BRIGARD & CASTRO
PROPIEDAD INTELECTUAL

CALLE 70A # 4 – 41
BOGOTÁ – COLOMBIA
TEL: (571) 744 22 00
FAX: (571) 742 22 00
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SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO



No. 14-099072- -00003-0000
Fecha: 2014-06-26 09:45:51 Dep. 2020 DIR.NUEVASCR
Tra. 2 PATENTES Eve: 1 REGDEPOSITO
Act. 444 RESPUESTAREQUE Folios: 77

AS. 128.142

Señor Director
DIRECCIÓN DE NUEVAS CREACIONES
SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO
E. S. D.

RESPUESTA A OFICIO 6260 DEL 27 DE MAYO DE 2014

REF: Expediente No. 14 099.072 - Solicitud de Patente Nacional
a favor de **TERCEL IP LIMITED**
Titulada: HERRAMIENTA DE FONDO DEL POZO ENSAMBLADA A UNA SARTA DE PERFORACIÓN ENTRE UN TALADRO Y UN TUBULAR PARA LA ESCARIFICACIÓN DE UN POZO

JUAN PABLO CADENA SARMIENTO, vecino de Bogotá, portador de la tarjeta profesional No. 57492, obrando como apoderado de la sociedad **TERCEL IP LIMITED**, según lo acredita el documento de poder anexo al presente escrito, para dar cumplimiento al requerimiento notificado por fijación en lista el 27 de mayo de 2014, de acuerdo con los Artículos 38 y 39 de la Decisión 486 de la comisión de la Comunidad Andina me permito allegar:

1. Fotocopia del documento de poder conferido por el solicitante.

2. Documento donde consta la cesión del derecho a la Patente otorgado por los inventores al solicitante junto con su correspondiente traducción al español.

3. Copia certificada por la Oficina de Patentes de Estados Unidos de la primera solicitud presentada para la misma invención de la cual REIVINDICAMOS PRIORIDAD junto con su correspondiente traducción al español.

Del señor Director atentamente,

JUAN PABLO CADENA SARMIENTO
C.C. No. 80.410.337 de Usaquén
Calle 70A No. 4-41

Bogotá, 25 de mayo de 2014
JPC/jpg
Folios: 97

Brigard & Castro
BOGOTA - COLOMBIA

PODER

Yo (nosotros), **TERCEL IP LIMITED**

domiciliado(s) en Kingston Chambers, P.O. Box 173 - Road Town, Tortola, British Virgin Islands.

Nombro(amos) a: **JUAN PABLO CADENA SARMIENTO** y/o **MARTIN E. TORRES CARDOZO**, de Bogotá, Colombia, apoderados verdaderos y legales con poder especial, amplio y suficiente, para recabar de las oficinas y autoridades colombianas administrativas, judiciales y de policía, en cualquier instancia o recurso, la obtención de patentes de invención, registros de marcas, diseños industriales, modelos de utilidad, depósitos de nombres comerciales y enseñas, lemas comerciales, nombres comerciales, registros de derechos de autor y contratos sobre los mismos, obtención de certificados de obtentor de variedades vegetales, así como sus prórrogas, renovaciones, anotaciones de traspaso, cambios de nombre y/o domicilio y/o dirección; elaborar, tramitar y registrar contratos de licencia y licencias de cualesquiera clases; intervenir como demandante o como demandado en cualquier instancia y recurso ante cualquier juez, corporación, funcionario público o autoridad en acciones judiciales, administrativas y de policía tales como: oposiciones al registro de marcas; acciones de caducidad, cancelación y nulidad; acciones reivindicatorias, acciones derivadas de la obtención o explotación de licencias; acciones de competencia desleal; demandas penales; acciones de indemnización de perjuicios, reclamos y observaciones a solicitudes de patentes, diseños industriales, modelos de utilidad, en el ejercicio de medidas cautelares y en otras acciones o medidas similares.

A este efecto, lo(s) faculto(amos) para elevar solicitudes, formular descripciones, enmiendas, protestas, declaraciones, oposiciones, cancelaciones, nulidades, apelaciones y reclamos; pagar impuestos, cuotas y gravámenes prescritos por la ley; renunciar o desistir a derechos concedidos o en curso de concesión; recibir toda clase de documentos y valores, dando el descargo respectivo, y, en general, para dar ante dichas autoridades todos los pasos necesarios al efecto indicado y tomar todas las medidas que creyeren conducentes al resguardo de mis (nuestros intereses), con todas las demás facultades legales necesarias.

Este poder comprende la facultad de ratificar o confirmar en mi (nuestro) nombre lo actuado así como la facultad de desistir, transigir, comprometer, y la de sustituirlo en todo o en parte y revocar sustituciones. Asimismo nombro(amos) a: **JUAN PABLO CADENA SARMIENTO** y/o **MARTIN E. TORRES CARDOZO**, domiciliado(s) en la calle 70A No. 4-41, mis (nuestros) apoderados en Colombia, con facultades para recibir notificaciones y designar apoderados judiciales o extrajudiciales.

Otorgado y firmado en

hoy de de 200_

Firma

Nombre
Cargo

HOU:3436498.1

POWER OF ATTORNEY

I (We), **TERCEL IP LIMITED**

domiciled in Kingston Chambers, P.O. Box 173 - Road Town, Tortola, Islas Virgenes Británicas,

Hereby appoints **JUAN PABLO CADENA SARMIENTO** and/or **MARTIN E. TORRES CARDOZO**, of Bogotá, Colombia, my (our) true and lawful attorneys with special, ample and sufficient power to obtain from the Colombian administrative, judicial and police offices and authorities, in any instance, privileges of patents of invention, registration of trademarks, industrial designs and utility models; registration of commercial names, slogans and emblems, registration of copyright and contracts related thereto, certificates of obtainers of vegetables varieties, as well as extensions, renewals and recordal of assignments and changes of name, domicile and address related to the above; to prepare, prosecute and register licenses of any kind; to act as plaintiff or defendant in any instance or recourse, and before any judge, corporation, public official or authority in judicial, administrative and police actions, such as: oppositions to the registration of trademarks; caducity, cancellation and nullity actions; claim actions derived from the obtaining or exploitation of licenses, action of unfair competition; criminal proceedings, actions for payment of damages: claims or observations on patent applications, models, industrial designs and utility models; in the exercise of preventive measures and in other actions or similar proceedings.

To that effect they hereby empowered to file applications, formulate descriptions, amendments, protests, declarations, oppositions, cancellations, nullities, appeals and claims; to pay taxes, quotas and assessments prescribed by law; renounce or waive the rights granted or in the process of granting; to receive all kinds of documents and valuables, giving the respective release of receipt, and, in general, to take before said authorities the necessary steps to such effect, and any measures that they may deem pertinent to the safeguard of my (our) interest(s) with all the other necessary legal powers.

This power includes the faculty to ratify or confirm desist, settle and compromise on my (our) behalf, and to substitute this power in whole or in part and to revoke substitutions. At the same time I (We) hereby appoint **JUAN PABLO CADENA SARMIENTO** and/or **MARTIN E. TORRES CARDOZO**, domiciled in calle 70A No. 4-41, my (our) attorney(s) in fact, with powers to receive notifications and to designate judicial and extrajudicial attorneys.

Granted and signed in Houston, TX - USA

this May 16th day of 2014

Signature H. ElBadawy

Name HOSSAM ELBADAWY
Title Director

3

A 7478509

THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office

May 23, 2014

THIS IS TO CERTIFY THAT ANNEXED IS A TRUE COPY FROM THE RECORDS OF THIS OFFICE OF A DOCUMENT RECORDED ON MAY 08, 2013.

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

P. R. Grant

P. R. GRANT
Certifying Officer

502340327 05/08/2013

PATENT ASSIGNMENT

Electronic Version v1.1
Stylesheet Version v1.1

SUBMISSION TYPE:	NEW ASSIGNMENT
NATURE OF CONVEYANCE:	ASSIGNMENT

CONVEYING PARTY DATA

Name	Execution Date
Lee Morgan Smith	11/26/2012

RECEIVING PARTY DATA

Name:	LB ENTERPRISES, LLC
Street Address:	1120 Huffman Road
Internal Address:	Suite 234
City:	Anchorage
State/Country:	ALASKA
Postal Code:	99515

PROPERTY NUMBERS Total: 1

Property Type	Number
Application Number:	13889969

CH $40.00 13889969

CORRESPONDENCE DATA

Fax Number: 7132753419
Correspondence will be sent via US Mail when the fax attempt is unsuccessful.
Phone: 713-275-3400
Email: sarah.gernhart@buskoplaw.com
Correspondent Name: BUSKOP LAW GROUP, P.C.
Address Line 1: 4511 Dacoma Street
Address Line 4: HOUSTON, TEXAS 77092

ATTORNEY DOCKET NUMBER:	2051.001A WESTERN ENERGY
NAME OF SUBMITTER:	Wendy Buskop
Signature:	/WBUSKOP/
Date:	05/08/2013

Total Attachments: 1
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PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
ASSIGNMENT FOR ISSUED PATENTS & PATENT APPLICATIONS

WHEREAS I, LEE MORGAN SMITH ("ASSIGNOR"), am an individual, is the owner of the entire right, title, and interest to the **United States Patent Application Serial No.: 61/693,459 filed on August 27, 2012 entitled, "DOWNHOLE TOOL FOR ENGAGING A TUBING STRING BETWEEN A DRILL BIT AND TUBULAR FOR REAMING A WELLBORE"**; and

WHEREAS, **LB ENTERPRISES, LLC** ("ASSIGNEE"), of **1120 Huffman Road, Suite 234, Anchorage, Alaska 99515 US**, is desirous of acquiring the entire right, title, and interest in and to the Inventions, which includes all continuations, continuation in part, and divisional applications in the United States and foreign countries and the Patents;

NOW, THEREFORE, for good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged:

ASSIGNOR hereby assigns and transfers to ASSIGNEE the entire right, title, and interest in and to the Inventions in the United States and foreign countries and the Patents and Patent Applications, including but not limited to all reissues, divisions, continuations and extensions of the Patents, all rights of action arising from the Patents, all claims for damages by reason of past infringement of the Patents and the right to sue and collect damages for such infringement, to be held and enjoyed by the Assignee for its own use and benefit and for its successors and assigns as the same would have been held by Assignor had this assignment not been made.

ASSIGNOR agrees, for no additional compensation, to cooperate with ASSIGNEE and to execute and deliver all papers, documents, instruments, and assignments as may be necessary to vest all rights, title, and interests in and to the aforesaid materials in ASSIGNEE, including without limitation, any patent applications and the recordation of the assignment with the United States Patent & Trademark Office or any other foreign patent office.

ASSIGNOR hereby warrants that he has read the above assignment prior to its execution, and is fully familiar with the contents thereof.

IN WITNESS HEREOF, with the intent to be legally bound, the ASSIGNOR subscribes to this Assignment.

ASSIGNOR,

Printed Name: LEE MORGAN SMITH

Signature: Lee M Smith

Date: 11-26-12

TRADUCCIÓN AL ESPAÑOL DEL DOCUMENTO DE CESIÓN A **TERCEL IP LIMITED** firmado por el cedente y el cesionario.

LOS ESTADOS UNIDOS DE AMÉRICA
A TODO AQUEL QUE PUEDA LLEGAR LA PRESENTE:

DEPARTAMENTO DE COMERCIO DE ESTADOS UNIDOS
Oficina de Marcas y Patentes de los Estados Unidos

23 de mayo de 2014

LA PRESENTE CERTIFICA QUE EL ANEXO ES UNA COPIA VERDADERA TOMADA DE LOS ARCHIVOS DE ESTA OFICINA DE UN DOCUMENTO ARCHIVADO EL 08 DE MAYO DE 2013.

Por la autoridad del
Subsecretario de Comercio para la Propiedad Intelectual
y Director de la Oficina de Marcas y Patentes de los Estados Unidos

(Firma)
P. R. GRANT
Funcionario que certifica

Hay un sello que dice:
Oficina de Marcas y Patentes de Estados Unidos
Departamento de Comercio

502340327 05/08/2013

CESIÓN DE PATENTE

Versión Electrónica v1.1

Versión de Hoja de Estilo v1.1

TIPO DE PRESENTACIÓN:	NUEVA CESIÓN
NATURALEZA DE LA TRANSMISIÓN	CESIÓN

DATOS DE LAS PARTES QUE TRANSMITEN	
Nombre	Fecha de legalización
LEE MORGAN SMITH	11/26/2012

DATOS DE LAS PARTES QUE RECIBEN	
Nombre:	LB ENTERPRISES, LLC
Dirección:	1120 Huffman Road
Dirección Interna	SUITE 234
Ciudad:	Anchorage
Estado/País	ALASKA
Código Postal:	99515

NÚMERO TOTAL DE PROPIEDAD: 1	
Tipo de Propiedad	Número
Número de Solicitud:	13889969

DATOS DE CORRESPONDENCIA

Número de Fax 7132753419

Se enviará correspondencia a través del correo EE.UU. cuando el intento de envío por correo electrónico no sea exitoso Número de Teléfono 713-275-3400 Correo electrónico sarah.gernhart@buskoplaw.com Nombre del Corresponsal: BUSKOP LAW GROUP, P.C. Dirección Línea 1: 4511 Dacoma Street Dirección Línea 4: HOUSTON, TEXAS 77092	
NÚMERO DE EXPEDIENTE DE ABOGADO	2051.001A WESTERN ENERGY
NOMBRE DEL REMITENTE	WENDY BUSKOP
Firma:	/WBUSKOP/
Fecha:	05/08/2013
Total de anexos : 1 source=2051.001A SIGNED ASSIGNMENT DOCUMENT#page1.tif	
INFORMACIÓN DE RECIBO: **ID DE EPAS:** **Fecha de recibo:**	 PAT2711405 05/08/2013

PATENTE

EN LA OFICINA DE MARCAS Y PATENTES DE LOS ESTADOS UNIDOS

CESIÓN DE SOLICITUDES DE PATENTE Y PATENTES OTORGADAS

CONSIDERANDO QUE Yo, **LEE MORGAN SMITH** ("CEDENTE"), UNA PERSONA, soy el propietario del derecho completo, título y participación para la **Solicitud de Patente de los Estados Unidos No. de Serie: 61/693,459 PRESENTADO EL 27 de agosto de 2012, titulada HERRAMIENTA DE FONDO DE POZO QUE ENGANCHA UNA SARTA DE TUBERÍA ENTRE UNA BROCA Y TUBO PARA ENSANCHAR UN POZO"**; y

CONSIDERANDO QUE, **LB ENTERPRISES, LLC** ("CESIONARIO"), de **1120 Huffman Road, Suite 234, Anchorage, Alaska 99515 US,** tiene interés en adquirir el derecho completo título y participación en y para las invenciones, que incluye todas las continuaciones, continuaciones en parte, y solicitudes divisionales en los Estados Unidos y demás países y las Patentes;

EN VIRTUD DE LO ANTERIOR, a título oneroso, cuyo recibo y suficiencia se reconoce por el presente:

El CEDENTE por el presente cede y transfiere al CESIONARIO el derecho completo, título y participación en y para las Invenciones en los Estados Unidos y demás países y las Patentes y Solicitudes de Patente, que incluyen pero no se limita a todas reemisones, divisiones, continuaciones y extensiones de las Patentes, todos los derechos de acción que surjan de las Patentes, todos los reclamos por daños y perjuicios por razón de infracciones pasas a las Patentes y el derecho a demandar y recaudar daños y perjuicios por dichas infracciones, para ser poseídas y disfrutadas por el Cesionario para su propio uso y beneficio y para sus sucesores y cesionarios como si la misma hubiera sido poseída por el Cedente si no se hubiera hecho esta cesión.

El CEDENTE, pacta, sin compensación adicional, cooperar con el CESIONARIO y legalizar y entregar todos los documentos, instrumentos, y cesiones que puedan ser necesarios para investir todos los derechos, título y participación en y para los aspectos mencionados anteriormente en el CESIONARIO, que incluyen sin limitación, cualquier solicitud de patente, y el registro de la cesión ante la Oficina de Marcas y Patentes de los Estados Unidos o cualquier otra oficina de patentes extranjera.

El CEDENTE por el presente garantiza que él ha leído la anterior cesión antes de su legalización, y está completamente familiarizado con los contenidos del mismo.

EN FE DE LO ANTERIOR, con la intención de estar legalmente vinculados, el CEDENTE se suscribe a esta Cesión.

CEDENTE,

Nombre en Letra de Imprenta: LEE MORGAN SMITH

Firma: (Aparece firma ilegible)

Fecha: 11-26-12

No. de Serie de Solicitud 61/693,459

Expediente de Abogado No.: 2051.001

POR LA PRESENTE CERTIFICO QUE ESTA ES UNA TRADUCCIÓN CORRECTA DE UN DOCUMENTO EN INGLÉS, REALIZADA EN BOGOTÁ, POR LUIS AUGUSTO RESTREPO, TRADUCTOR E INTERPRETE, NÚMERO DE LICENCIA 1725 VIGENTE, REGISTRADO ANTE EL MINISTERIO DE RELACIONES EXTERIORES. BOGOTÁ, 12 DE MAYO DE 2014

A 7478509

THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office

May 23, 2014

THIS IS TO CERTIFY THAT ANNEXED IS A TRUE COPY FROM THE RECORDS OF THIS OFFICE OF A DOCUMENT RECORDED ON APRIL 11, 2014.

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

P. R. GRANT
Certifying Officer

502763939 04/11/2014

PATENT ASSIGNMENT COVER SHEET

Electronic Version v1.1
Stylesheet Version v1.2

EPAS ID: PAT2810535

SUBMISSION TYPE:	NEW ASSIGNMENT
NATURE OF CONVEYANCE:	ASSIGNMENT

CONVEYING PARTY DATA

Name	Execution Date
LB ENTERPRISES, LLC	04/07/2014

RECEIVING PARTY DATA

Name:	TERCEL IP LIMITED
Street Address:	KINGSTON CHAMBERS
Internal Address:	P.O. BOX 173 - ROAD TOWN
City:	TORTOLA
State/Country:	BRITISH VIRGIN ISLANDS

PROPERTY NUMBERS Total: 3

Property Type	Number
Application Number:	61693459
Application Number:	13889969
Application Number:	14061684

CORRESPONDENCE DATA

Fax Number: (713)238-7343

Correspondence will be sent to the e-mail address first; if that is unsuccessful, it will be sent via US Mail.

Phone: 713/220-4394
Email: pat-tmk@andrewskurth.com
Correspondent Name: LEE DAVIS, ESQ./ ANDREWS KURTH LLP
Address Line 1: 600 TRAVIS, SUITE 4200
Address Line 4: HOUSTON, TEXAS 77002

ATTORNEY DOCKET NUMBER:	216586
NAME OF SUBMITTER:	LLOYD LEE DAVIS, REGN NO 67713
SIGNATURE:	/Lloyd Lee Davis/
DATE SIGNED:	04/11/2014

Total Attachments: 7
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EXECUTION VERSION

ASSIGNMENT AGREEMENT

This Assignment Agreement (this "***Assignment***"), is dated as of April 7th, 2014, and is made by and between, LB Enterprises, LLC, an Alaskan limited liability company, with a business address of 1120 Huffman Road, Suite 234, Anchorage, Alaska 99515 ("LB"), Lee Morgan Smith, an individual with a mailing address of 1120 Huffman Road, Suite 234, Anchorage, Alaska 99515 ("Smith" and collectively with LB the "***Assignors***", and each individually an "***Assignor***"); and Tercel IP Limited a British Virgin Islands corporation, with a business address of Kingston Chambers, P.O. Box 173 – Road Town, Tortola, British Virgin Islands (the "***Assignee***").

WHEREAS, Assignors wish to execute this Assignment Agreement with Assignee in consideration of Assignee entering into an agreement with Alaskan Energy Resources, Inc., an entity related to Assignors;

WHEREAS, in light of such other agreement, Assignee is willing to execute this Assignment Agreement as set forth herein.

NOW, THEREFORE, in consideration of the mutual covenants herein and other good and valuable consideration, , the receipt and sufficiency of which are hereby acknowledged, the parties hereto agree as follows:

1. **Assignment**. Assignors hereby, absolutely and unconditionally, convey, assign, transfer, grant and set over unto the Assignee, on an AS-IS basis other than the warranties set forth in Section 6 below, all of the Assignors' worldwide rights, title and interest and benefit in and to the following (the "***Assigned IP***"):

(a) The patents and patent applications set forth in Schedule 1 hereto, including, as applicable, all divisions, reissues, extensions, reexaminations, and renewals thereof (the "***Patents***");

(b) all rights of any kind whatsoever of the Assignors accruing under any of the foregoing provided by applicable law of any jurisdiction, by international treaties and conventions and otherwise throughout the world;

(c) any and all royalties, fees, income, payments, and other proceeds now or hereafter due or payable with respect to any and all of the foregoing; and

(d) any and all claims and causes of action, with respect to any of the foregoing, whether accruing before, on and/or after the date hereof, including all rights to and claims for damages, restitution and injunctive and other legal and equitable relief for past, present and future infringement, with the right but no obligation to sue for such legal and equitable relief and to collect, or otherwise recover, any such damages.

2. **Recordation and Further Actions**. The Assignors authorize the Commissioner for Patents and any other governmental officials to record and register this Assignment upon request by Assignee. The Assignors shall take such steps and actions following the date hereof,

H.E.

including the execution of any documents or other similar items, to ensure that the Assigned IP is properly assigned to the Assignee, or any assignee or successor thereto. The further prosecution of the pending patent applications shall be under the sole control and discretion of the Assignee.

3. **Cooperation.** The Assignors hereby covenant and agree that they will cooperate with the Assignee, its successors, legal representatives and assigns, including signing all lawful papers, execute all applications (including, but not limited to, powers of attorney, specific assignments, transfers and assurances), make all rightful oaths and use reasonable best efforts at the request of the Assignee to aid the Assignee, its successors, legal representatives and assigns in obtaining and enforcing protection for the Assigned IP and in enjoying the full benefits thereof. Assignees agree to compensate Assignors for any reasonable out-of-pocket costs incurred as a result of its time and effort in performing any obligations set forth in this Section 3. The Assignors hereby constitute and appoint the Assignee the true and lawful attorney of the Assignors to act as the Assignors' attorney-in-fact solely for the purpose of executing any documents and taking all necessary steps to cause the Assignors to perform any of the Assignors' obligations set forth in this Assignment Agreement. The Assignors shall deliver copies of the non-privileged documents related to the Patents in the possession of the patent attorneys and/or agents prosecuting the pending patent application to Assignee.

4. **Construction.** In this Assignment, unless a clear contrary intention appears: (a) the singular includes the plural and vice versa; (b) reference to a party includes such party's successors and assigns but, in the case of a party, only if such successors and assigns are permitted by this Assignment Agreement, and reference to a party in a particular capacity excludes such party in any other capacity; (c) references to any Schedule, Section, subsection and other subdivision refer to the corresponding Schedules, Sections, subsections and other subdivisions of this Assignment Agreement unless expressly provided otherwise; (d) references in any Section or definition to any clause means such clause of such Section or definition; (e) "hereunder," "hereof," "hereto" and words of similar import are references to this Assignment Agreement as a whole and not to any particular provision of this Assignment; (f) the word "or" is not exclusive, and the word "including" (in its various forms) means "including without limitation"; and (g) all references to money refer to the lawful currency of the United States. The Section titles and headings in this Assignment Agreement are inserted for convenience of reference only and are not intended to be a part of, or to affect the meaning or interpretation of, this Assignment Agreement.

5. **Signatures and Counterparts.** This Assignment Agreement may be executed by facsimile or other electronic signature by any party and such signature will be deemed to be binding for all purposes hereof, without delivery of an original signature being thereafter required. This Assignment Agreement may be executed in one or more counterparts, each of which will be deemed an original, but all of which together constitute one and the same instrument.

6. **Warranties.** Assignors warrant and represent that: (a) legal title to the Assigned IP is held solely by LB; (b) the Assigned IP has not been assigned, licensed, or otherwise transferred to any third party (other than the license granted to Alaskan Energy Resources, Inc. ("AER") under the License Agreement dated December 2, 2013 between LB Enterprises and AER, which license, as a result of the Limited Termination Agreement, shall be of no further

effect after the Effective Date with respect to the AER Patents (as defined in the Settlement Agreement); (c) the Assigned IP comprises all pending patent applications filed by Smith since August 2012 that relate to reamers; and (d) Assignor makes no representations or warranties as to the validity or enforceability of the Assigned IP.

7. **Successors and Assigns**. This Assignment Agreement will be binding upon and will inure to the benefit of the parties hereto and their respective successors and assigns.

8. **Choice of Law**. This Assignment Agreement shall be interpreted and construed in accordance with the laws of the State of Texas, without giving effect to principles of conflicts of laws or principles that might refer the governance or construction of this Assignment Agreement to the law of another jurisdiction.

[Signature Page Follows]

H.E.

EXECUTION VERSION

IN WITNESS WHEREOF, the Assignors have duly executed and delivered this Assignment Agreement as of the date first above written.

LB Enterprises, LLC

By: _____

Name: Betty Lastrup Smith

Title: President

STATE OF Florida)
) §§:
COUNTY OF Sarasota)

Before me, the undersigned, a notary public in and for said County and State, personally appeared Lee Morgan Smith and Betty Lastrup Smith, an authorized representative of LB Enterprises, LLC, an Alaska limited liability company, and acknowledged the execution of the foregoing Assignment Agreement to be his voluntary act and deed on behalf of said company.

WITNESS MY HAND AND SEAL THIS 7 day of April, 2014.

_____
Notary Public

AUGUST F. MAIER
Notary Public - State of Florida
My Comm. Expires Aug 29, 2016
Commission # EE 221820
Bonded Through National Notary Assn.

Printed: August F. Maier

My Commission Expires: 08/29/2016

[SEAL]

EXECUTION VERSION

LEE MORGAN SMITH

Name: _____

STATE OF Florida)
) §§:
COUNTY OF Sarasota)

Before me, the undersigned, a notary public in and for said County and State, personally appeared Lee Morgan Smith, and acknowledged the execution of the foregoing Assignment Agreement to be his voluntary act and deed.

WITNESS MY HAND AND SEAL THIS 7 day of April, 2014.

_____
Notary Public

AUGUST F. MAIER
Notary Public - State of Florida
My Comm. Expires Aug 29, 2016
Commission # EE 221320
Bonded Through National Notary Assn.

Printed: August F. Maier

My Commission Expires: 08/29/2016

[SEAL]

PATENT
REEL: 032654 FRAME: 0472

EXECUTION VERSION

AGREED TO AND ACCEPTED:

TERCEL IP LIMITED

By: _____
Name: HOSSAM ELBADAWY
Title: Director

STATE OF Texas)
) §§:
COUNTY OF Harris)

Before me, the undersigned, a notary public in and for said County and State, personally appeared HOSSAM ELBADAWY, an individual and authorized representative of TERCEL IP LIMITED, and acknowledged the execution of the foregoing Assignment Agreement to be his voluntary act and deed on behalf of himself and said companies.

WITNESS MY HAND AND SEAL THIS 07th day of April, 2014.

CLARE PLAUCHE
NOTARY PUBLIC STATE OF TEXAS
COMMISSION EXPIRES:
02-13-2017

Clare Plauche
Notary Public

Printed: Clare Plauche

My Commission Expires: 2-13-2017

PATENT
REEL: 032654 FRAME: 0473

EXECUTION VERSION

SCHEDULE 1

ASSIGNED PATENTS AND PATENT APPLICATIONS

"Assigned IP" means (1) U.S. Patent No. 8,607,900, (2) U.S. Application Serial Nos. 61/693,459, 13/889,969, and 14/061,684; and (3) any all U.S. or foreign patents and applications claiming priority to any of the foregoing items in (1) – (2), including all continuations, continuation-in-part, divisional, re-issues, re-examinations and extensions of any of the foregoing items in (1) – (2).

Country	Patent/Application Number	Filing/Issue Date	Title
US	8,607,900	Dec. 17, 2013	Downhole Tool Engaging a Tubing String Between a Drill Bit and Tubular for Reaming a Wellbore
US	61/693,459	Aug. 27, 2012	Downhole Tool For Engaging a Tubing String Between a Drill Bit and Tubular for Reaming a Wellbore
US	13/889,969	May 8, 2013	Downhole Tool For Engaging a Tubing String Between a Drill Bit and Tubular for Reaming a Wellbore
US	14/061,684	Oct. 23, 2013	Downhole Dual Cutting Reamer

H.E.

RECORDED: 04/11/2014

PATENT
REEL: 032654 FRAME: 0474

TRADUCCIÓN AL ESPAÑOL DEL DOCUMENTO DE CESIÓN A **TERCEL IP LIMITED** firmado por el cedente y el cesionario.

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Oficina de Marcas y Patentes de los Estados Unidos

23 de mayo de 2014

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Por la autoridad del
Subsecretario de Comercio para la Propiedad Intelectual
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Departamento de Comercio

CESIÓN DE PATENTE

Versión electrónica v1.1

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TIPO DE PRESENTACIÓN:	CESIÓN NUEVA
NATURALEZA DEL ACUERDO:	CESIÓN

DATOS DE LA PARTE CEDENTE

Nombre	Fecha de ejecución
LB ENTERPRISES, LLC	04/07/2014

DATOS DE LA PARTE QUE RECIBE

Nombre:	TERCEL IP LIMITED
Dirección:	Kingston Chambers
Dirección interna:	P.O. Box 173 – Road Town
Ciudad:	TORTOLA
Estado/País:	Islas Vírgenes Británicas

NÚMERO DE PROPIEDADES Total: 3

Tipo de Propiedad	Número
Número de solicitud:	61693459
Número de solicitud:	13889969
Número de solicitud:	14061684

DATOS DE CORRESPONDENCIA

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La correspondencia será enviada por Correo de Estados Unidos cuando los intentos de hacerlo por fax no sean exitosos.

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NÚMERO DE EXPEDIENTE DE ABOGADO:	216586
NOMBRE DEL REMITENTE:	Lloyd Lee Davis, Reg. No. 67713
FECHA DE FIRMA:	04/11/2014

Anexos totales: 7

Fuente=Assignment Agreement – Execution Version Tercel IP V20140407 (2) #page1.tif
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502763939 **PATENTE**

ROLLO: 032654 **CUADRO: 0466**

VERSIÓN DEFINITIVA

ACUERDO DE CESIÓN

Este Acuerdo de Cesión (esta "***Cesión***"), con fecha del 7 de abril de 2014 se realiza por y entre, LB Enterprises, LLC, una compañía de responsabilidad limitada de Alaska, con domicilio comercial de 1120 Huffman Road, Suite 234, Anchorage, Alaska 99515 ("LB"), Lee Morgan Smith, una persona con dirección postal de 1120 Huffman Road, Suite 234, Anchorage, Alaska 99515 ("Smith" y colectivamente con LB los "***Cedentes***", y cada uno individualmente un "***Cedente***"); y Tercel IP Limited una sociedad de las Islas Vírgenes Británicas, con domicilio comercial en Kingston Chambers, P.O. Box 173 - Road Town, Tortola, Islas Vírgenes Británicas (el "***Cesionario***").

CONSIDERANDO que, los Cedentes desean legalizar este Acuerdo de Cesión con el Cesionario en contraprestación de que el Cesionario celebre un acuerdo con Alaska Energy Resources, Inc., una entidad relacionada con los Cedentes;

CONSIDERANDO que, a la luz de dicho otro acuerdo, el Cesionario estará dispuesto a legalizar este Acuerdo de Cesión como se establece aquí.

EN VIRTUD DE LO ANTERIOR, en contraprestación de los convenios mutuos aquí y a título oneroso, cuyo recibo y suficiencia se reconoce por la presente, las partes acuerdan lo siguiente:

1. ***Cesión.*** Los Cedentes por este medio, absoluta e incondicionalmente, traspasan, ceden, transfieren, otorgan y enajenan al Cesionario, sobre una base COMO ESTÁ diferente de las garantías establecidas en el Artículo 6 adelante, todos los derechos, títulos y participaciones a nivel mundial de los Cedentes, y beneficio en y para lo siguiente (la "PI Cedida"):

(a) Las patentes y solicitudes de patentes establecidas en el Anexo 1 de este documento, que incluyen, como corresponda, todas las divisiones, nuevas emisiones, extensiones, reexaminaciones y renovaciones de los mismos (las "***Patentes***");

(b) todos los derechos de cualquier clase de los Cedentes que devengan en virtud de cualquiera de lo anterior proporcionado por la ley aplicable de cualquier jurisdicción, mediante y convenciones internacionales y de otra forma en todo el mundo;

(c) todas y cualesquier regalías, tarifas, ingresos, pagos y otros ingresos pagados ahora o pagaderos con respecto a todos y cualesquiera de los anteriores; y

(d) todos y cualquier reclamos y causas de acción, con respecto a cualquiera de los anteriores, ya sean devengados antes, en y/o después de la fecha del mismo, que incluyen todos los derechos y reclamos por daños, restitución y reparación judicial y legal y en equidad por infracciones pasadas, presentes y futuras, con el derecho pero no la obligación de demandar a dicha reparación legal y en equidad y recolectar o de otra forma recuperar, cualesquiera de dichos daños.

2. **Acciones de Inscripción y Otras**. Los Cedentes autorizan al Comisionado de Patentes y cualesquiera otros funcionarios gubernamentales para inscribir y registrar esta Cesión luego de solicitud del Cesionario. Los Cedentes deberán tomar dichas medidas y acciones posteriores a la fecha del presente documento, que incluyen la legalización de cualesquier documentos u otros ítems similares, para asegurar que la PI Cedida se cede correctamente al Cesionario, o cualquier cesionario o sucesor del mismo. El proceso adicional de las solicitudes de patentes pendientes estará bajo el control y discreción exclusiva del cesionario.

3. **Cooperación**. Los Cedentes por la presente pactan y acuerdan que cooperarán con el Cesionario, sus sucesores, representantes legales y cesionarios, que incluye firmar todos los documentos, legalizar todas las solicitudes (que incluyen, pero no se limitan a, poderes de abogado, cesiones específicas, transferencias y garantías), hacer todos los juramentos legales y todos los esfuerzos razonables, a solicitud del Cesionario para ayudar al Cesionario, sus sucesores, representantes legales y

cesionarios en la obtención y ejecución de la protección para la PI Cedida y a disfrutar todos los beneficios de la misma. Los Cesionarios acuerdan compensar a los Cedentes por cualesquier gastos de cuenta propia razonables incurridos como resultado de su tiempo y esfuerzo en el cumplimiento de cualesquier obligaciones establecidas en este Artículo 3. Los Cedentes por este medio constituyen y designan al Cesionario, el abogado legítimo y verdadero de los Cedentes para actuar como el apoderado de los Cedentes con el único propósito de legalizar cualquier documento y tomar todas las medidas necesarias para hacer que los Cedentes cumplan cualesquiera de las obligaciones de los Cedentes establecidas en este Acuerdo de Cesión. Los Cedentes deberán entregar copias de los documentos no privilegiados relacionados con las Patentes en la posesión de los abogados de patentes y/o agentes que procesan la solicitud de patente pendiente al Cesionario.

4. Construcción. En esta Cesión, a menos que aparezca una intención contraria clara: (a) el singular incluye el plural y viceversa; (b) la referencia a una parte incluye dichos sucesores y cesionarios de la parte pero, en el caso de una de parte, sólo si dichos sucesores y cesionarios se permiten por este Acuerdo de Cesión, y la referencia a una parte en una calidad particular, excluye dicha parte en cualquier otra calidad; (c) las referencias a cualquier Anexo, Artículo, inciso y otra subdivisión se refieren a los Anexos, Artículos, incisos y otras subdivisiones correspondientes de este Acuerdo de Cesión salvo disposición expresa de otra forma; (d) las referencias a cualquier artículo o definición de una cláusula significa dicha cláusula de dicho Artículo o definición; (e) "a continuación", "del mismo", "presente" y palabras de significado similar son referencias a este Acuerdo de Cesión como un todo y no a cualquier disposición particular de esta Cesión; (f) la palabra "o" no es excluyente, y la frase "que incluye" (en sus diversas formas) significa "que incluye sin limitación"; y (g) todas las referencias a dinero se refiere a la divisa legal de los Estados Unidos. Los títulos de los Artículos y encabezados de este Acuerdo de Cesión se insertan solo para conveniencia de referencia y no están destinados a ser una parte de, o afectar el significado o interpretación de este Acuerdo de Cesión.

5. **Firmas y Duplicados**. Este Acuerdo de Cesión se puede legalizar por facsímile u otra firma electrónica por cualquier parte y dicha firma se considerará vinculante para todos los propósitos del mismo, sin entrega de una firma original que se requiere a partir de entonces. Este Acuerdo de Cesión se puede legalizar en uno o varios duplicados, cada uno de los cuales se considera un original, pero todos en conjunto constituyen uno y el mismo instrumento.

6. **Garantías**. Los Cedentes garantizan y manifiestan que: (a) el título legal de la PI Cedida es poseída únicamente por LB; (b) la PI Cedida no se ha cedido, licenciado, o de otra forma transferido a terceros (diferentes de la licencia otorgada a Alaskan Energy Resources, Inc. ("AER") en virtud del Acuerdo de Licencia de fecha 02 de diciembre del 2013 entre LB Enterprises y AER, cuya licencia, como resultado del Acuerdo de Terminación Limitada, deberá quedar sin ningún efecto después de la Fecha de Vigencia con respecto a las patentes de la AER (como se define en el Acuerdo de Conciliación); (c) la PI Cedida comprende todas las solicitudes de patente pendientes presentadas por Smith desde agosto del 2012, que se relacionan con los escariadores, y (d) el Cedente no asume responsabilidades ni ofrece garantías en cuanto a la validez o eficacia de la PI Cedida.

7. **Sucesores y Cesionarios**. Este Acuerdo de Cesión será vinculante y redundará en beneficio de las partes y sus respectivos sucesores y cesionarios.

8. **Elección de la ley**. Este Acuerdo de Cesión se interpretará y constituirá de acuerdo con las leyes del Estado de Texas, sin dar efecto a principios de conflictos de leyes o principios que pudieran referirse al gobierno o construcción de este Acuerdo de Cesión a la ley de otra jurisdicción.

[*Sigue Página de Firmas*]

EN FE DE LO CUAL, los Cedentes han legalizado y entregado debidamente este Acuerdo de Cesión a partir de la primer fecha escrita anteriormente.

LB Enterprises, LLC

Por: (aparece firma ilegible)

Nombre: Betty Eastup Smith

Cargo: Presidente

ESTADO DE FLORIDA)

) §§

CONDADO DE SARASOTA)

Ante mí, el infrascrito, un notario público en para dicho Condado y Estado compareció personalmente Lee Morgan Smith y Betty Eastup Smith, un representante autorizado de LB Enterprises, LLC, una compañía de responsabilidad limitada de Alaska, y reconoció la legalización del anterior Acuerdo de Cesión como su acto libre y voluntario a nombre de dicha compañía.

EN FE DE LO CUAL COLOCO MI FIRMA Y SELLO ESTE día 7 de abril de 2014.

Aparece sello:
AUGUST F. MAIER
Notario Público – Estado de Florida
Mi Comisión Expira 29 de agosto, 2016
Comisión # EE 221920
Vinculado a través de la Aso. Notarial Nacional

(Aparece firma ilegible)

Notario Público

Impreso: August F. Maier

Mi comisión expira: 08/29/2016

[SELLO]

LEE MORGAN SMITH

Nombre: (aparece firma ilegible)

ESTADO DE FLORIDA)

)§§

CONDADO DE SARASOTA)

Ante mí, el infrascrito, un notario público en para dicho Condado y Estado compareció personalmente Lee Morgan Smith y reconoció la legalización del anterior Acuerdo de Cesión como su acto libre y voluntario.

EN FE DE LO CUAL COLOCO MI FIRMA Y SELLO ESTE día 7 de abril de 2014.

Aparece sello:
AUGUST F. MAIER
Notario Público – Estado de Florida
Mi Comisión Expira 29 de agosto, 2016
Comisión # EE 221920
Vinculado a través de la Aso. Notarial Nacional

(Aparece firma ilegible)

Notario Público

Impreso: August F. Maier

Mi comisión expira: 08/29/2016

[SELLO]

ACORDADO CON Y ACEPTADO:

TERCEL IP LIMITED

Por: (aparece firma ilegible)

Nombre: HOSSAM ELBADAWY

Cargo: Gerente

ESTADO DE Texas)

) §§

CONDADO DE Harris)

Ante mí, el infrascrito, un notario público en para dicho Condado y Estado compareció personalmente HOSSAM ELBADAWY, una persona y representante autorizado de TERCEL IP LIMITED, y reconoció la legalización del anterior Acuerdo de Cesión como su acto libre y voluntario a nombre de si mimo y de dichas compañías.

EN FE DE LO CUAL COLOCO MI FIRMA Y SELLO ESTE día 7 de abril de 2014.

Aparece sello:
CLARE PLAUCHE
NOTARIO PÚBLICO ESTADO DE TEXAS
Comisión Expira:
02-13-2017

(Aparece firma ilegible)

Notario Público

Impreso: Clare Plauche

Mi comisión expira: 2-13-2017

[SELLO]

PATENTES CEDIDAS Y SOLICITUDES DE PATENTE

"PI Cedida" las significa Patente Estadounidense No. 8,607,900, (2) Solicitud Estadounidense Nos. De Serie 61/693,459, 13/889,969, y 14/061,684; y (3) cualesquier todas las patentes y solicitudes Estadounidenses y extranjeras que reivindican la prioridad para cualquiera de los ítems anteriores en (1) – (2) que incluyen todas las continuaciones, continuación en parte, divisional, re-emisiones, reexaminaciones y extensiones de cualquiera de los ítems anteriores (1) - (2).

País	Número de Solicitud/ Patente	Fecha de Presentación/ Emisión	Título
US	8,607,900	17 dic. 2013	Herramienta de fondo de Pozo que Engancha la Sarta de Tuberías entre una Broca y Tubo para Ensanchar un Agujero de Pozo
US	61/693,459	27 ago. 2013	Herramienta de Fondo de Pozo que Engancha la Sarta de Tuberías entre una Broca y Tubo para Ensanchar un Agujero de Pozo
US	13/889,969	8 may. 2013	Herramienta de Fondo de Pozo que Engancha la Sarta de Tuberías entre una Broca y Tubo para Ensanchar un Agujero de Pozo
US	14/061,684	23 oct. 2013	Ensanchador de Corte Dual de Fondo de Pozo

POR LA PRESENTE CERTIFICO QUE ESTA ES UNA TRADUCCIÓN CORRECTA DE UN DOCUMENTO EN INGLÉS, REALIZADA EN BOGOTÁ, POR LUIS AUGUSTO RESTREPO, TRADUCTOR E INTERPRETE, NÚMERO DE LICENCIA 1725 VIGENTE, REGISTRADO ANTE EL MINISTERIO DE RELACIONES EXTERIORES. BOGOTÁ, 15 DE MAYO DE 2014

IA 7478509

THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office

May 22, 2014

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

APPLICATION NUMBER: *13/889,969*
FILING DATE: *May 08, 2013*

THE COUNTRY CODE AND NUMBER OF YOUR PRIORITY APPLICATION, TO BE USED FOR FILING ABROAD UNDER THE PARIS CONVENTION, IS *US13/889,969*

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

P. R. Grant

P. R. GRANT
Certifying Officer

Electronic Acknowledgement Receipt

EFS ID:	15727513
Application Number:	13889969
International Application Number:	
Confirmation Number:	1134
Title of Invention:	DOWNHOLE TOOL ENGAGING A TUBING STRING BETWEEN A DRILL BIT AND TUBULAR FOR REAMING A WELLBORE
First Named Inventor/Applicant Name:	Lee Morgan Smith
Customer Number:	29637
Filer:	Wendy Buskop/Sarah Gernhart
Filer Authorized By:	Wendy Buskop
Attorney Docket Number:	2051.001A
Receipt Date:	08-MAY-2013
Filing Date:	
Time Stamp:	17:29:47
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	$3160
RAM confirmation Number	4212
Deposit Account	501313
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The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

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Charge any Additional Fees required under 37 C.F.R. Section 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	TrackOne Request	2051-001A_REQUESTPRIORITIZEDEXAM.pdf	152986 8ad2001cc7c6d99e7006457f5140826f79dc1c3f	no	2
Warnings:					
Information:					
2	Application Data Sheet	2051-001A_ADSFORM.pdf	1503465 aedd0a9389f209f469a9c5a433e11bd3df299147	no	6
Warnings:					
Information:					
3	Oath or Declaration filed	2051-001A_DECLARATIONOATH.pdf	543295 7154f31e45f6e8b751fe0ca601019e08c50bb7ad	no	3
Warnings:					
Information:					
4	Nonpublication request from applicant.	2051-001A_NONPUBREQUEST.pdf	235046 b77ed1d7ce573c58fe35ada856561651d2f1541b	no	2
Warnings:					
Information:					
5	Information Disclosure Statement (IDS) Form (SB08)	2051-001A_IDSFORM.pdf	612163 c5705335f41a1fce8d90f726494cc4a8478ee516	no	4
Warnings:					
Information:					
6		2051-001A_PA_APPLICATION.pdf	96180 9388ed37ff55cb541aa0af99a300931abf92336a	yes	22

Multipart Description/PDF files in .zip description

Document Description	Start	End
Specification	1	16
Claims	17	21
Abstract	22	22

Warnings:

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Information:					
7	Drawings-only black and white line drawings	2051-001A_DRAWINGS.pdf	1441003 266368eb759a19c52598dd8037a16105715 0bf36	no	4
Warnings:					
Information:					
8	Fee Worksheet (SB06)	fee-info.pdf	40308 11fde83b65498d184e17095bec3c525b89d 16d1f	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	4624446		

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New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

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

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

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APPLICATION FOR PATENT

INVENTOR:

LEE MORGAN SMITH

TITLE:

DOWNHOLE TOOL ENGAGING A TUBING STRING BETWEEN A DRILL BIT AND TUBULAR FOR REAMING A WELLBORE

ATTORNEY DOCKET NO.: 2051.001A

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SPECIFICATION

CROSS REFERENCE TO RELATED APPLICATION

[0001] The current application claims priority and the benefit of co-pending US Provisional Patent Application Serial No. 61/693,459 filed on August 27, 2012, entitled "DOWNHOLE TOOL FOR ENGAGING A TUBING STRING BETWEEN A DRILL BIT AND TUBULAR FOR REAMING A WELLBORE". This reference is incorporated herein in its entirety.

FIELD

[0002] The present embodiments generally relate to drilling devices used in core drilling of wellbores.

BACKGROUND

[0003] Prior art has disclosed using polycrystalline diamond compacts in reamers, but a need exists for the ability to ream both into and out of a wellbore with polydiamond compacts, high density cutters, or both on both sides of the reamer simultaneously.

[0004] The present embodiments relate to a reamer which is bidirectional and can additionally be used as a drill to create a wellbore.

[0005] Prior art has also disclosed reamers, but these reamers do not bidirectionally widen and smooth a wellbore. A need exists for a bidirectional reamer that can both widen and smooth a wellbore while being run into and out of a wellbore allowing for faster insertion and removal of bottom hole assemblies.

[0006] A need exists for a tool made of steel or a non-magnetic material that allows the tool

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to be used in directional drilling applications wherein a high degree of accuracy in drilling is required.

[0007] The present embodiments meet these needs.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] The detailed description will be better understood in conjunction with the accompanying drawings as follows:

[0009] Figure 1 is cross sectional view of an embodiment of a downhole tool in a wellbore.

[00010] Figure 2 is a detailed side view of an embodiment of the downhole tool.

[00011] Figure 3 is a view from the first end of the tubular body of an embodiment of the downhole tool with the first spiral angled sections extending away from a longitudinal axis.

[00012] Figure 4 is a detail of a second spiral angled section that extends away from a longitudinal axis of the tubular body additionally showing flute depth and a plurality of polydiamond cutter nodes.

[00013] Figure 5 is a diagram of a stepped embodiment of the central cutting section of the downhole tool.

[00014] Figure 6 is a detail of an embodiment of the downhole tool showing hardfacing coating positioned on a helical blade.

[00015] Figure 7 depicts an embodiment of the downhole tool using only two helical blades.

[00016] The present embodiments are detailed below with reference to the listed Figures.

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DETAILED DESCRIPTION OF THE EMBODIMENTS

[00017] Before explaining the present apparatus in detail, it is to be understood that the apparatus is not limited to the particular embodiments and that it are practiced or carried out in various ways.

[00018] The present embodiments relate to drilling devices used in core drilling of wellbores. The present embodiments further relate to a reaming apparatus.

[00019] The reaming apparatus, in an embodiment, can use polycrystalline diamond compacts and helical blades to cut and smooth a wellbore while the device is attached to a drill string and is run into and out of a wellbore, reaming while drilling.

[00020] The downhole tool can ream a wellbore with a wellbore axis, in two directions while attached to a drill string, (i) into a wellbore and (ii) out of a wellbore as the drill string is inserted into the wellbore and pulled out of the wellbore. The tool can be attached between the drill bit and a tubular for use in the well.

[00021] The downhole tool can have a central annulus which can allow mud to be pumped through the tool and used for enhanced drilling.

[00022] An advantage of this downhole tool is that the downhole tool can be usable in 10,000 foot wells at depths including but not limited to 18,000 feet. In one or more embodiments, the downhole tool can be usable in wells with depths from 1,000 feet to 30,000 feet.

[00023] In one or more embodiments, the downhole tool can be usable with swell packers attached to a swell packer on one end as the swell packer is run into the wellbore.

[00024] Currently, operators are using from 20 to 40 plus swell packers or mechanical packers. These drilling operators need a very clean bore for accurate and precise well packer placement. The drilling operators can use this downhole tool to enable swell packers or mechanical packers to be placed at the precise position that they are needed in the wellbore. An advantage of the present downhole tool is that the

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downhole tool enables the creation of a very clean, smooth wellbore, with no large pieces of rock sticking out of the wellbore that would damage or cause misplacement of the swell packer.

[00025] Another advantage of the downhole tool is that the downhole tool is made up into the bottom hole assembly, replacing conventional stabilizers.

[00026] The downhole tool provides a less expensive solution to conventional stabilizers.

[00027] The downhole tool can perform drilling out of casing, simplifying drilling operations to a single trip instead of current technology that requires multiple trips. Since each trip into the well can cost about $250,000 per trip, only needing one trip for reaming the wellbore can save about $250,000 per reaming job over currently available single directional reamers.

[00028] The downhole tool provides smooth wellbores, which allow for faster drilling and faster packer installations.

[00029] An advantage of this downhole tool is that larger outer diameter swell packers can be usable in drilling, which can safely support high pressure in the well and provide a better frac job on a well.

[00030] The downhole tool can be usable to drill out through float equipment of a well.

[00031] The downhole tool can be usable to drill rock and ream the wellbore simultaneously.

[00032] The downhole tool can ream while drilling. The downhole tool can ream while operating measuring with drilling equipment.

[00033] In embodiments, the downhole tool for engaging a first bottom hole assembly component and a second bottom hole assembly component for use in a wellbore can have a tubular body with a central cutting section. The central cutting section can be made of a first end segment having a first end and a first end segment outer diameter; a second end segment having a second end and a second end segment outer diameter;

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and a central cutting section extending longitudinally along the tubular body between the first end segment and the second end segment and away from a longitudinal axis.

[00034] In an embodiment, the downhole tool can have a tubular body with a bulge, can also be referred to herein as the central cutting section.

[00035] The central cutting section can be formed extending from the tubular body between a first end segment with a first end and a second end segment with a second end.

[00036] The central cutting section can be formed between the ends and can have an outer diameter 2 percent to 15 percent larger than the outer diameter of the ends in some embodiments.

[00037] The downhole tool can have a central annulus allowing the flowing of drilling mud in one direction and well material in another direction.

[00038] In embodiments, the tubular body with a central cutting section can include a non-magnetic material, such as a non-magnetic steel, such as MONEL™.

[00039] The tubular body in embodiments can have a longitudinal axis extending from end to end. The downhole tool can rotate about the longitudinal axis to cut the rock. The central cutting section can bulge away from the longitudinal axis between the first end segment and the second end segment.

[00040] The downhole tool can have at least two helical blades formed between the end segments of the downhole tool. The end segments can have end segment diameters that are less than the diameter of the central cutting section, and the end segments can each be 1 percent to 10 percent the overall length of the tool. The end segments can be formed extending from each end of the tool.

[00041] In one or more embodiments, from 2 helical blades to 16 helical blades can be usable in the central cutting section. Each helical blade can have a length of 60 inches to 80 inches.

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[00042] In embodiments, each helical blade can have a first spiral angled section increasing in radius from the first end segment towards a midpoint of the downhole tool. The midpoint can intersect at a right angle with the longitudinal axis.

[00043] Each helical blade can have a first spiral angled section extending away from the first end segment at an angle from about 1 degree to about 20 degrees. The helical blade does not extend to the first end of the tool as weakness can occur with the helical blade extending to the end.

[00044] Each helical blade can have a second spiral angled section extending away from the second end segment at an angle from about 1 degree to about 20 degrees. The helical blade does not extend to the second end of the tool.

[00045] The second spiral angled section can increase in radius from the second end segment towards the midpoint of the downhole tool.

[00046] Both spiral angled sections can converge on a midpoint of the downhole tool and of the central cutting section. Each spiral angled section can be formed at the same angle forming a smooth curve from one end segment of the tool to the other end segment of the downhole tool.

[00047] Each spiral angled section can extend away from the end segment, but not the end, towards a midpoint of the central cutting section.

[00048] In embodiments, each spiral angled section can extend away from the first end segment and the second end segment at an angle ranging from about 10 degrees to about 30 degrees from a plane of the first and second end segments.

[00049] In one or more embodiments, the helical blades can have more than two spiral angled sections.

[00050] The spiral angled sections can be integrally connected to each other forming a smooth continuous helical blade with great strength, easily twice the strength of other types of reamers without deforming.

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[00051] In embodiments, the downhole tool can use helical blades that range in width from about 1.5 inches to about 6 inches.

[00052] In one or more embodiments, the tubular body can be a one piece integral steel component, formed from a single piece of cut steel.

[00053] In another embodiment, the helical blades can be welded to the tubular body forming the central cutting section.

[00054] Pluralities of polydiamond cutter nodes can be disposed on each spiral angled section. The polydiamond cutter nodes can be grouped in circles, organized in swirl patterns, or in another pattern. The density of the polydiamond cutter nodes in embodiments can range from about 1 per inch to about 6 per inch. In an embodiment the polydiamond cutter nodes can be aligned in rows of 2 polydiamond cutter nodes to 16 polydiamond cutter nodes. In another embodiment, the polydiamond cutter nodes can be aligned in two rows, such as several nodes in rows of 3, per spiral angled section.

[00055] In an embodiment, the polydiamond cutter nodes can be made from synthetic diamond material made by US Synthetic located in Orem, Utah. The polydiamond cutter nodes can be flat faced, dome shaped, or combinations thereof. The polydiamond cutter nodes can have a shape that is elliptical, circular, angular, or combinations thereof. The height of each polydiamond cutter node as measured from the surface of one of the spiraled angled sections can range from flush flat to about $3/4^{th}$ of an inch.

[00056] Spiral angled sections can be connected together to form a curved section. In one or more embodiments, the spiral angled sections can be a series of stepped sections welded together or otherwise connected. In an embodiment, each spiral angled section can have high strength carbide cutting nodes formed thereon.

[00057] The high strength carbide cutting nodes can be formed on the spiral angled section, either as a single row, double rows, triple rows, multiple rows, or in patches. The high strength carbide cutting nodes are known as "carbide inserts" in the industry. Usable

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high strength carbide cutting nodes can be round, elliptical, or angular. Usable high strength carbide cutting nodes can be flat faced or round faced.

[00058] In embodiments, teeth can be created on one or both edges of one or more of the spiral angled sections to enhance cutting by at least one of the helical blades.

[00059] In one or more embodiments, flute sections can be located between the helical blades. Each flute section can provide a "junk slot volume" providing an optimum drilling mud flow path and cuttings removal channel allowing "junk" from the wellbore to freely flow past the downhole tool without impeding operation. The flutes are critical for the tool to continuously operate bidirectionally. In embodiments, the flute sections can be tapered on both ends.

[00060] The helical spiral shape of the blades on the downhole tool can enable the downhole tool to slide easily in the wellbore.

[00061] In embodiments, a first connector can couple to the first end of the downhole tool to engage a bottom hole assembly component, such as a drill bit.

[00062] In embodiments, a second connector can couple to the second end of the downhole tool to engage a bottom hole assembly component, such as a tubular.

[00063] The downhole tool can use a box connection for providing quick install and removal of the tool from the drill string as the first connector, second connector, or combinations thereof.

[00064] The quick install and removal connection can engage a float assembly, or a measurement while drilling component.

[00065] In embodiments of the downhole tool, the spiral angled section can be a plurality of two or more stepped sections with high strength carbide cutting nodes disposed on each of the stepped sections. Each of the stepped sections can provide a different size outer diameter for reaming the wellbore. The stepped section outer diameters can increase by about 1 percent for each step in an embodiment.

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[00066] In an embodiment, one stepped section can have a height from about 1 centimeter to about 3 centimeters different in height from an adjacent stepped section.

[00067] In one or more embodiments, the central cutting section of the downhole tool can include a cutting material with more flexibility than the base tubular, thereby enabling the downhole tool to continue in the presence of stiff rock without breaking. The downhole tool can be constructed from two different materials, each having different physical properties, the central cutting section for example, can be a softer material than the tubular surrounding the annulus.

[00068] In embodiments, the downhole tool can have a downhole tool outer diameter calculated from an outermost surface of the spiral angled section. In one or more embodiments, the downhole tool outer diameter can range from about 3 inches to about 36 inches and can have specific outer diameters of 5 and ¾ inches, 5 and 7/8 inches, 6 inches, 6 and ¾ inches, 8 and ¾ inches, 8 and 5/8 inches, 9 and ¾ inches, 9 and 7/8 inches, 10 and 5/8 inches, 12 inches, 13 and ½ inches, 16 inches, and 17 and ½ inches.

[00069] In embodiments, the downhole tool can have high strength carbide cutting nodes that are made from a tungsten carbide material, such as Casmet Supply Ltd of Penticton, British Columbia products identified as "tungsten carbide inserts". The synthetic diamond cutting material can be one such as those made by US Synthetic and referred to as "stud cutter 2184" a diamond enhanced cutting material. Casmet Supply Ltd also provides a tungsten carbide insert with diamond particles positioned on it, or a diamond impregnated metal matrix, such as US Synthetic product termed "stud cutter" with a mix of natural diamond and synthetic diamonds, or combinations of these materials.

[00070] In one or more embodiments, the helical blades can be up to 22 inches in length for a 5 and 7/8 inch diameter downhole tool. The helical blades can be longer, up to 48 inches.

[00071] The downhole tool can be installable anywhere in the bottom hole assembly or

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adjacent a drilling component including the drill bit.

[00072] Turning now to the Figures, Figure 1 shows a wellbore 7 with a wellbore axis 8. A first bottom hole assembly component 42 is shown in the wellbore 7. The first bottom hole assembly component 42 can be a drill bit. A first connector 38 can engage the first bottom hole assembly component 42 and can engage the first end of a downhole tool 9.

[00073] This Figure shows a second connector 40 engaging a second bottom hole assembly component 44 as well as the second end of the downhole tool 9.

[00074] In embodiments, a central cutting section, which can sometimes be referred to as "the reamer," can run flush mounted to the drilling bit, or can be positioned several feet behind the drilling bit.

[00075] Figure 2 shows a detailed side view of an embodiment of the downhole tool 9 with a first end segment 12 having a first end 13 and a first end segment outer diameter 14.

[00076] The downhole tool 9 is shown with a second end segment 15 having a second end 16 and a second end segment outer diameter 17.

[00077] The downhole tool shown in this Figure can have a generally cylindrical body with a longitudinal axis 11.

[00078] A central cutting section 18 is depicted with a plurality of helical blades and is disposed between the first end segment 12 and the second end segment 15. Four helical blades 20a, 20b, 20c, and 20d are depicted.

[00079] The central cutting section 18 can have a cutting section outer diameter 19 that varies in size. The diameter of the cutting section adjacent the end segments can be less than the diameter of the cutting section at a midpoint 27. The cutting section 18 can have an outer diameter greater than each end segment outer diameter.

[00080] Flute sections 32a, 32b, 32c and 32d can be disposed between the helical blades. This

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embodiment shows the flute sections each having tapered ends 34a and 34b.

[00081] Each flute section can have sides sloping away from the helical blades towards a center point of the flute section. The depth of each flute section can form a trough that is equivalent in depth to the first end segment outer diameter 14 and the second end segment outer diameter 17.

[00082] A first spiral angled section 22c can extend from the first end segment 12. The first spiral angled section 22c is depicted with a single row of polydiamond cutter nodes 26a-26g.

[00083] The first spiral angled section 22c can increase in radius from the first end segment 12 towards a midpoint 27 of the downhole tool. The midpoint can intersect at a right angle with the longitudinal axis 11. The angle of the first spiral angle section can be 7.7 degrees +/- 0.5 degrees from the longitudinal axis.

[00084] A second spiral angled section 24b can increase in radius from the second end segment 15 towards the midpoint 27 of the downhole tool.

[00085] This first spiral angled section 22c can have from 3 polydiamond cutter nodes to 10 polydiamond cutter nodes. The polydiamond cutter nodes can be positioned in a single row, in a pair of rows, or even in a circle or swirl pattern on the surface of the first spiral angled section.

[00086] Each polydiamond cutter node can have a diameter ranging from about 3/8 of an inch to about 1 inch. Each polydiamond cutter node can have a shape that is a planar surface, concave in shape, triangular, or convex in shape. Each polydiamond cutter node can be crested or braised onto each spiral angled section.

[00087] The polydiamond cutter nodes can be disposed on portions of each angled section proximate the midpoint. Alternatively, a plurality of high strength carbide cutting nodes can be disposed on portions of each spiral angled section proximate the midpoint. In still another embodiment, both polydiamond cutter nodes and high

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strength carbide nodes can both be used on portions of the spiral angled sections.

[00088] Each helical blade is shown having blade edges, such as blade edges 72a and 72b. In embodiments, the blade edges can be smooth, have teeth 70, or combinations thereof.

[00089] Flute sections can be formed between pairs of helical blades. Each flute section can have a flute depth that can be 0 percent to 15 percent less than either (a) the first end segment outer diameter, (b) the second end segment outer diameter, or (c) combinations of both end segment outer diameters.

[00090] A third spiral angled section 28b is shown with three rows of high strength carbide cutting nodes 30a-30bw having circular shapes. The third spiral angled section 28b can have the high strength carbide cutting nodes positioned in the section on a single row or multiple rows.

[00091] In embodiments, the high strength carbide cutting nodes can be arranged in more than three rows. It is also anticipated in an embodiment that the high strength carbide cutting nodes can be positioned in patches, with densely clustered high strength carbide cutting nodes in each patch. The high strength carbide cutting nodes can also be formed in the spiral angled section in swirl or helical patterns.

[00092] The high strength carbide cutting nodes can each have a diameter from about $1/8^{th}$ of an inch to about $3/4^{th}$ of an inch. Each high strength carbide cutting node can be flush, creating friction. The high strength carbide cutting nodes being flush can cause the helical blades to last longer since the high strength carbide cutting nodes are harder than the steel of the helical blades.

[00093] In an embodiment, the high strength carbide cutting nodes can be positioned offset to each other, not in orderly rows. In an embodiment, the density of the high strength carbide cutting nodes on each helical blade, which can be 22 inches long, can have about 180 high strength carbide cutting nodes on the helical blade.

[00094] Figure 3 is a view from the first end of the tubular body of an embodiment of the

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downhole tool with first spiral angled sections extending from the tubular body.

[00095] In this Figure, the first spiral angled sections 22a, 22b, 22c, 22d, 22e and 22f of the central cutting section are shown extending from the tubular body 10.

[00096] A single row of polydiamond cutter nodes 26a-26d can be located on each of the first spiral angled sections.

[00097] In one or more embodiments, more polydiamond cutter nodes are usable on each of the first spiral angled sections. The second spiral angled section can have the same number of cutter nodes or a different number of cutter nodes, depending on the particular use intended for the cutting tool.

[00098] In an embodiment, an annulus 25 can have a 2.5 inch inner diameter annulus and the overall outer diameter of the central cutting section of the tool can be 5 and 7/8 inches. Fluid can flow through the annulus bi-directionally.

[00099] In other embodiments, the outer diameter of the central cutting section of the tool can be as large as 36 inches.

[000100] Figure 4 is a detail of a second spiral angled section 24b showing a flute section 34a with a flute depth 36 and a plurality of polydiamond cutter nodes 26a-26d. In this Figure, the second end segment 15 is seen with a flute having flute depth 36 and the plurality of polydiamond cutter nodes 26a-26b formed on the surface of the second spiral angled section 24b.

[000101] Figure 5 is a diagram of a stepped embodiment of the cutting section of the downhole tool with stepped portions 46a, 46b, 46c, 46d, and 46e between the first spiral angled section 22 and the second spiral angled section 24.

[000102] Each stepped portion can be oriented from about 1/4 of an inch to about 1/2 of an inch apart. In an embodiment, each stepped portion can have different widths on each side, that is, stepped portion 46a can have a smaller width than stepped portion 46b, and stepped portion 46b can have a smaller width than section 46c. Similarly, stepped

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section 46d can have an identical width to section 46b or a slightly different width if desired, and stepped section 46e can have an identical width to section 46a.

[000103] Figure 6 is an embodiment of an application of tungsten carbide hardfacing coating 70a, 70b and 70c on one of the helical blades 20b, wherein the tungsten carbide hardfacing coating can be installed on each helical blade. In this embodiment, the tungsten carbide hardfacing coating is shown formed as a plurality of rectangular tungsten carbide inserts hardfacing surfaces. Each hardfacing surface can have a thickness of about 3 mm.

[000104] In embodiments, the tungsten carbide hardfacing coating can be annealed on each spiral angled section.

[000105] In embodiments, the tungsten carbide hardfacing coating can be a crushed tungsten carbide in a nickel bronze matrix. In embodiments, the tungsten carbide hardfacing coating can be a plurality of separated tungsten carbide cutting segments, such as 6 to 20 rectangular cutting segments, or segments formed in other shapes, such as polygonal, square, octagonal, or triangular.

[000106] Figure 7 depicts an embodiment of the downhole tool 9 using only two helical blades 20a and 20b.

[000107] In an embodiment, each helical blade can be tempered prior to installing the polydiamond cutter nodes, high strength carbide cutting nodes, or combinations thereof. In embodiments, a surface Brinell hardness can be HB 285-341.

[000108] In one or more embodiments, the central cutting section can have a cutting section outer diameter that is greater than each end segment outer diameter and a plurality of helical blades. Each helical blade can have a first spiral angled section increasing in radius from the first end segment towards a midpoint of the downhole tool, wherein the midpoint intersects at a right angle with the longitudinal axis. Each helical blade can have a second spiral angled section increasing in radius from the second end segment towards the midpoint of the downhole tool.

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[000109] In embodiments either (1) a plurality of polydiamond cutter nodes can be securely attached, such as with welding, on portions of each angled section proximate the midpoint, (2) a plurality of high strength carbide cutting nodes can be disposed on each angled section away from the midpoint, or (3) combinations of both types of nodes can be used on each of the spiral angled sections of the blades.

[000110] The downhole tool can rotate about the longitudinal axis allowing the central cutting section to ream the wellbore, such as the central cutting section can bidirectionally ream a wellbore while allowing drill fluid to flow down an annulus of the tubular body while simultaneously allowing wellbore particulates to flow up and across the flute sections. The simultaneous action is both novel and provides improved safety in the well

[000111] While these embodiments have been described with emphasis on the embodiments, it should be understood that within the scope of the appended claims, the embodiments might be practiced other than as specifically described herein.

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CLAIMS

What is claimed is:

1. A downhole tool for engaging a first bottom hole assembly component and a second bottom hole assembly component for use in a wellbore having a wellbore axis, wherein the downhole tool is a tubular body comprising:

   a. a first end segment having a first end and a first end segment outer diameter;

   b. a second end segment having a second end and a second end segment outer diameter;

   c. a longitudinal axis extending from the first end segment to the second end segment; and

   d. a central cutting section, wherein the central cutting section extends longitudinally along the tubular body between the first end segment and the second end segment and away from the longitudinal axis, the central cutting section comprising:

      (i) a cutting section outer diameter greater than each end segment outer diameter;

      (ii) a plurality of helical blades, each helical blade comprising:

         1. a first spiral angled section increasing in radius from the first end segment towards a midpoint of the downhole tool, wherein the midpoint intersects at a right angle with the longitudinal axis;

         2. a second spiral angled section increasing in radius from the second end segment towards the midpoint of the downhole tool; and

         3. a plurality of polydiamond cutter nodes disposed on portions of each spiral angled section proximate the midpoint, a plurality of high strength carbide cutting nodes disposed on each spiral angled section,

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and combinations thereof on portions of the spiral angled sections; and

(iii) a plurality of flute sections formed between each pair of helical blades, wherein each flute section has a flute depth that is 0 percent to 15 percent less than the first end segment outer diameter, the second end segment outer diameter, or combinations thereof; and

when the downhole tool rotates about the longitudinal axis, the central cutting section bidirectionally reams the wellbore while allowing drill fluid to flow down an annulus of the tubular body while simultaneously allowing wellbore particulates to flow up and across the flute sections.

2. The downhole tool of claim 1, wherein each flute section has a flute section tapered end at each end of the flute section between the helical blades.

3. The downhole tool of claim 1, wherein the first and second spiral angled sections extend away from the first and second end sections at an angle from 10 degrees to 30 degrees.

4. The downhole tool of claim 1, further comprising a first connector for engaging the first end and a second connector for engaging a second end.

5. The downhole tool of claim 1, wherein the spiral angled section comprises a plurality of stepped portions.

6. The downhole tool of claim 1, wherein each of the high strength carbide cutting nodes comprises:

a. a tungsten carbide insert;

b. a synthetic diamond cutting material;

c. a diamond enhanced cutting material;

d. a diamond impregnated metal matrix; or

e. combinations thereof.

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7. The downhole tool of claim 1, wherein the central cutting section comprises from 2 helical blades to 16 helical blades.

8. The downhole tool of claim 1, wherein the cutting section outer diameter ranges from 3 inches to 36 inches.

9. The downhole tool of claim 1, wherein the downhole tool is a non-magnetic material.

10. The downhole tool of claim 1, wherein the tubular body is a one piece construction.

11. The downhole tool of claim 1, further comprising teeth disposed on a blade edge of at least one helical blade.

12. The downhole tool of claim 1, wherein the plurality of polydiamond cutter nodes comprise at least two rows of polydiamond cutter nodes on each spiral angled section.

13. The downhole tool of claim 1, wherein the plurality of polydiamond cutter nodes and the plurality of high strength carbide cutting nodes are flat faced, dome shaped, or combinations thereof.

14. The downhole tool of claim 1, wherein the plurality of polydiamond cutter nodes and the plurality of high strength carbide cutting nodes have a shape selected from the group consisting of: circular, elliptical, angular, or combinations thereof.

15. The downhole tool of claim 1, wherein each helical blade is tempered prior to installing the polydiamond cutter nodes, high strength carbide cutting nodes, or combinations thereof.

16. A downhole tool for engaging a first bottom hole assembly component and a second bottom hole assembly component for use in a wellbore having a wellbore axis, comprising:

a. a tubular body with a first end segment having a first end and a first end segment outer diameter, and a second end segment having a second end and a second end segment outer diameter; and

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b. a central cutting section forming a bulge, wherein the central cutting section extends longitudinally along the tubular body between the first end segment and the second end segment and away from a longitudinal axis, and wherein the central cutting section comprises:

(i) a cutting section outer diameter greater than each end segment outer diameter;

(ii) at least two helical blades, each helical blade having a length of 60 inches to 80 inches, each helical blade comprising:

1. a first spiral angled section increasing in radius from the first end segment towards a midpoint of the downhole tool, wherein the midpoint intersects at a right angle with the longitudinal axis;

2. a second spiral angled section increasing in radius from the second end segment towards the midpoint of the downhole tool; and

3. a tungsten carbide hardfacing coating annealed on each spiral angled section; and

(iii) a plurality of flute sections formed between each pair of helical blades, wherein each flute section has a flute depth that is 0 percent to 15 percent less than the first end segment outer diameter, the second end segment outer diameter, or combinations thereof; and

when the downhole tool rotates about the longitudinal axis, the central cutting section bidirectionally reams the wellbore while allowing drilling fluid to flow down an annulus of the tubular body while simultaneously allowing wellbore particulates and wellbore fluids to flow up and across the flute sections.

17. The downhole tool of claim 16, wherein the tungsten carbide hardfacing coating is a crushed tungsten carbide in a nickel bronze matrix.

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18. The downhole tool of claim 17, wherein the tungsten carbide hardfacing coating is a plurality of separated tungsten carbide cutting segments formed in polygonal shapes.

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ABSTRACT OF DISCLOSURE

A downhole tool for bidirectional reaming of a wellbore with a tubular body with a central cutting section between a first end segment and a second end segment, wherein the central cutting section has a plurality of helical blades separated by flute sections, and wherein the helical blades each have at least two spiral angled sections connected together, polydiamond cutter nodes, high strength carbide cutting nodes, tungsten carbide hardfacing coating or combinations thereof on the helical blades, and wherein the outer diameter of the central cutting section is larger than the outer diameter of each of the end segments.

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DECLARATION FOR UTILITY OR DESIGN PATENT APPLICATION (37 CFR 1.63)

☐ Declaration Submitted With Initial Filing OR ☐ Declaration Submitted After Initial Filing (surcharge (37 CFR 1.16(f)) required)

Attorney Docket Number	2051.001A
First Named Inventor	Lee Morgan Smith
COMPLETE IF KNOWN	
Application Number	
Filing Date	
Art Unit	
Examiner Name	

DOWNHOLE TOOL ENGAGING A TUBING STRING BETWEEN A DRILL BIT AND TUBULAR FOR REAMING A WELLBORE

(Title of the Invention)

As a below named inventor, I hereby declare that:

This declaration is directed to:

☐ The attached application,

OR

☐ United States Application Number or PCT International application number _____

filed on _____.

The above-identified application was made or authorized to be made by me.

I believe I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

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Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available. Petitioner/applicant is advised that documents which form the record of a patent application (such as the PTO/SB/01) are placed into the Privacy Act system of records DEPARTMENT OF COMMERCE, COMMERCE-PAT-7, System name: *Patent Application Files*. Documents not retained in an application file (such as the PTO-2038) are placed into the Privacy Act system of COMMERCE/PAT-TM-10, System name: *Deposit Accounts and Electronic Funds Transfer Profiles*.

LEGAL NAME OF SOLE OR FIRST INVENTOR:

(*E.g.*, Given Name (first and middle (if any)) and Family Name or Surname)

Lee Morgan Smith

Inventor's Signature	Date (Optional)
	April 19 2013

Residence: City	State	Country
Anchorage	AK	US

Mailing Address

1120 East Huffman Road, Suite 234

City	State	Zip	Country
Anchorage	AK	33515	US

☐ Additional inventors are being named on the _____ supplemental sheet(s) PTO/AIA/10 attached hereto

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Privacy Act Statement

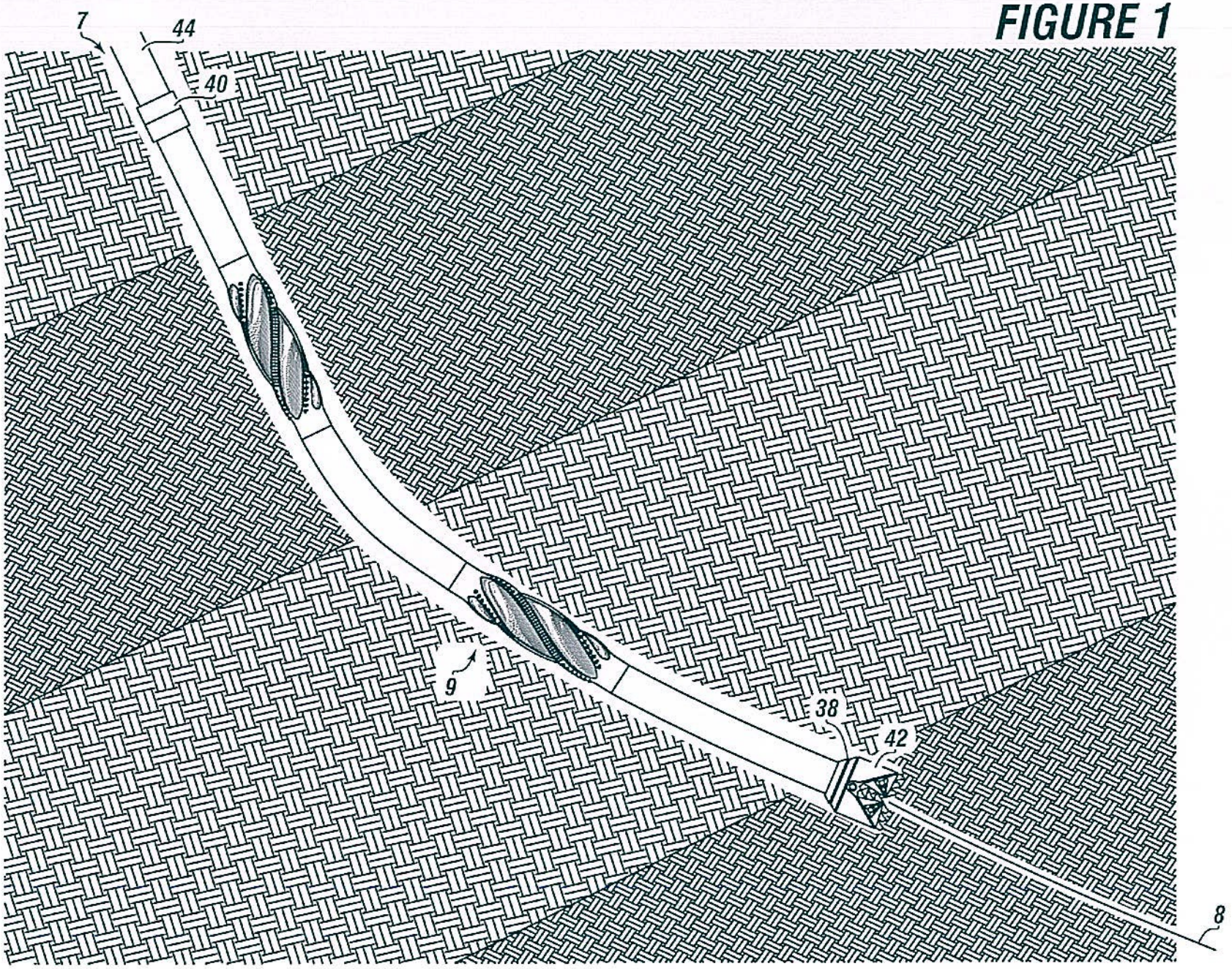
The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection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

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

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

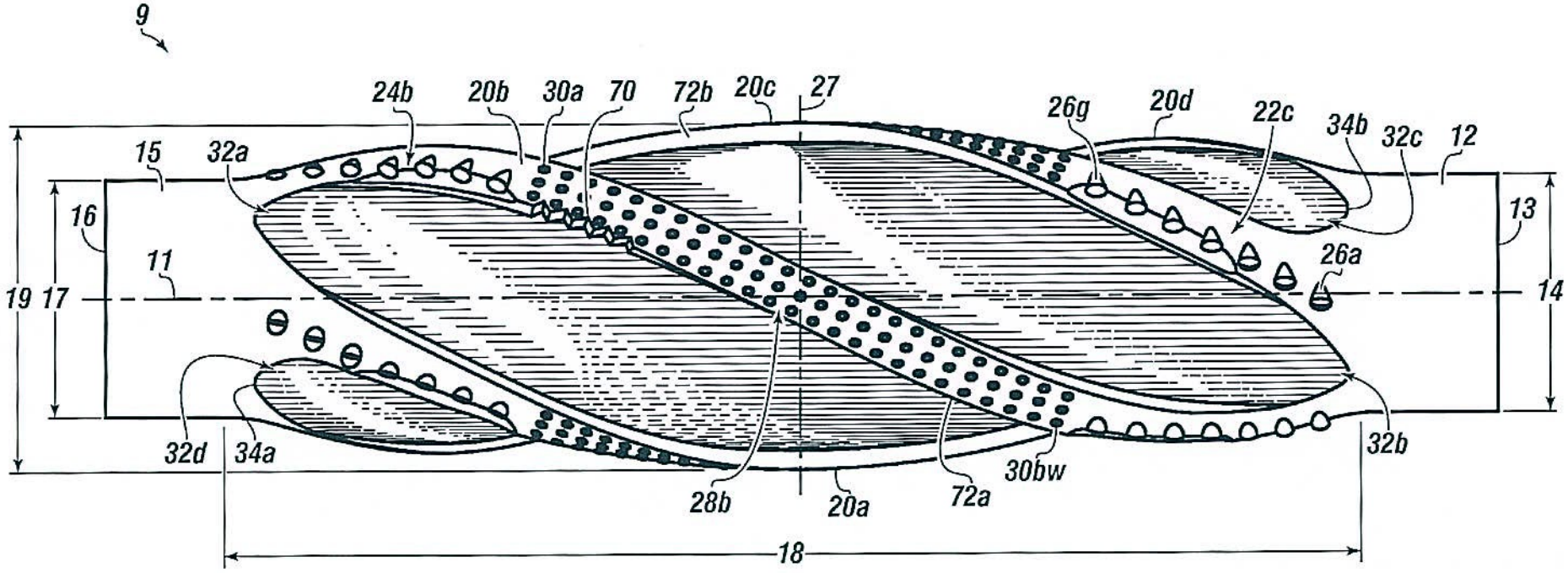
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FIGURE 1



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FIGURE 2



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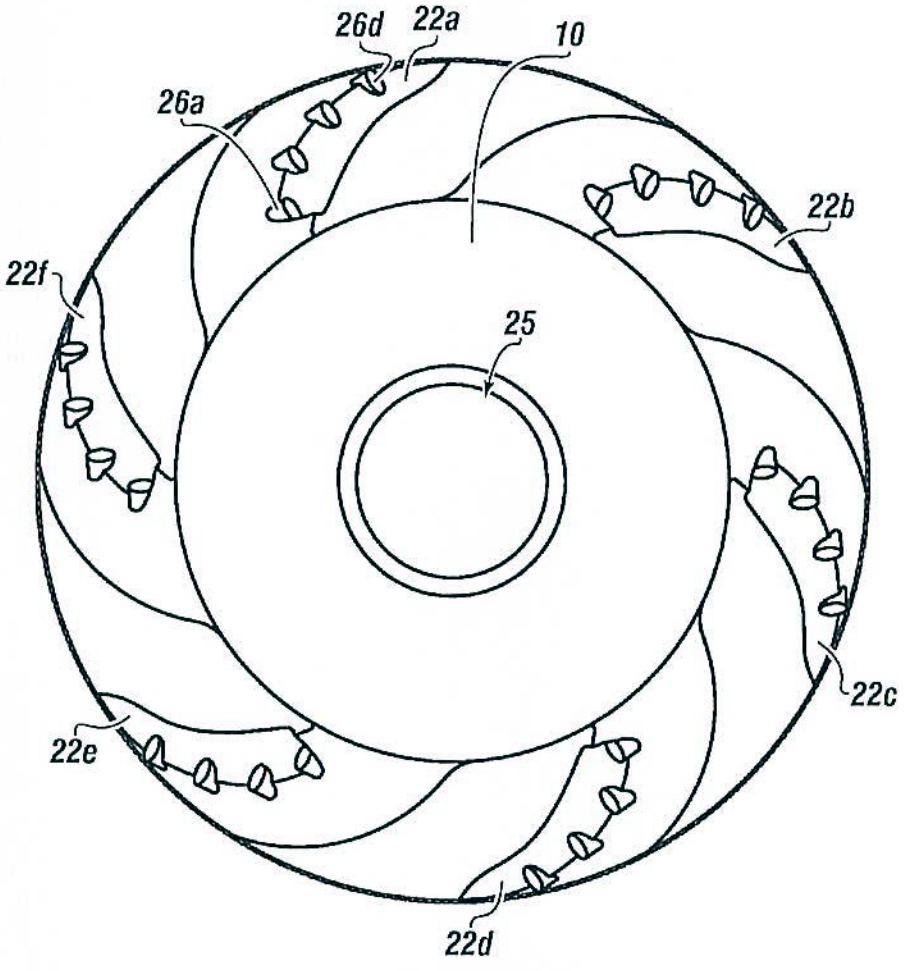


FIGURE 3

FIGURE 4

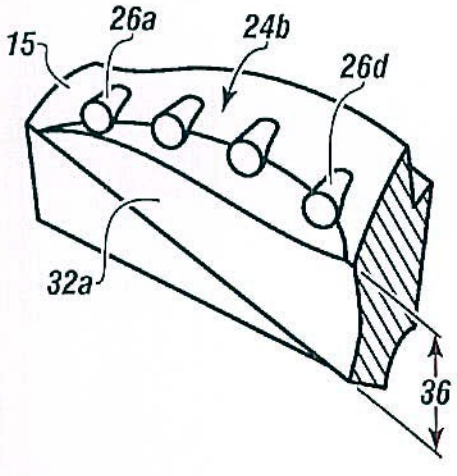
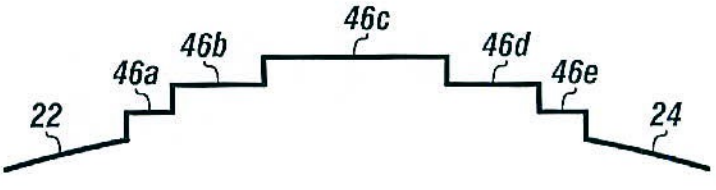


FIGURE 5



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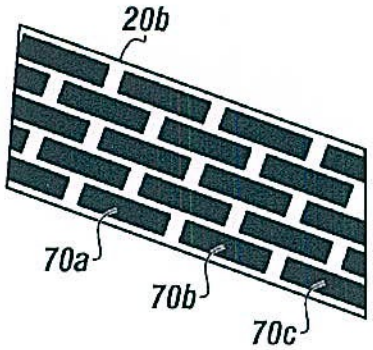


FIGURE 6

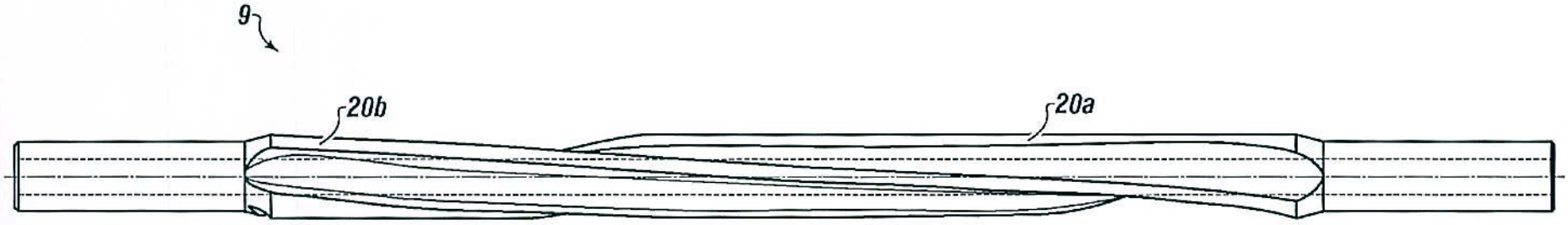


FIGURE 7

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	2051.001A
	Application Number	
Title of Invention	DOWNHOLE TOOL ENGAGING A TUBING STRING BETWEEN A DRILL BIT AND TUBULAR FOR REAMING A WELLBORE	

The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.
This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.

Secrecy Order 37 CFR 5.2

☐ Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)

Inventor Information:

Inventor 1 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Lee	Morgan	Smith	

Residence Information (Select One) ◉ US Residency ○ Non US Residency ○ Active US Military Service

City	Anchorage	State/Province	AK	Country of Residence i	US

Mailing Address of Inventor:

Address 1	1120 East Huffman Road		
Address 2	Suite 234		
City	Anchorage	State/Province	AK
Postal Code	33515	Country i	US

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

Correspondence Information:

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

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

Customer Number	29637		
Email Address	sarah.gernhart@buskoplaw.com	Add Email	Remove Email

Application Information:

Title of the Invention	DOWNHOLE TOOL ENGAGING A TUBING STRING BETWEEN A DRILL BIT AND TUBULAR FOR REAMING A WELLBORE		
Attorney Docket Number	2051.001A	Small Entity Status Claimed	☒
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	4	Suggested Figure for Publication (if any)	

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	Application Number	
Title of Invention	DOWNHOLE TOOL ENGAGING A TUBING STRING BETWEEN A DRILL BIT AND TUBULAR FOR REAMING A WELLBORE	

Publication Information:

☐	Request Early Publication (Fee required at time of Request 37 CFR 1.219)
☒	**Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32).
Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Please Select One:	◉ Customer Number	○ US Patent Practitioner	○ Limited Recognition (37 CFR 11.9)
Customer Number	29637		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, or 365(c) or indicate National Stage entry from a PCT application. Providing this information in the application data sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.

Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
	non provisional of	61693459	2012-08-27

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

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55(d). When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX) [i]the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(h)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

Remove

Application Number	Country [i]	Filing Date (YYYY-MM-DD)	Access Code[i] (if applicable)

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

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	2051.001A
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Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

☒ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.

Authorization to Permit Access:

☒ Authorization to Permit Access to the Instant Application by the Participating Offices

If checked, the undersigned hereby grants the USPTO authority to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the World Intellectual Property Office (WIPO), and any other intellectual property offices in which a foreign application claiming priority to the instant patent application is filed access to the instant patent application. See 37 CFR 1.14(c) and (h). This box should not be checked if the applicant does not wish the EPO, JPO, KIPO, WIPO, or other intellectual property office in which a foreign application claiming priority to the instant patent application is filed to have access to the instant patent application.

In accordance with 37 CFR 1.14(h)(3), access will be provided to a copy of the instant patent application with respect to: 1) the instant patent application-as-filed; 2) any foreign application to which the instant patent application claims priority under 35 U.S.C. 119(a)-(d) if a copy of the foreign application that satisfies the certified copy requirement of 37 CFR 1.55 has been filed in the instant patent application; and 3) any U.S. application-as-filed from which benefit is sought in the instant patent application.

In accordance with 37 CFR 1.14(c), access may be provided to information concerning the date of filing this Authorization.

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

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	Application Number	
Title of Invention	DOWNHOLE TOOL ENGAGING A TUBING STRING BETWEEN A DRILL BIT AND TUBULAR FOR REAMING A WELLBORE	

Applicant 1 Remove

If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.

Clear

(●) Assignee ( ) Legal Representative under 35 U.S.C. 117 ( ) Joint Inventor

( ) Person to whom the inventor is obligated to assign. ( ) Person who shows sufficient proprietary interest

If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:

Name of the Deceased or Legally Incapacitated Inventor :

If the Applicant is an Organization check here. [X]

Organization Name	LB ENTERPRISES, LLC		
Mailing Address Information:			
Address 1	1120 Huffman Road		
Address 2	Suite 234		
City	Anchorage	**State/Province**	AK
Country [i]	US	Postal Code	99515
Phone Number		Fax Number	
Email Address			

Additional Applicant Data may be generated within this form by selecting the Add button. Add

Non-Applicant Assignee Information:

Providing assignment information in this section does not subsitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Assignee 1

Complete this section only if non-applicant assignee information is desired to be included on the patent application publication in accordance with 37 CFR 1.215(b). Do not include in this section an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest), as the patent application publication will include the name of the applicant(s).

Remove

If the Assignee is an Organization check here. [ ]

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	Application Number	
Title of Invention	DOWNHOLE TOOL ENGAGING A TUBING STRING BETWEEN A DRILL BIT AND TUBULAR FOR REAMING A WELLBORE	

Prefix	**Given Name**	Middle Name	**Family Name**	Suffix

Mailing Address Information:

Address 1			
Address 2			
City		**State/Province**	
Country i		Postal Code	
Phone Number		Fax Number	
Email Address			

Additional Assignee Data may be generated within this form by selecting the Add button. Add

Signature:

Remove

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

Signature	/WBUSKOP/			Date (YYYY-MM-DD)	2013-05-08
First Name	Wendy	Last Name	Buskop	Registration Number	32202

Additional Signature may be generated within this form by selecting the Add button. Add

This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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Privacy Act Statement

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3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

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6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

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9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

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TRADUCCIÓN DEL INGLÉS AL ESPAÑOL del documento de prioridad relacionado con la solicitud de Patente de los Estados Unidos No. 13/889,969 titulada:

HERRAMIENTA DE FONDO DEL POZO ENSAMBLADA A UNA SARTA DE PERFORACIÓN ENTRE UN TALADRO Y UN TUBULAR PARA LA ESCARIFICACIÓN DE UN POZO

ANEXOS. La solicitud de Patente de los Estados Unidos No. 13/889,969 arriba mencionada y Certificación del Comisionado de Patentes y Marcas de los Estados Unidos.

LOS ESTADOS UNIDOS DE AMÉRICA
A TODO AQUEL QUE PUEDA LLEGARLE LA PRESENTE:

DEPARTAMENTO DE COMERCIO DE ESTADOS UNIDOS
Oficina de Marcas y Patentes de Estados Unidos

22 de mayo de 2014

LA PRESENTE CERTIFICA QUE EL ANEXO ES UNA COPIA VERDADERA TOMADA DE LOS ARCHIVOS DE LA OFICINA DE MARCAS Y PATENTES DE LOS ESTADOS UNIDOS DE LOS DOCUMENTOS DE LA SOLICITUD DE PATENTE IDENTIFICADA ABAJO LA CUAL CUMPLIÓ LOS REQUERIMIENTOS PARA OTORGÁRSELE UNA FECHA DE PRESENTACIÓN BAJO EL 35 USC 111.

NÚMERO DE SOLICITUD: *13/889,969*
FECHA DE PRESENTACIÓN: *Mayo 8, 2013*

EL CÓDIGO DEL PAÍS Y EL NÚMERO DE SU SOLICITUD PRIORITARIA A SER UTILIZADO PARA PRESENTACIÓN EN EL EXTRANJERO BAJO LA CONVENCIÓN DE PARÍS ES *13/889,969.*

Por autoridad del
Subsecretario de Comercio para la Propiedad Intelectual
y Director de la Oficina de Marcas y Patente de Estados Unidos

(firma)
P. R. GRANT
Funcionario que Certifica

Hay un sello que dice:
OFICINA DE MARCAS Y PATENTE DE ESTADOS UNIDOS
DEPARTAMENTO DE COMERCIO

REIVINDICACIONES

1. Una herramienta de fondo de pozo para enganchar un primer componente de ensamble de agujero de fondo y un segundo componente de ensamble de agujero de fondo para uso en un agujero de pozo que tiene un eje de agujero de pozo, en donde la herramienta de fondo de pozo es un cuerpo tubular que comprende:
   a. un primer segmento de extremo que tiene un primer extremo y un primer diámetro externo del segmento de extremo;
   b. un segundo segmento de extremo que tiene un segundo extremo y un segundo diámetro externo del segmento de extremo;
   c. un eje longitudinal que se extiende desde el primer segmento de extremo hasta el segundo segmento de extremo; y
   d. una sección de corte central, en donde la sección de corte central se extiende longitudinalmente a lo largo del cuerpo tubular entre el primer segmento de extremo y el segundo segmento de extremo y lejos del eje longitudinal, la sección de corte central comprende:
      (i) un diámetro externo de la sección de corte mayor que cada uno del diámetro externo del segmento de extremo;
      (ii) una pluralidad de cuchillas helicoidales, cada cuchilla helicoidal comprende:
         1. una primera sección en ángulo en espiral que aumenta en radio desde el primer segmento de extremo hacia un punto medio de la herramienta de fondo de pozo, en donde el punto medio se intersecta en un ángulo recto con el eje longitudinal;
         2. una segunda sección en ángulo en espiral que aumenta en radio desde el segundo segmento de extremo hasta el punto medio de la herramienta de fondo de pozo; y
         3. una pluralidad de nodos de cortador de polidiamante dispuestos en porciones de cada sección en ángulo en espiral próxima al punto medio, una pluralidad de nodos de corte de carburo de alta resistencia dispuestos en cada sección en ángulo en espiral, y combinaciones de los mismos en porciones de las secciones en ángulo en espiral; y

(iii) una pluralidad de secciones de acanalado formadas entre cada par de cuchillas helicoidales, en donde cada sección de acanalado tiene una profundidad de acanalado que es 0 por ciento a 15 por ciento menor que el primer diámetro externo del segmento de extremo, el segundo diámetro externo del segmento de extremo, o combinaciones de los mismos; y

cuando la herramienta de fondo de pozo rota alrededor del eje longitudinal, la sección de corte central ensancha de forma bidireccional el agujero de pozo mientras que permite que el fluido de perforación fluya hacia abajo de un espacio anular del cuerpo tubular mientras que permite de forma simultánea que los particulados de agujero de pozo fluyan hacia arriba y a través de las secciones de acanalado.

2. La herramienta de fondo de pozo de la reivindicación 1, en donde cada sección de acanalado tiene un extremo cónico de la sección de acanalado en cada extremo de la sección de acanalado entre las cuchillas helicoidales.

3. La herramienta de fondo de pozo de la reivindicación 1, en donde la primera y segunda secciones en ángulo en espiral se extienden lejos de la primera y segunda secciones de extremo en un ángulo desde 10 grados hasta 30 grados.

4. La herramienta de fondo de pozo de la reivindicación 1, que comprende adicionalmente un primer conector para enganchar el primer extremo y un segundo conector para enganchar un segundo extremo.

5. La herramienta de fondo de pozo de la reivindicación 1, en donde la sección en ángulo en espiral comprende una pluralidad de porciones escalonadas.

6. La herramienta de fondo de pozo de la reivindicación 1, en donde cada uno de los nodos de corte de carburo de alta resistencia comprende:
   a. un inserto de carburo de tungsteno;

b. un material de corte de diamante sintético;
c. un material de corte mejorado con diamante;
d. una matriz metálica impregnada con diamante; o
e. combinaciones de los mismos.

7. La herramienta de fondo de pozo de la reivindicación 1, en donde la sección de corte central comprende desde 2 cuchillas helicoidales hasta 16 cuchillas helicoidales.

8. La herramienta de fondo de pozo de la reivindicación 1, en donde el diámetro externo de la sección de corte varía desde 3 pulgadas hasta 36 pulgadas.

9. La herramienta de fondo de pozo de la reivindicación 1, en donde la herramienta de fondo de pozo es un material no magnético.

10. La herramienta de fondo de pozo de la reivindicación 1, en donde el cuerpo tubular es una construcción de una pieza.

11. La herramienta de fondo de pozo de la reivindicación 1, que comprende adicionalmente dientes dispuestos en un borde de cuchilla de por lo menos una cuchilla helicoidal.

12. La herramienta de fondo de pozo de la reivindicación 1, en donde la pluralidad de nodos de cortador de polidiamante comprende por lo menos dos filas de nodos de cortador de polidiamante sobre cada sección en ángulo en espiral.

13. La herramienta de fondo de pozo de la reivindicación 1, en donde la pluralidad de nodos de cortador de polidiamante y la pluralidad de nodos de corte de carburo de alta resistencia tienen cara plana, forma de domo, o combinaciones de los mismos.

14. La herramienta de fondo de pozo de la reivindicación 1, en donde la pluralidad de nodos de cortador de polidiamante y la pluralidad de nodos de corte de carburo de alta resistencia tienen una forma seleccionada del

grupo que consiste de: circular, elíptica, angular, o combinaciones de las mismas.

15. La herramienta de fondo de pozo de la reivindicación 1, en donde cada cuchilla helicoidal se templa antes de instalar los nodos de cortador de polidiamante, nodos de corte de carburo de alta resistencia, o combinaciones de los mismos.

16. Una herramienta de fondo de pozo para enganchar un primer componente de ensamble de agujero de fondo y un segundo componente de ensamble de agujero de fondo para uso en un agujero de pozo que tiene un eje de agujero de pozo, que comprende:

    a. un cuerpo tubular con un primer segmento de extremo que tiene un primer extremo y un primer diámetro externo del segmento de extremo, y un segundo segmento de extremo que tiene un segundo extremo y un segundo diámetro externo del segmento de extremo; y

    b. una sección de corte central que forma una protuberancia, en donde la sección de corte central se extiende longitudinalmente a lo largo del cuerpo tubular entre el primer segmento de extremo y el segundo segmento de extremo y lejos de un eje longitudinal, y en donde la sección de corte central comprende:

        (i) un diámetro externo de la sección de corte mayor que cada uno del diámetro externo del segmento de extremo;

        (ii) por lo menos dos cuchillas helicoidales, cada cuchilla helicoidal tiene una longitud de 60 pulgadas hasta 80 pulgadas, cada cuchilla helicoidal comprende:

            1. una primera sección en ángulo en espiral que aumenta en radio desde el primer segmento de extremo hacia un punto medio de la herramienta de fondo de pozo, en donde el punto medio se intersecta en un ángulo recto con el eje longitudinal;

            2. una segunda sección en ángulo en espiral que aumenta en radio desde el segundo segmento de extremo hasta el punto medio de la herramienta de fondo de pozo; y

3. un recubrimiento de refrentado duro de tungsteno recocido sobre cada sección en ángulo en espiral; y

(iii) una pluralidad de secciones de acanalado formadas entre cada par de cuchillas helicoidales, en donde cada sección de acanalado tiene una profundidad de acanalado que es 0 por ciento a 15 por ciento menor que el primer diámetro externo del segmento de extremo, el segundo diámetro externo del segmento de extremo, o combinaciones de los mismos; y

cuando la herramienta de fondo de pozo rota alrededor del eje longitudinal, la sección de corte central ensancha de forma bidireccional el agujero de pozo mientras que permite que el fluido de perforación fluya hacia abajo de un espacio anular del cuerpo tubular mientras que de forma simultánea permite que los particulados de agujero de pozo y fluidos de agujero de pozo fluyan hacia arriba y a través de las secciones de acanalado.

17. La herramienta de fondo de pozo de la reivindicación 16, en donde el recubrimiento de refrentado duro de carburo de tungsteno es un carburo de tungsteno triturado en una matriz de níquel bronce.

18. La herramienta de fondo de pozo de la reivindicación 17, en donde el recubrimiento de refrentado duro de carburo de tungsteno es una pluralidad de segmentos de corte de carburo de tungsteno separados conformados en formas poligonales.