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Deville et al.

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(45) **Date of Patent:** **Jan. 14, 2020**

(54) **ASPIRATION THROMBECTOMY SYSTEM
AND METHODS FOR THROMBUS
REMOVAL WITH ASPIRATION CATHETER**

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(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 0 days.

(21) Appl. No.: **16/516,232**

(22) Filed: **Jul. 18, 2019**

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filed on Oct. 24, 2018.

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A61B 17/22 (2006.01)
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(52) **U.S. Cl.**
CPC **A61B 17/22** (2013.01); **A61F 2/013**
(2013.01); **A61M 25/0075** (2013.01);
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(58) **Field of Classification Search**
CPC **A61B 17/3207**; **A61B 17/22**; **A61B**
2017/00022; **A61B 2017/22079**;
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(56) **References Cited**

U.S. PATENT DOCUMENTS

4,164,223 A 8/1979 Munib
4,315,506 A 2/1982 Kayser et al.
(Continued)

FOREIGN PATENT DOCUMENTS

CN 101027004 A 8/2007
EP 1799128 B1 3/2010
(Continued)

OTHER PUBLICATIONS

Health technology assessment of a national emergency endovascular
service for mechanical thrombectomy in the management of acute
ischaemic stroke, Health Information and Quality Authority, Jan.
25, 2017, pp. 1-197.

(Continued)

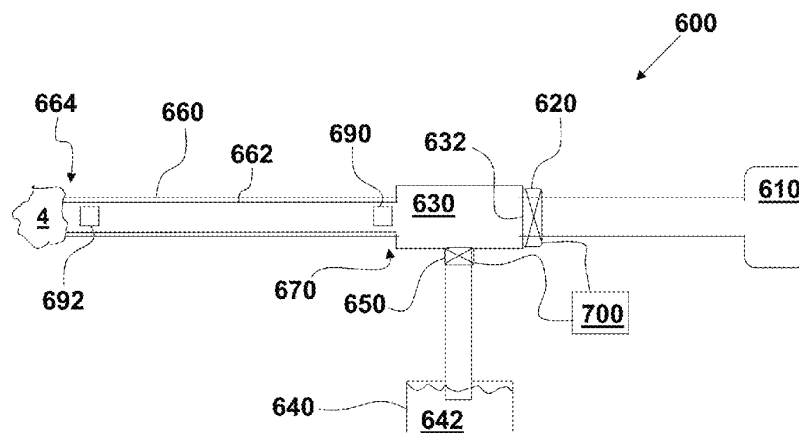
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(57) **ABSTRACT**

A thrombectomy removal system includes a catheter having
a distal end and defining a lumen filled with a liquid column
having a proximal portion and a distal portion, a vacuum
source, a vent liquid source, and a vacuum and vent control
system configured to cyclically connect or disconnect the
vacuum source and the vent liquid source to change a level
of vacuum at the distal end and substantially prevent forward
flow. The vacuum source and the vent source are
respectively fluidically connected to the vacuum and vent
valves. A manifold connects the proximal portion to the
vacuum and vent sources through the valves. Control of the
valves prevents forward flow of the distal portion out from
the distal end during each cycle. Each cycle can have states
including vacuum-only, first double-closed, vent-only, and
second double-closed. A time of the double-closed states can
be no greater than 30 ms.

18 Claims, 29 Drawing Sheets



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departing from the scope of the systems, apparatuses, and methods as defined by the following claims.

What is claimed is:

1. A clot removal system, comprising:
 - a catheter having a distal end and defining a lumen filled with a liquid column having a proximal portion and a distal portion;
 - a controllable vacuum valve;
 - a vacuum source fluidically connected to the vacuum valve;
 - a controllable vent valve having a vent liquid input;
 - a vent fluid source containing a vent liquid and fluidically connected to the vent valve to retain the vent liquid at the vent fluid input;
 - a manifold connected to the catheter, to the vacuum valve, and to the vent valve, the manifold fluidically connecting the proximal portion of the liquid column in the lumen:
 - to the vacuum source through the vacuum valve; and
 - to the vent fluid source through the vent valve;
 - a controller connected to the vacuum valve and the vent valve and configured to selectively open and close the vacuum valve and the vent valve such that:
 - responsive to opening the vacuum valve, the vacuum source is fluidically connected to the liquid column in the lumen; and
 - responsive to opening the vent valve, the vent fluid source is fluidically connected to the liquid column in the lumen,
 - the controller configured to cyclically open and close the vacuum valve and the vent valve to:
 - change a level of vacuum at the distal end; and
 - prevent forward flow of the distal portion out from the distal end during each cycle.
2. The system according to claim 1, wherein the controller is configured to cyclically open and close the vacuum valve and the vent valve in a repeated cycle comprising a double-closed state in which the vacuum valve is closed and the vent valve is closed.
3. The system according to claim 2, wherein a time of the double-closed state is no greater than 30 ms.
4. The system according to claim 1, wherein the controller is configured to cyclically open and close the vacuum valve and the vent valve in a repeated cycle comprising a vent-only state in which the vacuum valve is closed and the vent valve is open.
5. The system according to claim 4, wherein a time of the vent-only state is no greater than 50 ms.
6. The system according to claim 1, wherein the controller is configured to selectively open and close the vacuum valve and the vent valve cycle in a repeated cycle comprising:
 - a vacuum-only state in which the vacuum valve is open and the vent valve is closed;
 - a first double-closed state in which the vacuum valve is closed and the vent valve is closed;
 - a vent-only state in which the vacuum valve is closed and the vent valve is open;
 - a second double-closed state in which the vacuum valve is closed and the vent valve is closed.
7. The system according to claim 6, wherein a time between an opening of the vent valve and a closing of the vent valve is between approximately 10 ms and approximately 50 ms.
8. The system according to claim 6, wherein a period of the cycle is between approximately 6 Hz and approximately 16 Hz.

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9. The system according to claim 6, wherein a period of the cycle is between approximately 8 Hz and 12 Hz.

10. The system according to claim 1, wherein the change in the level of vacuum at the distal end is greater than approximately 15 inHg and no greater than approximately 50 ms.

11. The system according to claim 1, wherein the change in the level of vacuum at the distal end is greater than approximately 20 inHg and no greater than approximately 30 ms.

12. The system according to claim 1, wherein the change in the level of vacuum at the distal end is greater than approximately 25 inHg and no greater than approximately 20 ms.

13. The system according to claim 1, wherein: the lumen has an internal diameter of between approximately 0.038" and approximately 0.106"; and the controller is configured to cyclically open and close the vacuum valve and the vent valve at a frequency of between 2 and 16 Hz.

14. The system according to claim 1, wherein: the lumen has an internal diameter of between approximately 0.068" and approximately 0.088"; and the controller is configured to cyclically open and close the vacuum valve and the vent valve at a frequency of between 2 and 16 Hz.

15. The system according to claim 1, wherein the controller is configured to cyclically open and close the vacuum valve and the vent valve in a repeated cycle and prevent forward flow of the distal portion out from the distal end during each cycle by regulating timing of the vent valve.

16. The system according to claim 1, wherein the controller is configured to cyclically open and close the vacuum valve and the vent valve to retain a level of pressure at the distal end at less than physiological pressure.

17. The system according to claim 1, which further comprises a shaft and the vacuum valve and the vent valve are mounted together on the shaft.

18. A clot removal system, comprising:
 - a catheter having a distal end and defining a lumen filled with a liquid column having a proximal portion and a distal portion;
 - a controllable vacuum valve;
 - a vacuum source fluidically connected to the vacuum valve;
 - a controllable vent valve having a vent liquid input;
 - a vent fluid source containing a vent liquid and fluidically connected to the vent valve to retain the vent liquid at the vent fluid input;
 - a manifold connected to the catheter, to the vacuum valve, and to the vent valve, the manifold fluidically connecting the proximal portion of the liquid column in the lumen:
 - to the vacuum source through the vacuum valve; and
 - to the vent fluid source through the vent valve;
 - a controller connected to the vacuum valve and the vent valve and configured to selectively open and close the vacuum valve and the vent valve such that:
 - responsive to opening the vacuum valve, the vacuum source is fluidically connected to the liquid column in the lumen; and
 - responsive to opening the vent valve, the vent fluid source is fluidically connected to the liquid column in the lumen,
 - the controller configured to cyclically open and close the vacuum valve and the vent valve in a repeated cycle

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comprising a double-closed state in which the vacuum
valve is closed and the vent valve is closed to:
change a level of vacuum at the distal end; and
prevent forward flow of the distal portion out from the
distal end during each cycle, and
a time of the double-closed state is no greater than
approximately 30 ms.

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'402 Patent Family

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Deville et al.

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(54) **ASPIRATION THROMBECTOMY SYSTEM
AND METHODS FOR THROMBUS
REMOVAL WITH ASPIRATION CATHETER**

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(73) Assignee: **Syntheon 2.0, LLC**, Miami, FL (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

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Related U.S. Application Data

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(52) **U.S. Cl.**
CPC **A61B 17/22** (2013.01); **A61F 2/013** (2013.01); **A61M 25/0075** (2013.01);
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(58) **Field of Classification Search**

CPC **A61B 17/22**; **A61B 17/3207**; **A61B 2017/00022**; **A61B 2017/22079**;
(Continued)

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,164,223 A 8/1979 Munib
4,315,506 A 2/1982 Kayser et al.
(Continued)

FOREIGN PATENT DOCUMENTS

CN 101027004 A 8/2007
EP 1799128 B1 3/2010
(Continued)

OTHER PUBLICATIONS

International Search Report and Written Opinion for patent application PCT/US2019/42546 dated Oct. 7, 2019.

(Continued)

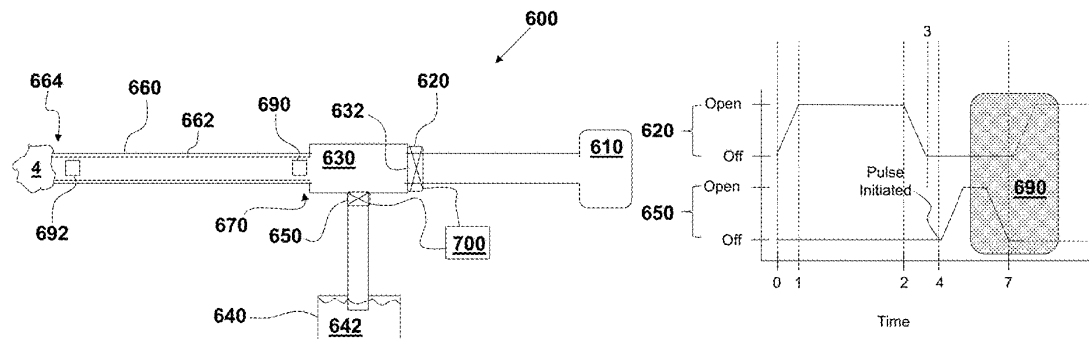
Primary Examiner — Wade Miles

(74) *Attorney, Agent, or Firm* — Gregory L. Mayback;
Dickinson Wright PLLC

(57) **ABSTRACT**

A clot removal system includes a catheter having proximal and distal ends and defining a lumen configured to be filled with a liquid column having a proximal portion, a vacuum pump supplying vacuum, a vent container holding vent liquid, a vent valve configured to fluidically communicate with the vent liquid and with the proximal portion of the liquid column at the proximal end of the catheter, a vacuum valve configured to fluidically communicate with the vacuum and with the proximal portion of the liquid column at the proximal end of the catheter, and a controller configured to carry out a pre-determined pattern of opening and closing the vent and vacuum valves to change a level of vacuum at the distal end and, while changing the level of

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departing from the scope of the systems, apparatuses, and methods as defined by the following claims.

What is claimed is:

1. A clot removal system, comprising:
 - a catheter having a proximal end and a distal end and defining a lumen configured to be filled with a liquid column having a proximal portion;
 - a vacuum pump configured to supply vacuum;
 - a vent container holding a vent liquid;
 - a vent valve configured to fluidically communicate:
 - with the vent liquid in the vent container; and
 - with the proximal portion of the liquid column at the proximal end of the catheter;
 - a vacuum valve configured to fluidically communicate:
 - with the vacuum from the vacuum pump; and
 - with the proximal portion of the liquid column at the proximal end of the catheter; and
 - a controller configured to carry out a pre-determined pattern of opening and closing the vent and vacuum valves to change a level of vacuum at the distal end and, while changing the level of vacuum at the distal end, to substantially prevent forward flow of liquid at a distal end of the liquid column.
2. The system according to claim 1, wherein the liquid at the distal end of the liquid column is one or more of albumin, d5W water, normal saline, half-normal saline, lactated Ringer's solution, and blood, and mixtures thereof.
3. The system according to claim 1, further comprising:
 - a manifold comprising the vent valve, the vacuum valve, and an output; and
 - an extension line fluidically connecting the proximal end of the catheter to the output of the manifold.
4. The system according to claim 1, wherein a portion of the pre-determined pattern includes a time period where both the vent and vacuum valves are closed.
5. The system according to claim 4, wherein the controller is configured to open and close the vent and vacuum valves in a repeated cycle comprising a double-closed state in which both the vent and vacuum valves are closed.
6. The system according to claim 5, wherein a time of the double-closed state is no greater than 30 ms.
7. The system according to claim 1, wherein the controller is configured to open and close the vent and vacuum valves in a repeated cycle comprising a vent-only state in which the vacuum valve is closed and the vent valve is open, and a time of the vent-only state is no greater than 50 ms.
8. The system according to claim 1, wherein the controller is configured to repeatedly and periodically carry out the pre-determined pattern.
9. The system according to claim 1, wherein the controller is configured to selectively open and close the vent and vacuum valves in a repeated cycle comprising:
 - a vacuum-only state in which the vacuum valve is open and the vent valve is closed;
 - a first double-closed state in which the vacuum valve is closed and the vent valve is closed;
 - a vent-only state in which the vacuum valve is closed and the vent valve is open; and
 - a second double-closed state in which the vacuum valve is closed and the vent valve is closed.
10. The system according to claim 1, wherein the controller is configured to selectively open and close the vent and vacuum valves in a repeated cycle comprising a vacuum-only state in which the vacuum valve is open and the vent valve is closed, followed by a first double-closed state in which the vacuum valve is closed and the vent valve is closed and a time of the first double-closed state is no

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greater than 30 ms, followed by a vent-only state in which the vacuum valve is closed and the vent valve is open, followed by a second double-closed state in which the vacuum valve is closed and the vent valve is closed.

11. The system according to claim 9, wherein a time between an opening of the vent valve and a closing of the vent valve is between approximately 10 ms and approximately 50 ms.

12. The system according to claim 9, wherein a frequency of the cycle is between approximately 6 Hz and approximately 16 Hz.

13. The system according to claim 9, wherein a frequency of the cycle is between approximately 8 Hz and 12 Hz.

14. The system according to claim 1, wherein the change in the level of vacuum at the distal end is one of:

- greater than approximately 15 inHg and occurs in no greater than approximately 50 ms;
- greater than approximately 20 inHg and occurs in no greater than approximately 30 ms; and
- greater than approximately 25 inHg and occurs in no greater than approximately 20 ms.

15. The system according to claim 1, wherein:

- the lumen has a diameter of between approximately 0.038" and approximately 0.106"; and
- the controller is configured to repeatedly and periodically carry out the pre-determined pattern of opening and closing the vent and vacuum valves at a frequency of between 2 and 16 Hz.

16. The system according to claim 1, wherein:

- the lumen has an internal diameter of between approximately 0.068" and approximately 0.088"; and
- the controller is configured to repeatedly and periodically carry out the pre-determined pattern of opening and closing the vent and vacuum valves at a frequency of between 6 and 12 Hz.

17. The system according to claim 1, wherein the controller is configured to open and close the vent and vacuum valves in a repeated cycle of the pre-determined pattern and prevent forward flow of the liquid column out from the distal end during each cycle by regulating timing of the vent valve.

18. The system according to claim 1, wherein the controller is configured to open and close the vacuum valve and the vent valve in a repeated cycle of the pre-determined pattern to retain a level of pressure at the distal end at less than physiological pressure.

19. The system according to claim 1, wherein the controller is one of a mechanical valve controller and an electronic valve controller.

20. The system according to claim 1, which further comprises a shaft and the vent and vacuum valves are cam-driven valves with respective cams mounted together on the shaft.

21. A clot removal system, comprising:

- a catheter having a proximal end and a distal end and defining a lumen configured to be filled with a liquid column having a proximal portion;
- a vacuum pump configured to supply vacuum;
- a vent liquid container holding a vent liquid;
- a vent valve configured to fluidically communicate:
 - with the vent liquid in the liquid container; and
 - with the proximal portion of the liquid column at the proximal end of the catheter;
- a vacuum valve configured to fluidically communicate:
 - with the vacuum from the vacuum pump; and
 - with the proximal portion of the liquid column at the proximal end of the catheter; and

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a controller configured to carry out a pre-determined cycle of opening and closing the vent and vacuum valves to change a level of vacuum at the distal end and, during each cycle, to substantially prevent forward flow of liquid at the distal end of the liquid column.

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'402 Patent Family

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(12) **United States Patent**
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(45) **Date of Patent:** **Aug. 13, 2024**

(54) **ASPIRATION THROMBECTOMY SYSTEM
AND METHODS FOR THROMBUS
REMOVAL WITH ASPIRATION CATHETER**

(58) **Field of Classification Search**

CPC A61B 17/22; A61B 17/3207; A61B
2017/00022; A61B 2017/22079;

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(56)

References Cited

U.S. PATENT DOCUMENTS

4,164,223 A 8/1979 Munib
4,315,506 A 2/1982 Kayser et al.

(Continued)

FOREIGN PATENT DOCUMENTS

CN 101027004 A 8/2007
EP 1799128 B1 3/2010

(Continued)

OTHER PUBLICATIONS

International Search Report and Written Opinion for patent appli-
cation PCT/US2019/42546 dated Oct. 7, 2019.

(Continued)

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Cartledge, Boca Raton, FL (US);
Thomas O. Bales, Jr., Miami, FL (US);
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(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
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(65) **Prior Publication Data**

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Related U.S. Application Data

(63) Continuation of application No. 16/681,564, filed on
Nov. 12, 2019, now Pat. No. 10,722,253, and a
(Continued)

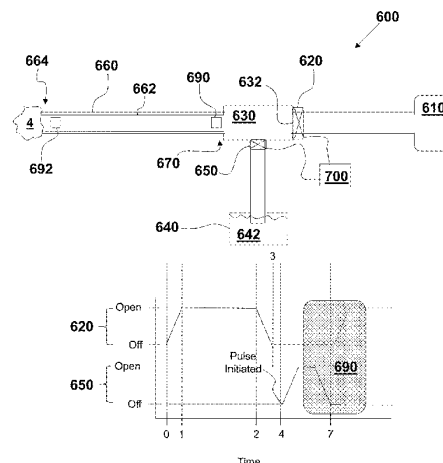
(51) **Int. Cl.**
A61B 17/22 (2006.01)
A61B 17/00 (2006.01)
(Continued)

(52) **U.S. Cl.**
CPC **A61B 17/22** (2013.01); **A61F 2/013**
(2013.01); **A61M 25/0075** (2013.01);
(Continued)

(57) **ABSTRACT**

A clot removal system comprises a catheter, a vacuum source, and a controller. The catheter comprises a proximal end, a distal end, and controller operating parameters and defines a lumen configured to be filled with a liquid column having a proximal portion. The vacuum source is configured to supply vacuum. The controller is configured to carry out a control pattern of turning on and off the vacuum based upon the controller operating parameters and is configured to receive the controller operating parameters in an automatic response to the catheter being operatively connected to at least one of the vacuum source and the controller and, responsive to the connection, to carry out the control pattern to change a level of vacuum at the distal end of the catheter.

35 Claims, 29 Drawing Sheets



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The foregoing description and accompanying drawings illustrate the principles, exemplary embodiments, and modes of operation of the systems, apparatuses, and methods. However, the systems, apparatuses, and methods should not be construed as being limited to the particular embodiments discussed above. Additional variations of the embodiments discussed above will be appreciated by those skilled in the art and the above-described embodiments should be regarded as illustrative rather than restrictive. Accordingly, it should be appreciated that variations to those embodiments can be made by those skilled in the art without departing from the scope of the systems, apparatuses, and methods as defined by the following claims.

What is claimed is:

1. A clot removal system, comprising:
a catheter:
comprising a proximal end, a distal end, and controller operating parameters; and
defining a lumen configured to be filled with a liquid column having a proximal portion;
a vacuum source configured to supply vacuum; and
a controller:
configured to carry out a control pattern of turning on and off the vacuum based upon the controller operating parameters; and
configured to receive the controller operating parameters in an automatic response to the catheter being operatively connected to at least one of the vacuum source and the controller and, responsive to the connection, to carry out the control pattern to change a level of vacuum at the distal end of the catheter.
2. The system according to claim 1, wherein the controller operating parameters are stored in the catheter and are provided to the controller responsive to the connection.
3. The system according to claim 1, wherein the catheter comprises an extension line:
having a first end connected to the catheter and a second end connected to at least one of the vacuum source and the controller; and
comprising the controller operating parameters and, responsive to the connection:
configured to provide the controller operating parameters to the controller; and
fluidically connecting the proximal end of the catheter with the vacuum source.
4. The system according to claim 3, wherein:
the controller is part of the vacuum source; and
the controller is configured to receive the controller operating parameters in the automatic response to the catheter being operatively connected to the vacuum source.
5. The system according to claim 3, wherein:
the controller is separate from the vacuum source; and
the controller is configured to receive the controller operating parameters in the automatic response to the catheter being operatively connected to the controller.
6. The system according to claim 3, wherein the extension line comprises an identification subassembly including system controls for operating the aspiration thrombectomy system.
7. The system according to claim 3, wherein one of:
the controller is part of the vacuum source and the extension line fluidically connects the proximal end of the catheter to the vacuum source; and
the controller is separate from the vacuum source and is removably coupleable to the vacuum source and the

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extension line fluidically connects the proximal end of the catheter to the controller.

8. The system according to claim 3, further comprising an identification sub-assembly disposed at the connection between the catheter and the extension line.

9. The system according to claim 8, wherein the identification sub-assembly is at least one of:

- an inductive sensor and sensed part;
- an RFID tag and reader;
- an NFC tag and reader;
- a 1-wire detection system;
- a 2-wire detection configuration;
- a Bluetooth low energy device;
- metallic touch pads;
- at least one passive resistor configuration; and
- at least one hall sensor.

10. The system according to claim 8, wherein the identification sub-assembly is at least one of:

- a manual user interface in which a user communicates to the controller which controller operating parameters to use with the catheter;
- a QR code and a QR code reader in which the QR code provided with the catheter communicates to the controller which controller operating parameters to use with the catheter;
- a bar code and a bar code reader in which the bar code provided with the catheter communicates to the controller which controller operating parameters to use with the catheter; and
- a punch-card and a punch-card reader in which the punch-card provided with the catheter communicates to the controller which controller operating parameters to use with the catheter.

11. The system according to claim 8, wherein the identification

- sub-assembly comprises a reader disposed at least at:
the vacuum source; and/or
the controller.

12. The system according to claim 3, wherein the operative connection of at least one of the catheter and the extension line to the at least one of the vacuum source and the controller is an identification sub-assembly.

13. The system according to claim 1, wherein:
the controller operating parameters comprise a catheter identifier; and

the controller is configured to receive the catheter identifier in the automatic response to the catheter being operatively connected to at least one of the vacuum source and the controller and, responsive to the connection, to carry out a pre-determined control pattern associated with the catheter identifier to change the level of vacuum at the distal end of the catheter.

14. The system according to claim 13, wherein:
the controller is part of the vacuum source; and
the controller is configured to receive the catheter identifier in the automatic response to the catheter being operatively connected to the vacuum source.

15. The system according to claim 13, wherein:
the controller is separate from the vacuum source; and
the controller is configured to receive the catheter identifier in the automatic response to the catheter being operatively connected to the controller.

16. The system according to claim 1, wherein:
the controller operating parameters comprise a catheter identifier; and

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the catheter comprises an extension line:

having a first end connected to the catheter and a second end connected to at least one of the vacuum source and the controller;
comprising the catheter identifier; and
responsive to the connection, the extension line:
is configured to provide the catheter identifier to the controller; and
fluidically connects the proximal end of the catheter with the vacuum source.

17. The system according to claim 16, wherein: the controller is part of the vacuum source; and the controller is configured to receive the catheter identifier in the automatic response to the extension line being operatively connected to the vacuum source.

18. The system according to claim 16, wherein: the controller is separate from the vacuum source; and the controller is configured to receive the catheter identifier in the automatic response to the extension line being operatively connected to the controller.

19. The system according to claim 1, wherein the controller is configured to repeatedly and periodically carry out the control pattern.

20. The system according to claim 1, wherein the controller is one of a mechanical valve controller and an electronic valve controller.

21. The system according to claim 1, which further comprises an identification subassembly including a sensed part configured to be operatively connected to the catheter and, responsive to sensing the sensed part, the controller carries out the control pattern.

22. The system according to claim 1, wherein the operative connection of the catheter to the at least one of the vacuum source and the controller is an identification sub-assembly.

23. The system according to claim 1, wherein: the catheter comprises an extension line having a first end connected to the catheter and a second end opposite the first end; and

the operative connection of the catheter is an identification sub-assembly comprising a reader disposed at least at:

the extension line;
the vacuum source; and/or
the controller.

24. A clot removal system, comprising:
a catheter:

comprising a proximal end, a distal end, and controller operating parameters; and
defining a lumen configured to be filled with a liquid column having a proximal portion;

a vacuum source configured to supply vacuum;
a vacuum modulator configured to fluidically communicate:

with the vacuum from the vacuum source; and
with the proximal portion of the liquid column at the proximal end of the catheter; and

a controller:

configured to carry out a control pattern of modulating the vacuum modulator based upon the controller operating parameters; and

configured to receive the controller operating parameters in an automatic response to the catheter being operatively connected to at least one of the vacuum modulator and the controller and, responsive to the connection, to carry out the control pattern to change a level of vacuum at the distal end of the catheter.

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25. The system according to claim 24, further comprising: a manifold comprising the vacuum modulator and an output; and

an extension line fluidically connecting the proximal end of the catheter to the output of the manifold.

26. The system according to claim 24, wherein the controller is configured to repeatedly and periodically carry out the control pattern.

27. The system according to claim 24, which further comprises an extension line:

operatively connected to at least one the vacuum modulator and the controller; and

fluidically connecting the proximal end of the catheter to at least one the vacuum modulator and the controller.

28. The system according to claim 24, wherein the operative connection of the catheter to the at least one of the vacuum modulator and the controller is an identification sub-assembly.

29. A clot removal system, comprising:
a catheter:

comprising a proximal end, a distal end, and controller operating parameters; and

defining a lumen configured to be filled with a liquid column having a proximal portion;

a vacuum source configured to supply vacuum;

a vent container holding a vent liquid;

a vent valve configured to fluidically communicate:

with the vent liquid in the vent container; and
with the proximal portion of the liquid column at the proximal end of the catheter;

a vacuum valve configured to fluidically communicate with:

the vacuum source; and

the proximal portion of the liquid column at the proximal end of the catheter; and

a controller:

configured to carry out a control pattern of opening and closing the vent and vacuum valves based upon the controller operating parameters; and

configured to receive the controller operating parameters in an automatic response to the catheter being operatively connected to at least one of the vent valve, the vacuum valve, the vacuum source, and the controller and, responsive to the connection, to carry out the control pattern to change a level of vacuum at the distal end of the catheter.

30. The system according to claim 29, wherein a portion of the control pattern includes a time period where both the vent and vacuum valves are closed.

31. The system according to claim 29, wherein the controller is configured to repeatedly and periodically carry out the control pattern with the vent and vacuum valves.

32. The system according to claim 29, wherein the controller is configured to open and close the vent and vacuum valves in a repeated cycle comprising a vent-only state in which the vacuum valve is closed and the vent valve is open, and a time of the vent-only state is no greater than 50 ms.

33. The system according to claim 29, wherein:

the lumen has a diameter of between approximately 0.038" and approximately 0.106"; and

the controller is configured to repeatedly and periodically carry out the control pattern of opening and closing the vent and vacuum valves at a frequency of between approximately 2 Hz and approximately 16 Hz.

34. The system according to claim 29, which further comprises an extension line:

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operatively connected to at least one of the vent valve, the vacuum valve, and the controller; and fluidically connecting the proximal end of the catheter to at least one of the vent valve, the vacuum valve, and the controller.

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35. The system according to claim **34**, wherein the operative connection of the catheter to the at least one of the vent valve, the vacuum valve, the vacuum source, and the controller is an identification sub-assembly.

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'402 Patent Family

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Filed: 2022 Jan. 26

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(12) **United States Patent**
Deville et al.

(10) **Patent No.:** **US 11,918,240 B2**

(45) **Date of Patent:** **Mar. 5, 2024**

(54) **ASPIRATION THROMBECTOMY SYSTEM
AND METHODS FOR THROMBUS
REMOVAL WITH ASPIRATION CATHETER**

(58) **Field of Classification Search**
CPC A61B 17/22; A61B 17/3207; A61B
2017/00022; A61B 2017/22079;
(Continued)

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(56) **References Cited**

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Thomas O. Bales, Jr., Miami, FL (US);
Carlos Rivera, Cooper City, FL (US)

U.S. PATENT DOCUMENTS

3,955,574 A 5/1976 Rubinstein
4,164,223 A 8/1979 Munib
(Continued)

FOREIGN PATENT DOCUMENTS

CN 101027004 A 8/2007
EP 1799128 B1 3/2010
(Continued)

(73) Assignee: **RapidPulse, Inc.**, Miami, FL (US)

OTHER PUBLICATIONS

(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 0 days.

IPR2021-01466, Petition for Inter Partes Review of U.S. Pat. No.
10,531,883, Aug. 30, 2021, 87 pages.
(Continued)

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Primary Examiner — Wade Miles

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(74) *Attorney, Agent, or Firm* — Perkins Coie LLP

(65) **Prior Publication Data**

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Related U.S. Application Data

(63) Continuation of application No. 16/899,514, filed on
Jun. 11, 2020, which is a continuation of application
(Continued)

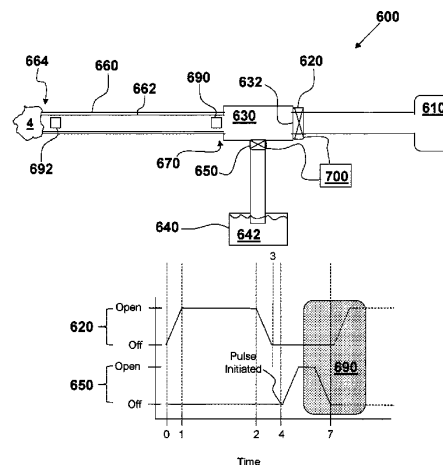
(57) **ABSTRACT**

A clot removal system comprises a catheter, a vacuum
source, and a controller. The catheter comprises a proximal
end, a distal end, and controller operating parameters and
defines a lumen configured to be filled with a liquid column
having a proximal portion. The vacuum source is configured
to supply vacuum. The controller is configured to carry out
a control pattern of turning on and off the vacuum based
upon the controller operating parameters and is configured
to receive the controller operating parameters in an auto-
matic response to the catheter being operatively connected
to at least one of the vacuum source and the controller and,
responsive to the connection, to carry out the control pattern
to change a level of vacuum at the distal end of the catheter.

(51) **Int. Cl.**
A61B 17/22 (2006.01)
A61B 17/00 (2006.01)
(Continued)

(52) **U.S. Cl.**
CPC **A61B 17/22** (2013.01); **A61F 2/013**
(2013.01); **A61M 25/0075** (2013.01);
(Continued)

13 Claims, 29 Drawing Sheets



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The foregoing description and accompanying drawings illustrate the principles, exemplary embodiments, and modes of operation of the systems, apparatuses, and methods. However, the systems, apparatuses, and methods should not be construed as being limited to the particular embodiments discussed above. Additional variations of the embodiments discussed above will be appreciated by those skilled in the art and the above-described embodiments should be regarded as illustrative rather than restrictive. Accordingly, it should be appreciated that variations to those embodiments can be made by those skilled in the art without departing from the scope of the systems, apparatuses, and methods as defined by the following claims.

We claim:

1. A method for removing thromboembolic material from a person using aspiration, comprising:

positioning a distal end of a catheter at least proximate to thromboembolic material in a blood vessel of the person;

applying a vacuum through a lumen of the catheter such that a vacuum flow draws at least a portion of the thromboembolic material into the catheter lumen;

stopping the vacuum flow through the catheter lumen such that a fluid column is positioned in the catheter lumen;

causing the fluid column to shift in a distal direction along the catheter lumen;

limiting the shift of the fluid column to a displacement limit of fluid at the distal end that imparts a controlled reversal of flow to the fluid column that slightly translates the thromboembolic material distally relative to the distal opening of the catheter lumen;

reapplying the vacuum through the catheter lumen thereby drawing the thromboembolic material into the catheter lumen; and

repeating the acts of stopping the vacuum flow, causing the fluid column to shift distally, limiting the shift of the fluid column and reapplying the vacuum through the catheter lumen, wherein the displacement limit for each distal shift of the fluid column is limited to a specific volume of liquid that exits the distal end of the catheter before vacuum is reapplied, whereby upon reapplication of vacuum the fluid column accelerates to the catheter such that the thromboembolic material accelerates back into the catheter lumen thereby deforming the thromboembolic material such that thromboembolic material is completely aspirated through the catheter lumen.

2. The method of claim 1 wherein limiting the shift of the fluid column comprises stopping the distal movement of the fluid column such that the displacement limit is approximately 0.001 ml to approximately 1.0 ml of fluid that exits the distal end of the catheter before fluid is drawn back into the catheter lumen.

3. The method of claim 1 wherein limiting the shift of the fluid column comprises stopping the distal movement of the fluid column such that the displacement limit is approximately 0.1 ml to approximately 0.5 ml of fluid that exits the distal end of the catheter before fluid is drawn back into the catheter lumen.

4. The method of claim 1 wherein limiting the shift of the fluid column comprises stopping the distal movement of the fluid column such that the displacement limit is approximately 0.5 mm to approximately 30 mm of fluid from the fluid column that exits the distal end of the catheter before fluid is drawn back into the catheter lumen.

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5. The method of claim 1 wherein limiting the shift of the fluid column comprises stopping the distal movement of the fluid column such that the displacement limit is approximately 0.5 mm to approximately 15 mm of fluid from the fluid column that exits the distal end of the catheter before fluid is drawn back into the catheter lumen.

6. The method of claim 1 wherein the acts of stopping the vacuum flow through the catheter lumen and causing the fluid column to shift in a distal direction along the catheter lumen are caused by moving a compressor that first occludes a vacuum channel through which the vacuum is applied to the catheter lumen and then moves the fluid column distally a given distance.

7. The method of claim 1 wherein the act of positioning a distal end of a catheter at least proximate to thromboembolic material in a blood vessel of a person comprises positioning the distal end of the catheter in a blood vessel in a brain of the person.

8. The method of claim 1 wherein the act of positioning a distal end of a catheter at least proximate to thromboembolic material in a blood vessel of a person comprises positioning the distal end of the catheter in a blood vessel in the Circle of Willis in a brain of the person.

9. A method for removing thromboembolic material from a person using aspiration, comprising:

positioning a distal end of a catheter at least proximate to thromboembolic material in a blood vessel of the person;

applying a vacuum through a lumen of the catheter such that a vacuum flow draws at least a portion of the thromboembolic material into the catheter lumen;

stopping the vacuum flow through the catheter lumen such that a fluid column is positioned in the catheter lumen;

causing the fluid column to shift in a distal direction along the catheter lumen;

limiting the shift of the fluid column to a metered volumetric column shift at the distal end that imparts a controlled reversal of flow to the fluid column that slightly translates the thromboembolic material distally relative to the distal opening of the catheter lumen;

reapplying the vacuum through the catheter lumen thereby drawing the thromboembolic material into the catheter lumen; and

repeating the acts of stopping the vacuum flow, causing the fluid column to shift distally, limiting the shift of the fluid column and reapplying the vacuum through the catheter lumen, wherein the metered volumetric column shift for each distal shift of the fluid column is limited to a specific volume of liquid that exits the distal end of the catheter before vacuum is reapplied, whereby upon reapplication of vacuum the fluid column accelerates to the catheter such that the thromboembolic material accelerates back into the catheter lumen thereby deforming the thromboembolic material such that the thromboembolic material is completely aspirated through the catheter lumen.

10. The method of claim 9 wherein limiting the shift of the fluid column comprises stopping the distal movement of the fluid column such that the metered volumetric column shift is approximately 0.001 ml to approximately 1.0 ml of fluid that exits the distal end of the catheter before fluid is drawn back into the catheter lumen.

11. The method of claim 9 wherein limiting the shift of the fluid column comprises stopping the distal movement of the fluid column such that the metered volumetric column shift

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is approximately 0.1 ml to approximately 0.5 ml of fluid that exits the distal end of the catheter before fluid is drawn back into the catheter lumen.

12. The method of claim 9 wherein limiting the shift of the fluid column comprises stopping the distal movement of the fluid column such that the metered volumetric column shift is approximately 0.5 mm to approximately 30 mm of fluid from the fluid column that exits the distal end of the catheter before fluid is drawn back into the catheter lumen.

13. The method of claim 9 wherein limiting the shift of the fluid column comprises stopping the distal movement of the fluid column such that the metered volumetric column shift is approximately 0.5 mm to approximately 15 mm of fluid from the fluid column that exits the distal end of the catheter before fluid is drawn back into the catheter lumen.

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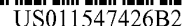
'402 Patent Family

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Filed: **2022 Jan. 26**

Issued: **2023 Jan. 10**



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The foregoing description and accompanying drawings illustrate the principles, exemplary embodiments, and modes of operation of the systems, apparatuses, and methods. However, the systems, apparatuses, and methods should not be construed as being limited to the particular embodiments discussed above. Additional variations of the embodiments discussed above will be appreciated by those skilled in the art and the above-described embodiments should be regarded as illustrative rather than restrictive. Accordingly, it should be appreciated that variations to those embodiments can be made by those skilled in the art without departing from the scope of the systems, apparatuses, and methods as defined by the following claims.

We claim:

1. A method for removing thromboembolic material from a person using aspiration, comprising:
 - positioning a distal end of a catheter at least proximate to thromboembolic material in a blood vessel of the person;
 - applying a vacuum through a lumen of the catheter such that a vacuum flow draws at least a portion of the thromboembolic material into the catheter lumen;
 - stopping the vacuum flow through the catheter lumen such that a fluid column is positioned in the catheter lumen;
 - causing a reverse flow through the catheter lumen that shifts the fluid column in a distal direction along the catheter lumen such that a positive amount of exit flow occurs at the distal end of the catheter;
 - limiting movement of the fluid column at the distal end of the catheter such that the positive amount of exit flow is within a volume range that imparts a controlled reversal of flow to the fluid column that slightly translates the thromboembolic material distally relative to the distal opening of the catheter lumen;
 - reapplying vacuum through the catheter lumen whereby the thromboembolic material that was translated slightly distally is drawn proximally through only a portion of the catheter lumen; and
 - repeating the acts of stopping the vacuum flow, causing a reverse flow, limiting movement of the fluid column at the distal end of the catheter, and reapplying the vacuum whereby the thromboembolic material that was translated slightly distally is drawn proximally through the catheter lumen.
2. The method of claim 1 wherein limiting movement of the fluid column at the distal end of the catheter comprises stopping the reverse flow through the catheter lumen and reapplying the vacuum through the catheter lumen such that the range of the positive amount of exit flow is approximately 0.001 ml to approximately 1.0 ml before fluid is drawn back into the catheter lumen.
3. The method of claim 1 wherein limiting movement of the fluid column at the distal end of the catheter comprises stopping the reverse flow through the catheter lumen and reapplying the vacuum through the catheter lumen such that the range of the positive amount of exit flow is approximately 0.1 ml to approximately 0.5 ml before fluid is drawn back into the catheter lumen.
4. The method of claim 1 wherein during the acts of (a) applying a vacuum through a catheter lumen and (b) reapplying vacuum through the catheter lumen, only vacuum is applied to the thromboembolic material at the distal end of the catheter.

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plying vacuum through the catheter lumen, only vacuum is applied to the thromboembolic material at the distal end of the catheter.

5. The method of claim 1 wherein positioning a distal end of a catheter at least proximate to thromboembolic material in a blood vessel of the person comprises positioning the distal end of the catheter in a cerebral vessel.

6. A method for removing thromboembolic material from a person using aspiration, comprising:

- positioning a distal end of a catheter at least proximate to thromboembolic material in a blood vessel of the person;
- applying a vacuum through a lumen of the catheter such that a vacuum flow draws at least a portion of the thromboembolic material into the catheter lumen;
- stopping the vacuum flow through the catheter lumen such that a fluid column is positioned in the catheter lumen;
- causing a reverse flow through the catheter lumen that shifts the fluid column in a distal direction along the catheter lumen such that a positive amount of exit flow occurs at the distal end of the catheter;
- limiting movement of the fluid column at the distal end of the catheter such that the positive amount of exit flow is within a range of a length of the fluid column that exits the distal end of the catheter that imparts a controlled reversal of flow to the fluid column that slightly translates the thromboembolic material distally relative to the distal opening of the catheter lumen;
- reapplying vacuum through the catheter lumen whereby the thromboembolic material that was translated slightly distally is drawn proximally through only a portion of the catheter lumen; and
- repeating the acts of stopping the vacuum flow, causing a reverse flow, limiting movement of the fluid column, and reapplying the vacuum whereby the thromboembolic material that was translated slightly distally is drawn proximally through the catheter lumen.

7. The method of claim 6 wherein limiting movement of the fluid column at the distal end of the catheter comprises stopping the reverse flow through the catheter lumen and reapplying the vacuum through the catheter lumen such that the range of the positive amount of exit flow is approximately 0.5 mm to approximately 30 mm of the fluid column before fluid is drawn back into the catheter lumen.

8. The method of claim 6 wherein limiting movement of the fluid column at the distal end of the catheter comprises stopping the reverse flow through the catheter lumen and reapplying the vacuum through the catheter lumen such that the range of the positive amount of exit flow is approximately 0.5 mm to approximately 15 mm of the fluid column before fluid is drawn back into the catheter lumen.

9. The method of claim 6 wherein during the acts of (a) applying a vacuum through a catheter lumen and (b) reapplying vacuum, through the catheter lumen, only vacuum is applied to the thromboembolic material at the distal end of the catheter.

10. The method of claim 6 wherein positioning a distal end of a catheter at least proximate to thromboembolic material in a blood vessel of the person comprises positioning the distal end of the catheter in a cerebral vessel.

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'402 Patent Family

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Deville et al.

(10) **Patent No.:** **US 11,406,402 B2**

(45) **Date of Patent:** ***Aug. 9, 2022**

(54) **ASPIRATION THROMBECTOMY SYSTEM
AND METHODS FOR THROMBUS
REMOVAL WITH ASPIRATION CATHETER**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

This patent is subject to a terminal disclaimer.

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(22) Filed: **Feb. 11, 2022**

(65) **Prior Publication Data**

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Related U.S. Application Data

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(51) **Int. Cl.**
A61B 17/22 (2006.01)
A61M 25/00 (2006.01)
(Continued)

(52) **U.S. Cl.**
CPC **A61B 17/22** (2013.01); **A61F 2/013** (2013.01); **A61M 25/0075** (2013.01);
(Continued)

(58) **Field of Classification Search**

CPC A61B 17/22; A61B 17/3207; A61B 2017/00022; A61B 2017/22079;
(Continued)

(56) **References Cited**

U.S. PATENT DOCUMENTS

3,955,574 A 5/1976 Rubinstein
4,164,223 A 8/1979 Munib
(Continued)

FOREIGN PATENT DOCUMENTS

CN 101027004 A 8/2007
EP 1799128 B1 3/2010
(Continued)

OTHER PUBLICATIONS

IPR2021-01466, Petition for Inter Partes Review of U.S. Pat. No. 10,531,883, Aug. 30, 2021, 87 pages.

(Continued)

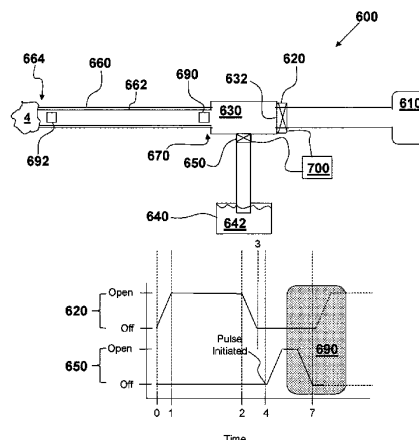
Primary Examiner — Wade Miles

(74) *Attorney, Agent, or Firm* — Perkins Coie LLP

(57) **ABSTRACT**

A clot removal system comprises a catheter, a vacuum source, and a controller. The catheter comprises a proximal end, a distal end, and controller operating parameters and defines a lumen configured to be filled with a liquid column having a proximal portion. The vacuum source is configured to supply vacuum. The controller is configured to carry out a control pattern of turning on and off the vacuum based upon the controller operating parameters and is configured to receive the controller operating parameters in an automatic response to the catheter being operatively connected to at least one of the vacuum source and the controller and, responsive to the connection, to carry out the control pattern to change a level of vacuum at the distal end of the catheter.

20 Claims, 29 Drawing Sheets



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The foregoing description and accompanying drawings illustrate the principles, exemplary embodiments, and modes of operation of the systems, apparatuses, and methods. However, the systems, apparatuses, and methods should not be construed as being limited to the particular embodiments discussed above. Additional variations of the embodiments discussed above will be appreciated by those skilled in the art and the above-described embodiments should be regarded as illustrative rather than restrictive. Accordingly, it should be appreciated that variations to those embodiments can be made by those skilled in the art without departing from the scope of the systems, apparatuses, and methods as defined by the following claims.

We claim:

1. An aspiration thrombectomy system, comprising:
an aspiration catheter having a proximal portion, a distal end and a lumen extending through the catheter;
a vacuum source fluidically coupled to the catheter;
a vacuum valve connected between the vacuum source and the proximal portion of the catheter to control a vacuum flow in the catheter lumen;
a vent valve fluidically coupled to the proximal portion of the catheter, the vent valve being configured to control a flow of a vent fluid in the catheter lumen; and
a controller configured to open and close the vacuum valve and the vent valve in a predetermined cycle to change a level of vacuum at the distal end of the catheter and to control fluid flow in and out from the distal end of the catheter.
2. The system of claim 1, further comprising a vent fluid source, and wherein:
the vent fluid source is configured to provide vent fluid at a pressure greater than atmospheric pressure; and
the controller is configured to cyclically open and close the vacuum valve and the vent valve to change a level of negative pressure and positive pressure at the distal end of the catheter during each cycle.
3. The system of claim 2 wherein the controller is configured to cyclically open and close the vacuum valve and the vent valve such that movement of the fluid column at the distal end of the catheter is limited to a positive amount of exit flow from approximately 0.001 ml to approximately 1.0 ml before fluid is drawn back into the catheter lumen.
4. The system of claim 2 wherein the controller is configured to cyclically open and close the vacuum valve and the vent valve such that movement of the fluid column at the distal end of the catheter is limited to a positive amount of exit flow of approximately 0.1 ml to approximately 0.5 ml before fluid is drawn back into the catheter lumen.
5. The system of claim 1 wherein the controller is configured to cyclically open and close the vacuum valve and the vent valve in a repeated cycle comprising an off-off state in which the vacuum valve is closed while the vent valve is closed.
6. The system of claim 1 wherein:
the controller is configured to cyclically open and close the vacuum valve and the vent valve in a cycle comprising (a) a first off-off state in which the vacuum valve is closed while the vent valve is closed, (b) a vacuum-only state following the first off-off state in which the vacuum valve is open while the vent valve is closed, (c) a second off-off state following the vacuum-only state in which the vacuum valve is closed while the vent valve is closed, and (d) a vent-only state

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following the second off-off state in which the vacuum valve is closed while the vent valve is open; and
the cycle is repeated.

7. The system of claim 6 wherein the cycle is repeated at a frequency of 2 Hz to 12 Hz.
8. The system of claim 1 wherein the vacuum valve and the vent valve are solenoid pinch valves.
9. The system of claim 1 wherein the vacuum valve and the vent valve are cammed pinch valves.
10. The system of claim 1 wherein the controller is configured to cyclically open and close the vacuum valve and the vent valve such that an amount of momentum transfer from the fluid column in the catheter lumen is sufficient to unstick thromboembolic material at the distal end of the catheter.
11. A method for removing thromboembolic material, comprising:
aspirating thromboembolic material from a person using the system of claim 1 by—
(a) positioning the distal end of the catheter at least proximate to thromboembolic material in a blood vessel of the person;
(b) applying a vacuum through the lumen of the catheter such that a vacuum flow draws at least a portion of the thromboembolic material into the catheter lumen; and
(c) controlling the vacuum valve fluidically coupled to the vacuum source and the catheter and the vent valve fluidically coupled to a vent fluid source and the catheter such that a level of vacuum at the distal end of the catheter changes and thereby controls flow in and out from the distal end of the catheter.
12. The method of claim 11 wherein:
the vent fluid source is configured to provide the vent fluid at a pressure greater than atmospheric pressure; and
controlling the vacuum valve and the vent valve comprises cyclically opening and closing the vacuum valve and the vent valve to change a level of negative pressure and positive pressure at the distal end of the catheter during each cycle.
13. The method of claim 12 wherein controlling the vacuum valve and the vent valve comprises limiting movement of a fluid column in the catheter lumen at the distal end of the catheter to a positive amount of exit flow within a range of a length of the fluid column that exits the distal end of the catheter.
14. The method of claim 13 wherein limiting movement of the fluid column at the distal end of the catheter comprises stopping a distal flow through the catheter lumen and reapplying the vacuum through the catheter lumen such that the positive amount of exit flow is approximately 0.5 mm to approximately 30 mm of the fluid column before fluid is drawn back into the catheter lumen.
15. The method of claim 12 wherein controlling the vacuum valve and the vent valve comprises limiting movement of a fluid column in the catheter lumen at the distal end of the catheter to a positive amount of exit flow within a range of volume of fluid that exits the distal end of the catheter.
16. The method of claim 15 wherein limiting movement of the fluid column at the distal end of the catheter comprises stopping a distal flow through the catheter lumen and reapplying the vacuum through the catheter lumen such that the positive amount of exit flow is approximately 0.001 ml to approximately 1.0 ml before fluid is drawn back into the catheter lumen.
17. The method of claim 15 wherein limiting movement of the fluid column at the distal end of the catheter comprises

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stopping a distal flow through the catheter lumen and reapplying the vacuum through the catheter lumen such that the positive amount of exit flow is approximately 0.1 ml to approximately 0.5 ml before fluid is drawn back into the catheter lumen.

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18. The method of claim 11, further comprising cyclically opening and closing the vacuum valve and the vent valve in a repeated cycle including an off-off state in which the vacuum valve is closed while the vent valve is closed.

19. The method of claim 11, further comprising:

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cyclically opening and closing the vacuum valve and the vent valve in a cycle including (a) a first off-off state in which the vacuum valve is closed while the vent valve is closed, (b) a vacuum-only state following the first off-off state in which the vacuum valve is open while the vent valve is closed, (c) a second off-off state following the vacuum-only state in which the vacuum valve is closed while the vent valve is closed, and (d) a vent-only state following the second off-off state in which the vacuum valve is closed while the vent valve is open; and

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repeating the cycle.

20. The method of claim 19 wherein the cycle is repeated at a frequency of 2 Hz to 12 Hz.

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'402 Patent Family

Ref. No: RP-7

Patent App. No.: US 18/061,094

Filed: 2022 Dec. 02

Allowed: 2025 Jun. 09



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NGUYEN, TUAN VAN

ART UNIT

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18/061,094	12/02/2022	Derek Dee Deville	145404.8001.US08	2921

TITLE OF INVENTION: ASPIRATION THROMBECTOMY SYSTEM AND METHODS FOR THROMBUS REMOVAL WITH ASPIRATION CATHETER

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	\$516	\$0.00	\$0.00	\$516	09/09/2025

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 40% the amount of undiscounted fees, and micro entity fees are 20% the amount of undiscounted fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

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PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via the USPTO patent electronic filing system.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications. **Because electronic patent issuance may occur shortly after issue fee payment, any desired continuing application should preferably be filed prior to payment of this issue fee in order not to jeopardize copendency.**

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

25096 7590 06/09/2025
PERKINS COIE LLP - SEA General
PATENT-SEA
P.O. BOX 1247
SEATTLE, WA 98111-1247

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via the USPTO patent electronic filing system or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
18/061,094	12/02/2022	Derek Dee Deville	145404.8001.US08	2921

TITLE OF INVENTION: ASPIRATION THROMBECTOMY SYSTEM AND METHODS FOR THROMBUS REMOVAL WITH ASPIRATION CATHETER

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	\$516	\$0.00	\$0.00	\$516	09/09/2025

EXAMINER	ART UNIT	CLASS-SUBCLASS
NGUYEN, TUAN VAN	3771	606-127000

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☐ Change of correspondence address (or Change of Correspondence Address form PTO/AIA/122 or PTO/SB/122) attached.

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2. For printing on the patent front page, list

(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,

(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

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3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

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(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent): ☐ Individual ☐ Corporation or other private group entity ☐ Government

4a. Fees submitted: ☐ Issue Fee ☐ Publication Fee (if required)

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☐ Applicant certifying micro entity status. See 37 CFR 1.29

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Authorized Signature _____

Date _____

Typed or printed name _____

Registration No. _____



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25096 7590 06/09/2025 PERKINS COIE LLP - SEA General PATENT-SEA P.O. BOX 1247 SEATTLE, WA 98111-1247			EXAMINER NGUYEN, TUAN VAN	
			ART UNIT	PAPER NUMBER
			3771	
DATE MAILED: 06/09/2025				

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b) (Applications filed on or after May 29, 2000)

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The information collected by PTOL-85 Part B is required by 37 CFR 1.311. 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 30 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, Virginia 22313-1450. **DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.** Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

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. The United States Patent and Trademark Office (USPTO) collects the information in this record under authority of 35 U.S.C. 2. The USPTO's system of records is used to manage all applicant and owner information including name, citizenship, residence, post office address, and other information with respect to inventors and their legal representatives pertaining to the applicant's/owner's activities in connection with the invention for which a patent is sought or has been granted. The applicable Privacy Act System of Records Notice for the information collected in this form is COMMERCE/PAT-TM-7 Patent Application Files, available in the Federal Register at 78 FR 19243 (March 29, 2013).

<https://www.govinfo.gov/content/pkg/FR-2013-03-29/pdf/2013-07341.pdf>

Routine uses of the information in this record may include disclosure to:

- 1) law enforcement, in the event that the system of records indicates a violation or potential violation of law;
- 2) a federal, state, local, or international agency, in response to its request;
- 3) a contractor of the USPTO having need for the information in order to perform a contract;
- 4) the Department of Justice for determination of whether the Freedom of Information Act (FOIA) requires disclosure of the record;
- 5) a Member of Congress submitting a request involving an individual to whom the record pertains, when the individual has requested the Member's assistance with respect to the subject matter of the record;
- 6) a court, magistrate, or administrative tribunal, in the course of presenting evidence, including disclosures to opposing counsel in the course of settlement negotiations;
- 7) the Administrator, General Services Administration (GSA), or their designee, during an inspection of records conducted by GSA under authority of 44 U.S.C. 2904 and 2906, in accordance with the GSA regulations and any other relevant (i.e., GSA or Commerce) directive, where such disclosure shall not be used to make determinations about individuals;
- 8) 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));
- 9) the Office of Personnel Management (OPM) for personnel research purposes; and
- 10) the Office of Management and Budget (OMB) for legislative coordination and clearance.

If you do not furnish the information requested on this form, the USPTO may not be able to process and/or examine your submission, which may result in termination of proceedings, abandonment of the application, and/or expiration of the patent.

Notice of Allowability	Application No. 18/061,094	Applicant(s) Deville et al.	
	Examiner TUAN V NGUYEN	Art Unit 3771	AIA (First Inventor to File) Status Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to the Request for Continued Examination filed May 2, 2025.
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

3. ☒ The allowed claim(s) is/are 1-8,10-16 and 18-19. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
Certified copies:
a) ☐ All b) ☐ Some* c) ☐ None of the:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).
* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)	5. ☒ Examiner's Amendment/Comment
2. ☒ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____.	6. ☒ Examiner's Statement of Reasons for Allowance
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____.	7. ☐ Other _____.
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date. _____.	

/TUAN V NGUYEN/ Primary Examiner, Art Unit 3771	
--	--

Notice of Pre-AIA or AIA Status

The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after allowance or after an Office action under *Ex Parte Quayle*, 25 USPQ 74, 453 O.G. 213 (Comm'r Pat. 1935). Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, prosecution in this application has been reopened pursuant to 37 CFR 1.114. Applicant's submission filed on May 2, 2025 has been entered.

Information Disclosure Statement

The information disclosure statement (IDS) submitted on May 2, 2025 is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner.

Allowable Subject Matter

Claims 1-8, 10-16 and 18-19 allowed.

Please see Notice of Allowance issued on April 9, 2025 for examiner's statement of reasons for allowance.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to TUAN V NGUYEN whose telephone number is (571)272-5962. The examiner can normally be reached Monday - Friday 8:30 AM - 5:30 PM.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at <http://www.uspto.gov/interviewpractice>.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jackie Ho can be reached at 571-272-4696. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of published or unpublished applications may be obtained from Patent Center. Unpublished application information in Patent Center is available to registered users. To file and manage patent submissions in Patent Center, visit: <https://patentcenter.uspto.gov>. Visit <https://www.uspto.gov/patents/apply/patent-center> for more information about Patent Center and <https://www.uspto.gov/patents/docx> for information about filing in DOCX format. For additional questions, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/TUAN V NGUYEN/
Primary Examiner, Art Unit 3771



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
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NOTICE OF ALLOWANCE AND FEE(S) DUE

25096 7590 04/09/2025
PERKINS COIE LLP - SEA General
PATENT-SEA
P.O. BOX 1247
SEATTLE, WA 98111-1247

EXAMINER

NGUYEN, TUAN VAN

ART UNIT

PAPER NUMBER

3771

DATE MAILED: 04/09/2025

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
18/061,094	12/02/2022	Derek Dee Deville	145404.8001.US08	2921

TITLE OF INVENTION: ASPIRATION THROMBECTOMY SYSTEM AND METHODS FOR THROMBUS REMOVAL WITH ASPIRATION CATHETER

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	\$516	\$0.00	\$0.00	\$516	07/09/2025

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

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OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. 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 30 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, Virginia 22313-1450. **DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.** Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

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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. The United States Patent and Trademark Office (USPTO) collects the information in this record under authority of 35 U.S.C. 2. The USPTO's system of records is used to manage all applicant and owner information including name, citizenship, residence, post office address, and other information with respect to inventors and their legal representatives pertaining to the applicant's/owner's activities in connection with the invention for which a patent is sought or has been granted. The applicable Privacy Act System of Records Notice for the information collected in this form is COMMERCE/PAT-TM-7 Patent Application Files, available in the Federal Register at 78 FR 19243 (March 29, 2013).

<https://www.govinfo.gov/content/pkg/FR-2013-03-29/pdf/2013-07341.pdf>

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- 8) 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));
- 9) the Office of Personnel Management (OPM) for personnel research purposes; and
- 10) the Office of Management and Budget (OMB) for legislative coordination and clearance.

If you do not furnish the information requested on this form, the USPTO may not be able to process and/or examine your submission, which may result in termination of proceedings, abandonment of the application, and/or expiration of the patent.

Notice of Allowability	Application No. 18/061,094	Applicant(s) Deville et al.	
	Examiner TUAN V NGUYEN	Art Unit 3771	AIA (FITF) Status Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to the Request for Continued Examination filed 01/16/25.
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

3. ☒ The allowed claim(s) is/are 1-8,10-16 and 18-19 . As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information , please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
Certified copies:
a) ☐ All b) ☐ Some* c) ☐ None of the:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).
* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)	5. ☒ Examiner's Amendment/Comment
2. ☒ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____.	6. ☒ Examiner's Statement of Reasons for Allowance
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____.	7. ☐ Other _____.
4. ☒ Interview Summary (PTO-413), Paper No./Mail Date. _____.	

/TUAN V NGUYEN/ Primary Examiner, Art Unit 3771	
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Notice of Pre-AIA or AIA Status

The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on January 16, 2025 has been entered.

Information Disclosure Statement

The information disclosure statement (IDS) submitted on January 16, 2025 is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner.

Interview Summary

In a telephonic interview with applicant's representative on March 26, 2025, the limitation of "5.2 ms" in claims 1 and 12 was discussed. Examiner stated that the limitation at issue is not disclosed in the specification. Applicant's representative stated that the limitation of "5.2 ms" is derived from paragraphs [0074], [0275] and [0281] and Table 1.

Paragraph [0275] discloses "*Rotation of the cams are measured in degrees, a full rotation being 360 degrees of movement....the cams 430, 450 stop both venting and vacuum between each respective application of vacuum and venting, for example, with a 30 degrees rotation.*" Table 1, first row, shows off-off state has a cam angle 0 degrees to 30 degrees. This means that the off-off state occurs or lasts for a period of $1/12$ ($30 \text{ degrees} / 360 \text{ degrees} = 1/12$) of the total time to complete a full rotation (one cycle).

Paragraphs [0074] and [0281] disclose the cams are operated at a frequency of 16 Hz (16 cycles per second or 16 cycles per 1000 ms). This means that a full rotation of the cams (one cycle) lasts for a period of 62.5 ms ($1000 \text{ ms} / 16 \text{ cycles} = 62.5 \text{ ms/cycle}$). Since the off-off state occurs or lasts for a period of $1/12$ of the total time to complete a full rotation (one cycle) and the total time to complete one full rotation is 62.5 ms, thus, the off-off state lasts a time period of 5.2 ms ($62.5 \text{ ms} / 12 = 5.2 \text{ ms}$).

Response to Amendment and Arguments

The amendment to claims 1, 6, 12 and 15 overcome the rejection under 35 U.S.C. § 112(a) or 35 U.S.C § 112 (pre-AIA), First Paragraph the most recent Office action.

Applicant arguments in the Remarks filed on January 16, 2025 with respect to the limitations in items (a) through (c) in claims 1 and 12 have been fully considered and persuasive.

Allowable Subject Matter

Claims 1-8, 10-16 and 18-19 allowed.

There is no art of record alone or in combination that teaches an aspiration thrombectomy system and a method for removing thromboembolic material that includes the combination of recited limitations in claims 1 and 12.

Prior art of record alone or in combination did not teach the limitations of the first predetermined sequence includes the first off-off state lasts a predetermined period of time from 5.2 ms to less than the time for a pressure pulse to propagate from the vacuum valve to the distal end of the catheter and the first predetermined sequence is repeated at a first frequency of approximately 6 Hz to approximately 16 Hz.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to TUAN V NGUYEN whose telephone number is (571)272-5962. The examiner can normally be reached Monday - Friday 8:30 AM - 5:30 PM.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at <http://www.uspto.gov/interviewpractice>.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jackie Ho can be reached on 571-272-4696. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of published or unpublished applications may be obtained from Patent Center. Unpublished application information in Patent Center is available to registered users. To file and manage patent submissions in Patent Center, visit: <https://patentcenter.uspto.gov>. Visit <https://www.uspto.gov/patents/apply/patent-center> for more information about Patent Center and <https://www.uspto.gov/patents/docx> for information about filing in DOCX format. For additional questions, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/TUAN V NGUYEN/
Primary Examiner, Art Unit 3771

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:
Derek Dee Deville et al.

Application No.: 18/061,094

Confirmation No.: 2921

Filed: December 2, 2022

Art Unit: 3771

For: ASPIRATION THROMBECTOMY SYSTEM
AND METHODS FOR THROMBUS
REMOVAL WITH ASPIRATION CATHETER

Examiner: Jonathan Wade Miles

**REQUEST FOR CONTINUED EXAMINATION AND
AMENDMENT UNDER 37 C.F.R. §1.114**

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Commissioner:

The present communication responds to the Final Office Action dated July 16, 2024, and the Advisory Action dated September 18, 2024, in the above-identified U.S. patent application, and is filed concurrently with a Request for Continued Examination under 37 C.F.R. § 1.114.

Amendments to the Claims are reflected in the listing of claims which begins on page 2 of this paper.

Remarks/Arguments begin on page 6 of this paper.

AMENDMENTS TO THE CLAIMS

Please amend the claims as follows:

1. (Currently Amended) An aspiration thrombectomy system, comprising:

a catheter system including an aspiration catheter having a proximal portion, a distal end and a lumen extending through the aspiration catheter;

a vacuum source fluidically coupled to the catheter system;

a vacuum valve connected between the vacuum source and the proximal portion of the aspiration catheter to control a vacuum flow in the catheter lumen;

a vent valve fluidically coupled to the proximal portion of the aspiration catheter, the vent valve being configured to control a flow of a vent fluid in the catheter lumen;

and

a controller configured to open and close the vacuum valve and the vent valve in at least a first predetermined sequence comprising a vacuum-only state in which the vacuum valve is open and the vent valve is closed, a first off-off state following the vacuum-only state in which both the vacuum valve and the vent valve are closed, a vent-only state in which the vent valve is open and the vacuum valve is closed, and a second off-off state after the vent-only state in which both the vacuum valve and the vent valve are closed, wherein -

(a) the first off-off state ~~is~~ lasts a predetermined period of time from 5.2 ms to less than the time for a pressure pulse to propagate from the vacuum valve to the distal end of the catheter,

(b) the second off-off state lasts a predetermined period of time, and

(c) the first predetermined sequence is repeated at a first frequency of approximately 6 Hz to approximately 16 Hz.

2. (Currently Amended) The system of claim 1, further comprising a vent fluid source, and wherein:

the vent fluid source is configured to provide vent fluid at a pressure from greater than atmospheric pressure to about body pressure; and

the controller is configured to cyclically open and close the vacuum valve and the vent valve to alternate between a negative pressure and a positive pressure at the distal end of the aspiration catheter during each cycle.

3. (Currently Amended) The system of claim 2 wherein the controller is configured to cyclically open and close the vacuum valve and the vent valve such that distal movement of a fluid column at the distal end of the aspiration catheter is limited to a positive amount of exit flow of less than ~~2-00.02~~ ml before fluid is drawn back into the catheter lumen.

4. (Original) The system of claim 3 wherein the positive amount of exit flow before fluid is drawn back into the catheter lumen is less than 6 microliters.

5. (Original) The system of claim 3 wherein the positive amount of exit flow before fluid is drawn back into the catheter lumen is less than 2 microliters.

6. (Currently Amended) The system of claim 1 wherein the first off-off state and the second off-off state are from 5.2 ms ~~To~~ to 13.9 ms.

7. (Previously Presented) The system of claim 1 wherein the first sequence is repeated at a frequency of 8 Hz to 12 Hz.

8. (Previously Presented) The system of claim 1 wherein the first sequence is repeated at a frequency of 6 Hz to 8 Hz.

9. (Canceled)

10. (Previously Presented) The system of claim 1 wherein the first predetermined sequence is adapted to at least a compliance of the catheter system such that a pressure pulse from a vent phase is reversed before the thromboembolic material moves further downstream off the distal end in the distal direction.

11. (Original) The system of claim 1 wherein the controller is configured to open and close the vacuum valve and the vent valve such that the change in level of vacuum each cycle is approximately 20 inHg in a time of not greater than approximately 20 ms.

12. (Currently Amended) A method for removing thromboembolic material, comprising:

positioning the distal end of a catheter at least proximate to thromboembolic material in a blood vessel of a person, wherein the catheter has a proximal portion, a distal end and a lumen extending from the proximal portion to the distal end; and

controlling a vacuum valve fluidically coupled to a vacuum source and the catheter and a vent valve fluidically coupled to a vent fluid source and the catheter according to a first predetermined sequence comprising a vacuum-only state in which the vacuum valve is open and the vent valve is closed, a first

off-off state following the vacuum-only state in which both the vacuum valve and the vent valve are closed, a vent-only state in which the vent valve is open and the vacuum valve is closed, and a second off-off state after the vent-only state in which both the vacuum valve and the vent valve are closed, wherein -

- (a) the first off-off state ~~is~~ lasts a predetermined period of time from 5.2 ms to less than the time for a pressure pulse to propagate from the vacuum valve to the distal end of the catheter,
- (b) the second off-off state lasts a predetermined period of time, and
- (c) the first predetermined sequence is repeated at a first frequency of approximately 6 Hz to approximately 16 Hz.

13. (Original) The method of claim 12 wherein:
the vent fluid source provides the vent fluid at a pressure greater than atmospheric pressure; and
controlling the vacuum valve and the vent valve comprises cyclically opening and closing the vacuum valve and the vent valve to alternate between a negative pressure and a positive pressure at the distal end of the catheter during each cycle.

14. (Previously Presented) The method of claim 12 wherein controlling the vacuum valve and the vent valve comprises limiting movement of a fluid column in the catheter lumen at the distal end of the catheter to a positive amount of exit flow within a specific range of volume of fluid that exits the distal end of the catheter.

15. (Currently Amended) The method of claim 14 wherein the range of volume is less than ~~2.00~~ 0.02 ml.

16. (Original) The method of claim 14 wherein the controlling the vacuum valve and the vent valve comprises imparting an amount of momentum transfer from the fluid column in the catheter lumen in a distal direction sufficient to unstick thromboembolic material at the distal end of the catheter.

17. (Canceled)

18. (Previously Presented) The method of claim 12 wherein controlling the vacuum valve and the vent valve comprises opening and closing the vacuum valve and the vent valve in a predetermined cycle adapted to at least a compliance of the catheter such that a pressure pulse from a vent phase is reversed before the thromboembolic material moves further downstream off the distal end in the distal direction.

19. (Original) The method of claim 12 wherein controlling the vacuum valve and the vent valve comprises opening the vacuum valve for approximately 60% of each cycle and opening the vent valve for approximately 20% - 25% of each cycle.

'402 Patent Family

Ref. No: RP-8

Patent No.: US 12,082,830

Filed: 2022 Dec. 2

Issued: 2024 Sep. 10



US012082830B2

(12) **United States Patent**
Deville et al.

(10) **Patent No.:** **US 12,082,830 B2**

(45) **Date of Patent:** ***Sep. 10, 2024**

(54) **ASPIRATION THROMBECTOMY SYSTEM
AND METHODS FOR THROMBUS
REMOVAL WITH ASPIRATION CATHETER**

(71) Applicant: **RapidPulse, Inc.**, Miami, FL (US)

(72) Inventors: **Derek Dee Deville**, Coral Gables, FL (US); **Matthew A. Palmer**, Miami, FL (US); **William T. Bales**, Miami, FL (US); **M. Sean McBrayer**, Coral Gables, FL (US); **Eric Petersen**, Homestead, FL (US); **Richard Cartledge**, Boca Raton, FL (US); **Thomas O. Bales, Jr.**, Miami, FL (US); **Carlos Rivera**, Cooper City, FL (US)

(73) Assignee: **RapidPulse, Inc.**, Miami, FL (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 187 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **18/061,123**

(22) Filed: **Dec. 2, 2022**

(65) **Prior Publication Data**

US 2023/0099283 A1 Mar. 30, 2023

Related U.S. Application Data

(63) Continuation of application No. 16/899,514, filed on Jun. 11, 2020, which is a continuation of application (Continued)

(51) **Int. Cl.**
A61B 17/22 (2006.01)
A61B 17/00 (2006.01)
(Continued)

(52) **U.S. Cl.**
CPC **A61B 17/22** (2013.01); **A61F 2/013** (2013.01); **A61M 25/0075** (2013.01);
(Continued)

(58) **Field of Classification Search**

CPC **A61B 17/22**; **A61B 17/3207**; **A61B 2017/00022**; **A61B 2017/22079**;
(Continued)

(56) **References Cited**

U.S. PATENT DOCUMENTS

3,955,574 A 5/1976 Rubinstein
4,164,223 A 8/1979 Munib
(Continued)

FOREIGN PATENT DOCUMENTS

CN 101027004 A 8/2007
EP 1799128 B1 3/2010
(Continued)

OTHER PUBLICATIONS

Notice of Reasons for Refusal with translation for Japanese Patent Application No. 2021-503097, dated May 30, 2023, 8 pages.

(Continued)

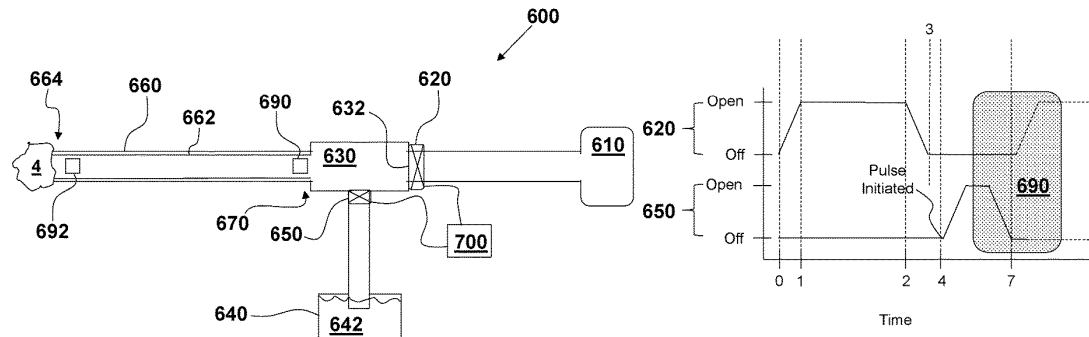
Primary Examiner — Wade Miles

(74) *Attorney, Agent, or Firm* — Perkins Coie LLP

(57) **ABSTRACT**

A clot removal system comprises a catheter, a vacuum source, and a controller. The catheter comprises a proximal end, a distal end, and controller operating parameters and defines a lumen configured to be filled with a liquid column having a proximal portion. The vacuum source is configured to supply vacuum. The controller is configured to carry out a control pattern of turning on and off the vacuum based upon the controller operating parameters and is configured to receive the controller operating parameters in an automatic response to the catheter being operatively connected to at least one of the vacuum source and the controller and, responsive to the connection, to carry out the control pattern to change a level of vacuum at the distal end of the catheter.

20 Claims, 29 Drawing Sheets



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The foregoing description and accompanying drawings illustrate the principles, exemplary embodiments, and modes of operation of the systems, apparatuses, and methods. However, the systems, apparatuses, and methods should not be construed as being limited to the particular embodiments discussed above. Additional variations of the embodiments discussed above will be appreciated by those skilled in the art and the above-described embodiments should be regarded as illustrative rather than restrictive. Accordingly, it should be appreciated that variations to those embodiments can be made by those skilled in the art without departing from the scope of the systems, apparatuses, and methods as defined by the following claims.

We claim:

1. An aspiration thrombectomy system, comprising:
 - a catheter system including an aspiration catheter having a proximal portion, a distal end, and a lumen extending through the aspiration catheter;
 - a vacuum source fluidically coupled to the catheter system;
 - a vacuum valve connected between the vacuum source and the proximal portion of the aspiration catheter to control a vacuum flow in the catheter lumen;
 - a vent valve fluidically coupled to the proximal portion of the aspiration catheter, the vent valve being configured to control a flow of a vent fluid in the catheter lumen; and
 - a controller configured to cyclically open and close the vacuum valve and the vent valve in a predetermined repeated cycle based on a compliance of the catheter system such that a pressure pulse from a vent phase momentarily moves the thromboembolic material downstream in the distal direction and whereby a subsequent vacuum phase reverses the pressure pulse and draws the thromboembolic material back against the distal end of the aspiration catheter.
2. The system of claim 1, further comprising a vent fluid source, and wherein:
 - the vent fluid source is configured to provide vent fluid at a pressure greater than atmospheric pressure; and
 - the controller is configured to cyclically open and close the vacuum valve and the vent valve to alternate between a negative pressure and a positive pressure at the distal end of the aspiration catheter during each cycle.
3. The system of claim 2 wherein the controller is configured to cyclically open and close the vacuum valve and the vent valve such that movement of the fluid column at the distal end of the aspiration catheter is limited to a positive amount of exit flow of less than 20 microliters before fluid is drawn back into the catheter lumen.
4. The system of claim 1 wherein the controller is configured to cyclically open and close the vacuum valve and the vent valve in a cycle comprising a vacuum-only state in which the vacuum valve is open and the vent valve is closed, an off-off state in which the vacuum valve is closed while the vent valve is closed for a controlled period of time, and a vent-only state in which the vacuum valve is closed and the vent valve is open.
5. The system of claim 4 wherein the vacuum-only state is 40-60% of the cycle, the vent-only state is approximately 20-25% of the cycle, and the off-off state is the remainder of the cycle.
6. The system of claim 1 wherein:
 - the controller is configured to cyclically open and close the vacuum valve and the vent valve in a cycle comprising a combination of a first off-off state in which the

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- vacuum valve is closed while the vent valve is closed, a vacuum-only state in which the vacuum valve is open while the vent valve is closed, a second off-off state in which the vacuum valve is closed while the vent valve is closed, and a vent-only state in which the vacuum valve is closed while the vent valve is open; and
- the cycle is repeated.
7. The system of claim 1 wherein the cycle is repeated at a frequency of 6 Hz to 16 Hz.
8. The system of claim 7 wherein a change in vacuum level at the distal end each cycle is at least approximately 15 inHg to 25 inHg in a time of not greater than 20 ms to 50 ms.
9. The system of claim 8 wherein the cycle is repeated at a frequency of 8 Hz to 12 Hz and during each cycle the pressure differential at the distal end of the aspiration catheter is at least approximately 20 inHg in a time of not greater than approximately 20 ms.
10. A method for removing thromboembolic material, comprising:
 - positioning the distal end of a catheter at least proximate to thromboembolic material in a blood vessel of a person, wherein the catheter has a proximal portion, a distal end and a lumen extending from the proximal portion to the distal end; and
 - controlling a vacuum valve fluidically coupled to a vacuum source and the catheter and a vent valve fluidically coupled to a vent fluid source and the catheter according to a predetermined cycle based on a compliance of the catheter such that a pressure pulse from a vent phase is reversed before the thromboembolic material moves uncontrollably off the distal end in the distal direction.
11. The method of claim 10 wherein:
 - the vent fluid source provides the vent fluid at a pressure greater than atmospheric pressure; and
 - controlling the vacuum valve and the vent valve comprises cyclically opening and closing the vacuum valve and the vent valve to alternate between a negative pressure and a positive pressure at the distal end of the catheter during each cycle.
12. The method of claim 11 wherein controlling the vacuum valve and the vent valve comprises limiting movement of a fluid column in the catheter lumen at the distal end of the catheter to a positive amount of exit flow within a specific range of volume of fluid that exits the distal end of the catheter.
13. The method of claim 12 wherein the range of volume is less than 20 microliters.
14. The method of claim 10 wherein controlling the vacuum valve and the vent valve comprises cyclically opening and closing the vacuum valve and the vent valve in a cycle comprising a vacuum-only state in which the vacuum valve is open and the vent valve is closed, an off-off state in which the vacuum valve is closed while the vent valve is closed for a controlled period of time, and a vent-only state in which the vacuum valve is closed and the vent valve is open.
15. The method of claim 14 wherein the vacuum-only state is 40-60% of the cycle, the vent-only state is approximately 20-22% of the cycle, and the off-off state is the remainder of the cycle.
16. The method of claim 10 wherein the controlling the vacuum valve and the vent valve comprises opening and closing the vacuum valve and the vent valve in cycles of approximately 6 Hz to approximately 16 Hz, wherein during each cycle a change in level of vacuum at the distal end of

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the catheter is at least approximately 15 inHg to 25 inHg in a time of not greater than approximately 20 ms to 50 ms.

17. The method of claim 10, further comprising:

cyclically opening and closing the vacuum valve and the vent valve in a cycle including a combination of a first off-off state in which the vacuum valve is closed while the vent valve is closed, a vacuum-only state in which the vacuum valve is open while the vent valve is closed, a second off-off state in which the vacuum valve is closed while the vent valve is closed, and a vent-only state in which the vacuum valve is closed while the vent valve is open; and

repeating the cycle.

18. The method of claim 10, further comprising:

sensing identification information from a sense part associated with the catheter, wherein the identification information includes configuration data of the catheter; and

controlling the vacuum valve and the vent valve according to the configuration information of the catheter.

19. The method of claim 18, wherein the configuration information is based on the compliance of the catheter.

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20. An aspiration thrombectomy system, comprising:

a catheter system including an aspiration catheter having a proximal portion, a distal end, and a lumen extending through the aspiration catheter;

a vacuum source fluidically coupled to the catheter system;

a vacuum valve connected between the vacuum source and the proximal portion of the aspiration catheter to control a vacuum flow in the catheter lumen;

a vent valve fluidically coupled to the proximal portion of the aspiration catheter, the vent valve being configured to control a flow of a vent fluid in the catheter lumen; and

a controller configured to cyclically open and close the vacuum valve and the vent valve in a predetermined repeated cycle based on a compliance of the catheter system such that a pressure pulse from a vent phase causes a small distal movement of the thromboembolic material and is then reversed by subsequent application of vacuum whereby the repeated cycle macerates the thromboembolic material at the distal end of the aspiration catheter.

* * * * *

'402 Patent Family

Ref. No: RP-9

Patent No.: US 12,004,757

Filed: 2023 Jun. 30

Issued: 2024 Jun. 11



US012004757B2

(12) **United States Patent**
Deville et al.

(10) **Patent No.:** **US 12,004,757 B2**

(45) **Date of Patent:** **Jun. 11, 2024**

(54) **ASPIRATION THROMBECTOMY SYSTEM
AND METHODS FOR THROMBUS
REMOVAL WITH ASPIRATION CATHETER**

(71) Applicant: **RapidPulse, Inc.**, Miami, FL (US)

(72) Inventors: **Derek Dee Deville**, Coral Gables, FL (US); **Matthew A. Palmer**, Miami, FL (US); **William T. Bales**, Miami, FL (US); **M. Sean McBrayer**, Coral Gables, FL (US); **Eric Petersen**, Homestead, FL (US); **Richard Cartledge**, Boca Raton, FL (US); **Thomas O. Bales, Jr.**, Miami, FL (US); **Carlos Rivera**, Cooper City, FL (US)

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **18/345,991**

(22) Filed: **Jun. 30, 2023**

(65) **Prior Publication Data**

US 2023/0338047 A1 Oct. 26, 2023

Related U.S. Application Data

(63) Continuation of application No. 16/899,514, filed on Jun. 11, 2020, which is a continuation of application (Continued)

(51) **Int. Cl.**
A61B 17/22 (2006.01)
A61B 17/00 (2006.01)
(Continued)

(52) **U.S. Cl.**
CPC **A61B 17/22** (2013.01); **A61F 2/013** (2013.01); **A61M 25/0075** (2013.01);
(Continued)

(58) **Field of Classification Search**

CPC A61B 17/22; A61B 17/3207; A61B 2017/00022; A61B 2017/22079;
(Continued)

(56) **References Cited**

U.S. PATENT DOCUMENTS

3,955,574 A * 5/1976 Rubinstein A61M 1/772 604/151
4,164,223 A 8/1979 Munib
(Continued)

FOREIGN PATENT DOCUMENTS

CN 101027004 A 8/2007
EP 1799128 B1 3/2010
(Continued)

OTHER PUBLICATIONS

IPR2021-01466, Petition for Inter Partes Review of U.S. Pat. No. 10,531,883, Aug. 30, 2021, 87 pages.
(Continued)

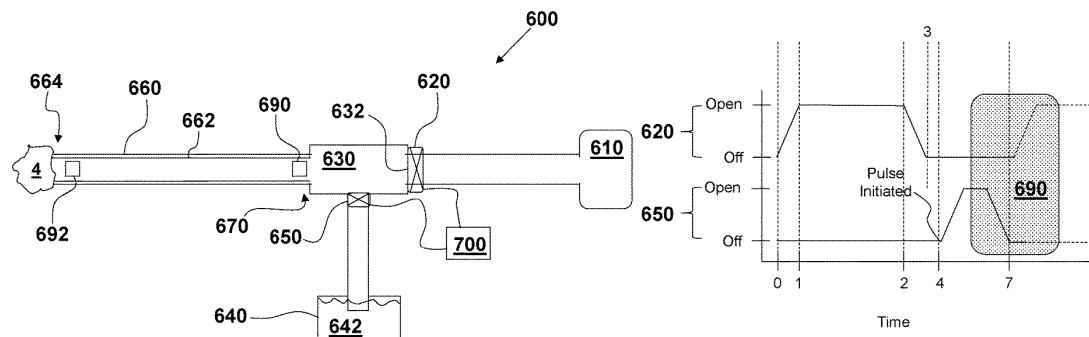
Primary Examiner — Wade Miles

(74) *Attorney, Agent, or Firm* — Perkins Coie LLP

(57) **ABSTRACT**

A clot removal system comprises a catheter, a vacuum source, and a controller. The catheter comprises a proximal end, a distal end, and controller operating parameters and defines a lumen configured to be filled with a liquid column having a proximal portion. The vacuum source is configured to supply vacuum. The controller is configured to carry out a control pattern of turning on and off the vacuum based upon the controller operating parameters and is configured to receive the controller operating parameters in an automatic response to the catheter being operatively connected to at least one of the vacuum source and the controller and, responsive to the connection, to carry out the control pattern to change a level of vacuum at the distal end of the catheter.

14 Claims, 29 Drawing Sheets



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embodiments or features, they are equally applicable to similar features or not a reference numeral is used or another reference numeral is omitted.

The foregoing description and accompanying drawings illustrate the principles, exemplary embodiments, and modes of operation of the systems, apparatuses, and methods. However, the systems, apparatuses, and methods should not be construed as being limited to the particular embodiments discussed above. Additional variations of the embodiments discussed above will be appreciated by those skilled in the art and the above-described embodiments should be regarded as illustrative rather than restrictive. Accordingly, it should be appreciated that variations to those embodiments can be made by those skilled in the art without departing from the scope of the systems, apparatuses, and methods as defined by the following claims.

We claim:

1. An aspiration thrombectomy system, comprising:
a catheter system including an aspiration catheter having a proximal portion, a distal end, and a lumen extending through the aspiration catheter;
a vacuum source fluidically coupled to the catheter system;
a vacuum valve fluidically coupled to the vacuum source and the proximal portion of the aspiration catheter to control a vacuum flow in the catheter lumen;
a vent valve fluidically coupled to the proximal portion of the aspiration catheter, the vent valve being configured to control a flow of a vent fluid in the catheter lumen; and
a controller configured to cyclically open and close the vacuum valve and the vent valve in a predetermined repeated cycle having a vacuum-only state in which the vacuum valve is open and the vent valve is closed, an off-off state in which both the vacuum valve and the vent valve are closed, and a vent-only state in which the vent valve is open and the vacuum valve is closed, wherein the off-off state is a programmed predetermined period of time less than the time for a pressure pulse caused by closing the vacuum valve to propagate to the distal end of the catheter.
2. The system of claim 1, further comprising a vent fluid source, wherein the controller is configured to cyclically open and close the vacuum valve and the vent valve to alternate between a negative pressure phase and a positive pressure phase at the distal end of the aspiration catheter during each cycle such that an exit flow occurs at the distal end during at least a portion of the positive pressure phase.
3. The system of claim 2 wherein the controller is configured to cyclically open and close the vacuum valve and the vent valve such that the exit flow is less than 20 microliters before fluid is drawn back into the catheter lumen.
4. The system of claim 1 wherein the vacuum-only state is 40-60% of the cycle, the vent-only state is approximately 20-25% of the cycle, and the off-off state is the remainder of the cycle.
5. The system of claim 1 wherein the off-off state is about 10 ms.

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6. The system of claim 5 wherein the off-off state is not more than 30 ms.

7. The system of claim 1 wherein the off-off state is about 8% to about 24% of each cycle.

8. The system of claim 1 wherein the off-off state is about 12% to about 36% of each cycle.

9. The system of claim 1 wherein:

the off-off state comprises a first off-off state after the vacuum-only state and before the vent-only state;

the predetermined repeated cycle further comprises a second off-off state after the vent-only state and before a subsequent vacuum-only state of a subsequent cycle; and

the second off-off state is a programmed predetermined period of time.

10. A method for removing thromboembolic material, comprising:

positioning the distal end of a catheter at least proximate to thromboembolic material in a blood vessel of a person, wherein the catheter has a proximal portion, a distal end and a lumen extending from the proximal portion to the distal end; and

controlling a vacuum valve fluidically coupled to a vacuum source and the catheter and a vent valve fluidically coupled to a vent fluid source and the catheter according to a predetermined cycle having a vacuum-only state in which the vacuum valve is open and the vent valve is closed, an off-off state in which both the vacuum valve and the vent valve are closed, and a vent-only state in which the vent valve is open and the vacuum valve is closed, wherein the off-off state is a programmed predetermined period of time less than the time for a pressure pulse caused by closing the vacuum valve to propagate to the distal end of the catheter.

11. The method of claim 10 wherein controlling the vacuum valve and the vent valve comprises cyclically opening and closing the vacuum valve and the vent valve to alternate between a negative pressure phase and a positive pressure phase at the distal end of the catheter during each cycle and limiting movement of a fluid column in the catheter lumen at the distal end of the catheter such that a positive amount of exit flow occurs within a specific volume of fluid during at least a portion of the positive pressure phase.

12. The method of claim 11 wherein the specific volume is less than 20 microliters.

13. The method of claim 10 wherein the vacuum-only state is 40-60% of the cycle, the vent-only state is approximately 20-22% of the cycle, and the off-off state is the remainder of the cycle.

14. The method of claim 10 wherein the controlling the vacuum valve and the vent valve comprises opening and closing the vacuum valve and the vent valve in cycles of approximately 6 Hz to approximately 16 Hz, wherein during each cycle a change in level of vacuum at the distal end of the catheter is at least approximately 15 inHg to 25 inHg in a time of not greater than approximately 20 ms.

* * * * *

'402 Patent Family

Ref. No: RP-10

Patent App. No.: US 18/346,008

Filed: 2023 Jun. 30

Allowed: 2025 Jul. 2



UNITED STATES PATENT AND TRADEMARK OFFICE

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NOTICE OF ALLOWANCE AND FEE(S) DUE

25096 7590 07/02/2025
PERKINS COIE LLP - SEA General
PATENT-SEA
P.O. BOX 1247
SEATTLE, WA 98111-1247

EXAMINER

NGUYEN, TUAN VAN

ART UNIT

PAPER NUMBER

3771

DATE MAILED: 07/02/2025

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
18/346,008	06/30/2023	Derek Dee Deville	145404.8001.US11	3114

TITLE OF INVENTION: ASPIRATION THROMBECTOMY SYSTEM AND METHODS FOR THROMBUS REMOVAL WITH ASPIRATION CATHETER

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	\$516	\$0.00	\$0.00	\$516	10/02/2025

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 40% the amount of undiscounted fees, and micro entity fees are 20% the amount of undiscounted fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Maintenance fees are due in utility patents issuing on applications filed on or after Dec. 12, 1980. It is patentee's responsibility to ensure timely payment of maintenance fees when due. More information is available at www.uspto.gov/PatentMaintenanceFees.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via the USPTO patent electronic filing system.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications. **Because electronic patent issuance may occur shortly after issue fee payment, any desired continuing application should preferably be filed prior to payment of this issue fee in order not to jeopardize copendency.**

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

25096 7590 07/02/2025
PERKINS COIE LLP - SEA General
PATENT-SEA
P.O. BOX 1247
SEATTLE, WA 98111-1247

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via the USPTO patent electronic filing system or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
18/346,008	06/30/2023	Derek Dee Deville	145404.8001.US11	3114

TITLE OF INVENTION: ASPIRATION THROMBECTOMY SYSTEM AND METHODS FOR THROMBUS REMOVAL WITH ASPIRATION CATHETER

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	\$516	\$0.00	\$0.00	\$516	10/02/2025

EXAMINER	ART UNIT	CLASS-SUBCLASS
NGUYEN, TUAN VAN	3771	606-127000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

☐ Change of correspondence address (or Change of Correspondence Address form PTO/AIA/122 or PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/AIA/47 or PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,

(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 _____
2 _____
3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent): ☐ Individual ☐ Corporation or other private group entity ☐ Government

4a. Fees submitted: ☐ Issue Fee ☐ Publication Fee (if required)

4b. Method of Payment: (Please first reapply any previously paid fee shown above)

☐ Electronic Payment via the USPTO patent electronic filing system ☐ Enclosed check ☐ Non-electronic payment by credit card (Attach form PTO-2038)

☐ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. _____

5. Change in Entity Status (from status indicated above)

☐ Applicant certifying micro entity status. See 37 CFR 1.29

☐ Applicant asserting small entity status. See 37 CFR 1.27

☐ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____

Date _____

Typed or printed name _____

Registration No. _____



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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
18/346,008	06/30/2023	Derek Dee Deville	145404.8001.US11	3114
25096	7590	07/02/2025	EXAMINER	
PERKINS COIE LLP - SEA General			NGUYEN, TUAN VAN	
PATENT-SEA			ART UNIT	PAPER NUMBER
P.O. BOX 1247			3771	
SEATTLE, WA 98111-1247			DATE MAILED: 07/02/2025	

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b) (Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. 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 30 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, Virginia 22313-1450. **DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.** Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

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. The United States Patent and Trademark Office (USPTO) collects the information in this record under authority of 35 U.S.C. 2. The USPTO's system of records is used to manage all applicant and owner information including name, citizenship, residence, post office address, and other information with respect to inventors and their legal representatives pertaining to the applicant's/owner's activities in connection with the invention for which a patent is sought or has been granted. The applicable Privacy Act System of Records Notice for the information collected in this form is COMMERCE/PAT-TM-7 Patent Application Files, available in the Federal Register at 78 FR 19243 (March 29, 2013).

<https://www.govinfo.gov/content/pkg/FR-2013-03-29/pdf/2013-07341.pdf>

Routine uses of the information in this record may include disclosure to:

- 1) law enforcement, in the event that the system of records indicates a violation or potential violation of law;
- 2) a federal, state, local, or international agency, in response to its request;
- 3) a contractor of the USPTO having need for the information in order to perform a contract;
- 4) the Department of Justice for determination of whether the Freedom of Information Act (FOIA) requires disclosure of the record;
- 5) a Member of Congress submitting a request involving an individual to whom the record pertains, when the individual has requested the Member's assistance with respect to the subject matter of the record;
- 6) a court, magistrate, or administrative tribunal, in the course of presenting evidence, including disclosures to opposing counsel in the course of settlement negotiations;
- 7) the Administrator, General Services Administration (GSA), or their designee, during an inspection of records conducted by GSA under authority of 44 U.S.C. 2904 and 2906, in accordance with the GSA regulations and any other relevant (i.e., GSA or Commerce) directive, where such disclosure shall not be used to make determinations about individuals;
- 8) 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));
- 9) the Office of Personnel Management (OPM) for personnel research purposes; and
- 10) the Office of Management and Budget (OMB) for legislative coordination and clearance.

If you do not furnish the information requested on this form, the USPTO may not be able to process and/or examine your submission, which may result in termination of proceedings, abandonment of the application, and/or expiration of the patent.

Notice of Allowability	Application No. 18/346,008	Applicant(s) Deville et al.	
	Examiner TUAN V NGUYEN	Art Unit 3771	AIA (First Inventor to File) Status Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to the Request for Continued Examination filed on February 4, 2025.
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

3. ☒ The allowed claim(s) is/are 1-5 and 7-8. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
Certified copies:
 a) ☐ All b) ☐ Some* c) ☐ None of the:
 1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).
 * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892) 2. ☒ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____ 3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____ 4. ☐ Interview Summary (PTO-413), Paper No./Mail Date. _____	5. ☒ Examiner's Amendment/Comment 6. ☒ Examiner's Statement of Reasons for Allowance 7. ☐ Other _____
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/TUAN V NGUYEN/ Primary Examiner, Art Unit 3771	
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Notice of Pre-AIA or AIA Status

The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on February 4, 2025 and May 2, 2025 have been entered.

Information Disclosure Statement

The information disclosure statements (IDSs) submitted on February 4, 2025 and May 2, 2025 is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statements are being considered by the examiner.

Allowable Subject Matter

Claims 1-5 and 7-8 allowed.

As to the limitation of "5.2 ms" and 13.9 ms in claim 1, examiner agreed with applicant that these limitations derived from paragraphs [0074], [0275] and [0281] and Table 1.

Paragraph [0275] discloses "*Rotation of the cams are measured in degrees, a full rotation being 360 degrees of movement....the cams 430, 450 stop both venting and vacuum between each respective application of vacuum and venting, for example, with a 30 degrees rotation.*" Table 1, first row, shows off-off state has a cam angle 0 degrees to 30 degrees. This means that the off-off state occurs or lasts for a period of $1/12$ (30 degrees / 360 degrees = $1/12$) of the total time to complete a full rotation (one cycle).

Paragraphs [0074] and [0281] disclose the cams are operated at a frequency of 16 Hz (16 cycles per second or 16 cycles per 1000 ms). This means that a full rotation of the cams (one cycle) lasts for a period of 62.5 ms (1000 ms / 16 cycles = 62.5 ms/cycle). Since the off-off state occurs or lasts for a period of $1/12$ of the total time to complete a full rotation (one cycle) and the total time to complete one full rotation is 62.5 ms, thus, the off-off state lasts a time period of 5.2 ms (62.5 ms / 12 = 5.2 ms).

Similarly, the limitation of "13.9 ms" also derive from paragraphs [0074], [0275] and [0281] and Table 1.

Paragraph [0275] discloses "*Rotation of the cams are measured in degrees, a full rotation being 360 degrees of movement....the cams 430, 450 stop both venting and vacuum between each respective application of vacuum and venting, for example, with a 30 degrees rotation.*" Table 1, first row, shows off-off state has a cam angle 0 degrees to 30 degrees. This means that the off-off state occurs or lasts for a period of $1/12$ (30 degrees / 360 degrees = $1/12$) of the total time to complete a full rotation (one cycle).

Paragraphs [0074] and [0281] disclose the cams are operated at a frequency of 6 Hz (6 cycles per second or 6 cycles per 1,000 ms). This means that a full rotation of the cams (one cycle) lasts for a period of 166.7 ms (1,000 ms / 6 cycles = 166.7 ms/cycle).

Since the off-off state occurs or lasts for a period of $1/12$ of the total time to complete a full rotation (one cycle) and the total time to complete one full rotation is 62.5 ms, thus, the off-off state lasts a time period of 13.9 ms ($166.7 \text{ ms} / 12 = 13.9 \text{ ms}$).

There is no art of record alone or in combination that teaches an aspiration thrombectomy system and a method for removing thromboembolic material that includes the combination of recited limitations in claims 1 and 12.

Prior art of record alone or in combination did not teach the limitations of the first predetermined sequence includes the first off-off state lasts a predetermined period of time from 5.2 ms to 13.9 ms to propagate from the vacuum valve to the distal end of the catheter and the first predetermined sequence is repeated at a first frequency of approximately 6 Hz to approximately 16 Hz.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to TUAN V NGUYEN whose telephone number is (571)272-5962. The examiner can normally be reached Monday - Friday 8:30 AM - 5:30 PM.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an

interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at <http://www.uspto.gov/interviewpractice>.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jackie Ho can be reached at 571-272-4696. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of published or unpublished applications may be obtained from Patent Center. Unpublished application information in Patent Center is available to registered users. To file and manage patent submissions in Patent Center, visit: <https://patentcenter.uspto.gov>. Visit <https://www.uspto.gov/patents/apply/patent-center> for more information about Patent Center and <https://www.uspto.gov/patents/docx> for information about filing in DOCX format. For additional questions, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/TUAN V NGUYEN/
Primary Examiner, Art Unit 3771

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:
Derek Dee Deville et al.

Application No.: 18/346,008

Confirmation No.: 3114

Filed: June 30, 2023

Art Unit: 3771

For: ASPIRATION THROMBECTOMY SYSTEM
AND METHODS FOR THROMBUS
REMOVAL WITH ASPIRATION CATHETER

Examiner: Tuan Van Nguyen

RESPONSE TO NOTICE OF NON-COMPLIANT AMENDMENT

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Commissioner:

In response to the Notice of Non-Compliant Amendment dated
February 11, 2025, please amend the above-identified application as follows:

Amendments to the Claims are reflected in the listing of claims which begins on
page 2 of this paper.

Remarks/Arguments begin on page 5 of this paper.

AMENDMENTS TO THE CLAIMS

Please amend the claims as follows:

1. (Currently Amended) A method for removing thromboembolic material, comprising:

positioning the distal end of a catheter at least proximate to thromboembolic material in a blood vessel of a person, wherein the catheter has a proximal portion, a distal end and a lumen extending from the proximal portion to the distal end;

providing a vent liquid at a pressure from above atmospheric pressure to approximately equal to body pressure of a human; and

controlling a vacuum valve fluidically coupled to a vacuum source and the catheter and a vent valve fluidically coupled to the vent liquid and the catheter according to a first predetermined sequence at a first frequency at approximately 6 Hz to approximately 16 Hz and a second predetermined sequence at a second frequency at approximately 6 Hz to 16 Hz, wherein

—

(a) the first frequency is different than the second frequency,

(b) the first predetermined sequence and the second ~~predetermine~~ predetermined sequence each have a vacuum-only state in which the vacuum valve is open and the vent valve is closed, a first off-off state following the vacuum-only state in which both the vacuum valve and the vent valve are closed, a vent-only state in which the vent valve is open and the vacuum valve is closed, and a second off-off state after the vent-only state in which both the vacuum valve and the vent valve are closed,

- (c) the first off-off state ~~is~~ lasts a predetermined period of time from 5.2 ms to 13.9 ms ~~less than the time for a pressure pulse after closing the vacuum valve to propagate to the distal end of the catheter, and~~
- (d) the second off-off state lasts a predetermined period of time.

2. (Currently Amended) The method of claim 1 wherein ~~the first off-off state and the second off-off state are~~ is from 5.2 ms to 13.9 ms.

3. (Previously Presented) The method of claim 1 wherein the first off-off state and the second off-off state are about 10 ms.

4. (Currently Amended) The method of claim 1 wherein controlling the vacuum valve and the vent valve comprises cyclically opening and closing the vacuum valve and the vent valve to alternate between a negative pressure during a vacuum phase and a positive pressure at the distal end of the catheter during a vent phase such that an exit flow occurs at the distal end during at least a portion of the vent phase, and wherein the exit flow is less than about ~~[0.2]~~ 0.02 ml.

5. (Original) The method of claim 1 wherein the controlling the vacuum valve and the vent valve comprises imparting an amount of momentum transfer from the fluid column in the catheter lumen in a distal direction sufficient to unstick thromboembolic material at the distal end of the catheter.

6. (Canceled)

7. (Currently Amended) The method of claim 1~~[6]~~ wherein controlling the vacuum valve and the vent valve comprises opening and closing the vacuum valve and

the vent valve in a predetermined cycle adapted to at least a compliance of the catheter such that a pressure pulse from a vent phase is reversed before the thromboembolic material moves uncontrollably downstream off the distal end in the distal direction.

8. (Original) The method of claim 1 wherein controlling the vacuum valve and the vent valve comprises opening the vacuum valve for approximately 60% of each cycle and opening the vent valve for approximately 20% - 25% of each cycle.

9-19. (Canceled)

'402 Patent Family

Ref. No: RP-11

Patent App. No.: US 18/346,027

Filed: 2023 Jun. 30

Allowed: 2025 Jul. 28



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

25096 7590 07/28/2025
PERKINS COIE LLP - SEA General
PATENT-SEA
P.O. BOX 1247
SEATTLE, WA 98111-1247

EXAMINER

NGUYEN, TUAN VAN

ART UNIT

PAPER NUMBER

3771

DATE MAILED: 07/28/2025

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
18/346,027	06/30/2023	Derek Dee Deville	145404.8001.US12	6400

TITLE OF INVENTION: ASPIRATION THROMBECTOMY SYSTEM AND METHODS FOR THROMBUS REMOVAL WITH ASPIRATION CATHETER

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	\$516	\$0.00	\$0.00	\$516	10/28/2025

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 40% the amount of undiscounted fees, and micro entity fees are 20% the amount of undiscounted fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Maintenance fees are due in utility patents issuing on applications filed on or after Dec. 12, 1980. It is patentee's responsibility to ensure timely payment of maintenance fees when due. More information is available at www.uspto.gov/PatentMaintenanceFees.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via the USPTO patent electronic filing system.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications. **Because electronic patent issuance may occur shortly after issue fee payment, any desired continuing application should preferably be filed prior to payment of this issue fee in order not to jeopardize copendency.**

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

25096 7590 07/28/2025
PERKINS COIE LLP - SEA General
PATENT-SEA
P.O. BOX 1247
SEATTLE, WA 98111-1247

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via the USPTO patent electronic filing system or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
18/346,027	06/30/2023	Derek Dee Deville	145404.8001.US12	6400

TITLE OF INVENTION: ASPIRATION THROMBECTOMY SYSTEM AND METHODS FOR THROMBUS REMOVAL WITH ASPIRATION CATHETER

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	\$516	\$0.00	\$0.00	\$516	10/28/2025

EXAMINER	ART UNIT	CLASS-SUBCLASS
NGUYEN, TUAN VAN	3771	606-127000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

☐ Change of correspondence address (or Change of Correspondence Address form PTO/AIA/122 or PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/AIA/47 or PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,

(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 _____

2 _____

3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent): ☐ Individual ☐ Corporation or other private group entity ☐ Government

4a. Fees submitted: ☐ Issue Fee ☐ Publication Fee (if required)

4b. Method of Payment: (Please first reapply any previously paid fee shown above)

☐ Electronic Payment via the USPTO patent electronic filing system ☐ Enclosed check ☐ Non-electronic payment by credit card (Attach form PTO-2038)

☐ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. _____

5. Change in Entity Status (from status indicated above)

☐ Applicant certifying micro entity status. See 37 CFR 1.29

☐ Applicant asserting small entity status. See 37 CFR 1.27

☐ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____

Date _____

Typed or printed name _____

Registration No. _____



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UNITED STATES DEPARTMENT OF COMMERCE
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
18/346,027	06/30/2023	Derek Dee Deville	145404.8001.US12	6400
25096	7590	07/28/2025	EXAMINER	
PERKINS COIE LLP - SEA General			NGUYEN, TUAN VAN	
PATENT-SEA			ART UNIT	PAPER NUMBER
P.O. BOX 1247			3771	
SEATTLE, WA 98111-1247			DATE MAILED: 07/28/2025	

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b) (Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. 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 30 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, Virginia 22313-1450. **DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.** Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

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. The United States Patent and Trademark Office (USPTO) collects the information in this record under authority of 35 U.S.C. 2. The USPTO's system of records is used to manage all applicant and owner information including name, citizenship, residence, post office address, and other information with respect to inventors and their legal representatives pertaining to the applicant's/owner's activities in connection with the invention for which a patent is sought or has been granted. The applicable Privacy Act System of Records Notice for the information collected in this form is COMMERCE/PAT-TM-7 Patent Application Files, available in the Federal Register at 78 FR 19243 (March 29, 2013).

<https://www.govinfo.gov/content/pkg/FR-2013-03-29/pdf/2013-07341.pdf>

Routine uses of the information in this record may include disclosure to:

- 1) law enforcement, in the event that the system of records indicates a violation or potential violation of law;
- 2) a federal, state, local, or international agency, in response to its request;
- 3) a contractor of the USPTO having need for the information in order to perform a contract;
- 4) the Department of Justice for determination of whether the Freedom of Information Act (FOIA) requires disclosure of the record;
- 5) a Member of Congress submitting a request involving an individual to whom the record pertains, when the individual has requested the Member's assistance with respect to the subject matter of the record;
- 6) a court, magistrate, or administrative tribunal, in the course of presenting evidence, including disclosures to opposing counsel in the course of settlement negotiations;
- 7) the Administrator, General Services Administration (GSA), or their designee, during an inspection of records conducted by GSA under authority of 44 U.S.C. 2904 and 2906, in accordance with the GSA regulations and any other relevant (i.e., GSA or Commerce) directive, where such disclosure shall not be used to make determinations about individuals;
- 8) 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));
- 9) the Office of Personnel Management (OPM) for personnel research purposes; and
- 10) the Office of Management and Budget (OMB) for legislative coordination and clearance.

If you do not furnish the information requested on this form, the USPTO may not be able to process and/or examine your submission, which may result in termination of proceedings, abandonment of the application, and/or expiration of the patent.

Notice of Allowability	Application No. 18/346,027	Applicant(s) Deville et al.	
	Examiner TUAN V NGUYEN	Art Unit 3771	AIA (First Inventor to File) Status Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to the Request for Continued Examination filed May 2, 2025.
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

3. ☒ The allowed claim(s) is/are 1-7. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
Certified copies:
a) ☐ All b) ☐ Some* c) ☐ None of the:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).
* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892) 2. ☒ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____ 3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____ 4. ☐ Interview Summary (PTO-413), Paper No./Mail Date. _____	5. ☒ Examiner's Amendment/Comment 6. ☒ Examiner's Statement of Reasons for Allowance 7. ☐ Other _____
---	--

/TUAN V NGUYEN/ Primary Examiner, Art Unit 3771	
--	--

Notice of Pre-AIA or AIA Status

The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after allowance or after an Office action under *Ex Parte Quayle*, 25 USPQ 74, 453 O.G. 213 (Comm'r Pat. 1935). Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, prosecution in this application has been reopened pursuant to 37 CFR 1.114. Applicant's submission filed on May 2, 2025 has been entered.

Information Disclosure Statement

The information disclosure statement (IDS) submitted on May 2, 2025 is being considered by the examiner.

Allowable Subject Matter

Claims 1-7 allowed.

Please see Notice of Allowance issued on March 4, 2025 for examiner's amendment and examiner's statement of reasons for allowance.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to TUAN V NGUYEN whose telephone number is (571)272-5962. The examiner can normally be reached Monday - Friday 8:30 AM - 5:30 PM.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at <http://www.uspto.gov/interviewpractice>.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jackie Ho can be reached at 571-272-4696. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of published or unpublished applications may be obtained from Patent Center. Unpublished application information in Patent Center is available to registered users. To file and manage patent submissions in Patent Center, visit: <https://patentcenter.uspto.gov>. Visit <https://www.uspto.gov/patents/apply/patent-center> for more information about Patent Center and <https://www.uspto.gov/patents/docx> for information about filing in DOCX format. For additional questions, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/TUAN V NGUYEN/
Primary Examiner, Art Unit 3771



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

25096 7590 03/24/2025
PERKINS COIE LLP - SEA General
PATENT-SEA
P.O. BOX 1247
SEATTLE, WA 98111-1247

EXAMINER

NGUYEN, TUAN VAN

ART UNIT

PAPER NUMBER

3771

DATE MAILED: 03/24/2025

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
18/346,027	06/30/2023	Derek Dee Deville	145404.8001.US12	6400

TITLE OF INVENTION: ASPIRATION THROMBECTOMY SYSTEM AND METHODS FOR THROMBUS REMOVAL WITH ASPIRATION CATHETER

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	\$516	\$0.00	\$0.00	\$516	06/24/2025

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 40% the amount of undiscounted fees, and micro entity fees are 20% the amount of undiscounted fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Maintenance fees are due in utility patents issuing on applications filed on or after Dec. 12, 1980. It is patentee's responsibility to ensure timely payment of maintenance fees when due. More information is available at www.uspto.gov/PatentMaintenanceFees.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via the USPTO patent electronic filing system.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications. **Because electronic patent issuance may occur shortly after issue fee payment, any desired continuing application should preferably be filed prior to payment of this issue fee in order not to jeopardize copendency.**

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

25096 7590 03/24/2025
PERKINS COIE LLP - SEA General
PATENT-SEA
P.O. BOX 1247
SEATTLE, WA 98111-1247

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via the USPTO patent electronic filing system or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
18/346,027	06/30/2023	Derek Dee Deville	145404.8001.US12	6400

TITLE OF INVENTION: ASPIRATION THROMBECTOMY SYSTEM AND METHODS FOR THROMBUS REMOVAL WITH ASPIRATION CATHETER

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	\$516	\$0.00	\$0.00	\$516	06/24/2025

EXAMINER	ART UNIT	CLASS-SUBCLASS
NGUYEN, TUAN VAN	3771	606-127000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

☐ Change of correspondence address (or Change of Correspondence Address form PTO/AIA/122 or PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/AIA/47 or PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,

(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 _____
2 _____
3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent): ☐ Individual ☐ Corporation or other private group entity ☐ Government

4a. Fees submitted: ☐ Issue Fee ☐ Publication Fee (if required)

4b. Method of Payment: (Please first reapply any previously paid fee shown above)

☐ Electronic Payment via the USPTO patent electronic filing system ☐ Enclosed check ☐ Non-electronic payment by credit card (Attach form PTO-2038)

☐ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. _____

5. Change in Entity Status (from status indicated above)

☐ Applicant certifying micro entity status. See 37 CFR 1.29

☐ Applicant asserting small entity status. See 37 CFR 1.27

☐ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____

Date _____

Typed or printed name _____

Registration No. _____



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
18/346,027	06/30/2023	Derek Dee Deville	145404.8001.US12	6400
25096	7590	03/24/2025	EXAMINER	
PERKINS COIE LLP - SEA General			NGUYEN, TUAN VAN	
PATENT-SEA				
P.O. BOX 1247			ART UNIT	PAPER NUMBER
SEATTLE, WA 98111-1247			3771	
DATE MAILED: 03/24/2025				

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b) (Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. 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 30 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, Virginia 22313-1450. **DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.** Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

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. The United States Patent and Trademark Office (USPTO) collects the information in this record under authority of 35 U.S.C. 2. The USPTO's system of records is used to manage all applicant and owner information including name, citizenship, residence, post office address, and other information with respect to inventors and their legal representatives pertaining to the applicant's/owner's activities in connection with the invention for which a patent is sought or has been granted. The applicable Privacy Act System of Records Notice for the information collected in this form is COMMERCE/PAT-TM-7 Patent Application Files, available in the Federal Register at 78 FR 19243 (March 29, 2013).

<https://www.govinfo.gov/content/pkg/FR-2013-03-29/pdf/2013-07341.pdf>

Routine uses of the information in this record may include disclosure to:

- 1) law enforcement, in the event that the system of records indicates a violation or potential violation of law;
- 2) a federal, state, local, or international agency, in response to its request;
- 3) a contractor of the USPTO having need for the information in order to perform a contract;
- 4) the Department of Justice for determination of whether the Freedom of Information Act (FOIA) requires disclosure of the record;
- 5) a Member of Congress submitting a request involving an individual to whom the record pertains, when the individual has requested the Member's assistance with respect to the subject matter of the record;
- 6) a court, magistrate, or administrative tribunal, in the course of presenting evidence, including disclosures to opposing counsel in the course of settlement negotiations;
- 7) the Administrator, General Services Administration (GSA), or their designee, during an inspection of records conducted by GSA under authority of 44 U.S.C. 2904 and 2906, in accordance with the GSA regulations and any other relevant (i.e., GSA or Commerce) directive, where such disclosure shall not be used to make determinations about individuals;
- 8) 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));
- 9) the Office of Personnel Management (OPM) for personnel research purposes; and
- 10) the Office of Management and Budget (OMB) for legislative coordination and clearance.

If you do not furnish the information requested on this form, the USPTO may not be able to process and/or examine your submission, which may result in termination of proceedings, abandonment of the application, and/or expiration of the patent.

Notice of Allowability	Application No. 18/346,027	Applicant(s) Deville et al.	
	Examiner TUAN V NGUYEN	Art Unit 3771	AIA (FITF) Status Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to the amendment filed on February 10, 2025.
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

3. ☒ The allowed claim(s) is/are 1-7 . As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
Certified copies:
a) ☐ All b) ☐ Some* c) ☐ None of the:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).
* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)	5. ☒ Examiner's Amendment/Comment
2. ☒ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____.	6. ☒ Examiner's Statement of Reasons for Allowance
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____.	7. ☐ Other _____.
4. ☒ Interview Summary (PTO-413), Paper No./Mail Date. _____.	

/TUAN V NGUYEN/ Primary Examiner, Art Unit 3771	
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Notice of Pre-AIA or AIA Status

The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

Information Disclosure Statement

The information disclosure statement (IDS) submitted on February 10, 2025 is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner.

EXAMINER'S AMENDMENT

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in an interview with Paul Parker on March 7, 2025.

The application has been amended as follows:

1. (Currently Amended) An aspiration thrombectomy system, comprising:
 - a catheter system including an aspiration catheter having a proximal portion, a distal end and a lumen extending through the aspiration catheter;
 - a vacuum source fluidically coupled to the catheter system;
 - a vacuum valve fluidically coupled to the vacuum source and the proximal portion of the aspiration catheter to control a vacuum flow in the catheter lumen;

a vent valve fluidically coupled to the proximal portion of the aspiration catheter, the vent valve being configured to control a flow of a vent fluid in the catheter lumen; and

a controller configured to

(1) perform a purge cycle to remove air in the catheter system in which the vent valve is opened while the vacuum valve is closed such that vent fluid flows through catheter system thereby removing air from the catheter system, and

(2) after performing the purge cycle, open and close the vacuum valve and the vent valve in a predetermined cycle to change a level of vacuum at the distal end of the catheter and to control fluid flow in and out from the distal end of the catheter.

Allowable Subject Matter

Claims 1-7 allowed.

Teigen et al. (US 11,096,712) and Grey (WO 2014/151209 A1), which are cited in the Inter Partes Reviews in related U.S. Patent Application Nos 10/531,883 and 10/722,253, and other prior art of record alone or in combination fail to teach an aspiration thrombectomy system that includes the combination of recited limitations in claim 1.

Prior art of record alone or in combination did not teach the limitations of a controller configured to (1) perform a purge cycle to remove air in the catheter system in which the vent valve is opened while the vacuum valve is closed such that vent fluid flows through catheter system thereby removing air from the catheter system, and (2) after performing the purge cycle, open and close the vacuum valve and the vent valve in

a predetermined cycle to change a level of vacuum at the distal end of the catheter and to control fluid flow in and out from the distal end of the catheter.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to TUAN V NGUYEN whose telephone number is (571)272-5962. The examiner can normally be reached Monday - Friday 8:30 AM - 5:30 PM.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at <http://www.uspto.gov/interviewpractice>.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jackie Ho can be reached on 571-272-4696. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of published or unpublished applications may be obtained from Patent Center. Unpublished application information in Patent Center is available to registered users. To file and manage patent submissions in Patent Center, visit: <https://patentcenter.uspto.gov>. Visit <https://www.uspto.gov/patents/apply/patent->

Application/Control Number: 18/346,027
Art Unit: 3771

Page 5

center for more information about Patent Center and

<https://www.uspto.gov/patents/docx> for information about filing in DOCX format. For

additional questions, contact the Electronic Business Center (EBC) at 866-217-9197

(toll-free). If you would like assistance from a USPTO Customer Service

Representative, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/TUAN V NGUYEN/

Primary Examiner, Art Unit 3771

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:
Derek Dee Deville et al.

Application No.: 18/346,027

Confirmation No.: 6400

Filed: June 30, 2023

Art Unit: 3771

For: ASPIRATION THROMBECTOMY SYSTEM
AND METHODS FOR THROMBUS
REMOVAL WITH ASPIRATION CATHETER

Examiner: Jonathan Wade Miles

**AMENDMENT AND RESPONSE TO
NON-FINAL OFFICE ACTION UNDER 37 CFR 1.111**

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Commissioner:

In response to the Non-Final Office Action mailed on September 9, 2024, please amend the above-identified U.S. patent application as follows:

Amendments to the Claims are reflected in the listing of claims which begins on page 2 of this paper.

Remarks/Arguments begin on page 5 of this paper.

AMENDMENTS TO THE CLAIMS

Please amend claims 1-6 and cancel without prejudice claims 8-18. Following is a complete listing of the claims pending in the application, as amended.

1. (Currently Amended) An aspiration thrombectomy system, comprising:
a catheter system including an aspiration catheter having a proximal portion, a distal end and a lumen extending through the aspiration catheter;
a vacuum source fluidically coupled to the catheter system;
a vacuum valve fluidically coupled to the vacuum source and the proximal portion of the aspiration catheter to control a vacuum flow in the catheter lumen;
a vent valve fluidically coupled to the proximal portion of the aspiration catheter, the vent valve being configured to control a flow of a vent fluid in the catheter lumen; and

a controller configured to ...

- ~~(1) perform a purge cycle in which the vent valve is opened while the vacuum valve is closed such that vent fluid flows through catheter system thereby removing air from the catheter system, and~~
- ~~(2) after performing the purge cycle, open and close the vacuum valve and the vent valve in a predetermined cycle to change a level of vacuum at the distal end of the catheter and to control fluid flow in and out from the distal end of the catheter open and close the vacuum valve and the vent valve in a predetermined cycle of approximately 6 Hz to approximately 16 Hz, wherein during each cycle a change in level of vacuum at the distal end of the aspiration catheter is at least approximately 15 inHg to 25 inHg in a time of not greater than approximately 20 ms to 30 ms, and wherein the controller is configured to cyclically open and close the vacuum valve and the vent valve such that distal movement of the fluid~~

~~column at the distal end of the aspiration catheter causes a limited positive amount of exit flow of less than 20 microliters before fluid is drawn back into the catheter lumen.~~

2. (Currently Amended) The system of claim 1, further comprising a vent fluid source, and wherein:

the vent fluid source is configured to provide vent fluid at a pressure from above atmospheric pressure to about body pressure of a human; and

the controller is configured to cyclically open and close the vacuum valve and the vent valve to alternate between a negative pressure and a positive pressure at the distal end of the aspiration catheter during each cycle.

3. (~~Currently Amended~~Original) ~~The system of claim 1 wherein the controller is configured to automatically performs the purge cycle 2 wherein the controller is configured to cyclically open and close the vacuum valve and the vent valve such that distal movement of the fluid column at the distal end of the aspiration catheter is limited to an exit flow of less than 20 microliters before fluid is drawn back into the catheter lumen.~~

4. (~~Currently Amended~~Original) ~~The system of claim 3 wherein the controller automatically performs the purge cycle before opening and closing the vacuum valve and the vent valve to alternate between a negative pressure and a positive pressure at the distal end of the aspiration catheter during each cycle wherein the exit flow before fluid is drawn back into the catheter lumen is less than 6 microliters.~~

5. (~~Currently Amended~~Original) ~~The system of claim 3 wherein the controller automatically performs the purge cycle after detecting air in the catheter system the exit flow before fluid is drawn back into the catheter lumen is less than 2 microliters.~~

6. ~~(Currently Amended)~~Original) The system of claim 1, further comprising a remote along the catheter system having a switch, and wherein the purge cycle is initiated by activating the switch on the controller;

~~the controller is configured to cyclically open and close the vacuum valve and the vent valve in a cycle comprising a combination of a first off-off state in which the vacuum valve is closed while the vent valve is closed, a vacuum-only state in which the vacuum valve is open while the vent valve is closed, a second off-off state in which the vacuum valve is closed while the vent valve is closed, and a vent-only state in which the vent valve is open while the vacuum valve is closed; and~~

~~the cycle is repeated.~~

7. ~~(Currently Amended)~~Original) The system of claim 1, wherein after opening the vent valve while the vacuum valve is closed such that vent fluid flows through catheter system thereby removing air from the catheter system, the purge cycle executed by the controller further comprises opening the vacuum valve while the vent valve is open for a period and then closing the vacuum valve cycle is repeated at a frequency of 8 Hz to 12 Hz.

8-18. (Canceled)

'402 Patent Family

Ref. No: RP-12

Patent No.: US 12,185,959

Filed: 2023 Jun. 30

Issued: 2025 Jan. 7



US012185959B2

(12) **United States Patent**
Deville et al.

(10) **Patent No.:** **US 12,185,959 B2**
(45) **Date of Patent:** **Jan. 7, 2025**

(54) **ASPIRATION THROMBECTOMY SYSTEM
AND METHODS FOR THROMBUS
REMOVAL WITH ASPIRATION CATHETER**

(58) **Field of Classification Search**
CPC A61B 17/22; A61B 17/3207; A61B
2017/00022; A61B 2017/22079;
(Continued)

(71) Applicant: **RapidPulse, Inc.**, Miami, FL (US)

(56) **References Cited**

(72) Inventors: **Derek Dee Deville**, Coral Gables, FL
(US); **Matthew A. Palmer**, Miami, FL
(US); **William T. Bales**, Miami, FL
(US); **M. Sean McBrayer**, Coral
Gables, FL (US); **Eric Petersen**,
Homestead, FL (US); **Richard**
Cartledge, Boca Raton, FL (US);
Thomas O. Bales, Jr., Miami, FL (US);
Carlos Rivera, Cooper City, FL (US)

U.S. PATENT DOCUMENTS

3,955,574 A 5/1976 Rubinstein
4,164,223 A 8/1979 Munib
(Continued)

FOREIGN PATENT DOCUMENTS

CN 101027004 A 8/2007
EP 1799128 B1 3/2010
(Continued)

(73) Assignee: **RapidPulse, Inc.**, Miami, FL (US)

OTHER PUBLICATIONS

(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 30 days.

Judgment of Final Written Decision received from Patent Trial and
Appeal Board of U.S. Patent and Trademark Office for U.S. Pat. No.
10,722,253, entered on Sep. 6, 2023, 67 pages.

(21) Appl. No.: **18/346,044**

(Continued)

(22) Filed: **Jun. 30, 2023**

(65) **Prior Publication Data**

US 2024/0000468 A1 Jan. 4, 2024

Primary Examiner — Wade Miles

(74) *Attorney, Agent, or Firm* — Perkins Coie LLP

Related U.S. Application Data

(63) Continuation of application No. 16/899,514, filed on
Jun. 11, 2020, now Pat. No. 12,059,161, which is a
(Continued)

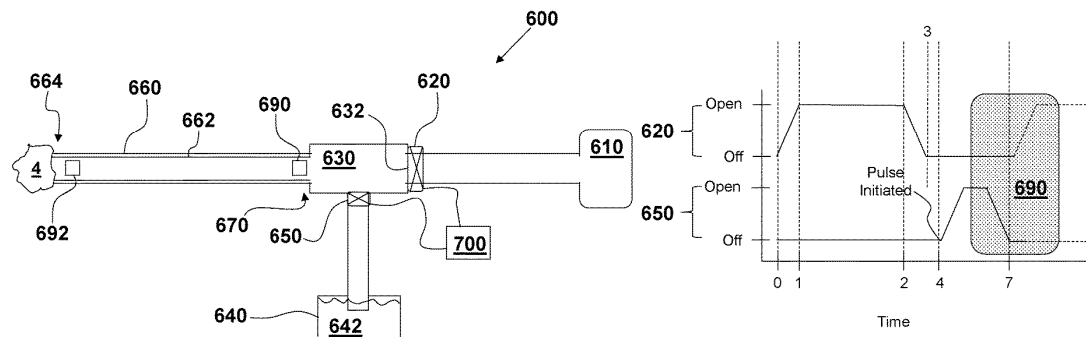
(57) **ABSTRACT**

(51) **Int. Cl.**
A61B 17/22 (2006.01)
A61B 17/00 (2006.01)
(Continued)

A clot removal system comprises a catheter, a vacuum
source, and a controller. The catheter comprises a proximal
end, a distal end, and controller operating parameters and
defines a lumen configured to be filled with a liquid column
having a proximal portion. The vacuum source is configured
to supply vacuum. The controller is configured to carry out
a control pattern of turning on and off the vacuum based
upon the controller operating parameters and is configured
to receive the controller operating parameters in an auto-
matic response to the catheter being operatively connected
to at least one of the vacuum source and the controller and,
responsive to the connection, to carry out the control pattern
to change a level of vacuum at the distal end of the catheter.

(52) **U.S. Cl.**
CPC **A61B 17/22** (2013.01); **A61F 2/013**
(2013.01); **A61M 25/0075** (2013.01);
(Continued)

13 Claims, 29 Drawing Sheets



61

The foregoing description and accompanying drawings illustrate the principles, exemplary embodiments, and modes of operation of the systems, apparatuses, and methods. However, the systems, apparatuses, and methods should not be construed as being limited to the particular embodiments discussed above. Additional variations of the embodiments discussed above will be appreciated by those skilled in the art and the above-described embodiments should be regarded as illustrative rather than restrictive. Accordingly, it should be appreciated that variations to those embodiments can be made by those skilled in the art without departing from the scope of the systems, apparatuses, and methods as defined by the following claims.

We claim:

1. An aspiration thrombectomy system, comprising:
 - a body configured to house components;
 - a vacuum source coupled to the body;
 - a vacuum valve at the body and fluidically coupled to the vacuum source, wherein the vacuum valve is configured to control a vacuum applied to a catheter system;
 - a vent valve at the body and configured to be fluidically coupled to a vent fluid, wherein the vent valve is configured to control vent fluid applied to the catheter system; and
 - a controller configured to open and close the vacuum valve and the vent valve in a predetermined cycle such that when a fluid column is in the catheter system the fluid column shifts distally and proximally, wherein the controller is configured to control distal displacement of the fluid column to a specific volume liquid that exits the catheter system distally before vacuum is reapplied thereby avoiding thromboembolic material from being uncontrollably ejected further distally within the blood vessel.
2. The system of claim 1 wherein the vacuum valve is a first solenoid valve and the vent valve is a second solenoid valve.
3. The system of claim 1 wherein:
 - the controller is configured to cyclically open and close the vacuum valve and the vent valve in a cycle comprising a combination of a vacuum-only state in which the vacuum valve is open while the vent valve is closed, a first off-off state in which the vacuum valve is closed while the vent valve is closed, a vent-only state in which the vacuum valve is closed while the vent valve is open, and a second off-off state in which the vacuum valve is closed while the vent valve is closed; and
 - the cycle is repeated.
4. The system of claim 1 wherein the cycle is repeated at a frequency of 8 Hz to 12 Hz.
5. The system of claim 1 wherein the cycle is repeated at a frequency of 6 Hz to 8 Hz.
6. The system of claim 1 wherein:
 - the controller is configured to cyclically open and close the vacuum valve and the vent valve in a cycle comprising a combination of an off-off state in which the vacuum valve is closed while the vent valve is closed, a vacuum-only state in which the vacuum valve is open while the vent valve is closed, and a vent-only state in which the vacuum valve is closed while the vent valve is open; and
 - the cycle is repeated.
7. The system of claim 1 wherein the controller is configured to open and close the vacuum valve and the vent valve in a predetermined cycle adapted to at least a compliance of the catheter system such that a pressure pulse

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from a vent phase is reversed before the thromboembolic material moves further downstream off the distal end in the distal direction.

8. The system of claim 1 wherein:

the system further includes a vent fluid source fluidically coupled to the manifold, wherein the vent fluid source provides vent fluid at a pressure of atmospheric pressure to an elevated pressure caused by positioning the vent fluid at an elevation above the thromboembolic material; and

the controller is configured to open and close the vacuum valve and the vent valve in a cycle repeated at a frequency of 8 Hz to 16 Hz such that the change in level of vacuum each cycle is approximately 20 inHg in a time of not greater than approximately 20 ms.

9. A method for removing thromboembolic material, comprising:

activating a system for removing the thromboembolic material, the system including a body configured to house components, a vacuum source coupled to the body, a catheter system have a proximal portion coupled to the body and a distal end, a vacuum valve at the body and fluidically coupled to the vacuum source and the catheter system, and a vent valve at the body and configured to be fluidically coupled to a vent fluid and the catheter system;

positioning the distal end of a catheter system at least proximate to thromboembolic material in a blood vessel of a person; and

controlling the vacuum valve and the vent valve to operate at the body according to a predetermined cycle such that when a fluid column is in the catheter system the fluid column shifts distally and proximally, wherein the controller is configured to control distal displacement of the fluid column to a specific volume liquid that exits the catheter system distally before vacuum is reapplied thereby avoiding thromboembolic material from being uncontrollably ejected further distally within the blood vessel.

10. The method of claim 9 wherein:

the vent fluid source provides the vent fluid at a pressure at or greater than atmospheric pressure; and

controlling the vacuum valve and the vent valve comprises cyclically opening and closing the vacuum valve and the vent valve to alternate between a negative pressure phase and a positive pressure phase at the distal end of the catheter system during each cycle such that fluid exits the distal end of the catheter system during at least a portion of the positive pressure phase.

11. The method of claim 9, further comprising:

cyclically opening and closing the vacuum valve and the vent valve in a cycle including a vacuum-only state in which the vacuum valve is open while the vent valve is closed, a first off-off state in which the vacuum valve is closed while the vent valve is closed, a vent-only state in which the vacuum valve is closed while the vent valve is open, and a second off-off state in which the vacuum valve is closed while the vent valve is closed; and

repeating the cycle.

12. The method of claim 11 wherein the vacuum valve is a first solenoid pinch valve and the vent valve is a second solenoid pinch valve.

13. The method of claim 9 wherein controlling the vacuum valve and the vent valve comprises opening and closing the vacuum valve and the vent valve in a predetermined cycle adapted to at least a compliance of the catheter

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such that a pressure pulse from a vent phase is reversed before the thromboembolic material moves further downstream off the distal end in the distal direction.

* * * * *

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'402 Patent Family

Ref. No: RP-14

Patent App. No.: US 18/946,479

Filed: 2024 Nov. 13

Allowed: 2025 Aug. 14



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
18/946,479	11/13/2024	Derek Dee Deville	145404.8001.US14	8147
25096 7590 08/14/2025 PERKINS COIE LLP - SEA General PATENT-SEA P.O. BOX 1247 SEATTLE, WA 98111-1247			EXAMINER TANNER, JOCELIN C	
			ART UNIT 3771	PAPER NUMBER
			NOTIFICATION DATE 08/14/2025	DELIVERY MODE ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patentprocurement@perkinscoie.com

CORRECTED Notice of Allowability	Application No. 18/946,479	Applicant(s) Deville et al.	
	Examiner JOCELIN C TANNER	Art Unit 3771	AIA (First Inventor to File) Status Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to claims filed 10 July 2025.
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

3. ☒ The allowed claim(s) is/are 1-10 and 17. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
Certified copies:
 a) ☐ All b) ☐ Some* c) ☐ None of the:
 1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).
 * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892) 2. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____. 3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____. 4. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____.	5. ☒ Examiner's Amendment/Comment 6. ☒ Examiner's Statement of Reasons for Allowance 7. ☐ Other _____.
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/JOCELIN C TANNER/ Primary Examiner, Art Unit 3771	
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EXAMINER'S AMENDMENT

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it **MUST** be submitted no later than the payment of the issue fee.

The application has been amended as follows:

Please cancel withdrawn claims 11-16, 18.

Claim 1, line 10, please change "the valve assembly" to --the valve system--.

Claim 1, line 11, please change "the valve assembly" to --the valve system--.

Claim 1, line 13, please change "the distal end" to --a distal end--.

Claim 6, line 8, please change "the timing" to --timing--.

Claim 6, lines 11-12, please change "the pressure pulses" to --pressure pulses--.

Claim 10, line 8, please change "the timing" to --timing--.

Claim 17, line 8, please change "the timing" to --timing--.

Reasons for Allowance

2. The following is an examiner's statement of reasons for allowance: Regarding claim 1, the prior art of record does not disclose or suggest a thrombectomy aspiration system including a vacuum line fluidically coupled to a vacuum source, a vent line, a valve system having a vacuum valve within a housing and coupled to a base, a vent valve within the housing and coupled to the base, the vacuum source is outside of the housing containing the vacuum valve and vent valve, an aspiration catheter having a proximal end coupled to the valve system, a controller configured to open and close the

vacuum and vent valves in a predetermined sequence, in combination with the other claimed limitations. The closest prior art includes Garrison et al. (US 2016/0220741A1) which discloses an aspiration thrombectomy system including a catheter (220), a vacuum source [0060-0062], a vent liquid source, and a vacuum and vent control system [0114-0118]. Garrison does not disclose that the vacuum valve and vent valve are located within a housing and coupled to a base and are apart from the vacuum source. It would not have been obvious nor is there any motivation to modify the system of Garrison to meet the claimed limitations. No other references, or reasonable combination thereof, could be found which disclose or suggest these features in combination with other claimed limitations.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JOCELIN C TANNER whose telephone number is (571)270-5202. The examiner can normally be reached M-F 8am-4pm.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at <http://www.uspto.gov/interviewpractice>.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jackie Ho can be reached at (571)272-4696. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of published or unpublished applications may be obtained from Patent Center. Unpublished application information in Patent Center is available to registered users. To file and manage patent submissions in Patent Center, visit: <https://patentcenter.uspto.gov>. Visit <https://www.uspto.gov/patents/apply/patent-center> for more information about Patent Center and <https://www.uspto.gov/patents/docx> for information about filing in DOCX format. For additional questions, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/JOCELIN C TANNER/
Primary Examiner, Art Unit 3771



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
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NOTICE OF ALLOWANCE AND FEE(S) DUE

25096 7590 07/31/2025
PERKINS COIE LLP - SEA General
PATENT-SEA
P.O. BOX 1247
SEATTLE, WA 98111-1247

EXAMINER

TANNER, JOCELIN C

ART UNIT

PAPER NUMBER

3771

DATE MAILED: 07/31/2025

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
18/946,479	11/13/2024	Derek Dee Deville	145404.8001.US14	8147

TITLE OF INVENTION: ASPIRATION THROMBECTOMY SYSTEM AND METHODS FOR THROMBUS REMOVAL WITH ASPIRATION CATHETER

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	\$516	\$0.00	\$0.00	\$516	10/31/2025

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 40% the amount of undiscounted fees, and micro entity fees are 20% the amount of undiscounted fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Maintenance fees are due in utility patents issuing on applications filed on or after Dec. 12, 1980. It is patentee's responsibility to ensure timely payment of maintenance fees when due. More information is available at www.uspto.gov/PatentMaintenanceFees.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via the USPTO patent electronic filing system.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications. **Because electronic patent issuance may occur shortly after issue fee payment, any desired continuing application should preferably be filed prior to payment of this issue fee in order not to jeopardize copendency.**

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

25096 7590 07/31/2025
PERKINS COIE LLP - SEA General
PATENT-SEA
P.O. BOX 1247
SEATTLE, WA 98111-1247

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via the USPTO patent electronic filing system or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
18/946,479	11/13/2024	Derek Dee Deville	145404.8001.US14	8147

TITLE OF INVENTION: ASPIRATION THROMBECTOMY SYSTEM AND METHODS FOR THROMBUS REMOVAL WITH ASPIRATION CATHETER

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	\$516	\$0.00	\$0.00	\$516	10/31/2025

EXAMINER	ART UNIT	CLASS-SUBCLASS
TANNER, JOCELIN C	3771	606-127000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

☐ Change of correspondence address (or Change of Correspondence Address form PTO/AIA/122 or PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/AIA/47 or PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,

(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 _____
2 _____
3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent): ☐ Individual ☐ Corporation or other private group entity ☐ Government

4a. Fees submitted: ☐ Issue Fee ☐ Publication Fee (if required)

4b. Method of Payment: (Please first reapply any previously paid fee shown above)

☐ Electronic Payment via the USPTO patent electronic filing system ☐ Enclosed check ☐ Non-electronic payment by credit card (Attach form PTO-2038)

☐ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. _____

5. Change in Entity Status (from status indicated above)

☐ Applicant certifying micro entity status. See 37 CFR 1.29

☐ Applicant asserting small entity status. See 37 CFR 1.27

☐ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____

Date _____

Typed or printed name _____

Registration No. _____



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
18/946,479	11/13/2024	Derek Dee Deville	145404.8001.US14	8147
25096 7590 07/31/2025 PERKINS COIE LLP - SEA General PATENT-SEA P.O. BOX 1247 SEATTLE, WA 98111-1247			EXAMINER TANNER, JOCELIN C	
			ART UNIT	PAPER NUMBER
			3771	
DATE MAILED: 07/31/2025				

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b) (Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. 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 30 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, Virginia 22313-1450. **DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.** Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

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. The United States Patent and Trademark Office (USPTO) collects the information in this record under authority of 35 U.S.C. 2. The USPTO's system of records is used to manage all applicant and owner information including name, citizenship, residence, post office address, and other information with respect to inventors and their legal representatives pertaining to the applicant's/owner's activities in connection with the invention for which a patent is sought or has been granted. The applicable Privacy Act System of Records Notice for the information collected in this form is COMMERCE/PAT-TM-7 Patent Application Files, available in the Federal Register at 78 FR 19243 (March 29, 2013).

<https://www.govinfo.gov/content/pkg/FR-2013-03-29/pdf/2013-07341.pdf>

Routine uses of the information in this record may include disclosure to:

- 1) law enforcement, in the event that the system of records indicates a violation or potential violation of law;
- 2) a federal, state, local, or international agency, in response to its request;
- 3) a contractor of the USPTO having need for the information in order to perform a contract;
- 4) the Department of Justice for determination of whether the Freedom of Information Act (FOIA) requires disclosure of the record;
- 5) a Member of Congress submitting a request involving an individual to whom the record pertains, when the individual has requested the Member's assistance with respect to the subject matter of the record;
- 6) a court, magistrate, or administrative tribunal, in the course of presenting evidence, including disclosures to opposing counsel in the course of settlement negotiations;
- 7) the Administrator, General Services Administration (GSA), or their designee, during an inspection of records conducted by GSA under authority of 44 U.S.C. 2904 and 2906, in accordance with the GSA regulations and any other relevant (i.e., GSA or Commerce) directive, where such disclosure shall not be used to make determinations about individuals;
- 8) 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));
- 9) the Office of Personnel Management (OPM) for personnel research purposes; and
- 10) the Office of Management and Budget (OMB) for legislative coordination and clearance.

If you do not furnish the information requested on this form, the USPTO may not be able to process and/or examine your submission, which may result in termination of proceedings, abandonment of the application, and/or expiration of the patent.

Notice of Allowability	Application No. 18/946,479	Applicant(s) Deville et al.	
	Examiner JOCELIN C TANNER	Art Unit 3771	AIA (First Inventor to File) Status Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to claims filed 10 July 2025.
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

3. ☒ The allowed claim(s) is/are 1-10 and 17. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
Certified copies:
a) ☐ All b) ☐ Some* c) ☐ None of the:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).
* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
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5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)	5. ☒ Examiner's Amendment/Comment
2. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____.	6. ☒ Examiner's Statement of Reasons for Allowance
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____.	7. ☐ Other _____.
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date. _____.	

/JOCELIN C TANNER/ Primary Examiner, Art Unit 3771	
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EXAMINER'S AMENDMENT

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

The application has been amended as follows:

Please cancel withdrawn claims 11-16, 18.

Claim 1, line 10, please change "the valve assembly" to --the valve system--.

Claim 1, line 11, please change "the valve assembly" to --the valve system--.

Claim 1, line 113, please change "the distal end" to --a distal end--.

Claim 6, line 8, please change "the timing" to --timing--.

Claim 6, lines 11-12, please change "the pressure pulses" to --pressure pulses--.

Claim 10, line 8, please change "the timing" to --timing--.

Claim 17, line 8, please change "the timing" to --timing--.

Reasons for Allowance

2. The following is an examiner's statement of reasons for allowance: Regarding claim 1, the prior art of record does not disclose or suggest a thrombectomy aspiration system including a vacuum line fluidically coupled to a vacuum source, a vent line, a valve system having a vacuum valve within a housing and coupled to a base, a vent valve within the housing and coupled to the base, the vacuum source is outside of the housing containing the vacuum valve and vent valve, an aspiration catheter having a proximal end coupled to the valve system, a controller configured to open and close the

vacuum and vent valves in a predetermined sequence, in combination with the other claimed limitations. The closest prior art includes Garrison et al. (US 2016/0220741A1) which discloses an aspiration thrombectomy system including a catheter (220), a vacuum source [0060-0062], a vent liquid source, and a vacuum and vent control system [0114-0118]. Garrison does not disclose that the vacuum valve and vent valve are located within a housing and coupled to a base and are apart from the vacuum source. It would not have been obvious nor is there any motivation to modify the system of Garrison to meet the claimed limitations. No other references, or reasonable combination thereof, could be found which disclose or suggest these features in combination with other claimed limitations.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JOCELIN C TANNER whose telephone number is (571)270-5202. The examiner can normally be reached M-F 8am-4pm.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at <http://www.uspto.gov/interviewpractice>.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jackie Ho can be reached at (571)272-4696. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of published or unpublished applications may be obtained from Patent Center. Unpublished application information in Patent Center is available to registered users. To file and manage patent submissions in Patent Center, visit: <https://patentcenter.uspto.gov>. Visit <https://www.uspto.gov/patents/apply/patent-center> for more information about Patent Center and <https://www.uspto.gov/patents/docx> for information about filing in DOCX format. For additional questions, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/JOCELIN C TANNER/
Primary Examiner, Art Unit 3771

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:
Derek Dee Deville et al.

Application No.: 18/946,479

Confirmation No.: 8147

Filed: November 13, 2024

Art Unit: 3771

For: ASPIRATION THROMBECTOMY SYSTEM
AND METHODS FOR THROMBUS
REMOVAL WITH ASPIRATION CATHETER

Examiner: Jocelin C. Tanner

**AMENDMENT AND RESPONSE TO
RESTRICTION REQUIREMENT UNDER 37 CFR 1.142**

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Commissioner:

In response to the Restriction Requirement mailed on March 10, 2025, please
amend the above-identified U.S. patent application as follows:

INTRODUCTORY COMMENTS

Amendments to the Claims are reflected in the listing of claims which begins on
page 2 of this paper.

Remarks/Arguments begin on page 8 of this paper.

AMENDMENTS TO THE CLAIMS

Please amend the claims as follows:

1. (Original) A thrombectomy aspiration system, comprising:
a vacuum source;
a vacuum line fluidically coupled to the vacuum source;
a vent line configured to be fluidically coupled to a vent fluid source;
a valve system having a base, a housing, a vacuum valve within the housing and coupled to the base, and a vent valve within the housing and coupled to the base, wherein vacuum source is outside of the housing containing the vacuum valve and the vent valve such that the valve system is located apart from the vacuum source;
an aspiration catheter having a proximal end coupled to the valve assembly such that the valve assembly is proximate to the catheter; and
a controller configured to open and close the vacuum valve and the vent valve in a predetermined sequence to change a level of vacuum at the distal end of the aspiration catheter and to impart a controlled amount of exit flow out from the distal end of the catheter.
2. (Original) The thrombectomy aspiration system of claim 1 wherein the valve system is located close to the proximal end of the aspiration catheter.
3. (Original) The thrombectomy aspiration system of claim 2 wherein the valve system is directly connected to the proximal end of the aspiration catheter by a short length of tubing.

4 (Original) The thrombectomy aspiration system of claim 1, further comprising:

- a first elastomeric tube portion in the housing fluidically coupled to the vacuum line and aligned with the vacuum valve such that the vacuum valve can selectively pinch and thereby close the first elastomeric tube; and
- a second elastomeric tube portion in the housing fluidically coupled to the vent line and aligned with vent valve such that the vent valve can selectively pinch and thereby close the second elastomeric tube.

5. (Original) The thrombectomy aspiration system of claim 1 wherein the vacuum valve comprises a first solenoid-driven pinch valve and the vent valve comprises a second solenoid-driven pinch valve.

6. (Original) The thrombectomy aspiration system of claim 1 wherein the controller is configured to open and close the vacuum valve and the vent valve in a predetermined sequence in which:

- (a) the vacuum valve closes while the vent valve is closed;
- (b) the vent valve opens after the vacuum valve has closed;
- (c) the vent valve closes while the vacuum valve is closed;
- (d) the vacuum valve reopens to reapply vacuum; and

wherein the timing of acts (a)-(d) of the sequence are set such that one pressure wave caused by closing the vacuum valve and another pressure wave caused by expansion of the catheter due to opening the vent valve cause fluid to flow out of the distal end of the catheter but are reversed before the pressure pulses move a thrombus downstream through a blood vessel.

7. (Original) The thrombectomy aspiration system of claim 6 wherein the timing of acts (a)-(d) of the sequence are set such that fluid flow out of the distal end of

the catheter is reversed before the pressure pulses move the thrombus downstream through a neurovascular vessel.

8. (Original) The thrombectomy aspiration system of claim 7 wherein the flow out from the distal end of the aspiration catheter is from approximately 0.001 ml to approximately 1.0 ml before reapplying the vacuum draws fluid back into the aspiration catheter.

9. (Original) The thrombectomy aspiration system of claim 7 wherein the flow out from the distal end of the aspiration catheter is from approximately 0.1 ml to approximately 0.5 ml before reapplying the vacuum draws the fluid back into the aspiration catheter.

10. (Original) The thrombectomy aspiration system of claim 1 wherein the controller is configured to open and close the vacuum valve and the vent valve in a predetermined sequence in which:

- (a) the vacuum valve closes while the vent valve is closed;
- (b) the vent valve opens after the vacuum valve has closed;
- (c) the vent valve closes while the vacuum valve is closed;
- (d) the vacuum valve reopens to reapply vacuum; and

wherein the timing of acts (a)-(d) of the sequence are set such that one pressure wave caused by closing the vacuum valve and another pressure wave caused by expansion of the catheter due to opening the vent valve cause fluid to flow out of the distal end of the catheter but are reversed to limit momentum transfer from fluid in the catheter to create a small distal movement of the thrombus whereby reapplying vacuum in act (d) is able to macerate the thrombus against the distal end of the catheter.

11. (Withdrawn) A method of aspirating a thrombus from a blood vessel, comprising:

attaching a proximal end of an aspiration catheter to a valve system such that the proximal end of the aspiration catheter is proximate to the valve system, wherein the valve system includes a base, a housing, a vacuum valve within the housing and coupled to the base, and a vent valve within the housing and coupled to the base;

fluidically coupling a vacuum line to the valve system and to a vacuum source such that the vacuum valve can control aspiration through the vacuum line, wherein vacuum source is outside of the housing containing the vacuum valve and the vent valve such that the valve system is located apart from the vacuum source;

coupling a vent line to the valve system and to a vent fluid source such that the vent valve can control flow of the vent fluid through the vent line;

inserting a distal end of the aspiration catheter into a blood vessel such that the distal end of the catheter is proximate a thrombus; and

controlling opening and closing the vacuum valve and the vent valve in a predetermined sequence to change a level of vacuum at the distal end of the aspiration catheter and to impart a controlled exit flow out from the distal end of the catheter.

12. (Withdrawn) The method of claim 11 wherein the valve system is directly connected to the proximal end of the aspiration catheter by a short length of tubing.

13. (Withdrawn) The method of claim 11, wherein:

the valve system further comprises (a) a first elastomeric tube portion in the housing fluidically coupled to the vacuum line and aligned with the vacuum valve such that the vacuum valve can selectively pinch and thereby close

the first elastomeric tube, and (b) a second elastomeric tube portion in the housing fluidically coupled to the vent line and aligned with vent valve such that the vent valve can selectively pinch and thereby close the second elastomeric tube; and

the method further comprises compressing the first elastomeric tube portion to shut off vacuum to the aspiration catheter and compressing the second elastomeric tube to shut off vent fluid to the aspiration catheter.

14. (Withdrawn) The method of claim 13 wherein the vacuum valve comprises a first solenoid-driven pinch valve and the vent valve comprises a second solenoid-driven pinch valve, and compressing the first elastomeric tube comprises controlling the first solenoid-driven pinch valve and compressing the second elastomeric tube comprises controlling the second solenoid-driven pinch valve.

15. (Withdrawn) The method claim 11 wherein controlling opening and closing the vacuum valve and the vent valve in a predetermined sequence comprises:

- (a) closing the vacuum valve while the vent valve is closed;
- (b) opening the vent valve after the vacuum valve has closed;
- (c) closing the vent valve while the vacuum valve is closed;
- (d) reopening the vacuum to reapply vacuum; and

wherein the timing of acts (a)-(d) of the sequence are set such that one pressure wave caused by closing the vacuum valve and another pressure wave caused by expansion of the catheter due to opening the vent valve cause fluid to flow out of the distal end of the catheter but are reversed before the pressure pulses move a thrombus downstream through the blood vessel.

16. (Withdrawn) The method of claim 15 wherein the flow out from the distal end of the aspiration catheter is from approximately 0.001 ml to approximately 1.0 ml before reapplying the vacuum draws fluid back into the aspiration catheter.

17. (Original) The thrombectomy aspiration system of claim 1 wherein controlling opening and closing the vacuum valve and the vent valve in a predetermined sequence comprises:

- (a) closing the vacuum valve while the vent valve is closed;
- (b) opening the vent valve after the vacuum valve has closed;
- (c) closing the vent valve while the vacuum valve is closed;
- (d) reopening the vacuum to reapply vacuum; and

wherein the timing of acts (a)-(d) of the sequence are set such that one pressure wave caused by closing the vacuum valve and another pressure wave caused by expansion of the catheter due to opening the vent valve cause fluid to flow out of the distal end of the catheter but are reversed to limit momentum transfer from fluid in the catheter to create a small distal movement of the thrombus whereby reapplying vacuum in act (d) is able to macerate the thrombus against the distal end of the catheter.

18. (Withdrawn) The method of claim 11 wherein inserting a distal end of the catheter into a blood vessel comprises inserting the distal end of the catheter into a neurovascular blood vessel to treat ischemic stroke.

'402 Patent Family

Ref. No: RP-15

Patent App. No.: US 18/946,722

Filed: 2024 Nov. 13

Allowed: 2025 Aug. 29



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

25096 7590 08/29/2025
PERKINS COIE LLP - SEA General
PATENT-SEA
P.O. BOX 1247
SEATTLE, WA 98111-1247

EXAMINER

NGUYEN, TUAN VAN

ART UNIT

PAPER NUMBER

3771

DATE MAILED: 08/29/2025

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
18/946,722	11/13/2024	Derek Dee Deville	145404.8001.US15	3000

TITLE OF INVENTION: ASPIRATION THROMBECTOMY SYSTEM AND METHODS FOR THROMBUS REMOVAL WITH ASPIRATION CATHETER

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	\$516	\$0.00	\$0.00	\$516	12/01/2025

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 40% the amount of undiscounted fees, and micro entity fees are 20% the amount of undiscounted fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Maintenance fees are due in utility patents issuing on applications filed on or after Dec. 12, 1980. It is patentee's responsibility to ensure timely payment of maintenance fees when due. More information is available at www.uspto.gov/PatentMaintenanceFees.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via the USPTO patent electronic filing system.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications. **Because electronic patent issuance may occur shortly after issue fee payment, any desired continuing application should preferably be filed prior to payment of this issue fee in order not to jeopardize copendency.**

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

25096 7590 08/29/2025
PERKINS COIE LLP - SEA General
PATENT-SEA
P.O. BOX 1247
SEATTLE, WA 98111-1247

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via the USPTO patent electronic filing system or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
18/946,722	11/13/2024	Derek Dee Deville	145404.8001.US15	3000

TITLE OF INVENTION: ASPIRATION THROMBECTOMY SYSTEM AND METHODS FOR THROMBUS REMOVAL WITH ASPIRATION CATHETER

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	\$516	\$0.00	\$0.00	\$516	12/01/2025

EXAMINER	ART UNIT	CLASS-SUBCLASS
NGUYEN, TUAN VAN	3771	606-127000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

☐ Change of correspondence address (or Change of Correspondence Address form PTO/AIA/122 or PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/AIA/47 or PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,

(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 _____
2 _____
3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent): ☐ Individual ☐ Corporation or other private group entity ☐ Government

4a. Fees submitted: ☐ Issue Fee ☐ Publication Fee (if required)

4b. Method of Payment: (Please first reapply any previously paid fee shown above)

☐ Electronic Payment via the USPTO patent electronic filing system ☐ Enclosed check ☐ Non-electronic payment by credit card (Attach form PTO-2038)

☐ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. _____

5. Change in Entity Status (from status indicated above)

☐ Applicant certifying micro entity status. See 37 CFR 1.29

☐ Applicant asserting small entity status. See 37 CFR 1.27

☐ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____

Date _____

Typed or printed name _____

Registration No. _____



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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
18/946,722	11/13/2024	Derek Dee Deville	145404.8001.US15	3000
25096	7590	08/29/2025	EXAMINER	
PERKINS COIE LLP - SEA General			NGUYEN, TUAN VAN	
PATENT-SEA				
P.O. BOX 1247			ART UNIT	PAPER NUMBER
SEATTLE, WA 98111-1247			3771	
DATE MAILED: 08/29/2025				

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b) (Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. 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 30 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, Virginia 22313-1450. **DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.** Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

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. The United States Patent and Trademark Office (USPTO) collects the information in this record under authority of 35 U.S.C. 2. The USPTO's system of records is used to manage all applicant and owner information including name, citizenship, residence, post office address, and other information with respect to inventors and their legal representatives pertaining to the applicant's/owner's activities in connection with the invention for which a patent is sought or has been granted. The applicable Privacy Act System of Records Notice for the information collected in this form is COMMERCE/PAT-TM-7 Patent Application Files, available in the Federal Register at 78 FR 19243 (March 29, 2013).

<https://www.govinfo.gov/content/pkg/FR-2013-03-29/pdf/2013-07341.pdf>

Routine uses of the information in this record may include disclosure to:

- 1) law enforcement, in the event that the system of records indicates a violation or potential violation of law;
- 2) a federal, state, local, or international agency, in response to its request;
- 3) a contractor of the USPTO having need for the information in order to perform a contract;
- 4) the Department of Justice for determination of whether the Freedom of Information Act (FOIA) requires disclosure of the record;
- 5) a Member of Congress submitting a request involving an individual to whom the record pertains, when the individual has requested the Member's assistance with respect to the subject matter of the record;
- 6) a court, magistrate, or administrative tribunal, in the course of presenting evidence, including disclosures to opposing counsel in the course of settlement negotiations;
- 7) the Administrator, General Services Administration (GSA), or their designee, during an inspection of records conducted by GSA under authority of 44 U.S.C. 2904 and 2906, in accordance with the GSA regulations and any other relevant (i.e., GSA or Commerce) directive, where such disclosure shall not be used to make determinations about individuals;
- 8) 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));
- 9) the Office of Personnel Management (OPM) for personnel research purposes; and
- 10) the Office of Management and Budget (OMB) for legislative coordination and clearance.

If you do not furnish the information requested on this form, the USPTO may not be able to process and/or examine your submission, which may result in termination of proceedings, abandonment of the application, and/or expiration of the patent.

Notice of Allowability	Application No. 18/946,722	Applicant(s) Deville et al.	
	Examiner TUAN V NGUYEN	Art Unit 3771	AIA (First Inventor to File) Status Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to the Request for Continued Examination filed May 2, 2025.
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

3. ☒ The allowed claim(s) is/are 1-8,10-11 and 13-20. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
Certified copies:
a) ☐ All b) ☐ Some* c) ☐ None of the:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).
* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)	5. ☒ Examiner's Amendment/Comment
2. ☒ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____.	6. ☒ Examiner's Statement of Reasons for Allowance
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____.	7. ☐ Other _____.
4. ☒ Interview Summary (PTO-413), Paper No./Mail Date. _____.	

/TUAN V NGUYEN/ Primary Examiner, Art Unit 3771	
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Notice of Pre-AIA or AIA Status

The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after allowance or after an Office action under *Ex Parte Quayle*, 25 USPQ 74, 453 O.G. 213 (Comm'r Pat. 1935). Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, prosecution in this application has been reopened pursuant to 37 CFR 1.114. Applicant's submission filed on May 2, 2015 has been entered.

EXAMINER'S AMENDMENT

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in an interview with Paul Parker on August 19, 2025.

Please amend the claims as follows, this listing of claims replacing all prior versions and listings of claims in the application. This listing of claims also replacing the examiner's amendment in the Notice of Allowance issued on March 18, 2025:

1. (Currently Amended) A thrombectomy aspiration system, comprising:
 - a vacuum source;
 - an aspiration catheter having a proximal portion, a distal end, and a lumen extending through the proximal portion to the distal end;
 - a vacuum line fluidically coupling the vacuum source to the aspiration catheter;
 - a vacuum interruption unit along the vacuum line, the vacuum interruption unit having a single contact member configured to compress the vacuum line and completely close the vacuum line thereby shutting off vacuum to the aspiration catheter by moving orthogonally to the vacuum line and to displace fluid in the aspiration catheter distally as the vacuum interruption unit compresses the vacuum line;
 - a sensor configured to detect the presence of a thrombus in the vacuum line; and
 - a computer connected to the sensor, wherein the computer is configured to determine a change in vacuum in the vacuum line based on information from the sensor and cause the vacuum interruption unit to compress the vacuum line thereby shutting off vacuum to the aspiration catheter[.]; and wherein the distal displacement of the fluid in the aspiration catheter produces an exit flow of approximately 0.001 ml to approximately 1.0 ml.
2. (Original) The thrombectomy aspiration system of claim 1 wherein the computer is configured to:
 - (a) determine a lack of flow associated with a thrombus clog based on information from the sensor and cause the vacuum interruption unit to move in a first direction to compress the vacuum line thereby shutting off vacuum to the aspiration catheter; and
 - (b) cause the vacuum interruption unit to move in a second direction after shutting off vacuum to the aspiration catheter, wherein the second direction is

opposite the first direction to open the vacuum line thereby reapplying vacuum to the aspiration catheter.

3. (Original) The thrombectomy aspiration system of claim 2 wherein, after causing the vacuum interruption unit to move in a second direction, the computer is further configured to repeat (a) moving the vacuum interruption unit in the first direction to shut off vacuum to the aspiration catheter upon determining a lack of flow associated with a thrombus clog based on information from the sensor and (b) causing the vacuum interruption unit to move in the second direction to open the vacuum line thereby reapplying vacuum to the aspiration catheter.

4. (Currently amended) The thrombectomy aspiration system of claim 1 wherein:

the computer is configured to determine a pressure drop in or at the vacuum line based on the sensor indicating a lack of flow associated with a thrombus clog and cause the vacuum interruption unit to compress the vacuum line thereby shutting off vacuum to the aspiration catheter[[:]].

~~the vacuum interruption unit is configured to displace fluid in the aspiration catheter distally as the vacuum interruption unit compresses the vacuum line; and the distal displacement of the fluid in the aspiration catheter produces an exit flow of approximately 0.001 ml to approximately 1.0 ml.~~

5. (Currently Amended) The thrombectomy aspiration system of claim [[4]]1 wherein the distal displacement of the fluid in the aspiration catheter produces an exit flow of approximately 0.1 ml to approximately 0.5 ml.

6. (Currently Amended) The thrombectomy aspiration system of claim 1 wherein:

the computer is configured to determine a pressure drop in or at the vacuum line based on the sensor indicating a lack of flow associated with a thrombus

clog and cause the vacuum interruption unit to compress the vacuum line thereby shutting off vacuum to the aspiration catheter; and
~~the vacuum interruption unit is configured to displace fluid in the aspiration catheter distally as the vacuum interruption unit compresses the vacuum line; and~~
the distal displacement of the fluid in the aspiration catheter is approximately 0.5 mm to approximately 30 mm.

7. (Original) The thrombectomy aspiration system of claim 6 wherein the distal displacement of the fluid in the aspiration catheter is approximately 0.5 mm to approximately 15 mm.

8. (Original) The thrombectomy aspiration system of claim 1 wherein the computer is configured to determine a pressure drop in or at the vacuum line based on the sensor indicating a lack of flow associated with a thrombus clog and cause the vacuum interruption unit to compress the vacuum line thereby shutting off vacuum to the aspiration catheter.

9. Canceled.

10. (Currently Amended) The thrombectomy aspiration system of claim [[9]]8 wherein the vacuum interruption unit comprises a cam configured to move in a first direction orthogonal to a longitudinal axis of the vacuum line at the vacuum interruption unit to close the vacuum line.

11. (Original) The thrombectomy aspiration system of claim 10 wherein the cam is configured to cause distal displacement of fluid in the catheter.

12. Canceled.

13. (Original) The thrombectomy aspiration system of claim 10 wherein the distal displacement of the fluid in the aspiration catheter produces an exit flow of approximately 0.1 ml to approximately 0.5 ml.

14. (Original) The thrombectomy system of claim 10 wherein distal displacement of the fluid in the aspiration catheter is approximately 0.5 mm to approximately 30 mm.

15. (Original) The thrombectomy aspiration system of claim 10 wherein the distal displacement of the fluid in the aspiration catheter is approximately 0.5 mm to approximately 15 mm.

16. (Currently amended) A thrombectomy aspiration system, comprising:
a vacuum source;
an aspiration catheter having a proximal portion, a distal end, and a lumen extending through the proximal portion to the distal end;
a vacuum line fluidically coupling the vacuum source to the aspiration catheter;
a vacuum interruption unit along the vacuum line, the vacuum interruption unit having a single contact member configured to compress the vacuum line and completely close the vacuum line thereby shutting off vacuum to the aspiration catheter by moving orthogonally to the vacuum line and to displace fluid in the aspiration catheter distally as the vacuum interruption unit compresses the vacuum line;
a sensor configured to detect the presence of a thrombus in the vacuum line; and
a computer connected to the sensor, wherein the computer is configured to determine a state of vacuum in the vacuum line based on information from the sensor and cause the vacuum interruption unit to compress the vacuum line thereby shutting off vacuum to the aspiration catheter based on the state of vacuum in the vacuum line[.]; and
wherein the distal displacement of the fluid in the aspiration catheter produces an exit flow of approximately 0.001 ml to approximately 1.0 ml.

17. (Original) The thrombectomy aspiration system of claim 16 wherein the computer is configured to:

- (a) determine a lack of flow associated with a thrombus clog based on information from the sensor and cause the vacuum interruption unit to move in a first direction to compress the vacuum line thereby shutting off vacuum to the aspiration catheter; and
- (b) cause the vacuum interruption unit to move in a second direction after shutting off vacuum to the aspiration catheter, wherein the second direction is opposite the first direction to open the vacuum line thereby reapplying vacuum to the aspiration catheter.

18. (Original) The thrombectomy aspiration system of claim 17 wherein, after causing the vacuum interruption unit to move in a second direction, the computer is further configured to repeat (a) moving the vacuum interruption unit in the first direction to shut off vacuum to the aspiration catheter upon determining a lack of flow associated with a thrombus clog based on information from the sensor and (b) causing the vacuum interruption unit to move in the second direction to open the vacuum line thereby reapplying vacuum to the aspiration catheter.

19. (Currently amended) The thrombectomy aspiration system of claim 17 wherein:

the computer is configured to determine a pressure drop in or at the vacuum line based on the sensor indicating a lack of flow associated with a thrombus clog and cause the vacuum interruption unit to compress the vacuum line thereby shutting off vacuum to the aspiration catheter; ~~and the vacuum interruption unit is configured to displace fluid in the aspiration catheter distally as the vacuum interruption unit compresses the vacuum line; and the distal displacement of the fluid in the aspiration catheter produces an exit flow of approximately 0.001 ml to approximately 1.0 ml.~~

20. (Original) The thrombectomy aspiration system of claim 16 wherein the computer is configured to determine a pressure drop in or at the vacuum line based on the sensor indicating a lack of flow associated with a thrombus clog and cause the vacuum interruption unit to compress the vacuum line thereby shutting off vacuum to the aspiration catheter.

Allowable Subject Matter

Claims 1-8, 10-11 and 13-20 allowed.

Examiner notes that Teigen et al. (US 11,096,712), which is cited in the Inter Partes Reviews in related U.S. Patent Application Nos 10/531,883 and 10/722,253, is not prior art because U.S. Provisional Application No. 62/701,086, filed July 20, 2018 provides support to all subject matter in claims 1-20.

Grey (WO 2014/151209 A1), which is cited in the Inter Partes Reviews in related U.S. Patent Application Nos 10/531,883 and 10/722,253, discloses a thrombectomy aspiration system, comprising: a vacuum source (208 as shown in Fig. 2A; 608 as shown in Fig. 6; 708 as shown in Fig. 7; and 808 as shown in Figs. 8A-8C); an aspiration catheter having a proximal portion, a distal end (206 as shown in Fig. 2A; 406 as shown in Figs. 4A; 506 as shown in Fig. 5; and 806 as shown in Figs. 8A-8C); a vacuum line fluidically coupling the vacuum source to the aspiration catheter (212 as shown in Fig. 2A; 412 as shown in Fig. 4A; 712 as shown in Fig. 7; and Fig. 8); vacuum interruption unit (214 as shown in Fig. 2A; 414 as shown in Fig. 4A; 514 as shown in Fig. 5; 614 as shown in Fig. 6; 710 as shown in Fig. 7; and 814 as shown in Fig. 8) configured to interrupt vacuum pressure in the aspiration catheter and a computer connected to the sensor, wherein the computer is configured to determine a change in vacuum in the vacuum line based on information from the sensor.

Brady et al. (US 2019/0239910) a thrombectomy aspiration system, comprising: a vacuum source (502 as shown in Fig. 19; paras. [0148]-[0149]); an aspiration catheter having a proximal portion, a distal end (503 as shown in Fig. 19); a vacuum line fluidically coupling the vacuum source to the aspiration catheter (Fig. 19); vacuum interruption unit (pulse generator 501 as shown in Fig. 19) configured to interrupt vacuum pressure in the aspiration catheter. Figures 20A-20B show the pulse generator 501 includes a vacuum interruption unit 551 along the vacuum line, the vacuum interruption unit having a single contact member configured to compress the vacuum line. Figure 20B shows that the aspiration line is not fully closed by the vacuum interruption unit.

There is no art of record alone or in combination that teaches a thrombectomy aspiration system that includes the combination of recited limitations in claims 1 and 16.

As to claim 1, prior art of record alone or in combination did not teach the limitations of a vacuum interruption unit along the vacuum line, the vacuum interruption unit having a single contact member configured to compress the vacuum line and completely close the vacuum line thereby shutting off vacuum to the aspiration catheter by moving orthogonally to the vacuum line and to displace fluid in the aspiration catheter distally as the vacuum interruption unit compresses the vacuum line; a sensor configured to detect the presence of a thrombus in the vacuum line; and a computer connected to the sensor, wherein the computer is configured to determine a change in vacuum in the vacuum line based on information from the sensor and cause the vacuum interruption unit to compress the vacuum line thereby shutting off vacuum to the aspiration catheter; and wherein the distal displacement of the fluid in the aspiration catheter produces an exit flow of approximately 0.001 ml to approximately 1.0 ml.

As to claim 16, prior art of record alone or in combination did not teach the limitations of a vacuum interruption unit along the vacuum line, the vacuum interruption unit having a single contact member configured to compress the vacuum line and completely close the vacuum line thereby shutting off vacuum to the aspiration catheter by moving orthogonally to the vacuum line and to displace fluid in the aspiration catheter distally as the vacuum interruption unit compresses the vacuum line; a sensor configured to detect the presence of a thrombus in the vacuum line; and a computer connected to the sensor, wherein the computer is configured to determine a state of vacuum in the vacuum line based on information from the sensor and cause the vacuum interruption unit to compress the vacuum line thereby shutting off vacuum to the aspiration catheter based on the state of vacuum in the vacuum line; and wherein the distal displacement of the fluid in the aspiration catheter produces an exit flow of approximately 0.001 ml to approximately 1.0 ml.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to TUAN V NGUYEN whose telephone number is (571)272-5962. The examiner can normally be reached Monday - Friday 8:30 AM - 5:30 PM.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at <http://www.uspto.gov/interviewpractice>.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jackie Ho can be reached on 571-272-4696. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of published or unpublished applications may be obtained from Patent Center. Unpublished application information in Patent Center is available to registered users. To file and manage patent submissions in Patent Center, visit: <https://patentcenter.uspto.gov>. Visit <https://www.uspto.gov/patents/apply/patent-center> for more information about Patent Center and <https://www.uspto.gov/patents/docx> for information about filing in DOCX format. For additional questions, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/TUAN V NGUYEN/
Primary Examiner, Art Unit 3771



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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
18/946,722	11/13/2024	Derek Dee Deville	145404.8001.US15	3000
25096 7590 04/02/2025 PERKINS COIE LLP - SEA General PATENT-SEA P.O. BOX 1247 SEATTLE, WA 98111-1247			EXAMINER NGUYEN, TUAN VAN	
			ART UNIT 3771	PAPER NUMBER
			NOTIFICATION DATE 04/02/2025	DELIVERY MODE ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patentprocurement@perkinscoie.com

CORRECTED Notice of Allowability	Application No. 18/946,722	Applicant(s) Deville et al.	
	Examiner TUAN V NGUYEN	Art Unit 3771	AIA (FITF) Status Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to the Decision Granting Request for Prioritized Examination issued February 12, 2025.
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

3. ☒ The allowed claim(s) is/are 1-8 and 10-20 . As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information , please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
Certified copies:
 a) ☐ All b) ☐ Some* c) ☐ None of the:
 1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).
 * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892) 2. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____. 3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____. 4. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____.	5. ☐ Examiner's Amendment/Comment 6. ☐ Examiner's Statement of Reasons for Allowance 7. ☐ Other _____.
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/TUAN V NGUYEN/ Primary Examiner, Art Unit 3771	
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NOTICE OF ALLOWANCE AND FEE(S) DUE

25096 7590 03/18/2025
PERKINS COIE LLP - SEA General
PATENT-SEA
P.O. BOX 1247
SEATTLE, WA 98111-1247

EXAMINER

NGUYEN, TUAN VAN

ART UNIT

PAPER NUMBER

3771

DATE MAILED: 03/18/2025

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
18/946,722	11/13/2024	Derek Dee Deville	145404.8001.US15	3000

TITLE OF INVENTION: ASPIRATION THROMBECTOMY SYSTEM AND METHODS FOR THROMBUS REMOVAL WITH ASPIRATION CATHETER

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	\$516	\$0.00	\$0.00	\$516	06/18/2025

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 40% the amount of undiscounted fees, and micro entity fees are 20% the amount of undiscounted fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Maintenance fees are due in utility patents issuing on applications filed on or after Dec. 12, 1980. It is patentee's responsibility to ensure timely payment of maintenance fees when due. More information is available at www.uspto.gov/PatentMaintenanceFees.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via the USPTO patent electronic filing system.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications. **Because electronic patent issuance may occur shortly after issue fee payment, any desired continuing application should preferably be filed prior to payment of this issue fee in order not to jeopardize copendency.**

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

25096 7590 03/18/2025
PERKINS COIE LLP - SEA General
PATENT-SEA
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SEATTLE, WA 98111-1247

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via the USPTO patent electronic filing system or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
18/946,722	11/13/2024	Derek Dee Deville	145404.8001.US15	3000

TITLE OF INVENTION: ASPIRATION THROMBECTOMY SYSTEM AND METHODS FOR THROMBUS REMOVAL WITH ASPIRATION CATHETER

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	\$516	\$0.00	\$0.00	\$516	06/18/2025

EXAMINER	ART UNIT	CLASS-SUBCLASS
NGUYEN, TUAN VAN	3771	606-127000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

☐ Change of correspondence address (or Change of Correspondence Address form PTO/AIA/122 or PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/AIA/47 or PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,

(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 _____
2 _____
3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent): ☐ Individual ☐ Corporation or other private group entity ☐ Government

4a. Fees submitted: ☐ Issue Fee ☐ Publication Fee (if required)

4b. Method of Payment: (Please first reapply any previously paid fee shown above)

☐ Electronic Payment via the USPTO patent electronic filing system ☐ Enclosed check ☐ Non-electronic payment by credit card (Attach form PTO-2038)

☐ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. _____

5. Change in Entity Status (from status indicated above)

☐ Applicant certifying micro entity status. See 37 CFR 1.29

☐ Applicant asserting small entity status. See 37 CFR 1.27

☐ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____

Date _____

Typed or printed name _____

Registration No. _____



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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
18/946,722	11/13/2024	Derek Dee Deville	145404.8001.US15	3000
25096	7590	03/18/2025	EXAMINER	
PERKINS COIE LLP - SEA General			NGUYEN, TUAN VAN	
PATENT-SEA				
P.O. BOX 1247			ART UNIT	PAPER NUMBER
SEATTLE, WA 98111-1247			3771	
DATE MAILED: 03/18/2025				

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b) (Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. 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 30 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, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

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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. The United States Patent and Trademark Office (USPTO) collects the information in this record under authority of 35 U.S.C. 2. The USPTO's system of records is used to manage all applicant and owner information including name, citizenship, residence, post office address, and other information with respect to inventors and their legal representatives pertaining to the applicant's/owner's activities in connection with the invention for which a patent is sought or has been granted. The applicable Privacy Act System of Records Notice for the information collected in this form is COMMERCE/PAT-TM-7 Patent Application Files, available in the Federal Register at 78 FR 19243 (March 29, 2013).

<https://www.govinfo.gov/content/pkg/FR-2013-03-29/pdf/2013-07341.pdf>

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- 6) a court, magistrate, or administrative tribunal, in the course of presenting evidence, including disclosures to opposing counsel in the course of settlement negotiations;
- 7) the Administrator, General Services Administration (GSA), or their designee, during an inspection of records conducted by GSA under authority of 44 U.S.C. 2904 and 2906, in accordance with the GSA regulations and any other relevant (i.e., GSA or Commerce) directive, where such disclosure shall not be used to make determinations about individuals;
- 8) 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));
- 9) the Office of Personnel Management (OPM) for personnel research purposes; and
- 10) the Office of Management and Budget (OMB) for legislative coordination and clearance.

If you do not furnish the information requested on this form, the USPTO may not be able to process and/or examine your submission, which may result in termination of proceedings, abandonment of the application, and/or expiration of the patent.

Notice of Allowability	Application No. 18/946,722	Applicant(s) Deville et al.	
	Examiner TUAN V NGUYEN	Art Unit 3771	AIA (FITF) Status Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to the Decision Granting Request for Prioritized Examination issued February 12, 2025.
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

3. ☒ The allowed claim(s) is/are 1-20 . As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
Certified copies:
a) ☐ All b) ☐ Some* c) ☐ None of the:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).
* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)	5. ☒ Examiner's Amendment/Comment
2. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____.	6. ☒ Examiner's Statement of Reasons for Allowance
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____.	7. ☐ Other _____.
4. ☒ Interview Summary (PTO-413), Paper No./Mail Date. _____.	

/TUAN V NGUYEN/ Primary Examiner, Art Unit 3771	
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Notice of Pre-AIA or AIA Status

The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

Priority

This application is a continuation of U.S. Patent Application Serial No. 18/346,027, filed on June 30, 2023, and U.S. Patent Application Serial No. 18/346,044, filed on June 30, 2023. All these applications are continuations of:

- U.S. Patent Application Serial No. 16/899,514, filed on June 11, 2020, now U.S. Patent No. 12,059,161, issued August 13, 2024, which is a continuation of U.S. Patent Application Serial No. 16/681,564, filed on November 12, 2019, now U.S. Patent No. 10,722,253, issued July 28, 2020, which is a continuation of U.S. Patent Application Serial No. 16/516,232, filed on July 18, 2019, now U.S. Patent No. 10,531,883, issued January 14, 2020, which claims the benefit of U.S. Provisional Application Serial Nos. 62/701,086, filed July 20, 2018, and 62/750,011, filed October 24, 2018; and
- International Application No. PCT/US2019/042546 under 35 U.S.C. § 120, filed July 19, 2019, which designated the United States and under 35 U.S.C. § 119 claims the priority of U.S. Patent Application Serial No. 16/516,232, filed on July 18, 2019, which claims the benefit of U.S. Provisional Application Serial Nos. 62/701,086, filed July 20, 2018, and 62/750,011, filed October 24, 2018.

Examiner notes that Provisional Application No. 62/701,086, filed July 20, 2018 provides support to all subject matter in claims 1-20.

Claim Interpretation

The following is a quotation of 35 U.S.C. 112(f):

(f) Element in Claim for a Combination. – An element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof.

The following is a quotation of pre-AIA 35 U.S.C. 112, sixth paragraph:

An element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof.

The claims in this application are given their broadest reasonable interpretation using the plain meaning of the claim language in light of the specification as it would be understood by one of ordinary skill in the art. The broadest reasonable interpretation of a claim element (also commonly referred to as a claim limitation) is limited by the description in the specification when 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph, is invoked.

As explained in MPEP § 2181, subsection I, claim limitations that meet the following three-prong test will be interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph:

- (A) the claim limitation uses the term “means” or “step” or a term used as a substitute for “means” that is a generic placeholder (also called a nonce term or a non-

structural term having no specific structural meaning) for performing the claimed function;

- (B) the term “means” or “step” or the generic placeholder is modified by functional language, typically, but not always linked by the transition word “for” (e.g., “means for”) or another linking word or phrase, such as “configured to” or “so that”; and
- (C) the term “means” or “step” or the generic placeholder is not modified by sufficient structure, material, or acts for performing the claimed function.

Use of the word “means” (or “step”) in a claim with functional language creates a rebuttable presumption that the claim limitation is to be treated in accordance with 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph. The presumption that the claim limitation is interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph, is rebutted when the claim limitation recites sufficient structure, material, or acts to entirely perform the recited function.

Absence of the word “means” (or “step”) in a claim creates a rebuttable presumption that the claim limitation is not to be treated in accordance with 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph. The presumption that the claim limitation is not interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph, is rebutted when the claim limitation recites function without reciting sufficient structure, material or acts to entirely perform the recited function.

Claim limitations in this application that use the word “means” (or “step”) are being interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph, except as otherwise indicated in an Office action. Conversely, claim limitations in this

application that do not use the word “means” (or “step”) are not being interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph, except as otherwise indicated in an Office action.

This application includes one or more claim limitations that do not use the word “means,” but are nonetheless being interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph, because the claim limitation(s) uses a generic placeholder that is coupled with functional language without reciting sufficient structure to perform the recited function and the generic placeholder is not preceded by a structural modifier. Such claim limitation(s) is/are: “**vacuum interruption unit**” in claims **1-4, 6, 8-9, and 16-20** (emphasis added).

Because this/these claim limitation(s) is/are being interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph, it/they is/are being interpreted to cover the corresponding structure described in the specification as performing the claimed function, and equivalents thereof.

If applicant does not intend to have this/these limitation(s) interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph, applicant may: (1) amend the claim limitation(s) to avoid it/them being interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph (e.g., by reciting sufficient structure to perform the claimed function); or (2) present a sufficient showing that the claim limitation(s) recite(s) sufficient structure to perform the claimed function so as to avoid it/them being interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph.

EXAMINER'S AMENDMENT

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in an interview with Paul Parker on March 4, 2025.

The application has been amended as follows:

Claim 9 is canceled.

Claims 1, 4, 6, 10, 16 and 19 have been amended as follows:

1. A thrombectomy aspiration system, comprising:
 - a vacuum source;
 - an aspiration catheter having a proximal portion, a distal end, and a lumen extending through the proximal portion to the distal end;
 - a vacuum line fluidically coupling the vacuum source to the aspiration catheter;
 - a vacuum interruption unit along the vacuum line, the vacuum interruption unit configured to compress the vacuum line and completely close the vacuum line thereby shutting off vacuum to the aspiration catheter and displacing fluid in the aspiration catheter distally as the vacuum interruption unit compresses the vacuum line;
 - a sensor configured to detect the presence of a thrombus in the vacuum line; and
 - a computer connected to the sensor, wherein the computer is configured to determine a change in vacuum in the vacuum line based on information from the sensor

and cause the vacuum interruption unit to compress the vacuum line thereby shutting off vacuum to the aspiration catheter.

4. The thrombectomy aspiration system of claim 1 wherein:

the computer is configured to determine a pressure drop in or at the vacuum line based on the sensor indicating a lack of flow associated with a thrombus clog and cause the vacuum interruption unit to compress the vacuum line thereby shutting off vacuum to the aspiration catheter; and

~~the vacuum interruption unit is configured to displace fluid in the aspiration catheter distally as the vacuum interruption unit compresses the vacuum line; and the~~
distal displacement of the fluid in the aspiration catheter produces an exit flow of approximately 0.001 ml to approximately 1.0 ml.

6. The thrombectomy aspiration system of claim 1 wherein:

the computer is configured to determine a pressure drop in or at the vacuum line based on the sensor indicating a lack of flow associated with a thrombus clog and

cause the vacuum interruption unit to compress the vacuum line thereby shutting off vacuum to the aspiration catheter; and

~~the vacuum interruption unit is configured to displace fluid in the aspiration catheter distally as the vacuum interruption unit compresses the vacuum line; and~~

the distal displacement of the fluid in the aspiration catheter is approximately 0.5 mm to approximately 30 mm.

10. The thrombectomy aspiration system of claim [[9]]8 wherein the vacuum interruption unit comprises a cam configured to move in a first direction orthogonal to a longitudinal axis of the vacuum line at the vacuum interruption unit to close the vacuum line.

16. A thrombectomy aspiration system, comprising:

a vacuum source;

an aspiration catheter having a proximal portion, a distal end, and a lumen extending through the proximal portion to the distal end;

a vacuum line fluidically coupling the vacuum source to the aspiration catheter;

a vacuum interruption unit along the vacuum line, the vacuum interruption unit configured to compress the vacuum line and close the vacuum line thereby shutting off

vacuum to the aspiration catheter and displacing fluid in the aspiration catheter distally as the vacuum interruption unit compresses the vacuum line;

a sensor configured to detect the presence of a thrombus in the vacuum line; and
a computer connected to the sensor, wherein the computer is configured to determine a state of vacuum in the vacuum line based on information from the sensor and cause the vacuum interruption unit to compress the vacuum line thereby shutting off vacuum to the aspiration catheter based on the state of vacuum in the vacuum line.

19. The thrombectomy aspiration system of claim 17 wherein:

the computer is configured to determine a pressure drop in or at the vacuum line based on the sensor indicating a lack of flow associated with a thrombus clog and cause the vacuum interruption unit to compress the vacuum line thereby shutting off vacuum to the aspiration catheter; and

~~the vacuum interruption unit is configured to displace fluid in the aspiration catheter distally as the vacuum interruption unit compresses the vacuum line; and~~

the distal displacement of the fluid in the aspiration catheter produces an exit flow of approximately 0.001 ml to approximately 1.0 ml.

Allowable Subject Matter

Claims 1-20 allowed.

Examiner notes that Teigen et al. (US 11,096,712), which is cited in the Inter Partes Reviews in related U.S. Patent Application Nos 10/531,883 and 10/722,253, is

not prior art because U.S. Provisional Application No. 62/701,086, filed July 20, 2018 provides support to all subject matter in claims 1-20.

Grey (WO 2014/151209 A1), which is cited in the Inter Partes Reviews in related U.S. Patent Application Nos 10/531,883 and 10/722,253, discloses a thrombectomy aspiration system, comprising: a vacuum source (208 as shown in Fig. 2A; 608 as shown in Fig. 6; 708 as shown in Fig. 7; and 808 as shown in Figs. 8A-8C); an aspiration catheter having a proximal portion, a distal end (206 as shown in Fig. 2A; 406 as shown in Figs. 4A; 506 as shown in Fig. 5; and 806 as shown in Figs. 8A-8C); a vacuum line fluidically coupling the vacuum source to the aspiration catheter (212 as shown in Fig. 2A; 412 as shown in Fig. 4A; 712 as shown in Fig. 7; and Fig. 8); vacuum interruption unit (214 as shown in Fig. 2A; 414 as shown in Fig. 4A; 514 as shown in Fig. 5; 614 as shown in Fig. 6; 710 as shown in Fig. 7; and 814 as shown in Fig. 8) configured to interrupt vacuum pressure in the aspiration catheter and a computer connected to the sensor, wherein the computer is configured to determine a change in vacuum in the vacuum line based on information from the sensor.

Look et al. (US 2018/0207397) discloses a thrombectomy aspiration system, comprising: a vacuum source 22 ([0195]-[0196]); an aspiration catheter having a proximal portion, a distal end; a vacuum line 2057 (Fig. 64) fluidically coupling the vacuum source to the aspiration catheter; and a pinch valve 2023 (Fig. 64) positioned along the vacuum line to shutting off vacuum to the aspiration catheter (pinch valve 2023 as shown in Fig. 64).

There is no art of record alone or in combination that teaches a thrombectomy aspiration system that includes the combination of recited limitations in claims 1 and 16.

As to claim 1, prior art of record alone or in combination did not teach the limitations of a vacuum interruption unit along the vacuum line, the vacuum interruption unit configured to compress the vacuum line and completely close the vacuum line thereby shutting off vacuum to the aspiration catheter and displacing fluid in the aspiration catheter distally as the vacuum interruption unit compresses the vacuum line; a sensor configured to detect the presence of a thrombus in the vacuum line; and a computer connected to the sensor, wherein the computer is configured to determine a change in vacuum in the vacuum line based on information from the sensor and cause the vacuum interruption unit to compress the vacuum line thereby shutting off vacuum to the aspiration catheter.

As to claim 16, prior art of record alone or in combination did not teach the limitations of a vacuum interruption unit along the vacuum line, the vacuum interruption unit configured to compress the vacuum line and close the vacuum line thereby shutting off vacuum to the aspiration catheter and displacing fluid in the aspiration catheter distally as the vacuum interruption unit compresses the vacuum line; a sensor configured to detect the presence of a thrombus in the vacuum line; and a computer connected to the sensor, wherein the computer is configured to determine a state of vacuum in the vacuum line based on information from the sensor and cause the vacuum interruption unit to compress the vacuum line thereby shutting off vacuum to the aspiration catheter based on the state of vacuum in the vacuum line.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably

accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to TUAN V NGUYEN whose telephone number is (571)272-5962. The examiner can normally be reached Monday - Friday 8:30 AM - 5:30 PM.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at <http://www.uspto.gov/interviewpractice>.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jackie Ho can be reached on 571-272-4696. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of published or unpublished applications may be obtained from Patent Center. Unpublished application information in Patent Center is available to registered users. To file and manage patent submissions in Patent Center, visit: <https://patentcenter.uspto.gov>. Visit <https://www.uspto.gov/patents/apply/patent-center> for more information about Patent Center and <https://www.uspto.gov/patents/docx> for information about filing in DOCX format. For additional questions, contact the Electronic Business Center (EBC) at 866-217-9197

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/TUAN V NGUYEN/
Primary Examiner, Art Unit 3771

CLAIMS

I/We claim:

1. A thrombectomy aspiration system, comprising:
 - a vacuum source;
 - an aspiration catheter having a proximal portion, a distal end, and a lumen extending through the proximal portion to the distal end;
 - a vacuum line fluidically coupling the vacuum source to the aspiration catheter;
 - a vacuum interruption unit along the vacuum line, the vacuum interruption unit configured to compress the vacuum line and completely close the vacuum line thereby shutting off vacuum to the aspiration catheter;
 - a sensor configured to detect the presence of a thrombus in the vacuum line; and
 - a computer connected to the sensor, wherein the computer is configured to determine a change in vacuum in the vacuum line based on information from the sensor and cause the vacuum interruption unit to compress the vacuum line thereby shutting off vacuum to the aspiration catheter.
2. The thrombectomy aspiration system of claim 1 wherein the computer is configured to:
 - (a) determine a lack of flow associated with a thrombus clog based on information from the sensor and cause the vacuum interruption unit to move in a first direction to compress the vacuum line thereby shutting off vacuum to the aspiration catheter; and
 - (b) cause the vacuum interruption unit to move in a second direction after shutting off vacuum to the aspiration catheter, wherein the second direction is opposite the first direction to open the vacuum line thereby reapplying vacuum to the aspiration catheter.
3. The thrombectomy aspiration system of claim 2 wherein, after causing the vacuum interruption unit to move in a second direction, the computer is further configured to

repeat (a) moving the vacuum interruption unit in the first direction to shut off vacuum to the aspiration catheter upon determining a lack of flow associated with a thrombus clog based on information from the sensor and (b) causing the vacuum interruption unit to move in the second direction to open the vacuum line thereby reapplying vacuum to the aspiration catheter.

4. The thrombectomy aspiration system of claim 1 wherein:

the computer is configured to determine a pressure drop in or at the vacuum line based on the sensor indicating a lack of flow associated with a thrombus clog and cause the vacuum interruption unit to compress the vacuum line thereby shutting off vacuum to the aspiration catheter;

the vacuum interruption unit is configured to displace fluid in the aspiration catheter distally as the vacuum interruption unit compresses the vacuum line; and

the distal displacement of the fluid in the aspiration catheter produces an exit flow of approximately 0.001 ml to approximately 1.0 ml.

5. The thrombectomy aspiration system of claim 4 wherein the distal displacement of the fluid in the aspiration catheter produces an exit flow of approximately 0.1 ml to approximately 0.5 ml.

6. The thrombectomy aspiration system of claim 1 wherein:

the computer is configured to determine a pressure drop in or at the vacuum line based on the sensor indicating a lack of flow associated with a thrombus clog and cause the vacuum interruption unit to compress the vacuum line thereby shutting off vacuum to the aspiration catheter;

the vacuum interruption unit is configured to displace fluid in the aspiration catheter distally as the vacuum interruption unit compresses the vacuum line; and

the distal displacement of the fluid in the aspiration catheter is approximately 0.5 mm to approximately 30 mm.

7. The thrombectomy aspiration system of claim 6 wherein the distal displacement of the fluid in the aspiration catheter is approximately 0.5 mm to approximately 15 mm.

8. The thrombectomy aspiration system of claim 1 wherein the computer is configured to determine a pressure drop in or at the vacuum line based on the sensor indicating a lack of flow associated with a thrombus clog and cause the vacuum interruption unit to compress the vacuum line thereby shutting off vacuum to the aspiration catheter.

9. The thrombectomy aspiration system of claim 8 wherein the vacuum interruption unit is configured to displace fluid in the aspiration catheter distally as the vacuum interruption unit compresses the vacuum line.

10. The thrombectomy aspiration system of claim 9 wherein the vacuum interruption unit comprises a cam configured to move in a first direction orthogonal to a longitudinal axis of the vacuum line at the vacuum interruption unit to close the vacuum line.

11. The thrombectomy aspiration system of claim 10 wherein the cam is configured to cause distal displacement of fluid in the catheter.

12. The thrombectomy system of claim 10 wherein distal displacement of the fluid in the aspiration catheter produces an exit flow of approximately 0.001 ml to approximately 1.0 ml.

13. The thrombectomy aspiration system of claim 10 wherein the distal displacement of the fluid in the aspiration catheter produces an exit flow of approximately 0.1 ml to approximately 0.5 ml.

14. The thrombectomy system of claim 10 wherein distal displacement of the fluid in the aspiration catheter is approximately 0.5 mm to approximately 30 mm.

15. The thrombectomy aspiration system of claim 10 wherein the distal displacement of the fluid in the aspiration catheter is approximately 0.5 mm to approximately 15 mm.

16. A thrombectomy aspiration system, comprising:

a vacuum source;

an aspiration catheter having a proximal portion, a distal end, and a lumen extending through the proximal portion to the distal end;

a vacuum line fluidically coupling the vacuum source to the aspiration catheter;

a vacuum interruption unit along the vacuum line, the vacuum interruption unit configured to compress the vacuum line and close the vacuum line thereby shutting off vacuum to the aspiration catheter;

a sensor configured to detect the presence of a thrombus in the vacuum line; and

a computer connected to the sensor, wherein the computer is configured to determine a state of vacuum in the vacuum line based on information from the sensor and cause the vacuum interruption unit to compress the vacuum line thereby shutting off vacuum to the aspiration catheter based on the state of vacuum in the vacuum line.

17. The thrombectomy aspiration system of claim 16 wherein the computer is configured to:

(a) determine a lack of flow associated with a thrombus clog based on information from the sensor and cause the vacuum interruption unit to move in a first direction to compress the vacuum line thereby shutting off vacuum to the aspiration catheter; and

(b) cause the vacuum interruption unit to move in a second direction after shutting off vacuum to the aspiration catheter, wherein the second direction is opposite the first direction to open the vacuum line thereby reapplying vacuum to the aspiration catheter.

18. The thrombectomy aspiration system of claim 17 wherein, after causing the vacuum interruption unit to move in a second direction, the computer is further configured to repeat (a) moving the vacuum interruption unit in the first direction to shut off vacuum to the aspiration catheter upon determining a lack of flow associated with a thrombus clog based on information from the sensor and (b) causing the vacuum interruption unit to move in the second direction to open the vacuum line thereby reapplying vacuum to the aspiration catheter.

19. The thrombectomy aspiration system of claim 17 wherein:
the computer is configured to determine a pressure drop in or at the vacuum line based on the sensor indicating a lack of flow associated with a thrombus clog and cause the vacuum interruption unit to compress the vacuum line thereby shutting off vacuum to the aspiration catheter;
the vacuum interruption unit is configured to displace fluid in the aspiration catheter distally as the vacuum interruption unit compresses the vacuum line; and
the distal displacement of the fluid in the aspiration catheter produces an exit flow of approximately 0.001 ml to approximately 1.0 ml.

20. The thrombectomy aspiration system of claim 16 wherein the computer is configured to determine a pressure drop in or at the vacuum line based on the sensor indicating a lack of flow associated with a thrombus clog and cause the vacuum interruption unit to compress the vacuum line thereby shutting off vacuum to the aspiration catheter.

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	145404.8001.US15
		Application Number	
Title of Invention	ASPIRATION THROMBECTOMY SYSTEM AND METHODS FOR THROMBUS REMOVAL WITH ASPIRATION CATHETER		
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:

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Prefix	Given Name	Middle Name	Family Name	Suffix	
	William	T.	Bales		
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service					

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

Application Data Sheet 37 CFR 1.76		Attorney Docket Number		145404.8001.US15	
		Application Number			
Title of Invention		ASPIRATION THROMBECTOMY SYSTEM AND METHODS FOR THROMBUS REMOVAL WITH ASPIRATION CATHETER			
City	Miami	State/Province	FL	Country of Residence ⁱ	US
Mailing Address of Inventor:					
Address 1		c/o RapidPulse, Inc.			
Address 2		13755 S.W. 119 Avenue			
City	Miami	State/Province	FL		
Postal Code	33186	Country ⁱ	US		
Inventor 4					Remove
Legal Name					
Prefix	Given Name	Middle Name	Family Name	Suffix	
	M.	Sean	McBrayer		
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service					
City	Coral Gables	State/Province	FL	Country of Residence ⁱ	US
Mailing Address of Inventor:					
Address 1		c/o RapidPulse, Inc.			
Address 2		13755 S.W. 119 Avenue			
City	Miami	State/Province	FL		
Postal Code	33186	Country ⁱ	US		
Inventor 5					Remove
Legal Name					
Prefix	Given Name	Middle Name	Family Name	Suffix	
	Eric		Petersen		
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service					
City	Homestead	State/Province	FL	Country of Residence ⁱ	US
Mailing Address of Inventor:					
Address 1		c/o RapidPulse, Inc.			
Address 2		13755 S.W. 119 Avenue			
City	Miami	State/Province	FL		
Postal Code	33186	Country ⁱ	US		
Inventor 6					Remove
Legal Name					
Prefix	Given Name	Middle Name	Family Name	Suffix	
	Richard		Cartledge		
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service					
City	Boca Raton	State/Province	FL	Country of Residence ⁱ	US

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number		145404.8001.US15	
		Application Number			
Title of Invention		ASPIRATION THROMBECTOMY SYSTEM AND METHODS FOR THROMBUS REMOVAL WITH ASPIRATION CATHETER			
Mailing Address of Inventor:					
Address 1		c/o RapidPulse, Inc.			
Address 2		13755 S.W. 119 Avenue			
City	Miami	State/Province		FL	
Postal Code		33186	Country	US	
Inventor 7					<input type="button" value="Remove"/>
Legal Name					
Prefix	Given Name	Middle Name		Family Name	Suffix
	Thomas	O.		Bales	Jr.
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service					
City	Miami	State/Province	FL	Country of Residence	US
Mailing Address of Inventor:					
Address 1		c/o RapidPulse, Inc.			
Address 2		13755 S.W. 119 Avenue			
City	Miami	State/Province		FL	
Postal Code		33186	Country	US	
Inventor 8					<input type="button" value="Remove"/>
Legal Name					
Prefix	Given Name	Middle Name		Family Name	Suffix
	Carlos			Rivera	
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service					
City	Cooper City	State/Province	FL	Country of Residence	US
Mailing Address of Inventor:					
Address 1		c/o RapidPulse, Inc.			
Address 2		13755 S.W. 119 Avenue			
City	Miami	State/Province		FL	
Postal Code		33186	Country	US	
All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the Add button. <input type="button" value="Add"/>					

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below. For further information see 37 CFR 1.33(a).	
☐ An Address is being provided for the correspondence information of this application.	
Customer Number	25096

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	145404.8001.US15
		Application Number	
Title of Invention	ASPIRATION THROMBECTOMY SYSTEM AND METHODS FOR THROMBUS REMOVAL WITH ASPIRATION CATHETER		
Email Address	patentprocurement@perkinscoie.com		<input type="button" value="Add Email"/> <input type="button" value="Remove Email"/>

Application Information:

Title of the Invention	ASPIRATION THROMBECTOMY SYSTEM AND METHODS FOR THROMBUS REMOVAL WITH ASPIRATION CATHETER		
Attorney Docket Number	145404.8001.US15	Small Entity Status Claimed	☒
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	29	Suggested Figure for Publication (if any)	47

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	25096		

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	145404.8001.US15
		Application Number	
Title of Invention	ASPIRATION THROMBECTOMY SYSTEM AND METHODS FOR THROMBUS REMOVAL WITH ASPIRATION CATHETER		

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	Pending	Remove			
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)		
	Continuation of	18/346027	2023-06-30		
Prior Application Status	Pending	Remove			
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)		
	Continuation of	18/346044	2023-06-30		
Prior Application Status	Patented	Remove			
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
18/346027	Continuation of	16/899514	2020-06-11	12059161	2024-08-13
Prior Application Status	Patented	Remove			
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
18/346044	Continuation of	16/899514	2020-06-11	12059161	2024-08-13
Prior Application Status	Patented	Remove			
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
16/899514	Continuation of	16/681564	2019-11-12	10722253	2020-07-28
Prior Application Status	Patented	Remove			
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
16/681564	Continuation of	16/516232	2019-07-18	10531883	2020-01-14
Prior Application Status	Expired	Remove			
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)		
16/516232	Claims benefit of provisional	62/701086	2018-07-20		
Prior Application Status	Expired	Remove			
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)		
16/516232	Claims benefit of provisional	62/750011	2018-10-24		

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number		145404.8001.US15	
		Application Number			
Title of Invention		ASPIRATION THROMBECTOMY SYSTEM AND METHODS FOR THROMBUS REMOVAL WITH ASPIRATION CATHETER			

Prior Application Status		Expired		Remove	
Application Number		Continuity Type		Prior Application Number	
16/899514		Continuation of		PCT/US2019/042546	
Filing or 371(c) Date (YYYY-MM-DD)		2019-07-19			
Prior Application Status		Patented		Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
PCT/US2019/042546	Continuation of	16/516232	2019-07-19	10531883	2020-01-14
Prior Application Status		Expired		Remove	
Application Number		Continuity Type		Prior Application Number	
16516232		Claims benefit of provisional		62/701086	
Filing or 371(c) Date (YYYY-MM-DD)		2018-07-20			
Prior Application Status		Expired		Remove	
Application Number		Continuity Type		Prior Application Number	
16516232		Claims benefit of provisional		62/750011	
Filing or 371(c) Date (YYYY-MM-DD)		2018-10-24			
Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the Add button. Add					

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55. 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).

Remove			
Application Number	Country ⁱ	Filing Date (YYYY-MM-DD)	Access Code ⁱ (if applicable)
Additional Foreign Priority Data may be generated within this form by selecting the Add button. Add			

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

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

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	145404.8001.US15
		Application Number	
Title of Invention	ASPIRATION THROMBECTOMY SYSTEM AND METHODS FOR THROMBUS REMOVAL WITH ASPIRATION CATHETER		

☐	<p>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.</p> <p>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.</p>
--------------------------	---

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	145404.8001.US15
		Application Number	
Title of Invention	ASPIRATION THROMBECTOMY SYSTEM AND METHODS FOR THROMBUS REMOVAL WITH ASPIRATION CATHETER		

Authorization or Opt-Out of Authorization to Permit Access:

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

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

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

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

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

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

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

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

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

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

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

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

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	145404.8001.US15
	Application Number	
Title of Invention	ASPIRATION THROMBECTOMY SYSTEM AND METHODS FOR THROMBUS REMOVAL WITH ASPIRATION CATHETER	

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	RapidPulse, Inc.		
Mailing Address Information For Applicant:			
Address 1	13755 S.W. 119 Avenue		
Address 2			
City	Miami	State/Province	FL
Country	US	Postal Code	33186
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.

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

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	145404.8001.US15
		Application Number	
Title of Invention	ASPIRATION THROMBECTOMY SYSTEM AND METHODS FOR THROMBUS REMOVAL WITH ASPIRATION CATHETER		

Assignee 1

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

[Remove](#)

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

☐

Prefix	Given Name	Middle Name	Family Name	Suffix

Mailing Address Information For Assignee including Non-Applicant Assignee:

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

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

[Add](#)**Signature:**[Remove](#)

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

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

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

Signature	/Paul Parker/		Date (YYYY-MM-DD)	2024-11-13	
First Name	Paul	Last Name	Parker	Registration Number	38264

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

[Add](#)

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

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	145404.8001.US15
		Application Number	
Title of Invention	ASPIRATION THROMBECTOMY SYSTEM AND METHODS FOR THROMBUS REMOVAL WITH ASPIRATION CATHETER		

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

Privacy Act Statement

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

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

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

'402 Patent Family

Ref. No: RP-16

Patent App. No.: US 18/946,766

Filed: 2024 Nov. 13

Allowed: 2025 Aug. 26



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

25096 7590 08/26/2025
PERKINS COIE LLP - SEA General
PATENT-SEA
P.O. BOX 1247
SEATTLE, WA 98111-1247

EXAMINER

NGUYEN, TUAN VAN

ART UNIT

PAPER NUMBER

3771

DATE MAILED: 08/26/2025

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
18/946,766	11/13/2024	Derek Dee Deville	145404.8001.US17	9939

TITLE OF INVENTION: ASPIRATION THROMBECTOMY SYSTEM AND METHODS FOR THROMBUS REMOVAL WITH ASPIRATION CATHETER

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	\$516	\$0.00	\$0.00	\$516	11/26/2025

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 40% the amount of undiscounted fees, and micro entity fees are 20% the amount of undiscounted fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Maintenance fees are due in utility patents issuing on applications filed on or after Dec. 12, 1980. It is patentee's responsibility to ensure timely payment of maintenance fees when due. More information is available at www.uspto.gov/PatentMaintenanceFees.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via the USPTO patent electronic filing system.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

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CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

25096 7590 08/26/2025
PERKINS COIE LLP - SEA General
PATENT-SEA
P.O. BOX 1247
SEATTLE, WA 98111-1247

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via the USPTO patent electronic filing system or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
18/946,766	11/13/2024	Derek Dee Deville	145404.8001.US17	9939

TITLE OF INVENTION: ASPIRATION THROMBECTOMY SYSTEM AND METHODS FOR THROMBUS REMOVAL WITH ASPIRATION CATHETER

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	\$516	\$0.00	\$0.00	\$516	11/26/2025

EXAMINER	ART UNIT	CLASS-SUBCLASS
NGUYEN, TUAN VAN	3771	606-127000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

☐ Change of correspondence address (or Change of Correspondence Address form PTO/AIA/122 or PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/AIA/47 or PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,

(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 _____
2 _____
3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

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(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent): ☐ Individual ☐ Corporation or other private group entity ☐ Government

4a. Fees submitted: ☐ Issue Fee ☐ Publication Fee (if required)

4b. Method of Payment: (Please first reapply any previously paid fee shown above)

☐ Electronic Payment via the USPTO patent electronic filing system ☐ Enclosed check ☐ Non-electronic payment by credit card (Attach form PTO-2038)

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5. **Change in Entity Status** (from status indicated above)

☐ Applicant certifying micro entity status. See 37 CFR 1.29

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Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____



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25096	7590	08/26/2025	EXAMINER	
PERKINS COIE LLP - SEA General			NGUYEN, TUAN VAN	
PATENT-SEA				
P.O. BOX 1247			ART UNIT	PAPER NUMBER
SEATTLE, WA 98111-1247			3771	
DATE MAILED: 08/26/2025				

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Privacy Act Statement

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<https://www.govinfo.gov/content/pkg/FR-2013-03-29/pdf/2013-07341.pdf>

Routine uses of the information in this record may include disclosure to:

- 1) law enforcement, in the event that the system of records indicates a violation or potential violation of law;
- 2) a federal, state, local, or international agency, in response to its request;
- 3) a contractor of the USPTO having need for the information in order to perform a contract;
- 4) the Department of Justice for determination of whether the Freedom of Information Act (FOIA) requires disclosure of the record;
- 5) a Member of Congress submitting a request involving an individual to whom the record pertains, when the individual has requested the Member's assistance with respect to the subject matter of the record;
- 6) a court, magistrate, or administrative tribunal, in the course of presenting evidence, including disclosures to opposing counsel in the course of settlement negotiations;
- 7) the Administrator, General Services Administration (GSA), or their designee, during an inspection of records conducted by GSA under authority of 44 U.S.C. 2904 and 2906, in accordance with the GSA regulations and any other relevant (i.e., GSA or Commerce) directive, where such disclosure shall not be used to make determinations about individuals;
- 8) 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));
- 9) the Office of Personnel Management (OPM) for personnel research purposes; and
- 10) the Office of Management and Budget (OMB) for legislative coordination and clearance.

If you do not furnish the information requested on this form, the USPTO may not be able to process and/or examine your submission, which may result in termination of proceedings, abandonment of the application, and/or expiration of the patent.

Notice of Allowability	Application No. 18/946,766	Applicant(s) Deville et al.	
	Examiner TUAN V NGUYEN	Art Unit 3771	AIA (First Inventor to File) Status Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to the Request for Continued Examination filed May 2, 2025.
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

3. ☒ The allowed claim(s) is/are 1-19. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
Certified copies:
a) ☐ All b) ☐ Some* c) ☐ None of the:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).
* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)	5. ☒ Examiner's Amendment/Comment
2. ☒ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____.	6. ☒ Examiner's Statement of Reasons for Allowance
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____.	7. ☐ Other _____.
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date. _____.	

/TUAN V NGUYEN/ Primary Examiner, Art Unit 3771	
--	--

Notice of Pre-AIA or AIA Status

The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after allowance or after an Office action under *Ex Parte Quayle*, 25 USPQ 74, 453 O.G. 213 (Comm'r Pat. 1935). Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, prosecution in this application has been reopened pursuant to 37 CFR 1.114. Applicant's submission filed on May 2, 2025 has been entered.

Information Disclosure Statement

The information disclosure statements (IDS) submitted on May 2, 2025 are being considered by the examiner.

Allowable Subject Matter

Claims 1-19 allowed.

Please see Notice of Allowance issued on March 11, 2025 for examiner's statement of reasons for allowance.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to TUAN V NGUYEN whose telephone number is (571)272-5962. The examiner can normally be reached Monday - Friday 8:30 AM - 5:30 PM.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at <http://www.uspto.gov/interviewpractice>.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jackie Ho can be reached at 571-272-4696. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of published or unpublished applications may be obtained from Patent Center. Unpublished application information in Patent Center is available to registered users. To file and manage patent submissions in Patent Center, visit: <https://patentcenter.uspto.gov>. Visit <https://www.uspto.gov/patents/apply/patent-center> for more information about Patent Center and <https://www.uspto.gov/patents/docx> for information about filing in DOCX format. For additional questions, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/TUAN V NGUYEN/

Primary Examiner, Art Unit 3771



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NOTICE OF ALLOWANCE AND FEE(S) DUE

25096 7590 03/11/2025
PERKINS COIE LLP - SEA General
PATENT-SEA
P.O. BOX 1247
SEATTLE, WA 98111-1247

EXAMINER

NGUYEN, TUAN VAN

ART UNIT

PAPER NUMBER

3771

DATE MAILED: 03/11/2025

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
18/946,766	11/13/2024	Derek Dee Deville	145404.8001.US17	9939

TITLE OF INVENTION: ASPIRATION THROMBECTOMY SYSTEM AND METHODS FOR THROMBUS REMOVAL WITH ASPIRATION CATHETER

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	\$516	\$0.00	\$0.00	\$516	06/11/2025

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 40% the amount of undiscounted fees, and micro entity fees are 20% the amount of undiscounted fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Maintenance fees are due in utility patents issuing on applications filed on or after Dec. 12, 1980. It is patentee's responsibility to ensure timely payment of maintenance fees when due. More information is available at www.uspto.gov/PatentMaintenanceFees.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via the USPTO patent electronic filing system.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

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<https://www.govinfo.gov/content/pkg/FR-2013-03-29/pdf/2013-07341.pdf>

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- 8) 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));
- 9) the Office of Personnel Management (OPM) for personnel research purposes; and
- 10) the Office of Management and Budget (OMB) for legislative coordination and clearance.

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Notice of Allowability	Application No. 18/946,766	Applicant(s) Deville et al.	
	Examiner TUAN V NGUYEN	Art Unit 3771	AIA (FITF) Status Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to the Decision Granting for Prioritized Examination issued on February 13, 2025.
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

3. ☒ The allowed claim(s) is/are 1-19 . As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
Certified copies:
a) ☐ All b) ☐ Some* c) ☐ None of the:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).
* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)	5. ☐ Examiner's Amendment/Comment
2. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____.	6. ☒ Examiner's Statement of Reasons for Allowance
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____.	7. ☐ Other _____.
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date. _____.	

/TUAN V NGUYEN/ Primary Examiner, Art Unit 3771	
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Notice of Pre-AIA or AIA Status

The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

Allowable Subject Matter

Claims 1-19 allowed.

Teigen et al. (US 11,096,712, hereinafter "Teigen"), which is best prior art, discloses a thrombectomy aspiration system (claim 1 of Teigen), comprising: a vacuum source (claim 1 of Teigen); a vacuum valve fluidically coupled to the vacuum source (claim 1 of Teigen); a vent valve configured to be fluidically coupled to a vent fluid source (claim 1 of Teigen); an aspiration catheter having a proximal end fluidically coupled the vacuum valve and the vent valve (claim 1 of Teigen); and a controller (claim 1 of Teigen) configured to open and close the vacuum valve and the vent valve in a predetermined sequence to change a level of vacuum at the distal end of the aspiration catheter (claim 1 of Teigen).

As to claim 1, prior art of record alone or in combination did not teach the limitations of wherein timing of opening and closing the vacuum valve and the vent valve in the sequence is set, at least in part, based on (a) a time to cause an exit volume of fluid to flow out of the distal end of the catheter because of one pressure wave resulting from closing the vacuum valve and/or another pressure wave resulting from subsequently opening the vent valve, and (b) a time at which the vacuum valve is reopened to control the exit volume of fluid such that reapplication of vacuum draws at least a portion of a thrombus toward the distal end of the aspiration catheter.

As to claim 10, prior art of record alone or in combination did not teach the limitations of the timing of opening and closing the vacuum valve and the vent valve in the sequence is tuned, at least in part, such that (a) an exit volume of fluid flows out of the distal end of the catheter and thereby imparts distal movement to a thrombus because of one pressure wave resulting from closing the vacuum valve and/or another pressure wave resulting from expansion of the aspiration catheter as the vent valve opens, and (b) the time at which the vacuum valve reopens controls the exit volume of fluid such that reapplication of vacuum draws at least a portion of the thrombus toward the distal end of the aspiration catheter.

As to claim 12, prior art of record alone or in combination did not teach the limitations of the timing of opening and closing the vacuum valve and the vent valve in the sequence is set such that (a) an exit volume of fluid flows out of the distal end of the catheter because of one pressure wave resulting from closing the vacuum valve and/or another pressure wave resulting from subsequently opening the vent valve, and (b) the time at which the vacuum valve reopens controls the exit volume of fluid such that reapplication of vacuum draws at least a portion of the thrombus toward the distal end of the aspiration catheter.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to TUAN V NGUYEN whose telephone number is (571)272-5962. The examiner can normally be reached Monday - Friday 8:30 AM - 5:30 PM.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at <http://www.uspto.gov/interviewpractice>.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jackie Ho can be reached on 571-272-4696. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of published or unpublished applications may be obtained from Patent Center. Unpublished application information in Patent Center is available to registered users. To file and manage patent submissions in Patent Center, visit: <https://patentcenter.uspto.gov>. Visit <https://www.uspto.gov/patents/apply/patent-center> for more information about Patent Center and <https://www.uspto.gov/patents/docx> for information about filing in DOCX format. For additional questions, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/TUAN V NGUYEN/
Primary Examiner, Art Unit 3771

CLAIMS

I/We claim:

1. A thrombectomy aspiration system, comprising:
a vacuum source;
a vacuum valve fluidically coupled to the vacuum source;
a vent valve configured to be fluidically coupled to a vent fluid source;
an aspiration catheter having a proximal end fluidically coupled the vacuum valve and the vent valve; and
a controller configured to open and close the vacuum valve and the vent valve in a predetermined sequence to change a level of vacuum at the distal end of the aspiration catheter, wherein timing of opening and closing the vacuum valve and the vent valve in the sequence is set, at least in part, based on (a) a time to cause an exit volume of fluid to flow out of the distal end of the catheter because of one pressure wave resulting from closing the vacuum valve and/or another pressure wave resulting from subsequently opening the vent valve, and (b) a time at which the vacuum valve is reopened to control the exit volume of fluid such that reapplication of vacuum draws at least a portion of a thrombus toward the distal end of the aspiration catheter.
2. The thrombectomy aspiration system of claim 1 wherein the vacuum valve and the vent valve are in a housing located close to the proximal end of the aspiration catheter, and wherein the vacuum source is outside of and separated from the housing.
3. The thrombectomy system of claim 1 wherein the controlled exit volume of fluid that flows out of the distal end of the catheter each cycle is approximately 0.1 ml to approximately 0.5 ml.

4 The thrombectomy aspiration system of claim 1 wherein the controlled exit volume of fluid that flows out of the distal end of the catheter each cycle is approximately 0.001 ml to approximately 1.0 ml.

5. The thrombectomy aspiration system of claim 1 wherein:
the vacuum valve comprises a first solenoid-driven pinch valve and the vent valve comprises a second solenoid-driven pinch valve; and
the timing of reopening the vacuum valve is set such that a distal shift of the fluid column caused by pinching the vacuum line closed is reversed before the distal shift of the fluid column caused by pinching the vacuum line moves the thrombus downstream through a blood vessel to the extent that reapplying vacuum is unable to draw at least a portion of the thrombus into the distal end of the catheter.

6. The thrombectomy aspiration system of claim 1 wherein the controller is configured to open and close the vacuum valve and the vent valve in a predetermined sequence in which:

- (a) the vacuum valve closes while the vent valve is closed;
- (b) the vent valve opens after the vacuum valve has closed;
- (c) the vent valve closes while the vacuum valve is closed;
- (d) the vacuum valve reopens to reapply vacuum; and

wherein the timing of acts (a)-(d) of the sequence are set such that (a) the one pressure wave resulting from closing the vacuum valve and the other pressure wave resulting from opening the vent valve impart a small distal movement to the thrombus and (b) the time at which the vacuum valve reopens controls the exit volume of fluid such that reapplication of vacuum macerates at least a portion of the thrombus at the distal end of the aspiration catheter.

7. The thrombectomy aspiration system of claim 6 wherein the timing of acts (a)-(d) of the sequence are set such that the controlled exit flow out of the distal end of the

catheter is reversed before the pressure pulses move the thrombus downstream through a neurovascular vessel.

8. The thrombectomy aspiration system of claim 7 wherein the controlled exit volume of fluid that flows out of the distal end of the catheter each cycle is approximately 0.001 ml to approximately 1.0 ml.

9. The thrombectomy aspiration system of claim 7 wherein the controlled exit volume of fluid that flows out of the distal end of the catheter each cycle is approximately 0.1 ml to approximately 0.5 ml.

10. A thrombectomy aspiration system, comprising:

a vacuum source;

a vacuum valve fluidically coupled to the vacuum source;

a vent valve configured to be fluidically coupled to a vent fluid source;

an aspiration catheter having a proximal end fluidically coupled the vacuum valve and the vent valve; and

a controller configured to open and close the vacuum valve and the vent valve in a predetermined sequence to change a level of vacuum at the distal end of the aspiration catheter, wherein the timing of opening and closing the vacuum valve and the vent valve in the sequence is tuned, at least in part, such that (a) an exit volume of fluid flows out of the distal end of the catheter and thereby imparts distal movement to a thrombus because of one pressure wave resulting from closing the vacuum valve and/or another pressure wave resulting from expansion of the aspiration catheter as the vent valve opens, and (b) the time at which the vacuum valve reopens controls the exit volume of fluid such that reapplication of vacuum draws at least a portion of the thrombus toward the distal end of the aspiration catheter.

11. The thrombectomy aspiration system of claim 10 wherein the controller is configured to open and close the vacuum valve and the vent valve in a predetermined sequence in which:

- (a) the vacuum valve closes while the vent valve is closed;
- (b) the vent valve opens after the vacuum valve has closed;
- (c) the vent valve closes while the vacuum valve is closed;
- (d) the vacuum valve reopens to reapply vacuum; and

wherein reopening the vacuum valve to apply the vacuum reverses the one pressure wave resulting from closing the vacuum valve and/or the other pressure wave resulting from expansion of the catheter as the vent valve opens to thereby macerate the thrombus at the distal end of the catheter.

12. A method of aspirating a thrombus from a blood vessel, comprising:
attaching a proximal end of an aspiration catheter to a valve system having a vacuum valve and a vent valve;
fluidically coupling a vacuum source to the vacuum valve;
fluidically coupling a vent fluid to the vent valve;
inserting a distal end of the aspiration catheter into a blood vessel such that the distal end of the catheter is proximate a thrombus; and
controlling opening and closing the vacuum valve and the vent valve in a predetermined sequence to impart a controlled amount of exit flow out from the distal end of the catheter, wherein the timing of opening and closing the vacuum valve and the vent valve in the sequence is set such that (a) an exit volume of fluid flows out of the distal end of the catheter because of one pressure wave resulting from closing the vacuum valve and/or another pressure wave resulting from subsequently opening the vent valve, and (b) the time at which the vacuum valve reopens controls the exit volume of fluid such that reapplication of vacuum draws at least a portion of the thrombus toward the distal end of the aspiration catheter.

13. The method of claim 12 wherein the controlled volume of fluid that flows out of the distal end of the catheter each cycle is approximately 0.1 ml to approximately 0.5 ml.

14. The method of claim 12 wherein the controlled volume of fluid that flows out of the distal end of the catheter each cycle is approximately 0.001 ml to approximately 1.0 ml.

15. The thrombectomy aspiration system of claim 12 wherein:
the vacuum valve comprises a first solenoid-driven pinch valve and the vent valve comprises a second solenoid-driven pinch valve; and
the timing of reopening the vacuum valve is set such that a distal shift of the fluid column caused by pinching the vacuum line closed is reversed before the distal shift of the fluid column caused by pinching the vacuum line moves the thrombus downstream through a blood vessel to the extent that reapplying vacuum is unable to draw at least a portion of the thrombus into the distal end of the catheter.

16. The method of claim 12 wherein controlling opening and closing the vacuum valve and the vent valve in a predetermined sequence comprises:

- (a) closing the vacuum valve while the vent valve is closed;
- (b) opening the vent valve after the vacuum valve has closed;
- (c) closing the vent valve while the vacuum valve is closed;
- (d) reopening the vacuum to reapply vacuum; and

wherein the timing of acts (a)-(d) of the sequence are set such (a) the one pressure wave resulting from closing the vacuum valve and/or the other pressure wave resulting from opening the vent valve impart a small distal movement to the thrombus and (b) the time at which the vacuum valve reopens controls the exit volume of fluid such that reapplication of vacuum macerates at least a portion of the thrombus at the distal end of the aspiration catheter.

17. The method of claim 15 wherein the flow out from the distal end of the aspiration catheter is from approximately 0.001 ml to approximately 1.0 ml before reapplying the vacuum draws fluid back into the aspiration catheter.

18. The thrombectomy aspiration system of claim 12 wherein controlling opening and closing the vacuum valve and the vent valve in a predetermined sequence comprises:

- (a) closing the vacuum valve while the vent valve is closed;
- (b) opening the vent valve after the vacuum valve has closed;
- (c) closing the vent valve while the vacuum valve is closed;
- (d) reopening the vacuum to reapply vacuum; and

wherein reopening the vacuum valve to apply the vacuum reverses the one pressure wave resulting from closing the vacuum valve and/or the other pressure wave resulting from expansion of the catheter as the vent valve opens to thereby macerate the thrombus at the distal end of the catheter.

19. The method of claim 12 wherein inserting a distal end of the catheter into a blood vessel comprises inserting the distal end of the catheter into a neurovascular blood vessel to treat ischemic stroke.

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	145404.8001.US17
		Application Number	
Title of Invention	ASPIRATION THROMBECTOMY SYSTEM AND METHODS FOR THROMBUS REMOVAL WITH ASPIRATION CATHETER		
The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76. This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.			

Secrecy Order 37 CFR 5.2:

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

Inventor Information:

Inventor 1					Remove
Legal Name					
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Application Data Sheet 37 CFR 1.76		Attorney Docket Number		145404.8001.US17	
		Application Number			
Title of Invention		ASPIRATION THROMBECTOMY SYSTEM AND METHODS FOR THROMBUS REMOVAL WITH ASPIRATION CATHETER			
City	Miami	State/Province	FL	Country of Residence ⁱ	US
Mailing Address of Inventor:					
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City	Boca Raton	State/Province	FL	Country of Residence ⁱ	US

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	145404.8001.US17
		Application Number	
Title of Invention	ASPIRATION THROMBECTOMY SYSTEM AND METHODS FOR THROMBUS REMOVAL WITH ASPIRATION CATHETER		

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Mailing Address of Inventor:				
Address 1		c/o RapidPulse, Inc.		
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All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the Add button. Add				

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below. For further information see 37 CFR 1.33(a).	
☐ An Address is being provided for the correspondence information of this application.	
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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	145404.8001.US17
		Application Number	
Title of Invention	ASPIRATION THROMBECTOMY SYSTEM AND METHODS FOR THROMBUS REMOVAL WITH ASPIRATION CATHETER		
Email Address	patentprocurement@perkinscoie.com		<input type="button" value="Add Email"/> <input type="button" value="Remove Email"/>

Application Information:

Title of the Invention	ASPIRATION THROMBECTOMY SYSTEM AND METHODS FOR THROMBUS REMOVAL WITH ASPIRATION CATHETER		
Attorney Docket Number	145404.8001.US17	Small Entity Status Claimed	☒
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	29	Suggested Figure for Publication (if any)	47

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)
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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	145404.8001.US17
		Application Number	
Title of Invention	ASPIRATION THROMBECTOMY SYSTEM AND METHODS FOR THROMBUS REMOVAL WITH ASPIRATION CATHETER		

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	Pending		Remove		
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)		
	Continuation of	18/346027	2023-06-30		
Prior Application Status	Pending		Remove		
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)		
	Continuation of	18/346044	2023-06-30		
Prior Application Status	Patented		Remove		
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
18/346027	Continuation of	16/899514	2020-06-11	12059161	2024-08-13
Prior Application Status	Patented		Remove		
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
18/346044	Continuation of	16/899514	2020-06-11	12059161	2024-08-13
Prior Application Status	Patented		Remove		
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
16/899514	Continuation of	16/681564	2019-11-12	10722253	2020-07-28
Prior Application Status	Patented		Remove		
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
16/681564	Continuation of	16/516232	2019-07-18	10531883	2020-01-14
Prior Application Status	Expired		Remove		
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)		
16/516232	Claims benefit of provisional	62/701086	2018-07-20		
Prior Application Status	Expired		Remove		
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)		
16/516232	Claims benefit of provisional	62/750011	2018-10-24		

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number		145404.8001.US17	
		Application Number			
Title of Invention		ASPIRATION THROMBECTOMY SYSTEM AND METHODS FOR THROMBUS REMOVAL WITH ASPIRATION CATHETER			

Prior Application Status		Expired		Remove	
Application Number		Continuity Type		Prior Application Number	
16/899514		Continuation of		PCT/US2019/042546	
Prior Application Status		Patented		Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
PCT/US2019/042546	Continuation of	16/516232	2019-07-19	10531883	2020-01-14
Prior Application Status		Expired		Remove	
Application Number		Continuity Type		Prior Application Number	
16516232		Claims benefit of provisional		62/701086	
Prior Application Status		Expired		Remove	
Application Number		Continuity Type		Prior Application Number	
16516232		Claims benefit of provisional		62/750011	
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Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	145404.8001.US17
		Application Number	
Title of Invention	ASPIRATION THROMBECTOMY SYSTEM AND METHODS FOR THROMBUS REMOVAL WITH ASPIRATION CATHETER		

☐	<p>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.</p> <p>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.</p>
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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	145404.8001.US17
		Application Number	
Title of Invention	ASPIRATION THROMBECTOMY SYSTEM AND METHODS FOR THROMBUS REMOVAL WITH ASPIRATION CATHETER		

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).

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	145404.8001.US17
		Application Number	
Title of Invention	ASPIRATION THROMBECTOMY SYSTEM AND METHODS FOR THROMBUS REMOVAL WITH ASPIRATION CATHETER		

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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.								
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Mailing Address Information For Applicant:								
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Address 2								
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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	145404.8001.US17
		Application Number	
Title of Invention	ASPIRATION THROMBECTOMY SYSTEM AND METHODS FOR THROMBUS REMOVAL WITH ASPIRATION CATHETER		

Assignee 1

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	145404.8001.US17
		Application Number	
Title of Invention	ASPIRATION THROMBECTOMY SYSTEM AND METHODS FOR THROMBUS REMOVAL WITH ASPIRATION CATHETER		

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'402 Patent Family

Ref. No: RP-EP1

Patent No.: EP 3,823,686

Filed: 2019 Jul. 19

Issued: 2024 Oct. 30



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- (51) International Patent Classification (IPC):
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WO 2020/018880 (23.01.2020 Gazette 2020/04)

(54) **ASPIRATION THROMBECTOMY SYSTEM FOR THROMBUS REMOVAL WITH ASPIRATION CATHETER**

ASPIRATIONSTHROMBEKTOMIE-SYSTEM ZUR THROMBUSENTNAHMEN MIT ASPIRATIONSKATHETER

SYSTÈME DE THROMBECTOMIE PAR ASPIRATION D'ÉLIMINATION DE THROMBUS AU MOYEN D'UN CATHÉTER D'ASPIRATION

- | | |
|---|--|
| <p>(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR</p> <p>(30) Priority: 20.07.2018 US 201862701086 P
24.10.2018 US 201862750011 P
18.07.2019 US 201916516232</p> <p>(43) Date of publication of application:
26.05.2021 Bulletin 2021/21</p> <p>(60) Divisional application:
24202175.6</p> <p>(73) Proprietor: RapidPulse, Inc.
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WO-A1-2018/019829 US-A1- 2015 342 682
US-A1- 2016 220 741 US-A1- 2016 220 741
US-A1- 2017 181 760</p> |
|---|--|

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are equally applicable to similar features or not a reference numeral is used or another reference numeral is omitted.

[0183] The foregoing description and accompanying drawings illustrate the principles, exemplary embodiments, and modes of operation of the systems and apparatuses. However, the systems and apparatuses should not be construed as being limited to the particular embodiments discussed above. Additional variations of the embodiments discussed above will be appreciated by those skilled in the art and the above-described embodiments should be regarded as illustrative rather than restrictive. Accordingly, it should be appreciated that variations to those embodiments can be made by those skilled in the art without departing from the scope of the invention as defined by the following claims.

Claims

1. A clot removal system, comprising:

a catheter (410) having a distal end and defining a lumen filled with a liquid column having a proximal portion and a distal portion;
 a controllable vacuum valve;
 a vacuum source (80) fluidically connected to the vacuum valve (420);
 a controllable vent valve (440) having a vent liquid input; a vent fluid source containing a vent liquid and fluidically connected to the vent valve (440) to retain the vent liquid at the vent fluid input;

characterised in that the clot removal system further comprises
 a manifold connected to the catheter (410), to the vacuum valve (420), and to the vent valve (440), the manifold fluidically connecting the proximal portion of the liquid column in the lumen:

to the vacuum source (80) through the vacuum valve (420); and
 to the vent fluid source through the vent valve (440);

a controller (560) connected to the vacuum valve (420) and the vent valve (440) and configured to selectively open and close the vacuum valve (420) and the vent valve (440) such that:

responsive to opening the vacuum valve (420), the vacuum source (80) is fluidically connected to the liquid column in the lumen; and
 responsive to opening the vent valve (440), the vent fluid source is fluidically connected to the liquid column in the lumen,

the controller (560) configured to cyclically open and close the vacuum valve (420) and the vent valve (440) to:

change a level of vacuum at the distal end; and
 prevent forward flow of the distal portion out from the distal end during each cycle.

2. The system according to claim 1, wherein the controller (560) is configured to cyclically open and close the vacuum valve (420) and the vent valve (440) in a repeated cycle comprising a double-closed state in which the vacuum valve (420) is closed and the vent valve (440) is closed.

3. The system according to claim 2, wherein a time of the double-closed state is no greater than 30 ms

4. The system according to claim 1, wherein the controller (560) is configured to cyclically open and close the vacuum valve (420) and the vent valve (440) in a repeated cycle comprising a vent-only state in which the vacuum valve (420) is closed and the vent valve (440) is open.

5. The system according to claim 4, wherein a time of the vent-only state is no greater than 50 ms.

6. The system according to claim 1, wherein the controller (560) is configured to selectively open and close the vacuum valve (420) and the vent valve cycle in a repeated cycle comprising:

a vacuum-only state in which the vacuum valve (420) is open and the vent valve (440) is closed;
 a first double-closed state in which the vacuum valve (420) is closed and the vent valve (440) is closed;
 a vent-only state in which the vacuum valve (420) is closed and the vent valve (440) is open; and
 a second double-closed state in which the vacuum valve (420) is closed and the vent valve (440) is closed.

7. The system according to claim 6, wherein a time between an opening of the vent valve (440) and a closing of the vent valve (440) is between approximately 10 ms and approximately 50 ms.
8. The system according to claim 6, wherein a period of the cycle is:
between approximately 6 Hz and approximately 16 Hz; or
between approximately 8 Hz and 12 Hz.
9. The system according to claim 1, wherein the change in the level of vacuum at the distal end is:
greater than approximately 51 kPa (15 inHg) in no greater than approximately 50 ms; or
greater than approximately 68 kPa (20 inHg) and no greater than approximately 30 ms; or
greater than approximately 85 kPa (25 inHg) and no greater than approximately 20 ms.
10. The system according to claim 1, wherein:
the lumen has an internal diameter of between approximately 0.965 mm (0.038") and approximately 2.692 mm (0.106"); and
the controller (560) is configured to cyclically open and close the vacuum valve (420) and the vent valve (440) at a frequency of between 2 and 16 Hz.
11. The system according to claim 1, wherein:
the lumen has an internal diameter of between approximately 1.73 mm (0.068") and approximately 2.24 mm (0.088"); and
the controller (560) is configured to cyclically open and close the vacuum valve (420) and the vent valve (440) at a frequency of between 2 and 16 Hz.
12. The system according to claim 1, wherein the controller (560) is configured to cyclically open and close the vacuum valve (420) and the vent valve (440) in a repeated cycle and prevent forward flow of the distal portion out from the distal end during each cycle by regulating timing of the vent valve (440).
13. The system according to claim 1, wherein the controller (560) is configured to cyclically open and close the vacuum valve (420) and the vent valve (440) to retain a level of pressure at the distal end at less than physiological pressure.
14. The system according to claim 1, which further comprises a shaft and the vacuum valve (420) and the vent valve (440) are mounted together on the shaft.

Patentansprüche

1. System zur Entfernung von Gerinnseln, umfassend:

einen Katheter (410), der ein distales Ende aufweist und ein Lumen definiert,
das mit einer Flüssigkeitssäule gefüllt ist, aufweisend einen proximalen Bereich und einen distalen Bereich;
ein steuerbares Vakuumventil;
eine Vakuumquelle (80), die fluidisch mit dem Vakuumventil (420) verbunden ist,
ein steuerbares Entlüftungsventil (440), das einen Entlüftungsflüssigkeitseingang aufweist;
eine Entlüftungsfluidquelle, die eine Entlüftungsflüssigkeit enthält und fluidisch mit dem Entlüftungsventil (440) verbunden ist, um die Entlüftungsflüssigkeit an dem Entlüftungsfluideingang zurückzuhalten;
dadurch gekennzeichnet, dass das System zur Entfernung von Gerinnseln ferner umfasst
einen Verteiler, der mit dem Katheter (410), dem Vakuumventil (420), und dem Entlüftungsventil (440) verbunden ist, wobei der Verteiler den proximalen Bereich der Flüssigkeitssäule in dem Lumen fluidisch verbindet mit:

der Vakuumquelle (80) durch das Vakuumventil (420); und
der Entlüftungsfluidquelle durch das Entlüftungsventil (440);

eine Steuerung (560), die mit dem Vakuumventil (420) und dem Entlüftungsventil (440) verbunden ist und so