

DSP5403CONP1

CERTIFICATION

I hereby certify that on January 24, 2019, I have compared the attached document with the original, and that such said document is a true copy of the original assignment as filed with the United States Patent Office in connection with USSN 15/852887 filed 12/22/17.



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BRIAN POLANSKY



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Amanda Lin Blyth  
(Notary Public of New Jersey)  
My Commission Expires:  
October 28, 2028



## UNITED STATES PATENT AND TRADEMARK OFFICE

UNDER SECRETARY OF COMMERCE FOR INTELLECTUAL PROPERTY AND  
DIRECTOR OF THE UNITED STATES PATENT AND TRADEMARK OFFICE

DECEMBER 20, 2018

PTAS

TROUTMAN SANDERS  
875 THIRD AVENUE  
NEW YORK, NY 10022

**505245462**

### UNITED STATES PATENT AND TRADEMARK OFFICE NOTICE OF RECORDATION OF ASSIGNMENT DOCUMENT

THE ENCLOSED DOCUMENT HAS BEEN RECORDED BY THE ASSIGNMENT RECORDATION BRANCH OF THE U.S. PATENT AND TRADEMARK OFFICE. A COMPLETE COPY IS AVAILABLE AT THE ASSIGNMENT SEARCH ROOM ON THE REEL AND FRAME NUMBER REFERENCED BELOW.

PLEASE REVIEW ALL INFORMATION CONTAINED ON THIS NOTICE. THE INFORMATION CONTAINED ON THIS RECORDATION NOTICE REFLECTS THE DATA PRESENT IN THE PATENT AND TRADEMARK ASSIGNMENT SYSTEM. IF YOU SHOULD FIND ANY ERRORS OR HAVE QUESTIONS CONCERNING THIS NOTICE, YOU MAY CONTACT THE ASSIGNMENT RECORDATION BRANCH AT 571-272-3350. PLEASE SEND REQUEST FOR CORRECTION TO: U.S. PATENT AND TRADEMARK OFFICE, MAIL STOP: ASSIGNMENT RECORDATION BRANCH, P.O. BOX 1450, ALEXANDRIA, VA 22313.

RECORDATION DATE: 12/19/2018

REEL/FRAME: 047819/0328  
NUMBER OF PAGES: 3

BRIEF: ASSIGNMENT OF ASSIGNORS INTEREST (SEE DOCUMENT FOR DETAILS).

DOCKET NUMBER: 243382.000065

ASSIGNOR:  
LORENZO, JUAN

DOC DATE: 12/18/2018

ASSIGNEE:  
DEPUY SYNTHES PRODUCTS, INC.  
325 PARAMOUNT DRIVE  
RAYNHAM, MASSACHUSETTS 02767

APPLICATION NUMBER: 15852887  
PATENT NUMBER:  
TITLE: ANEURYSM DEVICE AND DELIVERY SYSTEM

FILING DATE: 12/22/2017  
ISSUE DATE:

ASSIGNMENT RECORDATION BRANCH  
PUBLIC RECORDS DIVISION

**General Assignment**

WHEREAS, Juan LORENZO, having its place of business at 325 Paramount Drive, Raynham, MA 02767 (hereinafter referred to as "Assignor"), is the owner of certain new and useful inventions relating to

**ANEURYSM DEVICE AND DELIVERY SYSTEM**

for which application was filed in the U.S. Patent and Trademark Office on December 22, 2017 and assigned Serial No. 15/852,887.

WHEREAS, DePuy Synthes Products, Inc., having its place of business at 325 Paramount Drive Raynham, MA 02767 (hereinafter referred to as "Assignee") is desirous of acquiring Assignors' entire right, title and interest therein, including the right to claim priority thereof,

NOW, THEREFORE, BE IT KNOWN, that in view of good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the Assignor hereby assigns and transfers, for all countries in the world, to said Assignee its entire right, title and interest, including the right to claim priority, in and to all said inventions disclosed in said applications and in and to said applications, and all foreign equivalents thereof, including all substitutions, divisions, and continuations thereof, and in and to all Letters Patent, that may be granted for said inventions, and in and to all extensions, renewals, and reissues thereof, the same to be held and enjoyed by said Assignee, its successors and assigns, as fully and entirely as the same would have been held and enjoyed by Assignor if this Assignment had not been made.

And for purpose of obtaining patent protection in any foreign country, the Assignor hereby agrees that, any right, title and interest, in and to all said inventions disclosed in said applications and in and to said applications, and all foreign equivalents thereof can be directly assigned by the inventors to the Assignee without explicit confirmation of the Assignor.

The Assignor agrees that this general assignment is effective from December 21, 2017.

IN TESTIMONY WHEREOF, the Assignor set hereunto its hand and seal this date.

FOR Juan Lorenzo

/Juan Lorenzo/  
Signature

Digitally signed by JUAN LORENZO  
DN: c=US, o=JNJ, ou=Subscribers, cn=JUAN  
LORENZO,  
0.9.2342.19200300.100.1.1=118229  
Reason: I attest to the accuracy and  
integrity of this document.  
Date: 2018.12.18 15:16:58 -05'00'

\_\_\_\_\_  
Name

\_\_\_\_\_  
Title of Authorized Signatory

\_\_\_\_\_  
Date

## PATENT ASSIGNMENT AGREEMENT

This Patent Assignment Agreement ("Assignment"), effective on the date of the last signature below, is by and between:

DePuy Ireland Unlimited Company, an Irish corporation having an office at Loughbeg Industrial Estate, Ringaskiddy, Co Cork, Ireland, ("Ireland")

AND

DePuy International Limited, a company registered in England and Wales number 3319712 of St. Anthony's Road, Leeds, West Yorkshire LS11 8DT ("International")

(hereinafter individually referred to as a "Party"; collectively referred as the "Parties").

**WHEREAS**, Ireland and International entered into a Contract Research and Development Agreement ("Research Agreement") effective January 8, 2012 ("Effective Date") related to a Research and Development Programme;

**WHEREAS**, DePuy (Ireland) has changed its name to DePuy Ireland Unlimited Company;

**WHEREAS**, under the Research Agreement, Ireland owns all patent applications and patents resulting from the work on the Research and Development Programme, including patent applications and patents filed by International prior to the Effective Date of the Research Agreement (including those listed in Schedule 3 of the Research Agreement), and other patent applications and patents relating to inventions made under the Research Agreement;

**WHEREAS**, additional patent applications have been filed since the Effective Date from the work on the Research and Development Programme;

**WHEREAS**, the Parties wish to memorialize and confirm the assignment of intellectual property rights under the Research Agreement or to assign intellectual property rights to Ireland to the extent that such rights have not already been assigned;

**NOW THEREFORE**, in consideration of valuable consideration, the receipt of which is hereby acknowledged, it is hereby agreed by and between the Parties as follows:

1. The Parties confirm and agree that under the Research Agreement, Ireland owns the entire right, title and interest to all Intellectual Property as defined in the Research Agreement, including all patents and patent applications identified in Exhibit A attached hereto and all counterparts of the patents and patents applications listed in Exhibit A worldwide, as well as any and all related continuations, continuations-in-part, divisional, renewals, reissues, reexaminations, extensions, patents of addition, patents of importation and all patents and patent applications claiming priority to the patents and patent applications listed in Exhibit A.

2. To the extent that International is deemed to own any interest in any Intellectual Property as defined in the Research Agreement, or to the extent necessary or desirable to effectuate Section 1 above or the terms of the Research Agreement, International assigns to Ireland the entire right, title and interest in all Intellectual Property as defined in the Research Agreement, including all patents and patent applications identified in Exhibit A attached hereto and all counterparts of the patents and patents applications listed in Exhibit A worldwide, as well as any and all related continuations, continuations-in-part, divisional, renewals, reissues, reexaminations, extensions, patents of addition, patents of importation and all patents and patent applications claiming priority to the patents and patent applications listed in Exhibit A.

3. Any Party may assign this Assignment or any and all rights and obligations contemplated herein to an affiliate or to a company acquiring substantially all of the assets of such Party to which this Assignment relates without the consent of the other Party. Any such assignment shall be subject to the terms of this Assignment. Subject to the foregoing, this Assignment shall bind and inure to the benefit of the respective Parties hereto and their successors and assigns.

IN WITNESS WHEREOF, the Parties have caused this Agreement to be duly executed effective as of the date of the last signature below.

DePuy International Limited

By: Cynthia K. Barnett  
Cynthia K. Barnett

Title: Attorney

Date: May 16, 2017

DePuy Ireland Unlimited Company

By: Stephen J. Manich  
Stephen J. Manich

Title: Attorney

Date: May 16, 2017

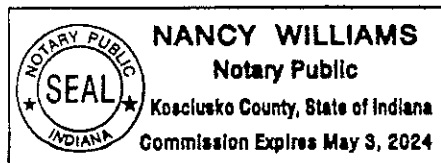
State/Commonwealth of: INDIANA

County of: KOSCIUSKO

On this 16th day of May, 2017 before me, the undersigned notary public, personally appeared STEPHEN J. MANICH, who is personally known to me to be the person whose name is signed on the preceding or attached document, and acknowledged to me that he signed it voluntarily for its stated purpose.

Nancy Williams  
Notary Public

My Commission Expires: \_\_\_\_\_



### Schedule A

| Parent ID    | Filing Date | Serial No. | Patent Title                                                                       | Issue Date | Patent No. |
|--------------|-------------|------------|------------------------------------------------------------------------------------|------------|------------|
| DEP6729USPSP | 05/18/2016  | 62/338468  | SYSTEM AND METHOD FOR PREPARING A PATIENT'S BONE TO RECEIVE A PROSTHETIC COMPONENT |            |            |

TRADUCCIÓN OFICIAL No. 098/CKM REALIZADA POR DIEGO F. VARGAS ZAMORA, TRADUCTOR E  
INTÉRPRETE OFICIAL INGLÉS-ESPAÑOL, RECONOCIDO MEDIANTE RESOLUCIÓN No. 0001 DEL 4 DE  
ENERO DE 1999 DEL MINISTERIO DE JUSTICA

DSP5403CONP1

CERTIFICACIÓN

Por el presente certifico que el 24 de enero de 2019, comparé  
el documento adjunto con el original y que dicho documento es  
una copia fiel de la cesión original, tal como fue presentada  
ante la Oficina de Marcas y Patentes de los Estados Unidos  
con respecto a la solicitud USSN 15/852887, presentada el  
12/22/17.

*Firma Ilegible*

BRIAN POLANSKY

*Firma Ilegible*

Amanda Lin Blyth

(Notario Público de Nueva Jersey)

Mi Comisión Vence:

28 de octubre de 2028



OFICINA DE MARCAS Y PATENTES DE LOS ESTADOS UNIDOS

*Subsecretario de Comercio para los Propiedad Intelectual y  
Director de la Oficina de Marcas y Patentes de los Estados Unidos*

20 de diciembre de 2018

PTAS

TROUTMAN SANDERS

875 THIRD AVENUE

NUEVA YORK, NY 10022

**505245462**

**DIEGO F. VARGAS Z.**  
TRADUCTOR E INTÉRPRETE OFICIAL  
ESPAÑOL - INGLÉS - INGLÉS - ESPAÑOL  
RES. 0001 DE ENERO 4 DE 1999  
MINISTERIO DE JUSTICIA

OFICINA DE MARCAS Y PATENTES DE LOS ESTADOS UNIDOS  
NOTIFICACIÓN DE INSCRIPCIÓN DE DOCUMENTO DE CESIÓN

EL DOCUMENTO ADJUNTO HA SIDO INSCRITO POR LA SECCIÓN DE REGISTRO DE CESIONES DE LA OFICINA DE MARCAS Y PATENTES DE LOS ESTADOS UNIDOS. UNA COPIA COMPLETA ESTÁ DISPONIBLE EN LA SALA DE BÚSQUEDAS DE CESIONES CON EL NÚMERO DE ROLLO Y CUADRO INDICADOS A CONTINUACIÓN.

POR FAVOR REVISE TODA LA INFORMACIÓN QUE CONTIENE LA PRESENTE NOTIFICACIÓN. LA INFORMACIÓN QUE CONTIENE ESTA NOTIFICACIÓN DE INSCRIPCIÓN REFLEJA LA INFORMACIÓN PRESENTE EN EL SISTEMA DE CESIONES DE MARCAS Y PATENTES. SI ENCUENTRA ERRORES O TIENE PREGUNTAS RELATIVAS A ESTA NOTIFICACIÓN, PUEDE CONTACTAR LA SECCIÓN DE INSCRIPCIÓN DE CESIONES AL 571-272-3350. POR FAVOR ENVÍE SU SOLICITUD DE CORRECCIÓN A: U.S. PATENT AND TRADEMARK OFFICE, MAIL STOP: ASSIGNMENT RECORDATION BRANCH, P.O. BOX 1450, ALEXANDRIA, VA 22313.

FECHA DE INSCRIPCIÓN: 12/19/2018 ROLLO/CUADRO: 047819/0328

NÚMERO DE HOJAS: 3

RESUMEN: CESIÓN DEL INTERÉS DE LOS CEDENTES (VER DOCUMENTO PARA MAYOR INFORMACIÓN)

REFERENCIA DEL APODERADO NÚMERO: 243382.000065

CEDENTE:

LORENZO, JUAN

FECHA DOCUMENTO: 12/18/2018

CESIONARIO:

DEPUY SYNTHES PRODUCTS, INC.

325 PARAMOUNT DRIVE

RAYNHAM, MASSACHUSETTS 02767

**DIEGO VARGAS Z.**  
TRADUCTOR E INTERPRETE OFICIAL  
ESPAÑOL - INGLÉS - INGLÉS - ESPAÑOL  
RES. 0001 DE ENERO 4 DE 1995  
MINISTERIO DE JUSTICIA

NÚMERO DE SOLICITUD: 15852887 FECHA DE PRESENTACIÓN: 12/22/2017

NÚMERO DE PATENTE:

FECHA DE EXPEDICIÓN:

TÍTULO: DISPOSITIVO DE ANEURISMA Y SISTEMA DE ENTREGA

SECCIÓN DE INSCRIPCIÓN DE CESIONES

DIVISIÓN DE REGISTROS PÚBLICO

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Referencia del Apoderado No. 243382/000065

Cesión General

CONSIDERANDO que Juan LORENZO, domiciliado en 325 Paramount Drive, Raynham, MA 02767 (denominado en adelante como el "Cedente"), es propietario de ciertas y útiles invenciones relativas a

DISPOSITIVO DE ANEURISMA Y SISTEMA DE ENTREGA

para la cual se presentó una solicitud ante la Oficina de Marcas y Patentes de los Estados Unidos el 22 de diciembre de 2017 y a la cual le fue asignado el número de serie 15/852,887.

CONSIDERANDO que DePuy Synthes Products, Inc., domiciliada en 325 Paramount Drive, Raynham, MA 02767 (en adelante la "Cesionaria") desea adquirir todo el derecho, título e interés del cedente en esta, incluyendo el derecho de reivindicar prioridad respecto a la misma.

POR CONSIGUIENTE, POR EL PRESENTE SE DEJA CONSTANCIA que en razón de contraprestación válida y legal, el recibo y suficiencia de la cual se reconoce por el presente, el Cedente por el presente cede y transfiere, para todos los países del mundo, a dicha Cesionaria, todo su derecho, título e interés, incluyendo el derecho de reivindicar prioridad en

**DIEGO F. VARGAS Z.**  
TRADUCTOR E INTERPRETE OFICIAL<sup>3</sup>  
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MINISTERIO DE JUSTICIA

y a todas dichas invenciones divulgadas en dichas solicitudes, así como en y a dichas solicitudes y todas las equivalencias extranjeras de las mismas, incluyendo todas las sustituciones, divisiones y continuaciones de la misma, así como en y todas las Patentes de Invención, que se lleguen a otorgar a dichas invenciones, y a todas las prórrogas, renovaciones y reexpediciones de las mismas, para que estas sean tenidas y disfrutadas por dicha cesionaria, sus sucesores y cesionarios, tan completa y plenamente como estas hubieran sido tenidas y disfrutadas por el Cedente, si no se hubiera realizado la presente Cesión.

Y con el objeto de obtener protección de patentes en cualquier país extranjero, el Cedente por el presente acuerda que cualquier derecho, título e interés en y todas dichas invenciones divulgadas en dichas solicitudes, así como en y a dichas solicitudes y todos las equivalencias extranjeras de las mismas pueden ser cedidas directamente por los inventores a la Cesionaria, sin que medie confirmación explícita del Cedente.

El Cedente acuerda que la presente cesión general está vigente desde el 21 de diciembre de 2017.

EN TESTIMONIO DE LO CUAL, el Cedente ha fijado su firma y sello el día de hoy.

POR Juan Lorenzo

/Juan Lorenzo/

Firmado Digitalmente por Juan Lorenzo  
DN: c=US, o=JNJ, ou=Suscriptores, cn=JUAN  
LORENZO  
0.9.2342.1.19200300.100.1.1=118229  
Motivo: Integridad de este documento  
Fecha: 2018.12.18 15:16:58-05'DO'

Firma

Nombre

Cargo del Signatario Autorizado

Fecha

**DIEGO F. VARELAS Z.**  
TRADUCTOR E INTERPRETE OFICIAL  
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## ACUERDO DE CESIÓN DE PATENTES

El presente Acuerdo de Cesión de Patentes ("Cesión"), vigente a partir de la fecha de la última firma que aparece abajo, se realiza por y entre:

DePuy Ireland Unlimited Company, una sociedad irlandesa,  
domiciliada en Loughbeg Industrial Estate, Ringaskiddy, Co  
Cork, Irlanda ("Irlanda")

Y

DePuy International Limited, una sociedad registrada en  
Inglaterra y Gales con el número 3319172, domiciliada en St.  
Anthony's Road, Leeds, West Yorkshire LS11 8DT  
("Internacional")

(denominadas individualmente cada una como una "Parte;  
conjuntamente como las "Partes").

CONSIDERANDO que Irlanda e Internacional celebraron un  
Acuerdo de Investigación y Desarrollo por Contrato ("Acuerdo  
de Investigación"), vigente a partir del 8 de enero de 2012  
("Fecha de Vigencia") relativo a un Programa de Investigación  
y Desarrollo;

CONSIDERANDO que DePuy (Irlanda) cambió su nombre a  
DePuy Ireland Unlimited Company;

CONSIDERANDO que de conformidad con el Acuerdo de  
Investigación, Irlanda es propietaria de todas solicitudes y  
patentes que resulten del trabajo en el Programa de  
Investigación y Desarrollo, incluyendo las solicitudes de  
patente y patentes que hayan sido presentadas por  
Internacional con anterioridad a la Fecha de Vigencia del  
Acuerdo de Investigación (incluyendo las enumeradas en el

Anexo 3 del Acuerdo de Investigación) así como de otras solicitudes de patente y patentes relativas a invenciones realizadas de conformidad con el Acuerdo de Investigación;

CONSIDERANDO que se han presentado solicitudes de patente adicionales desde la Fecha de Vigencia originadas en el trabajo en el Programa de Investigación y Desarrollo;

CONSIDERANDO que las Partes desean dejar constancia y confirmar la cesión de los derechos de propiedad intelectual de conformidad con el Acuerdo de Investigación o ceder derechos de propiedad intelectual a Irlanda, en la medida que dichos derechos no hayan sido ya cedidos;

POR CONSIGUIENTE, en consideración de valiosa contraprestación, el recibo de la cual se reconoce por el presente, se acuerda lo siguiente por y entre las Partes:

1. Las Partes confirman y pactan que de conformidad con el Acuerdo de Investigación, Irlanda es propietaria de todo el derecho, título e interés a la Propiedad Intelectual, tal como se define en el Acuerdo de Investigación, incluyendo todas las patentes y solicitudes de patente identificadas en el Anexo A adjunto al presente y todos los ejemplares de las patentes y solicitudes de patente relacionadas en el Anexo A, a nivel mundial, así como cualquier y todas las continuación, continuaciones en parte, divisionales, renovaciones, reexpediciones, nuevos exámenes, prórrogas, patentes de adición, patentes de importación y todas las patentes y solicitudes de patente que reivindiquen prioridad a las patentes y solicitudes de patentes relacionadas en el Anexo A.

**DIEGO F. VARGAS Z**  
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2. En la medida que se considere que Internacional es propietaria de cualquier participación en cualquier Propiedad Intelectual, según se define en el Acuerdo de Investigación, o en la medida que sea necesaria o conveniente para efectuar el Artículo 1 anterior o los términos del Acuerdo de Investigación, Internacional cede a Irlanda todo el derecho, título e interés en toda la Propiedad Intelectual, según se define en el Acuerdo de Investigación, incluyendo todas las patentes y solicitudes de patente identificadas en el Anexo A, adjunto al presente y todos los ejemplares de las patentes y solicitudes de patente relacionadas en el Anexo A, a nivel mundial, así como cualquier y todas las continuaciones, continuaciones en parte, divisionales, renovaciones, reexpediciones, nuevos exámenes, prórrogas, patentes de adición, patentes de importación y todas las patentes y solicitudes de patente que reivindiquen prioridad a las patentes y solicitudes de patente relacionadas en el Anexo A.

3. Cualquiera de la Partes podrá ceder la presente Cesión o cualquiera de los derechos y obligaciones contempladas en el presente a una filial o a una compañía que adquiera de manera sustancial la totalidad de los bienes de dicha Parte a los que hace referencia la presente Cesión, sin el consentimiento de la otra Parte. Dicha cesión estará sujeta a los términos de la presente Cesión. Con sujeción a lo anterior, la presente Cesión será vinculante y redundará en beneficio de las partes respectivas del presente y sus sucesores y cesionarios.

EN TESTIMONIO DE LO CUAL, las Partes han ordenado que la presente Cesión sea debidamente suscrita con vigencia a partir de la fecha de la última firma a continuación.

**DIEGO F. VARGAS Z.**  
TRADUCTOR E INTERPRETE OFICIAL 7  
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RES. 0001 DE ENERO 4 DE 1991  
MINISTERIO DE JUSTICIA

DePuy International Limited

Por: Firma Ilegible

Cynthia K. Barnett

Cargo: Apoderada

Fecha: 16 de mayo de 2017

DePuy Ireland Unlimited Company

Por: Firma Ilegible

Stephen J. Manich

Cargo: Apoderada

Fecha: 16 de mayo de 2017

Estado/Mancomunidad de INDIANA

Condado de: KOSCIUSKO

Hoy 16 de mayo de 2017, ante el suscrito notario público, compareció personalmente STEPHEN J. MANICH, a quien doy fe de conocer personalmente como la persona cuyo nombre se suscribe en el anterior o adjunto documento y reconoció ante mí que él lo firmó de manera voluntaria para los fines indicados en este.

Firma Ilegible

Notario Público

Mi Comisión Vence: \_\_\_\_\_

NANCY WILLIAMS

Notario Público

Condado de Kosciusko, Estado de Indiana

Comisión Vence 3 de mayo de 2024

#### Anexo A

| Identificación Matriz | Fecha Presentación | No. de Serie | Título de Patente                                                                           | Fecha Expedición | Patente No. |
|-----------------------|--------------------|--------------|---------------------------------------------------------------------------------------------|------------------|-------------|
| DEP6729USPSP          | 05/18/2016         | 62/338468    | SISTEMA Y MÉTODO PARA PREPARAR EL HUESO DE UN PACIENTE PARA RECIBIR UN COMPONENTE PROTÉSICO |                  |             |

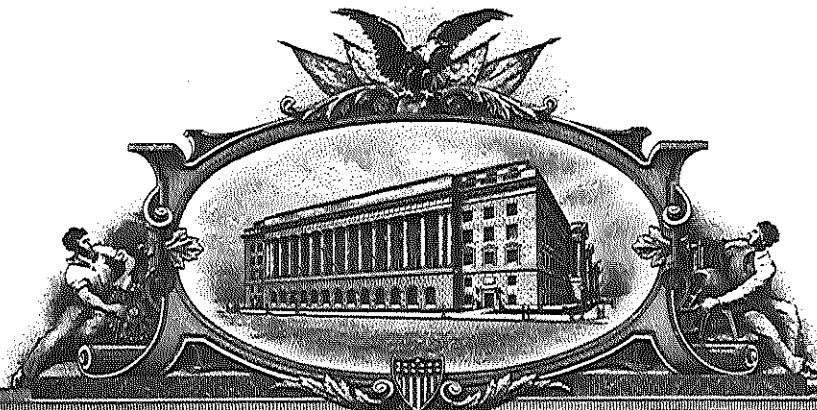
FIN DE LA TRADUCCIÓN

Bogotá D.C., 22 de febrero de 2019

Es traducción fiel y completa del documento original realizada por:

DIEGO F. VARGAS ZAMORA, Traductor e Intérprete Oficial, Resolución No. 0001 de 1999 del Ministerio de Justicia de Colombia.

**DIEGO F. VARGAS Z.**  
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MINISTERIO DE JUSTICIA



# THE UNITED STATES OF AMERICA

**TO ALL TO WHOM THESE PRESENTS SHALL COME:**

UNITED STATES DEPARTMENT OF COMMERCE

United States Patent and Trademark Office

December 27, 2018

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: *15/852,887*

FILING DATE: *December 22, 2017*

THE COUNTRY CODE AND NUMBER OF YOUR PRIORITY APPLICATION, TO BE USED FOR FILING ABROAD UNDER THE PARIS CONVENTION, IS *US15/852,887*

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



  
R GLOVER  
Certifying Officer

## Electronic Acknowledgement Receipt

|                                             |                                     |
|---------------------------------------------|-------------------------------------|
| <b>EFS ID:</b>                              | 31324180                            |
| <b>Application Number:</b>                  | 15852887                            |
| <b>International Application Number:</b>    |                                     |
| <b>Confirmation Number:</b>                 | 4604                                |
| <b>Title of Invention:</b>                  | ANEURYSM DEVICE AND DELIVERY SYSTEM |
| <b>First Named Inventor/Applicant Name:</b> | Juan LORENZO                        |
| <b>Customer Number:</b>                     | 6980                                |
| <b>Filer:</b>                               | Louis J. DelJuidice/Dwight Peck     |
| <b>Filer Authorized By:</b>                 | Louis J. DelJuidice                 |
| <b>Attorney Docket Number:</b>              | 243382.000065                       |
| <b>Receipt Date:</b>                        | 22-DEC-2017                         |
| <b>Filing Date:</b>                         |                                     |
| <b>Time Stamp:</b>                          | 15:33:11                            |
| <b>Application Type:</b>                    | Utility under 35 USC 111(a)         |

### Payment information:

|                                          |                             |
|------------------------------------------|-----------------------------|
| Submitted with Payment                   | yes                         |
| Payment Type                             | DA                          |
| Payment was successfully received in RAM | \$1740                      |
| RAM confirmation Number                  | 122617INTEFSW00006571201507 |
| Deposit Account                          |                             |
| Authorized User                          |                             |

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

|                 |                                                     |                                            |                                          |                  |                  |
|-----------------|-----------------------------------------------------|--------------------------------------------|------------------------------------------|------------------|------------------|
|                 |                                                     |                                            |                                          |                  |                  |
| File Listing:   |                                                     |                                            |                                          |                  |                  |
| Document Number | Document Description                                | File Name                                  | File Size(Bytes)/ Message Digest         | Multi Part /.zip | Pages (if appl.) |
| 1               | Transmittal of New Application                      | UTILITY-TRANSMITTAL- _FINAL-2017-12-22.PDF | 293116                                   | no               | 2                |
|                 |                                                     |                                            | 1db83c9b5b2e46023ee70ea35887ca83003a2199 |                  |                  |
| Warnings:       |                                                     |                                            |                                          |                  |                  |
| Information:    |                                                     |                                            |                                          |                  |                  |
| 2               | Application Data Sheet                              | ADS_FINAL-2017-12-22.PDF                   | 1822903                                  | no               | 8                |
|                 |                                                     |                                            | 6f66e2c8ee98fb5444e8237e4def703ee97b48d0 |                  |                  |
| Warnings:       |                                                     |                                            |                                          |                  |                  |
| Information:    |                                                     |                                            |                                          |                  |                  |
| 3               |                                                     | SPECIFICATION_FINAL-2017-12-22.PDF         | 183881                                   | yes              | 22               |
|                 |                                                     |                                            | 53aea491079858abf55af062dce9cb4c7b9f3d8a |                  |                  |
|                 | Multipart Description/PDF files in .zip description |                                            |                                          |                  |                  |
|                 | Document Description                                |                                            | Start                                    | End              |                  |
|                 | Specification                                       |                                            | 1                                        | 17               |                  |
|                 | Claims                                              |                                            | 18                                       | 21               |                  |
|                 | Abstract                                            |                                            | 22                                       | 22               |                  |
| Warnings:       |                                                     |                                            |                                          |                  |                  |
| Information:    |                                                     |                                            |                                          |                  |                  |
| 4               | Drawings-only black and white line drawings         | DRAWINGS-FINAL.PDF                         | 1075835                                  | no               | 9                |
|                 |                                                     |                                            | 34233dc31ae8985f51571411d87f30a3c0195dd6 |                  |                  |
| Warnings:       |                                                     |                                            |                                          |                  |                  |
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| 5               | Power of Attorney                                   | POA- TRANSMITTAL_FINAL-2017-12-22.PDF      | 905297                                   | no               | 2                |
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| <b>Information:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                      |              |                                          |    |   |
| 6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Fee Worksheet (SB06) | fee-info.pdf | 36738                                    | no | 2 |
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| <b>Warnings:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                      |              |                                          |    |   |
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| <p>This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.</p> <p><b><u>New Applications Under 35 U.S.C. 111</u></b><br/>         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.</p> <p><b><u>National Stage of an International Application under 35 U.S.C. 371</u></b><br/>         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.</p> <p><b><u>New International Application Filed with the USPTO as a Receiving Office</u></b><br/>         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.</p> |                      |              |                                          |    |   |

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**UTILITY  
PATENT APPLICATION  
TRANSMITTAL**

(Only for new nonprovisional applications under 37 CFR 1.53(b))

|                        |                                     |
|------------------------|-------------------------------------|
| Attorney Docket No.    | 243382.000065                       |
| First Named Inventor   | Juan Lorenzo                        |
| Title                  | ANEURYSM DEVICE AND DELIVERY SYSTEM |
| Express Mail Label No. |                                     |

**APPLICATION ELEMENTS**

See MPEP chapter 600 concerning utility patent application contents.

1. ☐ **Fee Transmittal Form**  
(PTO/SB/17 or equivalent)
2. ☐ **Applicant asserts small entity status.**  
See 37 CFR 1.27
3. ☐ **Applicant certifies micro entity status.** See 37 CFR 1.29.  
Applicant must attach form PTO/SB/15A or B or equivalent.
4. ☒ **Specification** [Total Pages 22]  
Both the claims and abstract must start on a new page.  
(See MPEP § 508.01(a) for information on the preferred arrangement)
5. ☒ **Drawing(s)** (35 U.S.C. 113) [Total Sheets 9]
6. **Inventor's Oath or Declaration** [Total Pages \_\_\_\_\_]  
(including substitute statements under 37 CFR 1.64 and assignments  
serving as an oath or declaration under 37 CFR 1.63(e))
  - a. ☐ Newly executed (original or copy)
  - b. ☐ A copy from a prior application (37 CFR 1.63(d))
7. ☒ **Application Data Sheet** \* See note below.  
See 37 CFR 1.76 (PTO/AIA/14 or equivalent)
8. **CD-ROM or CD-R**  
in duplicate, large table, or Computer Program (Appendix)  
☐ Landscape Table on CD
9. **Nucleotide and/or Amino Acid Sequence Submission**  
(if applicable, items a. - c. are required)
  - a. ☐ Computer Readable Form (CRF)
  - b. ☐ Specification Sequence Listing on:
    - i. ☐ CD-ROM or CD-R (2 copies); or
    - ii. ☐ Paper
  - c. ☐ Statements verifying identity of above copies

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**ACCOMPANYING APPLICATION PAPERS**

10. ☐ **Assignment Papers**  
(cover sheet & document(s))  
Name of Assignee \_\_\_\_\_
11. ☐ **37 CFR 3.73(c) Statement** ☒ **Power of Attorney**  
(when there is an assignee)
12. ☐ **English Translation Document**  
(if applicable)
13. ☐ **Information Disclosure Statement**  
(PTO/SB/08 or PTO-1449)  
☐ Copies of citations attached
14. ☐ **Preliminary Amendment**
15. ☐ **Return Receipt Postcard**  
(MPEP § 503) (Should be specifically itemized)
16. ☐ **Certified Copy of Priority Document(s)**  
(if foreign priority is claimed)
17. ☐ **Nonpublication Request**  
Under 35 U.S.C. 122(b)(2)(B)(i). Applicant must attach form PTO/SB/35  
or equivalent.
18. ☐ **Other:** \_\_\_\_\_  
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**\*Note:** (1) Benefit claims under 37 CFR 1.78 and foreign priority claims under 1.55 must be included in an Application Data Sheet (ADS).  
(2) For applications filed under 35 U.S.C. 111, the application must contain an ADS specifying the applicant if the applicant is an assignee, person to whom the inventor is under an obligation to assign, or person who otherwise shows sufficient proprietary interest in the matter. See 37 CFR 1.46(b).

**19. CORRESPONDENCE ADDRESS**
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| Signature         | /Louis J. DeJuidice - 47,522/ | Date                              | 2017-12-22 |
| Name (Print/Type) | Louis John DeJuidice          | Registration No. (Attorney/Agent) | 47522      |

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**ANEURYSM DEVICE AND DELIVERY SYSTEM**

**FIELD**

[0001] This disclosure relates to medical instruments, and more particularly, delivery systems for aneurysm therapy.

**BACKGROUND**

[0002] Aneurysms can be complicated and difficult to treat. For example, treatment access may be limited or unavailable when an aneurysm is located proximate critical tissues. Such factors are of particular concern with cranial aneurysms due to the brain tissue surrounding cranial vessels the corresponding limited treatment access.

[0003] Prior solutions have included endovascular treatment access whereby an internal volume of the aneurysm sac is removed or excluded from arterial blood pressure and flow. In this respect, because the interior walls of the aneurysm may continue being subjected to flow of blood and related pressure, aneurysm rupture remains possible.

[0004] Alternative to endovascular or other surgical approaches can include occlusive devices. Such devices have typically incorporated multiple embolic coils that are delivered to the vasculature using microcatheter delivery systems. For example, when treating cranial aneurysms, a delivery catheter with embolic coils is typically first inserted into non-cranial vasculature through a femoral artery in the hip or groin area. Thereafter, the catheter is guided to a location of interest within the cranium. The sac of the aneurysm can then be filled with the embolic material to create a thrombotic mass that protects the arterial walls from blood flow and related pressure. However, such occlusive devices do have certain shortcomings, including mass effect, which can cause compression on the brain and its nerves.

[0005] One particular type of occlusive approach endeavors to deliver and treat the entrance or “neck” of the aneurysm as opposed to the volume of the aneurysm. In such “neck” approaches, by minimizing blood flow across the neck, then a cessation of flow into the aneurysm may be achieved. In turn, a thrombotic mass may naturally form without having to deliver embolic materials, as previously described. This is preferable to masses formed from embolic material since a natural mass can improve healing by reducing possible distention from arterial walls and permits reintegration into the original parent vessel shape along the neck plane

of the aneurysm. It is understood that the neck plane is an imaginary surface where the inner most layer of the parent wall would be but for the aneurysm. However, neck-occlusive approaches are not without drawbacks. It is desired to block the neck of the aneurysm in the parent vessel. Further, embolic coils do not always effectively treat aneurysms as re-canalization of the aneurysm and/or coil compaction can occur over time.

[0006] The solution of this disclosure resolves these and other issues of the art.

### SUMMARY

[0007] In some aspects, the present disclosure relates to a self-expanding braid for treating an aneurysm. The braid can include a lumen with a distal end opposite a proximal end. Translating the braid can cause the delivery portion to expand and form an occlusive sack as well as invert and fold into itself thereby for occluding an aneurysm.

[0008] In certain embodiments, an occlusive device for treating an aneurysm is provided. The device can include a delivery system and a braid being slideably disposed within the microcatheter in a collapsed state. The braid can have a distal end opposite a proximal end. The braid can include a distal segment between the distal and proximal ends. The braid can be distally translatable from within the microcatheter to a deployed state. The braid can expand to the deployed state as the distal end of the braid exits the microcatheter causing the distal segment to radially expand to form an occlusive sack for the aneurysm.

[0009] In some embodiments, the distal segment is capable of being disposed across the aneurysm neck, wherein the distal segment can include a porosity reduced relative to the occlusive sack thereby deflecting, diverting, and/or slowing a flow into the aneurysm.

[0010] In some embodiments, the distal segment is capable of being disposed across the aneurysm neck, wherein the distal segment can include a higher braid angle relative to the occlusive sack.

[0011] In some embodiments, distally translating the braid after the occlusive sack is formed causes one or more segments proximal the distal segment to invert and tuck into the occlusive sack. In some embodiments, wherein the one or more segments proximal the distal segment have an increased braid angle relative to a braid angle of the distal segment to facilitate inversion. In some embodiments, in the deployed state, the braid is detachable from the delivery

system in the aneurysm. The delivery system can also include a delivery tube with a distal end and a proximal end. The distal end of the delivery tube can be detachably connected to the proximal end of the braid whereby the delivery tube can be translatably disposable within a microcatheter. The delivery tube can distally translate the braid within the microcatheter from the collapsed state to the deployed state.

[0012] In some embodiments, the braid can include a tapered segment disposed between the distal segment and a proximal segment that can be elongate (e.g., partially, substantially, and/or entirely). The tapered segment can have a tapered shape. The proximal segment can be disposed on or adjacent the proximal end of the braid. The occlusive sack of the distal segment can be spherical or any other shape adequate to occlude the aneurysm when in the deployed, expanded state. The distal segment can form into the occlusive sack of the braid, which can be located at the neck of the aneurysm, by having the distal segment remain in place in the aneurysm, and the proximal segment translating distally, eventually inverting into the distal segment. The occlusive sack can be capable of sealing the neck of the aneurysm. In some embodiments, the tapered segment is operable to cover the neck of the aneurysm and the proximal segment can be operable to tuck into the occlusive sack formed by the distal segment. The tapered segment can divert flow or reduce the velocity of flow into the aneurysm. The proximal segment can attach the braid to the distal end of the delivery tube and, after the distal segment has expanded to form the occlusive sack, can initiate inversion of the proximal end of the braid into the occlusive sack of the distal segment. In one embodiment, inverting the proximal end functions such as a tube sock into the distal segment.

[0013] In some embodiments, the occlusive sack of the distal segment can be a collapsible cage-like vaso-occlusive structure. In some embodiment, the braid can include one or more buckle portions defined between the distal segment and the tapered and/or proximal segments. In this regard, the proximal end of the braid overlaid internal to the occlusive sack of the distal segment can be formed by inverting at the buckle portion, as the braid continues distally translating from the microcatheter and after the occlusive sack of the distal segment is formed by radial expansion. The distal segment can also include fewer wire segments than the tapered and proximal segments.

[0014] In some embodiments, each of the distal, tapered, and proximal segments can include different braid properties.

[0015] In some embodiments, the tapered segment diverts flow as the distal segment forms the occlusive sack adjacent or is against a wall of the aneurysm and the proximal segment inverts into the distal segment at the neck of the aneurysm.

[0016] In some embodiments, an imaging device operatively is in communication with the occlusive device, wherein the imaging device is capable of imaging the sack with respect to the aneurysm. An orientation of the occlusive sack can be adjustable by the braid being distally or proximally moved.

[0017] In some embodiments, a braid for treating an aneurysm is provided. The braid can have a distal segment defined between proximal and distal ends of the braid. The braid can also have a tapered segment disposed between the distal segment and an proximal segment. The proximal segment can be disposed on or adjacent the proximal end. The braid can be capable of moving from a collapsed state within a microcatheter to a deployed state external to the microcatheter. In this embodiment, translating the braid so the distal end is distal of the microcatheter causes the distal segment to radially expand and form an outer occlusive sack. The occlusive sack can have a diameter greater than a diameter of the microcatheter. Additionally, translating the braid distally after the outer occlusive sack is formed can cause the tapered segment to invert into the occlusive sack.

[0018] In some embodiments, the braid can be detachably deployable by a delivery system to an aneurysm. The lumen of the braid can also include a buckle portion disposed between the distal segment and the tapered and/or proximal segments. The buckle portion can cause the tapered segment to invert into the occlusive sack. In some embodiments, a braid angle of the tapered segment can be adjusted (e.g., increased) compared to a braid angle of the distal segment.

[0019] In some embodiments, a method of delivering an occlusive device to an aneurysm in a blood vessel in a patient is disclosed. The method can include slidably positioning a delivery tube within a microcatheter; slidably positioning a braid with the delivery tube, the braid being in a collapsed state and comprising a distal end and a proximal end; selectively positioning the microcatheter, the delivery tube, and the braid into vasculature of the aneurysm; distally sliding

the braid, by the delivery tube, from the microcatheter towards the aneurysm; causing a distal segment between the proximal and distal ends of the braid to move from the collapsed state within the microcatheter to a deployed state defined by the distal segment radially expanding to form an occlusive sack as the distal end of the braid is moved distally from the microcatheter; inverting a segment proximal the distal segment into the occlusive sack; and releasing the braid within the aneurysm and withdrawing the delivery tube and the microcatheter from the aneurysm.

[0020] In some embodiments, the inverting the segment proximal the distal segment into the occlusive sack can deflect, divert, and/or slow a flow into the aneurysm.

[0021] In some embodiments, the method can include imaging the occlusive sack of the braid with respect to the aneurysm; determining whether the aneurysm is occluded by the sack; and distally or proximally sliding the braid to adjust the sack and to occlude the aneurysm.

[0022] In some embodiments, the method can include adjusting (e.g., increasing) a braid angle of the proximal segment; positioning said segment adjacent or in communication with a neck of the aneurysm; and deflecting, diverting, and/or slowing a flow into the aneurysm when the proximal segment is inverted into the occlusive sack.

[0023] In some embodiments, the method can include sealing, by the occlusive sack, the neck of the aneurysm.

[0024] In some embodiments, the method can include positioning the distal segment across a neck of the aneurysm; and reducing the porosity of the distal segment relative to the occlusive sack.

[0025] In some embodiments, the method can include positioning the distal segment across a neck of the aneurysm; and rendering higher a braid angle relative to the occlusive sack.

[0026] Other aspects and features of the present disclosure will become apparent to those of ordinary skill in the art, upon reviewing the following detailed description in conjunction with the accompanying figures.

#### BRIEF DESCRIPTION OF THE DRAWINGS

[0027] Reference will now be made to the accompanying drawings, which are not necessarily drawn to scale.

[0028] FIG. 1 depicts an example occlusive device of this disclosure deployed into an aneurysm;

[0029] FIG. 2 is a schematic side view of an exemplary delivery system with an occlusive device in communication within a microcatheter;

[0030] FIG. 3 is an enlarged schematic side view of the braid of FIGs. 1-2 in an expanded state;

[0031] FIG. 4A is an enlarged schematic side view of the delivery system and braid of FIGs. 1-3 as the braid is being pushed into an example aneurysm;

[0032] FIG. 4B is an enlarged schematic side view of the delivery system and braid of FIGs. 1-3 as the braid is being pushed into an example aneurysm;

[0033] FIG. 5A is an enlarged schematic side view of the delivery system and braid of FIGs. 1-3 as the braid is being pushed into an example aneurysm;

[0034] FIG. 5B is an enlarged schematic side view of the delivery system and braid of FIGs. 1-3 after the braid is deployed into an example aneurysm;

[0035] FIG. 6A is a perspective schematic view showing an exemplary delivery system for use with an example occlusive device;

[0036] FIG. 6B is a perspective schematic view of FIG. 6A but with partial cross-section of the delivery system and the occlusive device;

[0037] FIG. 7A is a perspective schematic view of FIGs. 6A-6B being deployed with partial cross-section of the delivery system and the occlusive device;

[0038] FIG. 7B is a perspective schematic view of FIGs. 6A-6B deployed with the exemplary delivery system detached from the occlusive device;

[0039] FIG. 8 is a flow diagram for a method of delivering an occlusive device; and

[0040] FIG. 9 is a flow diagram for a method of delivering an occlusive device.

#### DETAILED DESCRIPTION

[0041] Although example embodiments of the disclosed technology are explained in detail herein, it is to be understood that other embodiments are contemplated. Accordingly, it is not intended that the disclosed technology be limited in its scope to the details of construction and arrangement of components set forth in the following description or illustrated in the

drawings. The disclosed technology is capable of other embodiments and of being practiced or carried out in various ways.

[0042] It must also be noted that, as used in the specification and the appended claims, the singular forms “a,” “an” and “the” include plural referents unless the context clearly dictates otherwise. By “comprising” or “containing” or “including” it is meant that at least the named compound, element, particle, or method step is present in the composition or article or method, but does not exclude the presence of other compounds, materials, particles, method steps, even if the other such compounds, material, particles, method steps have the same function as what is named.

[0043] In describing example embodiments, terminology will be resorted to for the sake of clarity. It is intended that each term contemplates its broadest meaning as understood by those skilled in the art and includes all technical equivalents that operate in a similar manner to accomplish a similar purpose. It is also to be understood that the mention of one or more steps of a method does not preclude the presence of additional method steps or intervening method steps between those steps expressly identified. Steps of a method may be performed in a different order than those described herein without departing from the scope of the disclosed technology. Similarly, it is also to be understood that the mention of one or more components in a device or system does not preclude the presence of additional components or intervening components between those components expressly identified.

[0044] As discussed herein, vasculature of a “subject” or “patient” may be vasculature of a human or any animal. It should be appreciated that an animal may be a variety of any applicable type, including, but not limited thereto, mammal, veterinarian animal, livestock animal or pet type animal, etc. As an example, the animal may be a laboratory animal specifically selected to have certain characteristics similar to a human (e.g., rat, dog, pig, monkey, or the like). It should be appreciated that the subject may be any applicable human patient, for example.

[0045] As discussed herein, “operator” may include a doctor, surgeon, or any other individual or delivery instrumentation associated with delivery of a braid body to the vasculature of a subject.

[0046] The occlusive device 1 and corresponding delivery system 40 disclosed here addresses the drawbacks of previous approaches. Turning to FIG. 1, an example occlusive device 1 of this disclosure is shown deployed into an aneurysm A of blood vessel BV but not yet released from delivery system 40. The delivery system 40 can include a microcatheter 20 with a delivery tube 30 slideably disposed therein. In FIG. 1, the microcatheter 20 has been delivered to the aneurysm A and an occlusive sack formed by distal segment 12 of braid 10 is shown forming a predetermined shape and structure that outlines and supports the walls of the aneurysm A so as to occlude aneurysm A. Segment 12 can be formed on, with, or otherwise about distal end 14 of braid 10. The microcatheter 20 size is selected in consideration of the size, shape, and directionality of the aneurysm or the body lumens the catheter must pass through to get to the treatment site. The microcatheter 20 may have a total usable length anywhere from 80 centimeters to 170 centimeters. The microcatheter 20 may have an inner diameter ID of anywhere between 0.015 and 0.032 inches. The outer diameter OD may also range in size and may narrow at either its proximal end or distal end. At its proximal end 26, the microcatheter 20 may be attached to another device, and at its distal end 24 may be operable to positioned at the neck of the aneurysm A. While the distal end 24 of the microcatheter 20 as shown contains the braid 10, the end 24 may be varied in shape and may curve at an angle.

[0047] Turning to FIG. 2, a schematic side view of braid 10 and delivery system 40 is shown in a deployed configuration but prior to being positioned in a location of interest in the vasculature. System 40 can include a delivery tube 30 and a microcatheter 20. The delivery tube 30 can be capable of being distally pushed from a microcatheter 20 and the delivery tube 30 can have an inner lumen. Delivery tube 30 can be substantially elongate and can extend from the proximal 26 to the distal end 24 of microcatheter 20. Tube 30 can generally run along the inner lumen of microcatheter 20 and may leave a space between its outer surface and the internal surface of microcatheter 20. In turn, delivery tube 30 and microcatheter 20 may be axially aligned. System 40 can deliver braid 10 to a location of interest (e.g. a lesion site) using microcatheter 20. In certain embodiments, microcatheter 20 can be pre-placed at a level of the aneurysm neck and used to track the device 1 to the lesion. Delivery tube 30 can be in mechanical connection with braid 10 at locking portion 54. Braid 10 may be attached to locking portion 54 by slidable attachment, permanent attachment (e.g. crimped, laser, ultrasonic weld, or

other sources of heat, adhesive, or the like) or other detachable attachment approaches. When delivery tube 30 is mechanically attached to braid 10 at locking portion 54, distally translating, sliding, or otherwise moving tube 30 towards the aneurysm A can cause braid 10 to begin moving from a collapsed condition within microcatheter 20 to a deployed condition external to microcatheter with occlusive sack of segment 12, as discussed more particularly below.

[0048] The inner lumen of braid 10 can include a distal end 14 and a proximal end 16. The distal end 14 can be opened and/or be capable of allowing for sizing or conforming to the aneurysm A. For example, if the aneurysm is relatively small, distal end 14 may be a closed end, whereas in a larger aneurysm the same braid 10 can have an open distal end 14. The inner lumen of braid 10 can be formed from a self-expanding and an invertible multi-filament outer surface that can includes a mesh. The occlusive sack of braid 10 can be formed during deployment as distal end 14 of braid 10 slides out and exits microcatheter 20. The mesh of braid 10 can be defined by one or more mesh patterns with mesh openings defined by braided filaments. For example, the mesh of braid 10 can include a porosity region associated with the occlusive sack formed by braid 10. The mesh of braid 10 can be comprised of a tube of mesh, closed at one end (e.g. proximal end 16) and be made of several materials such as deposited thin films. The self-expanding mesh of braid 10 can include multiple wires, for example from 4 to 96 wires. The number of wires can be a factor in controlling material properties of the braid 10, including the stiffness.

[0049] The occlusive sack of braid 10 can be formed by braid 10 being distally translated from a collapsed state within microcatheter 20 and attached to delivery tube 30. The mesh of braid 10 is configured so that as braid 10 is distally translated and its end 14 exits from within microcatheter 20, segment 12 will begin immediately expanding. As braid 10 is further translated, the segments of braid 10, including segment 12 and its corresponding occlusive sack, will take shape. Fewer wires of the mesh of braid 10 can be used as a whole. The wires can be made from multiple alloys such as a nickel-titanium alloy, cobalt chromium alloys, Platinum, Nitinol, Stainless Steel, Tantalum, or other alloys, or any other suitable biocompatible materials, or combination of these materials. Also, these materials can be absorbable or non-absorbable by the patient over time.

[0050] The apertures in the mesh of braid 10 can also create a substantially unitary frame work or mesh. Thus, the apertures may be of any size, shape, or porosity, and may be uniformly or randomly spaced throughout the wall of the mesh of braid 10. The apertures can provide the tubular element of braid 10 with flexibility and also assist in the transformation of the mesh from the collapsed state to the expanded, deployed state, and vice versa.

[0051] Turning to FIG. 3, an enlarged schematic side view of the braid 10 of FIGs. 1-2 is shown in a close-up, expanded state. Other portions of the mesh of braid 10 can have different porosities and/or other material properties, including segments 11 and 13 of braid 10. The braid 10 can include several segments, including a generally spherical shaped segment associated with sack 12 along with a proximal tapered cone segment 13 leading to a relatively elongate proximal segment 11. Segment 11 of the braid 10 can have porosity less than the porosity of segment 13 and/or the segment of sack 12. The porosities associated with segments 11, 12, 13 and/or any other region or segment of braid 10 include filaments having modified braid angles at the different respective regions. For example, the braid angle can be modified by removing filaments in the respective region or by adding a coating or covering to a respective region or by selectively modifying the cross section of the wires. Portions of braid 10 on or proximate end 16 may be more pliable than portions of braid 10 on or proximate end 14 in order to induce self-expansion during delivery and inversion as braid 10 forms its predetermined, sack-like shape within aneurysm A (see, e.g., segment 12). The outer surface of braid 10 can also be made from nitinol with interwoven platinum filaments for radiopacity. The tapered segment 13 adjacent to the spherical segment 12 can allow the braid 10 to invert on itself (like a sock) as the device 1 is fully deployed in the aneurysm A. To facilitate inversion of the braid 10 in the segment 13, the braid 10 can be modified to weaken or make it more likely to invert. For example, segment 13 can include a buckle portion 17 that includes a localized braid angle change, removal of wire segments, localized heat treatment, and other approaches to change braid properties. In certain embodiments, the braid angle of segment 13 can be increased relative to other portions of braid 10 so that the porosity of braid 10 across the neck is reduced so that a flow into the aneurysm is deflected, diverted, or slowed. This is because segment 13 can be in communication with the neck of the aneurysm when braid 10 is inverted and deployed in the aneurysm, since end 16 can be tucked into segment 12 (e.g., see FIG. 5B).

[0052] In certain embodiments, a braid angle of one or some of the segments 11, 12, 13 of braid 10 can vary from the longitudinal axis of the braid 10. The wire diameter, pick count (i.e. the number of wire crossovers per lineal measurement) of braid 10 can also vary or otherwise be modified between segments of braid 10 to change the device characteristics. The shape of braid 10 and any of its respective segments can also be heat set. The fibers of braid 10 can be formed by being fastened at their free ends by heat bonding by laser or ultrasonic weld, solvent or adhesive binding, crimping, or any other attachment means. The fibers of each segment of braid 10 may be bonded at their internal crossover points by solvent, adhesive, or heat bonding like laser, ultrasonic weld, or any other source of heat. However, braid 10 is not so limited and it can have a braid angle, pitch count, wire diameter, porosity or any other property of braid 10 that is substantially similar throughout.

[0053] FIGs. 4A to 5B depict an enlarged schematic side view of the delivery system 40 and braid 10 as the braid 10 is being pushed into an example aneurysm A. The mesh of braid 10 expands and then proximal end 16 inverts into braid 10 as the occlusive sack of segment 12 of braid 10 is formed. This means that braid 10 inverts along segment 11 in and rests inside of the aneurysm sack once deployed. In one example, the inversion of the mesh of braid 10 can be formed when the end 14 of the braid 10 is relatively fixed against the wall of aneurysm A while end 16 is distally pushed forward away from microcatheter 20 and tucked into the sack of segment 12. In certain embodiments, proximal end 16 of braid 10 can begin inverting as the braid 10 moves distally forward as shown in Fig 4B and braid 10 does not need for the entire length of 10 to be deployed before the braid starts inverting. In other embodiments, once the entire length of braid 10 is deployed and distal of microcatheter 20, the proximal end 16 can invert and tuck into segment 12. Regardless, in the deployed state, once selectively positioned and arranged in the proper deployed configuration with respect to aneurysm A, braid 10 can be detached. The inversion of braid 10 can be formed akin to a tube sock. In other embodiments, once the mesh of braid 10 is fully deployed and the occlusive sack of braid 10 is formed within aneurysm A, both the ends 14, 16 can be next to or adjacent each other.

[0054] Prior to the arrangement of FIG. 4A, the braid 10 can be assembled with a delivery tube 30 and/or within a microcatheter 20 in a collapsed state. In this respect, the herein disclosed novel delivery system 40 and novel braid 10 can be packaged as a portable kit or

system. The assembly between microcatheter 20, delivery tube 30, and/or braid 10 can take place before being introduced into the vasculature. The delivery system 40 used with braid 10, which can include microcatheter 20 and delivery tube 30, can be selectively positioned at the lesion site and delivery tube 30 can begin distally translating braid 10 towards the aneurysm. Braid 10 can expand as or upon its delivery end 14 contacting aneurysm A as it distally moves away from distal end 24 of catheter 20 to form the spherical sack associated with segment 12 within aneurysm A. As shown in FIG. 4A, segment 12 of braid 10 is beginning to take a generally spherical shape internal to aneurysm A as braid 10 contacts dome D of aneurysm A and/or as braid is translated distally deeper into aneurysm A, further away from catheter 20 and tube 30. Delivery tube 30 may also include one or more fasteners operable to securely fasten braid 10 in place prior to deployment.

[0055] As shown in FIG. 4A, sack 12 can radially expand towards the outer walls of aneurysm A while unexpanded portions (e.g. segment 11) of braid 10 continue to be translated by delivery tube 30. In FIG. 4B, delivery tube 30 distally moves further away from microcatheter 20 and braid 10 begins inverting as its end 16 continues moving distally, by delivery tube 30, away from microcatheter 20 towards aneurysm A. Delivery tube 30 may be driven by a hypotube from its proximal end 36 (not depicted) by an operator or the like. Microcatheter 20 may remain relatively stationary or fixed while delivery tube 30 can be seen distally translating braid 10 towards and through the neck of aneurysm A. Braid 10 can include a pre-weakened or buckle portion 17 so that as braid 10 and delivery tube 30 are distally translated away from microcatheter 20 and into aneurysm A, segment 11 can be translated causing radial expansion of segment 12 to form the corresponding occlusive sack. Continued distal translation of braid 10 can also cause the braid 10 to buckle and for end 16 to invert into sack of segment 12. In certain embodiments, portion 17 can initiate inversion of end 16 into segment 12. Inverting end 16 into segment 12 is particularly advantageous as it prevents braid 10 from creating a protrusion that would otherwise extend into the parent vessel. Instead, any such protrusion is now inverted and tucked into segment 12. Arranging braid 10 in this manner across the neck of the aneurysm, including by inverting end 16 into the sack of segment 12, a flow diversion is created essentially inside of the sack of segment 12.

[0056] It is understood that buckle portion 17 may be formed into the interstices of braid 10 between end 14 of braid 10 and locking portion 54 between braid 10 and delivery tube 30 so that inversion occurs after braid 10 has distally translated a predetermined distance outside of delivery tube 30. Portion 17 may be simply a weak point or buckling point pre-set for a particular sack 12 so that buckling is induced so as to avoid strain of aneurysm A. Alternatively, no buckle portion 17 may be included and instead braid 10 may invert and fold into itself upon end 14 of braid contacting the dome D of aneurysm A (e.g. based on pre-selected pliability of braid 10).

[0057] Locking portion 54, and/or portions of delivery tube 30 can be at the level of the neck of the aneurysm A as seen under fluoroscopy. In moving between FIGs. 4A-5B, the outer diameter of the braid 10 about segment 12 radially expands to a diameter greater than the microcatheter 20 as the occlusive sack of segment 12 is formed. In FIG. 5A, the delivery system 40 can continue to be distally translated until the junction between end 16 of braid 10, locking portion 54, and delivery tube 30 is fully within the spherical, occlusive sack of segment 12 and inversion of braid 10 stops. Once braid 10, segment 12, and corresponding inversion of end 16 are selectively positioned and arranged to the desired condition (e.g. braid 10 has been translated distally to expand segment 12 to form its sack and segments have been inverted therein), braid 10 can be detached from the delivery tube 30 as shown in FIG. 5B. Delivery tube 30 between FIGs. 4A and 5A continues to distally slide braid 10 until in FIG. 5A, unexpanded, segments aft of segment 12 (e.g. segment 13, segment 11, or any other segments aft of segment 12 not depicted) invert and be tucked into the sack of segment 12. In other words, as the braid 10 is distally translated towards the dome of the aneurysm A, the segments of braid 10 that are proximal of segment 12 can be used to force invert like a tube sock. In turn, delivery tube 30 can be proximally translated back into microcatheter 20 and retracted from the braid 10 and aneurysm A.

[0058] The braid wire count of interstices of braid 10 that may form the outer surface of its expandable and invertible mesh can vary depending of the diameter of the sack of segment 12 and/or any sacks inverted internal thereto. For example, in order to induce formation of the predetermined shape and strength of the occlusive sack of segment 12, end 14 of braid 10 may be more pliable than the other end 16, or vice versa, and other segments of braid 10, including

segments 11, 12, and 13, may vary from most pliable on or about end 14 and less pliable on or about end 16. Interstices of braid 10 may also form openings for occlusion of the aneurysm.

[0059] In FIG. 5B, an example spherical sack of segment 12 fully formed in a manner sufficient to occlude aneurysm A with one or more inverted portions disposed internal to the sack of segment 12, braid 10 can be detached from locking portion 54. However, if the sack of segment 12 is not precisely positioned or if segment 12 and/or any internally disposed segments formed by inversion of segments proximal thereto need to be reset or adjusted within aneurysm A for safe occlusion without risk of rupture, braid 10, including segment 12, can be retracted back into delivery tube 30 by proximally withdrawing delivery tube 30 back into microcatheter 20 while still attached to braid 10. In FIG. 5B, since the sack of segment 12 has been selectively positioned and formed within aneurysm A, braid 10 has been detached from delivery tube 30 and delivery tube 30 and microcatheter 20 can now be retraced from aneurysm A and the lesion site. It is understood that some or all of locking portion 54 can be formed with the microcatheter 20 or delivery tube 30 and/or can be radiopaque so that positioning and detachment can be monitored and/or driven under fluoroscopy.

[0060] FIGs. 6A to 7B generally illustrate example attachment and delivery between delivery tube 30 and braid 10 for deploying and detaching braid 10 in aneurysm A. The embodiments of FIGs. 6A to 7B is merely one way that delivery tube 30 and braid 10 may be attached at end 34 and any number of attachment means are contemplated as needed or required. The delivery tube 30 as shown can have a lumen extending from a proximal end 36 to a distal, delivery end 34. FIG. 6A illustrates braid 10 engaged with the locking member 52 and loop wire 58 locked into the locking portion 54. The opening 60 of the loop wire 58 can be placed through the locking portion 54. The locking portion 54 preferably takes the form of a small diameter elongate filament, however, other forms such as wires or tubular structures are also suitable. While the locking portion 54 is preferably formed of nitinol, other metals and materials such as stainless steel, PTFE, nylon, ceramic or glass fiber and composites may also be suitable. Locking member 52, in one example, may be an elongated retractable fiber that may extend between ends 24 and 26 of the microcatheter 20. Locking member 52 preferably takes the form of a small diameter elongate filament, however, other forms such as wires or tubular structures are also suitable. While the locking member 52 is preferably formed of nitinol, other metals and materials

such as stainless steel, PTFE, nylon, ceramic or glass fiber and composites may also be suitable. When the locking member 52 is put through the opening 60 the braid 10 is now secure. It is understood that delivery tube 30 may include a compressible portion 38 disposed between its ends 34 and 36.

[0061] The compressible portion 38 can allow the delivery tube 30 to bend and/or flex. Such flexibility can assist tracking the braid 10 through the microcatheter 20 and the tortuous path through the vasculature. The compressible portion 38 can be formed with interference spiral cuts that can allow for gaps to permit bending but in one example, do not act as a spiral-cut spring. Compressible portion 38 can be axially adjustable between an elongated condition and a compressed condition. However, any other arrangement allowing axial adjustment (e.g., a wound wire or spiral ribbon) can also be suitable for use with detachment systems according to the present disclosure). The compressible portion 38 can be in the elongated condition at rest and automatically or resiliently returns to the elongated condition from a compressed condition, unless otherwise constrained. The function of the compressible portion 38 is described in greater detail herein.

[0062] In FIG. 6A, a force F was previously applied to place the delivery tube 30 in a compressed state. FIG. 6B illustrates the locking member 52 being drawn proximally to begin the release sequence for braid 10. FIG. 7A illustrates the instant the locking member 52 exits the opening 60 and is pulled free of the loop wire 58. The distal end 62 of the loop wire 58 falls away/returns to its preformed shape and exits the locking portion 54. As can be seen, there is now nothing holding the braid 10 to the delivery tube 30. FIG. 7B illustrates the end of the release sequence. Here, the compressible portion 38 of the delivery tube 30 has expanded/returned to its original shape and “sprung” forward. An elastic force E is imparted by the distal end 34 of the delivery tube 30 to the braid 10 to “push” it away to insure a clean separation and delivery of the braid 10 to the aneurysm A. It is to be understood that the delivery scheme described in FIGs. 6A-7B are merely example approaches to delivery of braid 10.

[0063] FIG. 8 is a flow diagram for a method 800 of delivering an occlusive device. Step 805 includes positioning an occlusive device within a microcatheter and in communication with a delivery tube, the occlusive device including a braid capable of expanding and inverting into itself. Step 810 includes distally sliding, by the delivery tube, the braid from the microcatheter.

Step 815 includes radially expanding, as the braid distally exits the microcatheter, a distal segment of the braid between proximal and distal ends of the braid to form an occlusive sack within the aneurysm. Step 820 includes inverting the proximal end of the braid into the occlusive sack. Step 825 includes detaching the braid from the delivery tube and withdrawing the delivery tube from the aneurysm.

[0064] FIG.9 is a flow diagram for a method 900 of delivering an occlusive device. Step 905 includes slidably positioning a delivery tube within a microcatheter. Step 910 includes slidably positioning a braid with the delivery tube, the braid being in a collapsed state and comprising a distal end and a proximal end. This step can also include detachably attaching the proximal end of the braid to the distal end of the delivery tube. Step 915 includes selectively positioning the microcatheter, the delivery tube, and the braid into the vasculature of the aneurysm. Step 920 includes distally sliding the braid, by the delivery tube, from the microcatheter towards the aneurysm. Step 925 includes causing a distal segment between the proximal and distal ends of the braid to move from the collapsed state within the microcatheter to a deployed state defined by the distal segment radially expanding to form an occlusive sack as the distal end of the braid is moved distally from the microcatheter. Step 930 includes inverting and/or tucking a proximal segment into the occlusive sack. Step 935 includes releasing the braid within the aneurysm and withdrawing the delivery tube and the microcatheter from the aneurysm and the vasculature.

[0065] It is understood that variations of the braid 10 can include various materials such as nitinol, stainless steel, bio absorbable materials, and polymers. Braid 10, including any specific portions such as any breaks and corresponding sacks, can be heat set to various configurations such as spherical, oblong, saddle shaped, etc. for the purpose of shaping the initial sack to better match the aneurysm morphology. In addition, the braid 10 can be heat shaped to include weak points to facility the braid buckling once it reaches the dome of the aneurysm. It is also understood that any sack formed by the herein discussed braids 10 can be in a spherical shape as depicted or any other shape, as needed or required, such as ellipsoidal, heart-shaped, ovoid, cylindrical, hemispherical, or the like. Further, interstices of braid 10 that form the sack can vary, or be selectively designed, in size or shape along its length depending on how much braid 10 is caused to radially expand as delivery tube 30 is distally moved.

[0066] The specific configurations, choice of materials and the size and shape of various elements can be varied according to particular design specifications or constraints requiring a system or method constructed according to the principles of the disclosed technology. Such changes are intended to be embraced within the scope of the disclosed technology. The presently disclosed embodiments, therefore, are considered in all respects to be illustrative and not restrictive. It will therefore be apparent from the foregoing that while particular forms of the disclosure have been illustrated and described, various modifications can be made without departing from the spirit and scope of the disclosure and all changes that come within the meaning and range of equivalents thereof are intended to be embraced therein.

**CLAIMS**

What is claimed is:

1. An occlusive device for treating an aneurysm, comprising:  
a delivery system; and  
a braid being slideably disposed within the microcatheter in a collapsed state, the braid having a distal end opposite a proximal end, the braid comprising a distal segment between the distal and proximal ends;  
wherein the braid is distally translatable from within the microcatheter to a deployed state;  
wherein the braid radially expands to the deployed state as the distal end of the braid exits the microcatheter causing the distal segment to form an occlusive sack for the aneurysm.
2. The device of claim 1, wherein the distal segment is capable of being disposed across the aneurysm neck, wherein the distal segment comprises a porosity reduced relative to the occlusive sack thereby inducing a flow diverting effect or reduction of flow velocity into the aneurysm.
3. The device of claim 1, wherein the distal segment is capable of being disposed across the aneurysm neck, wherein the distal segment comprises a higher braid angle relative to the occlusive sack.
4. The device of claim 1, wherein distally translating the braid after or as the occlusive sack is formed causes the proximal end of the braid to invert and one or more segments proximal the distal segment to tuck into the occlusive sack.
5. The device of claim 4, wherein the one or more segments proximal the distal segment have an increased braid angle relative to a braid angle of the distal segment to facilitate inversion.

6. The device of claim 1, wherein the distal end of the braid is opened.

7. The device of claim 1, wherein in the deployed state, the braid is detachable from the delivery system in the aneurysm, the delivery system comprising:

a delivery tube comprising a distal end and a proximal end, the distal end of the delivery tube being detachably connected to the proximal end of the braid, the delivery tube being translatablely disposable within a microcatheter;

wherein the delivery tube distally translates the braid within the microcatheter from the collapsed state to the deployed state.

8. The device of claim 7, the braid further comprising:

a tapered segment disposed between the distal segment and a proximal segment, the proximal segment being disposed on or adjacent the proximal end of the braid;

wherein the occlusive sack of the distal segment is spherical and is capable of sealing the neck of the aneurysm.

9. The device of claim 8, wherein the distal segment expands to form the occlusive sack as the distal end of the braid is distally translated away from the delivery tube.

10. The device of claim 8, wherein the proximal segment attaches the braid to the distal end of the delivery tube and, after the distal segment has expanded to form the occlusive sack, initiates inversion of the proximal end of the braid overlaid into the occlusive sack of the distal segment.

11. The device of claim 8, wherein the occlusive sack of the distal segment is a collapsible cage-like vaso-occlusive structure.

12. The device of claim 8, wherein the distal segment comprises fewer wire segments than the tapered and proximal segments.

13. The device of claim 8, wherein the tapered segment diverts flow as the distal segment forms the occlusive sack adjacent or is against a wall of the aneurysm and the proximal segment inverts into the distal segment at the neck of the aneurysm.

14. The device of claim 7, the braid further comprising a buckle portion defined between the distal segment and the tapered and/or proximal segments.

15. The device of claim 14, the proximal end of the braid overlaid internal to the occlusive sack of the distal segment is formed by inverting at the buckle portion, as the braid continues distally translating from the microcatheter and after the occlusive sack of the distal segment has formed by radially expanding.

16. The device of claim 1, further comprising:  
an imaging device in communication with the occlusive device, wherein the imaging device is capable of imaging the sack with respect to the aneurysm; and  
wherein an orientation of the occlusive sack is adjustable by the braid being distally or proximally moved.

17. A braid for treating an aneurysm, the braid comprising:  
a distal segment defined between proximal and distal ends of the braid; and  
a tapered segment disposed between the distal segment and a proximal segment, the proximal segment being disposed on or adjacent the proximal end;  
wherein the braid is capable of moving from a collapsed state within a microcatheter to a deployed state external to the microcatheter;  
wherein translating the braid so the distal end is distal of the microcatheter causes the distal segment to radially expand and form an outer occlusive sack, the occlusive sack having a diameter greater than the microcatheter;  
wherein translating the braid distally after the outer occlusive sack is formed causes the proximal end of the braid to invert into the occlusive sack.

18. The braid of claim 17, the lumen further comprising a buckle portion disposed between the distal segment and the tapered and/or proximal segments, the buckle portion causing the proximal end of the braid to invert into the occlusive sack.

19. The braid of claim 17, wherein a braid angle of the tapered segment is reduced compared to a braid angle of the distal segment.

20. A method of delivering an occlusive device to an aneurysm in a blood vessel in a patient, comprising:

slidably positioning a delivery tube within a microcatheter;

slidably positioning a braid with the delivery tube, the braid being in a collapsed state and comprising a distal end and a proximal end;

selectively positioning the microcatheter, the delivery tube, and the braid into vasculature of the aneurysm;

distally sliding the braid, by the delivery tube, from the microcatheter towards the aneurysm;

causing a distal segment between the proximal and distal ends of the braid to move from the collapsed state within the microcatheter to a deployed state defined by the distal segment radially expanding to form an occlusive sack as the distal end of the braid is moved distally from the microcatheter;

inverting a proximal segment proximal the distal segment into the occlusive sack; and

releasing the braid within the aneurysm and withdrawing the delivery tube and the microcatheter from the aneurysm.

**ABSTRACT**

The present disclosure relates to a self-expanding braid for treating an aneurysm. The braid can include a lumen with a proximal end opposite a distal end. Translating the braid can cause a distal segment of the braid to expand and form an outer occlusive sack while a segment proximal the distal segment can invert into the outer occlusive sack like a tube sock. The braid can then be detached from its delivery system.

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|                        |                                     |
|------------------------|-------------------------------------|
| Application Number     | Not Yet Assigned                    |
| Filing Date            | Filed Concurrently Herewith         |
| First Named Inventor   | Juan Lorenzo                        |
| Title                  | ANEURYSM DEVICE AND DELIVERY SYSTEM |
| Art Unit               | Not Yet Assigned                    |
| Examiner Name          | Not Yet Assigned                    |
| Attorney Docket Number | 243382.000065                       |

### SIGNATURE of Applicant or Patent Practitioner

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|-------------------------------------------|--------------------------------|---------------------|------------|
| Signature                                 | /Louis J. DelJuidice - 47,522/ | Date (Optional)     | 2017-12-22 |
| Name                                      | Louis John DelJuidice          | Registration Number | 47522      |
| Title (if Applicant is a juristic entity) |                                |                     |            |

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|----------------------------------------------------|------------------------------|
| Applicant Name (if Applicant is a juristic entity) | DePuy Synthes Products, Inc. |
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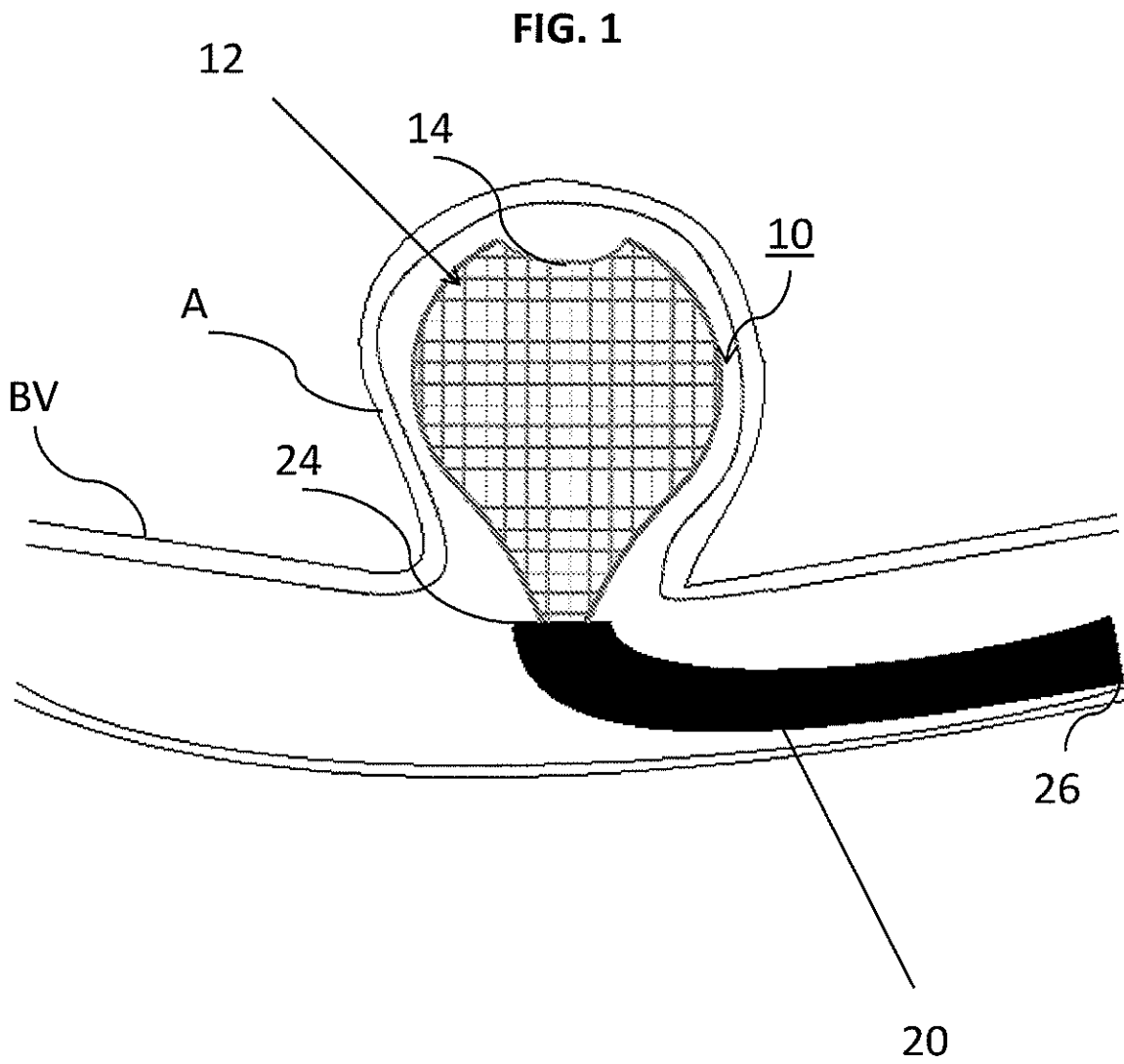
### SIGNATURE of Applicant for Patent

The undersigned (whose title is supplied below) is authorized to act on behalf of the applicant (e.g., where the applicant is a juristic entity).

|           |                                                                    |                 |                 |
|-----------|--------------------------------------------------------------------|-----------------|-----------------|
| Signature | /Eugene L. Szczecina, Jr./                                         | Date (Optional) | August 30, 2016 |
| Name      | Eugene L. Szczecina, Jr.                                           |                 |                 |
| Title     | Assistant General Counsel – Patents / DePuy Synthes Products, INC. |                 |                 |

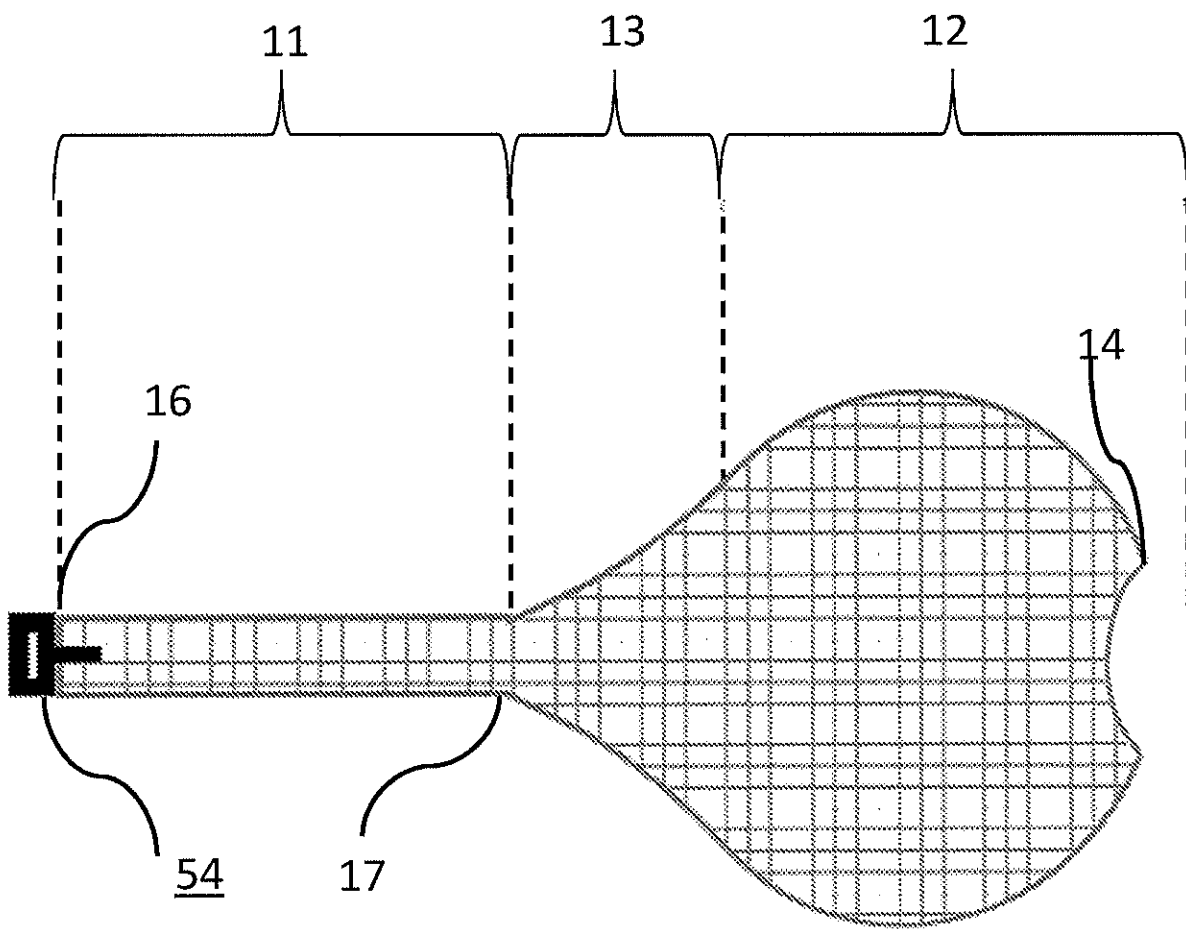
**NOTE:** Signature - This form must be signed by the applicant in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. If more than one applicant, use multiple forms.

☐ Total of forms are submitted.

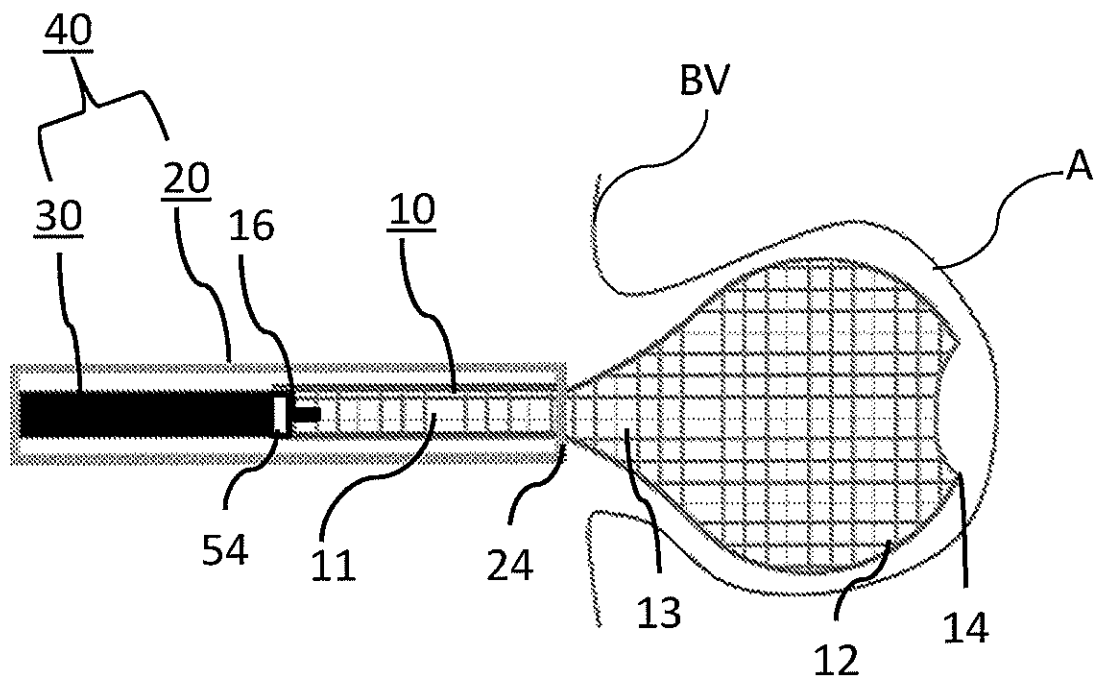




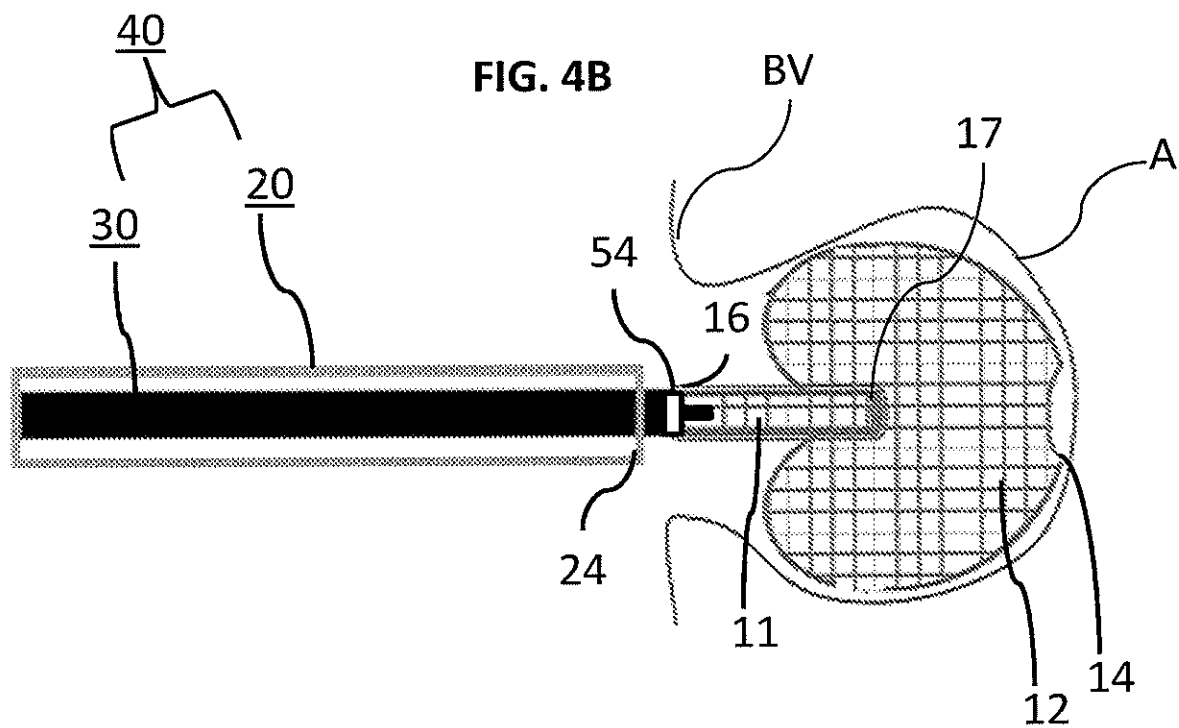
**FIG. 3**



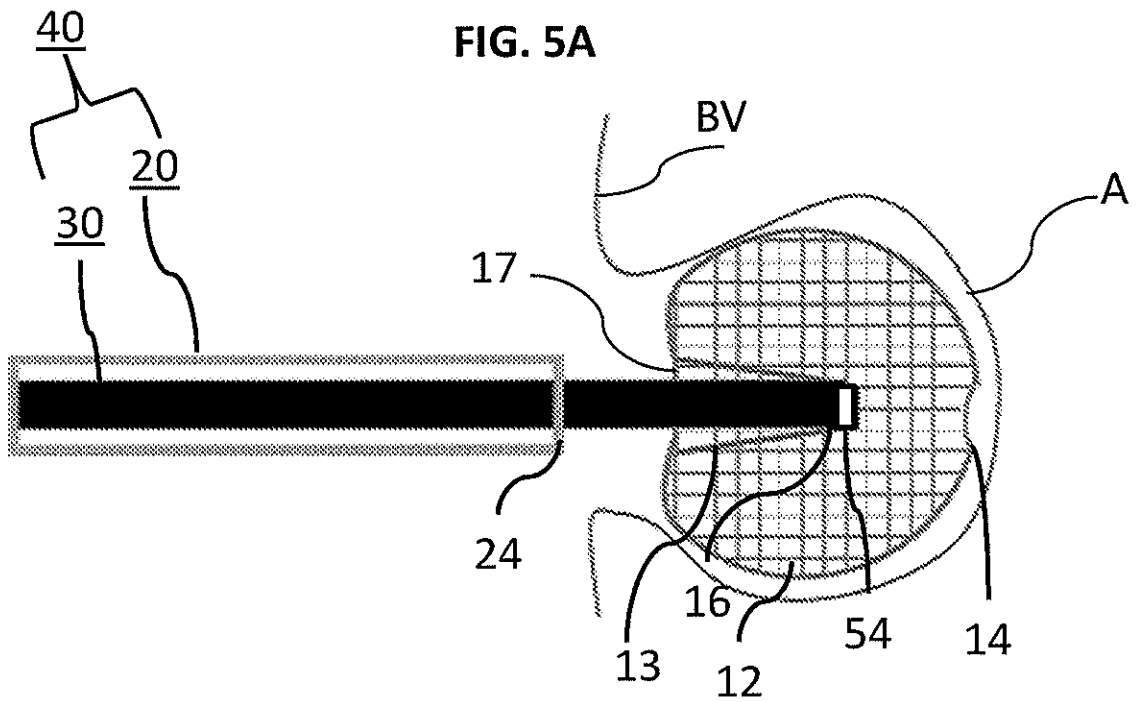
**FIG. 4A**



**FIG. 4B**



**FIG. 5A**



**FIG. 5B**

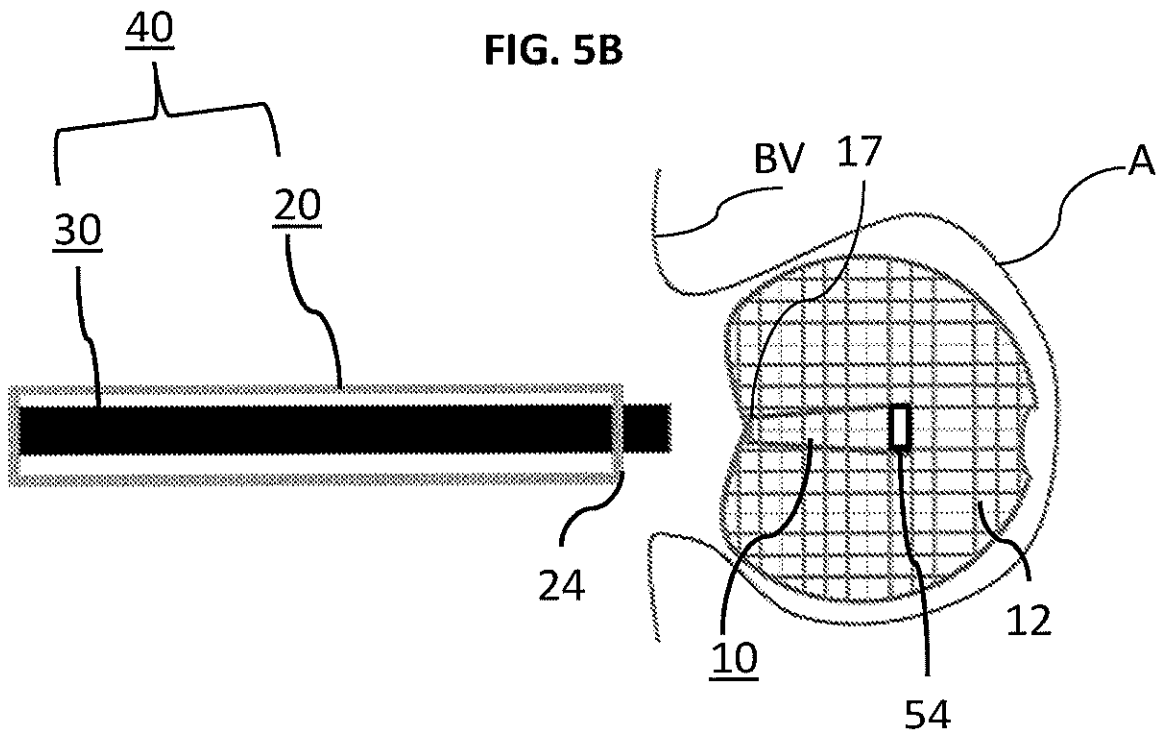


FIG. 6A

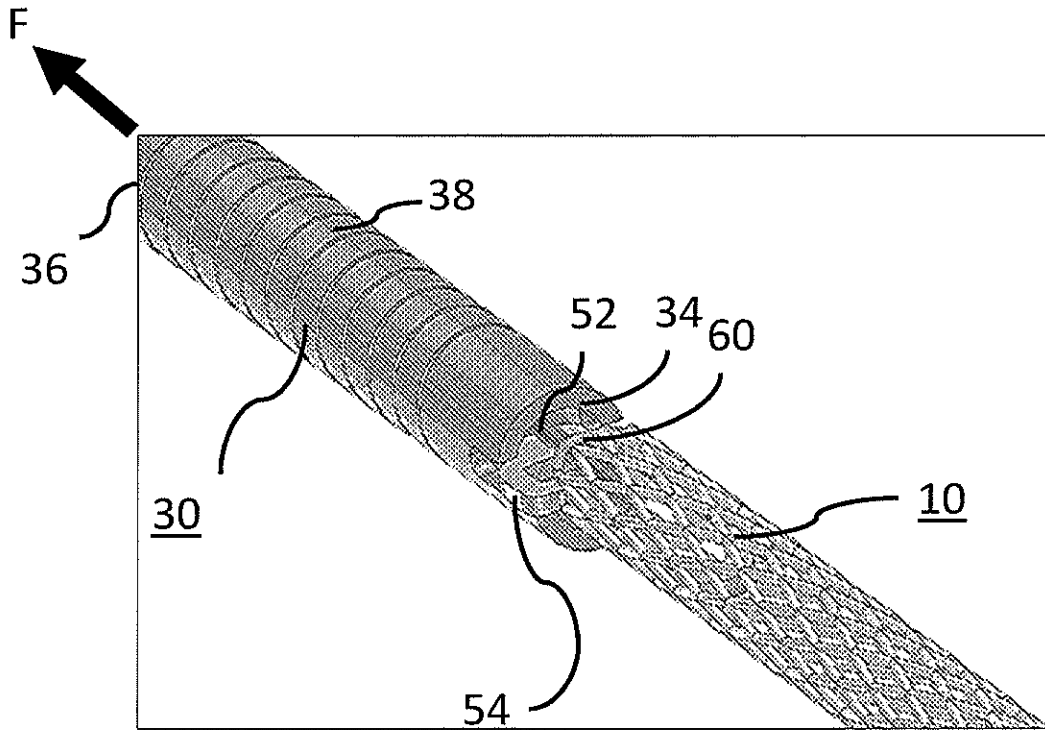
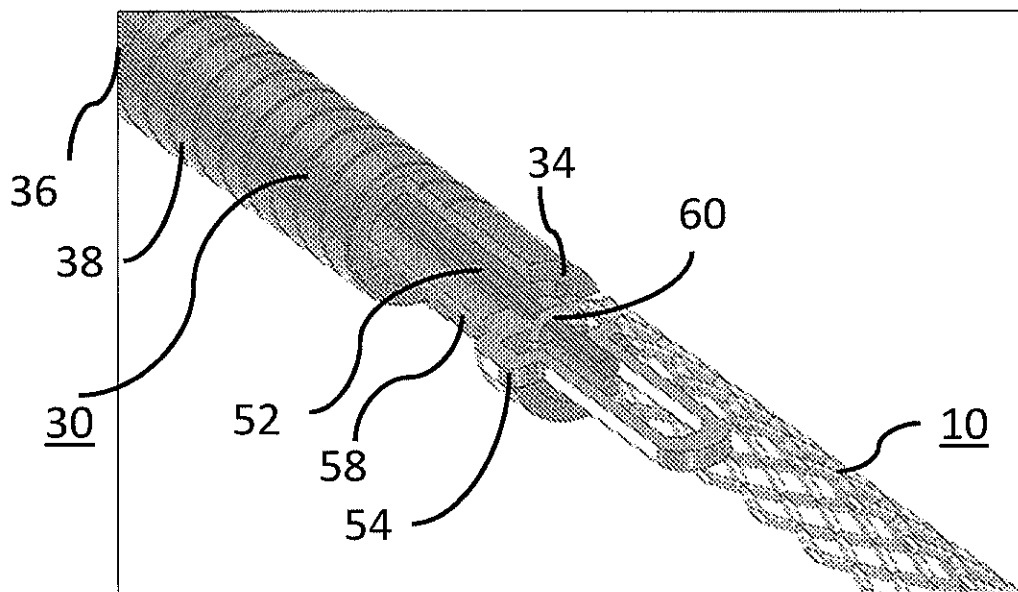
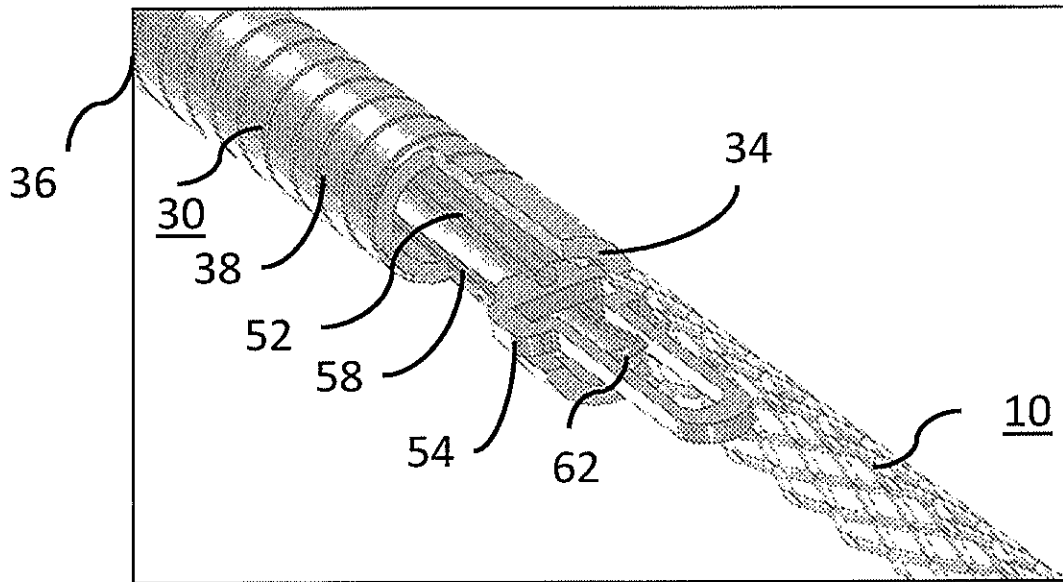


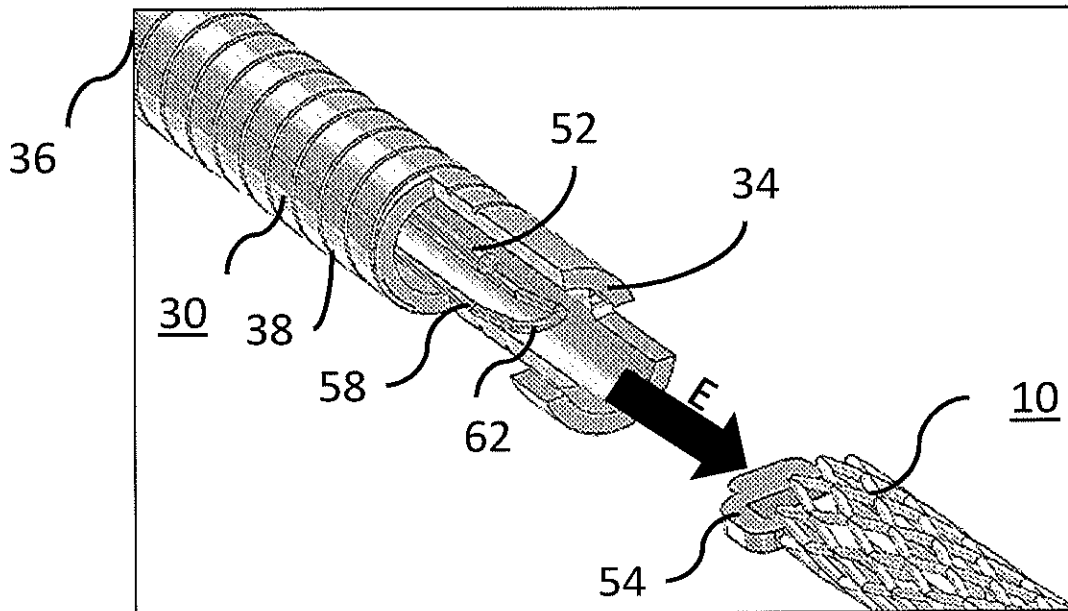
FIG. 6B



**FIG. 7A**

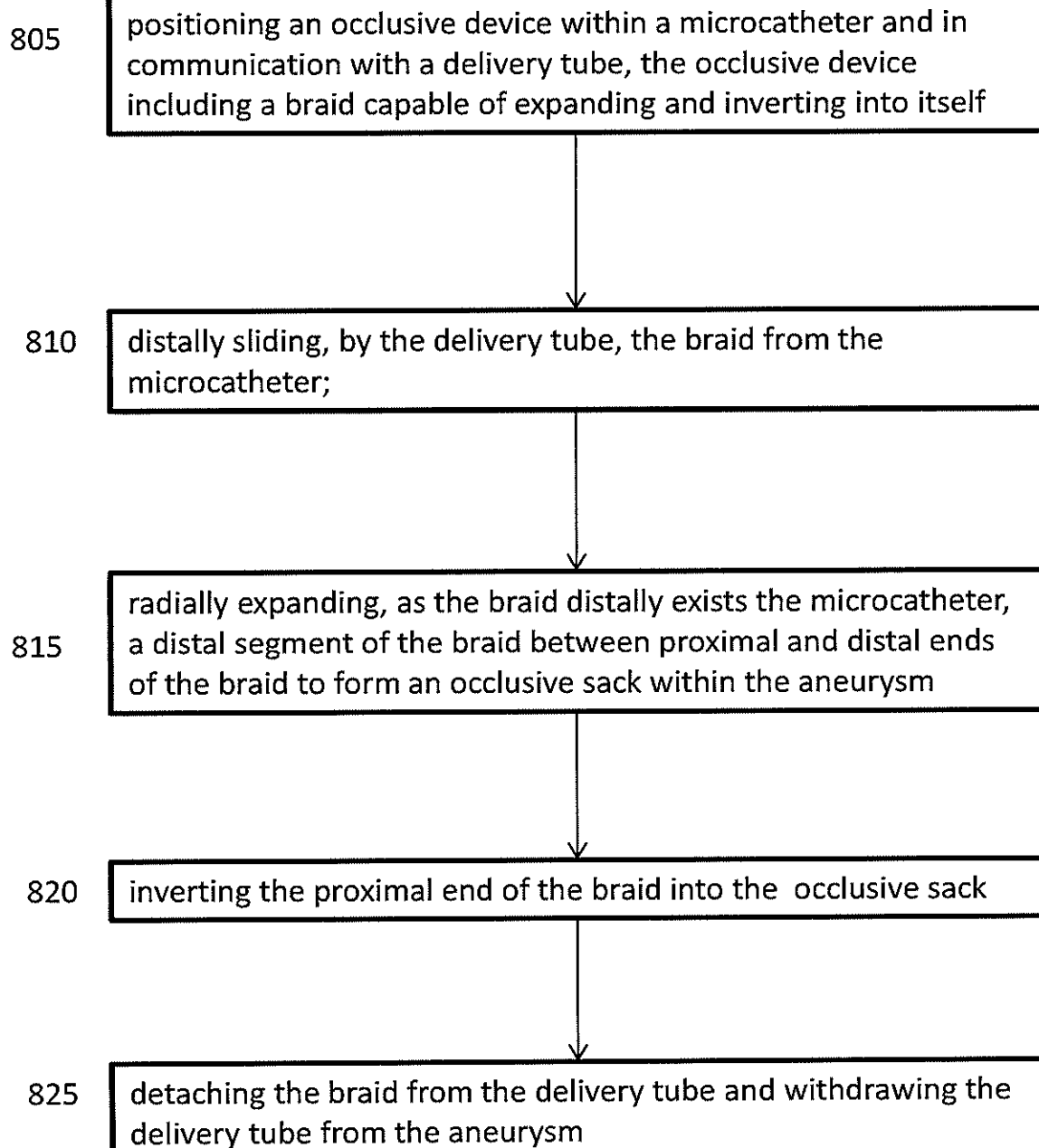


**FIG. 7B**



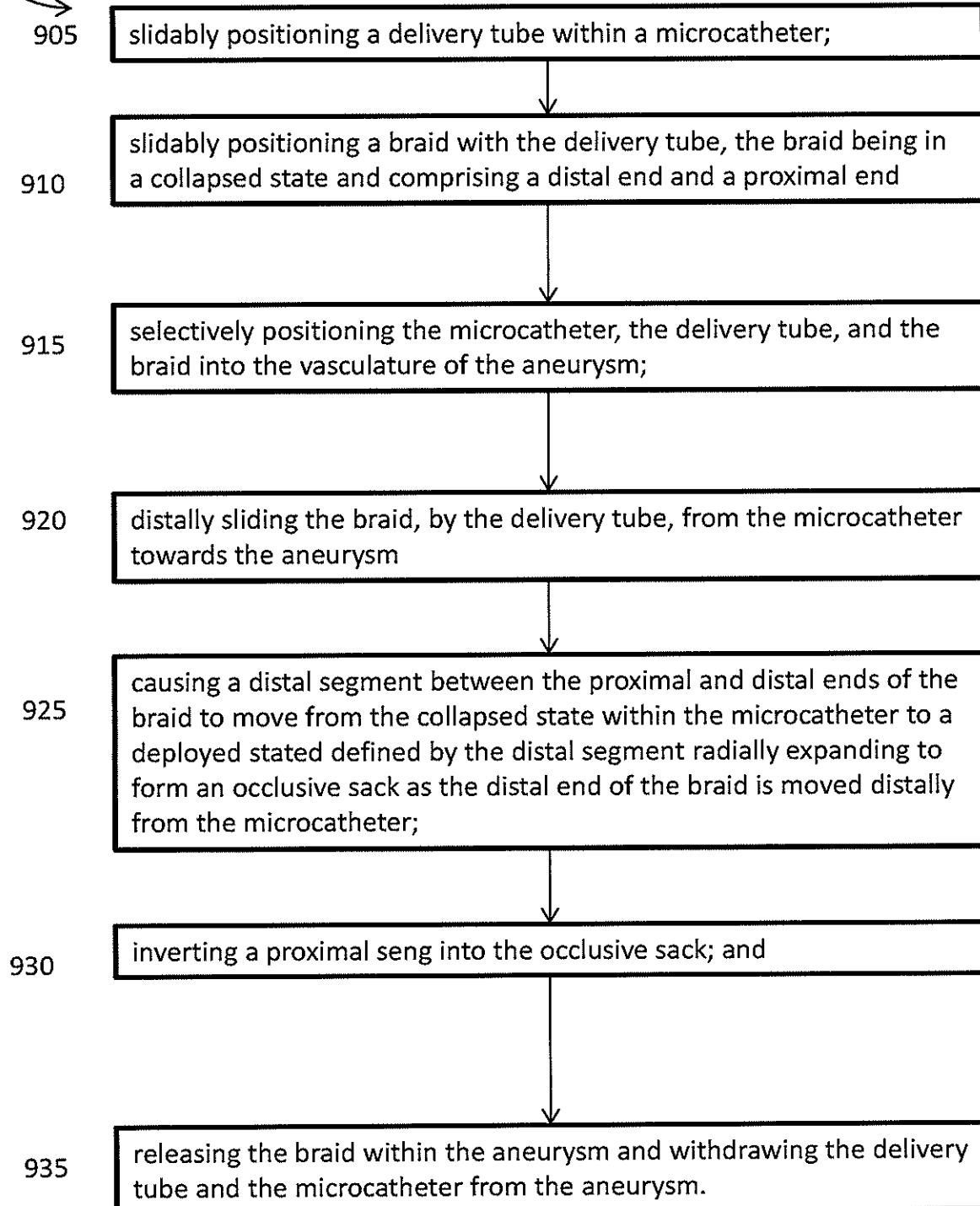
800

**FIG. 8**



900

**FIG. 9**



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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                     |                        |               |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|------------------------|---------------|
| <b>Application Data Sheet 37 CFR 1.76</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                     | Attorney Docket Number | 243382.000065 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                     | Application Number     |               |
| Title of Invention                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | ANEURYSM DEVICE AND DELIVERY SYSTEM |                        |               |
| <p>The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.</p> <p>This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.</p> |                                     |                        |               |

**Secrecy Order 37 CFR 5.2:**

|                          |                                                                                                                                                                                                                                       |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <input type="checkbox"/> | 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               |        |  |
|                                                                                                                                      | Juan                             |                | LORENZO     |                      |        |  |
| Residence Information (Select One) • US Residency Non US Residency Active US Military Service                                        |                                  |                |             |                      |        |  |
| City                                                                                                                                 | Raynham                          | State/Province | MA          | Country of Residence | US     |  |
| Mailing Address of Inventor:                                                                                                         |                                  |                |             |                      |        |  |
| Address 1                                                                                                                            | c/o DePuy Synthes Products, Inc. |                |             |                      |        |  |
| Address 2                                                                                                                            | 325 Paramount Drive              |                |             |                      |        |  |
| City                                                                                                                                 | Raynham                          | State/Province | MA          |                      |        |  |
| Postal Code                                                                                                                          | 02767                            | Country        | 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.<br>For further information see 37 CFR 1.33(a). |                                   |           |              |
| <input type="checkbox"/> An Address is being provided for the correspondence Information of this application.                         |                                   |           |              |
| Customer Number                                                                                                                       | 06980                             |           |              |
| Email Address                                                                                                                         | IPServicesNYC@troutmansanders.com | Add Email | Remove Email |

**Application Information:**

|                                         |                                     |                                           |                          |
|-----------------------------------------|-------------------------------------|-------------------------------------------|--------------------------|
| Title of the Invention                  | ANEURYSM DEVICE AND DELIVERY SYSTEM |                                           |                          |
| Attorney Docket Number                  | 243382.000065                       | Small Entity Status Claimed               | <input type="checkbox"/> |
| Application Type                        | Nonprovisional                      |                                           |                          |
| Subject Matter                          | Utility                             |                                           |                          |
| Total Number of Drawing Sheets (if any) | 9                                   | Suggested Figure for Publication (if any) |                          |

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| <b>Application Data Sheet 37 CFR 1.76</b> |                                     | Attorney Docket Number | 243382.000065 |
|                                           |                                     | Application Number     |               |
| Title of Invention                        | ANEURYSM DEVICE AND DELIVERY SYSTEM |                        |               |

**Filing By Reference:**

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

|                                                        |                          |                                            |
|--------------------------------------------------------|--------------------------|--------------------------------------------|
| Application number of the previously filed application | Filing date (YYYY-MM-DD) | Intellectual Property Authority or Country |
|                                                        |                          |                                            |

**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: | <input checked="" type="radio"/> Customer Number | <input type="radio"/> US Patent Practitioner | <input type="radio"/> Limited Recognition (37 CFR 11.9) |
| Customer Number    | 06980                                            |                                              |                                                         |

**Domestic Benefit/National Stage Information:**

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, 365(c), or 386(c) or indicate National Stage entry from a PCT application. Providing benefit claim 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.

When referring to the current application, please leave the "Application Number" field blank.

|                                                                                                                                           |                 |                          |                                    |
|-------------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------------|------------------------------------|
| Prior Application Status                                                                                                                  |                 | <a href="#">Remove</a>   |                                    |
| Application Number                                                                                                                        | Continuity Type | Prior Application Number | Filing or 371(c) Date (YYYY-MM-DD) |
|                                                                                                                                           |                 |                          |                                    |
| Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the <b>Add</b> button. <a href="#">Add</a> |                 |                          |                                    |

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| <b>Application Data Sheet 37 CFR 1.76</b> |                                     | Attorney Docket Number | 243382.000065 |
|                                           |                                     | Application Number     |               |
| Title of Invention                        | ANEURYSM DEVICE AND DELIVERY SYSTEM |                        |               |

## 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. When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)<sup>i</sup> the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(i)(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).

| Application Number | Country <sup>i</sup> | Filing Date (YYYY-MM-DD) | Access Code <sup>i</sup> (if applicable) | Remove |
|--------------------|----------------------|--------------------------|------------------------------------------|--------|
|                    |                      |                          |                                          |        |

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

## 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.

NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

|                                           |                                     |                        |               |
|-------------------------------------------|-------------------------------------|------------------------|---------------|
| <b>Application Data Sheet 37 CFR 1.76</b> |                                     | Attorney Docket Number | 243382.000065 |
|                                           |                                     | Application Number     |               |
| Title of Invention                        | ANEURYSM DEVICE AND DELIVERY SYSTEM |                        |               |

## Authorization or Opt-Out of Authorization to Permit Access:

When this Application Data Sheet is properly signed and filed with the application, applicant has provided written authority to permit a participating foreign intellectual property (IP) office access to the instant application-as-filed (see paragraph A in subsection 1 below) and the European Patent Office (EPO) access to any search results from the instant application (see paragraph B in subsection 1 below).

Should applicant choose not to provide an authorization identified in subsection 1 below, applicant **must opt-out** of the authorization by checking the corresponding box A or B or both in subsection 2 below.

**NOTE:** This section of the Application Data Sheet is **ONLY** reviewed and processed with the **INITIAL** filing of an application. After the initial filing of an application, an Application Data Sheet cannot be used to provide or rescind authorization for access by a foreign IP office(s). Instead, Form PTO/SB/39 or PTO/SB/69 must be used as appropriate.

### 1. Authorization to Permit Access by a Foreign Intellectual Property Office(s)

**A. Priority Document Exchange (PDX)** - Unless box A in subsection 2 (opt-out of authorization) is 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 State Intellectual Property Office of the People's Republic of China (SIPO), the World Intellectual Property Organization (WIPO), and any other foreign intellectual property office participating with the USPTO in a bilateral or multilateral priority document exchange agreement in which a foreign application claiming priority to the instant patent application is filed, access to: (1) the instant patent application-as-filed and its related bibliographic data, (2) any foreign or domestic application to which priority or benefit is claimed by the instant application and its related bibliographic data, and (3) the date of filing of this Authorization. See 37 CFR 1.14(h)(1).

**B. Search Results from U.S. Application to EPO** - Unless box B in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the EPO access to the bibliographic data and search results from the instant patent application when a European patent application claiming priority to the instant patent application is filed. See 37 CFR 1.14(h)(2).

The applicant is reminded that the EPO's Rule 141(1) EPC (European Patent Convention) requires applicants to submit a copy of search results from the instant application without delay in a European patent application that claims priority to the instant application.

### 2. Opt-Out of Authorizations to Permit Access by a Foreign Intellectual Property Office(s)

☐ A. Applicant **DOES NOT** authorize the USPTO to permit a participating foreign IP office access to the instant application-as-filed. If this box is checked, the USPTO will not be providing a participating foreign IP office with any documents and information identified in subsection 1A above.

☐ B. Applicant **DOES NOT** authorize the USPTO to transmit to the EPO any search results from the instant patent application. If this box is checked, the USPTO will not be providing the EPO with search results from the instant application.

**NOTE:** Once the application has published or is otherwise publicly available, the USPTO may provide access to the application in accordance with 37 CFR 1.14.

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

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|-------------------------------------------|-------------------------------------|------------------------|---------------|
| <b>Application Data Sheet 37 CFR 1.76</b> |                                     | Attorney Docket Number | 243382.000065 |
|                                           |                                     | Application Number     |               |
| Title of Invention                        | ANEURYSM DEVICE AND DELIVERY SYSTEM |                        |               |

## 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.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                          |                                                  |                                       |
| <b>Applicant</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 1                                        |                                                  | <input type="button" value="Remove"/> |
| <p>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.</p> |                                          |                                                  |                                       |
| <input type="button" value="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:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                          |                                                  |                                       |
| <div style="border: 1px solid black; height: 20px; width: 100%;"></div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                          |                                                  |                                       |
| Name of the Deceased or Legally Incapacitated Inventor: <div style="border: 1px solid black; height: 20px; width: 100%;"></div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                          |                                                  |                                       |
| If the Applicant is an Organization check here. <input checked="" type="checkbox"/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                          |                                                  |                                       |
| Organization Name                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | DePuy Synthes Products, Inc.             |                                                  |                                       |
| <b>Mailing Address Information For Applicant:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                          |                                                  |                                       |
| Address 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 325 Paramount Drive                      |                                                  |                                       |
| Address 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                          |                                                  |                                       |
| City                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Raynham                                  | State/Province                                   | MA                                    |
| Country                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | US                                       | Postal Code                                      | 02767                                 |
| Phone Number                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                          | Fax Number                                       |                                       |
| Email Address                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                          |                                                  |                                       |
| Additional Applicant Data may be generated within this form by selecting the Add button. <input type="button" value="Add"/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                          |                                                  |                                       |

## Assignee Information including Non-Applicant Assignee 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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|-------------------------------------------|-------------------------------------|------------------------|---------------|
| <b>Application Data Sheet 37 CFR 1.76</b> |                                     | Attorney Docket Number | 243382.000065 |
|                                           |                                     | Application Number     |               |
| Title of Invention                        | ANEURYSM DEVICE AND DELIVERY SYSTEM |                        |               |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                        |   |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
| Assignee                                                                                                                                                                                                                                                                                                                                                                                                                                               | 1 |
| Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication. |   |

Remove

If the Assignee or Non-Applicant Assignee is an Organization check here.



Organization Name

DePuy Synthes Products, Inc.

**Mailing Address Information For Assignee including Non-Applicant Assignee:**

|               |                     |                |       |
|---------------|---------------------|----------------|-------|
| Address 1     | 325 Paramount Drive |                |       |
| Address 2     |                     |                |       |
| City          | Raynham             | State/Province | MA    |
| Country i     | US                  | Postal Code    | 02767 |
| Phone Number  |                     | Fax Number     |       |
| Email Address |                     |                |       |

Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button.

Add

**Signature:**

Remove

**NOTE:** This Application Data Sheet must be signed in accordance with 37 CFR 1.33(b). However, if this Application Data Sheet is submitted with the **INITIAL** filing of the application and either box A or B is **not** checked in subsection 2 of the "Authorization or Opt-Out of Authorization to Permit Access" section, then this form must also be signed in accordance with 37 CFR 1.14(c).

This Application Data Sheet **must** be signed by a patent practitioner if one or more of the applicants is a **juristic entity** (e.g., corporation or association). If the applicant is two or more joint inventors, this form must be signed by a patent practitioner, **all** joint inventors who are the applicant, or one or more joint inventor-applicants who have been given power of attorney (e.g., see USPTO Form PTO/AIA/81) on behalf of **all** joint inventor-applicants.

See 37 CFR 1.4(d) for the manner of making signatures and certifications.

|            |                               |           |                   |                     |
|------------|-------------------------------|-----------|-------------------|---------------------|
| Signature  | /Louis J. DeJuidice - 47,522/ |           | Date (YYYY-MM-DD) | 2017-12-22          |
| First Name | Louis John                    | Last Name | DeJuidice         | Registration Number |
|            |                               |           |                   | 47522               |

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| <b>Application Data Sheet 37 CFR 1.76</b> |                                     | Attorney Docket Number | 243382.000065 |
|                                           |                                     | Application Number     |               |
| Title of Invention                        | ANEURYSM DEVICE AND DELIVERY SYSTEM |                        |               |

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

## Privacy Act Statement

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

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

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

PA 2038910



# THE UNITED STATES OF AMERICA

**TO ALL TO WHOM THESE PRESENTS SHALL COME:**

**DEPARTAMENTO DE COMERCIO DE LOS ESTADOS UNIDOS**

**Oficina de Patentes y Marcas de los Estados Unidos**

**27 de diciembre de 2018**

**POR LA PRESENTE SE CERTIFICA QUE EL DOCUMENTO ADJUNTO ES UNA COPIA FIEL DE LOS REGISTROS DE LA OFICINA DE PATENTES Y MARCAS DE LOS ESTADOS UNIDOS DE DICHS DOCUMENTOS DE LA SOLICITUD DE PATENTE IDENTIFICADA A CONTINUACIÓN QUE CUMPLIÓ CON LOS REQUISITOS PARA QUE SE LE OTORGARA UNA FECHA DE PRESENTACIÓN EN VIRTUD DE 35 USC 111.**

**NÚMERO DE SOLICITUD: 15/852.887**

**FECHA DE PRESENTACIÓN: 22 de diciembre de 2017**

**EL CÓDIGO DE PAÍS Y EL NÚMERO DE SU SOLICITUD DE PRIORIDAD, QUE SE USARÁ PARA LA PRESENTACIÓN EN EL EXTRANJERO EN VIRTUD DE LA CONVENCION DE PARÍS, ES US15/852.887**

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



  
**R GLOVER**

**Funcionario certificador**

## REIVINDICACIONES

Se reivindica:

1. Un dispositivo oclusivo para tratar un aneurisma, que comprende:

5 un sistema de suministro; y

una trenza dispuesta de manera deslizable dentro del microcatéter en un estado contraído, la trenza tiene un extremo distal opuesto a un extremo proximal, la trenza comprende un segmento distal entre los extremos distal y proximal;

10 en donde la trenza puede trasladarse distalmente desde la parte interior del microcatéter hasta un estado desplegado;

en donde la trenza se expande radialmente al estado desplegado a medida que el extremo distal de la trenza sale del microcatéter haciendo que el segmento distal forme un saco oclusivo para el aneurisma.

15 2. El dispositivo de la reivindicación 1, en donde el segmento distal puede disponerse a través del cuello del aneurisma, en donde el segmento distal comprende una porosidad reducida en relación al saco oclusivo, y así induce un efecto de desvío de flujo o reducción de la velocidad de flujo hacia el aneurisma.

20 3. El dispositivo de la reivindicación 1, en donde el segmento distal puede estar dispuesto a través del cuello del aneurisma, en donde el segmento distal comprende un ángulo de trenza más alto en relación con el saco oclusivo.

4. El dispositivo de la reivindicación 1, en donde trasladar distalmente la trenza después o mientras el saco oclusivo se forma hace que el extremo proximal de la trenza se invierta y uno o más segmentos proximales al segmento distal se metan en el saco oclusivo.

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5. El dispositivo de la reivindicación 4, en donde el uno o más segmentos proximales al segmento distal tienen un ángulo de trenza aumentado en relación con un ángulo de trenza del segmento distal para facilitar la inversión.

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6. El dispositivo de la reivindicación 1, en donde el extremo distal de la trenza está abierto.

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7. El dispositivo de la reivindicación 1, en donde en el estado desplegado, la trenza puede separarse del sistema de suministro en el aneurisma, el sistema de suministro comprende:

un tubo de suministro que comprende un extremo distal y un extremo proximal, el extremo distal del tubo de suministro se conecta de manera desmontable al extremo proximal de la trenza, el tubo de suministro está disponible de forma trasladable dentro de un microcatéter;

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en donde el tubo de suministro traslada distalmente la trenza dentro del microcatéter desde el estado contraído al estado desplegado.

8. El dispositivo de la reivindicación 7, la trenza comprende, además:

un segmento cónico dispuesto entre el segmento distal y un segmento proximal, el segmento proximal está dispuesto en o adyacente al extremo proximal de la trenza;

en donde el saco oclusivo del segmento distal es esférico y es capaz de sellar el cuello del aneurisma.

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9. El dispositivo de la reivindicación 8, en donde el segmento distal se expande para formar el saco oclusivo mientras el extremo distal de la trenza se traslada distalmente apartándola del tubo de suministro.

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10. El dispositivo de la reivindicación 8, en donde el segmento proximal une la trenza al extremo distal del tubo de suministro y, después de que el segmento distal se expande para formar el saco oclusivo, inicia la inversión del extremo proximal de la trenza superpuesta en el saco oclusivo del segmento distal.

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11. El dispositivo de la reivindicación 8, en donde el saco oclusivo del segmento distal es una estructura vaso oclusiva contraíble con forma de jaula.

12. El dispositivo de la reivindicación 8, en donde el segmento distal comprende menos segmentos de alambre que los segmentos cónico y proximal.

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13. El dispositivo de la reivindicación 8, en donde el segmento cónico desvía el flujo mientras el segmento distal forma el saco oclusivo adyacente o está en contra

de una pared del aneurisma y el segmento proximal se invierte en el segmento distal en el cuello del aneurisma.

14. El dispositivo de la reivindicación 7, la trenza comprende, además, una  
5 porción de pando definido entre el segmento distal y los segmentos cónico y/o proximal.

15. El dispositivo de la reivindicación 14, el extremo proximal de la trenza superpuesto interno al saco oclusivo del segmento distal se forma al invertirse en la porción de pando, mientras la trenza continúa trasladándose distalmente desde el microcatéter y  
10 después de que el saco oclusivo del segmento distal se ha formado al expandirse radialmente.

16. El dispositivo de la reivindicación 1, que comprende, además:  
un dispositivo de captación de imágenes en comunicación con el dispositivo  
15 oclusivo, en donde el dispositivo de captación de imágenes es capaz de tomar imágenes del saco con respecto al aneurisma; y  
en donde una orientación del saco oclusivo puede ajustarse al mover la trenza distal o proximalmente.

20 17. Una trenza para tratar un aneurisma, la trenza comprende:  
un segmento distal definido entre los extremos proximal y distal de la trenza; y  
un segmento cónico dispuesto entre el segmento distal y un segmento proximal, el segmento proximal está dispuesto en o adyacente al extremo proximal;

en donde la trenza puede moverse desde un estado contraído dentro de un microcatéter a un estado desplegado externo al microcatéter;

en donde, trasladar la trenza de manera que el extremo distal quede distal con respecto al microcatéter hace que el segmento distal se expanda radialmente y forme un  
5 saco oclusivo exterior, el saco oclusivo tiene un diámetro mayor que el microcatéter;

en donde trasladar la trenza distalmente después de que se forma el saco oclusivo exterior hace que el extremo proximal de la trenza se invierta en el saco oclusivo.

18. La trenza de la reivindicación 17, el lumen comprende, además, una porción  
10 de pandeo dispuesta entre el segmento distal y los segmentos cónico y/o proximal, la porción de pandeo hace que el extremo proximal de la trenza se invierta en el saco oclusivo.

19. La trenza de la reivindicación 17, en donde el ángulo de la trenza del  
15 segmento cónico se reduce comparado con un ángulo de la trenza del segmento distal.

20. Un método para suministrar un dispositivo oclusivo a un aneurisma en un vaso sanguíneo en un paciente, que comprende:

colocar de manera deslizable un tubo de suministro dentro de un microcatéter;

20 colocar de manera deslizable una trenza con el tubo de suministro; la trenza está en un estado contraído y comprende un extremo distal y un extremo proximal;

colocar selectivamente el microcatéter, el tubo de suministro y la trenza en la vasculatura del aneurisma;

deslizar distalmente la trenza, mediante el tubo de suministro, desde el microcatéter hacia el aneurisma;

hacer que un segmento distal entre los extremos proximal y distal de la trenza se muevan desde el estado contraído dentro del microcatéter al estado desplegado definido  
5 por el segmento distal que se expande radialmente para formar un saco oclusivo mientras el extremo distal de la trenza se mueve distalmente desde el microcatéter;

invertir un segmento proximal proximal al segmento distal en el saco oclusivo; y

liberar la trenza dentro del aneurisma y retirar el tubo de suministro y el microcatéter del aneurisma.

P-2018/16514

Señores

SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO

DIRECCIÓN DE NUEVAS CREACIONES

E. S. D.

Ref.: Expediente No. NC2018/0014003

Solicitud de registro patente de invención a nombre de **DEPUY SYNTHES PRODUCTS, INC.**

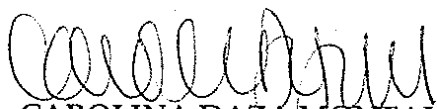
1. Yo, CAROLINA DAZA MONTALVO, identificada como aparece al pie de mi firma, domiciliada en la Carrera 11 No. 86-53, piso 3, obrando como apoderada de la solicitante de la patente de invención que se tramita en el expediente de la referencia, **DEPUY SYNTHES PRODUCTS, INC.**, en respuesta al Oficio No. 84 notificado el 2 de enero de 2019, atentamente me permito presentar los siguientes documentos:

1.1. **Cesión:** Presento con este escrito el documento en que consta la cesión de derechos del inventor LORENZO Juan, a favor de la sociedad solicitante DEPUY SYNTHES PRODUCTS, INC., con la correspondiente traducción al español.

1.2. **Prioridad:** Allego copia certificada de la solicitud de E.U. No. 15/852,887 del 22 de diciembre de 2017, de la cual se reivindica prioridad en el trámite de la presente solicitud. Adicionalmente, se presenta la correspondiente traducción al español. Este documento está siendo presentado dentro del término legal correspondiente, esto es 22 de abril de 2019, de conformidad con lo dispuesto en el Artículo 10 de la Decisión 486 de la Comisión de la Comunidad Andina.

2. Habiendo dado cumplimiento al requerimiento de ese Despacho, solicito respetuosamente se tengan en cuenta los documentos aportados y se continúe con el trámite de la presente solicitud.

Señor Director,



CAROLINA DAZA MONTALVO

C.C. 66.783.790 de Palmira Valle

TP-141563 CSJ

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