

Asia Pacífico

Bangkok
Hanói
Ho Chi Minh
Hong Kong
Kuala Lumpur*
Manila*
Melbourne
Pekin
Shanghai
Sidney
Singapur
Taipéi
Tokio
Yakarta*Europa, Medio
Oriente y ÁfricaAbu Dabi
Almaty
Amberes
Ámsterdam
Barén
Bakú
Barcelona
Berlín
Bruselas
Budapest
Casablanca
Doha
Düsseldorf
El Cairo
Estambul
Estocolmo
Fráncfort
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Madrid
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Moscú
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París
Praga
Riad
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S. Petersburgo
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Zúrich

Latinoamérica

Bogotá
Brasilia*
Buenos Aires
Caracas
Guadalajara
Juárez
Lima
México, D.F.
Monterrey
Porto Alegre*
Rio de Janeiro*
Santiago
Sao Paulo*
Tijuana
Valencia

Norteamérica

Chicago
Dallas
Houston
Miami
Nueva York
Palo Alto
San Francisco
Toronto
Washington, D.C.

* Firma Asociada

Doctor

José Luis Salazar

Director de División de Nuevas Creaciones (C)

SUPERINTENDENCIA DE INDUSTRIA

E. _____ S. _____

SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO



No. 13-183118-00003-0000

Fecha: 2013-11-19 16:31:50 Dep. 2020 DIR.NUEVASCR
Tra. 2 PATENTES Eve: 1 REGDEPOSITO
Act. 444 RESPUESTAREQUE Folios: 90

Referencia: Expediente No. 13.183.118

Solicitud de Patente de Invención titulada: "Cubierta de bomba sumergible
con puertos de purga de cierre"

Solicitante: Schlumberger Technology B.V

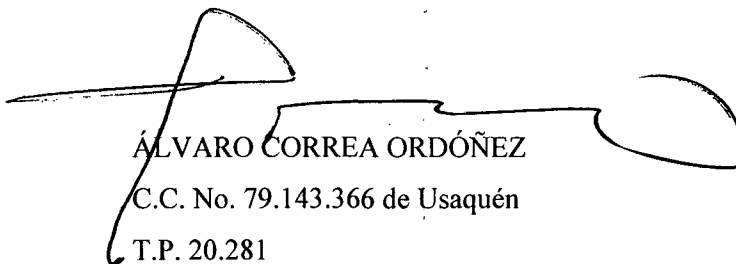
RESPUESTA AL AUTO NOTIFICADO POR FIJACIÓN EN LISTADEL 13 DE AGOSTO DE 2013, OFICIO NO. 14685, TRÁMITE: 2, EVENTO: 1, ACTUACIÓN:430 (EXAMEN DE FORMA)

ÁLVARO CORREA ORDÓÑEZ, mayor de edad y vecino de Bogotá D.C., identificado tal como aparece al pie de mi firma, en mi carácter de apoderado de la sociedad en referencia, doy respuesta al auto emanado por ese Despacho dentro del término de prórroga solicitado en mi memorial 13-183118-00002-0000 de fecha 8 de octubre de 2013:

1. Presento copias certificadas de los documentos en que consta la cesión del derecho a la patente del inventor a la entidad solicitante, junto con su traducción simple al castellano.
2. Presento copia del documento de poder de abogado, junto con su traducción simple al castellano.

3. Presento copias certificadas de los documentos de prioridad No. US 61,678,101 del 1 de agosto de 2012 y No. US 13/604,628 del 6 de septiembre de 2012 junto con su traducción simple al castellano de carátula y reivindicaciones.

Atentamente,



ÁLVARO CORREA ORDÓÑEZ
C.C. No. 79.143.366 de Usaquén
T.P. 20.281

Anexos:

- Poder de Abogado
- Documentos de Cesión de Inventores (2)
- Copias certificadas de los documentos de prioridad (2)

BOGMGT/BOGDMS-#1793493-V1-P2013_000048-MEMORIAL_RESPUESTA_FORMA.DOC

A 1932211

THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office

October 16, 2013

THIS IS TO CERTIFY THAT ANNEXED IS A TRUE COPY FROM THE
RECORDS OF THIS OFFICE OF A DOCUMENT RECORDED ON
AUGUST 19, 2012.

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



P. Swain
P. SWAIN
Certifying Officer

502029598 08/19/2012

PATENT ASSIGNMENT

Electronic Version v1.1
Stylesheet Version v1.1

SUBMISSION TYPE:	NEW ASSIGNMENT
NATURE OF CONVEYANCE:	ASSIGNMENT
CONVEYING PARTY DATA	
Name	Execution Date
David Milton Eslinger	08/16/2012
RECEIVING PARTY DATA	
Name:	Schlumberger Technology Corporation
Street Address:	300 Schlumberger Drive
City:	Sugar Land
State/Country:	TEXAS
Postal Code:	77478
PROPERTY NUMBERS Total: 1	
Property Type	Number
Application Number:	61678101
CORRESPONDENCE DATA	
Fax Number:	7136896372
Phone:	81427595321
Email:	kawashima1@exchange.slb.com
<i>Correspondence will be sent to the e-mail address first; if that is unsuccessful, it will be sent via US Mail.</i>	
Correspondent Name:	Schlumberger - COE
Address Line 1:	WesternGeco 10001 Richmond Ave.
Address Line 2:	Room 3028
Address Line 4:	Houston, TEXAS 77042
ATTORNEY DOCKET NUMBER:	IS12.2334USPSP ASSIGNMENT
NAME OF SUBMITTER:	Setsuko Kawashima
Total Attachments: 4 source=IS122334USPSP_20120819_Assignment#page1.tif source=IS122334USPSP_20120819_Assignment#page2.tif source=IS122334USPSP_20120819_Assignment#page3.tif source=IS122334USPSP_20120819_Assignment#page4.tif	

CH \$40.00 61678101

502029598

PATENT
REEL: 028809 FRAME: 0274

Assignment

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

David Milton Eslinger a citizen of the United States of America, residing at 15718 N 102nd E Avenue Collinsville OK 74021 USA; ✓

Has/have invented certain new and useful improvements in

Submersible Pump Housing with Seal Bleed Holes

as described and set forth in a United States Provisional Patent Application filed on August 1, 2012 under Serial Number 61/678,101 (Docket No. IS12.2334 US PSP). **This assignment is effective as of August 1, 2012.**

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.

IN TESTIMONY WHEREOF, I have duly executed this Assignment on this 16th day of August, 2012.

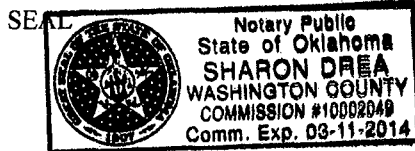
[Signature]
Name: David Milton Eslinger

Witnesses:

State of Oklahoma
County of Washington

Date: August 16th 2012

[Signature]
Name:
Notary Public



Schedule A

“COMPANIES”

SCHLUMBERGER TECHNOLOGY CORPORATION

Corporation of: United States of America

Located at: 300 Schlumberger Drive, Sugar Land, Texas 77478 U.S.A.

Assignee for applications in: United States of America

SCHLUMBERGER CANADA LIMITED

Corporation of: Canada

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

Assignee for applications in: Canada

SERVICES PETROLIERS SCHLUMBERGER

Corporation of: France

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

Assignee for applications in: France

SCHLUMBERGER HOLDINGS LIMITED

Corporation of: British Virgin Islands

Located at: P.O. Box 71, Craigmuir Chambers, Road Town, 1110 Tortola, British Virgin Islands

Assignee for applications in: Japan, The Netherlands, 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, Austria, Azerbaijan, Brunei, Bulgaria, Chile, Colombia, Croatia, Cyprus, Czech Republic, Denmark, Egypt, Equatorial Guinea, Falkland Islands, Faroe Islands, Georgia, Germany, Greece, Greenland, Hungary, Indonesia, Ireland, Israel, Italy, Kazakhstan, Kenya, Korea, Kuwait, Lithuania, Madagascar, Malaysia, Mexico, New Zealand, Norway, Oman, Pakistan, Poland, Qatar, Romania, Russia, Saudi Arabia, Slovakia, Slovenia, South Africa, Suriname, Switzerland, Tanzania, Thailand, Trinidad, Tunisia, Turkey, Turkmenistan, Uganda, Ukraine, Uruguay, Uzbekistan, Venezuela.

PRAD RESEARCH AND DEVELOPMENT LIMITED

Corporation of: British Virgin Islands

Located at: P.O. Box 71, Craigmuir Chambers, Road Town, 1110 Tortola, British Virgin Islands

Assignee for applications in: Eurasia, Gulf Cooperation Council, and Countries not otherwise listed.

A 1932211

LOS ESTADOS UNIDOS DE AMERICA

A QUIEN PUEDA INTERESAR:

DEPARTAMENTO DE COMERCIO DE ESTADOS UNIDOS

Oficina de Patentes y Marcas de los Estados Unidos.

16 de Octubre, 2013

LA PRESENTE ES PARA CERTIFICAR QUE EL ANEXO ES UNA COPIA VERDADERA DEL DOCUMENTO REGISTRADO EN EL ARCHIVO DE ESTA OFICINA EL 19 DE AGOSTO DE 2012:



Por la autoridad del
Sub Secretario de Comercio para la
Propiedad Intelectual y el Director de la
Oficina de Patentes y Marcas de los
Estados Unidos.

- firmado -

P. SWAIN

Funcionario Certificador.

TRASPASO DE PATENTE

Versión Electrónica v1.1
 Versión Hoja de estilo v1.1

TIPO DE SOLICITUD		NUEVO TRASPASO	
NATURALEZA DE LA CESIÓN:		TRASPASO	
INFORMACIÓN DEL CESIONARIO			
Nombre		Fecha de Ejecución	
David Milton Eslinger		08/16/2012	
INFOMACIÓN DE LA PARTE QUE LA RECIBE:			
Nombre:	Schlumberger Technology Corporation		
Dirección:	300 Schlumberger Drive		
Ciudad:	Sugar Land		
Estado/País:	TEXAS		
Código postal:	77478		
NÚMERO DE PROPIEDADES Total: 1			
Tipo de Propiedad	Número	Nombre de la Marca	
Número de Solicitud	61678101		
INFORMACIÓN DE CORRESPONDENCIA			
Número de fax:	7136896372		
Teléfono:	81427595321		
Correo electrónico:	kawashima1@exchange.sib.com		
La correspondencia se enviará vía correo de EE.UU. cuando el intento de fax no sea satisfactorio.			
Nombre del Corresponsal:	Schlumberger - COE		
Dirección Línea 1:	WestemGeco 10001 Richmond Ave.		
Dirección Línea 2:	Habitación 3028		
Dirección Línea 4:	Houston, TEXAS 77042		
NÚMERO DE REGISTRO DEL ABOGADO:		IS12.2334USPSP TRASPASO	
NOMBRE DEL REMITENTE:		Setsukok Kawashima	
Total de Adjuntos: 4			
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Fuente= IS122334USPSP_20120819_Assignment#page2.tif			
Fuente= IS122334USPSP_20120819_Assignment#page3.tif			
Fuente= IS122334USPSP_20120819_Assignment#page4.tif			

OP \$40.0061678101

TRASPASO

CONSIDERANDO QUE, los inventores abajo firmantes, de aquí en adelante referidos como "Inventores" cada uno tiene su dirección como se muestra a continuación:

David Milton Eslinger un ciudadano de los Estados Unidos de América, con domicilio en 15718 N 102nd E Avenue Collinsville OK 74021 USA;

Ha/han inventado ciertas nuevas y útiles mejoras en

Bomba con Carcasa Sumergible con Cavidades Selladas de Fuga

Como se describe y establece en la Solicitud de Patente Provisional de los Estados Unidos presentada el 1 de agosto de 2012, bajo el Número de Serie 61/678,101 (Expediente Número IS12.2334 US PSP). **Este traspaso es efectivo a partir del 1 de agosto de 2012.**

Y CONSIDERANDO QUE, las "EMPRESAS" enumeradas en la Lista A, están interesadas en adquirir o confirmar su adquisición del entero derecho y título e interés en el mismo y dicha invención, invenciones o mejoras en y para cualquier o todas las patentes, ambas de los Estados Unidos y de todos los países extranjeros que se pueden obtener por lo tanto, **como se indica en la Lista A;**

AHORA, POR LO TANTO, PARA TODOS AQUELLOS A QUIENES PUEDA INTERESAR QUE SE SEPA QUE, los Inventores abajo firmantes, con otras consideraciones convenientes y valiosas, cuya recepción y suficiencia por la presente es reconocida, han vendido, traspasado, transferido y transmitido y por éste traspaso vende, traspasa, transfiere y transmite a dicha EMPRESAS y a sus sucesores, el entero derecho, título e interés a lo largo del mundo, en y para la invención, invenciones o mejoras anteriormente descritas o establecidas en dicha solicitud, en cualquier formato o materialización de los mismos, en y para dicha solicitud, en y para cualesquiera solicitudes presentadas en cualquier país extranjero con base en ello, incluido el derecho a presentar solicitudes extranjeras en virtud de las disposiciones de un convenio o tratado; en y para cualquier confirmación, divisional, en curso, en curso por partes o solicitud sustituta, la cual será presentada en dicha invención, invenciones o mejoras en los Estados Unidos o cualquier país extranjero sobre los mismos,

A TENER Y MANTENER la misma hasta el final del término o términos para las cuales las patentes y otorgamientos, tanto extranjeros como de los Estados Unidos, sean expedidos para dicha invención, invenciones o mejoras.

Y dichos Inventores por la presente, transmiten y garantizan que dichos Inventores tienen todo el derecho de transmitir el entero derecho, título e interés aquí asignado libre y claro de todas las licencias, cargas y gravámenes en lo absoluto, y que dichos Inventores no han ejecutado y no ejecutarán cualquier instrumento que se oponga en este acto.

Y dichos Inventores, en las condiciones anteriormente mencionadas, por la presente, transmiten y acuerdan con y para dichas **EMPRESAS**, sus sucesores y cesionarios, que cada Inventor, sus ejecutores, administradores o cualquier otro personal representativo, será y va a realizar todos los actos legales y todos los juramentos que correspondan, y a hacer, ejecutar y entregar cualquier o todos los instrumentos por escrito, y cualquier o todas las solicitudes adicionales, papeles, poderes, declaraciones juradas, traspasos, exenciones de responsabilidad y otros documentos, que para dichas **EMPRESAS**, sus sucesores y cesionarios, según la opinión del consejo, sean requeridas o necesarias en este o cualquier país extranjero, más eficazmente para asegurar y otorgar a dichas **EMPRESAS**, sus sucesores y cesionarios, el entero derecho, título e interés en y para dicha invención, invenciones o mejoras, solicitud o solicitudes, patentes, derechos, títulos, beneficios, privilegios y ventajas por la presente vendidas, traspasadas, confirmadas, transferidas y transmitidas.

24
13

EN TESTIMONIO DE LO CUAL, he debidamente ejecutado este Traspaso el día 16 de agosto de 2012.

- firmado -

Nombre: Daniel Milton Eslinger

Testigos:

Estado de Oklahoma

Condado de Washington

Fecha: día 16 de agosto de 2012.

- firmado -

Nombre:
Notario Público:

Sello	Notario Público Estado de Oklahoma SHARON DREA CONDADO DE WASHINGTON COMISION __04010159 Comisión expira 03-11-2014
-------	--

Lista A

"EMPRESAS"

SCHLUMBERGER TECHNOLOGY CORPORATION.

Empresa de: Estados Unidos de América.

Ubicada en: 300 Schlumberger Drive, Sugar Land, Texas 77478 U.S.A.

Cesionario para aplicaciones en: Estados Unidos de América.

SCHLUMBERGER CANADA LIMITED.

Empresa de: Canadá.

Ubicada en: 523-3rd Avenue S.W., Calgary, Alberta, Canada T2P 0G4.

Cesionario para aplicaciones en: Canadá.

SERVICES PETROLIERS SCHLUMBERGER.

Empresa de: Francia.

Ubicada en: 42 rue Saint Dominique, 75007 Paris, Francia.

Cesionario para aplicaciones en: Francia.

SCHLUMBERGER HOLDINGS LIMITED.

Empresa de: Islas Vírgenes Británicas.

Ubicada en: P.O. Box 71, Craigmuir Chambers, Road Town, 1110 Tortola, Islas Vírgenes Británicas.

Cesionario para aplicaciones en: Japón, Países Bajos, Reino Unido.

SCHLUMBERGER TECHNOLOGY B.V.

Empresa de: Países Bajos.

Ubicada en: Parkstraat 83-89, 2514 JG The Hague, Países Bajos.

Cesionario para aplicaciones en: Albania, Argentina, Australia, Austria, Azerbaiyán, Brunei, Bulgaria, Chile, Colombia, Croacia, Chipre, República Checa, Dinamarca, Egipto, Guinea Ecuatorial, Islas Malvinas, Islas Feroe, Georgia, Alemania, Grecia, Groenlandia, Hungría, Indonesia, Irlanda, Israel, Italia, Kazajistán, Kenya, Corea, Kuwait, Lituania, Madagascar, Malasia, México, Nueva Zelanda, Noruega, Omán, Pakistán, Polonia, Qatar, Rumania, Rusia, Arabia Saudita, Eslovaquia, Eslovenia, Sudáfrica, Surinam, Suiza, Tanzania, Tailandia, Trinidad, Túnez, Turquía, Turkmenistán, Uganda, Ucrania, Uruguay, Uzbekistán, Venezuela.

PRAD RESEARCH AND DEVELOPMENT LIMITED

Empresa de: Islas Vírgenes Británicas.

Ubicada en: P.O. Box 71, Craigmuir Chambers, Road Town, 1110 Tortola, Islas Vírgenes Británicas.

Cesionario para aplicaciones en: Eurasia, Consejo de Cooperación del Golfo, y los países a no ser que se indique otra cosa.

A 1932211

THE UNITED STATES OF AMERICA

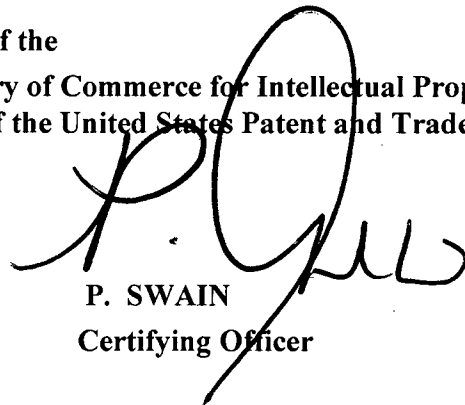
TO ALL TO WHOM THESE PRESENTS SHALL COME:

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office

October 16, 2013

THIS IS TO CERTIFY THAT ANNEXED IS A TRUE COPY FROM THE
RECORDS OF THIS OFFICE OF A DOCUMENT RECORDED ON
NOVEMBER 12, 2012.

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


P. SWAIN
Certifying Officer



502125970 11/12/2012

PATENT ASSIGNMENT

Electronic Version v1.1
Stylesheet Version v1.1

SUBMISSION TYPE:	NEW ASSIGNMENT
NATURE OF CONVEYANCE:	ASSIGNMENT
CONVEYING PARTY DATA	
Name	Execution Date
David Milton Eslinger	11/08/2012
RECEIVING PARTY DATA	
Name:	Schlumberger Technology Corporation
Street Address:	300 Schlumberger Drive
City:	Sugar Land
State/Country:	TEXAS
Postal Code:	77478
PROPERTY NUMBERS Total: 1	
Property Type	Number
Application Number:	13604628
CORRESPONDENCE DATA	
Fax Number:	7136896372
<i>Correspondence will be sent via US Mail when the fax attempt is unsuccessful.</i>	
Phone:	81427595321
Email:	kawashima1@exchange.slb.com
Correspondent Name:	Schlumberger - COE
Address Line 1:	WesternGeco 10001 Richmond Ave.
Address Line 2:	Room 3028
Address Line 4:	Houston, TEXAS 77042
ATTORNEY DOCKET NUMBER:	IS12.2334USNP ASSIGNMENT
NAME OF SUBMITTER:	Setsukok Kawashima
Total Attachments: 4 source=IS122334USNP_Assignment#page1.tif source=IS122334USNP_Assignment#page2.tif source=IS122334USNP_Assignment#page3.tif source=IS122334USNP_Assignment#page4.tif	

CH \$40.00 13604628

502125970

PATENT
REEL: 029283 FRAME: 0621

Assignment

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

David Milton Eslinger a citizen of the United States of America, residing at 15718 N 102nd E Avenue Collinsville OK 74021 USA;

Has/have invented certain new and useful improvements in

Submersible Pump Housing with Seal Bleed Ports

as described and set forth in a United States Provisional Patent Application filed on September 6, 2012 under Serial Number 13/604628 (Docket No. IS12.2334 US NP). This assignment is effective as of September 6, 2012.

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,

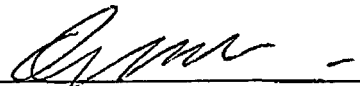
encumbrances and liens whatsoever, and that no said Inventors has executed and will execute any instruments in conflict herewith.

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.

20
19

Docket Number IS12.2334 US NP

IN TESTIMONY WHEREOF, I have duly executed this Assignment on this 8 day of
November, 2012.


Name: David Milton Eslinger

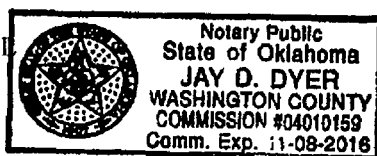
Witnesses:

State of
County of Washington

Date: November 8, 2012


Name: _____
Notary Public

SEAL



Schedule A

"COMPANIES"

SCHLUMBERGER TECHNOLOGY CORPORATION

Corporation of: United States of America

Located at: 300 Schlumberger Drive, Sugar Land, Texas 77478 U.S.A.

Assignee for applications in: United States of America

SCHLUMBERGER CANADA LIMITED

Corporation of: Canada

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

Assignee for applications in: Canada

SERVICES PETROLIERS SCHLUMBERGER

Corporation of: France

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

Assignee for applications in: France

SCHLUMBERGER HOLDINGS LIMITED

Corporation of: British Virgin Islands

Located at: P.O. Box 71, Craigmuir Chambers, Road Town, 1110 Tortola, British Virgin Islands

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

SCHLUMBERGER TECHNOLOGY B.V.

Corporation of: the Netherlands

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Assignee for applications in: Albania, Argentina, Australia, Austria, Azerbaijan, Brunei, Bulgaria, Chile, Colombia, Croatia, Cyprus, Czech Republic, Denmark, Egypt, Equatorial Guinea, Falkland Islands, Faroe Islands, Georgia, Germany, Greece, Greenland, Hungary, Indonesia, Ireland, Israel, Italy, Kazakhstan, Kenya, Korea, Kuwait, Lithuania, Madagascar, Malaysia, Mexico, New Zealand, Norway, Oman, Pakistan, Poland, Qatar, Romania, Russia, Saudi Arabia, Slovakia, Slovenia, South Africa, Suriname, Switzerland, Tanzania, Thailand, Trinidad, Tunisia, Turkey, Turkmenistan, Uganda, Ukraine, Uruguay, Uzbekistan, Venezuela.

PRAD RESEARCH AND DEVELOPMENT LIMITED

Corporation of: British Virgin Islands

Located at: P.O. Box 71, Craigmuir Chambers, Road Town, 1110 Tortola, British Virgin Islands

Assignee for applications in: Eurasia, Gulf Cooperation Council, and Countries not otherwise listed.

A 1932211

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16 de Octubre, 2013

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P. SWAIN

Funcionario Certificador.

TRASPASO DE PATENTE

Versión Electrónica v1.1
 Versión Hoja de estilo v1.1

TIPO DE SOLICITUD		NUEVO TRASPASO	
NATURALEZA DE LA CESIÓN:		TRASPASO	
INFORMACIÓN DEL CESIONARIO			
Nombre		Fecha de Ejecución	
David Milton Eslinger		11/08/2012	
INFOMACIÓN DE LA PARTE QUE LA RECIBE:			
Nombre:	Schlumberger Technology Corporation		
Dirección:	300 Schlumberger Drive		
Ciudad:	Sugar Land		
Estado/País:	TEXAS		
Código postal:	77478		
NÚMERO DE PROPIEDADES Total: 1			
Tipo de Propiedad	Número	Nombre de la Marca	
Número de Solicitud	13604628		
INFORMACIÓN DE CORRESPONDENCIA			
Número de fax:		7136896372	
La correspondencia se enviará vía correo de EE.UU. cuando el intento de fax no sea satisfactorio.			
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Dirección Línea 2:	Habitación 3028		
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NÚMERO DE REGISTRO DEL ABOGADO:		IS12.2334USNP TRASPASO	
NOMBRE DEL REMITENTE:		Setsukok Kawashima	
Total de Adjuntos: 4 Fuente= IS122334USNP_Assignment#page1.tif Fuente= IS122334USNP_Assignment #page2.tif Fuente= IS122334USNP_Assignment #page3.tif Fuente= IS122334USNP_Assignment #page4.tif			

CH \$40.00 13604628

TRASPASO

CONSIDERANDO QUE, los inventores abajo firmantes, de aquí en adelante referidos como "Inventores" cada uno tiene su dirección como se muestra a continuación:

David Milton Eslinger un ciudadano de los Estados Unidos de América, con domicilio en 15718 N 102nd E Avenue Collinsville OK 74021 USA;

Ha/han inventado ciertas nuevas y útiles mejoras en

Bomba con Carcasa Sumergible con Puerto Sellado de Fuga

Como se describe y establece en la Solicitud de Patente Provisional de los Estados Unidos presentada el 6 de septiembre de 2012, bajo el Número de Serie 13/604628 (Expediente Número IS12.2334 US NP). **Este traspaso es efectivo a partir del 6 de septiembre de 2012.**

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AHORA, POR LO TANTO, PARA TODOS AQUELLOS A QUIENES PUEDA INTERESAR QUE SE SEPA QUE, los Inventores abajo firmantes, con otras consideraciones convenientes y valiosas, cuya recepción y suficiencia por la presente es reconocida, han vendido, traspasado, transferido y transmitido y por éste traspaso vende, traspasa, transfiere y transmite a dicha EMPRESAS y a sus sucesores, el entero derecho, título e interés a lo largo del mundo, en y para la invención, invenciones o mejoras anteriormente descritas o establecidas en dicha solicitud, en cualquier formato o materialización de los mismos, en y para dicha solicitud, en y para cualesquiera solicitudes presentadas en cualquier país extranjero con base en ello, incluido el derecho a presentar solicitudes extranjeras en virtud de las disposiciones de un convenio o tratado; en y para cualquier confirmación, divisional, en curso, en curso por partes o solicitud sustituta, la cual será presentada en dicha invención, invenciones o mejoras en los Estados Unidos o cualquier país extranjero sobre los mismos,

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25-27

EN TESTIMONIO DE LO CUAL, he debidamente ejecutado este Traspaso el día 8 de noviembre de 2012.

- firmado -

Nombre: Daniel Milton Eslinger

Testigos:

Estado de

Condado de Washington

Fecha: día 8 de noviembre de 2012.

- firmado -

Nombre:
Notario Público:

Sello	Notario Público Estado de Oklahoma JAY D. DYER CONDADO DE WASHINGTON COMISION __04010159 Comisión expira 11-08-2016
-------	--

Lista A

"EMPRESAS"

SCHLUMBERGER TECHNOLOGY CORPORATION.

Empresa de: Estados Unidos de América.

Ubicada en: 300 Schlumberger Drive, Sugar Land, Texas 77478 U.S.A.

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Cesionario para aplicaciones en: Francia.

SCHLUMBERGER HOLDINGS LIMITED.

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SCHLUMBERGER TECHNOLOGY B.V.

Empresa de: Países Bajos.

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Cesionario para aplicaciones en: Eurasia, Consejo de Cooperación del Golfo, y los países a no ser que se indique otra cosa.



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POWER OF ATTORNEY

The undersigned.

Schlumberger Technology B.V.

located at

Parkstraat 83-89, 2514 JG The Hague, The Netherlands

declares that it hereby grants to

ÁLVARO CORREA-ORDÓÑEZ and/or RICARDO METKE MENDEZ and/or JUAN PABLO CONCHA-DELGADO

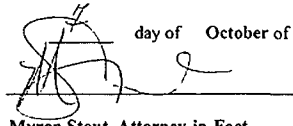
of the firm Baker & McKenzie S.A.S. members of Baker & McKenzie, domiciled at Av. 82 No. 10-62, 6th floor, of Bogotá D.C., Colombia, full and sufficient power of attorney to pursue before the competent authorities the following matters:

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Columbian Patent Application No.: 13183118
Entitled: SUBMERSIBLE PUMP HOUSING WITH SEAL BLEED PORTS

to which end it empowers them to file requests, petitions and lawsuits, appeals and objections, pay taxes, receive, including faculties to enter into settlement agreements, conciliations and transactions, abandon applications and renounce rights and, in general, to take all the actions before the competent authorities in order to duly protect our intellectual property. To the said mandatories sufficient power is granted hereby to receive notifications for and on behalf of the Company, to confer powers on those who are to represent the Company judicially and extrajudicially, to answer in court in the matter of all claims and demands that may be presented in connection with the marks and other intellectual property rights, and to do everything that may be required before administrative or judicial officers of any class to comply this power, giving them likewise faculty to substitute these presents and revoke such substitutions if necessary.

Done and subscribed in Sugar Land, TX,
USA

On the  day of October of 2013

Myron Stout, Attorney-in-Fact

Signature of the person Issuing the Power

PODER

La abajo firmada,

Schlumberger Technology B.V.

domiciliada en

Parkstraat 83-89, 2514 JG The Hague, Holanda

declara por el presente que otorga a

ÁLVARO CORREA-ORDÓÑEZ y/o RICARDO METKE MENDEZ y/o JUAN PABLO CONCHA-DELGADO

de la firma Baker & McKenzie S.A.S., miembros de Baker & McKenzie, domiciliada en la Av. 82 No. 10-62 Piso 6 en Bogotá D.C., Colombia, poder especial amplio y suficiente, para adelantar ante las autoridades competentes los siguientes asuntos:

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Solicitud de patente colombiana N° 13.183.118
titulada: "Cubierta de bomba sumergible
con puertos de purga de cierre"

a cuyo efecto los faculta para presentar solicitudes, peticiones y demandas, interponer recursos, reclamos, pagar impuestos y tasas, recibir, transigir y desistir, incluyendo facultades para entrar en acuerdos amigables, conciliaciones y transacciones, abandonar solicitudes y renunciar a derechos, y en general, a dar ante las autoridades competentes todos los pasos necesarios para la debida protección de nuestra propiedad industrial. Asimismo se concede a los expresados mandatarios poder suficiente para recibir notificaciones a nombre de la compañía, otorgar poderes a quienes vayan a representar a la compañía judicial y extrajudicialmente, responder en juicio a todas las reclamaciones o demandas que por motivo de marcas y otros derechos de propiedad industrial se presentaren y hacer cuanto fuere necesario ante las autoridades administrativas o judiciales de cualquier orden para el cumplimiento de este mandato, dándoles igualmente facultad para sustituir el presente poder y en caso necesario, revocar dichas sustituciones.

Dado y firmado en

A los 7 días del mes de Octubre de 2013

Firma de la persona que firma el Poder

PA 1932213

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October 11, 2013

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APPLICATION NUMBER: *13/604,628*

FILING DATE: *September 06, 2012*

THE COUNTRY CODE AND NUMBER OF YOUR PRIORITY
APPLICATION, TO BE USED FOR FILING ABROAD UNDER THE PARIS
CONVENTION, IS *US13/604,628*

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T. Lawrence

T. LAWRENCE
Certifying Officer

3A
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Electronic Acknowledgement Receipt

EFS ID:	13668466
Application Number:	13604628
International Application Number:	
Confirmation Number:	3709
Title of Invention:	Submersible Pump Housing with Seal Bleed Ports
First Named Inventor/Applicant Name:	David Milton Eslinger
Customer Number:	15603
Filer:	Jim D. Patterson/Setsuko Kawashima
Filer Authorized By:	Jim D. Patterson
Attorney Docket Number:	
Receipt Date:	06-SEP-2012
Filing Date:	
Time Stamp:	01:56:10
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	\$1250
RAM confirmation Number	10762
Deposit Account	505594
Authorized User	
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Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		IS122334USNP_Application-as-Filed.pdf	155660 fb09e4bed684c26ac06834a5c2494a45ffea70ac	yes	15
Multipart Description/PDF files in .zip description					
	Document Description		Start	End	
	Specification		1	10	
	Claims		11	14	
	Abstract		15	15	
Warnings:					
Information:					
2	Drawings-only black and white line drawings	IS122334USNP_Drawings-as-Filed.pdf	243247 0df3212661532622d605adfee82119014cd0305b	no	4
Warnings:					
Information:					
3	Information Disclosure Statement (IDS) Form (SB08)	IS122334USNP_20120906_IDS.pdf	786670 6e9beed474999abe7285842cdeea4554be5e82e4	no	4
Warnings:					
Information:					
4	Application Data Sheet	IS122334USNP_20120906_ADS.pdf	1662462 027f0711f47a011f3989757365373318d868b232	no	4
Warnings:					
Information:					
5	Fee Worksheet (SB06)	fee-info.pdf	32616 9e9db62853f4336260621feb6445c240d984b6f1	no	2
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Total Files Size (in bytes):			2880655		

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

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New International Application Filed with the USPTO as a Receiving Office

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APPLICATION FOR UNITED STATES UTILITY PATENT

for

SUBMERSIBLE PUMP HOUSING WITH SEAL BLEED PORTS

INVENTOR(S):

David Milton Eslinger

Correspondence Address:

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SUBMERSIBLE PUMP HOUSING WITH SEAL BLEED PORTS

RELATED APPLICATIONS

[0001] This patent application claims the benefit of priority to U.S. Provisional Patent No. 61/678,101 to Eslinger, filed August 1, 2012 and entitled, "Submersible Pump Housing With Seal Bleed Holes," which is incorporated herein by reference in its entirety.

BACKGROUND

[0002] An electric submersible pump (ESP) is often used in well settings to artificially lift subsurface resources such as hydrocarbons and water to the Earth's surface. Conventionally, the maximum pressure rating of a given ESP housing is limited by the stresses in the threaded end portion of the ESP housing. In a conventional centrifugal pump housing (diffuser), for example, the housing is sealed at the head and at the base with an O-ring seal located at the end of the housing and outboard of the end threads. Conventional arrangement of the end seals in an ESP causes the circumferential or hoop stresses of the housing in the threaded region to be the sum of the hoop stresses due to the thread radial forces resulting from axial loads on the thread flank angle, and the internal pressure differential from inside to outside the housing. The sum of these hoop stresses determines the maximum pressure rating of a conventional housing. Some conventional ESP housings have end seals both inboard and outboard of the threaded ends of the conventional housings. However, there is no fluid path from inside to outside the housing between these two seals. Thus, this conventional arrangement can trap the high internal pressure between the two seals and render the conventional inboard seal ineffective.

SUMMARY

A submersible pump housing with seal bleed ports is described. In an implementation, the submersible pump housing includes a housing, an interior compartment of the housing for fluid at high thrust pressure, a threaded end region of the housing, an inboard end seal to seal off the threaded end region from the interior compartment; and at least one bleed hole or port outboard of the end seal for allowing leakage of fluid from the interior compartment past the end seal to escape radially through the housing. An example centrifugal pump housing may include a diffuser for directing high thrust fluid accelerated by an impeller, an end seal inboard of each threaded end of the centrifugal pump housing, and at least one leak port outboard of each end seal to relieve a fluid seeping from inside the centrifugal pump housing past each end seal. An example method includes locating an end seal inboard of a threaded portion of a centrifugal pump housing to seal internal pressure from the threaded portion, and locating a radial bleed port outboard of the end seal to relieve pressure of seepage past the end seal. This summary section is not intended to give a full description of submersible pump housings with seal bleed ports. A detailed description with example embodiments follows.

BRIEF DESCRIPTION OF THE DRAWINGS

[0003] Fig. 1 is a diagram of an example electric submersible pump (ESP) section with inboard end seals and seal bleed ports.

[0004] Fig. 2 is a diagram of a second example ESP section with inboard end seals and seal bleed ports.

[0005] Fig. 3 is a diagram of an example ESP section with inboard end seals, seal bleed ports, and a lockplate protector.

[0006] Fig. 4 is a flow diagram of an example method of increasing the pressure rating of a submersible pump housing.

IS12.2334 US NP**DETAILED DESCRIPTION**

[0007] This disclosure describes submersible pump housings with seal bleed ports. Features, systems, and methods associated with submersible pump housings with seal bleed ports represent possible implementations and are included for illustration purposes and should not be construed as limiting. Moreover, it will be understood that different implementations can include all or different subsets of aspects described below. Furthermore, the aspects described below may be included in any order, and numbers and/or letters placed before various aspects are done for ease of reading and in no way imply an order, or level of importance to their associated aspects.

[0008] Fig. 1 shows a section of an example electric submersible pump (ESP) 100 of the centrifugal type. The illustrated section shows a base-end portion of the centrifugal ESP 100. An impeller region 102 inside the pump housing generates high thrust pressure as the impeller accelerates fluid radially outward and axially upward, or toward a wellhead of an ESP installation. At the periphery of the pump housing, the fluid in the interior high pressure compartment 104 that includes the impeller region 102 extends to a location at which the end seal 106 is situated to seal off the high thrust pressure and highly mobilized fluid from flowing out to the exterior of the pump housing or from flowing out to the next component in a stack of components.

[0009] In the example centrifugal ESP 100 with seal bleed ports 108, the end seals 106 are inboard of the threaded end regions 110 of the pump housing in order to contain the high pressure compartment 104 and prevent the threaded end region 110 from participating in the interior high pressure compartment(s) of the ESP 100. This arrangement of having the end seals 106 inboard of the threads 110 increases the

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maximum pressure rating of the pump housing, because the threaded end regions 110 of conventional pumps are subject to increased stresses over the non-threaded regions of conventional pump housings when subjected to interior pump pressures. In Fig. 1, the bleed ports 108 or vent ports are located just outboard of the end seal 106 to provide a leak path for fluid that seeps or blows by the end seal 106. The terms “port” and “hole” as used herein, are used representatively to mean a fluid path, passageway, port, hole, lumen, channel, vent, etc., enabling the movement of fluid from one location to another. The vent ports do not have to be “holes,” such as a round, straight passages as drilled by a bit. For example, the term bleed ports 108 can mean a vent passage that is a milled castellation(s) in the end face of either the housing or end cap (base or head).

[0010] In an implementation, the vent passage, leak path, or seal bleed ports 112 may be located outboard of the threaded end region 110, instead of just outboard of the end seal 106 as seal bleed ports 108 are. Locating the bleed ports 112 outboard of the threads 110 utilizes the threads 110 to dissipate leakage fluid pressure and minimize jetting velocity of fluid that has escaped the end seal 106.

[0011] The term “outboard” or “outboard of” as used herein, means “outside” or “on the other side of” a designated feature that is closer to, or more “inboard,” to the pump’s high thrust pressure compartments or to the fluids being accelerated by the pump. Correspondingly, “inboard,” as used herein, means “inside of,” in first contact with, or in closer contact with the high thrust pressure generated by the pump than a designated feature that is therefore more “outboard.”

[0012] Fig. 2 shows an example centrifugal ESP 200 with cutaway housing 202. The illustrated section shows a head-end portion of the example centrifugal ESP 200. The example centrifugal ESP 200 includes one or more impeller regions 204 in a high thrust pressure

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compartment. An end seal 206 is positioned inboard of one or more fluid bleed ports 208. The end seal 206 is also positioned inboard of a threaded end region 210. The illustrated bleed ports 208 are radially-directed to form a leak path from outboard of the end seal 206 to the exterior of the housing 202. In this manner, an internal pressure differential caused by the pumping action of the example centrifugal ESP 200 is sealed off from the end threads 210, and the hoop stresses in the same threaded region 210 are significantly reduced to enable a higher maximum pressure rating for the overall housing 202 of the example centrifugal ESP 200. Any fluid leakage that does seep past the end seal 206 on account of the high pressure that is inboard of the end seal 206 is allowed to escape the housing 202 without building up at the threaded region 210.

[0013] The bleed ports 208 form a leak path that is situated from inside to outside the housing 202 just outboard of the end seal 206. The leak path can be implemented so that a very small leakage of fluid past the end seal 206 does not pressure the space or volume that may exist between the end seal 206 and the contact face between the head (or the base) and the centrifugal pump housing 202. If this volume is pressured, then the same undesired stress state that exists in conventional housings occurs. In an implementation, the leak path can be created by drilling small radial holes in the housing 202 just downstream (outboard) of the end seal(s) 206. In an implementation, the seal bleed ports 214 may be located to form a leak path outboard of the threaded end region 210, instead of just outboard of the end seal 206 as seal bleed ports 208 are. Locating the bleed ports 214 outboard of the threads 210 utilizes the threads 210 to dissipate leakage fluid pressure and minimize jetting velocity of fluid that has escaped the end seal 206. The head-end of compression ring (CR)

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style pumps also requires a bleed path, such as port 212, for weepage that may occur past the compression ring-to-head seal.

[0014] Fig. 3 shows a centrifugal pump housing 302 with inboard seal 306, bleed port 308, and an example housing lockplate protector 310. The lockplate protector 310 covering the bleed port 308 shown in Fig. 3 can be used to protect the well casing from any damage due to fluid leaking from the radial bleed port 308 in the housing 302. The lockplate protector 310 can be a standard lockplate except that the housing-facing side of the lockplate can be stepped to allow bleed fluid to be deflected axially along the housing 302 rather radially toward the bore of the well casing.

[0015] In an implementation, an example submersible pump includes a housing, an interior compartment of the housing for fluid at high thrust pressure, a threaded end region of the housing, an inboard end seal to seal off the threaded end region from the interior compartment, and at least one bleed port or hole outboard of the end seal for allowing leakage of fluid from the interior compartment past the end seal to escape radially from the end seal through the housing.

[0016] The example submersible pump may comprise a centrifugal electric submersible pump (ESP) for the oil and gas industries. The housing may comprise a diffuser of the centrifugal ESP. The inboard end seal protects the threads to increase the pressure rating of the housing. The at least one bleed port can relieve a pressure between the end seal and a contact face between the submersible pump housing and a head or a base connecting to the submersible pump.

[0017] A lockplate protector over the bleed port can protect a well casing from the leakage of fluid from the interior compartment past the end seal. The lockplate protector can be stepped to deflect fluid axially along the housing instead of radially toward a bore of the well casing.

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[0018] When the submersible pump is a compression ring (CR) style pump, a leak port can be used for weepage past a compression ring-to-head seal.

[0019] A centrifugal ESP may operate at temperatures of up to approximately 149 degree Celsius and pressures of up to approximately 6,000 pounds per square inch or approximately 41 megapascals in a downhole environment of up to approximately 12,000 feet or 3.7 kilometers deep. The centrifugal ESP can use up to approximately 1000 horsepower or 750 kilowatts of power and has a speed of rotation of a rotor of up to approximately 4000 revolutions per minute. Even in such harsh conditions, the end seal protects the threaded end region from the fluid at high thrust pressure in the interior compartment of the centrifugal ESP.

[0020] In an implementation, a centrifugal pump housing includes a diffuser for directing high thrust fluid accelerated by an impeller, an end seal inboard of each threaded end of the centrifugal pump housing, and at least one leak port outboard of each end seal to relieve a fluid seeping from inside the centrifugal pump housing past each end seal. Each leak port can relieve a pressure between a respective end seal and a contact face between the centrifugal pump housing and a head or a base.

[0021] A lockplate protector can be used over the leak port. The lockplate protector protects the well casing from a fluid leaking from the leak port. The lockplate protector can be stepped to deflect fluid axially along the centrifugal pump housing instead of allowing the fluid to escape radially toward a bore of the well casing.

Example Method

[0022] Fig. 4 shows an example method 400 of increasing the pressure rating of a submersible pump housing. In an implementation,

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the submersible pump can be a centrifugal ESP. In the flow diagram, operations are shown in individual blocks.

[0023] At block 402, an end seal is located inboard of the threaded portion of a submersible pump housing to seal internal pressure from the threaded portion.

[0024] At block 404, radial bleed ports are located outboard of the end seal to relieve pressure of small blow-by or seepage past the end seal.

[0025] The example method enables an internal pressure differential of the submersible pump to be sealed from the end threads, and the hoop stresses in the threaded region of the housing to be significantly reduced, achieving a higher pressure rating for the example submersible pump housing.

Conclusion

[0026] Although only a few example embodiments have been described in detail above, those skilled in the art will readily appreciate that many modifications are possible in the example embodiments without materially departing from the subject matter. Accordingly, all such modifications are intended to be included within the scope of this disclosure as defined in the following claims. In the claims, means-plus-function clauses are intended to cover the structures described herein as performing the recited function and not only structural equivalents, but also equivalent structures. It is the express intention of the applicant not to invoke 35 U.S.C. § 112, paragraph 6 for any limitations of any of the claims herein, except for those in which the claim expressly uses the words 'means for' together with an associated function.

CLAIMS

1. A submersible pump, comprising:
a housing;
an interior compartment of the housing for fluid at high thrust pressure;
a threaded end region of the housing;
an inboard end seal to seal off the threaded end region from the interior compartment; and
at least one vent passage outboard of the end seal for allowing leakage of fluid from the interior compartment past the end seal to escape through the housing.
2. The submersible pump of claim 1, wherein the submersible pump comprises a centrifugal electric submersible pump (ESP) for the oil and gas industries.
3. The submersible pump of claim 1, wherein the housing comprises a diffuser of a centrifugal ESP.
4. The submersible pump of claim 1, wherein the inboard end seal increases the pressure rating of the housing.
5. The submersible pump of claim 1, wherein the at least one vent passage relieves a pressure between the end seal and a contact face between the submersible pump housing and a head or a base connecting to the submersible pump.

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6. The submersible pump of claim 1, wherein the vent passage is located outboard of the threaded end region to dissipate a leakage fluid pressure and to minimize a jetting velocity of the leakage of fluid that has escaped the inboard end seal.

7. The submersible pump of claim 1, wherein the vent passage comprises one of a fluid path, port, hole, lumen, channel, vent, passageway, or milled castellation(s) in an end face of either the housing, a base end cap, or a head end cap enabling a movement of the fluid from one location to another location.

8. The submersible pump of claim 1, further comprising a lockplate protector over the vent passage to protect a well casing from the leakage of fluid from the interior compartment past the end seal.

9. The submersible pump of claim 8, wherein the lockplate protector is stepped to deflect fluid axially along the housing instead of radially toward a bore of the well casing.

10. The submersible pump of claim 1, wherein the submersible pump comprises a compression ring (CR) style pump; and
further comprising a leak port for weepage past a compression ring-to-head seal.

11. The submersible pump of claim 1, wherein the submersible pump comprises a centrifugal ESP operating at a temperature of up to approximately 149 degree Celsius and a pressure of up to approximately 6,000 pounds per square inch or approximately 41 megapascals in a downhole environment of up to approximately 12,000 feet or 3.7 kilometers deep;

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wherein the centrifugal ESP uses up to approximately 1000 horsepower or 750 kilowatts of power and has a speed of rotation of a rotor of up to approximately 4000 revolutions per minute; and

wherein the end seal protects the threaded end region from the fluid at high thrust pressure in the interior compartment.

12. A centrifugal pump housing, comprising:
a diffuser for directing high thrust fluid accelerated by an impeller;
an end seal inboard of each threaded end of the centrifugal pump housing; and

at least one leak port outboard of each end seal to relieve a fluid seeping from inside the centrifugal pump housing past each end seal.

13. The centrifugal pump housing of claim 12, wherein the at least one leak port relieves a pressure between the end seal and a contact face between the centrifugal pump housing and a head or a base.

14. The centrifugal pump housing of claim 12, wherein the at least one leak port is located outboard of the threaded end to dissipate a leakage fluid pressure and to minimize a jetting velocity of a fluid leakage that has escaped the end seal.

15. The centrifugal pump housing of claim 12, wherein the at least one leak port comprises one of a fluid path, hole, lumen, channel, vent, passageway, or milled castellation(s) in an end face of either the diffuser, a base end cap, or a head end cap enabling a movement of the fluid from one location to another location.

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16. The centrifugal pump housing of claim 12, further comprising a lockplate protector over the leak port.

17. The centrifugal pump housing of claim 16, wherein the lockplate protector protects a well casing from a fluid leaking from the leak port.

18. The centrifugal pump housing of claim 16, wherein the lockplate protector is stepped to deflect fluid axially along the centrifugal pump housing instead of radially toward a bore of the well casing.

19. A method, comprising:

locating an end seal inboard of a threaded portion of a centrifugal pump housing to seal internal pressure from the threaded portion; and

locating a vent passage outboard of the end seal to relieve pressure of seepage past the end seal.

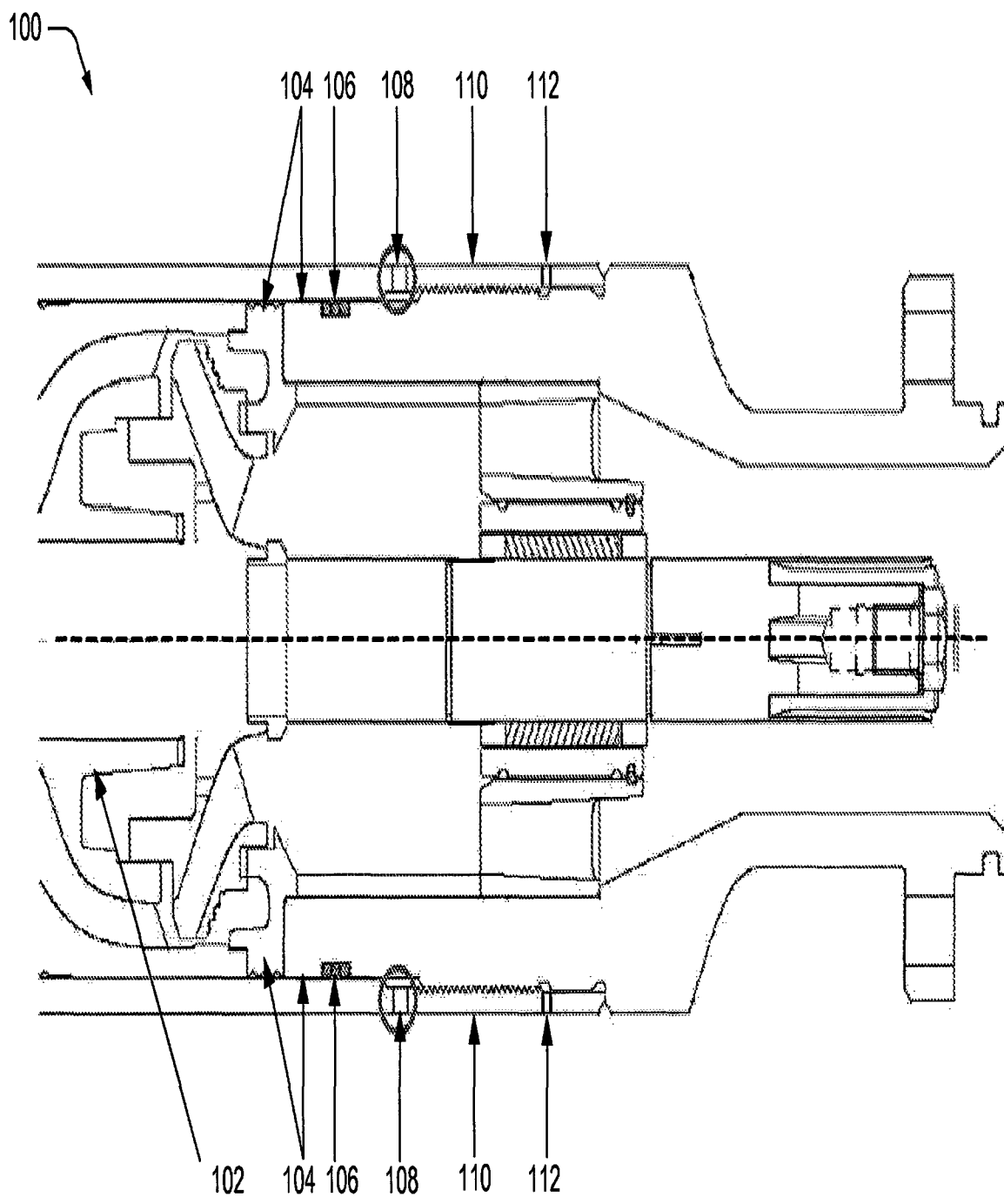
20. The method of claim 19, wherein each end seal is located between a pressurized internal fluid and a respective threaded portion of the centrifugal pump housing.

SUBMERSIBLE PUMP HOUSING WITH SEAL BLEED PORTS

ABSTRACT

A submersible pump housing with seal bleed ports is provided. In an implementation, a pump housing for electric submersible pumps (ESPs), such as a centrifugal ESP, has end seals that are located inside or further inboard toward the high thrust pressure generated by the pump, than the threaded ends of the pump housing. The inboard seals contain and seal off the pump pressure and spare the threaded regions that are more pressure-vulnerable from the pump's high pressure interior, thereby increasing the pressure rating of the entire housing. Leak ports or bleed ports are provided further outboard of the end seals to relieve fluid seeping from inside the submersible pump housing past each end seal. A plate may be added to direct small amounts of fluid escaping from the end seals away from the wellbore casing in which an ESP is situated.

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FIG. 1

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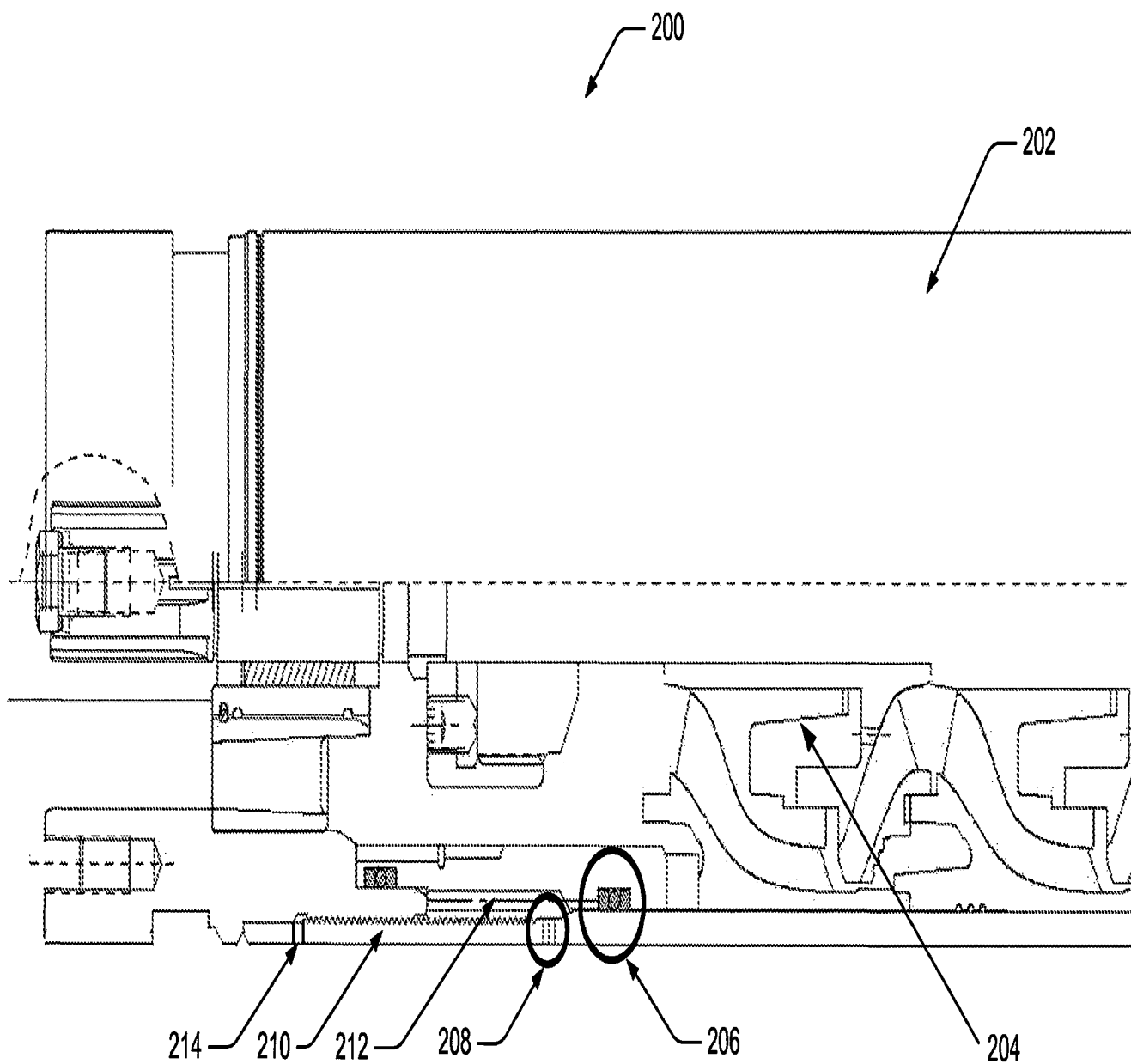
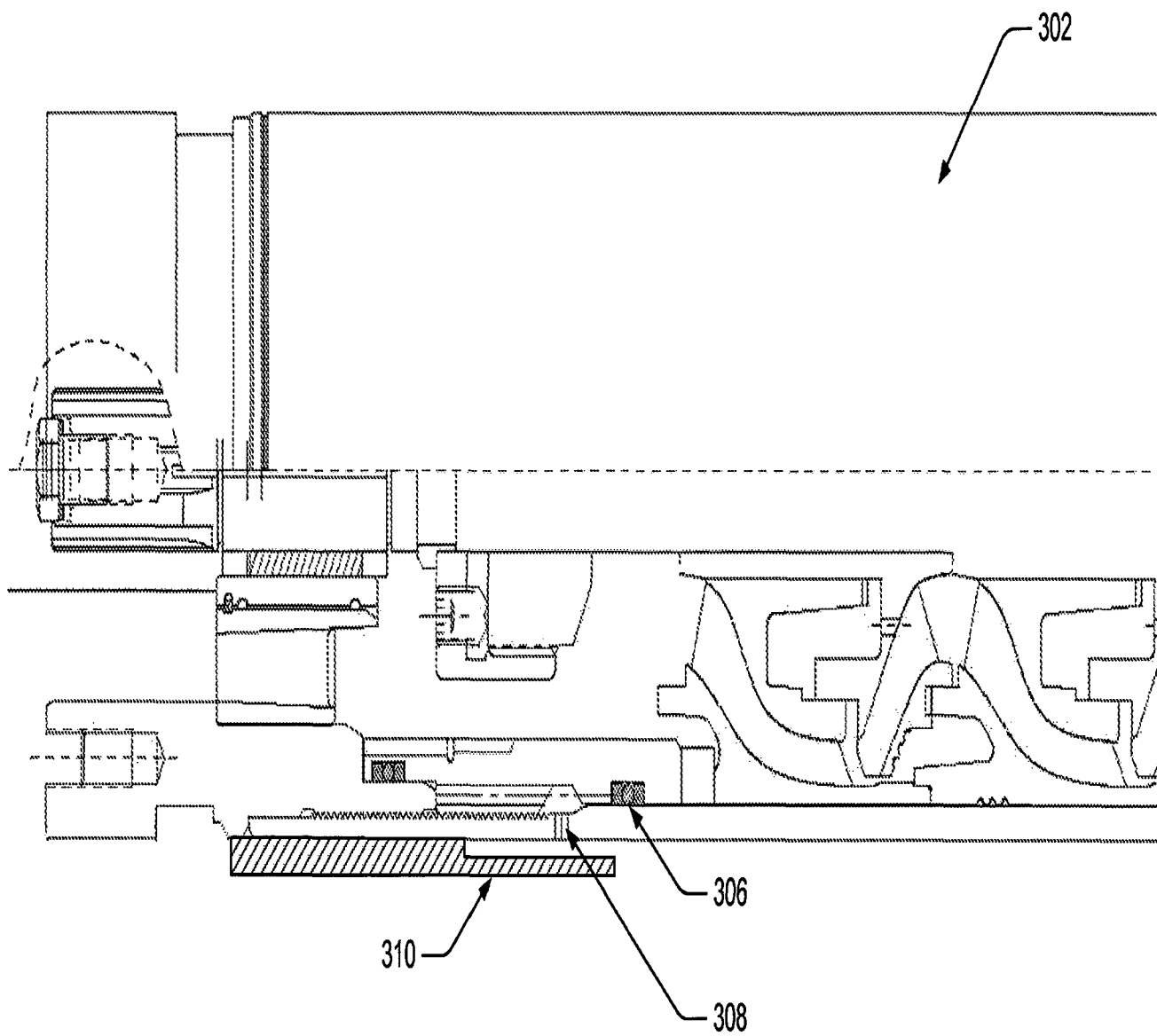


FIG. 2

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FIG. 3

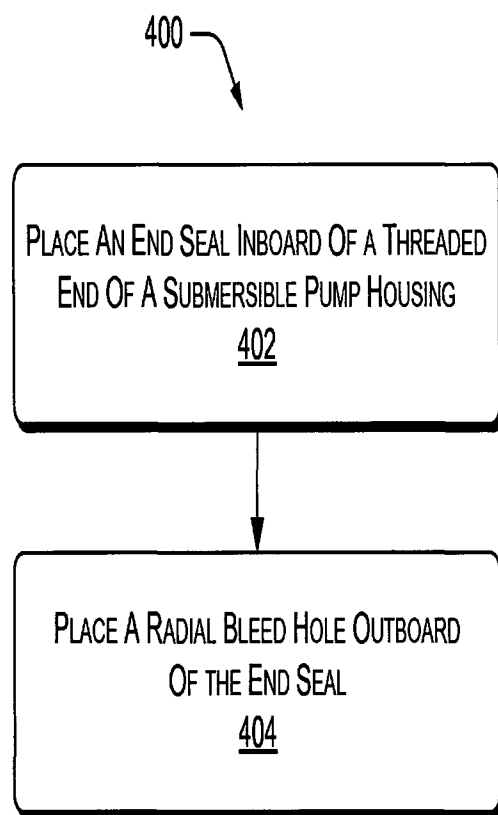


FIG. 4

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	IS12.2334 US NP
		Application Number	
Title of Invention	SUBMERSIBLE PUMP HOUSING WITH SEAL BLEED PORTS		
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.			

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Mailing Address of Applicant:					
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Title of the Invention	SUBMERSIBLE PUMP HOUSING WITH SEAL BLEED PORTS		
Attorney Docket Number	IS12.2334 US NP	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)	4	Suggested Figure for Publication (if any)	1

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	IS12.2334 US NP
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Title of Invention	SUBMERSIBLE PUMP HOUSING WITH SEAL BLEED PORTS		

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Prior Application Status	Pending	Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
	non provisional of	61678101	2012-08-01

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	IS12.2334 US NP
		Application Number	
Title of Invention	SUBMERSIBLE PUMP HOUSING WITH SEAL BLEED PORTS		

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First Name	Jim	Last Name	Patterson	Registration Number	52103

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Octubre 11, 2013

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NÚMERO DE SOLICITUD: 13/604.628

FECHA DE PRESENTACIÓN: Septiembre 6 de 2012

EL CÓDIGO DEL PAÍS Y EL NÚMERO DE SU SOLICITUD DE PRIORIDAD, QUE DEBEN USARSE PARA LA PRESENTACIÓN EN EL EXTERIOR BAJO EL CONVENIO DE PARIS, ES US 13/604.628

Por la autoridad del

Subsecretario de Comercio para la Propiedad Intelectual y

Director de la Oficina de Marcas y Patentes de los Estados Unidos

(Sello)

(Firmado)

T. Lawrence

Oficial de Certificaciones

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REIVINDICACIONES

1. Una bomba sumergible, que comprende:
Una carcasa;
Un compartimiento interior de la carcasa para fluidos con alta presión de empuje;
Una región de extremo con rosca de la carcasa;
Un sello de extremo interior para sellar la región de extremo con rosca desde el compartimiento interior; y
Al menos un pasaje de ventilación exterior del sello de extremo para permitir fugas de fluido desde el compartimiento interior pasando por el sello de extremo para escapar por la carcasa.
2. La bomba sumergible de la reivindicación 1, en donde la bomba sumergible comprende una bomba centrífuga eléctrica sumergible (ESP) para las industrias de gas y petróleo.
3. La bomba sumergible de la reivindicación 1, en donde la carcasa comprende un difusor de una ESP centrífuga.
4. La bomba sumergible de la reivindicación 1, en donde el sello de extremo interno incrementa el valor de presión de la carcasa.
5. La bomba sumergible de la reivindicación 1, en donde el al menos un pasaje de ventilación alivia una presión entre el sello de extremo y una cara de contacto entre la carcasa de la bomba sumergible y una cabeza o base que se conecta a la bomba sumergible.
6. La bomba sumergible de la reivindicación 1, en donde el pasaje de ventilación está localizado al exterior de la región de extremo con rosca para disipar una presión de fuga de fluido y para minimizar una velocidad de chorro de la fuga de fluido que se escapa por el sello de extremo interno.
7. La bomba sumergible de la reivindicación 6, en donde el pasaje de ventilación comprende uno entre un camino, puerta, agujero, lumen, canal, ventilación, pasaje, o encastrado molido del fluido en una cara extremo de la carcasa, tapa de extremo de base, o tapa de extremo de cabeza lo que le permite al fluido moverse desde un sitio a otro sitio.
8. La bomba sumergible de la reivindicación 1, en donde esta comprende adicionalmente un protector de placa de fijación sobre el pasaje de

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ventilación para proteger un revestimiento del pozo contra fugas de fluido desde el compartimiento interior pasando el sello de extremo.

9. La bomba sumergible de la reivindicación 8, en donde el protector de placa de fijación es escalonado para desviar al fluido axialmente a lo largo de la carcasa en vez de radialmente hacia un agujero del revestimiento del pozo.

10. La bomba sumergible de la reivindicación 1, en donde la bomba sumergible comprende una bomba estilo anillo de compresión (CR); y

Comprende además una puerta de fuga para fugas pequeñas que pasen por un sello de compresión entre anillo y cabeza.

11. La bomba sumergible de la reivindicación 1, en donde la bomba sumergible comprende una ESP centrífuga que opera a una temperatura de hasta aproximadamente 149 grados Celsius y a una presión de hasta aproximadamente 6000 libras por pulgada cuadrada o aproximadamente 41 megapascuales en un ambiente dentro del pozo de hasta 12000 pies o 3.7 kilómetros de profundidad;

En donde la ESP centrífuga usa hasta aproximadamente 1000 caballos de fuerza o 750 kilovatios de potencia y tiene una velocidad de rotación de un rotor de hasta aproximadamente 4000 revoluciones por minuto; y
En donde el sello de extremo protege la región de extremo con rosca contra el fluido a alta presión de empuje en el compartimiento interior.

12. Una carcasa para bomba centrífuga, comprende:

Un difusor para dirigir al fluido con alta presión de empuje acelerado por un impulsor;

Un sello de extremo interno de cada extremo con rosca de la carcasa de la bomba centrífuga; y

Al menos una puerta de fuga exterior de cada sello de extremo para aliviar un fluido que se filtra desde el interior de la carcasa de la bomba centrífuga por cada sello de extremo.

13. La carcasa para bomba centrífuga de la reivindicación 12, en donde el al menos una puerta de fuga alivia una presión entre el sello de extremo y una cara de contacto entre la carcasa para bomba centrífuga y una cabeza o una base.

14. La carcasa para bomba centrífuga de la reivindicación 12, en donde el al menos una puerta de fuga está localizada al exterior del extremo con rosca para disipar una presión de fuga de fluido y para minimizar una velocidad de chorro de una fuga de fluido que ha pasado por el sello de extremo.
15. La carcasa para bomba centrífuga de la reivindicación 12, en donde el al menos una puerta de fuga comprende uno entre un camino, puerta, agujero, lumen, canal, ventilación, pasaje, o encastrado molido del fluido en una cara extremo del difusor, una tapa de extremo de base, o una tapa de extremo de cabeza lo que le permite al fluido moverse desde un sitio a otro sitio.
16. La carcasa para bomba centrífuga de la reivindicación 12, comprende además un protector de placa de fijación sobre la puerta de fuga.
17. La carcasa para bomba centrífuga de la reivindicación 16, en donde el protector de placa de fijación protege un revestimiento de pozo de una fuga de fluido desde la puerta de fugas.
18. La carcasa para bomba centrífuga de la reivindicación 16, en donde el protector de placa de fijación es escalonado para desviar el fluido axialmente a lo largo de la carcasa para bomba centrífuga en vez de radialmente hacia un agujero del revestimiento de pozo.
19. Un método comprende:
 - Localizar un sello de extremo interno de una porción con rosca de una carcasa para bomba centrífuga para sellar la presión interna desde la porción con rosca; y
 - Localizar un pasaje de ventilación externo al sello de extremo para aliviar la presión de filtración por el sello de extremo.
20. El método de la reivindicación 19, en donde cada sello de extremo está localizado entre un fluido interno presurizado y una porción con rosca respectiva de la carcasa para bomba centrífuga.

PA 1932213

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EFS ID:	13388711
Application Number:	61678101
International Application Number:	
Confirmation Number:	2968
Title of Invention:	SUBMERSIBLE PUMP HOUSING WITH SEAL BLEED HOLES
First Named Inventor/Applicant Name:	DAVID ESLINGER
Customer Number:	15603
Filer:	Mark Farrell
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Attorney Docket Number:	IS12-2334-USProvisional
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		SLB-IS12-2334-PatApp-USP1.pdf	89636 e048c8c6619d87e8f41f3e0ddcac777df976eca4	yes	14

	Multipart Description/PDF files in .zip description		
	Document Description	Start	End
	Specification	1	9
	Claims	10	13
	Abstract	14	14

Warnings:

Information:

2	Drawings-only black and white line drawings	SLB-IS12-2334-USProvisional-Figs.pdf	238863	no	4
			44549451e89bd0dd359d67bab4985a03a63d5033		

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3	Provisional Cover Sheet (SB16)	ProvisionalSB.pdf	2071615	no	3
			44fbf26ddf198ac36495ab5ec99154e4d954e7a7		

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4	Fee Worksheet (SB06)	fee-info.pdf	29425	no	2
			702bbb5e92033c21829b109ede806c7234a0e9b6		

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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

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DAVID		ESLINGER	COLLINSVILLE	OK	US

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Title of Invention

SUBMERSIBLE PUMP HOUSING WITH SEAL BLEED HOLES

Attorney Docket Number (if applicable)

IS12-2334-Provisional

Correspondence Address

Direct all correspondence to (select one):

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15603

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

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

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**

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Signature	/Mark Farrell/			Date (YYYY-MM-DD)	2012-08-01
First Name	MARK	Last Name	FARRELL	Registration Number (If appropriate)	45988

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SUBMERSIBLE PUMP HOUSING WITH SEAL BLEED HOLES

BACKGROUND

[0001] An electric submersible pump (ESP) is often used in well settings to artificially lift subsurface resources such as hydrocarbons and water to the Earth's surface. Conventionally, the maximum pressure rating of a given ESP housing is limited by the stresses in the threaded end portion of the ESP housing. In a conventional centrifugal pump housing (diffuser), for example, the housing is sealed at the head and at the base with an O-ring seal located at the end of the housing and outboard of the end threads. Conventional arrangement of the end seals in an ESP causes the circumferential or hoop stresses of the housing in the threaded region to be the sum of the hoop stresses due to the thread radial forces resulting from axial loads on the thread flank angle, and the internal pressure differential from inside to outside the housing. The sum of these hoop stresses determines the maximum pressure rating of a conventional housing. Some conventional ESP housings have end seals both inboard and outboard of the threaded ends of the conventional housings. However, there is no fluid path from inside to outside the housing between these two seals. Thus, this conventional arrangement can trap the high internal pressure between the two seals and render the conventional inboard seal ineffective.

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SUMMARY

A submersible pump housing with seal bleed holes is described. In an implementation, the submersible pump housing includes a housing, an interior compartment of the housing for fluid at high thrust pressure, a threaded end region of the housing, an inboard end seal to seal off the threaded end region from the interior compartment; and at least one bleed hole outboard of the end seal for allowing leakage of fluid from the interior compartment past the end seal to escape radially through the housing. An example centrifugal pump housing may include a diffuser for directing high thrust fluid accelerated by an impeller, an end seal inboard of each threaded end of the centrifugal pump housing, and at least one leak port outboard of each end seal to relieve a fluid seeping from inside the centrifugal pump housing past each end seal. An example method includes locating an end seal inboard of a threaded portion of a centrifugal pump housing to seal internal pressure from the threaded portion, and locating a radial bleed hole outboard of the end seal to relieve pressure of seepage past the end seal. This summary section is not intended to give a full description of submersible pump housings with seal bleed holes. A detailed description with example embodiments follows.

BRIEF DESCRIPTION OF THE DRAWINGS

[0002] Fig. 1 is a diagram of an example electric submersible pump (ESP) section with inboard end seals and seal bleed holes.

[0003] Fig. 2 is a diagram of a second example ESP section with inboard end seals and seal bleed holes.

[0004] Fig. 3 is a diagram of an example ESP section with inboard end seals, seal bleed holes, and a lockplate protector.

[0005] Fig. 4 is a flow diagram of an example method of increasing the pressure rating of a submersible pump housing.

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DETAILED DESCRIPTION

[0006] This disclosure describes submersible pump housings with seal bleed holes. Features, systems, and methods associated with submersible pump housings with seal bleed holes represent possible implementations and are included for illustration purposes and should not be construed as limiting. Moreover, it will be understood that different implementations can include all or different subsets of aspects described below. Furthermore, the aspects described below may be included in any order, and numbers and/or letters placed before various aspects are done for ease of reading and in no way imply an order, or level of importance to their associated aspects.

[0007] Fig. 1 shows a section of an example electric submersible pump (ESP) 100 of the centrifugal type. The illustrated section shows a base-end portion of the centrifugal ESP 100. An impeller region 102 inside the pump housing generates high thrust pressure as the impeller accelerates fluid radially outward and axially upward, or toward a wellhead of an ESP installation. At the periphery of the pump housing, the fluid in the interior high pressure compartment 104 that includes the impeller region 102 extends to a location at which the end seal 106 is situated to seal off the high thrust pressure and highly mobilized fluid from flowing out to the exterior of the pump housing or from flowing out to the next component in a stack of components.

[0008] In the example ESP 100 with inboard end seals 106 and seal bleed holes 108, the end seals 106 are inboard of the threaded end regions 110 of the pump housing in order to contain the high pressure compartment 104 and prevent the threaded end region 110 from participating in the interior high pressure compartment(s) of the ESP 100. This increases the maximum pressure rating of the pump housing,

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because the threaded end regions 110 of conventional pumps are subject to increased stresses over the non-threaded regions of conventional pump housings when subjected to interior pump pressures.

[0009] The term “outboard” or “outboard of” as used herein, means “outside” or “on the other side of” a designated feature that is closer to, or more “inboard,” to the pump’s high thrust pressure compartments or to the fluids being accelerated by the pump. Correspondingly, “inboard,” as used herein, means “inside of,” in first contact with, or in closer contact with the high thrust pressure generated by the pump than a designated feature that is therefore more “outboard.”

[0010] Fig. 2 shows an example centrifugal ESP 200 with cutaway housing 202. The illustrated section shows a head-end portion of the example centrifugal ESP 200. The example centrifugal ESP 200 includes one or more impeller regions 204 in a high thrust pressure compartment. An end seal 206 is positioned inboard of one or more fluid bleed holes 208. The end seal 206 is also positioned inboard of a threaded end region 210. The illustrated bleed holes 208 are radially-directed to form a leak path from outboard of the end seal 206 to the exterior of the housing 202. In this manner, an internal pressure differential caused by the pumping action of the example centrifugal ESP 200 is sealed off from the end threads 210, and the hoop stresses in the same threaded region 210 are significantly reduced to enable a higher maximum pressure rating for the overall housing 202 of the example centrifugal ESP 200. Any fluid leakage that does seep past the end seal 206 on account of the high pressure that is inboard of the end seal 206 is allowed to escape the housing 202 without building up at the threaded region 210.

[0011] The bleed holes 208 form a leak path that is situated from inside to outside the housing 202 just outboard of the end seal 206. The

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leak path can be implemented so that a very small leakage of fluid past the end seal 206 does not pressure the space or volume that may exist between the end seal 206 and the contact face between the head (or the base) and the centrifugal pump housing 202. If this volume is pressured, then the same undesired stress state that exists in conventional housings occurs. In an implementation, the leak path can be created by drilling small radial holes in the housing 202 just downstream (outboard) of the end seal(s) 206. The head-end of compression ring (CR) style pumps also requires a bleed path, such as port 212, for weepage that may occur past the compression ring-to-head seal.

[0012] Fig. 3 shows a centrifugal pump housing 302 with inboard seal 306, bleed port 308, and an example housing lockplate protector 310. The lockplate protector 310 covering the bleed port 308 shown in Fig. 3 can be used to protect the well casing from any damage due to fluid leaking from the radial bleed port 308 in the housing 302. The lockplate protector 310 can be a standard lockplate except that the housing-facing side of the lockplate can be stepped to allow bleed fluid to be deflected axially along the housing 302 rather radially toward the bore of the well casing.

[0013] In an implementation, an example submersible pump includes a housing, an interior compartment of the housing for fluid at high thrust pressure, a threaded end region of the housing, an inboard end seal to seal off the threaded end region from the interior compartment, and at least one bleed hole outboard of the end seal for allowing leakage of fluid from the interior compartment past the end seal to escape radially from the end seal through the housing.

[0014] The example submersible pump may comprise a centrifugal electric submersible pump (ESP) for the oil and gas industries. The housing may comprise a diffuser of the centrifugal ESP. The inboard end

seal protects the threads to increase the pressure rating of the housing. The at least one bleed hole can relieve a pressure between the end seal and a contact face between the submersible pump housing and a head or a base connecting to the submersible pump.

[0015] A lockplate protector over the bleed hole can protect a well casing from the leakage of fluid from the interior compartment past the end seal. The lockplate protector can be stepped to deflect fluid axially along the housing instead of radially toward a bore of the well casing.

[0016] When the submersible pump is a compression ring (CR) style pump, a leak port can be used for weepage past a compression ring-to-head seal.

[0017] A centrifugal ESP may operate at temperatures of up to approximately 149 degree Celsius and pressures of up to approximately 5,000 pounds per square inch or approximately 34 megapascals in a downhole environment of up to approximately 12,000 feet or 3.7 kilometers deep. The centrifugal ESP can use up to approximately 1000 horsepower or 750 kilowatts of power and has a speed of rotation of a rotor of up to approximately 4000 revolutions per minute. Even in such harsh conditions, the end seal protects the threaded end region from the fluid at high thrust pressure in the interior compartment of the centrifugal ESP.

[0018] In an implementation, a centrifugal pump housing includes a diffuser for directing high thrust fluid accelerated by an impeller, an end seal inboard of each threaded end of the centrifugal pump housing, and at least one leak port outboard of each end seal to relieve a fluid seeping from inside the centrifugal pump housing past each end seal. Each leak port can relieve a pressure between a respective end seal and a contact face between the centrifugal pump housing and a head or a base.

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[0019] A lockplate protector can be used over the leak port. The lockplate protector protects the well casing from a fluid leaking from the leak port. The lockplate protector can be stepped to deflect fluid axially along the centrifugal pump housing instead of allowing the fluid to escape radially toward a bore of the well casing.

Example Method

[0020] Fig. 4 shows an example method 400 of increasing the pressure rating of a submersible pump housing. In an implementation, the submersible pump can be a centrifugal ESP. In the flow diagram, operations are shown in individual blocks.

[0021] At block 402, an end seal is located inboard of the threaded portion of a submersible pump housing to seal internal pressure from the threaded portion.

[0022] At block 404, radial bleed holes are located outboard of the end seal to relieve pressure of small blow-by or seepage past the end seal.

[0023] The example method enables an internal pressure differential of the submersible pump to be sealed from the end threads, and the hoop stresses in the threaded region of the housing to be significantly reduced, achieving a higher pressure rating for the example submersible pump housing.

Conclusion

[0024] Although only a few example embodiments have been described in detail above, those skilled in the art will readily appreciate that many modifications are possible in the example embodiments without materially departing from the subject matter. Accordingly, all such modifications are intended to be included within the scope of this

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disclosure as defined in the following claims. In the claims, means-plus-function clauses are intended to cover the structures described herein as performing the recited function and not only structural equivalents, but also equivalent structures. It is the express intention of the applicant not to invoke 35 U.S.C. § 112, paragraph 6 for any limitations of any of the claims herein, except for those in which the claim expressly uses the words 'means for' together with an associated function.

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CLAIMS

1. A submersible pump, comprising:
 - a housing;
 - an interior compartment of the housing for fluid at high thrust pressure;
 - a threaded end region of the housing;
 - an inboard end seal to seal off the threaded end region from the interior compartment; and
 - at least one bleed hole outboard of the end seal for allowing leakage of fluid from the interior compartment past the end seal to escape radially through the housing.
2. The submersible pump of claim 1, wherein the submersible pump comprises a centrifugal electric submersible pump (ESP) for the oil and gas industries.
3. The submersible pump of claim 1, wherein the housing comprises a diffuser of a centrifugal ESP.
4. The submersible pump of claim 1, wherein the inboard end seal increases the pressure rating of the housing.
5. The submersible pump of claim 1, wherein the at least one bleed hole relieves a pressure between the end seal and a contact face between the submersible pump housing and a head or a base connecting to the submersible pump.

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6. The submersible pump of claim 1, further comprising a lockplate protector over the bleed hole to protect a well casing from the leakage of fluid from the interior compartment past the end seal.

7. The submersible pump of claim 6, wherein the lockplate protector is stepped to deflect fluid axially along the housing instead of radially toward a bore of the well casing.

8. The submersible pump of claim 1, wherein the submersible pump comprises a compression ring (CR) style pump; and
further comprising a leak port for weepage past a compression ring-to-head seal.

10. The submersible pump of claim 1, wherein the submersible pump comprises a centrifugal ESP operating at a temperature of up to approximately 149 degree Celsius and a pressure of up to approximately 5,000 pounds per square inch or approximately 34 megapascals in a downhole environment of up to approximately 12,000 feet or 3.7 kilometers deep;

wherein the centrifugal ESP uses up to approximately 1000 horsepower or 750 kilowatts of power and has a speed of rotation of a rotor of up to approximately 4000 revolutions per minute; and

wherein the end seal protects the threaded end region from the fluid at high thrust pressure in the interior compartment.

11. A centrifugal pump housing, comprising:
a diffuser for directing high thrust fluid accelerated by an impeller;
an end seal inboard of each threaded end of the centrifugal pump housing; and

at least one leak port outboard of each end seal to relieve a fluid seeping from inside the centrifugal pump housing past each end seal.

12. The centrifugal pump housing of claim 11, wherein the at least one leak port relieves a pressure between the end seal and a contact face between the centrifugal pump housing and a head or a base.

13. The centrifugal pump housing of claim 11, further comprising a lockplate protector over the leak port.

14. The centrifugal pump housing of claim 13, wherein the lockplate protector protects a well casing from a fluid leaking from the leak port.

15. The centrifugal pump housing of claim 13, wherein the lockplate protector is stepped to deflect fluid axially along the centrifugal pump housing instead of radially toward a bore of the well casing.

16. A method, comprising:
locating an end seal inboard of a threaded portion of a centrifugal pump housing to seal internal pressure from the threaded portion; and
locating a radial bleed hole outboard of the end seal to relieve pressure of seepage past the end seal.

17. The method of claim 16, wherein each end seal is located between a pressurized internal fluid and a respective threaded portion of the centrifugal pump housing.

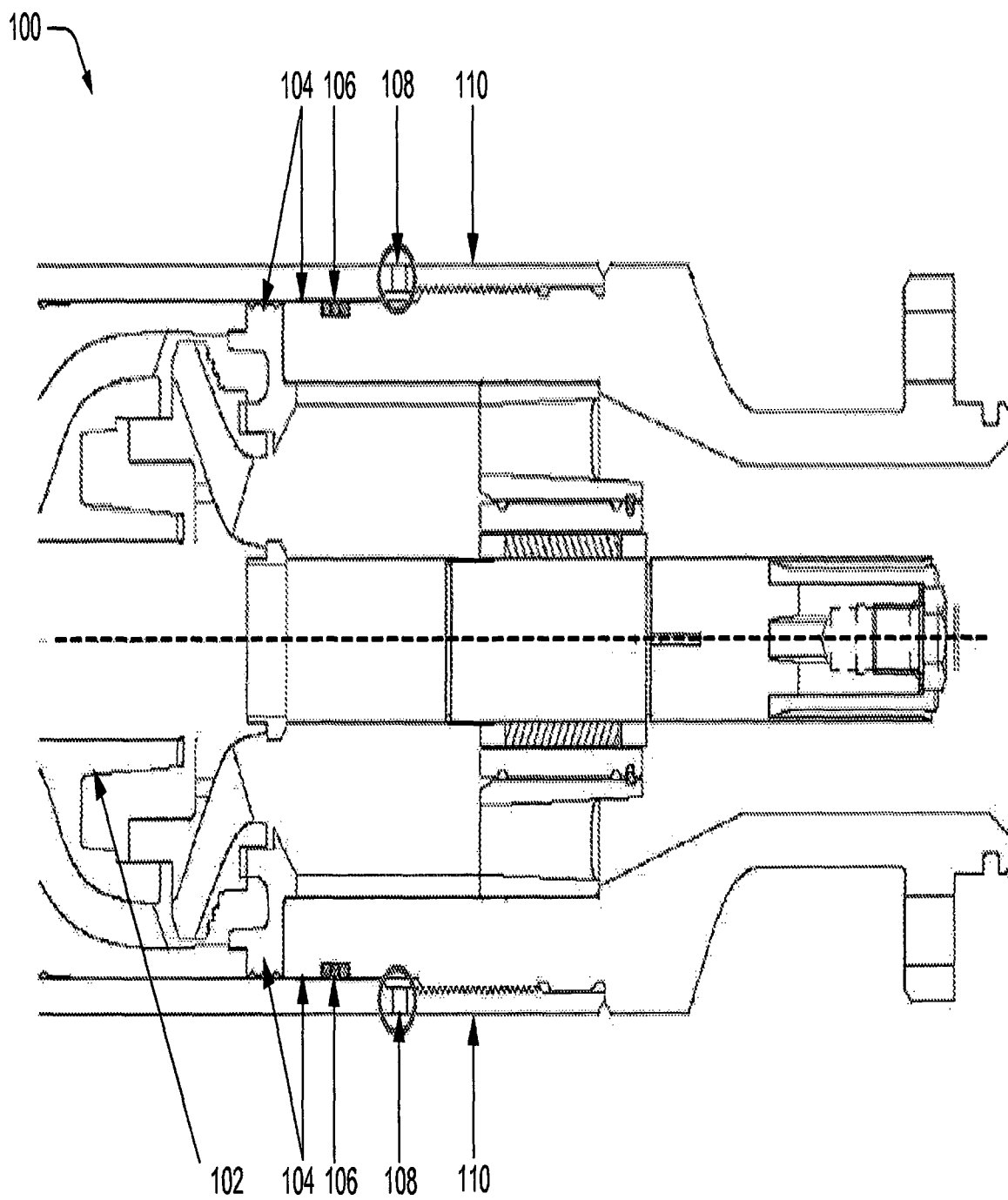
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SUBMERSIBLE PUMP HOUSING WITH SEAL BLEED HOLES

ABSTRACT

A submersible pump housing with seal bleed holes is provided. In an implementation, a pump housing for electric submersible pumps (ESPs), such as a centrifugal ESP, has end seals that are located inside or further inboard toward the high thrust pressure generated by the pump, than the threaded ends of the pump housing. The inboard seals contain and seal off the pump pressure and spare the threaded regions that are more pressure-vulnerable from the pump's high pressure interior, thereby increasing the pressure rating of the entire housing. Leak ports or bleed holes are provided further outboard of the end seals to relieve fluid seeping from inside the submersible pump housing past each end seal. A plate may be added to direct small amounts of fluid escaping from the end seals away from the wellbore casing in which an ESP is situated.

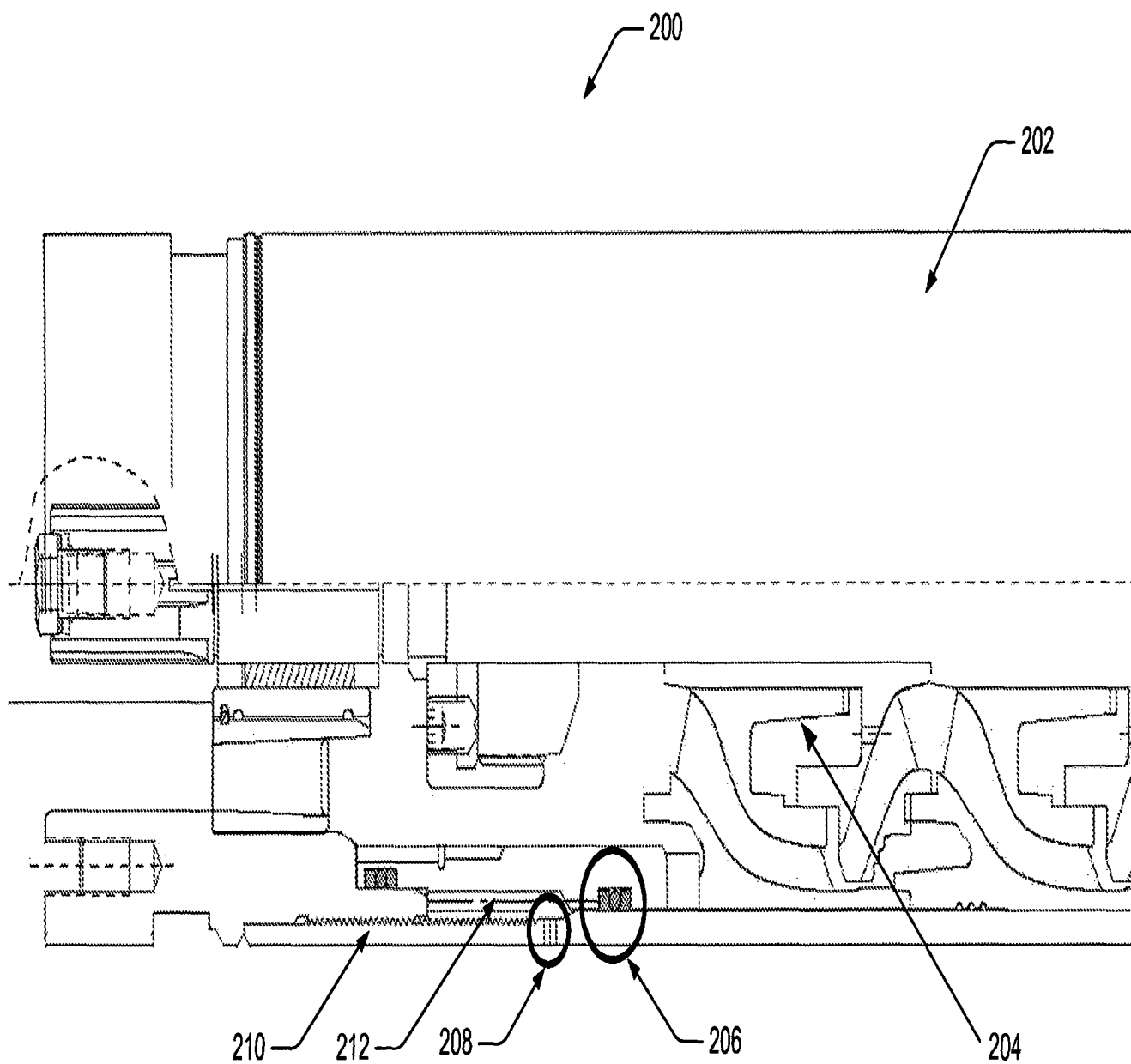
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FIG. 1

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FIG. 2

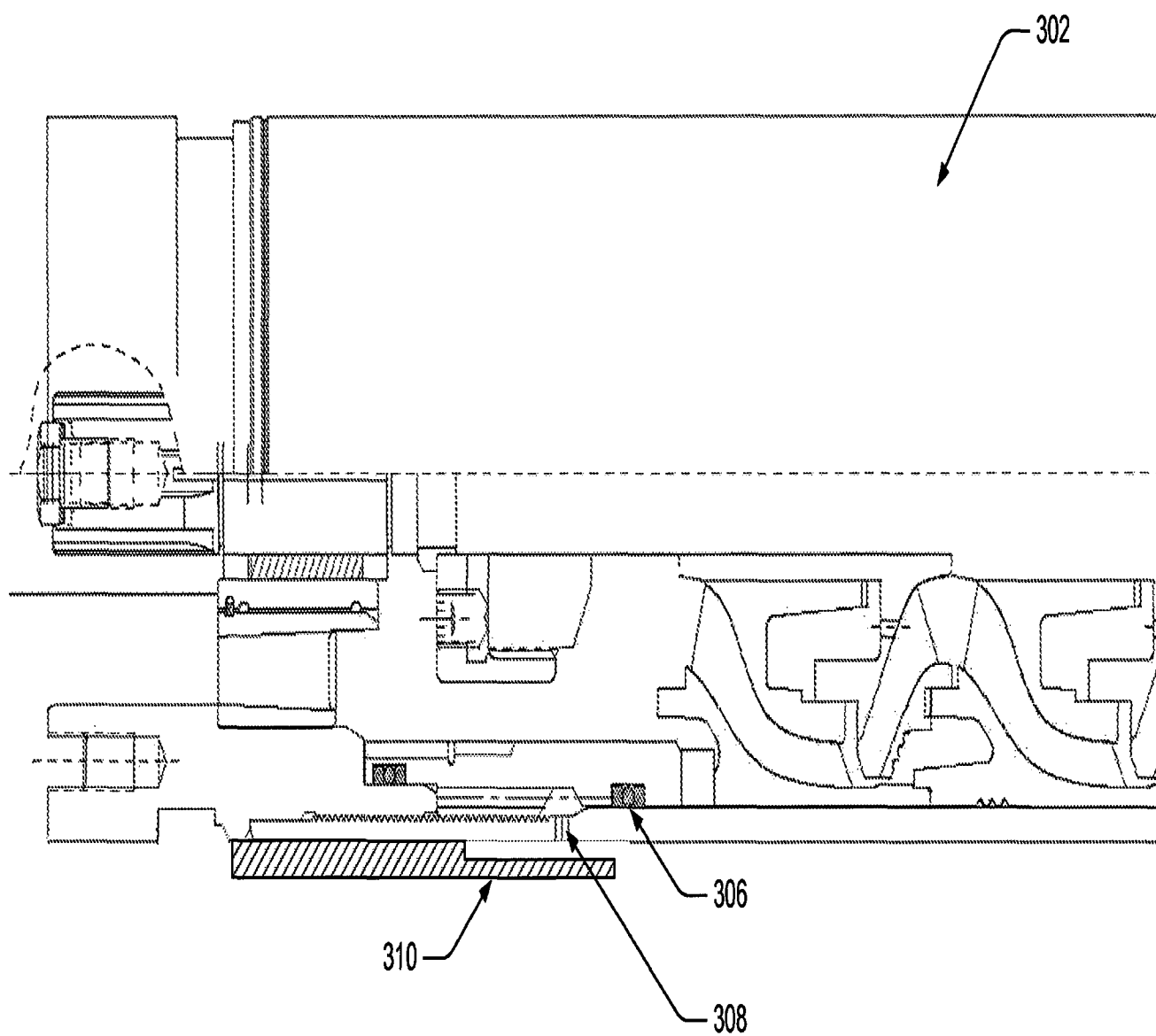
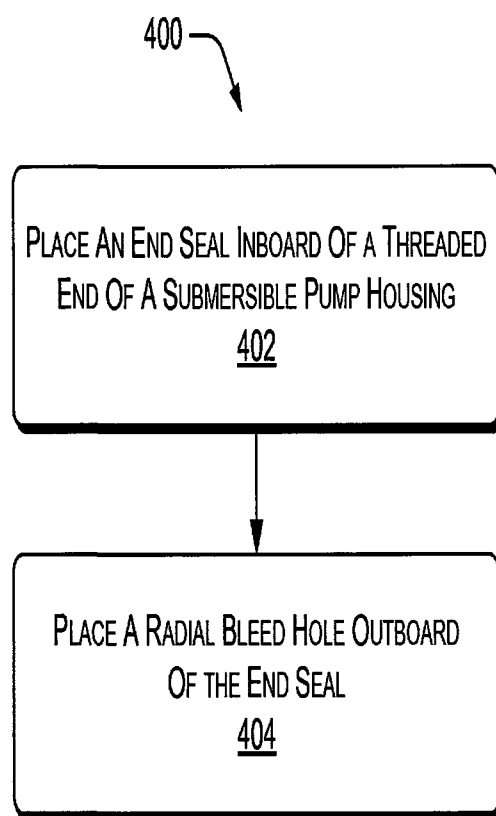


FIG. 3

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FIG. 4

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Octubre 11, 2013

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Director de la Oficina de Marcas y Patentes de los Estados Unidos

(Sello)

(Firmado)

T. Lawrence

Oficial de Certificaciones

REIVINDICACIONES

1. Una bomba sumergible, que comprende:
Una carcasa;
Un compartimiento interior de la carcasa para fluidos con alta presión de empuje;
Una región de extremo con rosca de la carcasa;
Un sello de extremo interior para sellar la región de extremo con rosca desde el compartimiento interior; y
Al menos un agujero de purga exterior del sello de extremo para permitir fugas de fluido desde el compartimiento interior pasando el sello de extremo para escapar radialmente por la carcasa.
2. La bomba sumergible de la reivindicación 1, en donde la bomba sumergible comprende una bomba centrífuga eléctrica sumergible (ESP) para las industrias de gas y petróleo.
3. La bomba sumergible de la reivindicación 1, en donde la carcasa comprende un difusor de una ESP centrífuga.
4. La bomba sumergible de la reivindicación 1, en donde el sello de extremo interno incrementa el valor de presión de la carcasa.
5. La bomba sumergible de la reivindicación 1, en donde el al menos un agujero de purga alivia una presión entre el sello de extremo y una cara de contacto entre la carcasa de la bomba sumergible y una cabeza o base que se conecta a la bomba sumergible.
6. La bomba sumergible de la reivindicación 1, en donde esta comprende adicionalmente un protector de placa de fijación sobre al agujero de purga para proteger un revestimiento del pozo contra fugas de fluido desde el compartimiento interior pasando el sello de extremo.
7. La bomba sumergible de la reivindicación 6, en donde el protector de placa de fijación es escalonado para desviar al fluido axialmente a lo largo de la carcasa en vez de radialmente hacia un agujero del revestimiento del pozo.
8. La bomba sumergible de la reivindicación 1, en donde la bomba sumergible comprende una bomba estilo anillo de compresión (CR); y

Comprende además una puerta de fuga para fugas pequeñas que pasen por un sello de compresión entre anillo y cabeza.

10. La bomba sumergible de la reivindicación 1, en donde la bomba sumergible comprende una ESP centrífuga que opera a una temperatura de hasta aproximadamente 149 grados Celsius y a una presión de hasta aproximadamente 5000 libras por pulgada cuadrada o aproximadamente 34 megapascuales en un ambiente dentro del pozo de hasta 12000 pies o 3.7 kilómetros de profundidad;
En donde la ESP centrífuga usa hasta aproximadamente 1000 caballos de fuerza o 750 kilovatios de potencia y tiene una velocidad de rotación de un rotor de hasta aproximadamente 4000 revoluciones por minuto; y
En donde el sello de extremo protege la región de extremo con rosca contra el fluido a alta presión de empuje en el compartimiento interior.
11. Una carcasa para bomba centrífuga, comprende:

Un difusor para dirigir al fluido con alta presión de empuje acelerado por un impulsor;

Un sello de extremo interno de cada extremo con rosca de la carcasa de la bomba centrífuga; y

Al menos una puerta de fuga exterior de cada sello de extremo para aliviar un fluido que se filtra desde el interior de la carcasa de la bomba centrífuga por cada sello de extremo.
12. La carcasa para bomba centrífuga de la reivindicación 11, en donde el al menos una puerta de fuga alivia una presión entre el sello de extremo y una cara de contacto entre la carcasa para bomba centrífuga y una cabeza o una base.
13. La carcasa para bomba centrífuga de la reivindicación 11, comprende además un protector de placa de fijación sobre al agujero de purga.
14. La carcasa para bomba centrífuga de la reivindicación 13, en donde el protector de placa de fijación protege un revestimiento de pozo de una fuga de fluido desde la puerta de fugas.
15. La carcasa para bomba centrífuga de la reivindicación 13, en donde el protector de placa de fijación es escalonado para desviar el fluido axialmente a lo largo de la carcasa para bomba centrífuga en vez de radialmente hacia un agujero del revestimiento de pozo.
16. Un método comprende:

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Localizar un sello de extremo interno de una porción con rosca de una carcasa para bomba centrífuga para sellar la presión interna desde la porción con rosca; y

Localizar un agujero de purga radial externo del sello de extremo para aliviar la presión filtración por el sello de extremo.

17. El método de la reivindicación 16, en donde cada sello de extremo está localizado entre un fluido interno presurizado y una porción con rosca respectiva de la carcasa para bomba centrífuga.