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Paper 21
Entered: June 18, 2018

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

AGILENT TECHNOLOGIES, INC.,
Petitioner,

v.

THERMO FISHER SCIENTIFIC INC. and
THERMO FISHER SCIENTIFIC (BREMEN) GMBH,
Patent Owner.

Case IPR2018-00299
Patent 7,230,232 B2

Before MICHAEL R. ZECHER, JOHN F. HORVATH, and DANIEL J. GALLIGAN, *Administrative Patent Judges*.

GALLIGAN, *Administrative Patent Judge.*

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

I. INTRODUCTION

Agilent Technologies, Inc. ("Petitioner") filed a Petition requesting *inter partes* review of claims 1–34 of U.S. Patent No. 7,230,232 B2 ("the '232 patent," Ex. 1001). Paper 1 ("Pet."). Thermo Fisher Scientific Inc. and Thermo Fisher Scientific (Bremen) GmbH (collectively, "Patent Owner") filed a Preliminary Response. Paper 11 ("Prelim. Resp."). Pursuant to 37 C.F.R. § 42.4(a), we have authority to determine whether to institute review.

The standard for instituting an *inter partes* review is set forth in 35 U.S.C. § 314(a), which provides that an *inter partes* review may not be instituted unless the information presented in the Petition and the Preliminary Response shows "there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition."

After considering the Petition, the Preliminary Response, and associated evidence, we institute an *inter partes* review as to claims 1–34 of the '232 patent.

A. Related Matters

Petitioner and Patent Owner cite the following judicial matter involving the '232 patent: *Thermo Fisher Scientific Inc. and Thermo Fisher Scientific (Bremen) GmbH v. Agilent Technologies, Inc.*, No. 1:17-cv-00600 (D. Del.). Pet. 1 (citing Ex. 1005); Paper 4, 2. In addition to this Petition, Petitioner filed three other petitions challenging the patentability of claims in the following two patents owned by Patent Owner: (1) U.S. Patent No. RE45,553 E (Case IPR2018-00297); and (2) U.S. Patent No. RE45,386 E (Cases IPR2018-00298 and IPR2018-00313). Pet. 1.

B. The ’232 Patent and Illustrative Claim

The ’232 patent generally relates to mass spectrometry and, in particular, is directed to removing unwanted ions from an ion beam. Ex. 1001, [57], 1:12–19. Figure 2 of the ’232 patent is reproduced below.

Fig.2.

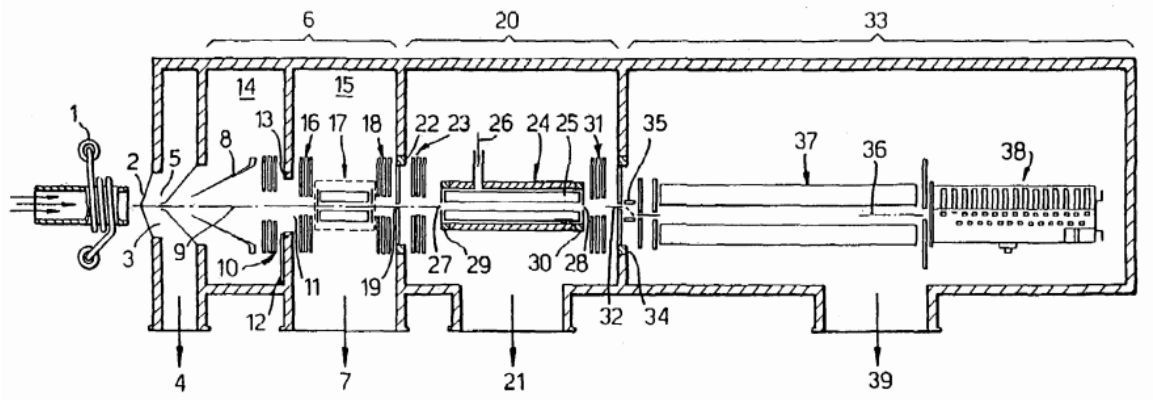

Figure 2 shows a mass spectrometer having inductively-coupled plasma (ICP) ion source 1, which generates ions that pass through aperture 2 into expansion chamber 3. Ex. 1001, 6:26–31. Figure 2 further illustrates ion optical device 17, which “assists in containing the ion beam” but does not confine the flow of neutral gas from the plasma. *Id.* at 7:7–15. According to the ’232 patent, “[d]evice 17 may be a quadrupole, a higher order multipole, an ion guide or an ion lens.” *Id.* at 7:16–17. After passing through ion optical device 17, the ion beam is focused through lenses 18 and 23 and enters collision cell 24, which is pressurized with a target gas chosen to remove unwanted ions. *Id.* at 7:22–55. Figure 2 also depicts “quadrupole mass filter 37, which is used to mass analyse the ion beam.” *Id.* at 8:12–15.

Claim 1, reproduced below, is directed to a mass spectrometer having certain of the structures illustrated in Figure 2. Independent claim 23 recites a method of operating a mass spectrometer.

> 1. A mass spectrometer, comprising:
>
> an ion source for generating an ion beam from a sample introduced into a plasma, the beam containing unwanted gas components and artifact ions;
>
> a collision cell within an evacuation chamber, the collision cell being disposed to receive at least a portion of the ion beam from the ion source and arranged to be pressurized with a target gas for removing unwanted artifact ions from the ion beam in the collision cell;
>
> an ion optical device configured upstream of the collision cell to reduce gas loading from the ion source on the collision cell; and
>
> a mass-to-charge ratio analyzer disposed within an analyzing chamber and arranged to receive at least a portion of the ion beam from the collision cell and to mass analyze the received ion beam to produce a mass spectrum of the received ion beam.

C. References

Petitioner relies upon the following references:

Tanner	US 6,140,638	Oct. 31, 2000 (filed May 29, 1998)	Ex. 1036
Speakman	US 6,222,185 B1	Apr. 24, 2001 (filed May 30, 1997)	Ex. 1024
I. Terzić & D. Ćirić, *The double cylindrical electrostatic sector as an ion energy analyzer*, *Nuclear Instruments and Methods* 166, no. 3 (1979): 419–423 ("Terzic")			Ex. 1039
Richard A. Yost & Dean D. Fetterolf, *Tandem mass spectrometry (MS/MS) instrumentation*, *Mass Spectrometry Reviews*, no. 2 (1983): 1–45 ("Yost")			Ex. 1015

Yoko Kishi, *A benchtop inductively coupled plasma mass spectrometer*, Hewlett-Packard Journal 48 (1997): 72–79 ("Kishi")	Ex. 1034
F.L. King & W.W. Harrison, *Collision-Induced Dissociation of Polyatomic Ions in Glow Discharge Mass Spectrometry*, Int'l Journal of Mass Spectrometry and Ion Processes (1989), vol. 89, pp. 171–185 ("King")	Ex. 1037
F.L. King & W. W. Harrison, *Glow discharge mass spectrometry: An introduction to the technique and its utility*, Mass Spectrometry Reviews , no. 9 (1990): 285–317 ("King II")	Ex. 1028
Patrick Turner et al., *Instrumentation For Low and High-Resolution ICP/MS*, Inductively Coupled Plasma Mass Spectrometry, Publication Wiley-VCH, edited by A. Montaser (1998), pp. 421–501 ("Turner")	Ex. 1038

D. Asserted Grounds of Unpatentability

Petitioner asserts claims 1–34 of the '232 patent are unpatentable based on the grounds set forth in the table below.

Reference(s)	**Basis**	**Claims**
Speakman	§ 102(e)	1–3, 6–12, and 16–34
Speakman, King, and King II	§ 103(a)	1–3, 5–12, and 16–34
Speakman and Yost	§ 103(a)	4 and 14
Speakman and Terzic	§ 103(a)	13 and 15
Tanner	§ 102(e)	1–3, 5–7, 17–20, 23, 24, 27, 29, and 34
Tanner and Kishi	§ 103(a)	1–3, 5–13, and 16–34

II. ANALYSIS

A. Claim Construction

Neither party proposes express constructions for any claim terms. For purposes of this Decision, we do not find it necessary to construe expressly any claim terms. *See, e.g.*, *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) ("[W]e need only construe terms 'that are in controversy, and only to the extent necessary to resolve the controversy' . . . ." (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999))).

B. Principles of Law

To establish anticipation, each and every element in a claim, arranged as recited in the claim, must be found in a single prior art reference. *Net MoneyIN, Inc. v. VeriSign, Inc.*, 545 F.3d 1359, 1371 (Fed. Cir. 2008). While the elements must be arranged or combined in the same way as in the claim, "the reference need not satisfy an *ipsissimis verbis* test," i.e., identity of terminology is not required. *In re Gleave*, 560 F.3d 1331, 1334 (Fed. Cir. 2009) (citing *In re Bond*, 910 F.2d 831, 832–33 (Fed. Cir. 1990)).

A patent claim is unpatentable under 35 U.S.C. § 103(a) if the differences between the claimed subject matter 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 ordinary skill in the art;[1] and (4) any secondary considerations, if in evidence.[2] *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

C. Alleged Anticipation by Speakman (Claims 1–3, 6–12, and 16–34)

Petitioner contends claims 1–3, 6–12, and 16–34 of the '232 patent are unpatentable under 35 U.S.C. § 102(e) as anticipated by Speakman. Pet. 4, 26–41. For purposes of determining whether to institute, we focus on Petitioner's contentions with respect to claim 1 in this ground.

1. Speakman

Like the '232 patent, Speakman is directed to plasma mass spectrometry. Ex. 1024, [57], 1:3–6. Figure 1 of Speakman is reproduced below.

[1] Relying on the testimony of Dr. Richard Yost, Petitioner offers an assessment as to the level of skill in the art as of September 1998, which is the earliest priority date on the face of the '232 patent. Pet. 5 (citing Ex. 1004 ¶¶ 20–22). Patent Owner's assessment is different from Petitioner's assessment insofar as it requires one of ordinary skill in the art to have *approximately* two to three years of experience—not *at least* two to three years of experience, as urged by Petitioner. Prelim. Resp. 3 n.2. To the extent necessary, and for purposes of this Decision, we accept the assessment offered by Petitioner with Patent Owner's qualification of "approximately two to three years of experience" because it is consistent with the '232 patent, the asserted prior art, and the evidence of record. *See* Ex. 1004 ¶ 23.

[2] Patent Owner does not present arguments or evidence of such secondary considerations in the Preliminary Response. *See* Prelim. Resp. 62 ("Patent Owner reserves its right to present evidence of objective indicia of non-obviousness of any claims on which trial is instituted.").

FIG. 1

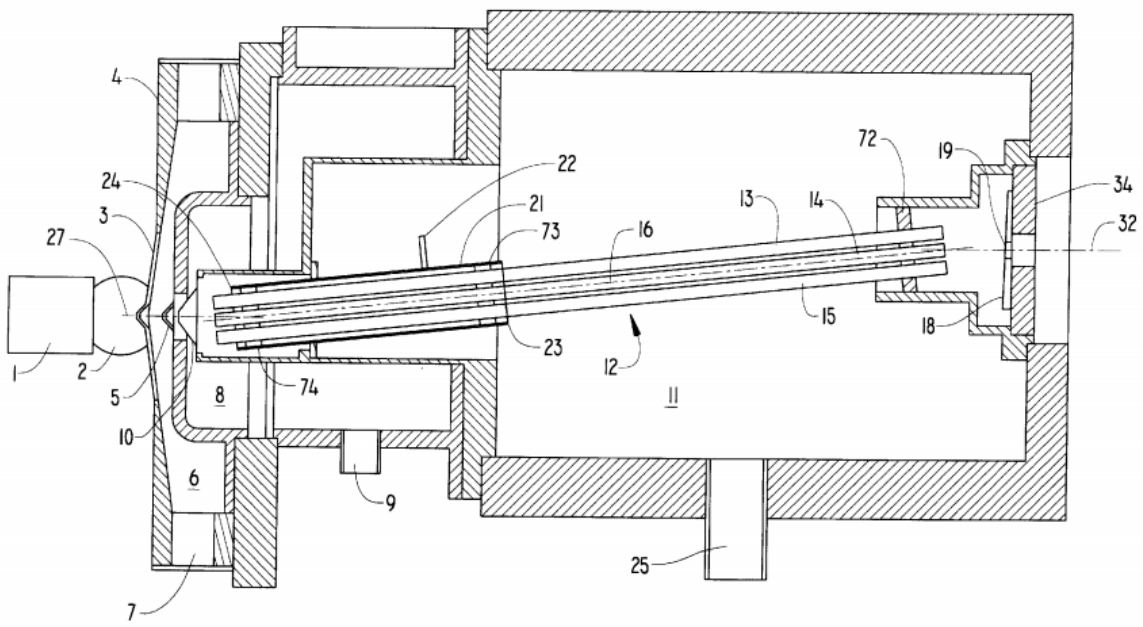

Figure 1 illustrates the interface and ion guiding regions of Speakman's mass spectrometer, including plasma torch 1, which generates plasma 2. Ex. 1024, 8:25–26, 8:42–44. Also depicted are electrostatic lens element 10, evacuated chamber 11, and hexapole ion guide 12, partially enclosed in tube 21. *Id.* at 8:59–9:3. In addition, Figures 3–6 depict various configurations for mass analyzers for use with the interface and ion guiding region of Figure 1. *Id.* at 8:27–41.

2. Independent Claim 1

a. "Ion source"

Independent claim 1 is reproduced above and is directed to "[a] mass spectrometer" having "an ion source for generating an ion beam from a sample introduced into a plasma, the beam containing unwanted gas components and artifact ions." Petitioner contends Speakman's plasma torch 1, which generates plasma 2, as depicted in Figure 1, describes the

claimed "ion source." Pet. 27–28 (citing Ex. 1024, 1:3–6, 1:14–20, 8:25–26, 8:42–47, 9:30, Fig. 1; Ex. 1004 ¶¶ 64–66); *see* Ex. 1024, 8:42–47 ("[A] spectrometer according to the invention comprises a plasma torch 1 which generates a plasma 2. Energy for generating the plasma is inductively coupled from RF [(radio frequency)] current flowing in a coil (not shown) surrounding the torch 1, as in a conventional ICP [(inductively-coupled plasma)] mass spectrometer."). Petitioner contends that "neutral particles from the plasma" describe the claimed "unwanted gas components" and that various ions, including Ar^+, Ar^{++}, ArH^+, and ArN^+, describe the claimed "artifact ions." Pet. 28 (citing Ex. 1024, 1:14–20, 9:30, Ex. 1004 ¶¶ 65–66).

Patent Owner argues "Petitioner cites no evidence to suggest that the [person of ordinary skill in the art], at the time of the invention, would have concluded that the neutral particles disclosed in Speakman posed a problem and were therefore unwanted." Prelim. Resp. 29 (emphasis omitted). We disagree. Petitioner's declarant, Dr. Yost, testifies:

> A [person of ordinary skill in the art] would have understood that when a sample is introduced into the plasma, the plasma generates ions from the atoms and molecules in the sample. The generated ions are comprised of analyte ions of interest, as well as unwanted artefact ions from the plasma gas, the vacuum gas, and the sample matrix. Moreover, the beam contains neutral gas components primarily from the plasma gas.

Ex. 1004 ¶ 65. This testimony is evidence that there are ions "of interest" in the ion beam and also other ions and neutral gas components, which would be unwanted if they are not of interest. Indeed, Speakman further discloses, in reference to Figure 3, that "[t]he entrance axis 32 of the mass filter 29 is inclined to the second axis 16 of the ion guiding means 12, as shown in the figure, in order to *further reduce the transmission of neutral particles from*

the plasma 2 into the filter 29." Ex. 1024, 9:27–31 (emphasis added). Speakman, therefore, seeks to reduce the transmission of these neutral particles, presumably because they are unwanted.

We further note that, although claim 1 recites that the ion beam contains "unwanted gas components," the claim does not recite any particular structure for dealing with these components. Claim 1, in fact, does not use the term "unwanted gas components" again. The '232 patent does not describe a new ion source that uniquely has a problem of generating unwanted gas components; rather, the ion source depicted in Figure 2 of the '232 patent is described as an "inductively-coupled plasma (ICP) ion source 1 . . . of conventional design." Ex. 1001, 6:7–9; *see also id.* at 6:26–29 ("FIG. 2 shows an embodiment of the present invention in which parts corresponding to those shown in FIG. 1 are numbered accordingly. As in the prior art, the ICP ion source 1 generates ions . . . .").

Patent Owner further argues that "[t]he inventor's appreciation of that problem [of neutral gas particles] is what gave rise to the '232 patent." Prelim. Resp. 29 (citing *Leo Pharm. Prod., Ltd. v. Rea*, 726 F.3d 1346, 1353 (Fed. Cir. 2013)). In *Leo*, the U.S. Court of Appeals for the Federal Circuit noted that the inventors "recognized *and solved* a problem with the storage stability of certain formulations—a problem that the prior art did not recognize and a problem that was not solved for over a decade." *Leo Pharm.*, 726 F.3d at 1353 (emphasis added).

Claim 1, however, does not appear to recite any structure that solves the problem Patent Owner argues was first identified by the inventor of the '232 patent. Rather, it recites a conventional ion source and purportedly recognizes that such ion sources generate unwanted gas components.

Furthermore, all of the various recited structures in claim 1—"ion source," "collision cell within an evacuation chamber," "ion optical device configured upstream of the collision cell," and "mass-to-charge ratio analyzer," which are described in the embodiment of Figure 2, are also described as part of the "prior art mass spectrometer" of Figure 1 with the same reference numerals referring to the same parts in both. Ex. 1001, 6:26–28 ("FIG. 2 shows an embodiment of the present invention in which parts corresponding to those shown in FIG. 1 are numbered accordingly."); *see id.* at 6:7–25 ("The inductively-coupled plasma (ICP) ion source 1 is of conventional design . . . . Located in the evacuated chamber 60 is an ion optical device 17, in this case a lens stack, and a collision cell 24 having an entrance aperture 27 and an exit aperture 28. The collision cell 24 is a simple passive collision cell ie a chamber pressurised with target gas 26. On exiting the collision cell 24, the ion beam passes through aperture 32 into evacuated chamber 33 which contains a mass analyser 37.").

On this record, we are persuaded Petitioner has shown sufficiently for purposes of institution that Speakman describes "[a] mass spectrometer" having "an ion source for generating an ion beam from a sample introduced into a plasma, the beam containing unwanted gas components and artifact ions," as recited in claim 1.

b. "Collision cell"

Claim 1 further recites "a collision cell within an evacuation chamber, the collision cell being disposed to receive at least a portion of the ion beam from the ion source and arranged to be pressurized with a target gas for removing unwanted artifact ions from the ion beam in the collision cell." Referring to Figure 1, Petitioner contends Speakman discloses hexapole ion

guide 12 within evacuated chamber 11 and argues that "[t]he enclosed portion of the hexapole ion guide means serves as a collision cell into which an inert gas can be introduced through an inlet (22)." Pet. 28 (citing Ex. 1024, 8:66–9:14, 11:37–46, Fig. 1; Ex. 1004 ¶ 67). In particular, Speakman discloses:

> [T]he six rod electrodes exemplified at 13–15 are enclosed along the front portion of their length (about half the total length) by gas containment means comprising a tube 21 which contains the support insulators 73 and 74 for the rods themselves. An inert gas is introduced into the tube 21 via an inlet pipe 22 so that the pressure in the elongate space 17 in the centre of the rods is at least 10^{-3} torr.

Ex. 1024, 11:37–44. Speakman identifies helium, neon, argon, krypton, xenon, and nitrogen as examples of inert gases that can be introduced into the "ion guiding means." Ex. 1024, 4:10–15, *cited in* Pet. 28–29. Speakman further discloses that "the addition of 0.5% of xenon to a helium inert gas surprisingly has been found to further reduce the intensity of oxygenated molecular ions." Ex. 1024, 8:17–19, *cited in* Pet. 29. Based on this disclosure, Petitioner contends Speakman describes a collision cell that is pressurized with a target gas to remove unwanted artifact ions. Pet. 28–29.

On this record, we are persuaded Petitioner has shown sufficiently for purposes of institution that Speakman describes the subject matter recited in this limitation.

c. "Ion optical device"

Claim 1 further recites "an ion optical device configured upstream of the collision cell to reduce gas loading from the ion source on the collision cell." Petitioner contends Speakman's electrostatic lens 10 describes the claimed "ion optical device." Pet. 29–30 (citing Ex. 1024, 7:51–8:8, 8:59–

65; Ex. 1004 ¶¶ 69–73). Petitioner argues Speakman's electrostatic lens 10 "reduce[s] gas loading from the ion source on the collision cell," as recited in claim 1, "because it is an ion transmission-enhancing device and provides an additional vacuum pumping stage." Pet. 29 (citing Ex. 1004 ¶ 73). Petitioner contends that a person of ordinary skill in the art "would have understood that because the electrostatic lens does not confine the neutral gas components, the neutral gas components diverge at the lens, thereby reducing the amount of gas components in the beam." Pet. 30 (citing Ex. 1004 ¶¶ 70–72).

Patent Owner argues Petitioner has not identified any disclosure in Speakman describing that electrostatic lens 10 reduces gas loading on the collision cell, and Patent Owner contends, therefore, that "Petitioner appears to be asserting that the electrostatic lens in Speakman will ***inherently*** reduce gas loading." Prelim. Resp. 30. Patent Owner argues that Petitioner has not established that a reduction in gas loading is inherent and notes that, "[b]y definition, an electrostatic lens will not have any effect on neutral particles, because they have no charge." Prelim. Resp. 31.

As an initial matter, we disagree with Patent Owner's assertion that Petitioner is relying on inherency. Rather, Petitioner argues that a person of ordinary skill in the art would have understood Speakman's disclosure regarding electrostatic lens 10 to be describing the claimed "ion optical device." Pet. 29–30. "'[T]he dispositive question regarding anticipation [i]s whether *one skilled in the art* would reasonably understand or infer from the [prior art reference's] teaching' that every claim element was disclosed in that single reference." *Dayco Prods., Inc. v. Total Containment, Inc.*, 329 F.3d 1358, 1368 (Fed. Cir. 2003) (alterations in original) (quoting *In re*

Baxter Travenol Labs., 952 F.2d 388, 390 (Fed. Cir. 1991)); *see also Wasica Fin. GmbH v. Cont'l Auto. Sys., Inc.*, 853 F.3d 1272, 1284 (Fed. Cir. 2017) ("Anticipation is an inquiry viewed from the perspective of one skilled in the art.").

Furthermore, Patent Owner's assertion that Speakman's electrostatic lens 10 does not have any effect on particles that have no charge, such as neutral particles (Prelim. Resp. 30), appears to support, rather than undermine, Petitioner's contentions. In particular, Petitioner contends that Speakman's "electrostatic lens [10] does not confine the neutral gas components," such that "the neutral gas components diverge at the lens, thereby reducing the amount of gas components in the beam." Pet. 30. As we understand its contentions, therefore, Petitioner is asserting that Speakman's electrostatic lens 10 focuses ions but not neutral particles, such that the ions are transmitted with higher efficiency to the ion guiding means in evacuated chamber 11. Pet. 29–30 (citing Ex. 1024, 7:51–8:8, 8:59–65; Ex. 1004 ¶¶ 69–73). Speakman discloses that "[t]he lens electrode may also serve as a second diaphragm to define an additional evacuated chamber and therefore provide an additional stage of differential pumping between the nozzle-skimmer interface and the ion-guiding means." Ex. 1024, 7:59–63; *see also id.* at 8:61–63 (describing that "electrostatic lens element 10 . . . also serves to divide the evacuated region 8 from a first evacuated chamber 11"). Speakman's electrostatic lens 10, therefore, separates two vacuum chambers. If this lens does not act on neutral particles, as asserted by Patent Owner (Prelim. Resp. 31), then Petitioner's explanation that a person of ordinary skill in the art "would have understood that having an additional vacuum pumping stage further reduces the neutral gas

components from the beam" (Pet. 30) makes sense because particles not focused by the lens would be drawn out of the vacuum chamber by its evacuating pump, thereby reducing the gas transmitted to the ion guiding means (i.e., "collision cell") in the next evacuated chamber. Indeed, the use of electrostatic lenses and differential pumping of vacuum chambers separated by apertures appears to be one way in which the '232 patent discloses reducing gas loading on the collision cell. *See* Ex. 1001, 7:7–35.

On this record, we are persuaded Petitioner has shown sufficiently for purposes of institution that Speakman describes "an ion optical device configured upstream of the collision cell to reduce gas loading from the ion source on the collision cell," as recited in claim 1.

d. "Mass-to-charge ratio analyzer"

Claim 1 further recites "a mass-to-charge ratio analyzer disposed within an analyzing chamber and arranged to receive at least a portion of the ion beam from the collision cell and to mass analyze the received ion beam to produce a mass spectrum of the received ion beam." Petitioner contends Speakman discloses four different configurations for mass analyzers, each of which describes the claimed "mass-to-charge ratio analyzer." Pet. 30–31 (citing Ex. 1024, 9:22–11:36, Figs. 3–6; Ex. 1004 ¶¶ 74, 75). For example, Figure 3 of Speakman illustrates a quadrupole mass analyzer, Figure 4 illustrates a magnetic sector mass analyzer, and Figure 5 depicts a time-of-flight mass analyzer. Ex. 1024, 8:30–38, 9:22–11:24. At this stage of the proceeding, we are persuaded that each of these devices describes a mass-to-charge ratio analyzer within the meaning of claim 1 because the '232 patent states that "the mass-to-charge ratio analysing means includes a main mass

filter which preferably is an RF quadrupole, although a magnetic sector or a time-of-flight analyser may alternatively be employed." Ex. 1001, 4:61–64.

On this record, we are persuaded Petitioner has shown sufficiently for purposes of institution that Speakman describes "a mass-to-charge ratio analyzer disposed within an analyzing chamber and arranged to receive at least a portion of the ion beam from the collision cell and to mass analyze the received ion beam to produce a mass spectrum of the received ion beam," as recited in claim 1.

e. Threshold determination as to claim 1

Based on this preliminary record, Petitioner has demonstrated a reasonable likelihood that it would prevail in showing that Speakman anticipated claim 1.

D. Alleged Anticipation by Tanner
(Claims 1–3, 5–7, 17–20, 23, 24, 27, 29, and 34)

Petitioner contends claims 1–3, 5–7, 17–20, 23, 24, 27, 29, and 34 of the '232 patent are unpatentable under 35 U.S.C. § 102(e) as anticipated by Tanner. Pet. 4, 53–64. For purposes of determining whether to institute, we focus on Petitioner's contentions with respect to claim 1 in this ground.

1. Tanner

Tanner is directed to reducing interferences in mass spectrometry. Ex. 1036, [57], 1:9–14. Figure 1 of Tanner is reproduced below.

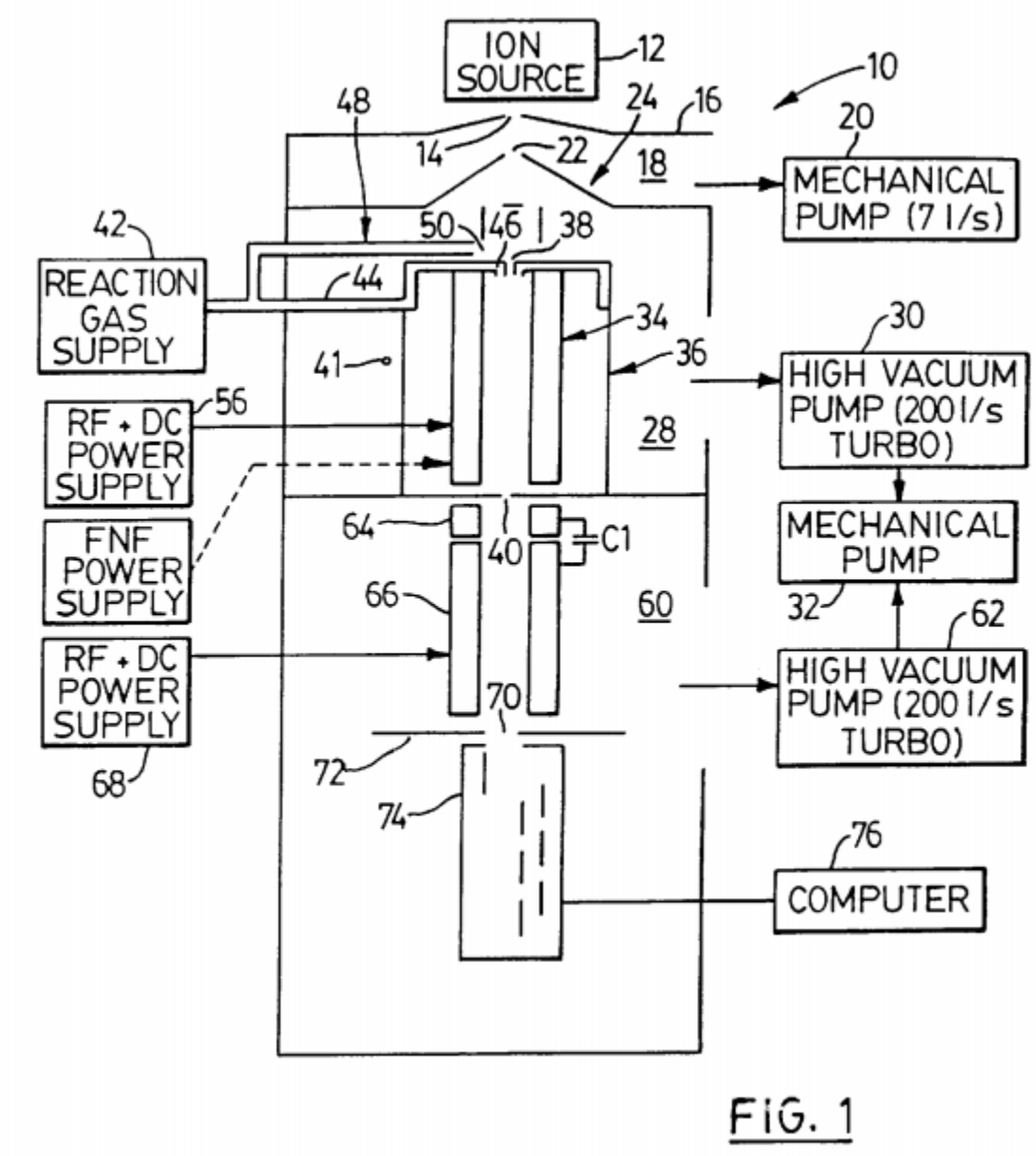

FIG. 1

Figure 1 illustrates mass spectrometer system 10 having "ion source 12, which will typically be a conventional inductively coupled plasma source, glow discharge source, or any other type of well-known ion source." Ex. 1036, 3:55–60. Tanner explains that ion source 12 injects ions through orifice 14 into first vacuum chamber 18 and that the ions then pass through orifice 22 and "through any desired conventional ion optics 26 in a second vacuum chamber 28." *Id.* at 3:60–67. Mass spectrometer 10 also has

quadrupole 34 within "can" 36, and Tanner explains that "[t]he combination of the quadrupole 34 and can 36 form what may be referred to as a collision cell 41." *Id.* at 4:5–8. Mass spectrometer 10 further has mass analyzer 66, "which is typically a quadrupole but may also be a different type of mass analyzer such as a time-of-flight mass spectrometer, a sector instrument, an ion trap, etc.)." *Id.* at 4:29–33.

2. Independent Claim 1

a. "Ion source"

Petitioner contends each of the mass spectrometers depicted in Figures 1 and 21 of Tanner describes the subject matter recited in independent claim 1. Pet. 53–59. For purpose of determining whether to institute, we analyze Petitioner's contentions as to Figure 1.

As discussed above, independent claim 1 recites, "an ion source for generating an ion beam from a sample introduced into a plasma, the beam containing unwanted gas components and artifact ions." Petitioner contends Tanner discloses that ion source 12 in mass spectrometer 10 of Figure 1 produces an ion beam having "neutral metastable species," which Petitioner contends describe the claimed "unwanted gas components," and also having artifact ions, such as Ar^+, ArH^+, ArO^+, and Ar_2^+. Pet. 56–57 (citing Ex. 1036, 1:52–55, 5:30–6:13, 7:28–39; Ex. 1004 ¶¶ 163–165). Tanner explains that, "[i]n mass analysis, non-spectral interferences are . . . commonly encountered" and "typically derive from neutral metastable species." Ex. 1036, 1:52–55. Tanner also explains that reactive gas introduced into the collision cell "dramatically reduce[s] the ion signals for Ar^+, ArH^+, and ArO^+." Ex. 1036, 5:50–56.

On this record, we are persuaded Petitioner has shown sufficiently for purposes of institution that Tanner describes "[a] mass spectrometer" having "an ion source for generating an ion beam from a sample introduced into a plasma, the beam containing unwanted gas components and artifact ions," as recited in claim 1.

b. "Collision cell"

Petitioner also contends Tanner describes "a collision cell within an evacuation chamber, the collision cell being disposed to receive at least a portion of the ion beam from the ion source and arranged to be pressurized with a target gas for removing unwanted artifact ions from the ion beam in the collision cell." Pet. 57 (citing Ex. 1036, 3:66–67, 4:5–8, 5:48–57, 5:62–6:13, 7:28–39, 11:63–64, Figs. 1 and 21; Ex. 1004 ¶¶ 166–167). In particular, Tanner discloses:

> Quadrupole 34 is contained in a "can" 36 having entrance and exit apertures 38, 40 for ions to enter and leave quadrupole 34. The combination of the quadrupole 34 and can 36 form what may be referred to as a collision cell 41. Reactive collision gas is supplied to the interior of can 36 from supply 42.

Ex. 1036, 4:5–10. Tanner further discloses:

> Reference is next made to FIG. 4, which shows a mass spectrum 98 obtained using the same sample as in FIG. 3, but with a reactive collision gas, specifically ammonia (NH_3), added to the collision cell in the manner described in connection with FIG. 1 (i.e. the reactive collision gas was added to the interior of the cell through conduit 44 and also at point 50 in front of the cell). The presence of the reactive collision gas dramatically reduce the ion signals for Ar^+, ArH^+, and ArO^+, due to transformation of these ions by reaction with the reactive collision gas.

Ex. 1036, 5:48–57. Tanner, therefore, describes introducing gas into its collision cell to reduce the presence of certain ions in the cell via reaction with the gas. Ex. 1036, 4:5–10, 5:48–57.

On this record, we are persuaded Petitioner has shown sufficiently for purposes of institution that Tanner describes the subject matter recited in this limitation.

c. "Ion optical device"

Claim 1 further recites "an ion optical device configured upstream of the collision cell to reduce gas loading from the ion source on the collision cell." Petitioner cites Tanner's disclosure that, before entering collision cell 41, the ions pass "through any desired conventional ion optics 26 in a second vacuum chamber 28." Ex. 1036, 3:64–67, *quoted in* Pet. 58. Petitioner contends that "a conventional ion optical device enhances ion transmission and does not confine any neutral gas components, and so the neutral gas components diverge under vacuum," resulting in reduced gas loading on the collision cell. Pet. 58 (citing Ex. 1004 ¶¶ 168–169).

Patent Owner makes similar arguments here that it makes with respect to the anticipatory ground based on Speakman—namely, that Tanner does not disclose that the ion optics reduce the gas load on the collision cell and that Petitioner has not shown this feature is inherent. Prelim. Resp. 49–52. For reasons similar to those discussed with respect to the anticipatory ground based on Speakman, we disagree. Patent Owner's assertion that "neutral gas components will not be diverted by an electrostatic field generated by ion optics" (Prelim. Resp. 51), while not wrong, tells only part of the story and, in fact, supports Petitioner's contention. Petitioner's assertion is that Tanner's ion optics 26 will not confine the neutral gas components and,

therefore, those components will diverge in a vacuum, absent some other force operating on them. Pet. 58 (citing Ex. 1004 ¶¶ 168–169). Tanner explains that ion optics 26 are "in a second vacuum chamber 28 pumped by a turbo pump 30." Ex. 1036, 3:66–67. Thus, Tanner's ion optics 26 reduce gas loading downstream of the optics by not confining neutral gases, which then diverge in vacuum chamber 28 in which ion optics 26 reside and are removed by turbo pump 30 that evacuates vacuum chamber 28. As noted above, the '232 patent discloses a similar method of reducing gas loading. *See* Ex. 1001, 7:7–35.

On this record, we are persuaded Petitioner has shown sufficiently for purposes of institution that Tanner describes "an ion optical device configured upstream of the collision cell to reduce gas loading from the ion source on the collision cell," as recited in claim 1.

d. "Mass-to-charge ratio analyzer"

Claim 1 further recites, "a mass-to-charge ratio analyzer disposed within an analyzing chamber and arranged to receive at least a portion of the ion beam from the collision cell and to mass analyze the received ion beam to produce a mass spectrum of the received ion beam." Petitioner contends mass analyzer 66 in Figure 1 describes this subject matter. Pet. 59 (citing Ex. 1036, 4:25–38, Figs. 5, 6; Ex. 1004 ¶¶ 170, 171). As noted above, Tanner discloses that mass analyzer 66 "is typically a quadrupole but may also be a different type of mass analyzer such as a time-of-flight mass spectrometer, a sector instrument, an ion trap, etc.)." Ex. 1036, 4:29–33.

On this record, we are persuaded Petitioner has shown sufficiently for purposes of institution that Tanner describes the subject matter recited in this limitation.

e. Threshold determination as to claim 1

Based on this preliminary record, Petitioner has demonstrated a reasonable likelihood that it would prevail in showing that Tanner anticipated claim 1.

E. Patent Owner's Constitutional Challenge

Patent Owner states that it "reserves its right to move for these proceedings to be terminated to the extent the Supreme Court decides that *inter partes* review is unconstitutional in *Oil States Energy Servs., LLC v. Greene's Energy Grp., LLC*, 137 S. Ct. 2239 (2017)." Prelim. Resp. 62. Patent Owner's reservation in this regard has been rendered moot because, on April 24, 2018, the Supreme Court held that "*inter partes* review does not violate Article III or the Seventh Amendment" of the Constitution. *Oil States Energy Servs., LLC v. Greene's Energy Grp., LLC*, 138 S. Ct 1365, 1379 (2018) (emphasis added).

III. CONCLUSION

For the foregoing reasons, we determine that the information presented in the Petition establishes that there is a reasonable likelihood that Petitioner would prevail in challenging at least one of claims 1–34 of the '232 patent. At this stage of the proceeding, we have not made a final determination with respect to the patentability of these challenged claims or the construction of any claim term. Because Petitioner has satisfied the threshold for institution as to one claim, we institute *inter partes* review on all claims and all grounds raised in the Petition. *See SAS Institute Inc. v. Iancu*, 138 S. Ct. 1348, 1359–60 (2018) (holding that a decision to institute under 35 U.S.C. § 314 may not institute on fewer than all claims challenged

in the petition); *see also* "Guidance on the impact of SAS on AIA trial proceedings"[3] (stating that, "if the PTAB institutes a trial, the PTAB will institute on all challenges raised in the petition").

IV. ORDER

Accordingly, it is:

ORDERED that pursuant to 35 U.S.C. § 314(a) and 37 C.F.R. § 42.4, an *inter partes* review is hereby instituted based on the following grounds:

A. claims 1–3, 6–12, and 16–34 as anticipated under § 102(e) by Speakman;

B. claims 1–3, 5–12, and 16–34 as unpatentable under § 103(a) over the combined teachings of Speakman, King, and King II;

C. claims 4 and 14 as unpatentable under § 103(a) over the combined teachings of Speakman and Yost;

D. claims 13 and 15 as unpatentable under § 103(a) over the combined teachings of Speakman and Terzic;

E. claims 1–3, 5–7, 17–20, 23, 24, 27, 29, and 34 as anticipated under § 102(e) by Tanner; and

F. claims 1–3, 5–13, and 16–34 as unpatentable under § 103(a) over the combined teachings of Tanner and Kishi; and

FURTHER ORDERED that pursuant to 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4, notice is hereby given of the institution of a trial; the trial will commence on the entry date of this decision.

[3] https://www.uspto.gov/patents-application-process/patent-trial-and-appeal-board/trials/guidance-impact-sas-aia-trial.

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