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DECEMBER 20, 2018

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505245675

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

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RECORDATION DATE: 12/19/2018

REEL/FRAME: 047820/0289
NUMBER OF PAGES: 3

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

DOCKET NUMBER: 243382.000063

ASSIGNOR:
LORENZO, JUAN

DOC DATE: 12/18/2018

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

APPLICATION NUMBER: 15852829
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. 15/852,829.

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 15:39:24 -05'00'

Name

Title of Authorized Signatory

Date

P-2018/16515

Señores

SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO

DIRECCIÓN DE NUEVAS CREACIONES

E. S. D.

Ref.: Expediente No. NC2018/0014001

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. 83 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. 15/852,829 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

notificaciones@clarkemodet.com.co

TRADUCCIÓN OFICIAL No. 101/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 JUSTICIA



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

505245675

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
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POR FAVOR REVISE TODA LA INFORMACIÓN QUE CONTIENE LA PRESENTE
NOTIFICACIÓN. LA INFORMACIÓN QUE CONTIENE ESTA NOTIFICACIÓN
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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.

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

PATENT AND TRADEMARK OFFICE, MAIL STOP: ASSIGNMENT
RECORDATION BRANCH, P.O. BOX 1450, ALEXANDRIA, VA 22313.

FECHA DE INSCRIPCIÓN: 12/19/2018 ROLLO/CUADRO: 047820/0289

NÚMERO DE HOJAS: 3

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

REFERENCIA DEL APODERADO NÚMERO: 243382.000063

CEDENTE:

LORENZO, JUAN

FECHA DOCUMENTO: 12/18/2018

CESIONARIO:

DEPUY SYNTHES PRODUCTS, INC.

325 PARAMOUNT DRIVE

RAYNHAM, MASSACHUSETTS 02767

NÚMERO DE SOLICITUD: 15852829 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

FIN DE LA TRADUCCIÓN

Bogotá D.C., 27 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.
TRADUCTOR E INTERPRETE OFICIAL
ESPAÑOL - INGLÉS - INGLÉS - ESPAÑOL
RES. 0001 DE ENERO 4 DE 1999
MINISTERIO DE JUSTICIA

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 15/852,829.

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 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 las mismas, 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 todas 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
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Firma

Nombre

Cargo del Signatario Autorizado

Fecha

FIN DE LA TRADUCCIÓN

Bogotá D.C., 27 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
TRADUCTOR E INTERPRETE OFICIAL
ESPAÑOL - INGLÉS - INGLÉS - ESPAÑOL
RES. 0001 DE ENERO 4 DE 1999
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 14, 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: *15/852,829*

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 *US15/852,829*

By Authority of the

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



M. TARVER
Certifying Officer

Electronic Acknowledgement Receipt	
EFS ID:	31323826
Application Number:	15852829
International Application Number:	
Confirmation Number:	7444
Title of Invention:	ANEURYSM DEVICE AND DELIVERY SYSTEM
First Named Inventor/Applicant Name:	Juan LORENZO
Customer Number:	6980
Filer:	Louis J. DeJuidice/Dwight Peck
Filer Authorized By:	Louis J. DeJuidice
Attorney Docket Number:	243382.000063
Receipt Date:	22-DEC-2017
Filing Date:	
Time Stamp:	15:19:28
Application Type:	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	122617INTEFSW00006224201507
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	293112	no	2
			4edea7b78724e7d23c6c059a8bd620269bec2ff0		
Warnings:					
Information:					
2	Application Data Sheet	ADS-FINAL-2017-12-22.PDF	1822906	no	8
			46ae2e1bfb6a63de36985b70dc8737f6d651dc0		
Warnings:					
Information:					
3		SPECIFICATION-FINAL-2017-12-22.PDF	198533	yes	25
			f97dbf973745212024c06995cea757af9cf9ec7e		
	Multipart Description/PDF files in .zip description				
	Document Description		Start	End	
	Specification		1	20	
	Claims		21	24	
	Abstract		25	25	
Warnings:					
Information:					
4	Drawings-only black and white line drawings	DRAWINGS-FINAL.PDF	2903617	no	12
			511c25e7a2a61f6707d7b203a4633cad2637ef93		
Warnings:					
Information:					
5	Power of Attorney	POA-TRANSMITTAL-FINAL-2017-12-22.PDF	700310	no	2
			648fa642257d24c3dc9c6e38fffd3fa61ffc810d		

Warnings:					
Information:					
6	Fee Worksheet (SB06)	fee-info.pdf	36738	no	2
			e330ba2311d7359965bfe97cadf9076fe4ce8be2		
Warnings:					
Information:					
Total Files Size (in bytes):			5955216		
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. <u>New Applications Under 35 U.S.C. 111</u> 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. <u>National Stage of an International Application under 35 U.S.C. 371</u> 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. <u>New International Application Filed with the USPTO as a Receiving Office</u> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.					

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UTILITY PATENT APPLICATION TRANSMITTAL <i>(Only for new nonprovisional applications under 37 CFR 1.53(b))</i>	Attorney Docket No.	243382.000063
	First Named Inventor	Juan Lorenzo
	Title	ANEURYSM DEVICE AND DELIVERY SYSTEM
	Express Mail Label No.	

APPLICATION ELEMENTS <i>See MPEP chapter 600 concerning utility patent application contents.</i>	Commissioner for Patents P.O. Box 1450 Alexandria, VA 22313-1450
1. ☐ Fee Transmittal Form (PTO/SB/17 or equivalent)	ACCOMPANYING APPLICATION PAPERS
2. ☐ Applicant asserts small entity status. See 37 CFR 1.27	10. ☐ Assignment Papers (cover sheet & document(s)) Name of Assignee _____
3. ☐ Applicant certifies micro entity status. See 37 CFR 1.29. Applicant must attach form PTO/SB/15A or B or equivalent.	11. ☐ 37 CFR 3.73(c) Statement ☒ Power of Attorney (when there is an assignee)
4. ☒ Specification [Total Pages <u>25</u>] Both the claims and abstract must start on a new page. (See MPEP § 608.01(a) for information on the preferred arrangement)	12. ☐ English Translation Document (if applicable)
5. ☒ Drawing(s) (35 U.S.C. 113) [Total Sheets <u>12</u>]	13. ☐ Information Disclosure Statement (PTO/SB/08 or PTO-1449) ☐ Copies of citations attached
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))	14. ☐ Preliminary Amendment
a. ☐ Newly executed (original or copy)	15. ☐ Return Receipt Postcard (MPEP § 503) (Should be specifically itemized)
b. ☐ A copy from a prior application (37 CFR 1.63(d))	16. ☐ Certified Copy of Priority Document(s) (if foreign priority is claimed)
7. ☒ Application Data Sheet * See note below. See 37 CFR 1.76 (PTO/AIA/14 or equivalent)	17. ☐ Nonpublication Request Under 35 U.S.C. 122(b)(2)(B)(i). Applicant must attach form PTO/SB/35 or equivalent.
8. CD-ROM or CD-R in duplicate, large table, or Computer Program (Appendix) ☐ Landscape Table on CD	18. ☐ Other: _____ _____ _____ _____
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	

***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				
☒ The address associated with Customer Number: <u>06980</u> OR ☐ Correspondence address below				
Name				
Address				
City	State	Zip Code		
Country	Telephone	Email		
Signature	/Louis J. DelJuidice - 47,522/		Date	2017-12-22
Name (Print/Type)	Louis John DelJuidice		Registration No. (Attorney/Agent)	47522

This collection of information is required by 37 CFR 1.53(b). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Privacy Act Statement

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

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

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

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 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 the fact that volume they can fill is somewhat permanent due to the thrombotic mass delivered therein.

[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 venostasis in 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 typical for neck-occlusive approaches to fail to impede flow into blood vessels while also blocking the aneurysm neck in the parent vessel. This can unintentionally lead to severe damage if the openings of the vessels are blocked. Furthermore, embolic coils do not always effectively treat aneurysms as re-canalization of the aneurysm and/or coil compaction can occur over time.

[0006] It is therefore desirable to have a device which easily, accurately, and safely occludes a neck of an aneurysm or other arterio-venous malformation in a parent vessel without blocking flow into perforator vessels communicating with the parent vessel.

SUMMARY

[0001] In some aspects, the present disclosure relates to a braid for treating an aneurysm. The braid can include a lumen with a distal end opposite a proximal end.

[0002] In one embodiment, an occlusive device for treating an aneurysm is disclosed. The device can include a braid that is translatably disposable within a microcatheter from a collapsed state to a deployed state. The braid can include a distal end and a proximal end. In the deployed state, the braid can include an outer occlusive sack capable of pushing against an aneurysm wall of the aneurysm. In the deployed state, the braid can also include an inner occlusive sack disposed inside and/or internally overlaid with the outer occlusive sack.

[0003] In some embodiments, a porosity of the inner occlusive sack can be greater than a porosity of the outer occlusive sack.

[0004] In some embodiments, in the deployed state, the outer occlusive sack is capable of sealing against the neck of the aneurysm.

[0005] In some embodiments, distally translating the braid after the outer occlusive sack is formed causes an inner layer of the braid inside of the outer occlusive sack to radially expand inside the outer occlusive sack and form the inner occlusive sack. The inner layer of the braid can be capable of radially expanding inside the outer occlusive sack while the outer occlusive sack is pushed against the aneurysm wall and aneurysm neck. In some embodiments, a marker band can be in communication with the proximal end of the braid. The inner layer that radially

expands inside the outer occlusive sack can be formed by folding the proximal end over the marker band.

[0006] In some embodiments, in the deployed state, the braid is detachable from a delivery system in the aneurysm. The delivery system can include a microcatheter and 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. In this regard, the delivery tube can be translatablely disposable within the microcatheter. The delivery tube can be capable of distally translating the braid within the microcatheter from the collapsed state to the deployed state.

[0007] In some embodiments, the outer occlusive sack is a collapsible cage-like vaso-occlusive structure.

[0008] In some embodiments, the outer occlusive sack can have fewer wire segments than the inner occlusive sack.

[0009] In some embodiments, the device can be in communication with an imaging device capable of imaging the outer and/or inner occlusive sacks with respect to the aneurysm. An orientation and/or packing density of the outer and/or inner occlusive sacks can be adjustable by the braid being distally or proximally moved.

[0010] In some embodiments, a braid for treating an aneurysm is disclosed. The braid can include a first radially expandable segment operable to move from a collapsed state within a microcatheter to a deployed state distal of the microcatheter. The first radially expandable segment can be capable of radially expanding to form an outer occlusive sack in the aneurysm in the deployed state that is sealable against a neck of the aneurysm. The braid can also include a second radially expandable segment operable to move from the collapsed state within the microcatheter to the deployed state distal of the microcatheter. The second radially expandable segment can be capable of radially expanding inside the outer occlusive sack to form an inner occlusive sack in the outer occlusive sack in the deployed state.

[0011] In some embodiments, the braid is detachably deployable by a delivery system to an aneurysm.

[0012] In some embodiments, the braid can also include a buckle portion disposed between the first and second radially expandable segments, the buckle portion permitting the inner occlusive sack to be formed within, overlaid with, and/or expand (e.g. radially) in the outer occlusive sack when positioned across the neck of the aneurysm.

[0013] In some embodiments, dimensions of interstices of the braid vary at the proximal end versus the distal end so that a porosity of the outer occlusive sack is less than a porosity of the inner occlusive sack.

[0014] In some embodiments, a method of occluding an aneurysm is disclosed. The method can include positioning a radially expandable braid into vasculature of the aneurysm; forming a first radially expandable segment of the braid with a porosity lower than a porosity of a second radially expandable segment; distally pushing the braid into the aneurysm whereby the first radially expandable segment radially expands to form an outer occlusive sack; further distally pushing the braid thereby expanding the second radially expandable segment inside of the outer occlusive sack; positioning the first radially expandable segment adjacent or in communication with a neck of the aneurysm; deflecting, diverting or slowing flow into the aneurysm across the neck of the aneurysm when the outer occlusive sack is formed across the neck and the inner occlusive sack is formed therein.

[0015] In some embodiments, a method of delivering an occlusive device to an aneurysm is disclosed. The method includes slidably positioning a delivery tube within a microcatheter; positioning a radially expandable braid within the microcatheter, the braid being in a collapsed state within the microcatheter and comprising a distal end and a proximal end; attaching the proximal end of the braid to the distal end of the delivery tube; selectively positioning the microcatheter, the delivery tube, and the braid into vasculature of the aneurysm; distally sliding the braid from the microcatheter, by the delivery tube, towards the aneurysm; distally pushing the braid, by the delivery tube, into the aneurysm whereby a first radially expandable segment of the braid radially expands to form an outer occlusive sack, the outer occlusive sack being operable to lay across a neck of the aneurysm; further distally pushing the braid thereby expanding a second radially expandable segment of the braid inside of the outer occlusive sack while distally pushing the outer occlusive sack against the aneurysm wall and the neck of the aneurysm; and releasing the braid, including the outer and inner occlusive sacks, and withdrawing the delivery tube and the microcatheter from the aneurysm.

[0016] In some embodiments, the method also includes forming the first radially expandable segment with a porosity lower than a porosity of the second radially expandable segment; positioning the first radially expandable segment adjacent or in communication with a neck of the aneurysm; and deflecting, diverting or slowing flow into the aneurysm across the

neck of the aneurysm when the outer occlusive sack is formed across the neck and the inner occlusive sack is formed therein.

[0017] In some embodiments, the inner occlusive sack comprises an inner layer of the braid. The outer and inner occlusive sacks, when formed in certain embodiments, include a predetermined packing density range.

[0018] In some embodiments, the method includes imaging the outer occlusive sack and/or inner occlusive sack with respect to the aneurysm; determining whether the aneurysm is occluded by the outer occlusive sack and/or inner occlusive sack; and distally or proximally sliding the braid to adjust the outer occlusive sack and/or inner occlusive sack to occlude the aneurysm.

[0019] 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

[0020] Reference will now be made to the accompanying drawings, which are not necessarily drawn to scale.

[0021] FIG. 1A depicts an example occlusive device of this disclosure in a collapsed state.

[0022] FIG. 1B depicts an example occlusive device of this disclosure in a collapsed state within an example microcatheter.

[0023] FIG. 2 depicts an example occlusive device of this disclosure, wherein the braid is being deployed.

[0024] FIG. 3 is a schematic side view of an exemplary delivery system with an occlusive device in a deployed state.

[0025] FIG. 4A is an enlarged schematic side view of the delivery system and braid of FIGs. 1-3 as the occlusive device is being pushed into an example aneurysm;

[0026] FIG. 4B is an enlarged schematic side view of the delivery system and braid of FIGs. 1-3 as the occlusive device is being pushed into an example aneurysm;

[0027] FIG. 5A is an enlarged schematic side view of the delivery system and braid of FIGs. 1-3 as the occlusive device is being pushed into an example aneurysm;

[0028] FIG. 5B is an enlarged schematic side view of the delivery system and braid of FIGs. 1-3 after the occlusive device is deployed into an example aneurysm;

[0029] FIG. 6A is a perspective schematic view showing an exemplary delivery system for use with an example occlusive device;

[0030] FIG. 6B is a perspective schematic view of FIG. 6A but with partial cross-section of the delivery system and the occlusive device;

[0031] 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;

[0032] FIG. 7B is a perspective schematic view of FIGs. 6A-6B deployed with the exemplary delivery system detached from the occlusive device;

[0033] FIG. 8A is an enlarged view one step of an exemplary delivery system device being deployed into an aneurysm in accordance with this disclosure, wherein the system is shown moving from a collapsed condition to a deployed condition;

[0034] FIG. 8B is an enlarged view one step of an exemplary delivery system device being deployed into an aneurysm in accordance with this disclosure, wherein the system is shown moving from a collapsed condition to a deployed condition;

[0035] FIG. 8C is an enlarged view one step of an exemplary delivery system device being deployed into an aneurysm in accordance with this disclosure, wherein the system is shown moving from a collapsed condition to a deployed condition;

[0036] FIG. 8D is an enlarged view one step of an exemplary delivery system device being deployed into an aneurysm in accordance with this disclosure, wherein the system is shown moving from a collapsed condition to a deployed condition;

[0037] FIG. 8E is an enlarged view one step of an exemplary delivery system device being deployed into an aneurysm in accordance with this disclosure, wherein the system is shown moving from a collapsed condition to a deployed condition;

[0038] FIG. 8F is an enlarged view one step of an exemplary delivery system device being deployed into an aneurysm in accordance with this disclosure, wherein the system is shown moving from a collapsed condition to a deployed condition;

[0039] FIG. 8G is an enlarged view one step of an exemplary delivery system device being deployed into an aneurysm in accordance with this disclosure, wherein the system is shown moving from a collapsed condition to a deployed condition;

[0040] FIG. 8H is an enlarged view one step of an exemplary delivery system device being deployed into an aneurysm in accordance with this disclosure, wherein the system is shown moving from a collapsed condition to a deployed condition;

[0041] FIG. 9 depicts an example braid of this disclosure deployed in an example aneurysm;

[0042] FIG. 10A depicts an example prototype braid of this disclosure;

[0043] FIG. 10B depicts an example prototype braid of this disclosure;

[0044] FIG. 10C depicts an example prototype braid of this disclosure;

[0045] FIG. 10D depicts an example prototype braid of this disclosure;

[0046] FIG. 11 is a flow diagram for a method of delivering an occlusive device;

[0047] FIG. 12 is a flow diagram for a method of delivering an occlusive device.

DETAILED DESCRIPTION

[0048] 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.

[0049] 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.

[0050] 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.

[0051] As discussed herein, vasculature can be that of any “subject” or “patient” including of any human or 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.

[0052] 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.

[0053] Cerebrovascular aneurysms are known to be treated using embolic coils, which are delivered to the aneurysm sack via a microcatheter and detached in situ. It is understood that “packing density” is the volume of the aneurysm sack occupied by the coil mass. In previous coil approaches, multiple coils (e.g. five coils) have been used to pack the aneurysms and the packing density can typically range between 20-25%. The herein disclosed device improves on prior approaches by being operable to seal the aneurysm neck and pack the aneurysm to a higher packing density while avoiding risk of aneurysm rupture during package.

[0054] In previous embolic-based approaches, packing the aneurysm required in placement of coils into the aneurysm sack until the aneurysm obtained the desired packing density to occlude the aneurysm. However, obtaining such a density without risk of rupture was difficult, unsafe, and aneurysm morphology (e.g. wide neck, bifurcation, etc.), and the like, rendered it difficult, if not impossible, for an operator to re-position the coils once delivered and installed on site. Furthermore, aneurysms treated with multiple coils often reanalyze or compact as a result of poor coiling, lack of coverage across the aneurysm neck, as a result of flow, or even aneurysm size.

[0055] Relatedly, flow diverters that are deployed across the aneurysm neck can alter the flow of blood into the aneurysm. An example flow diverter can be a braided device with relatively low porosity. Over time, the aneurysms can heal by sealing the aneurysm neck with a high rate of success. However, flow diversion technology is not without limitations. Challenges include placement of the devices intra-vascularly due to vessel morphology, vessel tortuosity, or braid malposition. In addition, patients receiving a flow diverter must be on anticoagulation medicine for an extended period to prevent vessel thrombosis. Intracascular devices also aim to cut circulation into the aneurysm while minimizing the amount of metal in the vessel and significantly cutting, or eliminating the need for coagulation medication. These types of devices may also be easier to track and/or deploy at the lesion site.

[0056] The occlusive device 1 disclosed herein addresses these and other drawbacks of previous approaches. Turning to FIG. 1A, an example occlusive device 1 of this disclosure is shown in a collapsed state prior to being arranged with a microcatheter 20. FIG. 1B depicts the occlusive device of FIG. 1A arranged in the collapsed state within the microcatheter 20. As shown, device 1 can include a braid 10 formed from multiple self-expanding multi-filament segments that can be formed from a mesh. For example, braid 10 can include a first radially expandable segment 12 associated with an outer occlusive sack and a second radially expandable segment 13 associated with an inner occlusive sack. Braid 10 can also have a distal end 14 associated with segment 12, a distal end 18 associated with segment 13, and a proximal end 16. Each of ends 14 and 18 can be opened.

[0057] The mesh of braid 10 can be defined by one or more mesh patterns, one or more discrete mesh portions, and/or one or more mesh openings defined by braided filaments. For example, the mesh of braid 10 can include a porosity region associated with an outer occlusive sack formed by braid 10 and another porosity region associated with an inner occlusive sack configured to expand and/or internally overlay the outer occlusive sack. The inner occlusive sack can have a higher porosity than the outer occlusive sack. For example, the mesh of braid 10 shown in FIGs. 1A and 1B can include a different porosity region associated with each of segments 12, 13. Each of segments 12, 13 can be radially expandable and capable of being disposed inside microcatheter 20 in a collapsed state. Segment 12 can be an expandable, outer shell while segment 13 can be an inner, expandable shell. Each of segments 12, 13 can be heat shaped to spherical, saddled, ellipsoid shaped, or any other shape, as shown in FIGs. 1-2.

Though only segments 12, 13 are depicted, any number of segments and corresponding sacks could be included as needed or required. Each of segments 12, 13 can be capable of being moved from the collapsed state to a deployed state.

[0058] In practice, the porosity of segment 12 can permit segment 12 to take on many shapes prior, during, or after delivery to aneurysm A. For example, the porosity of segment 12 can be relatively low to permit it to flexibly conform to a plurality of different shaped aneurysms. Segment 12 can have porosity less than the porosity of segment 13 based on differing aperture sizes. The porosities associated with segments 12, 13 and/or any other region or segment of braid 10 can also include filaments having a different shape and/or pick count than the filaments in the other porosity regions.

[0059] The mesh of braid 10 can be comprised of a tube that is closed at one end (e.g. proximal end 16) and/or opened at distal ends 14 and 18 and be made of several materials such as deposited thin films. The 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 porosity, shape in the deployed state, flexibility, stiffness, and the like. The combination of the one or more sacks internally overlaid with an outer occlusive sack can be taken into account when determining the number of wires of the mesh of braid 10 since one sack is inside the other. Fewer wires of the mesh of braid 10 can be used as a whole and still result in a high packing density when combined.

[0060] The diameter of the braid 10, and the braid wire count can vary depending the diameter of the device needed to treat the aneurysm, and/or the desired porosity. For example, the distal end 14 of segment 12 can be an open end with a first diameter. The distal end 18 of segment 13 can be an open end with a second diameter that is less than the first diameter in the deployed state. The braid angle of the braid 10 can also be fixed, or vary along the length of braid 10 to create different porosity therealong. For example, to induce or facilitate formation of the predetermined shape and strength of the occlusive sacks of segments 12 and 13, ends 14 and 18 may be more pliable than end 16, or vice versa, and other segments of braid 10 may vary from most pliable on or about end 14 and/or end 18 and less pliable on or about end 16. In some embodiments, ends 14, 18 can be looped as shown, which is particularly advantageous to ensure that the braid 10 is atraumatic when in contact with the dome D of aneurysm A.

[0061] The number of wires, braid angle, patterns, or the like, can be used to define the porosities of segments 12, 13. The wires of braid 10 can be made from nitinol with interwoven platinum filaments for radiopacity, or Drawn Filled Tube (DFT) Nitinol with 10 to 40% Platinum. The wires can be made from a nickel-titanium alloy, cobalt chromium alloys, Stainless Steel, Tantalum, and/or other alloys, and/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. In this respect, the first porosity associated with segment 12 can be less than the second porosity associated with segment 13. Arranging segments 12, 13 in the deployed state, varying the braid properties, and/or positioning segment 12 adjacent or in communication with a neck of the aneurysm can facilitate inversion and/or deflect, divert or slow flow into the aneurysm. Material properties of segments 12, 13 can differ in other respects as well, as needed or required, including heat treatment or covering.

[0062] 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.

[0063] As shown in FIGs. 1B and FIG. 2, the delivery system 40 can include the microcatheter 20 with a delivery tube 30 slideably disposed therein. The microcatheter 20 can be pre-placed at the level of the aneurysm neck and used to track the device to the aneurysm. The microcatheter 20 size can be selected in consideration of the size, shape, and directionality of the aneurysm or features through which the microcatheter 20 must pass 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 a surgical 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.

[0064] 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 30 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, for example by tracking marker band 44. Delivery tube 30 can be in mechanical connection with braid 10 at locking portion 54. As shown more particularly below, locking portion 54 can comprise or be a pusher ring. 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 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 the collapsed state within microcatheter 20 to its deployed state external to microcatheter 20 with segments 12 and 13.

[0065] In the deployed state, some or all of braid 10 is distal of microcatheter 20 so that segments 12, 13 can radially expand. Braid 10 is particularly advantageous as it is capable of being collapsed within microcatheter 20 while also being capable of forming multiple occlusive sacks in the deployed state. The mesh of braid 10 can be configured so that as braid 10 is distally translated and its end 14 exits from within microcatheter 20, segment 12 can radially expand to form an outer occlusive sack of the first porosity. The outer occlusive sack can be formed as end 14 slides away from end 24 of microcatheter 20.

[0066] As braid 10 is further distally translated, segment 13 can begin to radially expand internal to the outer occlusive sack of segment 12. By radially expanding inside segment 12, segment 13 can form an inner occlusive sack with a porosity greater than the porosity of segment 12, as shown in FIG. 2 whereby the respective sacks of segments 12, 13 are shown formed in a deployed state, segment 13 being internal to segment 12, but still connected to delivery tube 30 via locking portion 54. In FIG. 2, the distal end 14 can form the outer layer of the outer occlusive sack of segment 12 while the proximal end 16 can form the outer layer of the inner occlusive sack of segment 13.

[0067] As shown in FIG. 1B and FIG. 2, end 16 can be disposed on or adjacent marker band 44 and locking portion 54. The end 14 can be inserted through marker band 44 until proximal end 16 is disposed on or adjacent band 44 at locking portion 54. Locking portion 54

can then be connected to and/or folded over end 16. Braid 10 is not so limited and instead of being folded over, proximal end 16 can be operatively connected to locking portion 54 by sonic weld, mechanical attachment, or adhesive. Regardless of connection, the proximal end 16 being operatively connected to locking portion 54 can cause formation of an outer layer of the braid 10. When arranged and assembled with microcatheter 20 and a delivery tube 30, the device 1 can be delivered to the lesion site.

[0068] 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 but not delivered to an aneurysm. As shown, each of segments 12 and 13 can have a generally spherical shaped segment associated with their respective occlusive sacks. While segment 12 of FIG. 3 shows that portions about and/or in communication with marker band 44 can be mirrored ellipsoids.

[0069] In practice, as shown in FIGs. 4A to 5B, the braid 10 can be pushed into the aneurysm A by the delivery tube 30 and be deployed with the lower porosity outer layer of segment 13 laying across the neck of the aneurysm A, and the inner layer of segment 12 can be expanding inside of the outer layer while pushing the outer layer in position against the aneurysm wall and aneurysm neck. In particular, 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 outer diameter of segments 12, 13 can radially expand to a diameter greater than the microcatheter 20. Prior to the arrangement of FIG. 4A, the braid 10 can be assembled with a delivery tube 30 and/or a microcatheter 20 in a collapsed state. In this respect, the delivery system 40 and 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.

[0070] Turning to FIG. 4A, sack 12 has radially expanded towards the outer walls of aneurysm A while unexpanded portions proximal thereof of braid 10 continue to be translated by delivery tube 30. Braid 10 can expand as it as it distally moves away from end 24 of catheter 20 or upon its end 14 contacting aneurysm A. When expanding from the collapsed state to the state of FIG. 4A, segment 12 can radially expand to form the outer occlusive sack within aneurysm A. As shown in FIG. 4A, segment 12 can be a generally spherical shape internal to aneurysm A

while segment 13 in turn remains mostly collapsed and stored within microcatheter 20. However, the portion of segment 13 distal of microcatheter 20 on or about its end 18 has begun to radially expand. Delivery tube 30 may include one or more fasteners operable to securely fasten braid 10 in place prior to deployment.

[0071] In FIG. 4B, the delivery tube 30 has distally slid braid 10 deeper into aneurysm A so that the outer surface of segment 12 has moved closer to dome D. Marker band 44 has been distally translated closer and tucked into the neck of aneurysm A. It is understood that the outer surface of braid 10 can be made from nitinol with interwoven platinum filaments for radiopacity. 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 transition portion 19 (e.g., depicted in FIGs. 1A-1B) so that as braid 10 and delivery tube 30 are distally translated away from microcatheter 20 and deeper into aneurysm A, segments 12 can also translate causing radial expansion and formation of their respective occlusive sacks. In certain embodiments, portion 19 shown in FIG. 1 can initiate radial expansion of segment 13 inside segment 12. For example, translation of braid 10 a first predetermined distance can cause segment 12 to radially expand to form its outer occlusive sack. Further translating braid a second predetermined distance into aneurysm A, as is shown in FIG. 4B can cause the inner occlusive sack of segment 13 to form inside of the outer occlusive sack.

[0072] In FIG. 5A, the delivery tube 30 is distally translated deeper into aneurysm A. Moving between FIGs. 4A to 5A, it is shown that distally translating the braid 10, by the delivery tube 30, deeper into aneurysm A can cause segment 12 to further radially expand. Further distal translation also can cause band 44 to further tuck into braid 10, including segments 12, 13, which can cause the proximal portion of segment 12 adjacent or in communication with the neck of the aneurysm to become more spherical. In certain embodiments, the widening of segment 12 between FIGs. 4A and 5A can cause end 14 to slide proximally back towards end 24 of microcatheter while segment 13 continues to expand radially. For example, as end 14 of segment 12 expands to a larger diameter between FIGs. 4A and 5A, end 14 may also be drawn proximally from end 18 yet expand outwardly while end 18 may remain on or adjacent the dome of the aneurysm.

[0073] As also seen moving between FIGs. 4A to 5A, the junction between end 16 of braid 10, locking portion 54, and delivery tube 30 can move from within microcatheter 20 in the collapsed state to completely within aneurysm A in the deployed state. Once braid 10, including segments 12 and 13, are selectively positioned and arranged to the desired condition (e.g. braid 10 has been translated distally to expand segments 12, 13 to form the outer and inner sacks and/or braid 10 has expanded to a predetermined packing density), the outer occlusive sack of segment 12 can be seen being sealed against the aneurysm neck with its porosity being lower than the porosity of segment 13 to deflect, divert or slow flow into the aneurysm. At this point, braid 10 can be detached from the delivery tube 30 as shown in FIG. 5B. In other words, as the braid 10 is distally translated towards the dome of the aneurysm A, segments 12, 13 can expand and be used to support the aneurysm wall in a manner that is easy, efficient, and avoids risks of rupture (e.g., see also FIGs. 8G-8H).

[0074] Once expanded and positioned, delivery tube 30 can be proximally translated back into microcatheter 20 and retracted from the braid 10 and aneurysm A. FIG. 5B shows an example arrangement of braid 10 in its expanded state and the inner and outer sacks of segments 13 and 12, respectively, completely formed with delivery tube 30 having detached from locking portion 54. FIG. 5B merely shows example spherical sacks of segments 12, 13 fully formed in a manner sufficient to occlude aneurysm. However, if either sack of segments 12, 13 is not precisely positioned or need to be reset or adjusted within aneurysm A for safe occlusion without risk of rupture, braid 10 can be retracted back into microcatheter 20 by proximally withdrawing delivery tube 30 while still attached to braid 10.

[0075] In FIG. 5B, since the sacks of segments 12, 13 have 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. Marker band 44 and locking portion 54 has also distally translated so that it is positioned on or adjacent the neck of the aneurysm A. Expanding segments 12, 13 and tucking band 44 and/or locking portion 54 into the braid 10 is particularly advantageous as it can prevent braid 10 from creating a protrusion that would otherwise extend into the parent vessel. Instead, any such protrusion can now be tucked into segment 12. Arranging braid 10 in this manner across the neck of the aneurysm while also varying the porosity of segments 12, 13 can create a flow diversion essentially inside of the sacks of braid 10.

[0007] 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.

[0008] 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.

[0009] As shown in FIG. 6A, 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.

[0076] FIGs. 8A-8H depict example embodiments of braid 10 being deployed and delivered to an example aneurysm A. Specifically, in FIG. 8A, braid 10 can be seen being initially advanced into aneurysm A. End 24 of microcatheter 20 has been selectively positioned at the neck of aneurysm A while end 14 of braid 10 is being advanced distally towards aneurysm A and away from end 24 of microcatheter 20. In FIGs. 8B-8C, end 14 of braid 10 continues to be distally advanced towards dome D of aneurysm A while microcatheter 20 remains generally stationary until as seen in FIGs. 8D to 8E, end 14 of braid 10 contacts dome D and segment 12 begins radially expanding to form the outer occlusive sack of braid 10. In FIG. 8C in particular, the outer occlusive sack of segment 12 is nearly fully formed as braid 10 has continued its distal translation into aneurysm A. In FIG. 8D, braid 10 continues to be distally translated until its outer occlusive sack of segment 12 is fully formed. In FIG. 8D specifically, it can be seen that the outer occlusive sack of segment 12 is now adjacent and supporting dome D. Braid 10 meanwhile may continue to be translated to form inner occlusive sack of segment 13. The inner occlusive sack of segment 13 as shown can overlay sack 12 for additional stability. Further, by having segment 12 contact dome D causes segment 12 to begin to take shape as braid 10 expands.

[0077] In FIG. 8F, braid 10 continues to be pushed into the aneurysm wall causing the inner occlusive sack of segment 13 to continue to expand while the outer occlusive sack of segment 12 continues to expand along the aneurysm wall. In FIG. 8G, braid 10 continues its distal translation whereby the inner occlusive sack of segment 13 has been formed inside the

outer occlusive sack and its based end has been pushed further into the segment 12, similar to coil packing. It is understood that any number of inner occlusive sacks can be positioned internal to segment 12 (e.g. by providing one or more additional segments capable of forming inner occlusive sacks) and the one or more additional inner occlusive sacks can be formed as braid 10 is distally translated into aneurysm A. A packing density of braid 10 can also be tailored or adjusted as braid 10 is distally translated to form the inner occlusive sack of segment 13 overlaid internal to sack 12. For example, when comparing the arrangement of FIG. 8F versus 8G, the stem portion aft of the inner occlusive sack of segment 13 can act to "pack" the outer occlusive sack of segment 12 as it is distally translated. In FIG. 8H, braid 10 has been distally translated to the desired depth in aneurysm A and now locking portion 54 is visible as being external to microcatheter 20 and at or adjacent the neck of aneurysm A. Since braid 10 and corresponding segments 12 and 13 are now selectively positioned, expanded, and arranged within aneurysm A, delivery tube 30 and microcatheter 20 can be released from braid 10 and proximally translated away from the aneurysm A. By arranging segments 12 and 13 as shown in FIGs. 8A-8H and forming the outer occlusive sack of segment 12 with a lower porosity than the inner occlusive sack of segment 13, the braid 10 can induce a flow diverting effect across the neck of the aneurysm.

[0078] FIGs. 10A-10D depict example prototype braids with varying braid properties. These prototypes are strictly for illustrative purposes.

[0079] FIG. 11 is a flow diagram for a method 1100 of delivering an occlusive device to the aneurysm. Step 1105 includes slidably positioning a delivery tube within a microcatheter. Step 1110 includes slidably positioning an expandable and inwardly invertible braid within the microcatheter, the braid being in a collapsed state within the microcatheter and comprising a distal end and a proximal end. Step 1115 includes detachably attaching the proximal end of the braid to the distal end of the delivery tube. Step 1120 includes selectively positioning the microcatheter, the delivery tube, and the braid into vasculature of the aneurysm. For example, the microcatheter can position the braid and the delivery tube at the neck of the aneurysm. Step 1125 includes distally sliding the braid, by the delivery tube, towards the aneurysm. Prior to step 1125, the distal end of the braid can be inserted through a marker band until a proximal end of the braid is on or adjacent the marker band. Step 1130 includes distally pushing the braid, by the delivery tube, into the aneurysm sack whereby the braid radially expands to form an outer

occlusive sack with a lower porosity operable to lay across the neck of the aneurysm. The outer occlusive sack can form upon or as the distal end of the braid is moved distally from the microcatheter and in communication with a dome of the aneurysm.

[0080] Step 1135 includes expanding an inner layer of the braid inside of the outer occlusive sack while distally pushing the outer occlusive sack against the aneurysm wall and aneurysm neck. The inner layer that expands inside the outer occlusive sack can form an inner occlusive sack and be formed by folding the proximal end over the marker band and then distally pushing the braid into the aneurysm as described. The porosity of the inner occlusive sack can be greater than the porosity of the outer occlusive sack. Step 1140 includes releasing the occlusive device, including the outer and inner occlusive sacks, and withdrawing the delivery tube and the microcatheter from the aneurysm. By varying the porosities of portions of the braid, when installed in the aneurysm and detached from the delivery system, the braid can induce a flow diverting effect across the neck of the aneurysm.

[0081] FIG. 12 is a flow diagram for a method 1200 of occluding an aneurysm. Step 1205 includes positioning a radially expandable braid within vasculature of the aneurysm. Step 1210 includes forming a first radially expandable segment of the braid with a porosity lower than a porosity of a second radially expandable segment. Step 1215 includes distally pushing the braid into the aneurysm whereby the first radially expandable segment radially expands to form an outer occlusive sack. Step 1220 includes further distally pushing the braid thereby expanding the second radially expandable segment inside of the outer occlusive sack. Step 1225 includes positioning the first radially expandable segment adjacent or in communication with a neck of the aneurysm. Step 1230 includes deflecting, diverting or slowing flow into the aneurysm across the neck of the aneurysm when the outer occlusive sack is formed across the neck and the inner occlusive sack is formed therein.

[0082] It is understood that variations of the braid 10 can include various materials such as stainless steel, bio absorbable materials, and polymers. Braid 10, including any specific portions such as any breaks, varying regions of differing porosities, and occlusive sacks, can be heat set to various configurations such as spherical, oblong, saddle shaped, or the like, for the purpose of shaping the outer and/or inner sack to better match the aneurysm morphology. In addition, the braid 10 can be heat shaped to include weak points to facility the radial expansion of the occlusive sacks. Further, interstices of braid 10 that form the sacks 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.

[0083] 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 braid being translatably disposable within a microcatheter from a collapsed state to a deployed state, the braid comprising a distal end and a proximal end;
wherein in the deployed state, the braid comprises:
an outer occlusive sack capable of pushing against an aneurysm wall of the aneurysm; and
an inner occlusive sack disposed inside the outer occlusive sack.
2. The device of claim 1, wherein a porosity of the inner occlusive sack is greater than a porosity of the outer occlusive sack.
3. The device of claim 2, wherein in the deployed state, the outer occlusive sack is capable of sealing against the neck of the aneurysm.
4. The device of claim 1, wherein distally translating the braid after the outer occlusive sack is formed causes an inner layer of the braid inside of the outer occlusive sack to radially expand inside the outer occlusive sack and form the inner occlusive sack.
5. The device of claim 4, wherein the inner layer of the braid is capable of radially expanding inside the outer occlusive sack while the outer occlusive sack is pushed against the aneurysm wall and aneurysm neck.
6. The device of claim 4, further comprising a marker band in communication with the proximal end of the braid,
wherein the inner layer that radially expands inside the outer occlusive sack is formed by folding the proximal end over the marker band.

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

8. The device of claim 7, the delivery system comprising:
a microcatheter; and
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 translatably disposable within the microcatheter;
wherein the delivery tube is capable of distally translating the braid within the microcatheter from the collapsed state to the deployed state.

9. The device of claim 1, wherein the outer occlusive sack comprises fewer wire segments than the inner occlusive sack.

10. A braid for treating an aneurysm, the braid comprising:
a first radially expandable segment operable to move from a collapsed state within a microcatheter to a deployed state distal of the microcatheter, wherein the first radially expandable segment is capable of radially expanding to form an outer occlusive sack in the aneurysm in the deployed state that is sealable against a neck of the aneurysm;
a second radially expandable segment operable to move from the collapsed state within the microcatheter to the deployed state distal of the microcatheter, wherein the second radially expandable segment is capable of radially expanding inside the outer occlusive sack to form an inner occlusive sack in the outer occlusive sack in the deployed state.

11. The braid of claim 10, the braid is detachably deployable by a delivery system to an aneurysm.

12. The braid of claim 10, the braid further comprising a buckle portion disposed between the first and second radially expandable segments, the buckle portion permitting the inner occlusive sack to be formed within, overlaid with, and expand in the outer occlusive sack.

13. The braid of claim 10, wherein dimensions of interstices of the braid vary at the proximal end versus the distal end so that a porosity of the outer occlusive sack is less than a porosity of the inner occlusive sack when positioned across the neck of the aneurysm.

14. A method of occluding an aneurysm, comprising:
positioning a radially expandable braid according to Claim 10 into vasculature of the aneurysm;

forming the first radially expandable segment of the braid with a porosity lower than a porosity of the second radially expandable segment;

distally pushing the braid into the aneurysm whereby the first radially expandable segment radially expands to form an outer occlusive sack;

further distally pushing the braid thereby expanding the second radially expandable segment inside of the outer occlusive sack;

positioning the first radially expandable segment adjacent or in communication with a neck of the aneurysm;

deflecting, diverting or slowing flow into the aneurysm across the neck of the aneurysm when the outer occlusive sack is formed across the neck and the inner occlusive sack is formed therein.

15. A method of delivering an occlusive device to an aneurysm, comprising:
slidably positioning a delivery tube within a microcatheter;
positioning a radially expandable braid within the microcatheter, the braid being in a collapsed state within the microcatheter and comprising a distal end and a proximal end;
attaching the proximal end of the braid to the distal end of the delivery tube;
selectively positioning the microcatheter, the delivery tube, and the braid into vasculature of the aneurysm;

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

distally pushing the braid, by the delivery tube, into the aneurysm whereby a first radially expandable segment of the braid radially expands to form an outer occlusive sack, the outer occlusive sack being operable to lay across a neck of the aneurysm;

further distally pushing the braid thereby expanding a second radially expandable segment inside of the outer occlusive sack while distally pushing the outer occlusive sack against the aneurysm wall and the neck of the aneurysm; and

releasing the braid, including the outer and inner occlusive sacks, and withdrawing the delivery tube and the microcatheter from the aneurysm.

16. The method of claim 15, further comprising:

forming the first radially expandable segment with a porosity lower than a porosity of the second radially expandable segment;

positioning the first radially expandable segment adjacent or in communication with a neck of the aneurysm; and

deflecting, diverting or slowing flow into the aneurysm across the neck of the aneurysm when the outer occlusive sack is formed across the neck and the inner occlusive sack is formed therein.

17. The method of claim 15, wherein the inner occlusive sack comprises an inner layer of the braid.

ABSTRACT

The present disclosure relates to a braid for treating an aneurysm. The braid can include a first radially expandable segment operable to move from a collapsed state within a microcatheter to a deployed state distal of the microcatheter. The first radially expandable segment can be capable of radially expanding to form an outer occlusive sack in the aneurysm in the deployed state. The braid can also include a second radially expandable segment operable to move from the collapsed state within the microcatheter to the deployed state distal of the microcatheter, wherein the second radially expandable segment is capable of radially expanding inside the outer occlusive sack to form an inner occlusive sack in the outer occlusive sack in the deployed state.

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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: 243382.000063

SIGNATURE of Applicant or Patent Practitioner

Signature: /Louis J. DeJuidice - 47,522/
Date (Optional): 2017-12-22
Name: Louis John DeJuidice
Registration Number: 47522
Applicant Name (if Applicant is a juristic entity): DePuy Synthes Products, Inc.

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. If more than one applicant, use multiple forms.

*Total of forms are submitted.

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POWER OF ATTORNEY BY APPLICANT

I hereby revoke all previous powers of attorney given in the application identified in either the attached transmittal letter or the boxes below.

Application Number	Filing Date

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☒ I hereby appoint the Patent Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above:

06980

OR

☐ I hereby appoint Practitioner(s) named in the attached list (form PTO/AIA/82C) as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the patent application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above. (Note: Complete form PTO/AIA/82C.)

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City	State	Zip		
Country				
Telephone	Email			

I am the Applicant (if the Applicant is a juristic entity, list the Applicant name in the box):

DEPUY SYNTHES PRODUCTS, INC.

- ☐ Inventor or Joint Inventor (title not required below)
- ☐ Legal Representative of a Deceased or Legally Incapacitated Inventor (title not required below)
- ☒ Assignee or Person to Whom the Inventor is Under an Obligation to Assign (provide signer's title if applicant is a juristic entity)
- ☐ Person Who Otherwise Shows Sufficient Proprietary Interest (e.g., a petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document) (provide signer's title if applicant is a juristic entity)

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.

This collection of information is required by 37 CFR 1.131, 1.32, and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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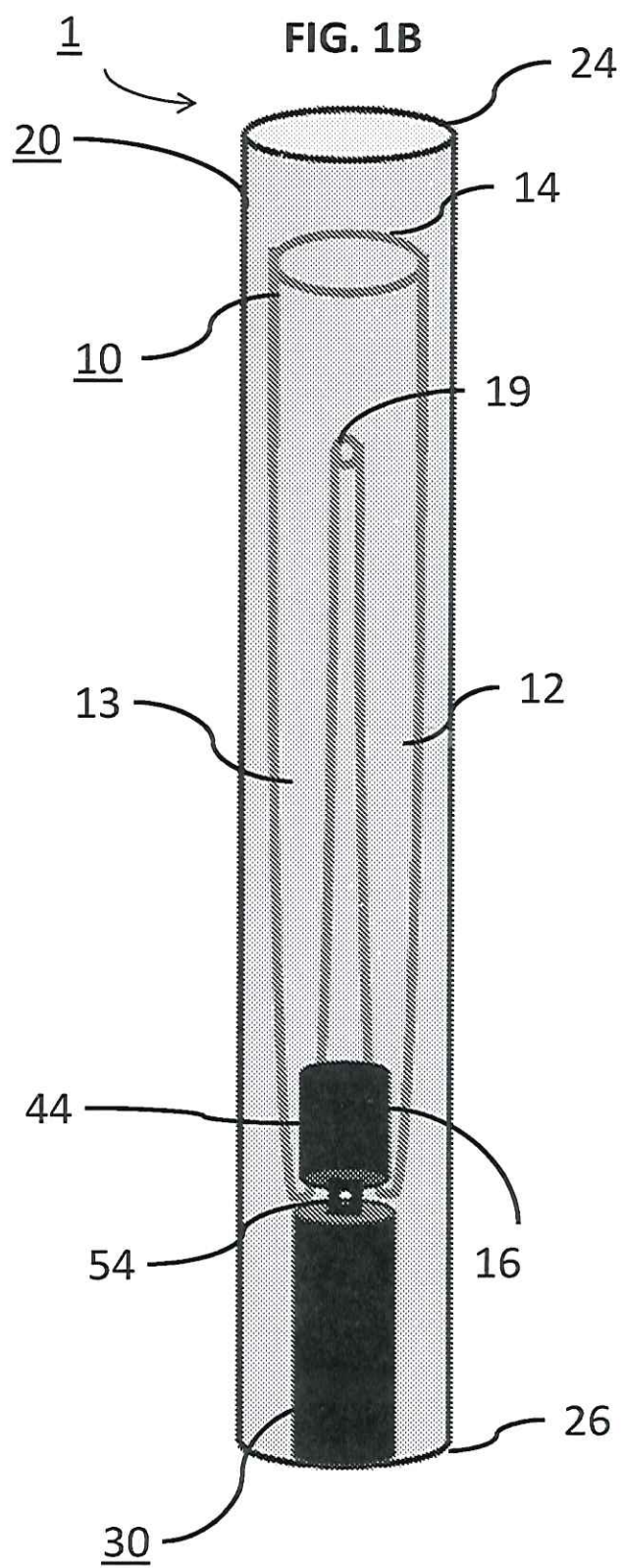
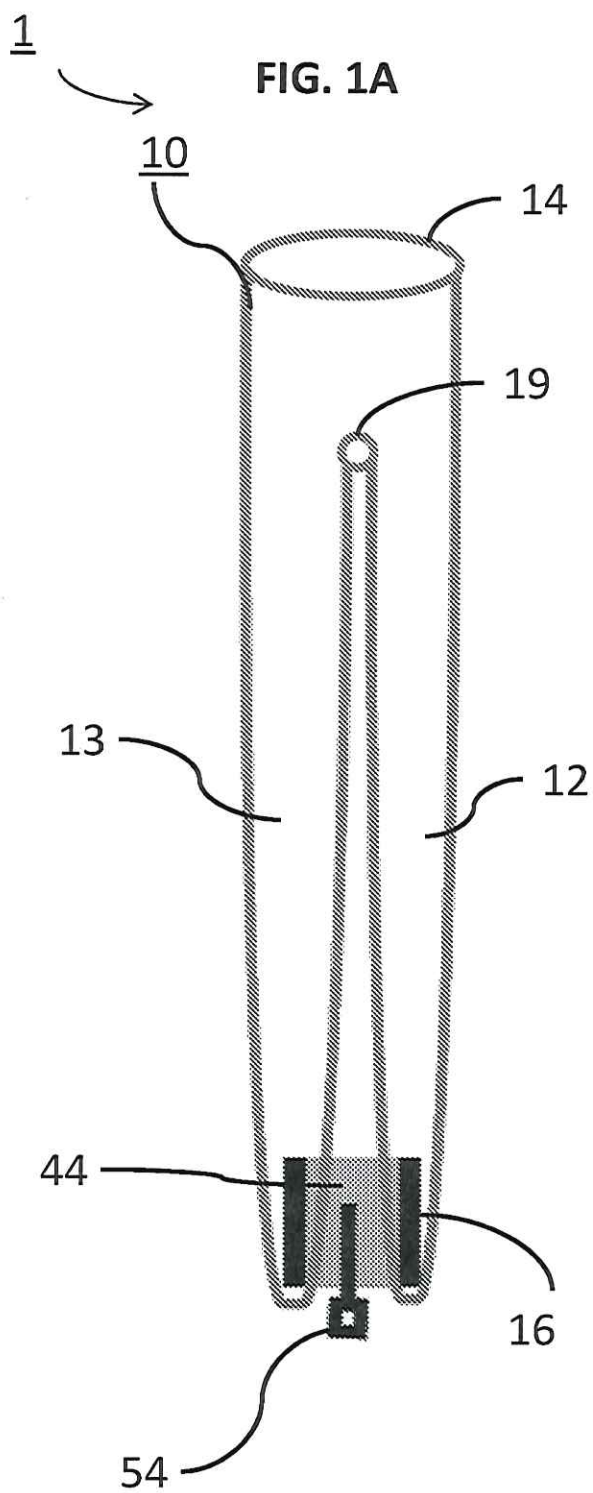


FIG. 2

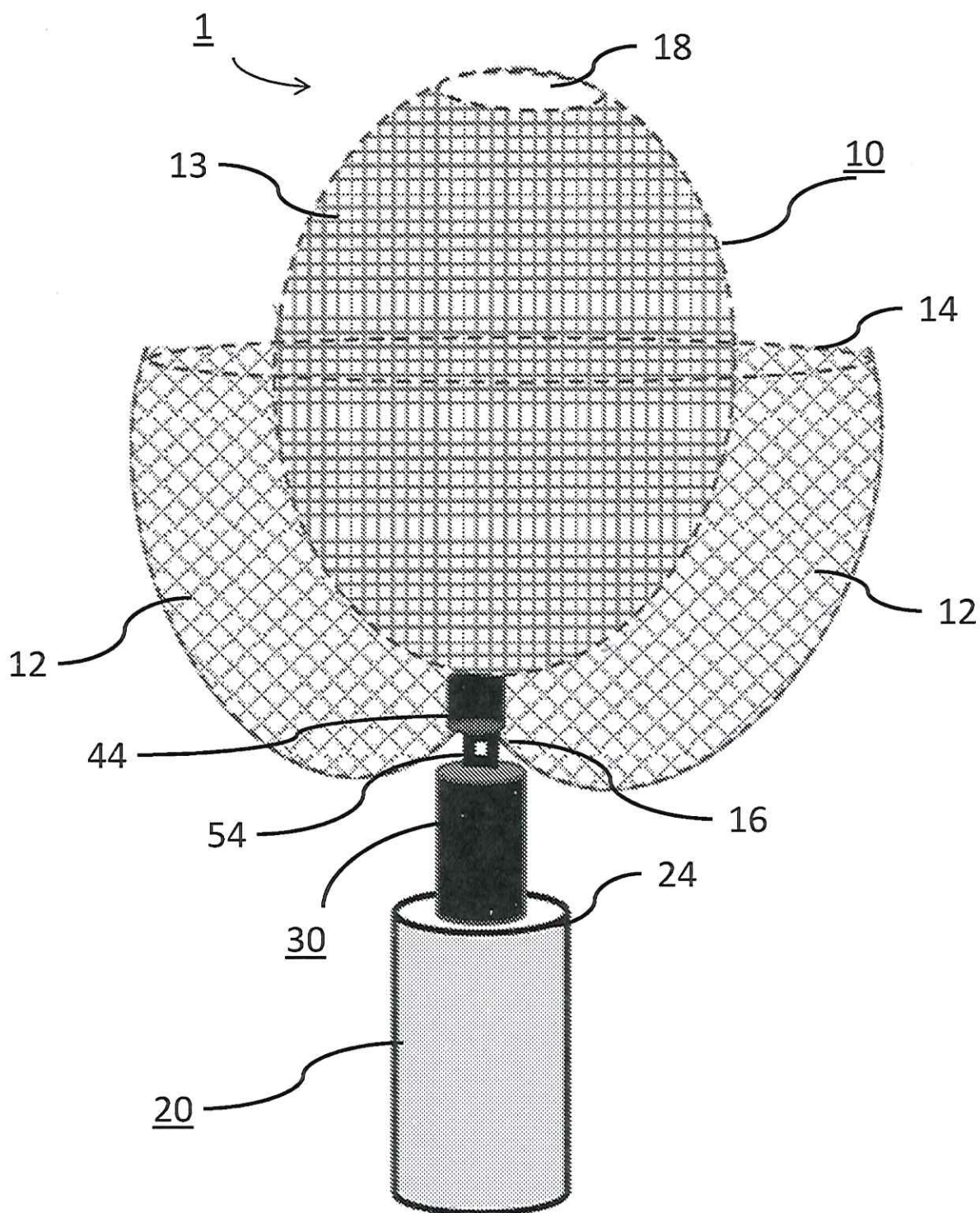


FIG. 3

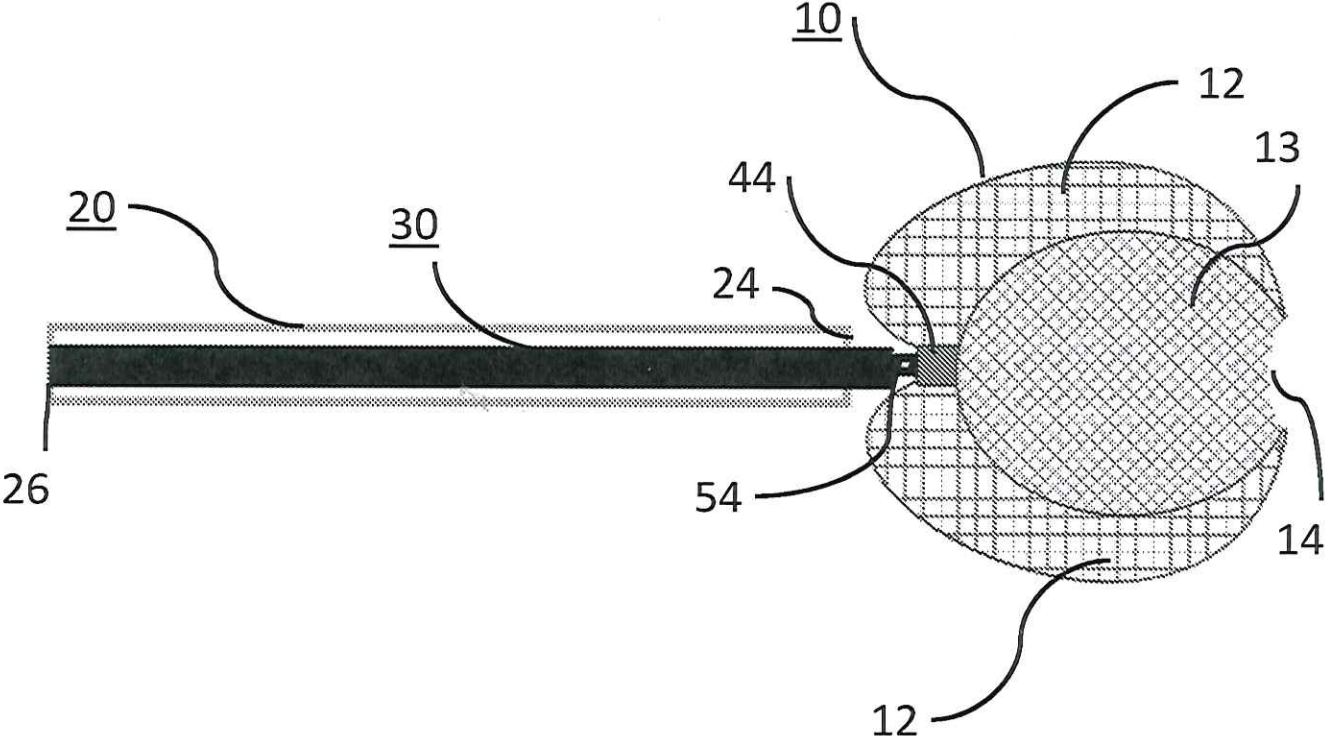


FIG. 4A

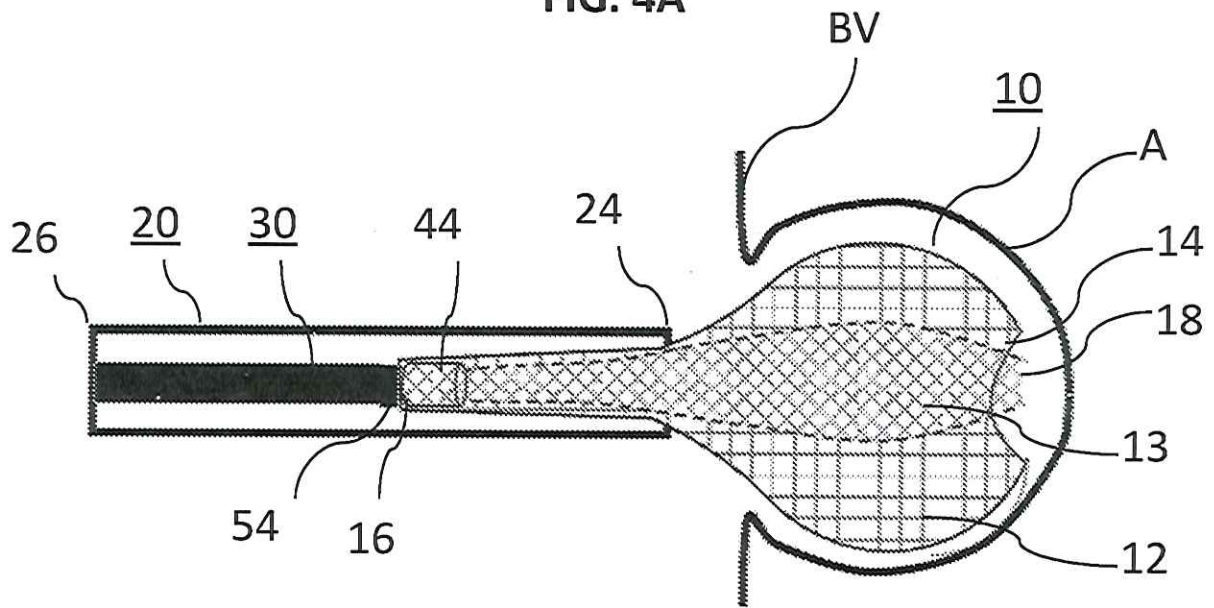


FIG. 4B

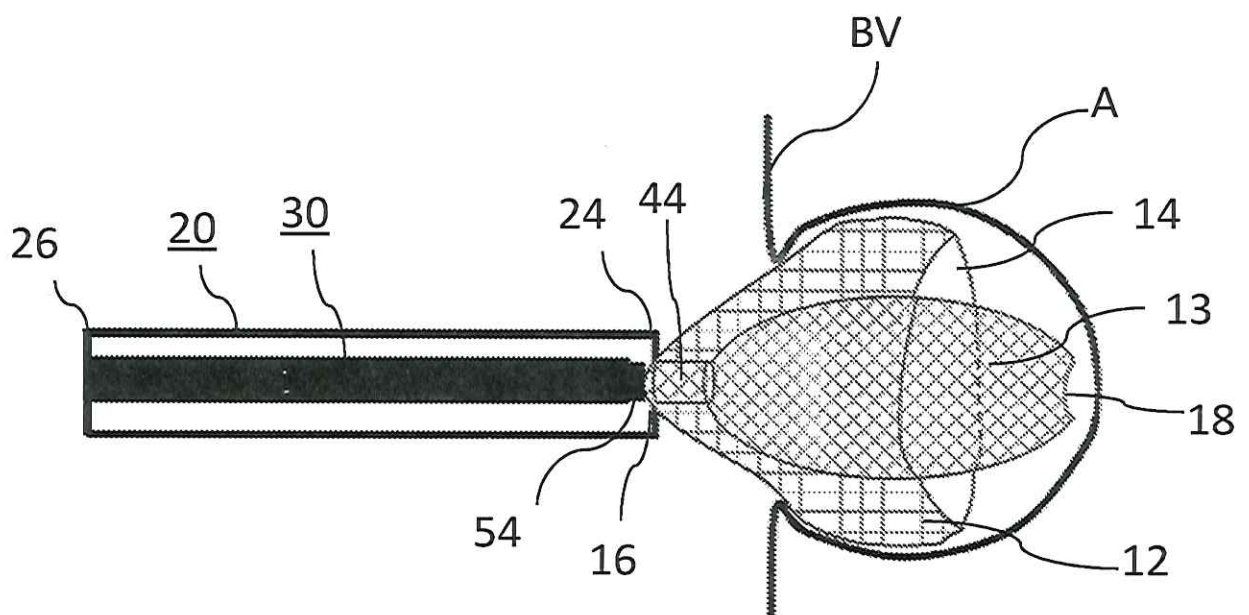


FIG. 5A

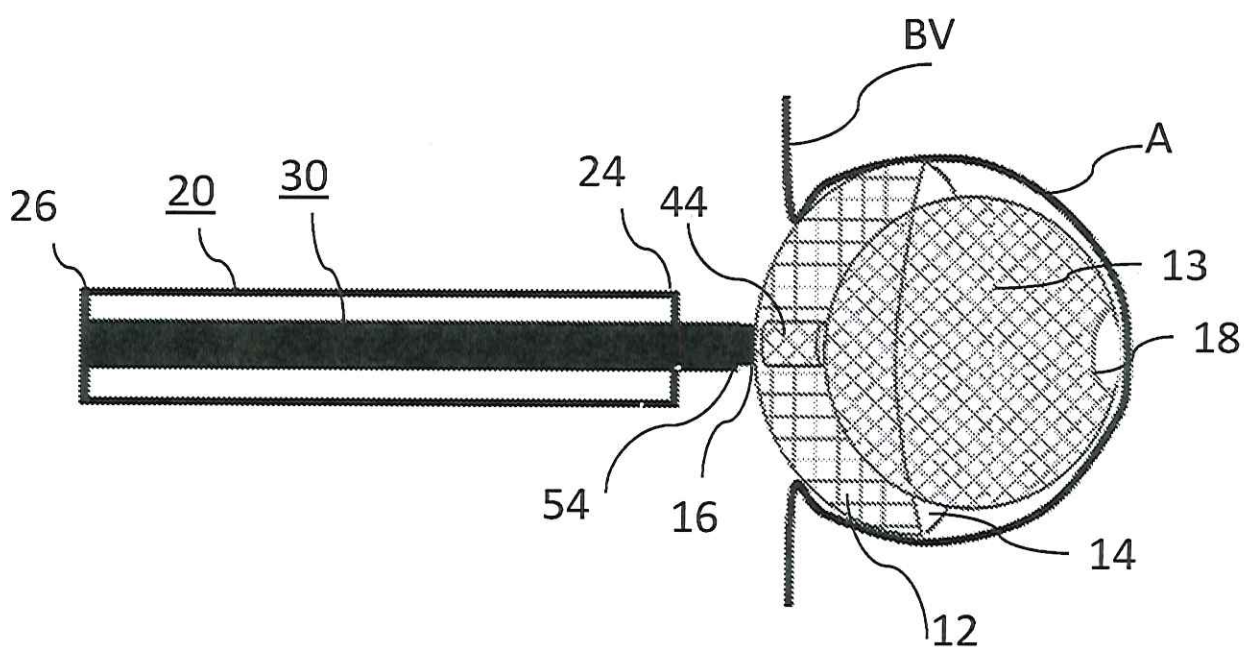


FIG. 5B

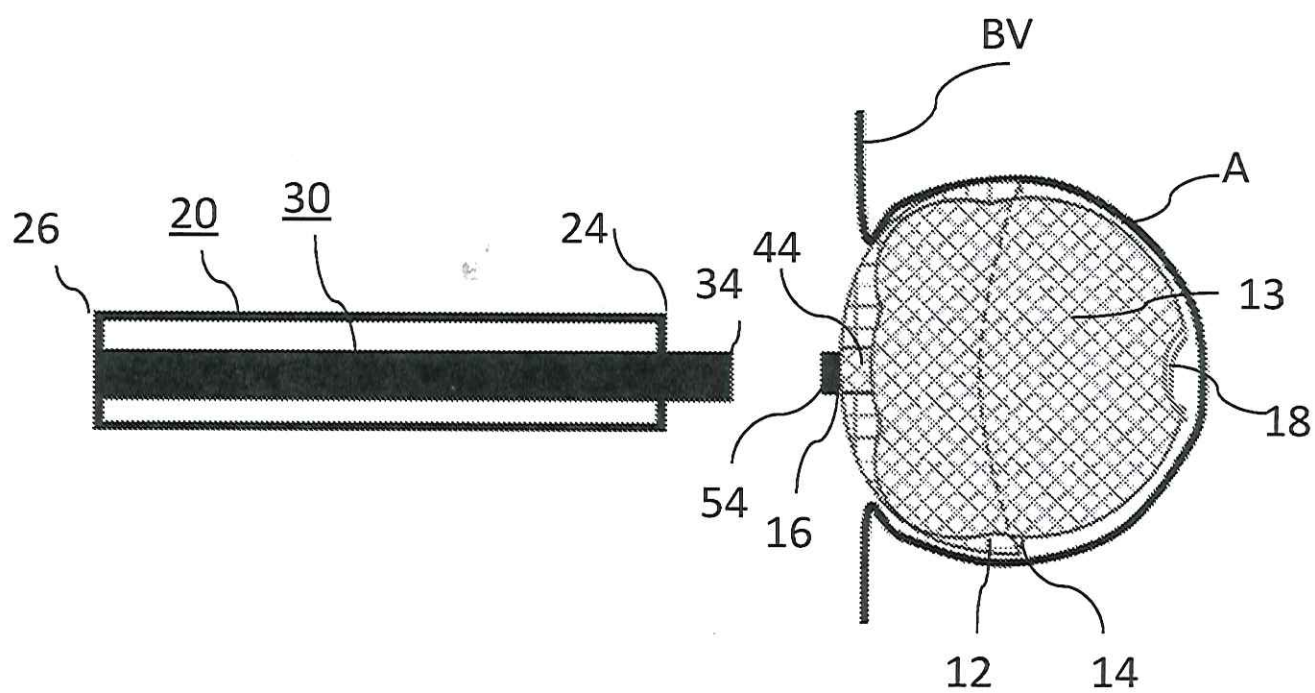


FIG. 6A

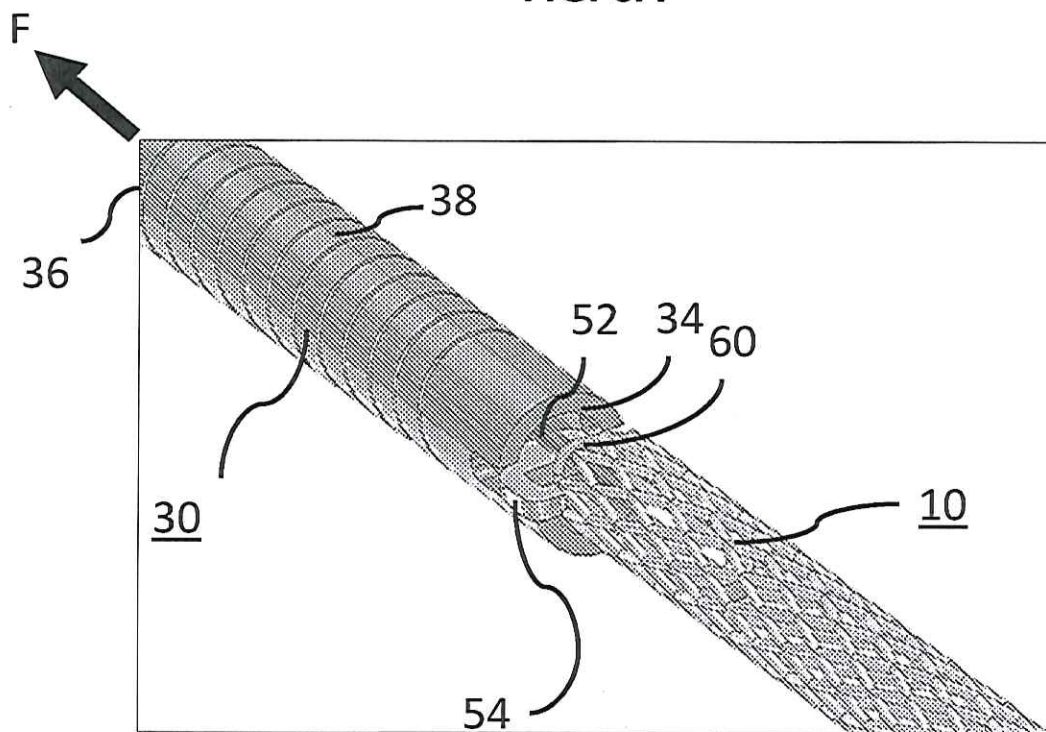


FIG. 6B

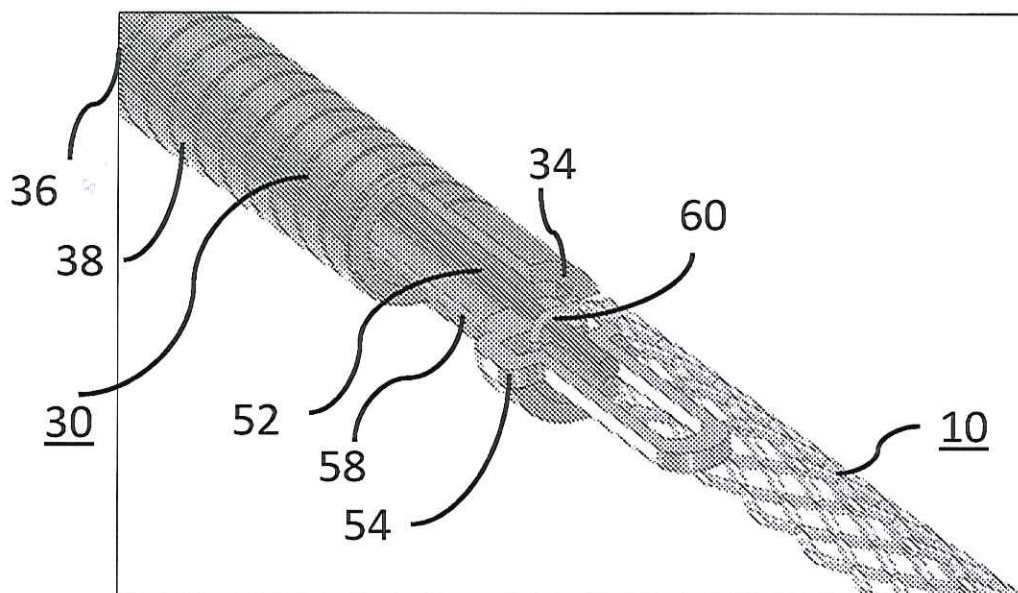


FIG. 7A

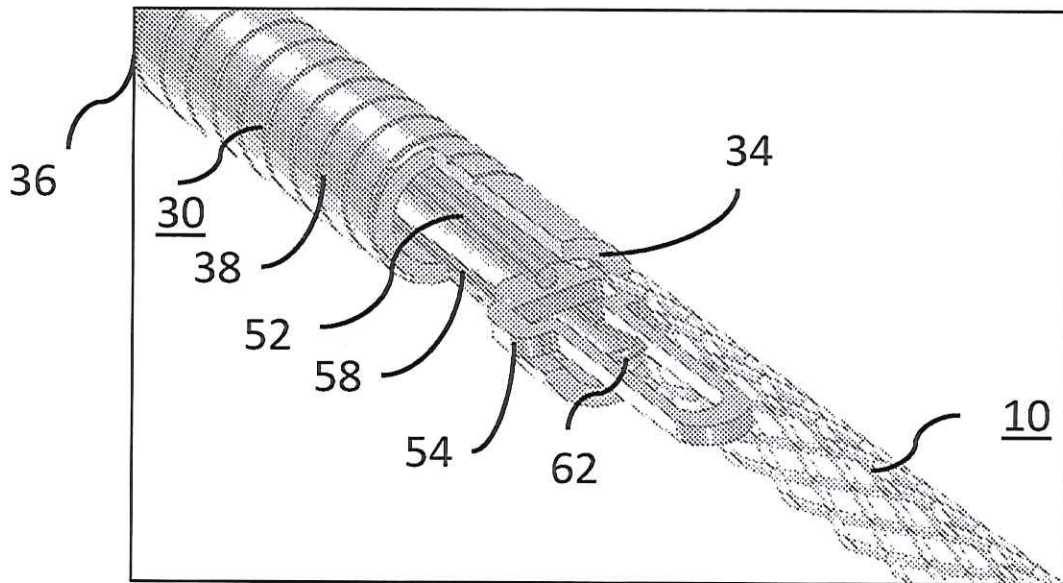


FIG. 7B

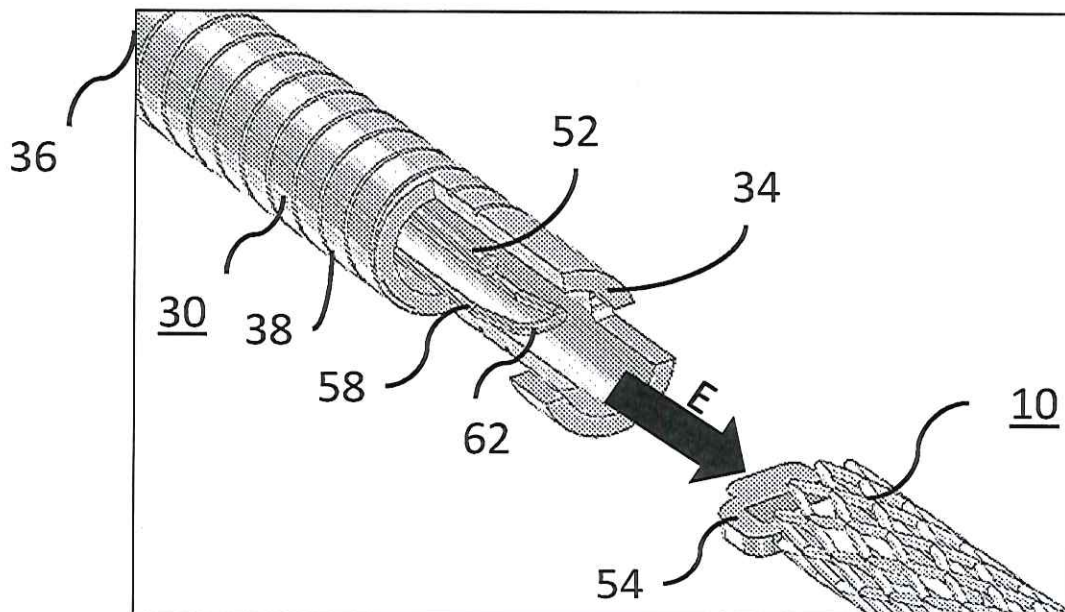


FIG. 8A

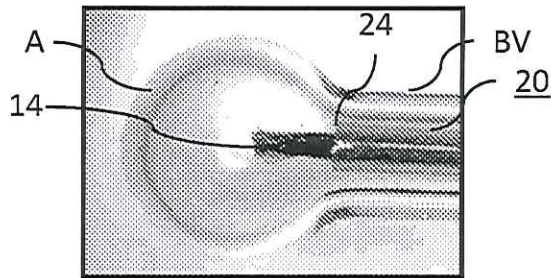


FIG. 8E

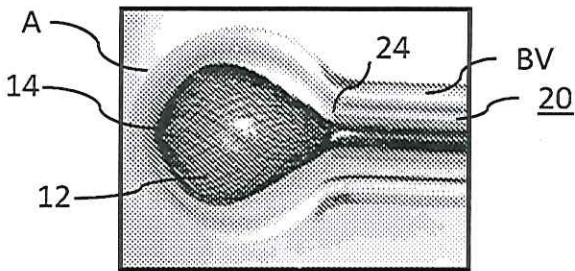


FIG. 8B

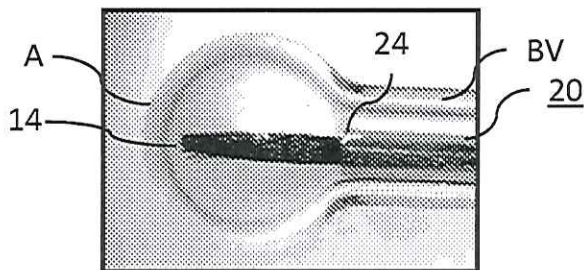


FIG. 8F

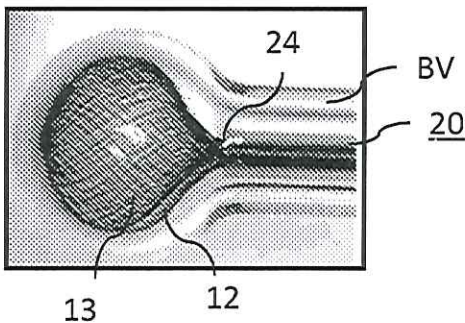


FIG. 8C

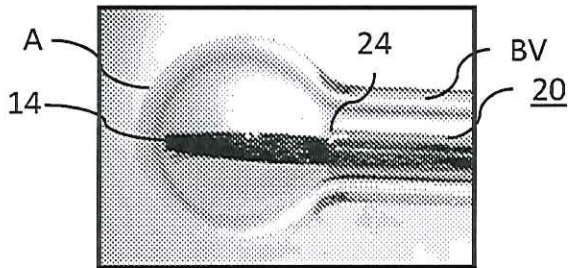


FIG. 8G

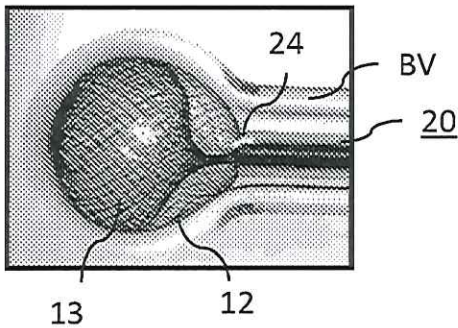


FIG. 8D

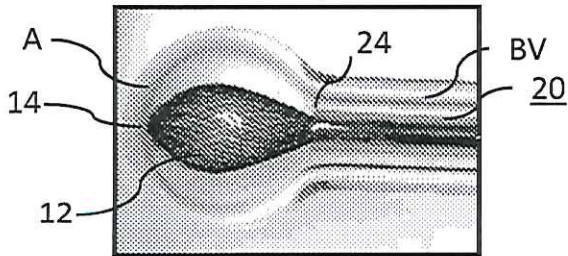


FIG. 8H

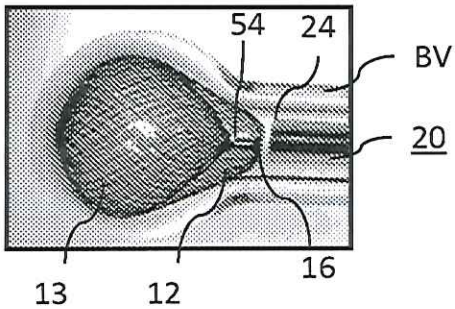


FIG. 9

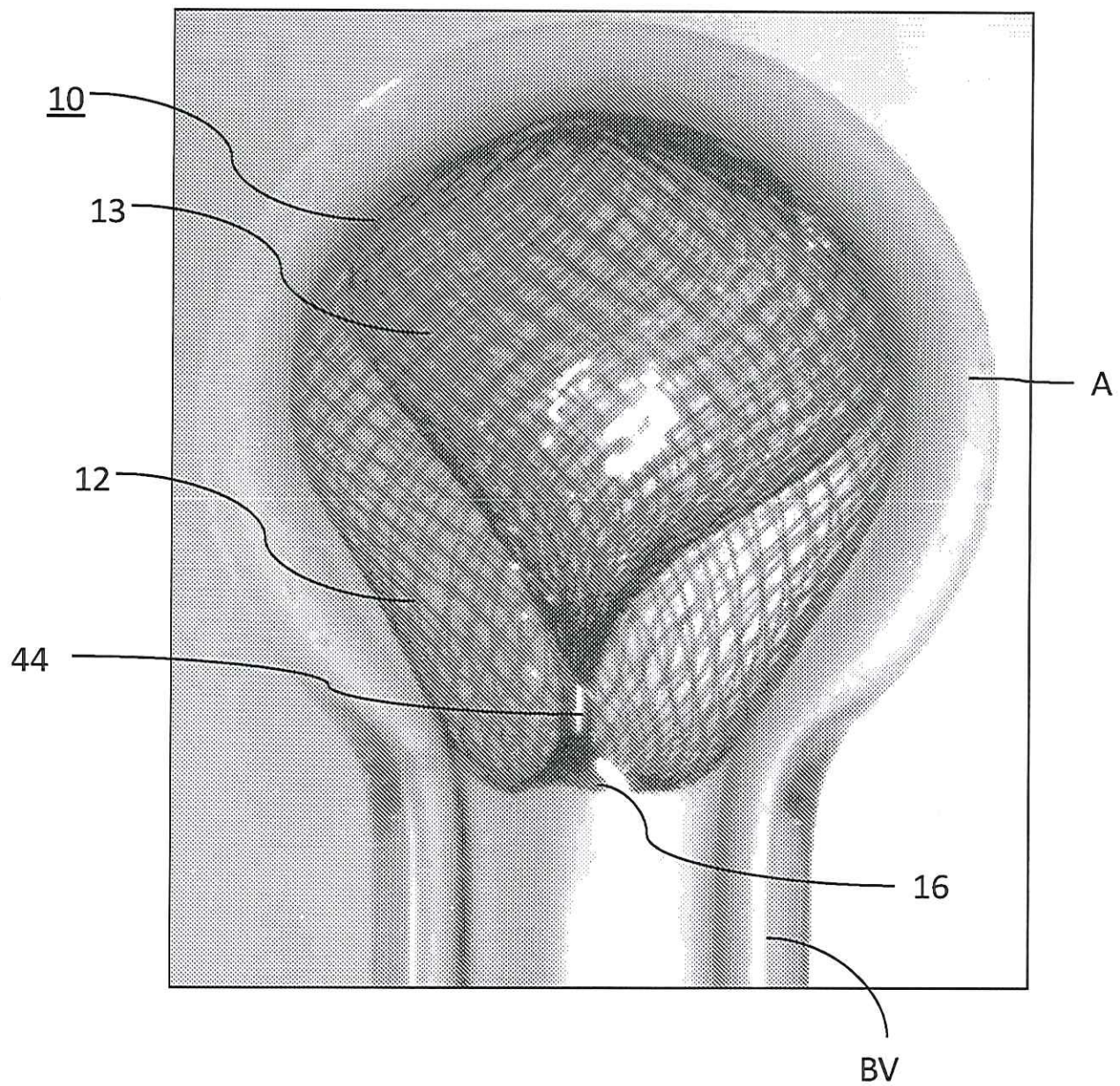


FIG. 10A

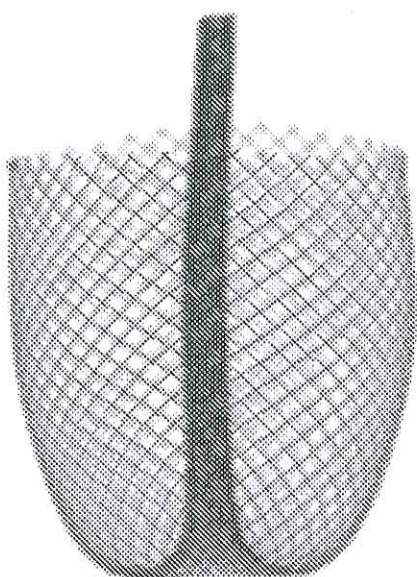


FIG. 10B

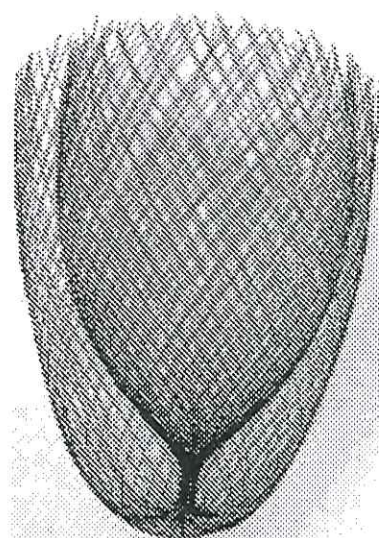


FIG. 10C

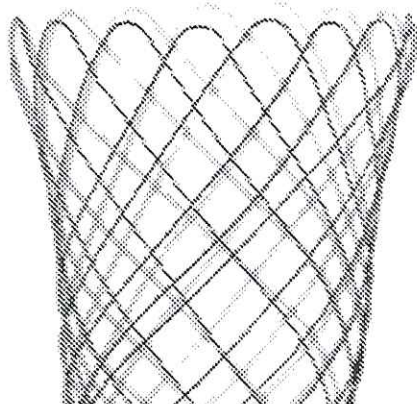
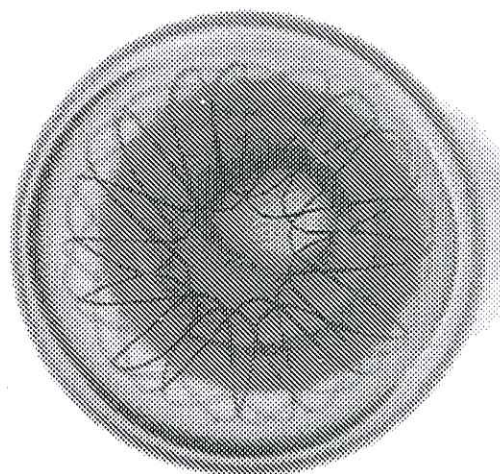


FIG. 10D



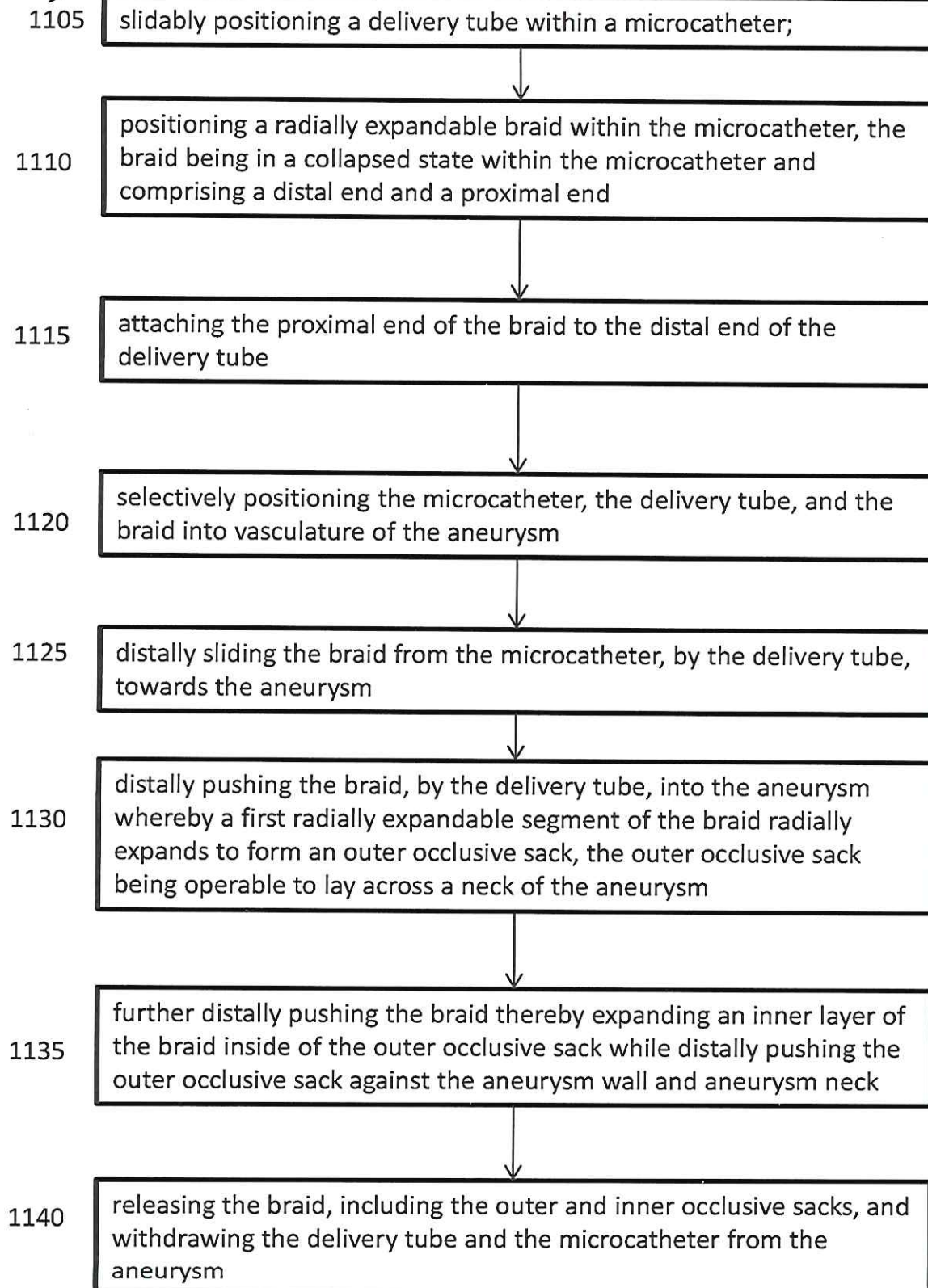
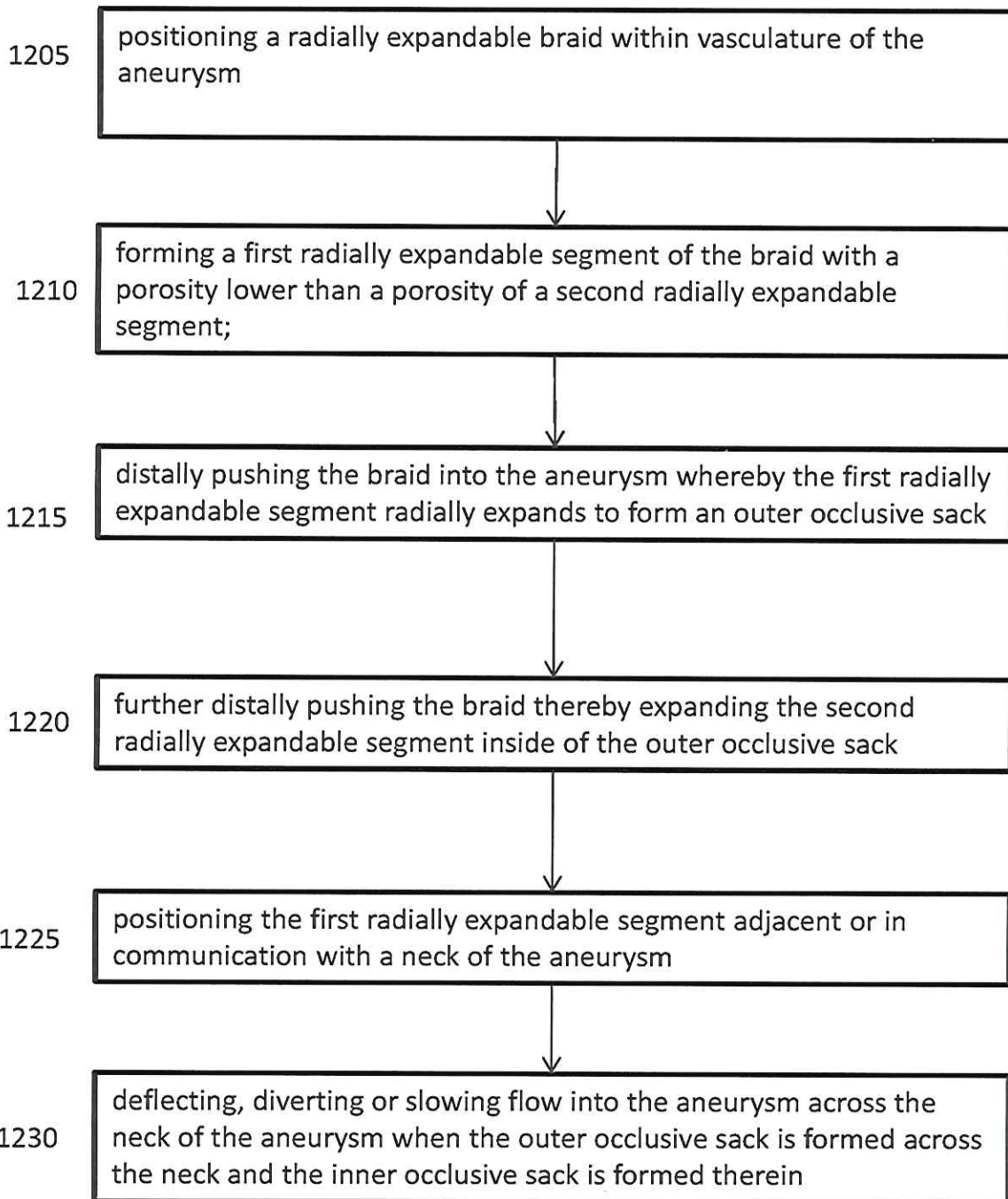
1100**FIG. 11**

FIG. 12

1200



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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	243382.000063
		Application Number	
Title of Invention	ANEURYSM DEVICE AND DELIVERY SYSTEM		
The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76. This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.			

Secrecy Order 37 CFR 5.2:

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

Inventor Information:

Inventor	1	<button>Remove</button>			
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
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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.					

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below. For further information see 37 CFR 1.33(a).			
☐ An Address is being provided for the correspondence information of this application.			
Customer Number	06980		
Email Address	IPServicesNYC@troutmansanders.com	<button>Add Email</button>	<button>Remove Email</button>

Application Information:

Title of the Invention	ANEURYSM DEVICE AND DELIVERY SYSTEM		
Attorney Docket Number	243382.000063	Small Entity Status Claimed	☐
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	12	Suggested Figure for Publication (if any)	

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	243382.000063
		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:	☒ Customer Number	☐ US Patent Practitioner	☐ 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		Remove	
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 Add button.			

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	243382.000063
		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)ⁱ 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 ⁱ	Filing Date (YYYY-MM-DD)	Remove Access Code ⁱ (if applicable)

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

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 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.

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	243382.000063
		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.

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	243382.000063
	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.			
Applicant	1		Remove
If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.			
Clear			
Assignee	Legal Representative under 35 U.S.C. 117	Joint Inventor	
Person to whom the inventor is obligated to assign.		Person who shows sufficient proprietary interest	
If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:			
Name of the Deceased or Legally Incapacitated Inventor:			
If the Applicant is an Organization check here. ☒			
Organization Name	DePuy Synthes Products, Inc.		
Mailing Address Information For Applicant:			
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. 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.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	243382.000063	
		Application Number		
Title of Invention	ANEURYSM DEVICE AND DELIVERY SYSTEM			

Assignee1

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	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.

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Signature

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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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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	243382.000063
		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.**

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

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

- 1 The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether 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.



THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

UNITED STATES DEPARTMENT OF COMMERCE

United States Patent and Trademark Office

14 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 AMÉRICA 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: 15/852,829

FECHA DE PRESENTACIÓN: 22 de diciembre de 2017

EL CÓDIGO DE PAÍS Y EL NÚMERO DE LA SOLICITUD DE PRIORIDAD, QUE SE USARÁ PARA LA PRESENTACIÓN EN EL EXTRANJERO EN VIRTUD DE LA CONVENCIÓN DE PARÍS, ES US15/852,829

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



M. TAVER
Funcionario certificador

REIVINDICACIONES

Se reivindica:

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

5 un trenzado desechable con la traslación dentro de un microcatéter desde un estado contraído a un estado desplegado, el trenzado comprende un extremo distal y un extremo proximal;

en donde en el estado desplegado, el trenzado comprende:

10 un saco oclusivo externo capaz de empujar contra una pared de aneurisma del aneurisma; y

un saco oclusivo interno dispuesto dentro del saco oclusivo externo.

2. El dispositivo de la reivindicación 1, en donde una porosidad del saco oclusivo interno es mayor que una porosidad del saco oclusivo externo.

15

3. El dispositivo de la reivindicación 2, en donde en el estado desplegado, el saco oclusivo externo es capaz de sellarse contra el cuello del aneurisma.

20 4. El dispositivo de la reivindicación 1, en donde trasladar distalmente el trenzado después de que el saco oclusivo externo se forma causa que una capa interna del trenzado dentro del saco oclusivo externo se expanda radialmente dentro del saco oclusivo externo y forme el saco oclusivo interno.

5. El dispositivo de la reivindicación 4, en donde la capa interna del trenzado es capaz de expandirse radialmente dentro del saco oclusivo externo mientras que el saco oclusivo externo se empuja contra la pared del aneurisma y el cuello del aneurisma.

5 6. El dispositivo de la reivindicación 4, que comprende, además, una banda marcadora en comunicación con el extremo proximal del trenzado,

en donde la capa interna que se expande radialmente dentro del saco oclusivo externo se forma al plegar el extremo proximal sobre la banda marcadora.

10 7. El dispositivo de la reivindicación 1, en donde en el estado desplegado, el trenzado es desmontable de un sistema de suministro en el aneurisma.

8. El dispositivo de la reivindicación 7, el sistema de suministro comprende:
un microcatéter; y

15 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 del trenzado, el tubo de suministro es desechable con la traslación dentro del microcatéter;

en donde el tubo de suministro es capaz de trasladar distalmente el trenzado
20 dentro del microcatéter desde el estado contraído hasta el estado desplegado.

9. El dispositivo de la reivindicación 1, en donde el saco oclusivo externo comprende menos segmentos de alambre que el saco oclusivo interno.

10. Un trenzado para tratar un aneurisma, el trenzado comprende:

un primer segmento radialmente expandible operable para moverse desde un estado contraído dentro de un microcatéter a un estado desplegado distal del microcatéter, en donde el primer segmento radialmente expandible es capaz de expandirse radialmente para formar un saco oclusivo externo en el aneurisma en el estado desplegado que se puede sellar contra un cuello del aneurisma;

un segundo segmento radialmente expandible operable para moverse desde el estado contraído dentro del microcatéter al estado desplegado distal del microcatéter, en donde el segundo segmento radialmente expandible es capaz de expandirse radialmente dentro del saco oclusivo externo para formar un saco oclusivo interno en el saco oclusivo externo en el estado desplegado.

11. El trenzado de la reivindicación 10, el trenzado es desplegable de forma desmontable por un sistema de suministro a un aneurisma.

12. El trenzado de la reivindicación 10, el trenzado comprende, además, una porción de hebilla dispuesta entre el primer y segundo segmentos radialmente expandibles, la porción de hebilla permite que el saco oclusivo interno se forme dentro, se superponga y se expanda en el saco oclusivo externo.

13. El trenzado de la reivindicación 10, en donde las dimensiones de los intersticios del trenzado varían en el extremo proximal en comparación con el extremo

distal de manera que una porosidad del saco oclusivo externo sea menor que una porosidad del saco oclusivo interno cuando se ubica a través del cuello del aneurisma.

14. Un método para ocluir un aneurisma, que comprende:

5 ubicar un trenzado radialmente expandible de acuerdo con la reivindicación 10 en la vasculatura del aneurisma;

 formar el primer segmento radialmente expandible del trenzado con una porosidad menor que una porosidad del segundo segmento radialmente expandible;

 empujar distalmente el trenzado hacia el interior del aneurisma, mediante lo cual
10 el primer segmento radialmente expandible se expande radialmente para formar un saco oclusivo externo;

 empujar distalmente de manera adicional el trenzado expandiendo de esa manera el segundo segmento radialmente expandible dentro del saco oclusivo externo;

 colocar el primer segmento radialmente expandible adyacente o en
15 comunicación con un cuello del aneurisma;

 bloquear, desviar o ralentizar el flujo en el aneurisma a través del cuello del aneurisma cuando el saco oclusivo externo se forma a través del cuello y el saco oclusivo interno se forma en este.

20 15. Un método para suministrar un dispositivo oclusivo a un aneurisma, que comprende:

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

ubicar un trenzado radialmente expandible dentro del microcatéter, el trenzado está en un estado contraído dentro del microcatéter y comprende un extremo distal y un extremo proximal;

unir el extremo proximal del trenzado con el extremo distal del tubo de suministro;

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

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

10 empujar distalmente el trenzado, mediante el tubo de suministro, hacia el interior del aneurisma, mediante lo cual un primer segmento radialmente expandible del trenzado se expande radialmente para formar un saco oclusivo externo, el saco oclusivo externo puede operarse para colocarse a través de un cuello del aneurisma;

15 empujar distalmente de manera adicional el trenzado, mediante lo cual se expande un segundo segmento radialmente expandible dentro del saco oclusivo externo mientras se empuja distalmente el saco oclusivo externo contra la pared del aneurisma y el cuello del aneurisma; y

liberar el trenzado, incluso los sacos oclusivos externo e interno, y retirar el tubo de suministro y el microcatéter del aneurisma.

20 16. El método de la reivindicación 15, que comprende, además:

formar el primer segmento radialmente expandible con una porosidad menor que una porosidad del segundo segmento radialmente expandible;

colocar el primer segmento radialmente expandible adyacente o en comunicación con un cuello del aneurisma; y

bloquear, desviar o ralentizar el flujo en el aneurisma a través del cuello del aneurisma cuando el saco oclusivo externo se forma a través del cuello y el saco
5 oclusivo interno se forma en este.

17. El método de la reivindicación 15, en donde el saco oclusivo interno comprende una capa interna del trenzado.