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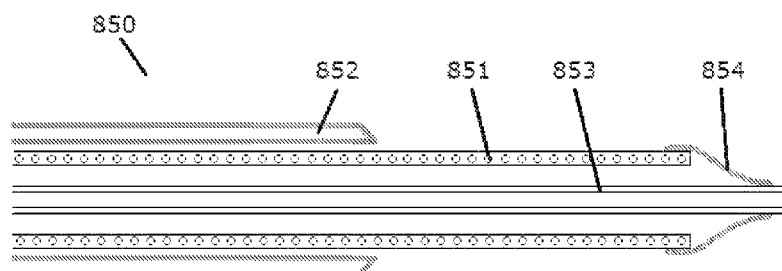


FIG 85A

(57) Abstract: Clot aspiration systems intended for removing clot from a blood vessel include an aspiration assembly which will have two or more of the following components: an aspiration catheter, an inner catheter, an intermediate catheter, and an outer catheter, the latter typically being a guiding or other sheath. A transition structure is coupled to a distal end of the aspiration assembly to cover or fill an open distal end of one or more of the components of the aspiration assembly. The transition structure may be configured to facilitate introduction of the aspiration catheter into the patient's vasculature and/or advancement of the aspiration catheter through the vasculature to a target site, such as a cerebral target site which may be occluded with clot, thrombus, or other occlusive material.



INTERNATIONAL SEARCH REPORT

International application No.

PCT/US21/42398

A. CLASSIFICATION OF SUBJECT MATTER

IPC - A61B 17/22 (2021.01)

CPC - A61B 17/22; A61B 2217/005; A61B 2017/22079

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

See Search History document

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

See Search History document

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

See Search History document

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- A	US 4,324,262 A (HALL, JE) 13 April 1982; figure 1; column 2, lines 24-25; column 4, lines 45-50; column 6, lines 29-33	1-6 --- 53-56
A	US 2014/0249569 A1 (COVIDIEN LP) 04 September 2014; figure 1A; paragraph [0054]	1-6, 53-56
A	US 2011/0092892 A1 (NITSAN, D et. al) 21 April 2011; figures 34C-E; paragraph [0222]	1-6, 53-56
A	US 2016/0367285 A1 (SQS, TA) 22 December 2016; figures 5A-5D	1-6, 53-56
A	US 2018/0104041 A1 (HAUSER, DL) 19 April 2018; entire document	1-6, 53-56
A	WO 2015/196156 A1 (BOSTON SCIENTIFIC LIMITED) 23 December 2015; entire document	1-6, 53-56
A	US 2017/0105743 A1 (NEURAVI LIMITED) 20 April 2017; entire document	1-6, 53-56
X, E	CN 214342506 U (SHANGHAI RONGMAI MEDICAL TECHNOLOGY CO LTD) 08 October 2021; entire document	1, 53-55

☐ Further documents are listed in the continuation of Box C.☐ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"D" document cited by the applicant in the international application

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US21/42398

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☒ Claims Nos.: Regarding claims 76-239, see Form ISA/224 mailed on 09 August 2021 (09.08.2021). PCT Article 6 states that it because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☒ Claims Nos.: 7-52, 57-67, 72-75, and 76-239
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:
-***-Please See Supplemental Page-***-

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:
Group I: Claims 1-6 and 53-56

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US21/42398

Continued From Box No. III: Observations where unity of invention is lacking

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fee must be paid.

Group I: Claims 1-6 and 53-56 are directed towards a clot aspiration system for aspirating clot from a blood vessel, said clot aspiration system comprising: wherein the inner catheter is slidably received in the aspiration lumen of the aspiration catheter; and a transition structure coupled to a distal segment of the inner catheter wherein the transition structure covers or fills the open distal end of the aspiration catheter when the distal end of the inner catheter is positioned at or near the distal end of the aspiration catheter.

Group II: Claims 68-71 are directed towards a method for aspirating clot from a patient's blood vessel, said method comprising: applying a negative pressure through the aspiration lumen to draw clot through the open end into said lumen.

The inventions listed as Groups I-II do not relate to a single inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features.

The special technical features of Group I are at least a system wherein an inner catheter is slidably received in the aspiration lumen of the aspiration catheter; and a transition structure coupled to a distal segment of the inner catheter wherein the transition structure covers or fills the open distal end of the aspiration catheter when the distal end of the inner catheter is positioned at or near the distal end of the aspiration catheter, which are not present in Group II.

The special technical features of Group II are at least a method for advancing a distal end of the aspiration assembly into the blood vessel over a guide wire passing through the guide wire lumen of the inner catheter, wherein a transition structure covers, fills, partially covers, partially fills, and/or abuts the open distal end of the aspiration assembly; retracting the transition structure; positioning the open end of the aspiration catheter near the clot; applying a negative pressure through the aspiration lumen to draw clot through the open end into said lumen, which are not present in Group I.

The common technical features of Groups I and II are a clot aspiration system for aspirating clot from a blood vessel, said clot aspiration system comprising: an aspiration assembly having a proximal end and a distal end and including at least an aspiration catheter having a proximal end, an open distal end, and an aspiration lumen therebetween; an inner catheter having a proximal end, a distal end, and a guide wire lumen therebetween; a transition structure; wherein the transition structure covers or fills the open distal end of the aspiration catheter, which are previously disclosed by US 2017/0105743 A1 to NEURAVI LIMITED (hereinafter "NEURAVI"). NEURAVI discloses a clot aspiration system for aspirating clot from a blood vessel (a clot receptor device 2 for aspirating clots from blood vessels; paragraph [0187]), said clot aspiration system comprising: an aspiration assembly having a proximal end and a distal end and including at least an aspiration catheter having a proximal end, an open distal end, and an aspiration lumen therebetween (13, 4, and 7 make up an assembly which includes a catheter 7 (aspiration catheter) having a proximal and distal end, and lumen therebetween; paragraph [0187]); an inner catheter having a proximal end, a distal end, and a guide wire lumen therebetween (microcatheter 12 having a proximal end and distal end, and a guidewire 17; paragraph [0189]); a transition structure, wherein the transition structure covers or fills the open distal end of the aspiration catheter (sheath 11 covers the open distal end of the catheter 7; figure 1).

Since the common technical features are previously disclosed by NEURAVI, these common features are not special and so Groups I-II lack unity.