Trials@uspto.gov
Tel: 571-272-7822

Paper 7
Entered: September 9, 2022

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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PENUMBRA, INC.,
Petitioner,

v.

RAPIDPULSE, INC.,
Patent Owner.

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IPR2022-00608
Patent 10,722,253 B1

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Before CHRISTOPHER G. PAULRAJ, JASON W. MELVIN, and JAMIE T. WISZ, *Administrative Patent Judges.*

WISZ, *Administrative Patent Judge*.

# DECISION
Granting Institution of *Inter Partes* Review
*35 U.S.C. § 314*

## I. INTRODUCTION

Penumbra, Inc. ("Petitioner") filed a Petition (Paper 2, "Pet.") requesting an *inter partes* review of claims 1–21 of U.S. Patent No. 10,722,253 B1 (Ex. 1001, "the '253 patent"). RapidPulse, Inc. ("Patent Owner") filed a Preliminary Response (Paper 6, "Prelim. Resp.").

We have authority to determine whether to institute an *inter partes* review under 35 U.S.C. § 314, which provides that an *inter partes* review may be instituted only upon a showing that "there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition." 35 U.S.C. § 314(a). After considering the Petition, the Preliminary Response, and the evidence of record, we determine that Petitioner has demonstrated a reasonable likelihood of prevailing with respect to at least one claim challenged in the Petition. Accordingly, we institute an *inter partes* review of all challenged claims of the '253 patent, based on all of the grounds identified in the Petition. *See SAS Inst., Inc. v. Iancu*, 138 S. Ct. 1348, 1359–60 (2018); *PGS Geophysical AS v. Iancu*, 891 F.3d 1354, 1360 (Fed. Cir. 2018) (interpreting the statute to require "a simple yes-or-no institution choice respecting a petition, embracing all challenges included in the petition").

The following findings of fact and conclusions of law are not final, but are made for the sole purpose of determining whether Petitioner meets the threshold for initiating review. Any final decision shall be based on the full trial record, including any response timely filed by Patent Owner. Any arguments not raised by Patent Owner in a timely-filed Response may be deemed waived, even if they were presented in the Preliminary Response.

*A. Real Parties-in-Interest*

Petitioner identifies Penumbra, Inc. as the real party-in-interest. Pet. 1. Patent Owner identifies RapidPulse, Inc. as the real party-in-interest. Paper 3, 1.

*B. Related Matters*

The parties note that the '253 patent is a continuation of U.S. Patent No. 10,531,883, which is the subject of pending IPR proceeding: IPR2021-01466. Pet. 1; Paper 3, 1. Patent Owner also identifies pending U.S. Patent Application Nos. 16/899,514, 17/585,451, and 17/585,457, which all claim priority to the '253 patent. Paper 3, 1.

*C. The '253 Patent*

The '253 patent, titled "Aspiration Thrombectomy System and Methods for Thrombus Removal with Aspiration Catheter," is directed to an aspiration thrombectomy system that may be used for treatment of ischemic strokes caused by a blood clot that blocks or plugs a blood vessel in the brain. Ex 1001, code (54), 1:40–3:9. We reproduce Figure 47 from the '253 patent below.

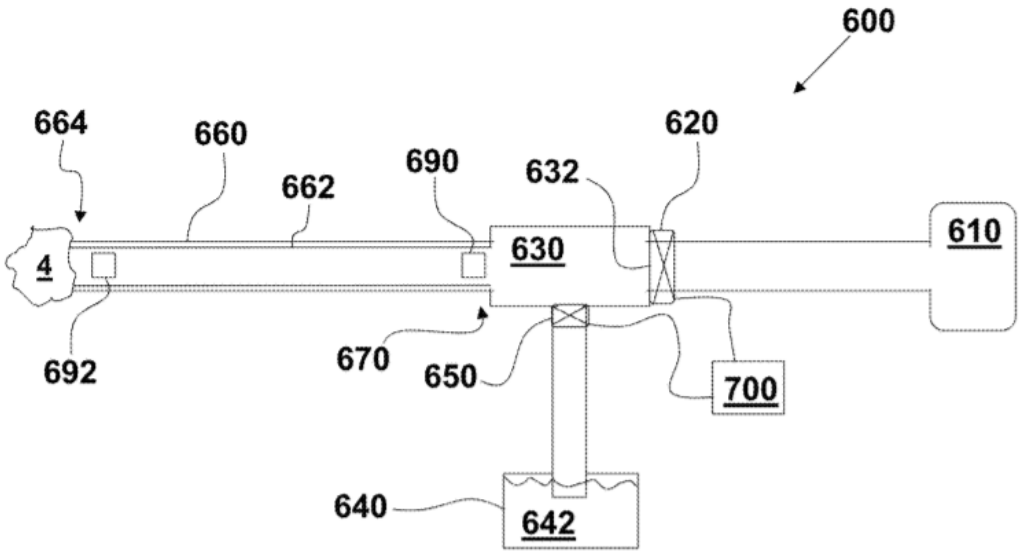



FIG. 47

Figure 47 illustrates an embodiment of the aspiration thrombectomy system 600 of the '253 patent that operates in a Rapid Onset Aspiration Repeater ("ROAR") mode. Ex. 1001, 35:22–24; 37:19–22; Fig 47. The system includes a vacuum source 610 fluidically connected to the input of a controllable vacuum valve 620, which in turn is fluidically connected to the vacuum input of a manifold 630. *Id.* at 37:22–28. A vent fluid source 640 containing a vent liquid 642 is fluidically connected to a controllable vent valve 650. *Id.* at 37:29–31. A ROAR catheter 660, configured to operate in relatively small vessels, "defines a working lumen 662 fluidically connecting a distal end 664 thereof to a proximal manifold connector assembly 670 at a proximal end of the ROAR catheter."[1] *Id.* at 37:55–58.

[1] Throughout this Decision, we omit bolding of reference numbers in quotes from the challenged patent and prior art references.

Operation of the aspiration thrombectomy system 600 occurs through a controller 700 that "selectively opens and closes the vacuum and vent valves 620, 650 such that, when the vacuum valve 620 is opened, the vacuum source 610 is fluidically connected to the liquid column in the lumen 662 and, when the vent valve 650 is opened, vent liquid 642 is fluidically connected to the liquid column in the lumen 662." Ex. 1001, 38:39–45. Controller 700 controls the timing of these valves to "change a level of vacuum at the distal end 664 and prevent the distal portion of the liquid column in the lumen 662 from exiting the distal end 664—substantially no forward flow." *Id.* at 38:45–49.

During a ROAR cycle, "suction is applied to the clot by rapidly opening a valve, causing a rapid rise in vacuum pressure." Ex. 1001, 42:32–34. The source of suction is then turned off and a vent fluid source is rapidly opened, which "relieves the vacuum present in the catheter 660, which again rapidly changes the pressure applied to the clot." *Id.* at 42:34–37. In some embodiments of the ROAR cycle, both the vacuum valve 620 and the vent valve 650 are closed at the same time before the vent valve is opened. *Id.* at 6:23–29, 45:17–46:10, Tables 1, 4, 5. "The vent valve 650 is then rapidly closed and the vacuum valve 620 is rapidly opened." *Id.* at 42:37–38. "This cycle is repeated multiple times per second." *Id.* at 42:39.

According to the '253 patent, the "ROAR effect overcomes the static friction of a clot that is fixed or 'stuck' on the catheter tip while under constant suction" by "provid[ing] an oscillating/alternating displacement that causes the clot to 'shuttle' back and forth to overcome static frictional force." Ex. 1001, 7:21–26. And with ROAR, "there is a morcellation of the

clot that overcomes different clot morphologies as well as overriding volume and diameter constraints of the small, fixed luminal volume dictated by the micro-anatomic environment." *Id.* at 7:26–30.

*D. Illustrative Claim*

Petitioner challenges claims 1–21 of the '253 patent. Claim 1, which is an independent claim, is illustrative of the challenged claims, and is reproduced below:

1. A clot removal system, comprising:

[a] 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;

[b] a vacuum pump configured to supply vacuum;

[c] a vent container holding a vent liquid;

[d] 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;

[e] 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

[f] 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,

[g] 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.

Ex. 1001, 57:4–23 (annotated with bracketed letters). Challenged claims 2–20 depend from claim 1, either directly or indirectly. Challenged claim 21 is independent.

*E. Person of Ordinary Skill in the Art*

In determining the level of skill in the art, we consider the type of problems encountered in the art, the prior art solutions to those problems, the rapidity with which innovations are made, the sophistication of the technology, and the educational level of active workers in the field. *Custom Accessories, Inc. v. Jeffrey-Allan Indus., Inc.*, 807 F.2d 955, 962 (Fed. Cir. 1986).

Petitioner, relying on the testimony of Mr. Brown, contends that a person of ordinary skill in the art ("POSA" or "POSITA") as of the relevant date would be either:

> (1) a person with a B.S. in engineering or an equivalent field, with two to four years of academic or industry experience in aspiration embolectomy and thrombectomy or comparable industry experience who would, where necessary or desired, work or consult with others, including a physician, to develop embolectomy or thrombectomy devices; or (2) an interventional neurosurgeon with at least three years of experience developing and/or using medical devices in embolectomy or thrombectomy procedures, and who would, where necessary, work or consult with others, including an engineer, to develop such a medical device.

Pet. 16 (citing Ex. 1005 ¶ 48). Petitioner also contends that, "[a] person with less education but more relevant practical experience, or more relevant education but less practical experience, may also meet this standard." *Id.* Patent Owner does not address the definition of a POSA in its Preliminary Response.[2] *See* Prelim. Resp.

[2] The Declaration of Dr. Finol expresses some disagreement with Petitioner's definition of a POSA; however, the Preliminary Response does

Because Petitioner's proposed definition is unopposed at this stage and is consistent with the level of skill reflected in the cited prior art, we adopt it for the purposes of this Decision.

*F. Claim Construction*

We interpret a claim "using the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. 282(b)." 37 C.F.R. § 42.100(b) (2019). Under this standard, we construe the claim "in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent." *Id.*

Petitioner provides proposed constructions for the terms, "the change in the level of vacuum at the distal end is one of: greater than approximately [15]/[20]/[25] in Hg and occurs in no greater than approximately [50]/[30]/[20] ms." Pet. 22–23. Patent Owner does not address claim construction in its Preliminary Response.[3] *See* Prelim. Resp.

Upon review of the parties' arguments and the evidence of record, we determine that the terms provided by Petitioner do not require express construction for purposes of this Decision. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017)

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not address the definition nor does it cite to the discussion of a POSA in the Finol Declaration. *See* Ex. 2001 ¶¶ 38–39.

[3] The Declaration of Dr. Finol does not dispute the constructions proposed by Petitioner, but Patent Owner does not cite this testimony or otherwise address claim construction in the Preliminary Response. *See* Ex. 2001 ¶¶ 35–36.

(citing *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999) ("[O]nly those terms need be construed that are in controversy, and only to the extent necessary to resolve the controversy.")).

*G. The '253 Patent Priority Date*

The application that issued as the '253 patent was filed on November 12, 2019, and is a continuation of Application No. 16/516,232, which was filed on July 18, 2019 and issued as U.S. Patent No. 10,531,883 ("the '883 patent"), and is a continuation of Application No. PCT/US2019/042546, which is a continuation of the '883 patent. Ex. 1001, codes (22), (63). These applications claim priority to U.S. Provisional App. Nos. 62/750,011 ("the '011 provisional"), filed October 24, 2018, and 62/701,086 ("the '086 provisional"), filed July 20, 2018. *Id.* at code (60).

*1. Petitioner's Position*

Petitioner contends that the claims of the '253 patent are entitled to a priority date no earlier than the July 18, 2019, filing date of the application that issued as the '883 patent because neither provisional application describes or enables the claims. Pet. 8–10. Specifically, Petitioner asserts that the provisional applications do not describe or enable the claim limitation of "substantially prevent[ing] forward flow of liquid at a distal end of the liquid column." *Id.* at 9. Petitioner further contends that each of the provisional applications expressly teaches forward-flow, which the '253 patent characterizes as "intentional" and distinguishes these earlier teachings from the later-added embodiments "where substantially no forward flow occurs." *Id.* (citing Ex. 1003 ¶ 126; Ex. 1002 ¶ 16; Ex. 1005 ¶ 68 (quoting Ex. 1001, 32:58–60)).

*2. Patent Owner's Position*

Patent Owner contends that the claims of the '253 patent are entitled to a priority benefit of at least the '011 provisional. Prelim. Resp. 25–41. Patent Owner argues that a POSITA would understand the term, "substantially prevent[ing] forward flow of liquid at a distal end of the liquid column," to mean "controlling the distal movement of the fluid column such that the distal portion of the fluid column is prevented from fully exiting the distal end of the catheter." *Id.* at 28 (citing Ex. 2001 ¶¶ 75–79).

With regard to the term "forward flow," Patent Owner cites to disclosure from the '253 patent which states that forward flow is "an amount of liquid in the lumen . . . that exits the distal end . . . in a distal direction." Prelim. Resp. 28 (citing Ex. 1001, 38:18–21). Patent Owner also cites to the portion of the '253 patent, which states that "the timing of these valves [vent and vacuum valves] is significant so that the controller 700 can change a level of vacuum at the distal end 664 and **prevent the distal portion of the liquid column in the lumen 662 from exiting the distal end 664—substantially no forward flow**." *Id.* (citing Ex. 1001, 38:45–49). Lastly, Patent Owner cites to the disclosure of the '253 patent stating that:

> Forward flow is defined as greater than 6 microliters of fluid (approximately 1 mm of catheter length of ID 0.071″=5.7 μL).[4] Less forward flow is also included in this definition. For example, the amount of forward flow can be restricted to no greater than 2 microliters or, in a particularly beneficial

[4] Patent Owner contends that the '253 patent "inadvertently calculated that 6 microliters of fluid was 1 mm of fluid column length in a 0.071″ ID catheter while the correct amount is 2.3 mm of column length in a 0.071″ ID catheter." Prelim. Resp. 30 n.5 (citing Ex. 2001 ¶ 75 n.1).

> embodiment forward flow is approximately zero microliters. In each case, no forward flow means that substantially no liquid exits the distal end 664 in the distal direction.

*Id.* at 29–30 (citing Ex. 1001, 38:21–29).

Patent Owner points to several portions of the '011 provisional as support for this claim element. Prelim. Resp. 31–34. First, Patent Owner cites to the '011 provisional disclosure which describes an aspiration thrombectomy system "that temporarily halts [the] vacuum at the distal end of the aspiration catheter, pushes the thrombus distally out of the lumen, and then re-applies [the] vacuum." *Id.* at 31 (citing Ex. 1003 ¶ 15). Patent Owner also cites to disclosure in the '011 provisional which states that "[i]t is desirable to have a minimal amount of momentum transfer from the fluid column to the stuck clot to unstick the clot sufficiently so that the next vacuum cycle macerates the clot against the distal end of the catheter 410 and causes it to enter the lumen of the catheter 410 and be removed from the vessel" and that "[t]he exiting movement of fluid is limited to a specific volume and/or pressure and is automatically and precisely controlled" to prevent the "possibility of overshooting." *Id.* at 31–32 (citing Ex. 1003 ¶¶ 16, 138). According to Patent Owner, "[a] POSITA would have understood that a 'minimal amount of momentum transfer from the fluid column' means that some, but only a minimal—e.g., 'substantially no'—amount of a distal portion of the fluid column exits the distal end of the catheter." *Id.* at 32 (citing Ex. 2001 ¶ 80).

Patent Owner further contends that the '011 provisional discloses multiple examples of liquid flow exiting the distal end of the catheter such that no forward flow occurs, such as 1 microliter or 0.5 mm of column shift.

Prelim. Resp. 32 (citing to Ex. 1003 ¶ 91 (providing ranges of approximately "0.001 ml to approximately 1.0 ml," "0.5 mm to 30 mm," and "0.5 mm to 15 mm")). According to Patent Owner, such specific embodiments of "substantially no forward flow" provide evidence that a POSITA would have understood that the inventors of the '011 provisional "had possession of a system including controlling the opening and closing of the vacuum and vent valves to control the distal movement of the fluid column such that the distal portion of the fluid column is prevented from fully exiting the distal end of the catheter." *Id.* at 32–33.

Patent Owner also contends that Petitioner's arguments regarding Grey, one of the references relied upon for the challenges presented in the Petition, confirm that a person of skill in the art would have understood that the inventors of the '011 provisional application had possession of the "substantially preventing forward flow" limitation. Prelim. Resp. 33. According to Patent Owner, Petitioner argues that Grey discloses "preventing forward flow" without the "more definitive disclosure" in the '011 provisional application. *Id.*

3. *Principles of Law*

Although the petitioner has the ultimate burden of persuasion to prove unpatentability, a patent owner must demonstrate entitlement to a priority date when the patent owner relies on that priority date to overcome an anticipation or obviousness argument. *See Dynamic Drinkware, LLC v. Nat'l Graphics, Inc.*, 800 F.3d 1375, 1379–80 (Fed. Cir. 2015) (discussing burdens in *inter partes* review to show entitlement to provisional filing dates); *In re NTP, Inc.*, 654 F.3d 1268, 1276 (Fed. Cir. 2011) ("[A] patent's

claims are not entitled to an earlier priority date because the patentee claims priority. Rather, for a patent's claims to be entitled to an earlier priority date, the patentee must demonstrate that the claims meet the requirements of 35 U.S.C. § 120." (citations omitted)); *Research Corp. Techs., Inc. v. Microsoft Corp.*, 627 F.3d 859, 870–71 (Fed. Cir. 2010); *Tech. Licensing Corp. v. Videotek, Inc.*, 545 F.3d 1316, 1327–29 (Fed. Cir. 2008).

"[T]he hallmark of written description is disclosure," and "the test [for satisfaction of the written description requirement] requires an objective inquiry into the four corners of the specification from the perspective of a person of ordinary skill in the art." *Ariad Pharms., Inc. v. Eli Lilly & Co.*, 598 F.3d 1336, 1351 (Fed. Cir. 2010) (en banc). The written description "must 'clearly allow persons of ordinary skill in the art to recognize that [the inventor] invented what is claimed,'" and "reasonably" convey to those skilled in the art "that the inventor had possession of the claimed subject matter as of the filing date." *Id.* (alteration in original, internal citations omitted). Stated another way, "one skilled in the art, reading the original disclosure, must immediately discern the limitation at issue in the claims." *Purdue Pharma L.P. v. Faulding Inc.*, 230 F.3d 1320, 1323 (Fed. Cir. 2000). "Whether a claim satisfies the written description requirement is a question of fact." *Nalpropion Pharms., Inc. v. Actavis Labs. FL, Inc.*, 934 F.3d 1344, 1348 (Fed. Cir. 2019) (citing *Ariad*, 598 F.3d at 1351).

*4. Analysis*

On the current record, we do not find that the disclosure of the '011 provisional application is sufficient to provide written description support for the limitation of "substantially prevent[ing] forward flow." The '253

patent defines forward flow as "an amount of liquid in the lumen . . . that exits the distal end . . . in the distal direction" and "is defined as greater than 6 microliters of fluid." Ex. 1001, 38:18–22. While Patent Owner points to disclosure from the '011 provisional application which describes "a minimal amount of momentum transfer from the fluid column to the stuck clot to unstick the clot sufficiently" and "[t]he exiting movement of fluid [being] limited to a specific volume and/or pressure and is automatically and precisely controlled" to prevent the "possibility of overshooting," it would not necessarily be apparent to one of ordinary skill in the art that such disclosure is referring to no greater than 6 microliters of fluid. Prelim. Resp. 31–32 (citing Ex. 1003 ¶¶ 16, 138).

Patent Owner also points to disclosure in the '011 provisional application that Patent Owner contends provides "multiple examples of liquid flow exiting the distal end of the catheter such that no forward flow occurs, such as 1 microliter or 0.5 mm of column shift." Prelim. Resp. 32 (citing Ex. 1003 ¶ 91). However, the disclosure cited by Patent Owner provides ranges of liquid flow of "approximately 0.001 ml to approximately 1.0 ml, in particular 0.1 ml to approximately 0.5 ml" and exemplary length of shift distances of "approximately 0.5 mm to approximately 30 mm, in particular, approximately 0.5 mm to approximately 15 mm." Ex. 1003 ¶ 91. There is nothing in the disclosure of the '011 provisional application that specifically directs the person of ordinary skill in the art to the portions of these ranges which fall within the '253 patent's definition of no "forward flow" (i.e., no greater than 6 microliters of fluid). In fact, the majority of the cited ranges are greater then 6 microliters such that there would be forward

flow in these examples. *Purdue Pharma*, 230 F.3d at 1326–27 ("[O]ne cannot disclose a forest in the original application and then later pick a tree out of the forest and say here is my invention. In order to satisfy the written description requirement, the blaze marks directing the skilled artisan to that tree must be in the originally filed disclosure."); *Fujikawa v. Wattanasin*, 93 F.3d 1559, 1571 (Fed. Cir. 1996).

Patent Owner's argument that Petitioner's assertions regarding Grey confirm that a POSITA would have understood the inventors of the '011 provisional to have possession of the concept of "substantially preventing forward flow" in the catheter is also unavailing. Although Patent Owner contends that Grey provides less disclosure than the '011 provisional application with respect to "preventing forward flow," Patent Owner's argument conflates the written description analysis with an obviousness analysis. *See Ariad*, 598 F.3d 1336 at 1352 ("A description that merely renders the invention obvious does not satisfy" the written description requirement.).

Thus, on the current record, we find that the '011 provisional application specification does not "clearly allow persons of ordinary skill in the art to recognize that [the inventors] invented what is claimed." *In re Gosteli*, 872 F.2d 1008, 1012 (Fed. Cir. 1989); *Lockwood v. American Airlines, Inc*., 107 F.3d 1565, 1572 (Fed. Cir. 1997) (to fulfill the written description requirement, a patent specification "must describe an invention and do so in sufficient detail that one skilled in the art can clearly conclude that the inventor invented the claimed invention"). For the reasons

described above, on this record, for purposes of institution, we use July 18, 2019, as the priority date of the '253 patent.

*H. The Asserted Grounds of Unpatentability*

Petitioner contends claims 1–21 of the '253 patent are unpatentable in view of the following grounds. Pet. 10.

| Ground | Claims Challenged | 35 U.S.C. §[5] | Reference(s)/Basis |
|---|---|---|---|
| 1 | 1–14, 17–19, 21 | 103 | Teigen,[6] Grey[7] |
| 2 | 4–6, 9–13 | 103 | Teigen, Grey, Rubenstein[8] |
| 3 | 15, 16 | 103 | Teigen, Grey, Yang[9] |
| 4 | 20 | 103 | Teigen, Grey, Matteo[10] |

Petitioner submits the Declarations of Brian Brown (Ex. 1005) and Ian Ross, M.D. (Ex. 1023) in support of institution of *inter partes* review. Patent Owner relies on the Declarations of Ender Finol, Ph.D. (Ex. 2001) and Michael Chen, M.D. (Ex. 2003) in support of its Preliminary Response.

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[5] The Leahy-Smith America Invents Act ("AIA"), Pub. L. No. 112-29, 125 Stat. 284 (2011), amended 35 U.S.C. § 103, effective March 16, 2013. Because the application from which the '253 patent issued was filed after this date, the post-AIA version of § 103 applies to this proceeding.

[6] Teigen et al., US 11,197,683 B1, issued Dec. 14, 2021 (Ex. 1007, "Teigen").

[7] Grey et al., WO 2014/151209 A1, published Sept. 25, 2014 (Ex. 1010, "Grey").

[8] Morton K. Rubenstein, US 3,955,574, issued May 11, 1976 (Ex. 1011, "Rubenstein").

[9] Yang et al., US 2017/0238953 A1, published Aug. 24, 2017 (Ex, 1012, "Yang").

[10] Joseph Matteo, US 2012/0138833 A1, published June 7, 2012 (Ex. 1013, "Matteo").

## II. ANALYSIS

### *A. Asserted Obviousness of Claims 1–14, 17–19, and 21 over Teigen in view of Grey*

Petitioner contends that the subject matter of claims 1–14, 17–19, and 21 of the '253 patent are obvious over the disclosure of Teigen in view of Grey. Pet. 23–67. Patent Owner disputes Petitioner's contentions. Prelim. Resp. 7–61.

#### *1. Principles of Law*

A claim is unpatentable under 35 U.S.C. § 103 if the differences between the subject matter sought to be patented and the prior art are such that the subject matter, as a whole, would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations, including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of skill in the art; and (4) when in evidence, objective evidence of non-obviousness, i.e., secondary considerations.[11] *See Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

"The combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results." *KSR*, 550 U.S. at 416. "[W]hen the question is whether a patent claiming the combination of elements of prior art is obvious," the answer depends on

[11] There is no secondary considerations evidence of record for us to consider at this stage.

"whether the improvement is more than the predictable use of prior art elements according to their established functions." *Id.* at 417. It is generally obvious to those skilled in the art to substitute one known equivalent for another. *See In re Omeprazole Patent Litigation*, 483 F.3d 1364, 1374 (Fed. Cir. 2007) ("[T]his court finds no . . . error in [the] conclusion that it would have been obvious to one skilled in the art to substitute one ARC [alkaline reactive compound] for another."); *see also Wm. Wrigley Jr. Co. v. Cadbury Adams USA LLC*, 683 F.3d 1356, 1364 (Fed. Cir. 2012) (the combination of known elements and substitution of one well known agent for another is obvious).

*2. Teigen (Ex. 1007)*

Teigen, titled "Aspiration Thrombectomy System and Methods for Thrombus Removal with Aspiration Catheter," is directed to devices and methods for controlling clot removal from a patient's vasculature by aspiration thrombectomy. Ex. 1007, code (54), 1:20–23. Teigen discloses an aspiration thrombectomy system comprising a vacuum source and an aspiration catheter. *Id.*, code (57).

Teigen further discloses that its aspiration thrombectomy system comprises an aspiration catheter with a proximal and distal end, a vacuum source, a controllable on-off vacuum valve, a pressure source, a controllable pressure valve, connection tubing including a lumen to accommodate fluid and which acts as a common conduit for fluid communication between the system components, a sensing unit, and a controller for pulsed aspiration. Ex. 1007, 2:56–4:20, 14:63–18:25, Figures 7A, 7B, 9, 14. Teigen discloses that the controller is configured to receive signals from pressure sensors in

the system, and open and close the valves to "clear occlusions in an aspiration catheter or to facilitate the aspiration of clot that are large or otherwise hard to aspirate." *Id.* at 3:63–4:28, 14:63–18:25. Teigen teaches that the pressure pulse can create a force impulse that breaks static friction momentarily, allowing a lower dynamic friction to ingest thrombus. *Id.* at 14:63–15:12. Teigen also discloses that, in one example, "pressure is generated by introducing fluid into the catheter, where the fluid is at a pressure between full vacuum and ambient pressure, at ambient pressure, at systolic pressure, or above systolic pressure." *Id.* at 15:40–44.

In some embodiments of Teigen, "the controller may modulate a vacuum valve [] and a pressure valve [], whereby the closing of the vacuum valve [] and the opening of the pressure valve [] may result in a relative increase in pressure at a distal tip of an aspiration catheter." Ex. 1007, 17:48–52. Further, "[a]lternatively, the opening of the vacuum valve [] and the closing of the pressure valve [] may result in a relative decrease in pressure at the distal tip of the aspiration catheter []." *Id.* at 17:53–55.

*3. Teigen Priority Date*

Teigen issued on December 14, 2021, from U.S. Patent Application No. 17/391,874 ("the '874 application"), filed August 2, 2021. Ex. 1007, codes (21), (22), (45). The '874 application is a continuation of Application No. 16/988,556 ("the '556 application"), which issued as U.S. Patent No. 11,096,717, which is a continuation of PCT/US2019/043095 ("the '095 PCT application"), filed on July 23, 2019. *Id.* at code (63). The '095 PCT application claims the benefit of priority to U.S. Provisional Application

Nos. 62/778,708 ("the '708 provisional"), filed December 12, 2018, and 62/702,804 ("the '804 provisional"), filed July 24, 2018. *Id.* at code (60).

Petitioner contends that Teigen qualifies as prior art under 35 U.S.C. §§ 102(a)(2) and 102(d)(2) because the subject matter of Teigen is fully supported by both provisional applications such that Teigen has a priority date of July 24, 2018 (i.e., the filing date of the '804 provisional). Pet. 16–19. Patent Owner contends that Teigen is not prior art. Prelim. Resp. 6–25.

*a.* Petitioner's Position

Petitioner asserts that Teigen should get priority to its provisional applications because a representative claim from Teigen is described and enabled by both provisional applications and because the disclosure relied on from Teigen in the Petition is also fully supported by both provisional applications. Pet. 17 (citing Ex. 1005 ¶¶ 86–95). Petitioner cites to the Brown Declaration to support these contentions. *Id.*

Mr. Brown opines that claim 1 of Teigen is fully supported and enabled by the disclosures of the '804 and '708 provisional applications and provides citations to both provisional applications to support this assertion. Ex. 1005 ¶¶ 88–95.[12] Claim 1 of Teigen is shown below:

1. An aspiration thrombectomy system, comprising:

[a] a vacuum source comprising a controllable vacuum valve;

[12] Mr. Brown also opines that both provisional applications adequately describe and support the relevant subject matter of Teigen relied upon in the Petition and provides cross cites to the provisional applications when discussing the obviousness arguments. *See id.*, *e.g.*, ¶¶ 87, 105–246.

> [b] a pressure source comprising a controllable pressure valve;
>
> [c] an aspiration catheter having a proximal end and a distal end, wherein the proximal end of the aspiration catheter comprises connection tubing having a lumen configured to accommodate fluid, and wherein the connection tubing acts as a common conduit for fluid communication between the aspiration catheter and the vacuum and pressure sources via the vacuum and pressure valves, respectively; and
>
> [d] a controller configured to open and close the vacuum and vent valves in a predetermined cycle to change a level of vacuum at the distal end of the aspiration catheter **and control flow in and out from the distal end of the catheter**.

Ex. 1007, 23:6–22 (bracketed letters and emphasis added).

In asserting that the provisional applications support limitation [1d] of Teigen, the Brown Declaration cites to paragraphs 63–65 and 69 of the '804 provisional and paragraphs 65–67 and 78 of the '708 provisional and concludes that

> a POSA would have understood that the disclosed controller is configured to open and close the vacuum and vent valves in a predetermined cycle to change a level of vacuum at the distal end of the aspiration catheter and control flow in and out from the distal end of the catheter, as recited in claim limitation [1d].

Ex. 1005 ¶ 94.

*b.* Patent Owner's Position

Patent Owner contends that Teigen is not entitled to the priority benefit of the '804 provisional application because it does not provide written description support for limitation [1d] of Teigen, which requires the controller to control flow in and out from the distal end of the catheter. Prelim. Resp. 7–25. Patent Owner and its declarant, Dr. Finol, assert that,

for flow to occur out from the distal end of the catheter, a pressure differential must exist at the distal end such that pressure at the distal end of the catheter is greater than pressure in the blood vessel. *Id.* at 12 (citing Ex. 2001 ¶ 52). Thus, according to Patent Owner, "to achieve 'flow…out from the distal end of the catheter' as required by claim 1 of [Teigen], there must be enough positive pressure at the proximal end of the catheter to drive fluid through the catheter and overcome the mean arterial pressure at the distal end." *Id.* Patent Owner and Dr. Finol contend that the '804 provisional does not disclose any "positive pressure" source in its system to overcome the mean arterial pressure required to produce "flow…out from the distal end." *Id.* (citing Ex. 2001 ¶¶ 52–66).

According to Patent Owner, the paragraphs from the '804 provisional application cited by Mr. Brown in support of this limitation do not explicitly disclose "flow…out from the distal end of the catheter" nor do they explicitly disclose a positive pressure in the system. Prelim. Resp. 13 (citing Ex. 2001 ¶¶ 54–63). For example, Patent Owner discusses paragraph 64 of the '804 provisional application (cited by Mr. Brown), which states that "by applying a vacuum, followed by **reducing** that vacuum with saline, and then reapplying vacuum, the clot experiences the pressure differential as an acceleration force which negatively impacts the structural integrity of the clot." *Id.* at 17 (citing Ex. 1008 ¶ 64). According to Patent Owner, this paragraph teaches that saline "reduc[es]" the vacuum, which necessarily means that some level of vacuum remains in the catheter, as opposed to generating a positive pressure. *Id.* at 17, 20 (citing Ex. 2001 ¶ 60). Patent Owner also discusses paragraph 65 of the '804 provisional application which

states that "[a]n influx or bolus of saline will partially relieve the vacuum." *Id.* at 15, 21. According to Patent Owner, if the vacuum is "partially" relieved, then by definition some level of negative pressure remains in the catheter. *Id.* at 21 (citing Ex. 2001 ¶ 62).

Patent Owner also contends that a POSITA would understand that merely opening and closing the vacuum and pressure valves to deliver "saline pulsated aspiration" as discussed in the '804 provisional application "**would not** inherently produce a positive pressure pulse sufficient to overcome the mean arterial pressure necessary for 'flow…out from the distal end of the catheter.'" Prelim. Resp. 17 (citing Ex. 2001 ¶ 58). Patent Owner and Dr. Finol contend that:

> a POSITA would understand that catheters are somewhat compliant such that, when a clot corks the distal end while the vacuum valve is open, fluid is withdrawn from the catheter causing the catheter volume to decrease. Upon closing the vacuum valve, the catheter will remain in a reduced-volume state. As such, when the saline valve is opened, saline at ambient pressure will flow into the catheter even though the saline is not above the mean arterial pressure. Such an ambient saline flow does not inherently produce a positive pressure sufficient to overcome the mean arterial pressure.

*Id.* at 17–18 (citing Ex. 2001 ¶ 58) (internal citations omitted). According to Patent Owner, there are many factors that influence the magnitude of the pressure pulse caused by introducing saline into the catheter when it is under vacuum and the vacuum valve has been closed such as the compliance of the catheter and the pressure of the saline. *Id.* at 18 (citing Ex. 2001 ¶ 59; Ex. 2013, 155:18–158:14, 159:17–160:19, 198:16–199:14, 160:19–165:6, 155:18–156:14). Patent Owner further contends that, while in some

conditions it is possible that a combination of factors could produce a positive pressure pulse, "a POSITA would understand that there [are] many conditions in which a pressure pulse would not be above zero at the distal end of the catheter, let alone above mean arterial pressure." *Id.* at 18–19 (citing Ex. 2001 ¶ 59).

Patent Owner also contends that the modifications made to paragraphs 64 and 65 of the '804 provisional application in the subsequently filed '708 provisional application confirm that the '804 provisional lacked written description support for limitation [1d] of Teigen. Prelim. Resp. 23–25. For example, the '708 provisional application discusses how an influx of fluid will "create a positive pressure or partially relieve the vacuum" while the '804 provisional application only mentioned "partially reliev[ing] the vacuum." *Id.* at 24 (citing Ex. 1008 ¶ 65; Ex. 1009 ¶ 67). According to Patent Owner, "a POSITA would understand that the inventor of [the '804 provisional application] (1) understood that there is a difference between positive pressure and 'partially reliev[ing]' the vacuum and (2) did not have possession of using positive pressure in the system at the time [the '804 provisional application] was filed." *Id.* at 24 (citing Ex. 2001 ¶ 67). Patent Owner also cites to newly added Figures 14–16 of the '708 provisional application, which include a pump "where positive pressure is desired." *Id.* (citing Ex. 1009 ¶ 72). Patent Owner contrasts this description of "positive" pressure in the '708 provisional application with the '804 provisional application's absence of any mention of "positive" pressure. *Id.* at 24–25.

Lastly, Patent Owner contends that the Petition fails because it improperly incorporates by reference statements from Mr. Brown's

Declaration to support the argument that a claim of Teigen is supported by the Teigen provisional applications. Prelim. Resp. 41–42.

*c.* Analysis

First, with regard to Patent Owner's argument regarding the improper incorporation by reference, the Petition states that a representative claim of Teigen is described and enabled by the provisional applications. Pet. 17. While it is true that Petitioner cites to paragraphs 86–95 of the Brown Declaration to provide support for a representative claim of Teigen being described and enabled by the provisional applications, we do not find this citation to be unreasonable. We find this case to be distinguishable from the Board case cited by Patent Owner in which footnotes were used to cite to large portions of an expert declaration, which itself cited to additional claim charts. *See Cisco Sys., Inc. v. C-Cation Techs., LLC*, No. IPR2014-00454, Paper 12 (PTAB Aug. 29, 2014).

Next, we note that Patent Owner does not appear to contest that Teigen gets priority back to the December 12, 2018, filing date of the '708 provisional application. *See e.g.*, Prelim. Resp. 25. As discussed above, because we find on the current record that the '253 patent is only entitled to a priority date of July 18, 2019, Teigen is 35 U.S.C. §§ 102(a)(2) and (d)(2) art to the '253 patent regardless of whether it can receive priority to the '804 provisional application. However, we discuss the priority date of Teigen here in order to provide guidance to the parties.

The '804 provisional application discloses pulsated aspiration in which, at times, the valve to the vacuum pump is closed and the valve to the saline injection unit is open in order to more efficiently digest a clot that is

large or otherwise difficult to aspirate. Ex. 1008 ¶¶ 65, 69. According to the '804 provisional, "[s]aline pulsated aspirations provide a 'dynamic' aspiration force" because "[i]nstead of aspirating clots with a static (constant) vacuum force, pulsated aspiration introduces an acceleration component to the mass transfer force which can help break up larger clots so that they can better fit in the catheter lumen." *Id.* ¶ 64. We agree with Patent Owner that the '804 provisional does not specifically mention "positive pressure." We also understand, based on the current record, that a positive pressure could result at the distal end of the catheter when the vacuum pump is turned off and the saline injection unit is open to create an influx of saline into the catheter. However, we acknowledge Patent Owner and Dr. Finol's contentions that such positive pressure is not necessarily inherent because catheters are somewhat compliant and there are many factors that influence the magnitude of a pressure pulse caused by introducing saline into the catheter. We also acknowledge their argument that such an ambient saline flow may not inherently produce a positive pressure sufficient to overcome the mean arterial pressure. These issues will be better resolved on a complete trial record. But, for the reasons stated above and based on the present record, we treat Teigen as prior art for purposes of this Decision.

*4. Grey (Ex. 1010)*

Grey, titled "Dynamic Aspiration Methods and Systems," is directed to "an aspiration system" including "a catheter[], an aspiration source providing a negative pressure in the catheter, and a device which repetitively changes the negative pressure to produce a dynamic suction force at a distal

end of the catheter." Ex 1010, codes (54), (57), 5:1–4. Grey discloses that "negative pressure and negative pressure oscillations are delivered by a fluid medium," and that, in some embodiments, a "second aspiration fluid may be provided at a positive pressure." *Id.* at 3:22–24, 8:24–25. Grey teaches that "dynamic aspiration as taught [] may cause facture and break-up of a clot applying smaller suction forces which are repetitively varied to induce material fatigue." *Id.* at 10:17–19.

Grey also discloses that "[o]ne very serious risk is the escape and travel of occlusive material from the initial site of occlusion to a distal portion of the lumen or to another lumen branching therefrom." *Id.* at 7:10–12. According to Grey, "[p]roviding a non-zero suction force in the catheter at all times reduces the risk of occlusive material breaking free of a clot and traveling distally in the vessel." *Id.* at 13:7–11.

Grey was published on September 25, 2014 and Petitioner contends that it qualifies as prior art at least under §102(a)(1) because it was published prior to the effective filing date of the '253 Patent. Ex. 1010, code (43); Pet. 19. Patent Owner does not contest that Grey is prior art to the '253 patent.

*5. Claims*

Petitioner contends that the subject matter of claims 1–14, 17–19, and 21 of the '253 patent would have been obvious over Teigen in view of Grey. Pet. 23–67.

*a.* Claim 1

Petitioner, with supporting testimony from Mr. Brown, provides evidence as to where Teigen and Grey disclose the limitations of claim 1 of

the '253 patent. Pet. 26–40. For claim 1, at this stage of the proceeding, Patent Owner only contests that Petitioner fails to establish a motivation to combine Teigen and Grey. Prelim. Resp. 42–47. We review the parties' positions below.

*(1) Petitioner's Position*

Petitioner cites to the disclosures of Teigen and Grey to support its contention that these disclosures render obvious the limitations of claim 1. Pet. 26–40. For claim limitations [1a] through [1g], Petitioner relies on disclosures from Teigen alone and for limitations [1f] through [1g], Petitioner relies on disclosures from Teigen in combination with Grey. *Id.* Specifically, for limitation [1g], which recites that the controller opens and closes the vent and vacuum valves to change a level of vacuum at the distal end of the catheter "to substantially prevent forward flow of liquid at a distal end of the liquid column," Petitioner cites to claims 1 and 13 of Teigen as rendering this limitation obvious. *Id.* at 38 (citing Ex. 1005 ¶¶ 146–152; Ex. 1007, Claim 1("a controller configured to . . . change a level of vacuum at the distal end of the aspiration catheter and control flow in and out from the distal end of the catheter"), Claim:13 ("wherein the controller is configured to substantially control flow in and out from the distal end of the catheter")).

Next, Petitioner cites to the portion of Teigen which discloses that during the pulsed extraction cycle:

> a controller may close vacuum valve [] and open pressure valve [] for a small period of time, thus allowing ***a minimal volume of fluid*** from the pressure source [] to be introduced into a proximal end of the aspiration catheter [] ***to increase the***

> ***relative pressure at the distal end of the aspiration catheter*** [] before reverting to vacuum by re-opening vacuum valve [] and closing pressure valve.

Pet. 39 (citing Ex. 1007, 17:20–18:10; Ex. 1008 ¶ 65; Ex. 1009 ¶ 67). Petitioner further contends that "Teigen also discloses that the fluid introduced into the catheter from the fluid source is 'at a pressure between full vacuum and ambient pressure,' such as to partially relieve the vacuum in the catheter." *Id.* (citing Ex. 1005 ¶ 147; Ex. 1007, 15:37–46; Ex. 1008 ¶ 65; Ex. 1009 ¶ 67).

Petitioner also asserts that Grey discloses that a "second aspiration fluid may be provided at a positive pressure" for dynamic aspiration and recognizes that "one very serious risk is the escape and travel of occlusive material from the initial site of occlusion to a distal portion of the lumen or to another lumen branching therefrom." Pet. 39 (citing Ex. 1010, 8:24–25, 7:10–12). Thus, according to Petitioner, Grey teaches that "the magnitude of the baseline pressure is preferably maintained above zero (i.e., a vacuum is maintained)" and that "providing ***a non-zero suction force in the catheter at all times reduces the risk of occlusive material breaking free of a clot and traveling distally in the vessel***." *Id.* at 39–40 (citing Ex. 1010, 13:7–11).

Petitioner, with supporting testimony from Mr. Brown, contends that "[a] POSA would have recognized that Grey teaches the substantial prevention of forward flow out of the distal end of the catheter as described in the '253 Patent." Pet. 40 (citing Ex 1005 ¶ 150; Ex 1001, 3:6–17 (defining forward flow)). According to Petitioner,

> A POSA would have been motivated in view of Grey to operate the dynamic aspiration system of Teigen in a manner that maintains 'a non-zero suction force' to substantially prevent forward flow of liquid at a distal end of the liquid column in order to reduce the risk of a clot travelling distally, as taught in Grey.

*Id.* Petitioner also contends that a POSA would have had a reasonable expectation of success in doing so because Grey discloses "a plurality of parameters" that "control/influence the pressure realized in a catheter and to which an occlusion is subjected." *Id.* at 40 (citing Ex. 1010, 10:22–31). According to Petitioner, "[a] POSA would have been able to follow the directions provided in Grey to 'optimize[] treatment efficacy' using Teigen's system, including to prevent forward flow, using no more than routine experimentation." *Id.* (citing Ex. 1005 ¶ 151).

*(2) Patent Owner's Position*

Patent Owner asserts that Petitioner fails to establish a motivation to combine Teigen with Grey because the Petition does not identify the specific teachings of Grey it intends to combine with Teigen and concludes that a "POSA would recognize that Teigen **could be** configured to achieve the benefits as taught by Gray," while obviousness is dependent on what a POSITA **would** do. Prelim. Resp. 43 (citing *Belden Inc. v. Berk–Tek LLC*, 805 F.3d 1064, 1073 (Fed. Cir. 2015)). Patent Owner also argues that none of the motivations provided by Petitioner to justify the combination provide sufficient rational underpinnings to support obviousness. *Id.* For example, Patent Owner contends that Petitioner provides no evidence or explanation to support its statement that "combining the teachings of Teigen and Grey would have been well within the skill of a POSA because it is nothing more

than combining known vacuum aspiration technologies described in these references to perform their intended functions with described benefits and predictable results." *Id.* at 44 (citing Pet. 24–25). According to Patent Owner, neither Petitioner nor Mr. Brown identify any alleged "described benefits" or explain why the results would have been predictable. *Id.* at 44–45 (citing Ex. 1005 ¶ 107).

Patent Owner further contends that Petitioner provides no explanation as to how Grey "improves" the system of Teigen and that Petitioner's statement that a "POSA would have been able to follow the directions provided in Grey to 'optimize [] treatment efficacy' using Teigen's system, including to prevent flow, using no more than routine experimentation" is speculative. *Id.* at 45 (citing Pet. 25). Patent Owner also asserts that neither Petitioner nor Mr. Brown provide sufficient support for the conclusion that the combination of Teigen and Grey would have been within the skill set of a POSITA. *Id.* at 45–46.

Further, according to Patent Owner, a POSITA would understand that it would be far more efficient and much simpler to maintain a non-zero suction force in the catheter at all times as taught by Grey if the suction is always 'on' - i.e., a vacuum valve does not cycle to a 'closed' position in which the suction is stopped" and a POSITA would not have been led to the claimed combination. Prelim. Resp. 46. Patent Owner concludes that Petitioner uses impermissible hindsight in combining the disclosures of Teigen and Grey. *Id.*

*(3) Analysis*

We find that, on the current record, Petitioner has provided sufficient evidence of motivation to combine the disclosures of Teigen and Gray. We agree with Petitioner and Mr. Brown that a POSA would have been motivated to combine the teachings of Teigen and Grey because they "address similar problems related to convention aspiration thrombectomy and share the common objective of improving aspiration efficiency." Pet. 23–24 (citing Ex. 1005 ¶¶ 104–111). We also agree that both Teigen and Grey "teach similar solutions involving a liquid source to temporarily vent/relieve vacuum within the catheter to create an accelerated suction force to efficiently remove blood clots." *Id.* at 24. Teigen and Grey both discuss issues with clogged catheters and the limitations of static aspiration technologies for controlled clot aspiration. *Id.* at 24 (citing Ex. 1007, 1:59–2:26, 2:49–55, 3:15–35, 14:63–15:36; Ex. 1008 ¶¶ 5, 9, 63–65; Ex. 1009 ¶¶ 6, 8, 11, 65–67; Ex. 1010, 1:7–9, 1:15–2:3). Both references also describe a similar approach of creating a dynamic aspiration force to more effectively clear clots from a clogged catheter. *Id.* (citing Ex. 1007, 2:27–67, 3:15–55, 14:63–18:25; Ex. 1010, 2:24–3:24).

Further, on this record, we disagree with Patent Owner's assertion that Petitioner does not identify the specific teachings of Grey it intends to combine with Teigen. The Petition specifically cites to the teachings of Grey that a POSA would have combined with Teigen, such as Grey's disclosure of "providing a non-zero suction force in the catheter at all times [to reduce] the risk of occlusive material breaking free of a clot and travelling distally in the vessel." *See* Pet. 39–40 (citing Ex. 1010, 13:7–11).

On the current record, we are similarly not persuaded by Patent Owner's argument that the Petition does not identify any alleged described benefits of combining the disclosures of Teigen and Grey or how Grey improves the system of Teigen. Petitioner contends that a POSA would have been motivated in view of Grey to operate Teigen's aspiration system in a manner that maintains "a non-zero suction force" to reduce the risk of a clot travelling distally as taught in Grey. *Id.* at 40.

We recognize Patent Owner's argument that it may have been simpler to maintain a non-zero suction force in the catheter at all times as taught by Grey if the suction is always on, rather than cycling to a closed position as in Teigen; however, we find that, on the current record, Petitioner has sufficiently established that a POSA would have had a motivation to combine the disclosures of Teigen and Grey. We will further evaluate this issue on a full trial record.

At this time, other than the arguments regarding motivation to combine, Patent Owner does not contest that Teigen and Grey disclose the limitations of claim 1 of the '253 patent. We find that Petitioner sufficiently shows that the disclosures of Teigen and Grey render these limitations obvious. *See* Pet. 26–40. Thus, on the current record, Petitioner has demonstrated a reasonable likelihood that the subject matter of claim 1 of the '253 patent would have been obvious over the combined disclosures of Teigen and Grey.

*b.* Claims 2, 3, 7, 8, 17–19, and 21

Petitioner, with supporting testimony from Mr. Brown, provides evidence as to where Teigen and Grey disclose the limitations of claims 2, 3,

7, 8, 17–19, and 21 of the ’253 patent. Pet. 40–46, 50–53, 64–68. Patent Owner also does not currently contest that Teigen and Grey disclose the limitations of claims 2, 3, 7, 8, 17–19, and 21 and we find that Petitioner sufficiently shows that the disclosures of Teigen and Grey render these limitations obvious. *See* Pet. 40–46, 50–53, 64–68. Thus, on the current record, Petitioner has demonstrated a reasonable likelihood that the subject matter of claims 2, 3, 7, 8, 17–19, and 21 of the ’253 patent would have been obvious over the combined disclosures of Teigen and Grey.

*c.* Claims 4–6 and 9–13

Petitioner, with supporting testimony from Mr. Brown, provides evidence as to where Teigen and Grey disclose the limitations of dependent claims 4–6 and 9–13 of the ’253 patent. Pet. 46–50, 54–59. At this stage of the proceeding, Patent Owner only contests whether Petitioner has sufficiently shown that Teigen and Grey disclose the limitations reciting a “double-closed state.” Prelim. Resp. 47–50.[13] We review the parties’ positions below.

*(1) Petitioner’s Position*

To support its contention that Teigen discloses a “double-closed state,” Petitioner cites to claim 4 of Teigen which recites “[t]he system

[13] On the current record, Patent Owner does not appear to argue that Petitioner fails to show that Teigen and Grey teach the limitations of claim 4 of the ’253 patent. Although claim 4 does not recite the term a “double-closed state,” it does recite the system of claim 1, which “includes a time period where both the vent and vacuum valves are closed.” Ex. 1001, 57:33–35. For purposes of our analysis in this Decision, we group claim 4 with claims 5, 6, and 9–13, which disclose a “double-closed state.”

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." Pet. 48 (citing Ex. 1005 ¶ 168; Ex. 1007, claim 4). Petitioner also cites to Teigen's teaching sequences of opening and closing the vacuum and vent valves including where "both valves are closed for at least short periods of time." *Id.* at 46 (citing Ex 1007,16:54–18:10; Ex. 1008 ¶¶ 63, 65; Ex. 1009 ¶¶ 65, 67, 70).

Petitioner further argues that, "[t]o the extent that Teigen does not explicitly disclose a double-closed state in which the vacuum valve and vent valve are both closed, a POSA would have found a double-closed state an obvious manner of implementing the dynamic aspiration sequence disclosed in Teigen." Pet. 46 (citing Ex 1005 ¶¶164–165). According to Petitioner, "[a] POSA would have found it obvious, in actual execution, to conduct the valve operation in serial to yield effective pulsing, e.g. closing the vacuum valve first and then opening the vent valve to generate the positive pulse." *Id.* at 47 (citing Ex. 1005 ¶ 165). Petitioner contends that "[t]his would be efficient , because if the vacuum valve remained open during this period, some of the positive pulse introduced by opening the vent valve would be reduced by the vacuum." *Id.* (citing Ex. 1005 ¶ 165). Thus, according to Petitioner, "[b]ecause of the nature of serial operation, it would be obvious to have a finite delay (e.g. for confirming the state of the valve) between the closing of the vacuum valve and the opening of the vent valve, which leads to at least a brief period where both the vacuum valve and the vent valve are closed, i.e. the double-closed state" and "[t]hus, it would have been obvious

for a second double-closed state to occur in the course of generating a negative pulse during an aspiration cycle." *Id.* (citing Ex. 1005 ¶¶ 164, 165).

*(2) Patent Owner's Position*

First, Patent Owner contends that neither claim 4 of Teigen nor the portions cited from Teigen at col. 17, lines 8–10[14] have written description support in the provisional applications. Prelim. Resp. 47–49. Patent Owner also argues that Petitioner's theories regarding obviousness regarding the "double-closed state" are inconsistent with Petitioner's arguments for combining the disclosures of Teigen and Gray for claim 1 because having a double-closed state to more effectively generate a positive pressure pulse "directly vitiates Petitioner's argument that a 'POSA would have been motivated in view of Grey to operate the dynamic aspiration system of Teigen in a manner that maintains a '**non-zero suction force**' to prevent forward flow of the distal portion out from the distal end…[to] reduce the risk of a clot traveling distally, as taught in Grey' for claim 1." *Id.* at 49 (citing Pet. 41; Ex. 2001 ¶¶ 160–162). According to Patent Owner, "[a] 'double-closed' state would cut off the vacuum source such that the 'positive pressure pulse' produced during the subsequent open state of the vent valve would eliminate the 'non-zero suction force at all times in the catheter' required by the combination of [Teigen] and Grey." *Id.* at 49–50 (citing Ex. 2001 ¶ 161).

[14] Patent Owner cites to col. 17, lines 5–7 of Teigen but the quoted language is actually at col. 17, lines 8–10.

*(3) Analysis*

First, on the current record, we agree with Patent Owner that neither claim 4 of Teigen nor the quote cited from Teigen at col. 17, lines 8–10 have written description support in the provisional applications. Therefore, we will not consider these disclosures in our analysis of the "double-closed state" claim limitations.

Teigen discloses dynamic aspiration by opening and closing vacuum and vent valves to generate pressure pulses to improve clot removal efficiency. Ex. 1007, 16:54–18:10; Ex. 1008 ¶¶ 63–65, Ex. 1009 ¶¶ 65–67, 70. We have considered the testimony of Mr. Brown that "[a] POSA would have found it obvious and typical to conduct the valve operation in serial to yield effective pulsing, e.g. closing the vacuum valve first and then opening the vent valve to generate the positive pulse." Ex. 1005 ¶ 165. However, we agree with Dr. Finol that Petitioner's arguments for the "double-closed stated" limitations appear to be in tension with their arguments regarding the combination of Teigen and Grey for claim 1. *See* Prelim. Resp. 49–50; Ex. 2001 ¶¶ 160–162. For example, Petitioner argues that "[a] POSA would have been motivated in view of Grey to operate the dynamic aspiration system of Teigen in a manner that maintains 'a non-zero suction force' to prevent forward flow of liquid at a distal end of the liquid column in order [to] reduce the risk of a clot travelling distally, as taught in Grey." Pet. 40. On the current record, we are persuaded by the testimony of Dr. Finol that a POSA "would understand that a 'double-closed' state would fluidically disconnect the vacuum source such that the 'positive pressure pulse' to produce 'positive pressure at the distal end' during the subsequent open state

of the vent valve would eliminate the 'non-zero suction force at all times in the catheter.'" Ex. 2001 ¶ 162.

In view of the foregoing, on the current record, we are somewhat skeptical as to whether a POSA would have combined the disclosures of Teigen and Grey to implement a "double-closed" state as recited in claims 4–6 and 9–13 of the '253 patent. Pursuant to *SAS* and *PGS*, however, when instituting on the basis that Petitioner has demonstrated a reasonable likelihood with respect to at least one challenged claim, we must institute on all claims and all grounds challenged in the Petition. *See SAS*, 138 S. Ct. at 1359–60; *PGS*, 891 F.3d at 1360. Thus, this issue will be resolved on a complete trial record.

*d.* Claim 14

Petitioner, with supporting testimony from Mr. Brown, provides evidence as to where Teigen and Grey disclose the limitations of claim 14 of the '253 patent. Pet. 59–64. Dependent claim 14 is shown below:

> 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.

Ex. 1001, 58:15–22. Patent Owner contends that Petitioner fails to establish that Teigen in combination with Grey renders claim 14 obvious. Prelim. Resp. 57–61. We review the parties' positions below.

*(1) Petitioner's Position*

First, Petitioner asserts that Teigen discloses "spaced-apart" pressure sensors and it would have been obvious to a POSA to properly situate the pressure sensors disclosed in Teigen to monitor the change of the level of vacuum near the distal end of the catheter. *Id.* at 60 (citing Ex. 1005 ¶¶ 215, 217; Ex. 1007, 11:3–12:11; Ex. 1008 ¶¶ 57–60; Ex. 1009 ¶¶ 59–62; Ex. 1023 ¶¶ 17–20). Petitioner also contends that Grey discloses that "the realized pressure differential (i.e. the magnitude of the difference between the maximum and minimum pressure achieved at the catheter tip) may be ***between 0 and -100 inHg***", or "[i]n some embodiments... ***between -5 and -20 inHg***." *Id.* (citing Ex. 1010, 13:4–11). According to Petitioner, these disclosed pressures at the distal end overlap the claimed range of "greater than approximately [15]/[20]/[25] inHg" of "the change in the level of vacuum at the distal end" and a POSA would have recognized the pressure differential is a result effective variable for safe and efficient thrombus extraction. *Id.* at 60–61 (citing Ex. 1005 ¶ 219; Ex. 1010, 10:32–37; Ex. 1023 ¶ 20).

Regarding time, Petitioner cites to Grey's disclosure of using "[d]ifferent frequencies of cyclic aspiration…to improve clot clearance" and that "[f]or some embodiments higher frequencies are more effective, particularly frequencies above 1 Hz…frequencies may be at least 10 Hz and . . . frequencies may be at least 50 Hz." Pet. 61 (citing Ex. 1010,10:28–31). According to Petitioner and Mr. Brown, a POSA would have understood the aspiration frequency imposes an inherent limitation to the rate of change and, thus "the time for the change in the level of vacuum from

low to high or from high to low" must be shorter than the aspiration period, e.g., "no greater than 20 ms." *Id.* at 62 (citing Ex. 1005 ¶ 220).

*(2) Patent Owner's Position*

Patent Owner contends that, instead of establishing that the combination of Teigen and Grey teaches the recited combination of a change in vacuum pressure differential over time, Petitioner only addresses each aspect in isolation. Prelim. Resp. 57. Specifically, Patent Owner argues that Grey does not relate the disclosed general pressure differentials to timing. *Id.* at 58–59. Further, according to Patent Owner, "Grey explicitly teaches that the pressure differential decreases with increasing frequency such that at 50 Hz or even 10 Hz the pressure differential would be less than 15 inHg." *Id.* at 59 (citing Ex. 2001 ¶¶ 165–69). Patent Owner contends that Example 1 is the only disclosure in Grey that explicitly describes combinations of vacuum pressure differentials together with frequency (i.e., time) in cyclic aspiration; however, in this example, the vacuum pressure differentials decreased as the frequency increased, such that at the 6.3 Hz maximum frequency, the pressure differentials decreased to only -13.9 inHg. *Id.* at 60–11 (citing Ex. 1010, 22:6–25:4; Ex. 2001 ¶¶ 166–167). Thus, according to Patent Owner and Dr. Finol, "when Grey discloses the combination of vacuum pressure differentials over time, even at the maximum frequency of 6.3 Hz tested in Grey, the disclosed pressure differential (-13.9 inHg) is less than the lowest claimed pressure differential (i.e., at least -15 inHg)." *Id.* at 61 (citing Ex. 2001 ¶ 167).

*(3) Analysis*

On the current record, we agree with Patent Owner that Petitioner does not sufficiently relate the pressure differentials to the timing in Grey. We also credit the testimony of Dr. Finol that Grey "teaches that increasing the frequency decreases the vacuum differential" such that "a POSITA would understand that increasing the frequency of Grey to 10 Hz or 50 Hz would result in changes in the level of vacuum far less than the -13.9 inHg that Grey achieved at only 6.3 Hz." Ex. 2001 ¶ 168. We further credit Dr. Finol's testimony that Grey's disclosures of frequencies of 10 Hz and 50 Hz would not be used in combination with a change in vacuum of -15/-20/-50 inHg [sic] as recited in claim 14. *Id.* at ¶ 169.

In view of the foregoing, on the current record, we are somewhat skeptical as to whether a POSA would have combined the disclosures of Teigen and Grey to arrive at the combinations of pressure differential and time recited in claim 14 of the '253 patent. Pursuant to *SAS* and *PGS*, however, when instituting on the basis that Petitioner has demonstrated a reasonable likelihood with respect to at least one challenged claim, we must institute on all claims and all grounds challenged in the Petition. *See SAS*, 138 S. Ct. at 1359–60; *PGS*, 891 F.3d at 1360. Thus, this issue will be resolved on a complete trial record.

*B. Asserted Obviousness of Claims 4–6 and 9–13 over Teigen in view of Grey and Rubenstein*

Petitioner contends that the subject matter of claims 4–6 and 9–13 of the '253 patent are obvious over the disclosure of Teigen in view of Grey

and Rubenstein. Pet. 68–74. Patent Owner disputes Petitioner's contentions. Prelim. Resp. 50–57.

*1. Rubenstein (Ex. 1011)*

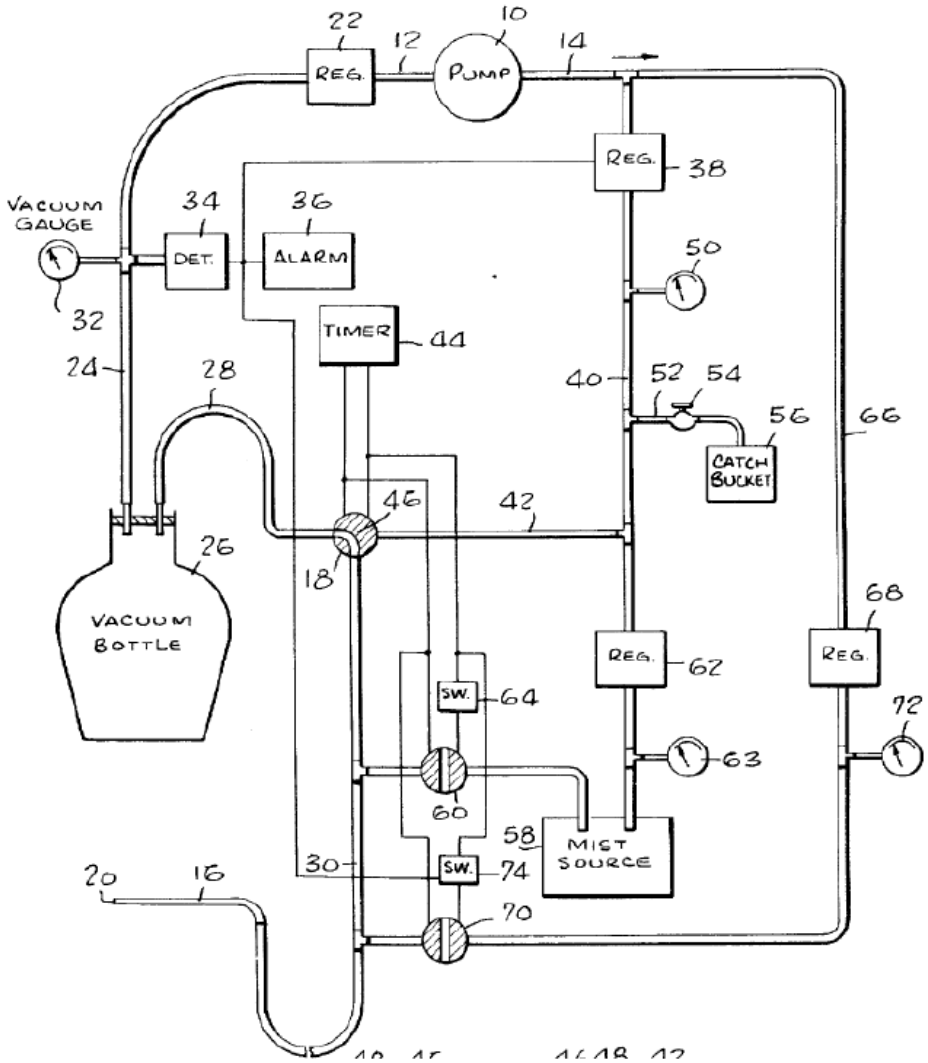
Rubenstein, titled "Pumping System for Catheter Suction Units," discloses an "improved pumping system for use with catheter suction units" "for drawing fluids and other viscous materials from a body" during medical procedures. Ex. 1011, codes (54), (57), 1:7–14. Rubenstein discloses applying cyclical reversals of positive and negative pressure to create a "self-cleaning" catheter. *Id.* at 1:10–14, 1:64–68. Rubenstein also discloses using "a time-controlled valve which is operated at predetermined time intervals to have suction through the catheter interrupted by a predetermined period of positive pressure to cause a reversal of fluid flow therethrough." *Id.* at 2:1–8.

Rubenstein issued on May 11, 1976, and Petitioner contends that it qualifies as prior art at least under §102(a)(1) because it was patented prior to the effective filing date of the '253 Patent. Ex. 1011, code (45); Pet. 20. Patent Owner does not contest that Rubenstein is prior art to the '253 patent.

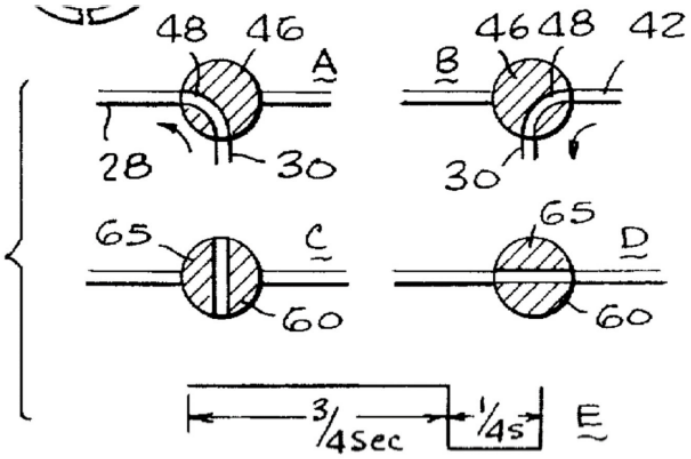
*2. Petitioner's Position*

As discussed above, Petitioner contends that Teigen in view of Grey discloses or renders obvious a "double-closed state" in which the vacuum valve is closed, and the vent valve is closed. Petitioner also contends that Rubenstein further discloses and renders this limitation obvious. Pet. 70 (citing Ex. 1005 ¶¶ 252–261).

Petitioner discusses figures 1 and 2 of Rubenstein shown below in asserting that Rubenstein discloses a double-closed state.




Ex. 1011, Fig. 1. Figure 1 of Rubenstein shown above is a schematic functional block diagram illustrating a pumping system for catheter suction units. *Id.* at 2: 15–16.




*Id.*, Fig. 2. Figure 2 of Rubenstein shown above is a series of graphic diagrams that illustrate the different possible positions of the movable plugs of the pumping system for catheter suction units. *Id.* at 2:18, 3:26–31, 4:19–21.

Petitioner contends that a POSA would have understood the mist source valve (60) and the suction valves (18) to be a vent valve and vacuum valve, respectively. Pet. 73 (citing Ex. 1005 ¶ 257). Petitioner also asserts that a POSA would have understood that the time it would take to rotate the movable plugs within the valves would not be instantaneous and there would, therefore, be a period when both valves are closed during the rotation of the plugs as the system transitions from its suction to blowing modes. *Id.* (citing Ex. 1005 ¶ 259). According to Petitioner, "a POSA would have found it an obvious design choice, when implementing the combination of Teigen and Grey, to use the controllable valves operated in the sequence described in Rubenstein to accomplish the dynamic aspiration taught by Teigen and Grey including 'the pre-determined pattern including a time

period where both the vent and vacuum valves are closed.'" *Id.* at 73–74 (citing Ex. 1005 ¶ 260).

*3. Patent Owner's Position*

Patent Owner contends that Rubenstein is non-analogous art and that Petitioner did not provide an adequate motivation to combine Teigen and Grey with Rubenstein. Prelim. Resp. 50–52, 56–57. Patent Owner also asserts that Rubenstein does not disclose a double-closed state because "Rubenstein does not disclose a state in which valve 18 **and** valve 60 is also closed," because valve 18 is always open in Rubenstein's system. *Id.* at 53, 55.

*4. Analysis*

On the current record, we agree with Patent Owner that Rubenstein does not appear to disclose a double-closed state.[15] We credit the testimony of Dr. Finol that, "for Petitioner's argument to stand, the alleged 'double-closed' state would require the mist valve 60 to be closed (as shown in Diagram C) to fluidically disconnect the positive pressure outlet 14 from the catheter 16 and the rotary valve 18/46 to be positioned to fluidically disconnect the vacuum source from the catheter 16 (as shown in Diagram 'B')." Ex. 2001 ¶ 182. We further credit Dr. Finol's opinion that

[15] We also note that, on the current record, we find that Rubenstein is analogous art because, even, assuming arguendo, that it is not in the same field of endeavor as the '253 patent, it is at least reasonably pertinent to the particular problem with which the inventor is involved because it describes issues with clogged catheters and using alternative cycling of negative and positive pressure to overcome these problems. Ex. 1011, 1:10–14, 1:26–27, 1:64–68; *In re Deminski*, 796 F.2d 436, 442 (Fed. Cir. 1986).

"[h]owever, in the position shown in Diagram 'B,' the rotary valve 18/46 fluidically connects the positive pressure outlet 14 catheter 16 such that even when valve 60 is closed and the vacuum source is fluidically disconnected from the catheter 16, positive pressure fluid still flows to the catheter 16." *Id.* at ¶¶ 177–178, 181. Therefore, it does not appear that Rubenstein discloses a system in which the vacuum valve and the vent valve are both closed.

In view of the foregoing, on the current record, we are somewhat skeptical as to whether a POSA would have combined the disclosures of Teigen, Grey, and Rubenstein to implement a "double-closed" state as recited in claims 4–6 and 9–13 of the '253 patent. Pursuant to *SAS* and *PGS*, however, when instituting on the basis that Petitioner has demonstrated a reasonable likelihood with respect to at least one challenged claim, we must institute on all claims and all grounds challenged in the Petition. *See SAS*, 138 S. Ct. at 1359–60; *PGS*, 891 F.3d at 1360. Thus, this issue will be resolved on a complete trial record.

### *C. Asserted Obviousness of Claims 15 and 16 over Teigen in view of Grey and Yang*

Petitioner contends that the subject matter of claims 15 and 16 of the '253 patent are obvious over the disclosures of Teigen in view of Grey and Yang. Pet. 74–78. At this time, Patent Owner does not make any arguments specific to this ground. *See* Prelim. Resp.

#### *1. Yang (Ex. 1012)*

Yang, titled "Telescoping Neurovascular Catheter with Active Distal Tip," is directed to a telescoping catheter for "distal neurovascular aspiration

or access" including a control for advancing the distal section into the patient's vasculature. Ex 1012, codes (54), (57), Figs. 1, 3A, 3B. The catheter can connect to "a controller for applying intermittent vacuum to the lumen" using combinations of vacuum pulses and "spaces of neutral pressure," higher negative pressure or lower negative pressure. *Id.* ¶ 14, Figs. 14, 25A–C. Yang also discloses ranges of catheter inner diameters. *Id.* ¶ 68.

Yang was published on August 4, 2017, and Petitioner contends that it qualifies as prior art at least under §102(a)(1) because it was published prior to the effective filing date of the '253 Patent. Ex. 1012, code (43); Pet. 21. Patent Owner does not contest that Yang is prior art to the '253 patent.

*2. Petitioner's Position*

As discussed above, Petitioner contends that Teigen in view of Grey discloses or renders obvious claim 1 of the '253 patent. Petitioner also contends that the disclosure of Teigen in view of Grey and Yang renders the limitations of dependent claims 15 and 16 obvious. Pet. 74–78.

Limitation 15[a] recites the system of claim 1, wherein "the lumen has a diameter of between approximately 0.038" and approximately 0.106"." Ex. 1001, 58:23–25. Petitioner contends that Yang discloses the inner diameter of the distal section of the catheter to be "between about 0.030 inches and about 0.112 inches," which renders this limitation obvious. Pet. 77 (citing Ex. 1012 ¶ 68; Ex. 1005 ¶¶ 281–282; Ex. 1023 ¶¶ 13–14). Limitation 15[b] recites that "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." Ex. 1001,

58:26–29. Petitioner asserts that Teigen in view of Grey and Yang render this limitation obvious for the same reasons provided for claim 12 of Ground 1. Pet. 77 (citing Pet. 58–59; Ex. 1005 ¶¶ 283–284).

Limitation 16[a] of claim 16 recites the system of claim 1, wherein "the lumen has an internal diameter of between approximately 0.068" and approximately 0.088"." Ex. 1001, 58:30–32. Petitioner contends that Yang discloses catheter lumen internal diameters between 0.030 inches and 0.112 inches, which overlaps with and renders obvious the claimed range. Pet. 77 (citing Ex. 1005 ¶¶ 285–287; Ex. 1023 ¶¶ 13–14). Limitation 16[b] recites that "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." Ex. 1001, 58:33–36. Petitioner asserts that Teigen in view of Grey and Yang render this limitation obvious for the same reasons provided for claims 12 and 13 of Ground 1. Pet. 78 (citing Pet. 58–59; Ex. 1005 ¶ 288).

*3. Analysis*

As discussed above, we find that, on the current record, Petitioner has demonstrated a reasonable likelihood that the subject matter of claim 1 would have been obvious over the combined disclosures of Teigen and Grey. We also find, on the current record, that Petitioner has sufficiently shown that the limitations of claims 15 and 16 are rendered obvious by the combined disclosures of Teigen, Grey, and Yang.

On this record, and upon review of Petitioner's arguments and supporting evidence, we determine that Petitioner sufficiently explains why a POSA would have found it obvious when implementing the combination

of Teigen and Grey to select catheters with internal diameters as taught in Yang. *See* Pet. 74–78. Accordingly, Petitioner has demonstrated a reasonable likelihood that the subject matter of claims 15 and 16 would have been obvious over the combined disclosures of Teigen, Grey, and Yang.

### *D. Asserted Obviousness of Claim 20 over Teigen in view of Grey and Matteo*

Petitioner contends that the subject matter of claim 20 of the '253 patent is obvious over the disclosures of Teigen in view of Grey and Matteo. Pet. 78–84. At this time, Patent Owner does not make any arguments specific to this ground. *See* Prelim. Resp.

#### *1. Matteo (Ex. 1013)*

Matteo, titled "Multi-Function Eccentrically Actuated Microvalves and Micropumps," is directed to a microfluidics system with "one cylindrical cam controlling several actuator balls and several microvalves" for use in various chemical, biological, and biomedical applications, including "medical and scientific instrumentation." Ex. 1013, codes (65), (57), ¶¶ 6, 12, 29, Figs. 11, 12. Matteo discloses that "[c]am-driven pinch-style microvalves are useful for serving as on/off valve devices for a microfluidic system." *Id.* ¶ 10. Matteo teaches that "a cam-driven actuator activates a microvalve by pressing on the elastomeric layer, deforming the elastomeric layer so that it meets a second layer at a location within the channel, thereby either partially or completely obstructing the flow of liquid through the channel at that location, i.e. 'pinching' the channel." *Id.* at code (57).

Matteo was published on June 7, 2012 and Petitioner contends that it qualifies as prior art at least under §102(a)(1) because it was published prior to the effective filing date of the '253 Patent. Ex. 1013, 1; Pet. 21. Patent Owner does not contest that Matteo is prior art to the '253 patent.

*2. Petitioner's Position*

As discussed above, Petitioner contends that Teigen in view of Grey discloses or renders obvious claim 1 of the '253 patent. Petitioner also contends that the disclosure of Teigen in view of Grey and Matteo renders the limitations of dependent claim 20 obvious. Pet. 78–84.

Claim 20 recites "[t]he system of 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." Ex. 1001, 58:50–53. Petitioner contends that Matteo teaches that "a single cam, controlled by ***a single position-control mechanism, is able to control multiple microvalves***." Pet. 83 (citing Ex. 1013, code (57), ¶¶ 10, 11, Figs. 11, 12). According to Petitioner, "[a] POSA would have understood that disclosures of the 'single cam, controlled by a single position-control mechanism' in Matteo to be a shaft with mounted valves because the cam disclosed in Matteo is used to move the cam actuators in and out of position to open and close their respective valves." *Id.* Petitioner, with supporting testimony from Mr. Brown concludes that, "[i]t would have been obvious for a POSA and required no undue experimentation to implement the valve operations and controls taught by Teigen and Grey with the cam-driven valves disclosed in Matteo to achieve the desired dynamic aspiration." *Id.* at 83–84 (citing Ex. 1005 ¶ 302).

*3. Analysis*

As discussed above, we find that, on the current record, Petitioner has demonstrated a reasonable likelihood that the subject matter of claim 1 would have been obvious over the combined disclosures of Teigen and Grey. We also find, on the current record, that Petitioner has sufficiently shown that the limitations of claim 20 are rendered obvious by the combined disclosures of Teigen, Grey, and Matteo.

On this record, and upon review of Petitioner's arguments and supporting evidence, we determine that Petitioner sufficiently explains why a POSA would have found it an obvious design choice, when implementing the valve operations and controls of Teigen and Grey, to use the cam-driven valves disclosed in Matteo. *See* Pet. 78–84. Accordingly, Petitioner has demonstrated a reasonable likelihood that the subject matter of claim 20 would have been obvious over the combined disclosures of Teigen, Grey, and Matteo.

## IV. CONCLUSION

For the forgoing reasons, Petitioner has demonstrated a reasonable likelihood that at least one challenged claim of the '253 patent would have been obvious over the prior art of record. Accordingly, we institute an *inter partes* review on all claims and all grounds set forth in the Petition.

## V. ORDER

It is hereby:

ORDERED that, pursuant to 35 U.S.C. § 314, an *inter partes* review is instituted on all claims and all grounds set forth in the Petition; and

FURTHER ORDERED that, pursuant to 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4, *inter partes* review of the '253 patent shall commence on the entry date of this Order, and notice is hereby given of the institution of a trial.

For PETITIONER:

Eliot Williams
Jeremy Taylor
Frank Zhu
BAKER BOTTS L.L.P.
eliot.williams@bakerbotts.com
jeremy.taylor@bakerbotts.com
frank.zhu@bakerbotts.com

For PATENT OWNER:

Lori Gordon
Paul Parker
PERKINS COIE LLP
gordon-ptab@perkinscoie.com
parker-ptab@perkinscoie.com