link arms may be coupled to a second or extension piston 182. With the series of extension links, movement of the second piston 182 will actuate the coring bit 121 between an extended position as shown in Fig. 2A and a retracted position as shown in Fig. 2B. As the second piston 182 moves toward an extended position, it drives the coring bit 121 to the extended position. The amount of lost motion in the series of extension link arms may be kept essentially constant to transfer an almost constant percentage of the piston force to the coring bit 121. As a result, the series of extension link arms produces a more constant weight on bit across the entire range of travel of the coring bit 121.

[0028] From the foregoing, it will further be appreciated that extension of the coring bit 121 is substantially decoupled from the rotation of the coring assembly 125. The first piston 172 and intermediate link arm 174 are independent from the second piston 182 and series of extension link arms used to extend the coring bit 121. Accordingly, the first and second pistons 172, 182 may be operated substantially independent of one another, which may allow for additional functionality of the coring tool 103. For example, and notwithstanding any clearance issues with the tool housing 150 or other tool structures, the coring bit 121 may be extended at any time regardless of the position of the bit housing 156. Consequently, core samples may be obtained along a diagonal plane when the coring assembly 125 is held at an orientation somewhere between the eject and coring positions described above.

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[0029] While the first and second pistons 172, 182 may be operated independently, operation of one of the pistons may impact or otherwise require cooperation of the other piston. During rotation of the coring assembly 125, for example, the second piston 182 may be de-energized or controlled in a manner (such as by dithering) to minimize any resistance the second piston 182 might exert against such rotation. The primary functions of the rotation of the coring assembly 125 and the extension of the coring bit 121, however, may be achieved independent of one another.

[0030] The coring tool 103 further comprises a system for efficiently handling and storing multiple core samples. Accordingly, the storage area 124 may be configured to have at least first and second storage columns 222 and 224, at least one storage column being sized to receive a core catching tube 226 adapted to hold core samples 228. In the illustrated embodiment, one core catching tube 226 is shown holding six cores 228. However, the core catching tube may be sized to hold more or less than six cores depending on the dimensions of the storage area 124. For example, each core catching tube may be sized to hold at least ten cores 228.

[0031] Shifters 234, 236 may be provided to move the core catching tube 226, among other components, between the storage columns 222, 224. In the illustrated embodiment, the shifter 234 includes fingers adapted to grip an exterior of the core catching tube 226. The shifter 234 may rotate from a first position in which the core catching tube 226 registers with an axis of the first storage column 222, to a second position (as indicated as 234' in Fig. 2A) in which the core catching tube registers with an axis of the second storage column 224 (as indicated as 226' in Fig. 2A). The other shifter 236 is similarly rotatable between a first position in which the shifter 236 registers with an axis of the second storage column 224 and second position in which it registers with an axis of the first storage column 222 (as indicated as 236' in Fig. 2B). The shifter may be configured to register a capture plug (not shown) with an upper throat of the core

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catching tube 266, as further described hereinafter. While two shifters 234 and 236 are depicted in Figs. 2A and 2B, the shifters may be omitted in some embodiments within the scope of the present disclosure. Further, any number of shifters may be provided in the core storage area 124 for moving core catching tubes or other components, such as separation or marking disks, sealing caps, etc.

[0032] A first transporter is provided for advancing cores from the coring bit 121 to the core catching tube 226 as it moves from a retracted position to an extended position. In the illustrated embodiment, the first transporter comprises a handling piston 240, such as a ball screw piston, which is positioned coaxially with respect to the first storage column 222 and is further coaxial with the coring bit 121 when the coring assembly 125 is in the eject position. The handling piston 240 comprises a brush 244, and also comprises a foot 242 sized to engage a majority of the cross-sectional area of a core or an outer diameter of the core. The handling piston 240 may be actuated to an extended position in which it passes through the bit and/or through the shifter 236 and partially into an opening of the core catching tube 226, thereby transporting a recently obtained core from the coring bit 121 to the core catching tube 226 located in the first storage column 222, and cleaning the coring bit inner bore for eventual debris.

[0033] A second transporter, such as lift piston 250, may be provided essentially coaxial with the second storage column 224 and configured to move from a retracted position to an extended position in which it passes through the shifter 234. As it moves to the extended position, the lift piston 250 may be used to engage sealing caps (not shown) with a core catching tube disposed in the second storage column 224, as further described hereinafter.

[0034] Fig. 3 is a flow-chart diagram of at least a portion of a method 300 according to one or more aspects of the present disclosure. The method 300 may be performed with the tool 103 of Figs. 1, 2A and 2B, among other tools within the scope of the present disclosure. It should be

appreciated that the order of execution of the steps of the method 300 may be changed and/or some of the steps may be combined, divided, rearranged, omitted, eliminated and/or implemented in other ways within the scope of the present disclosure. In some cases, the method 300 may be used to obtain a sample of formation fluid present in the pores of formation core samples that would otherwise be difficult to obtain using a conventional sampling tool. For example, in tight gas reservoirs, or in heavy oil reservoirs, the mobility of the formation fluid may be low and conventional sampling of these reservoirs may be difficult.

[0035] At step 310, at least one core is captured from a wellbore sidewall. For example, the coring tool may be anchored in the wellbore at a location of interest. The coring assembly may be rotated into a coring position, and the coring bit may be extended into the adjacent formation. After the coring bit has penetrated the formation, the coring assembly may be further rotated to sever a core from the formation. The coring bit may be retracted into the coring assembly and the coring assembly may then be rotated into an eject position. A handling piston may be used to advance the recently obtained core into a core catching tube, and introduce the core through a throat of the core catching tube. The core catching tube may be filled with wellbore fluid, or may be filled with a gel disposed in the core catching tube prior to lowering the coring tool in the wellbore. As the core is inserted into the core catching tube, the fluid located in the core catching tube is displaced into the wellbore. For example, the core catching tube may include fluid passageways and/or ports to facilitate the evacuation of the fluid. One or more cores may be stored in the core catching tube. For example, an extension and rotation mechanism as described in U.S. Patent Application Pub. No.2009/0025941, incorporated in its entirety herein by reference, may be used to collect a plurality of cores in a single formation layer.

[0036] At step 320, the captured core is sealed in the core catching tube, downhole. For example, the ports of the core catching tube may be sealed, such as further described hereinafter.

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[0037] At step 330, the core sealed in the core catching tube is transported to the surface.

The pressure in the core catching tube may be maintained, for example by using a cushion. As the core volume changes due to thermal expansion/contraction, and/or as the volume of the core catching tube expands under differential pressure, the pressure in the chamber may be kept at essentially the same level. At surface, the chamber may be detached from the coring tool and may be further secured for handling and/or transportation. For example, the chamber may be disposed in a DOT-approved pressure vessel. Alternatively, or additionally, breach locks disposed on the catching tube may be further secured by an operator.

[0038] At the well site, or in laboratory, properties of the sealed core may be measured at step 340. More specifically, the properties may be measured while the core is still encapsulated in the core catching tube. For example, at least a portion of the wall of the core catching tube may be configured to permit the transmission of a magnetic field, electromagnetic waves, and/or nuclear radiation therethrough. For example, the wall of the core catching tube may be made of polyether etherkethone, fiber reinforced resin (e.g., fiber reinforced epoxy). Thus, the properties of the core and/or the positions of separation or marking disks located in the core catching tube may be determined. Example of core evaluation methods and/or suitable materials for core catching tubes may be found in U.S. Patent No. 7,500,388, incorporated in its entirety herein by reference.

[0039] At the well site or in a laboratory, gas and/or liquid may be extracted from the sealed core at step 350. For example, an access port of the core catching tube may be opened and fluidly connected to a bottle. Pressurized gas may then controllably leak into the bottle. Liquid may also be extracted. For example, the core catching tube may be disposed in a vessel, and a piston disposed in the core catching tube may be energized to compress the cores and extract

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fluid therefrom into the bottle. One example of such technique may be found in PCT Patent Application Pub. No. WO 2008/098359, incorporated in its entirety herein by reference.

[0040] At step 360, the extracted fluid (gas and/or liquid) may be analyzed to determine, for example, a composition of the fluid. In some cases, gas chromatography may be used to determine the composition of the extracted fluid.

[0041] Fig. 4A shows a core catching tube 430, a capture plug 400, and a lower cap 470 according to one or more aspects of the present disclosure. The core catching tube 430 may be used to implement the core catching tube 226 in Figs. 2A and 2B.

[0042] The core catching tube 430 comprises a wall, such as a sleeve 450. The sleeve 450 may be made of any material suitable for downhole use, and may be adapted to withstand or bear internal pressure. In some cases, at least a portion of the sleeve 450 may be configured to permit the transmission of a magnetic field, electromagnetic waves, and/or nuclear radiation therethrough. For example, the sleeve 450 may be made of polyether etherkethone, fiber reinforced resin (e.g., fiber reinforced epoxy). The sleeve 450 comprises one or more slots 440 which may be configured to facilitate the circulation of a fluid (e.g., wellbore fluid, gel, etc.) present in the sleeve 450 as cores are advanced in the sleeve 450. The sleeve 450 may also comprise ports 445 configured to facilitate the evacuation of the fluid present in the sleeve 450 as cores are advanced in the sleeve 450 and/or as the capture plug 400 is inserted into the sleeve 450. The fluid may escape the sleeve 450 through at least one of an upper throat 431 of the core catching tube 430 and the ports 445. The core catching tube 430 may further comprise a cushion 465 (e.g., a nitrogen chamber pressurized at surface). The cushion 465 may be configured to reduce shocks to the cores during transportation and handling of the cores, and/or to maintain the pressure in the core catching tube 430 when the tube is sealed. Additionally, or alternatively, the

cushion 465 may be configured to reduce its volume as the capture plug 400 and/or the lower cap 470 are partially inserted into the core catching tube 430, thereby facilitating the insertion.

[0043] The capture plug 400 comprises a plurality of breach lock pins 410, each configured to engage a guiding J-slot 435 of the sleeve 450. The capture plug 400 also comprises a seal 405 configured to engage a seal surface 436 of the sleeve 450. The seal 405 may be a radial seal, such as a stepped radial seal (as shown), configured to prevent cutting the seal during insertion of the capture plug 400. The seal 405 may also be a corner seal. The capture plug 400 may comprise a formation fluid passageway 415. The passageway 415 may comprise an access port plug 420, such as a quick-connect port. The passageway 415 may be provided with a check valve 425 configured to prevent pressure and/or fluid losses prior to inserting a sampling tube (not shown) in the access port.

[0044] The lower cap 470 comprises a plurality of retaining arms 480 each having a protrusion configured engage a crimp guide 455, such as may be affixed to the core catching tube 430, and to crimp on a groove 460 of the core catching tube 430. The lower cap 470 also comprises a seal 475, for example an O-ring or a gasket, configured to seal against an outer surface of the core catching tube 430. The lower cap 470 may comprise a formation fluid passageway 485. The passageway 485 may include an access port plug 490, such as a quick-connect port. The passageway 485 may be provided with a check valve 495 configured to prevent pressure and/or fluid losses prior to inserting a sampling tube (not shown) in the access port.

[0045] Example operation of the core catching tube 430, the capture plug 400, and the lower cap 470 is now described in reference to Figs. 2A, 2B, 4A and 4B. The core catching tube 430 may be disposed in the first storage column 222. The capture plug 400 and the lower cap 470 may be disposed respectively at the bottom and top of the second storage column 224. The

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capture plug 400 and the lower cap 470 may be held in place with a retention device (not shown). The coring tool 103 may be used to acquire a plurality of cores 472 and store the cores in the core catching tube 430.

[0046] When desired, the obtained cores may be sealed in the wellbore. For example, one of the shifters 234 and/or 236 may be actuated to register or align the core catching tube 430 with the capture plug 400 and the lower cap 470 located in the second storage column 224, as indicated by the arrow 433. The lift piston 250 may be actuated to lift the lower cap 470 and the core catching tube 430, as indicated by the arrow 434. Consequently, the capture plug 400 is inserted into the upper throat 431 of the core catching tube 430. The seal 405 engages the sealing surface 436. Fluid in the sleeve 450 may still escape the coring chamber 430 through the ports 445. Also, the breach lock pins 410 are guided in the J-slots 435. In some cases, the capture plug 400 may be free to rotate with respect to the core catching tube 430. Thus, the breach lock pins 410 may secure the capture plug 400 on top of the core catching tube 430. Alternatively, the core catching tube 430 may be rotated at surface by an operator to insure proper securing of the capture plug 400 on the core catching tube 430. Further, the retaining arms 480 engage a clearance between the core catching tube 430 and the crimp guide 455. The retaining arms 480 are crimped and the protrusion at the distal ends thereof locks into the groove 460. The seal 475 engages an outer surface of the core catching tube 430, and prevents fluid in the sleeve 450 from escaping through the ports 445. Fluid trapped in the core catching tube may compress the cushion 465, therefore reducing the amount of force needed to move the lower cap 470 against the core catching tube 430. Thus, the cores 472 are sealed in the core catching tube 430.

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[0047] The core catching tube 430, the capture plug 400, and the lower cap 470 may be conveyed to the surface by the coring tool 103. During transportation, volume changes may be compensated by the cushion 465, thereby maintaining the pressure in the core catching tube 430.

[0048] At surface, the core catching tube 430, the capture plug 400, and the lower cap 470 may be removed from the coring tool 103, as shown in Fig. 4B. One or more of the access ports 415 and/or 485 may then be opened to collect fluid (gas and/or liquid) from the coring chamber 430. The fluid may be collected in a pressurized bottle (not shown), and/or analyzed.

[0049] Fig. 5 shows a horizontal cross section of the sleeve 250 shown in Figs. 4A and 4B. One example design of the slots 440 is shown in greater detail.

[0050] Fig. 6A shows a capture plug 500 and a core catching tube 530 according to one or more aspects of the present disclosure. The capture plug 500 may be similar to the capture plug 400 of Figs. 4A and 4B. In this example, however, the capture plug 500 includes a shoulder 521 configured to abut a corresponding shoulder 553 of the core catching tube 530.

[0051] The core catching tube 530 comprises a perforated sleeve 550 and an isolation sleeve 551. The isolation sleeve 551 is configured to reciprocate along the axis of the perforated sleeve 550. Seals, such as O-rings, may be provided therebetween. In a first position (as shown), apertures of the perforated sleeve 550 substantially align with apertures in the isolation sleeve 551 and cooperate to define ports 545. The ports 545 may be configured to facilitate the evacuation of the fluid located in the sleeve 550 as cores 572 are advanced in the perforated sleeve 550 and/or as the capture plug 500 is inserted into the isolation sleeve 551. The ports 545 may be maintained in an open position, such as by a spring 552. Thus, the ports 545 may be in a normally open position.

[0052] Example operation of the core catching tube 530 and the capture plug 500 is now described in reference to Figs. 2A, 2B, 6A. A plurality of cores 572 are extracted from the

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formation and inserted into the core catching tube 530. Fluid located in the core catching tube 530 is evacuated through the ports 545. If desired, separation or marking disks 573 may be inserted between the cores. For example, the separation or marking disks 573 may be stored in the second storage column 224, and may be inserted in the core catching tube 530 using the shifter 236. A capture plug 500 may also be stored in the second storage column 224. As indicated by arrow 533, the capture plug 500 may be aligned with a throat of the core catching tube 530 using the shifter 236. Then the capture plug 500 may be inserted on the core catching tube 530 using the handling piston 240. The distance between the breach lock pins and the shoulder 521 is configured to lower the shoulder 533 and the isolation sleeve 551 by a sufficient amount so that the ports 545 close. Thus, the cores 573 are sealed in the core catching tube 530.

[0053] At surface, the location of separation or marking disks 573, among other things, may be detected by transmitting of a magnetic field, an electromagnetic waves, and/or a nuclear radiation through the sleeves 550 and 551 and measuring a transmitted quantity. Gas and/or liquid may be extracted from the sealed core catching tube as previously described.

[0054] Fig. 6B shows a capture plug 600 and a core catching tube 630 according to one or more aspects of the present disclosure. The capture plug 600 and the core catching tube 630 may be used in lieu of the capture plug 500 and the core catching tube 530 of Fig. 6A.

[0055] The capture plug 600 is provided with a piston 605 having a seal 610 configured to engage the inner bore of the perforated sleeve 650. The piston 605 is affixed to a ram 620 extending through the length of the capture plug 600. The ram may include a threaded portion 625. A seal 615 is provided between the ram 620 and the body of the capture plug 600.

[0056] The core catching tube 630 is similar to the core catching tube 530 of Fig. 6A. However, the spring 652 is configured to maintain the plurality of ports 645 in a normally closed position. Further, the isolation sleeve 651 is configured to be recessed, so that an actuating

mechanism 621, for example a fork, can be engaged against the shoulder 653. The actuating mechanism 621 may be moved in a down direction to open the ports 645. When desired, the ports 645 may be closed by releasing the force applied by the actuating mechanism 621.

[0057] The capture plug 600 and core catching tube 630 may be used similarly to the capture plug 500 and core catching tube 530. In addition, the piston 605 may be connected to a force member (not shown), such as via the threaded portion 625. The piston may be used to apply a force on the core samples and mechanically extract liquid and/or gas from the pores of the core samples. In some cases, separation or marking disks 673 may be placed between cores, or perhaps at least between cores extracted from different formations. The separation or marking disks 673 may include a seal 674 configured to engage the inner bore of the core catching tube 630. The location of separation or marking disks 673 may be detected as previously described. The relative position of the separation or marking disks 673 ports 645 may be determined. Thus, liquid and/or gas from cores between two disks 673 may be collected through a corresponding port 645.

[0058] Fig. 7 shows core holders 735a, 735b, capture plugs 700a, 700b, and lower caps 770a, 770b according to one or more aspects of the present disclosure. The embodiment illustrated in FIG. 7 may be used to store each individual core (such as core 772) in its own pressurized container.

[0059] The core lower caps 770a and 770b include a locking mechanism (not shown), such as a crimping device or a breach lock device, as previously described, configured to engage the core holders 735a and 735b, respectively. Further, the core holders 735a and 735b include a locking mechanism (not shown) configured to engage the capture plugs 700a and 700b, respectively.

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[0060] The capture plugs 700a and 700b may include a sealed access port (such as a quick-connect port), and an optional actuated check valve as previously described. The core holders 735a and 735b include one or more ports 745 configured to facilitate the evacuation of the fluid present in the core holders 735a and 735b as cores are advanced in the core holders 735a and 735b and/or as the capture plug 700a and 700b are inserted into the core holders 735a and 735b. Further, the walls of the core holders 735a and 735b may include slots, as previously described. The core lower caps 770a and 770b include a cushion 765 for allowing fluid present in the core holders 735a and 735b to flow into a sealed chamber 766 as the capture plug 700a and 700b are inserted into the core holders 735a and 735b, thereby facilitating the insertion of the capture plugs.

[0061] Example operation is now described in reference to Figs. 2A, 2B, and 7. A plurality of capture plugs, core holders, and lower caps may be stored in the second storage column 224. As shown, the plurality of capture plugs, core holders, and lower caps stored in the second storage column 224 may be stored in reverse order, thereby preventing interlocking therebetween. A lower cap, such as the lower cap 770a, may be lifted into a position in which it engages the shifter 236, for example using a lead screw 720 coupled to an elevator plate 725. As indicated by arrow 733, the shifter 236 is actuated to register the lower cap 770a with the first storage column 222, and the handling piston 240 is actuated to advance the lower cap 770a into the first storage column 222. A core holder, such as the core holder 735a, is then lifted into a position in which it engages the shifter 236, using the lead screw 720 and the elevator plate 725. The shifter 236 is actuated to register the core holder 735a with the first storage column 222. The coring assembly 125 is used to obtain a core 772. The handling piston 240 is extended to dispose the obtained core into the core holder 735a. The handling piston 240 is further extended to lock the lower cap 770a and the core holder 735a. A capture plug, such as the capture plug

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700a, is then lifted into a position in which it engages the shifter 236, using the lead screw 720 and the elevator plate 725. The shifter 236 is actuated to register the capture plug 700a with the first storage column 222. The handling piston 240 is extended to lock the core holder 735a and the capture plug 700a. During operation, the elevator plate 715 may be lowered as desired, for example using a lead screw 710. More cores may then be captured in a similar fashion.

[0062] Fig. 8 shows an alternate aspect of the present disclosure. This aspect may be implemented using the coring tool 103 of Figs. 2A and 2B. Alternatively, this aspect may be implemented using other coring tools, such as the coring tools described in U.S. Patent Nos. 4,714,119 and/or 5,667,025, incorporated in their entirety herein by reference.

[0063] In this aspect, a pressure bearing core catching tube 5 is provided within a storage section of a coring tool, although some portions may be in the coring section. The core catching tube 5 may be a solid, un-perforated tube, a portion of which having a plurality of slots 3. The lower head of the core catching tube 5 may include a bottom isolation valve 6. The bottom isolation valve 6 may be a ball valve, a gate valve, or any other pressure bearing fluid valve. In an open position, the bottom isolation valve 6 may allow mud or other fluid to be ejected from the core catching tube 5 as cores are inserted therein. In a closed position, the bottom isolation valve 6 may hydraulically isolate the core catching tube 5, such as once the tube is filled and/or upon a command to the coring tool initiated by a surface operator. A perforated core support 8 may be installed above the bottom isolation valve 6, such as to insure mechanical integrity of the core samples in the core catching tube 5. Optionally, a spring or fluid cushion 7 may be provided to reduce the mechanical shock seen while acquiring and/or conveying the cores. The spring or fluid cushion 7 may be beneficial to preserve the mechanical integrity of the samples. In addition, separation/marketing disks (not shown) may be inserted in the core catching tube 5 between stored cores. Further, the core catching tube 5 is provided with a throat isolation valve

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11. The throat isolation valve 11 may be a large ball valve, or a sliding gate valve. In some cases, the bottom isolation valve 6 and the throat isolation valve 11 are detachably coupled to a valve actuating mechanism (not shown) disposed in the body of the coring tool.

[0064] In operation, the core catching tube 5 is filled with one or more cores. The bottom isolation valve 6 is closed. The upper throat of the core catching tube 5 may also be sealed using the throat isolation valve 11. The core catching tube 5 is brought to the Earth's surface. The core catching tube 5, the bottom isolation valve 6, and the throat isolation valve 11 may be detached from the coring tool. The bottom isolation valve 6 may be coupled to a surface actuating mechanism. The bottom isolation valve 6 may be opened and fluid (gas and/or liquid) may be extracted from the core catching tube 5.

[0065] In view of all of the above, those skilled in the art should recognize that the present disclosure introduces an apparatus comprising: a sidewall coring tool configured to obtain a plurality of sidewall formation cores from a sidewall of a wellbore extending into a subterranean formation, wherein the sidewall coring tool comprises: a core catching tube configured to store the plurality of sidewall formation cores therein, wherein the core catching tube comprises a fluid port configured to allow evacuation of fluid from the core catching tube as each of the plurality of sidewall formation cores is introduced therein, and wherein the core catching tube, including the fluid port, is configured to be sealed downhole without removing the sidewall coring tool from the wellbore. The core catching tube may comprise a cushion configured to maintain a pressure in the core catching tube once the fluid port is sealed downhole. The cushion may comprise a mechanical spring. At least a portion of the core catching tube may be configured to pass energy therethrough to the plurality of sidewall formation cores therein. The core catching tube may comprise a slot configured to open and close, thus allowing further evacuation of fluid from the core catching tube when the slot is opened. The sidewall coring tool

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may further comprise a capture plug configured to couple with an end of the core catching tube, thus contributing to sealing of the plurality of sidewall formation cores in the core catching tube. The capture plug may comprise an access port in fluid communication with a fluid passageway that opens into the core catching tube. The capture plug may comprise a breach lock pin configured to engage a corresponding feature of the core catching tube. The sidewall coring tool may further comprise a cap configured to couple with another end of the core catching tube, thus contributing to sealing of the plurality of sidewall formation cores in the core catching tube. The cap may comprise an access port in fluid communication with a fluid passageway that opens into the core catching tube. The cap may comprise a retaining arm configured to mate with a guide of the core catching tube. The core catching tube may comprise an inner sleeve and an outer sleeve concentric with the inner sleeve, wherein the inner and outer sleeves comprise corresponding slots configured to align in response to relative movement of the inner and outer sleeves, and when aligned the slots of the inner and outer sleeves allow further evacuation of fluid from the core catching tube as each additional one of the plurality of sidewall formation cores is inserted into the core catching tube. The core catching tube may further comprise a plurality of separators each configured to interpose and hydraulically isolate neighboring ones of the plurality of sidewall formation cores.

[0066] The present disclosure also introduces a method comprising: obtaining, with a sidewall coring tool positioned in a wellbore extending into a subterranean formation, a sidewall core from a sidewall of the wellbore; moving the sidewall core into a core catching tube of the sidewall coring tool, wherein moving the sidewall core into the core catching tube displaces a fluid in the core catching tube through a port in the core catching tube; sealing the core in the core catching tube, including the port, while the sidewall coring tool is in the wellbore; and removing the sidewall coring tool, including the core sealed in the core catching tube of the

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sidewall coring tool, from the wellbore. The method may further comprise anchoring the sidewall coring tool in the wellbore prior to obtaining the sidewall core. Moving the sidewall core into the core catching tube may displace a fluid in the core catching tube through a plurality of closable openings in the core catching tube. Removing the sidewall coring tool from the wellbore may comprise maintaining a constant pressure in the core catching tube. The method may further comprise detaching the core catching tube from the sidewall coring tool after removing the sidewall coring tool from the wellbore. The method may further comprise securing breach locks on the core catching tube after removing the sidewall coring tool from the wellbore. The method may further comprise measuring a property of the core while the core is sealed in the core catching tube. Measuring the property of the core may comprise transmitting energy into the sealed core through the core catching tube.

[0067] The foregoing outlines features of several embodiments so that those skilled in the art may better understand the aspects of the present disclosure. Those skilled in the art should appreciate that they may readily use the present disclosure as a basis for designing or modifying other processes and structures for carrying out the same purposes and/or achieving the same advantages of the embodiments introduced herein. Those skilled in the art should also realize that such equivalent constructions do not depart from the spirit and scope of the present disclosure, and that they may make various changes, substitutions and alterations herein without departing from the spirit and scope of the present disclosure.

[0068] The Abstract at the end of this disclosure is provided to comply with 37 C.F.R. §1.72(b) to allow the reader to quickly ascertain the nature of the technical disclosure. It is submitted with the understanding that it will not be used to interpret or limit the scope or meaning of the claims.

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WHAT IS CLAIMED IS:

1. An apparatus, comprising:

a sidewall coring tool configured to obtain a plurality of sidewall formation cores from a sidewall of a wellbore extending into a subterranean formation, wherein the sidewall coring tool comprises:

a core catching tube configured to store the plurality of sidewall formation cores therein, wherein the core catching tube comprises a fluid port configured to allow evacuation of fluid from the core catching tube as each of the plurality of sidewall formation cores is introduced therein, and wherein the core catching tube, including the fluid port, is configured to be sealed downhole without removing the sidewall coring tool from the wellbore.

2. The apparatus of claim 1 wherein the core catching tube comprises a cushion configured to maintain a pressure in the core catching tube once the fluid port is sealed downhole.

3. The apparatus of claim 2 wherein the cushion comprises a mechanical spring.

4. The apparatus of claim 1 wherein at least a portion of the core catching tube is configured to pass energy therethrough to the plurality of sidewall formation cores therein.

5. The apparatus of claim 1 wherein the core catching tube comprises a slot configured to open and close, thus allowing further evacuation of fluid from the core catching tube when the slot is opened.

6. The apparatus of claim 1 wherein the sidewall coring tool further comprises a capture plug configured to couple with an end of the core catching tube, thus contributing to sealing of the plurality of sidewall formation cores in the core catching tube.

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7. The apparatus of claim 6 wherein the capture plug comprises an access port in fluid communication with a fluid passageway that opens into the core catching tube.

8. The apparatus of claim 6 wherein the capture plug comprises a breach lock pin configured to engage a corresponding feature of the core catching tube.

9. The apparatus of claim 6 wherein the sidewall coring tool further comprises a cap configured to couple with another end of the core catching tube, thus contributing to sealing of the plurality of sidewall formation cores in the core catching tube.

10. The apparatus of claim 9 wherein the cap comprises an access port in fluid communication with a fluid passageway that opens into the core catching tube.

11. The apparatus of claim 10 wherein the cap comprises a retaining arm configured to mate with a guide of the core catching tube.

12. The apparatus of claim 1 wherein the core catching tube comprises an inner sleeve and an outer sleeve concentric with the inner sleeve, wherein the inner and outer sleeves comprise corresponding slots configured to align in response to relative movement of the inner and outer sleeves, and when aligned the slots of the inner and outer sleeves allow further evacuation of fluid from the core catching tube as each additional one of the plurality of sidewall formation cores is inserted into the core catching tube.

13. The apparatus of claim 1 wherein the core catching tube comprises a plurality of separators each configured to interpose and hydraulically isolate neighboring ones of the plurality of sidewall formation cores.

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14. A method, comprising:

obtaining, with a sidewall coring tool positioned in a wellbore extending into a subterranean formation, a sidewall core from a sidewall of the wellbore;

moving the sidewall core into a core catching tube of the sidewall coring tool, wherein moving the sidewall core into the core catching tube displaces a fluid in the core catching tube through a port in the core catching tube;

sealing the core in the core catching tube, including the port, while the sidewall coring tool is in the wellbore; and

removing the sidewall coring tool, including the core sealed in the core catching tube of the sidewall coring tool, from the wellbore.

15. The method of claim 14 further comprising anchoring the sidewall coring tool in the wellbore prior to obtaining the sidewall core.

16. The method of claim 14 wherein removing the sidewall coring tool from the wellbore comprises maintaining a constant pressure in the core catching tube.

17. The method of claim 14 further comprising detaching the core catching tube from the sidewall coring tool after removing the sidewall coring tool from the wellbore.

18. The method of claim 14 further comprising securing breach locks on the core catching tube after removing the sidewall coring tool from the wellbore.

19. The method of claim 14 further comprising measuring a property of the core while the core is sealed in the core catching tube.

20. The method of claim 19 wherein measuring the property of the core comprises transmitting energy into the sealed core through the core catching tube.

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SEALED CORE**ABSTRACT OF THE DISCLOSURE**

An apparatus comprising a sidewall coring tool configured to obtain a plurality of sidewall formation cores from a sidewall of a wellbore extending into a subterranean formation, wherein the sidewall coring tool comprises a core catching tube configured to store the plurality of sidewall formation cores therein, wherein the core catching tube comprises a fluid port configured to allow evacuation of fluid from the core catching tube as each of the plurality of sidewall formation cores is introduced therein, and wherein the core catching tube, including the fluid port, is configured to be sealed downhole without removing the sidewall coring tool from the wellbore.

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Fig. 1

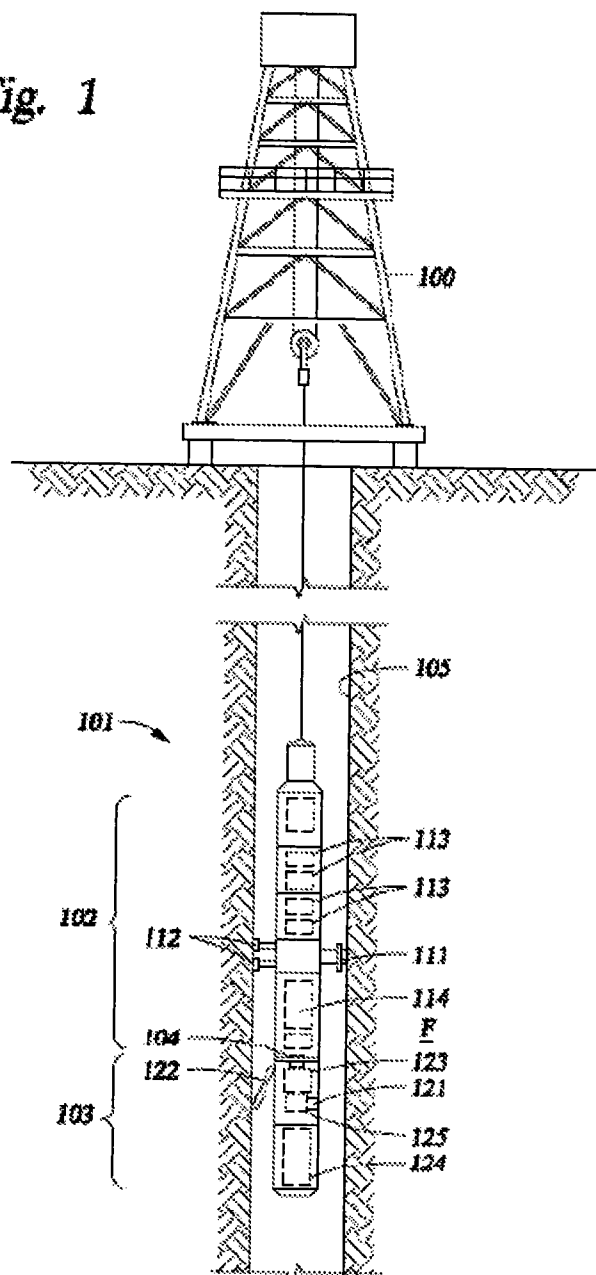
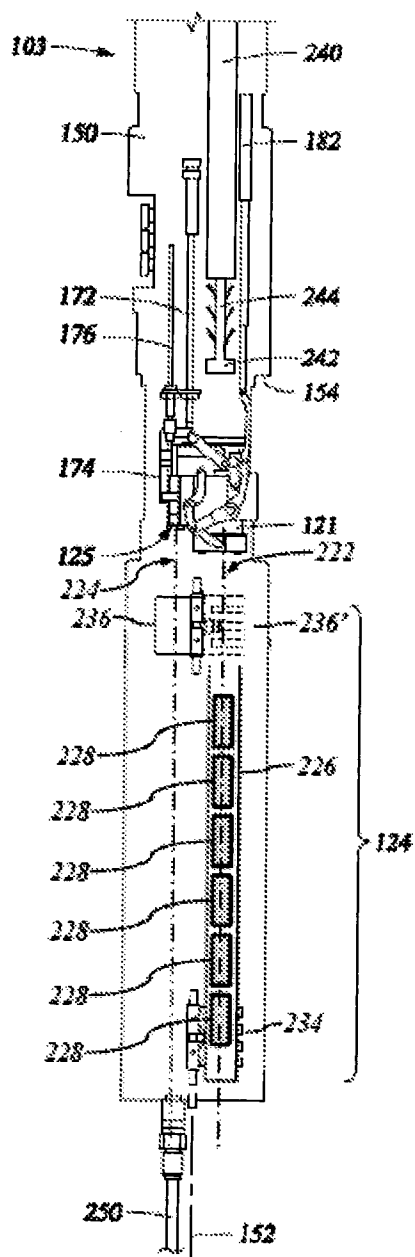


Fig. 2B



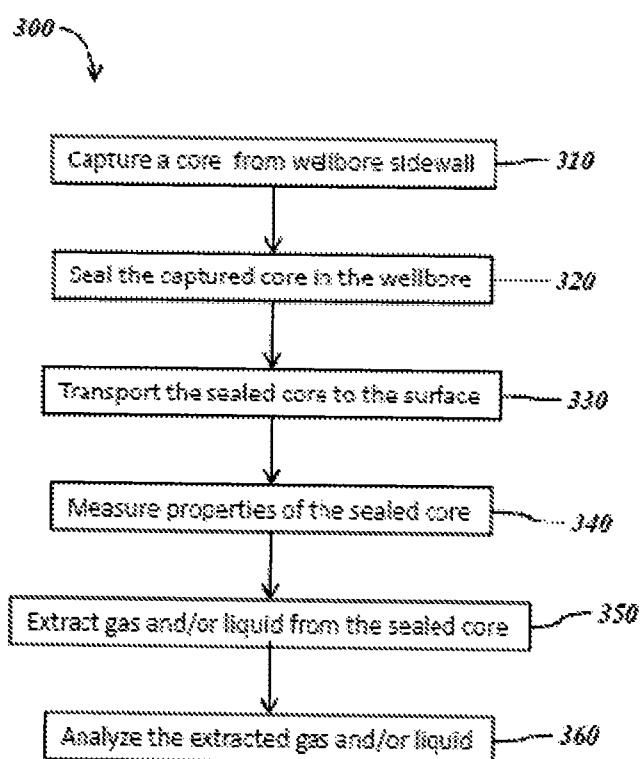
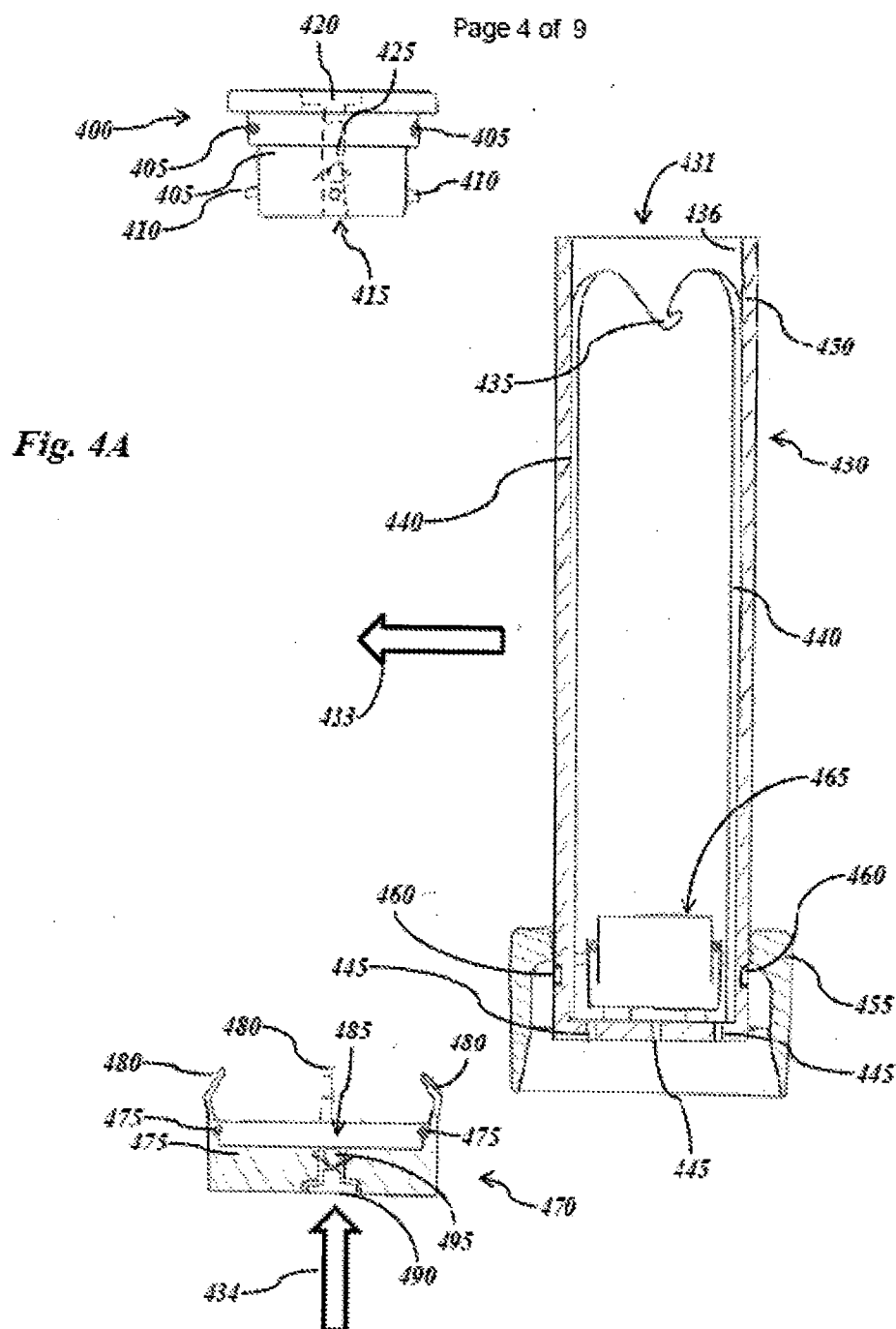


Fig. 3

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Fig. 4B

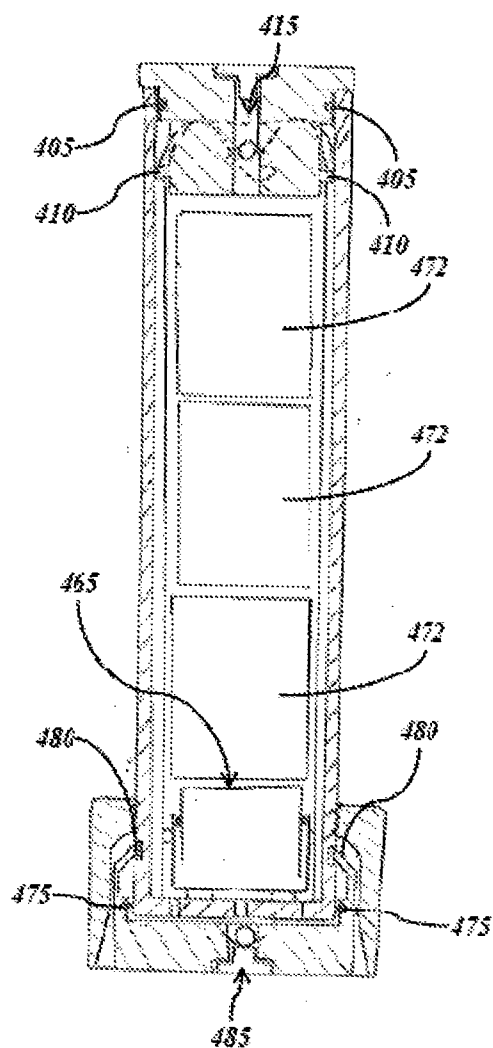
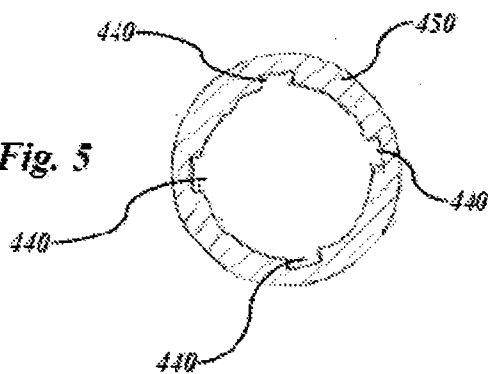
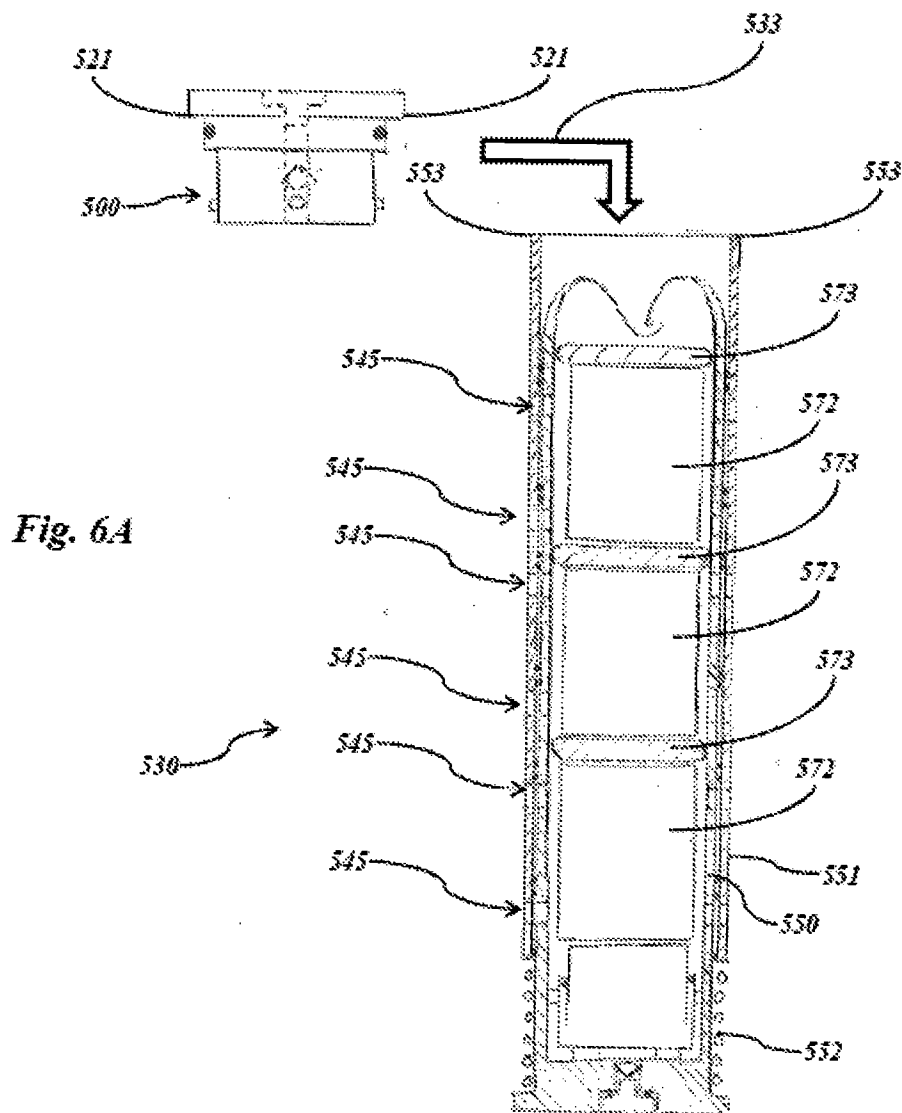


Fig. 5



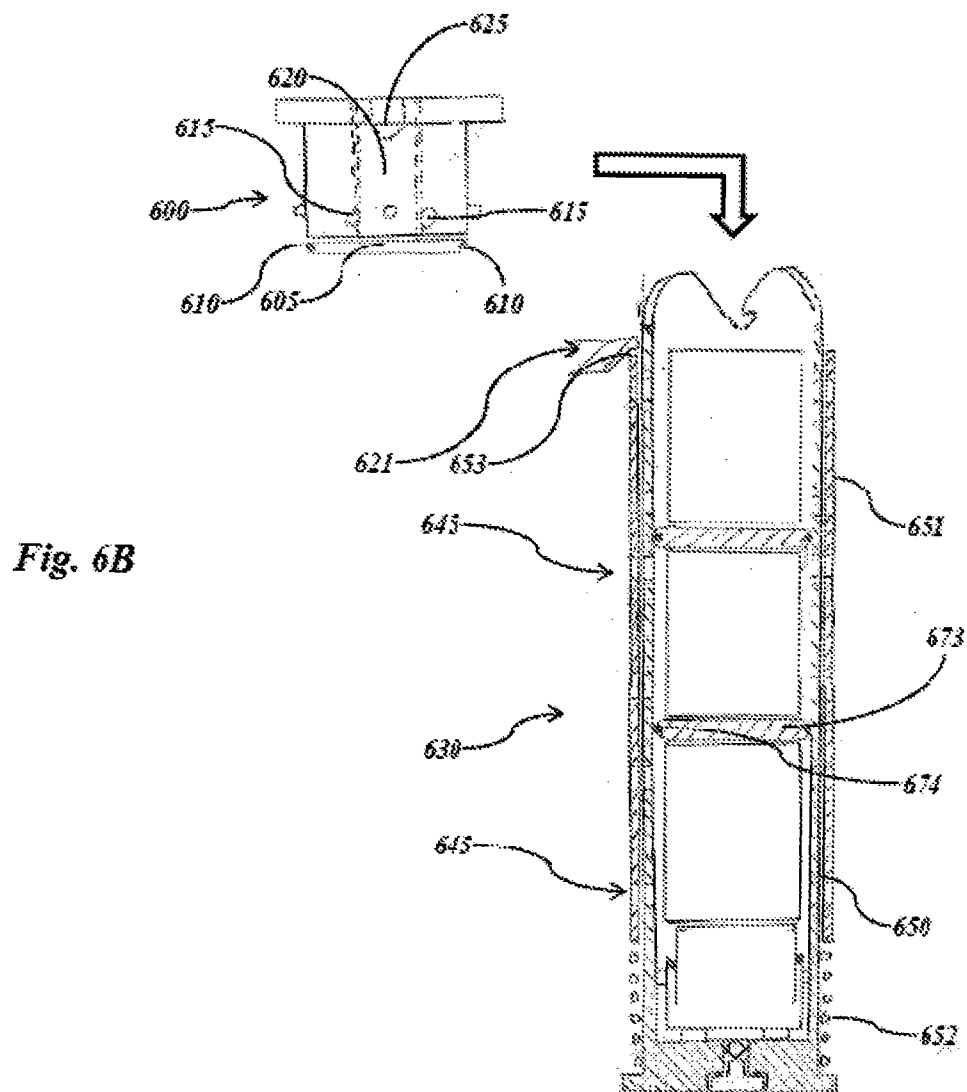
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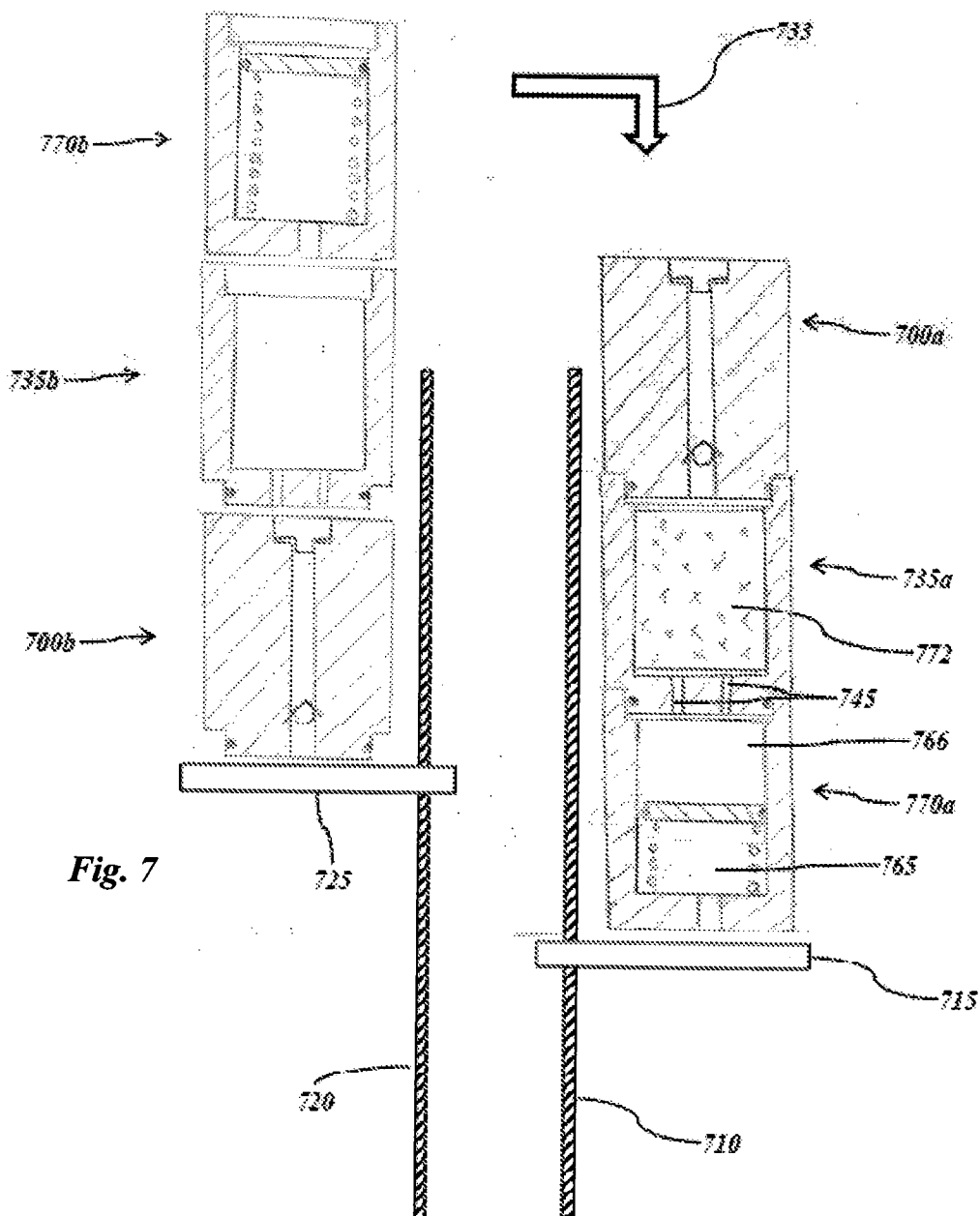


Fig. 7

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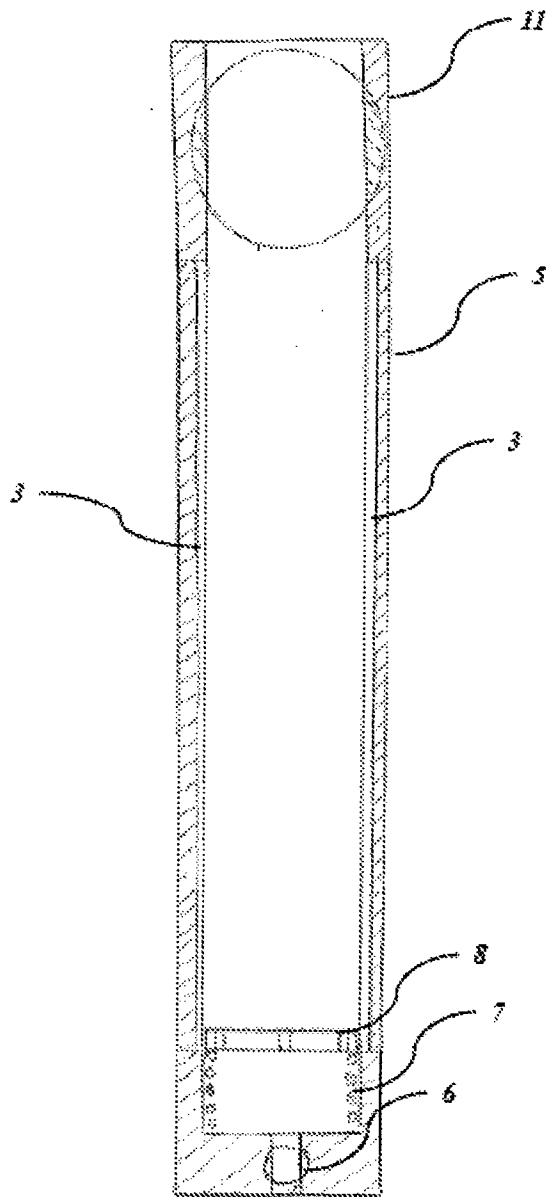


Fig. 8

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	20.3215
		Application Number	
Title of Invention	SEALED CORE		
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.			

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					
Applicant Authority		☒ Inventor		☐ Legal Representative under 35 U.S.C. 117	
				☐ Party of Interest under 35 U.S.C. 118	
Prefix	Given Name	Middle Name	Family Name	Suffix	
	Lennox	E.	Reid	Jr.	
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service					
City	Houston	State/Province	TX	Country of Residence	US
Citizenship under 37 CFR 1.41(b)		US			
Mailing Address of Applicant:					
Address 1		14915 Little Leaf Court			
Address 2					
City	Houston	State/Province	TX		
Postal Code	77082	Country	US		
Applicant 2					
Applicant Authority		☒ Inventor		☐ Legal Representative under 35 U.S.C. 117	
				☐ Party of Interest under 35 U.S.C. 118	
Prefix	Given Name	Middle Name	Family Name	Suffix	
	Carsten		Sonne		
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service					
City	Houston	State/Province	TX	Country of Residence	US
Citizenship under 37 CFR 1.41(b)		DK			
Mailing Address of Applicant:					
Address 1		616 Memorial Height Drive, #11220			
Address 2					
City	Houston	State/Province			
Postal Code	77007	Country	US		
All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the Add button.					

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below.
For further information see 37 CFR 1.33(a).

☐ An Address is being provided for the correspondence Information of this application.

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	20.3215
		Application Number	
Title of Invention	SEALED CORE		
Customer Number	93083		
Email Address	kmorris2@slb.com	Add Email	Remove Email

Application Information:

Title of the Invention	SEALED CORE		
Attorney Docket Number	20.3215	Small Entity Status Claimed	☐
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)	9	Suggested Figure for Publication (if any)	

Publication Information:☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☐ **Request Not to Publish.** 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 **has not and will not** 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:	☒ Customer Number	☐ US Patent Practitioner	☐ Limited Recognition (37 CFR 11.9)
Customer Number	93083		

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	Pending	Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
61176574	non provisional of		
Prior Application Status	Pending	Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
61187126	non provisional of		

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	20.3215
		Application Number	
Title of Invention	SEALED CORE		

Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the **Add** button.

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).

			Remove
Application Number	Country	Parent Filing Date (YYYY-MM-DD)	Priority Claimed
			☒ Yes ☐ No

Additional Foreign Priority Data may be generated within this form by selecting the **Add** button.

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

If the Assignee is an Organization check here. ☐

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Address 2			
City		State/Province	
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Phone Number		Fax Number	
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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	/Dave R. Hofman/		Date (YYYY-MM-DD)	2010-05-04	
First Name	Dave R.	Last Name	Hofman	Registration Number	55272

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	20.3215
		Application Number	
Title of Invention	SEALED CORE		

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.**

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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.
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2000-3

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Patente de Invención

Patente de Modelo de Utilidad

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Lugar de Constitución:

Domicilio: La Haya, Holanda

IDENTIFICACION

C.C. ☐ NIT ☐

C.E. ☐ Otro ☐

Número _____

3

REPRESENTANTE
O APODERADO
(74)

Nombre: LUIS FELIPE CASTILLO GIBSON

Dirección: Carrera 13 No. 37-43 Piso 12

Teléfono: 285 7460 Fax: 28 9267

E-mail info@castillograu.com

IDENTIFICACION

C.C. ☒ NIT ☐

C.E. ☐ OTRO ☐

Número: 79.397.879 de TP: 68.995 del
Bogotá C.S.J.

4

INVENTOR(ES)
(72)

Nombre: Lennox E. REID, Jr. - Carsten SONNE

Dirección: 14915 Little Leaf Court
616 Memorial Height Drive

Nacionalidad o Domicilio:
Houston, Texas, E.U.A.
Houston, Texas, E.U.A.

IDENTIFICACION

C.C. ☐ NIT ☐

C. 5 ☒ COMBATEO ☐

Número _____

5

Título (54) UNA HERRAMIENTA SACANÚCLEOS DE LA PARED LATERAL DE UN POZO QUE
COMPRENDE UN TUBO SELLADO DE CAPTACIÓN DE NÚCLEOS

6

Clasificación Internacional (51)

7

Prioridad

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(33) País de Origen
E.U.A.

(32) Fecha

08.05.2009 -
15.06.2009 -
04.05.2010

(31) Número de Solicitud

61/176,574 -
61/187,126 -
12/773,105

8

Para publicar a partir de la fecha de la presente solicitud a los:

6 meses

☐

12 meses

X

18 meses

☐

Otro

☐

9

Comprobante de pago N°:

Fecha:

Instrucciones para el diligenciamiento del presente formulario, ver reverso de esta página.

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		EXTRACTO PARA PUBLICACIÓN	
		☒ Patente de Invención ☐ Patente modelo de utilidad ☐ PCT	
(21) No. De solicitud		(51) int. Cl:	
(22) Fecha de solicitud		(71) Solicitante (s) SCHULUMBERGER TECHNOLOGY B.V	
(30) Prioridad		(72) Interventor (es)	
(31) No. Prioridad 61/176,574 – 61/187,126 – 12/773,105		Lennox E. REID, Jr. – Carsten SONNE	
(32) Fecha 08.05.2009 – 15.06.2009 – 04.05.2010			
(33) Pais E.U.A.		(74) Apoderado (s)	
		LUIS FELIPE CASTILLO GIBSONE	
(54) Título UNA HERRAMIENTA SACANÚCLEOS DE LA PARED LATERAL DE UN POZO QUE COMPRENDE UN TUBO SELLADO DE CAPTACION DE NÚCLEOS			
Las casillas identificadas con 85, 86 y 87 sólo aplican para PCT			
(85) Fecha límite inicio Fase Nacional			
(86) Datos relativos a la presentación de la solicitud PCT		(87) Publicación internacional	
Fecha de presentación de la solicitud		Fecha	
Fecha		Fecha	
No. de solicitud PCT		No. Publicación WO	
Resumen reivindicación (es):			
1. Un aparato, que comprende:			
una herramienta sacanúcleos de la pared lateral configurada para obtener una pluralidad de núcleos de la formación lateral de una pared de una perforación de pozo que se extiende hacia una formación subterránea, caracterizada porque la herramienta sacanúcleos de la pared lateral comprende:			
un tubo de captación de núcleos configurado para almacenar la pluralidad de núcleos laterales de la formación en el mismo, caracterizada porque el tubo de captación de núcleos comprende un puerto de fluido configurado para permitir la evacuación del fluido del tubo de captación de núcleos conforme cada uno de la pluralidad de núcleos laterales de la formación es introducido en el mismo, y caracterizado porque el tubo de captación de núcleos, incluyendo el puerto de fluido, es configurado para ser sellado barrenado abajo sin remover la herramienta sacanúcleos de la pared lateral de la perforación de pozo.			
14. Un método, que comprende:			
obtener, con una herramienta sacanúcleos de la pared lateral colocada en una perforación de pozo que se extiende hacia una formación subterránea, un núcleo lateral de una pared de la perforación de pozo;			
mover el núcleo lateral hacia un tubo de captación de núcleos de la herramienta sacanúcleos de la pared lateral, caracterizado porque el movimiento del núcleo lateral hacia el tubo de captación de núcleos desplaza un fluido en el tubo de captación de núcleos a través de un puerto en el tubo de captación de núcleos;			
sellar el núcleo en el tubo de captación de núcleos, incluyendo el puerto, mientras la herramienta sacanúcleos de la pared lateral está en la perforación de pozo; y			
remover la herramienta sacanúcleos de la pared lateral, incluyendo el núcleo sellado en el tubo de captación de núcleos de la herramienta sacanúcleos de la pared lateral, de la perforación de pozo.			

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2020
Bogotá D.C.,

Doctor(a)
CASTILLO GIBSON LUIS FELIPE
Apoderado(a) y/o Representante de
SCHLUMBERGER TECHNOLOGY B.V.

REFERENCIA	Radicación No. 10 54660
	Trámite 2
	Evento 1
	Actuación 416
	Oficio No. 12220
	Folios 1

Teniendo en cuenta que la solicitud de privilegio de patente que se tramita bajo el expediente indicado en la referencia, reúne los requisitos de forma establecidos en los artículos 26 y 27 de la Decisión 486 de la Comisión de la Comunidad Andina, y en las demás disposiciones vigentes sobre la materia, se envía el extracto de la solicitud a la Oficina de Comunicaciones para efecto de su publicación en la Gaceta de Propiedad Industrial.

De acuerdo con lo previsto por el artículo 40 de la Decisión 486/00, la publicación en este caso se hará a partir del día 07 del mes de Mayo de 2011.

Cúmplase
Dado en Bogotá DC,



JOSE LUIS SALAZAR LOPEZ
Director de Nuevas Creaciones (C)

02 MAR 2011

jfernand



Industria y Comercio
SUPERINTENDENCIA

Delegatura de Propiedad Industrial
División de Nuevas Creaciones

SOLICITUD
PATENTE DE INVENCION

21. **EXPEDIENTE No.** _____

54. **TÍTULO** _____
UNA HERRAMIENTA SACANUCLEOS DE LA PARED LATERAL DE UN POZO QUE
COMPRENDE UN TUBO SELLADO DE CAPTACION DE NUCLEOS

51. **CLASIFICACIÓN INTERNACIONAL** _____

71. **SOLICITANTE** _____
SCHLUMBERGER TECHNOLOGY B.V.

DOMICILIO _____
LA HAYA, HOLANDA

74. **APODERADO** _____
LUIS FELIPE CASTILLO

22. **BOGOTÁ, D.C.,** _____