

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

GCE GAS CONTROL EQUIPMENT INC.,

Petitioner,

v.

VBOX, Inc.,

Patent Owner.

Case No. IPR2023-00326

U.S. Patent No. 11,389,614

**PETITIONER'S REPLY TO PATENT OWNER'S
RESPONSE TO PETITION**

TABLE OF CONTENTS

I.	INTRODUCTION	1
II.	<i>DEANE'S</i> ASSEMBLY/DISASSEMBLY TEACHINGS	2
	A. <i>Deane's</i> Disassembly Teachings.....	2
	B. PO's Assertions Are Wrong.....	4
III.	CLAIM CONSTRUCTION	5
	A. "Separation Cartridge"	6
	B. "Receptacle"	7
	C. "Selectively Removable [From a Receptacle]"	9
	D. "By Movement Relative to the Receptacle in a First Direction"	11
IV.	<i>DEANE</i> OR <i>DEANE/BERNTSON</i> TEACHES [1B(i)].....	15
V.	<i>DEANE</i> TEACHES [1E], [12G], [13N]/[13Q]	26
VI.	<i>DEANE</i> OR <i>DEANE/HILL '719</i> TEACHES CLAIMS 2/15	30
VII.	SECONDARY CONSIDERATIONS	31
VIII.	CONCLUSION.....	32
	CLAIM APPENDIX.....	33

TABLE OF AUTHORITIES

	Page(s)
<u>Cases</u>	
<i>Becton, Dickinson & Co. v. Tyco Healthcare Grp., LP</i> 616 F.3d 1249 (Fed. Cir. 2010)	13, 14
GCE Gas Control Equipment, Inc. v. VBOX, Inc. IPR2023-00527 (PTAB Sept. 1, 2023).....	20, 21
<i>Intel Corp. v. Pact XPP Schweiz AG</i> 2023 U.S. Dist. LEXIS 4436 (Fed. Cir. Feb. 24, 2023)	32
<i>INVT SPE LLC v. ITC</i> 46 F.4th 1361 (Fed. Cir. 2022)	11, 12, 13
<i>Stratoflex, Inc. v. Aeroquip Corp.</i> 713 F.2d 1530 (Fed. Cir. 1983)	32

I. INTRODUCTION

The POPR raised only one substantive dispute relating to *Deane*'s teachings of [1e], [12g], and [13n]/[13q]. The POR repeats this argument (pp. 51-61), which is wrong and plainly misreads *Deane* (see §V).

Regarding [1b]'s "separation cartridge selectively removable from a receptacle by movement relative to the receptacle in a first direction" (herein [1b(i)]), the ID questions Petitioner's showing that *Deane*'s housing 602 (cartridge) is removable by movement relative to manifold 512 (receptacle). ID, 34-36. Despite not raising this issue in the POPR, PO now advances this argument..

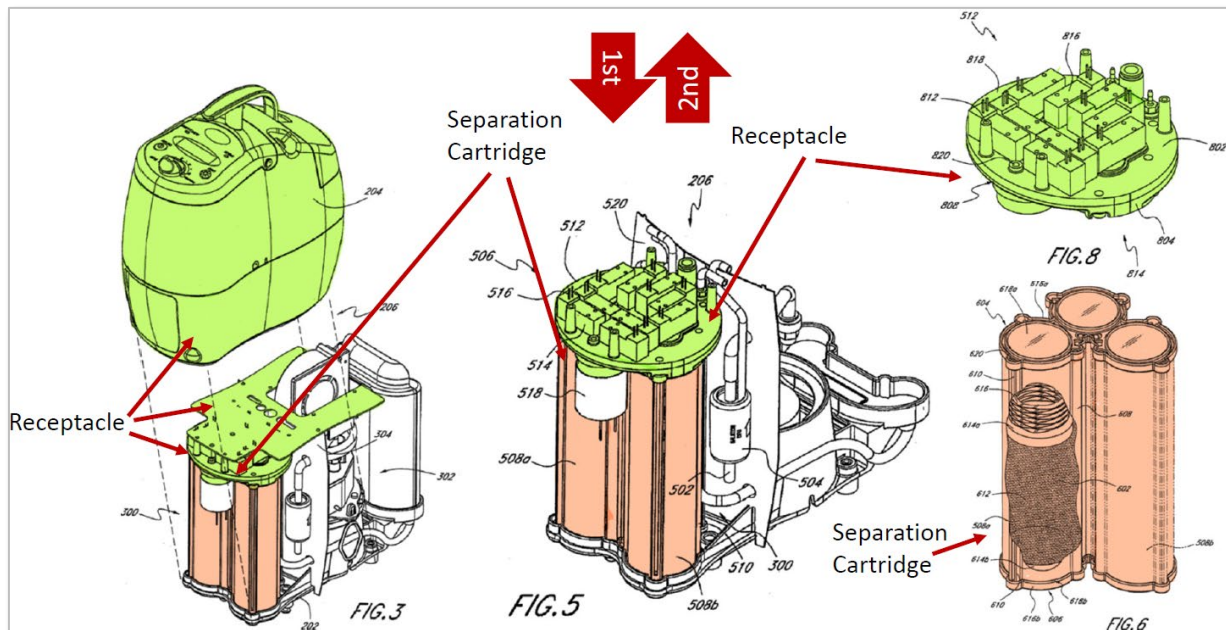
There are two issues for the Board to decide regarding PO's [1b(i)] patentability arguments. First, is PO's narrow interpretation of [1b(i)] that ignores its plain meaning and "movement relative to" language correct? Second, is Petitioner's reading of *Deane* impossible, as PO alleges? Because *Deane*'s disassembly, properly understood, would teach [1b(i)] even under PO's narrow construction, and PO's theory of *Deane*'s disassembly would teach [1b(i)] under Petitioner's (proper) construction, the Board must agree with PO on **both** issues to uphold claims 1-11. For the reasons below, the Board should reject PO's arguments.

The POR also argues for claim 1-11's patentability because *Deane* allegedly does not teach a "receptacle" and claims 2/15's patentability because *Deane* or *Deane/Hill '719* allegedly does not teach the recited spring placement. These arguments fail, per §§IV and VI.

II. DEANE'S ASSEMBLY/DISASSEMBLY TEACHINGS

A. Deane's Disassembly Teachings

Deane encompasses several assembly/disassembly methodologies, including that shown in the Petition's annotated drawings (Pet., 36) reproduced below, where, from left to right: (i) shell 204 is removed; (ii) circuit board 1314 is



(optionally) removed; (iii) PSA unit 108/506 is unmounted/removed from chassis 202; and (iv) PSA unit 108/506's manifold 512 is separated from housing 602

(e.g., by holding manifold 512 in one hand and housing 602 in the other and moving them apart). EX1078, ¶¶16-17.

Notable of *Deane's assembly/dis-assembly*: EX1078, ¶18. *First*, *Deane* teaches PSA unit 108/506 is a discrete assembly including housing 602 (with adsorbent columns 508a/b)¹ and manifold 512. EX1004, ¶¶[0032], [0062], [0065]; EX1078, ¶19. *Second*, *Deane* teaches its components, including PSA unit 108/506, are removable. EX1004, ¶¶[0057]-[0059] (FIG. 4 shows recesses 400a-c in chassis 202 “for mating with a PSA unit.”), [0065] (“PSA unit 506 is mounted”); EX1078, ¶¶20-21. *Third*, a POSITA would have understood that, after removing PSA unit 108/506 from chassis 202, manifold 512 and housing 602 would be disconnectable because *Deane* repeatedly teaches these components releasably interface (EX1004, Abstract, ¶¶[0007], [0062]-[0063], [0065], [0070]), and as a matter of routine engineering practice. EX1078, ¶¶22-24.

For this disconnection, a POSITA would recognize manifold 512 would be held in one hand with housing 602 in the other, and they would be separated along the long axis of housing 602 as dictated by the physical configuration of the manifold/housing interface. EX1078, ¶24. Referencing the drawing above, it would

¹ “Housing 602” refers herein to housing 602 and the remainder of its internal components shown in FIG. 6, including adsorbent columns 508a/b.

have been obvious to move housing 602 in the first direction away from a stationary manifold 512, to move manifold 512 in the second direction away from a stationary housing 602, or to simultaneously move housing 602 in the first direction and manifold 512 in the second direction away from each other. *Id.*

This understanding is confirmed by a POSITA's knowledge that removing cartridge/manifold assemblies from POCs was an art-recognized methodology. EX1078, ¶25; EX1010, ¶¶[0028]-[0030], FIGS. 7-9; EX 1006, ¶¶[0011]-[0013], FIGS. 1-2.

B. PO's Assertions Are Wrong

PO argues PSA unit 108/506 would not be removable as an assembly because: (i) after the fasteners holding PSA unit 108/506 to chassis 202 are removed, manifold 512 would "pop-up" due to the action of spring 616; and (ii) adsorbent would "fall out" of housing 602's bottom if one lifted it out of chassis 202 as part of PSA unit 108/506 (or alone). POR, 42-44. Neither is true, because *Deane's* housing 602 is self-contained per FIG. 6. EX1078, ¶¶31-32.² Spring 616

² Examiners repeatedly confirmed housing 602's self-contained and removable nature in the '614 patent family's prosecution. *See* EX1075, 107 (*Deane '059* teaches "a removable gas separation cartridge"); EX1050, 58-59 (*Deane '745* teaches a "cartridge 118a and 118b containing an adsorbent material"); EX1052,

is retained within housing 602 by its structure and other components like gasket 616 / filter 618 assembly and will not extend outside housing 602 to act on manifold 512 during PSA unit 108/506 removal. EX1078, ¶31. Similarly, housing 602's restraining disks 614a/b "for inhibiting movement of adsorbent material 612" (EX1004, ¶[0068]) would retain adsorbent 612 in housing 602 while it is removed from chassis 202 as part of PSA unit 108/506 (and as housing 602 is otherwise handled). EX1078, ¶32.

III. CLAIM CONSTRUCTION

The four highlighted terms in [1b(i)] below present claim construction issues.

a separation cartridge selectively removable from a receptacle by movement relative to the receptacle in a first direction, the separation cartridge comprising an inlet

The Petition's constructions for "separation cartridge," "selectively removable," and "receptacle" corresponded to those Petitioner advanced in the related District Court matter and are correct per the Petition. Pet., 21-26; EX1078, ¶¶37, 63, 80; EX1071, 13-17, 27-34. Petitioner has since advanced compromise

19 (*Deane* "disclose[s] an oxygen concentrator cartridge, best shown in Figure 6"). EX1078, ¶¶54-57.

constructions in the District Court, which are similarly correct. EX1078, ¶¶38, 64, 81; EX1073, 6-12, 23-27.

As it currently understands the disputes here, Petitioner does not believe “separation cartridge” must be construed as *Deane* teaches it under either Party’s construction. However, Petitioner believes constructions of “receptacle” and “selectively removable,” or at least a determination that PO’s narrowing readings of these elements (outside its constructions) do not comport with their plain meaning, are necessary.

Regarding “by movement relative to the receptacle in a first direction,” the Petition used its plain meaning (Pet., 21). PO asserts [1b(i)]’s patentability by reading this term far more narrowly than its plain meaning, including by ignoring the import of “by movement relative to.” Resolving this dispute is necessary.

A. “Separation Cartridge”

Petitioner’s Construction	PO’s Construction
“a housing[/container ³] that holds multiple adsorbent columns for gas separation and provides separate inlet and outlet ports for each adsorbent column”	“a cartridge configured to separate gas”

³ From district court; EX1073, 12.

Petitioner's construction is correct per the Petition. EX1078, ¶¶37-38. While PO's construction is partially correct as to the cartridge's purpose, it does not properly define "separation cartridge" according to the intrinsic record. As both experts agree, "separation cartridge" was not a term of art in 2004-2005. EX1074, 94:4-13; EX1078, ¶40. Thus, one must look to the '614 patent to understand its meaning. EX1078, ¶40. Here, every embodiment describes the cartridge consistent with Petitioner's construction, and the patent specifically indicates its Figures depicting a multi-bed cartridge show the "present invention." EX1001, 2:60-63; 3:41-44; EX1078, ¶40. PO's contrary arguments are unsupported. EX1078, ¶¶41-62.

B. "Receptacle"

Petitioner's Construction	PO's Construction
"a structure that releasably interfaces with the inlet(s) and outlet(s) of the separation cartridge and at least partially contains the separation cartridge." -OR- "a structure configured to releasably receive and at least partially contain the separation cartridge" (EX1073, 29)	"a space configured to receive and contain something"

Either of Petitioner's constructions is correct per the Petition. EX1078, ¶¶63-64.

PO's Construction Is Incorrect: First, "receptacle" must be defined as a structure; "space" provides no border as to what is or is not part of the "receptacle." EX1078, ¶¶65-69. Second, "receptacle" provides a "releasable" interface for the cartridge, not simply reception. EX1078, ¶70. Third, given the '614 patent's only embodiment shows partial containment (*see, e.g.*, EX1001, FIGS. 2/7), there is nothing in the intrinsic record regarding full containment, and partial containment reflects the normal use of "receptacle," "at least partially contain" is more appropriate than "contain." EX1078, ¶¶71-72.

[1b(i)] Does Not Require the "Receptacle" Be Accessible from Outside a POC or Be Fixed in POC: Beyond its construction, PO appears to also assert (in arguing patentability) that "receptacle" must be fixed to, and directly accessible from outside, a POC housing. EX1078, ¶73. But, the '614 patent does not support this as claim 1 requires only that a POC "comprise" a "receptacle," not that it be directly accessible from outside a POC or that it be fixed within the POC housing. EX1078, ¶¶73-75. [1b(i)] encompasses internal receptacles accessible after one or more disassembly steps and receptacles provided anywhere in the POC, including, *e.g.*, receptacles that are removable from POCs (*see* '614 patent's teachings at EX1001, 13:34-46) and those arranged internally at the end of flexible hoses.

EX1078, ¶¶74-78. PO recites “receptacle” in the ’614 patent without related structural requirements (*e.g.*, such as the ’628 patent’s requirement that a housing define the receptacle) and should be held to that recitation. EX1054, claim 1; EX1078, ¶79.

C. “Selectively Removable [From a Receptacle]”

Petitioner's Construction	PO's Construction
“withdrawable or separable as a whole from a receptacle” -OR- “can be individually chosen to be withdrawn” (compromise construction from district court matter; EX1073, 31)	“can be chosen to be removed”

While either of Petitioner's constructions is correct per the Petition, *Deane* and *Deane/Berntson* teach a selectively removable cartridge under either Party's construction. EX1078, ¶¶80-84.

“Selectively Removable” Does Not Require Removability from the POC or Removability in Any Particular Number of Steps: Beyond its construction, PO appears to assert “selectively removable” requires the cartridge be directly accessible/removable from outside the POC, or accessible/removable from the POC (or receptacle) in a particular number of steps. EX1078, ¶85. PO's arguments are incorrect for multiple reasons. EX1078, ¶86.

First, “selectively removable” does not require the cartridge be removable from *the POC*. EX1078, ¶87. All claim 1 requires is that the cartridge be removable from *the receptacle*, which is just a POC component. EX1078, ¶87. The ’614 patent family’s prosecution history confirms PO considers these concepts to be different. EX1053, 230, 237 (changing “removable from the cartridge module” to “removable from the receptacle”) and EX1052, 149-155 (advancing one claim reciting “removable from the oxygen concentrator” and one reciting “removable from [a] receptacle”); EX1078, ¶¶88-89.

Second, “removable” is broad and does not impose an artificial limit on an amount of steps or ease of removal. EX1078, ¶90. Indeed, PO’s expert testified that everything in the POC devices here is “removable” and that “removable” and “easily removable” are “quite different.” EX1074, 68:21-69:6, 122:18-123:4; EX1078, ¶¶90-91. The modifier “selectively” does not change this, as the parties agree that “selectively” relates to the chooseability of an object for removal/withdrawal. EX1078, ¶90. Even cartridges requiring multiple steps before removal can be chosen for removal (before/after those steps). *Id.*

A broad understanding of “removable” is confirmed by the ’614 patent family’s prosecution, where Examiners found *Deane* teaches a removable cartridge with no objection from PO. *See* fn. 2. EX1078, ¶¶92-94. Similarly, PO did not disagree with an Examiner describing *Hechinger*’s cartridge as removable even

though it is installed under significant structure that has to be removed (*see* EX1048, FIGS. 6-16). EX1052, 566-567, 503-505, 394-397. EX1078, ¶¶95-96.

D. “By Movement Relative to the Receptacle in a First Direction”

Petitioner's Construction	PO's Construction
Plain Meaning: Requires only the <i>capability</i> of <i>relative movement</i> of the cartridge <i>vis-à-vis</i> the receptacle in the first direction	Unspecified, Apparently: Absolute movement of the cartridge in a first direction away from a stationary receptacle

The Petition did not separately construe this phrase (other than “receptacle”) because a POSITA would have understood it describes the cartridge’s capability of being removable by “movement relative to the receptacle.” EX1078, ¶99. The POR offers no formal construction for this term, but its patentability arguments impose limitations unsupported by the intrinsic record. EX1078, ¶¶100-101.

This Term Requires Only the Capability of Movement: Claim 1 is an apparatus claim, not a method claim. Functional language in an apparatus claim may be interpreted as specifying a structure that merely must be *capable of* performing that function. *INVT SPE LLC v. ITC*, 46 F.4th 1361, 1372 (Fed. Cir. 2022). Such is the case here, as [1b(i)] recites movement capability (*e.g.*, the cartridge is “selectively removable ...”) in the passive voice (“by movement

relative to ...”). EX1078, ¶102. PO’s expert agreed [1b(i)] requires only the *capability* of the recited movement. *Id.*; EX1074, 83:14-20.

This Term Requires Only Relative, Not Absolute, Movement: Because *relative movement* is recited, this term covers: (i) cartridge movement in the first direction away from a stationary receptacle; (ii) receptacle movement in a second direction (opposite the first) away from a stationary cartridge; and (iii) simultaneous movement of the cartridge in the first direction and the receptacle in a second direction away from each other. EX1078, ¶103. In each instance, the cartridge moves “relative to the receptacle in a first direction.” *Id.*

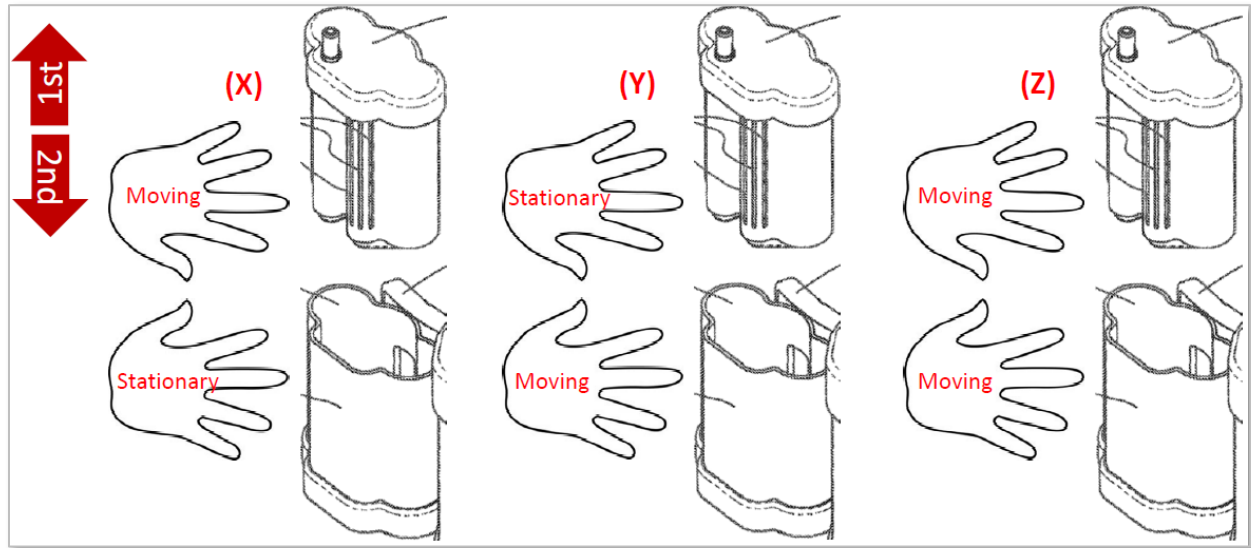
Relative movement is a commonly-used physics/engineering concept specifying movement relative to a particular *frame of reference*. EX1078, ¶104. In the context of two objects, as explained in detail by Dr. Knaebel, a first object may move “relative to” a second object’s frame of reference (*i.e.*, from the second object’s perspective) by, *e.g.*, moving the first object away from the second, moving the second away from the first, or moving both the first and second objects away from each other. *Id.* Relative movement between objects is different from “absolute” movement according to a fixed frame of reference, such as the ground. *Id.*

Restricting This Term to Absolute Movement Is Improper: PO argues this limitation would cover *only* absolute movement of the cartridge away from a

stationary receptacle in a first direction. EX1078, ¶105. This is incorrect because such restriction ignores the plain meaning of “movement relative to” and makes that phrase *superfluous*, violating a basic claim construction tenet. *Becton, Dickinson & Co. v. Tyco Healthcare Grp., LP*, 616 F.3d 1249, 1257 (Fed. Cir. 2010). EX1078, ¶¶106-107. PO's reading would mean there is no difference between the claim language and a recitation of “cartridge selectively removable from the receptacle in a first direction.” EX1078, ¶107. Adding “by movement relative to” means *something*; it cannot just be ignored. *Id.*

Further, no intrinsic evidence supports PO's restriction. EX1078, ¶108. The '614 patent is completely unconcerned with the precise motion for separating its cartridge and receptacle. *Id.* It only depicts them as separate *after* separation occurs. *Id.*; EX1001, FIG. 7, 11:61-12:3. Thus, a POSITA reading the '614 patent would not have understood a particular removal scheme to be required, just that separation happens. EX1078, ¶108. “By movement relative to” should therefore be understood, consistent with its plain meaning, to provide coverage for any removability contemplated by the '614 patent and to avoid the claims being *limited* to example “X” in the illustration below (*e.g.*, receptacle held stationary and cartridge pulled out in a first direction). EX1078, ¶109. Instead, “movement relative to ...” should cover all the '614 patent's possible removal methodologies,

including examples “Y” (cartridge held stationary and receptacle pulled away) and “Z” (cartridge and receptacle pulled away from each other). EX1078, ¶¶109-111.



Further in this regard, PO first introduced the phrase “selectively removable from a receptacle by movement relative to the receptacle in a first direction” in the ’614 patent family during the ’628 patent’s prosecution, not to define over particular prior art removal direction teachings, but because PO needed to define the second direction in which its cartridge inlets/outlets face. EX1053, 230, 237 (arguing “[i]n other words, the inlet and outlet are oriented in a direction opposite the direction of removability”), 253-255. The language was simply intended to protect a cartridge with inlets/outlets facing a receptacle, because that is all the ’614 patent fairly discloses.

Finally, the ’614 family’s prosecution history confirms this phrase should encompass at least *Deane*’s configuration. EX1052, 14-16, 19, 149-155 (claim 38

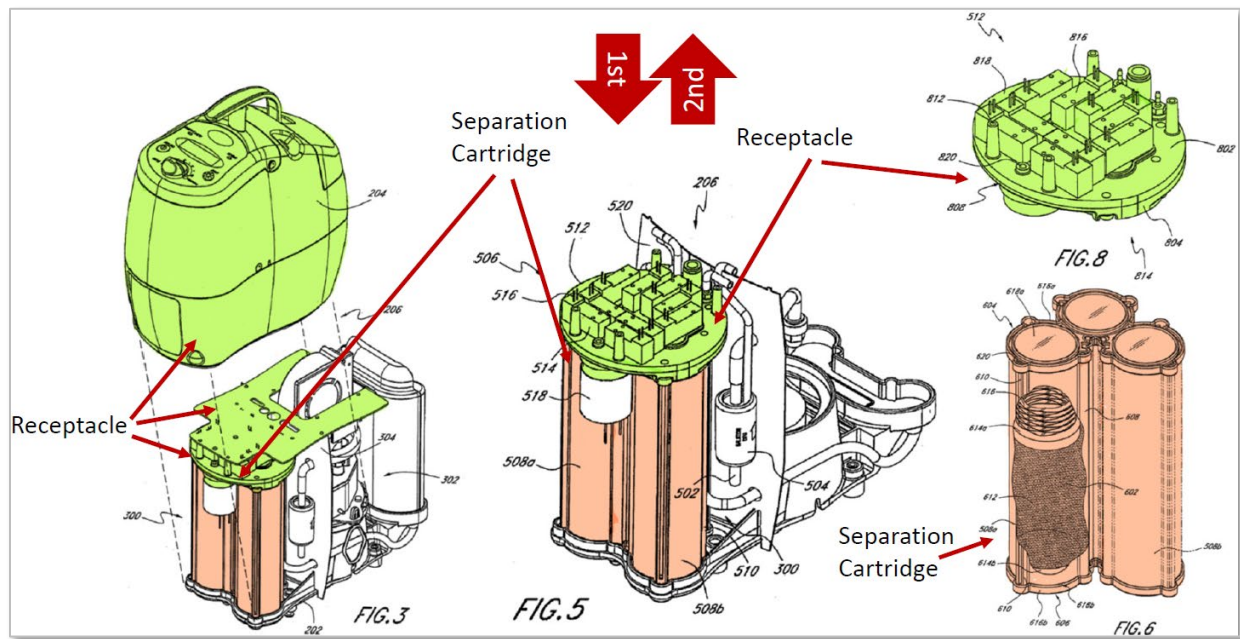
reciting a “cartridge selectively removable from [a] receptacle by movement relative to the receptacle in a first direction” did not differentiate from *Deane* '426); EX1078, ¶¶112-113. While claim 38 was not formally rejected in view of *Deane* (see ID, 11), a POSITA reading the file history and looking to understand [1b(i)] would have understood it to cover *Deane*. EX1078, ¶115.

IV. DEANE OR DEANE/BERNTSON TEACHES [1b(i)]

Per the Petition, [1b(i)] is taught by *Deane*, *Dubois*, and *Berntson* (Ground 1) or *Deane* alone (Ground 4). Pet., 32-48, 72. EX1078, ¶¶117-119.

Deane Teaches “A Separation Cartridge ...” by the stand-alone housing 602 of FIG. 6. EX1078, ¶120. Multiple Examiners agreed. *Id.* See fn. 2 above. 1078

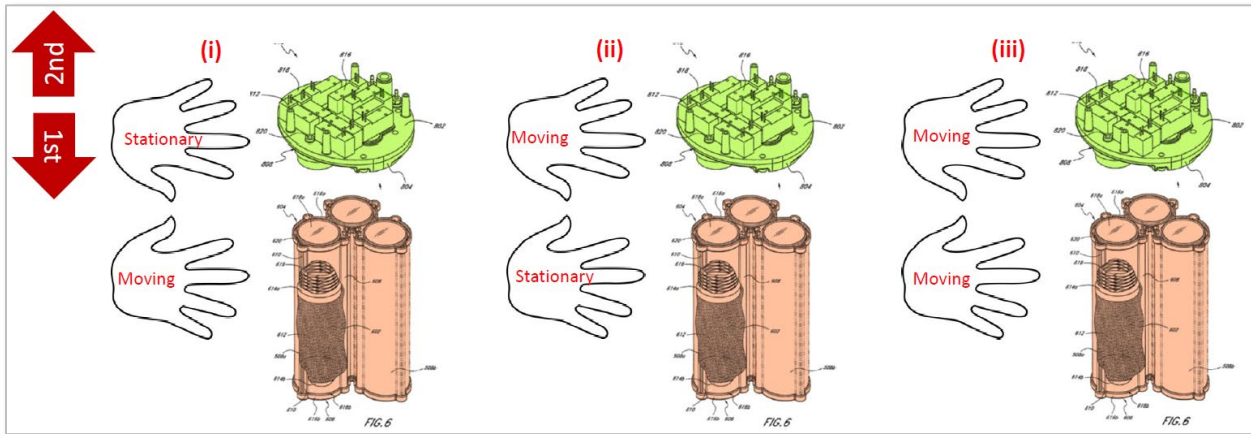
Deane Teaches “... Selectively Removable from a Receptacle by Movement Relative to the Receptacle in a First Direction”: Per §II.A, a POSITA would have understood *Deane*'s configuration to be disassemble-able in the manner discussed in §II.A and shown in the annotated drawings below. EX1078, ¶¶121-122.



In this regard: (i) manifold 512 is a “receptacle” (*see* “receptacle” section below); (ii) housing 602 would be individually chosen to be withdrawn from manifold 512 by the person disassembling PSA unit 108/506 (and thus “selectively removable” under either Party’s construction); and (iii) housing 602’s direction of removal from manifold 512 would have been in the first direction along the axis of housing 602 due at least to the geometry of the housing 602 / manifold 512 interface as explained in the Petition. Pet., 35-43; EX1078, ¶¶122-125.

In particular, PSA unit 108/506 would be disassemble-able using any of the following procedures: (i) moving housing 602 (cartridge) in the first direction away from stationary manifold 512 (receptacle); (ii) moving manifold 512 (receptacle) in a second direction (opposite the first) away from stationary housing 602 (cartridge); and (iii) simultaneously moving housing 602 (cartridge) in the first

direction and manifold 512 (receptacle) in a second direction away from each



other. EX1078, ¶126. Each procedure meets all of [1b(i)]'s requirements, properly construed. EX1078, ¶¶126-127. Indeed, they are no different from the removal options taught by the '614 Patent set forth on p. 14 above. EX1078, ¶127.

Moving Deane's Housing 602 Downward Vis-à-vis Manifold 512 After PSA Unit 108/506 Removal Meets [1b(i)]: PO argues *Deane* doesn't teach [1b(i)] because chassis 202 prevents housing 602 from moving downward in the first direction away from manifold 512. POR, 37-38. Even if PO's restriction of [1b(i)] to downward movement of housing 602 were correct (it is not per §III.D), PO's reading of *Deane* is wrong. EX1078, ¶129. *Deane* teaches downward removal of housing 602 from manifold 512 after PSA unit 108/506's removal according procedures (i) and (iii) above. EX1078, ¶¶129-132. Either teaches all [1b(i)]'s requirements even under PO's overly-narrow reading. *Id.*

Moving Deane's Manifold 512 Upward Vis-à-vis Stationary Housing 602

Meets [1b(i)]: PO argues [1b(i)] does not cover “movement of an alleged receptacle relative to a stationary cartridge.” POR, 36. But, other than citing the ID's preliminary reading of [1b(i)], PO provides no evidence that [1b(i)]'s scope would not include receptacle movement. EX1078, ¶133. And PO cannot, because it is encompassed by [1b(i)]'s plain meaning per §III.D. *Id.* Thus, holding housing 602 stationary while moving manifold 512 away after removing PSA unit 108/506 from chassis 202 (procedure (ii) above) teaches [1b(i)], because this still results in moving housing 602 ***relative to*** manifold 512 in a first direction (in manifold 512's frame of reference while moving, housing 602 moves away from manifold 512 in the first direction). EX1078, ¶134. The same would apply to moving manifold 512 upwardly away from housing 602 that remains mounted to chassis 202 under PO's (incorrect) theory of *Deane's* disassembly. EX1078, ¶135.

[1b(i)] Covers Removal After Some Disassembly: PO argues *Deane* does not teach a “selectively removable” cartridge due to the number of steps required to remove housing 602 from manifold 512. POR, 44. This is incorrect. EX1078, ¶¶137-138. First, per §III.C, “selectively removable” does not require the cartridge be directly removable from the POC or removable from the POC/receptacle in any number of steps. EX1078, ¶139. Second, even if [1b(i)] were understood as limiting the number of disassembly steps in some way, the above-discussed

procedures for separating housing 602 from manifold 512 after PSA unit 108/506 removal would not come close to approaching any rational limit. EX1078, ¶¶140-141. *Third*, PO's '628 patent *Infringement Contentions* (EX1076) in the district court matter asserts that patent's removable cartridge limitation covers a cartridge removable *after* some disassembly, thus confirming Petitioner's position. EX1076, 5 (showing removal of cover and installation/use of removal tool before cartridge removal); EX1078, ¶142.

Examiners Previously Compared [1b(i)] to Deane: Per §III.D, Examiner Vasat found that [1b(i)]'s language did not differentiate the '669 patent's claim 38 (very similar scope to claim 1 here) from *Deane*. EX1078, ¶143. This finding must include a reading of *Deane* (and applied claim scope) similar to Petitioner's. *Id.* Examiner Ali also found *Deane* '059 (EX1038, issued version) teaches "a removable gas separation cartridge" (EX1075, 107 (citing FIG. 6 and 203)), a finding PO did not dispute. EX1078, ¶144.

[1b(i)] Is Broader Than the Element at Issue in the '628 Patent IPR: PO argues the Board should come to the same conclusion regarding [1b(i)] that it did in denying institution in the related '628 patent IPR (IPR2023-00527, Paper 9). POR, 34-35. But [1b(i)] recites a broader removability concept than the '628 patent's claims (*i.e.*, removability from a receptacle defined by a cartridge

module). EX1078, ¶145. The receptacle here is disembodied in the POC and thus broader in scope. *Id.*

[1b(i)] Requires Only the Capability of (Not Actual) Movement and Only Removal from the Receptacle (Not the POC): Per §III.C, [1b(i)] requires only the capability that its cartridge (*e.g.*, housing 602) be removable from its receptacle (*e.g.*, manifold 512) . EX1078, ¶146. Thus, even if the above-discussed disassembly methodology for *Deane's* POC (§II.A) would not have been utilized every time, *Deane's* POC is still ***capable*** of such disassembly, which is all [1b(i)] requires. EX1078, ¶¶35, 146.

Similarly, per §III.C, [1b(i)] only requires the cartridge to be selectively removable from the ***receptacle***, not from the POC. The explanation in §II.A above shows how the cartridge (*e.g.*, housing 602) is removable from its receptacle (*e.g.*, manifold 512), which is all the claims require and therefore the only removability that matters. EX1078, ¶147. Thus, the number of removal steps required before one disassembles housing 602 from manifold 512 while holding PSA unit 108/506 is irrelevant to the claimed removability. *Id.*

Deane Teaches a "Receptacle": *Deane's* manifold 512 (or manifold 512/shell 204) teaches a "receptacle." Pet., 37-40; EX1078, ¶¶148-150. PO's arguments to the contrary are incorrect. EX1078, ¶148, 152-161.

PO argues the manifold 512 / housing 602 connection does not show manifold 512 “at least partially contains” housing 602 because: (i) “[m]anifold 512 only engages with the top of the adsorbent columns;” and (ii) it is actually portions of manifold 512 that are received/contained within adsorbent columns 508a/b.

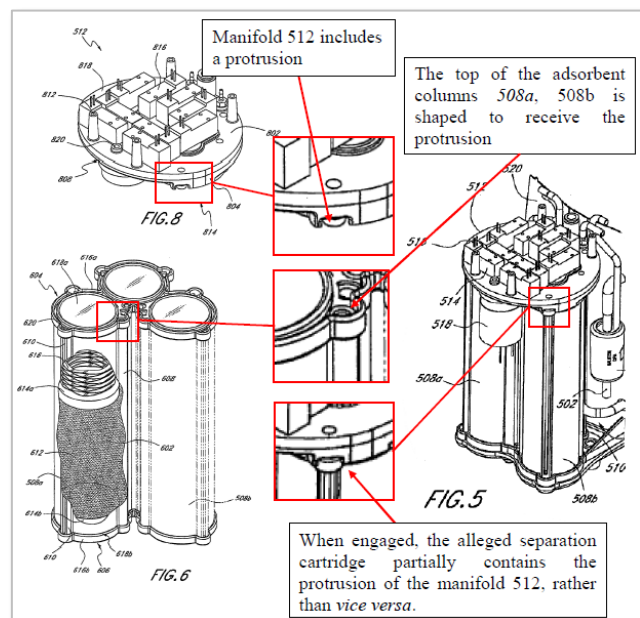
POR, 48. PO’s arguments are summarized in the POR’s annotated figures

reproduced below. POR, 49. PO’s

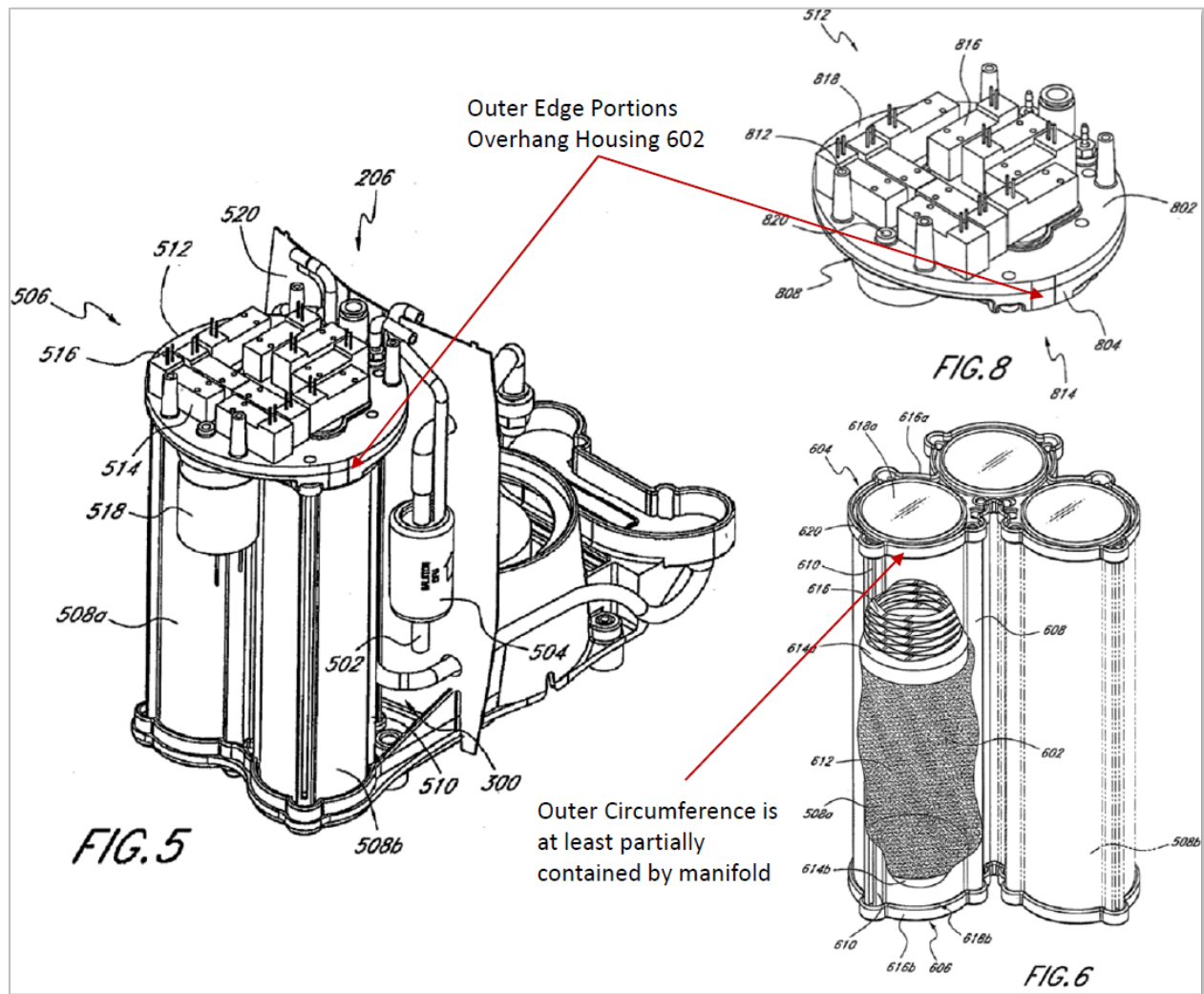
arguments and interpretation of

Deane are incorrect.

First, per §III.B, a “receptacle” need only “at least partially contain” a cartridge. The geometry of the manifold 512 and housing 602 connection shown in *Deane*’s FIGS.



5/6 teaches such partial containment. EX1078, ¶153. For example, as shown in the following annotated Figures, manifold 512’s outer edge portions overhang and surround housing 602’s outer circumference and therefore manifold 512 “at least partially contains” housing 602. *Id.*



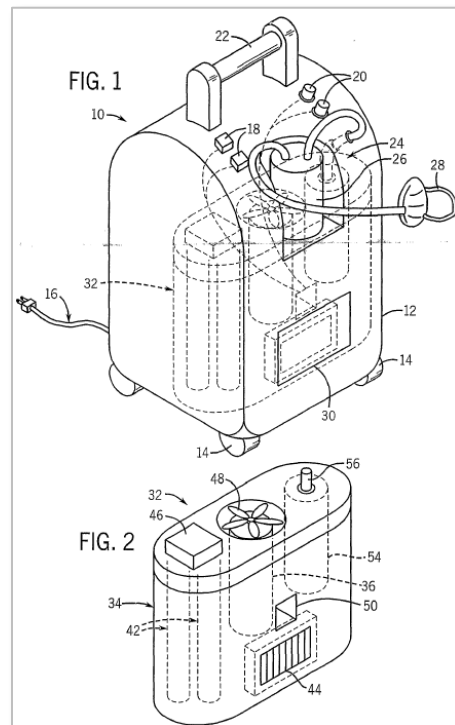
Additionally, as PO points out, manifold 512 has other features extending into housing 602. While PO asserts these features are contained by housing 602 (opposite the claimed arrangement), when they are considered together with manifold 512's outer edge portions as a complete structure, it is clear manifold 512 "at least partially contains" housing 602's upper end. EX1078, ¶¶154-155.

Additionally to manifold 512 alone being a "receptacle," it would have been obvious to utilize a combination of manifold 512 and shell 204 (and any

intervening parts like circuit board 1314) to form a “receptacle.” EX1078, ¶156. In such a configuration, a POSITA would have simply provided mounting hardware for PSA unit 108/506 on shell 204 and reversed the direction of the fasteners connecting PSA unit 108/506 to chassis 202 to provide an assembly of shell 204 and PSA unit 108/506 that would be installed/removed from chassis 202. EX1078, ¶157. This was an obvious design choice, particularly given the well-known desire to modularize assemblies. *Id.* And, importantly, such a configuration would still provide the capability for housing 602 to be removable from manifold 512 as discussed above while manifold 512 is retained in shell 204, thus otherwise meeting [1b]’s requirements and providing further “containment” of housing 602 (*i.e.*, within shell 204). EX1078, ¶158.

PO’s arguments that a POSITA would not have modified *Deane* this way are wrong. EX1078, ¶159. It is irrelevant to an assembly methodology that shell 204 and manifold 512 have different functions. EX1078, ¶160. Providing shell 204 and PSA unit 108/506 as an assembly removable from chassis 202 is simply a change in the manner of *Deane*’s component assembly. *Id.* Further, providing shell 204 and PSA unit 108/506 as an assembly removable from chassis 202 would, by its nature, change the manner in which *Deane*’s components are assembled, mooted PO’s argument that *Deane* would be “impossible to disassemble.” *Id.*

Deane/Berntson Teaches [1b(i)]: Further to *Deane*, *Berntson* teaches a self-contained removable cartridge (ORAG 32) in POC housing 12 with, *e.g.*, pump 36, adsorbent containers 42, valve system 46, and oxygen tank. EX1006, ¶¶[0011]-[0013], FIGS. 1-2; EX1078, ¶163. *Berntson* teaches “[s]ome components could be provided either as part of the ORAG 32 or not.” EX1006, ¶[0017]. Thus, ORAG 32’s component listing is adjustable/optional. EX1078, ¶163.



Even if *Deane* is found not to teach a “separation cartridge selectively removable from a receptacle,” a POSITA would have provided this feature given *Berntson* for several reasons. EX1078, ¶¶162, 164.

First, even if PO’s argument that *Deane*’s housing 602 is not self-contained (*e.g.*, its spring would pop-off manifold 512 or its adsorbent would fall out) is accepted, a POSITA would have been motivated to utilize *Berntson*’s teachings of a self-contained cartridge removable from a receptacle (ORAG 32 is removable from housing 12) to provide a more easily removable self-contained cartridge in *Deane*. EX1078, ¶165.

Second, even if PO's argument that *Deane*'s manifold 512 cannot alone teach a receptacle because it does not fully contain a cartridge is accepted, *Berntson* teaches its cartridge is directly removable from its housing that fully contains the cartridge. EX1078, ¶166.

Third, even if PO's argument that *Deane* does not teach disassembly by first removing PSA unit 108/506 from *Deane*'s chassis before separating manifold 512 from housing 602 is accepted, *Berntson* teaches these components should be provided in a single removable assembly, which a POSITA would have applied to *Deane*'s configuration to increase modularity. EX1078, ¶167. Specifically, *Berntson* teaches ORAG 32 has adsorbent containers 42, valve system 46, and an oxygen tank therein and is directly removable from its housing for maintenance. *Id.*; EX1006, ¶¶[0011]-[0013], FIGS. 1-2. A POSITA would have understood these features as analogous to *Deane*'s adsorbent columns 508a/b, manifold 512, and gas storage column 510, and thus would have been motivated to provide them together as a removable assembly corresponding to PSA unit 108/506 for maintenance. EX1078, ¶167. *McCombs* '957 teaches a similar self-contained removable assembly, confirming the motivation to modify *Deane* as discussed above. EX1010, ¶¶[0028]-[0030], FIGS. 7-9; EX1078, ¶168.

Motivation to Combine: PO argues a POSITA would not have been motivated to modify *Deane* in view of *Berntson* because *Deane* teaches thermally

separating its motor and adsorbent columns whereas *Berntson* teaches providing these features together in ORAG 32. POR, 46-47. PO is incorrect. A POSITA would have understood *Berntson*'s applicable teaching to be that various POC components should be included in a removable assembly to improve serviceability. EX1006, ¶¶[0004]-[0006]; EX1078, ¶170. A POSITA would have known how to apply that teaching in *Deane* by selecting appropriate components to include in a removable assembly, e.g., PSA unit 108/506's components. *Id.* Indeed, *Berntson* teaches its ORAG components are optionally provided. *Id.*; EX1006, ¶[0017]. Additionally, *Deane* does not teach PSA unit 108/506 cannot be included in a removable assembly with a motor. EX1078, ¶170. It simply teaches it is advantageous to thermally isolate PSA unit 108/506 from the motor. *Id.* A POSITA motivated to provide a removable assembly including PSA unit 108/506 and a motor would have known how to thermally isolate these components within the assembly using *Deane*'s teachings. *Id.*

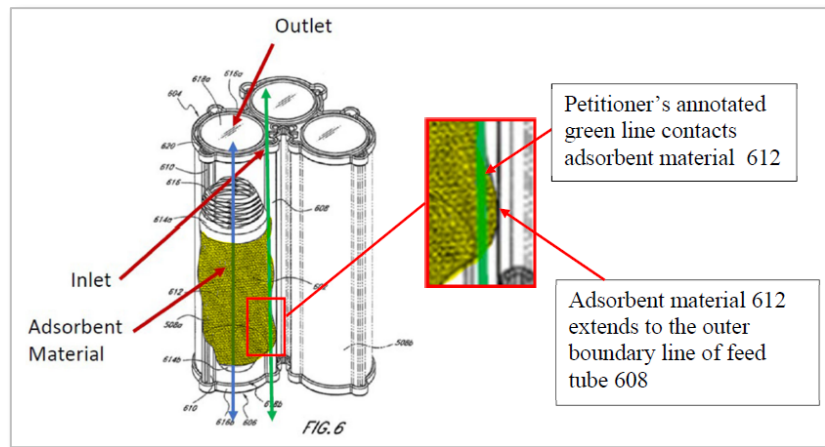
V. DEANE TEACHES [1E], [12G], [13N]/[13Q]

Deane teaches these elements per the Petition. Pet., 48-51, 59, 61-63 (*see* Dr. Knaebel's annotated versions of *Deane*'s FIGS. 6/7A). EX1078, ¶172. PO's assertions to the contrary are wrong.

Deane's FIG. 6 Teaches [1e]: Per PO's further annotated version of Dr.

Knaebel's annotated FIG. 6 (reproduced below), PO argues "adsorbent material 612 extends to the outer boundary line of the feed tube 608" and thus Dr.

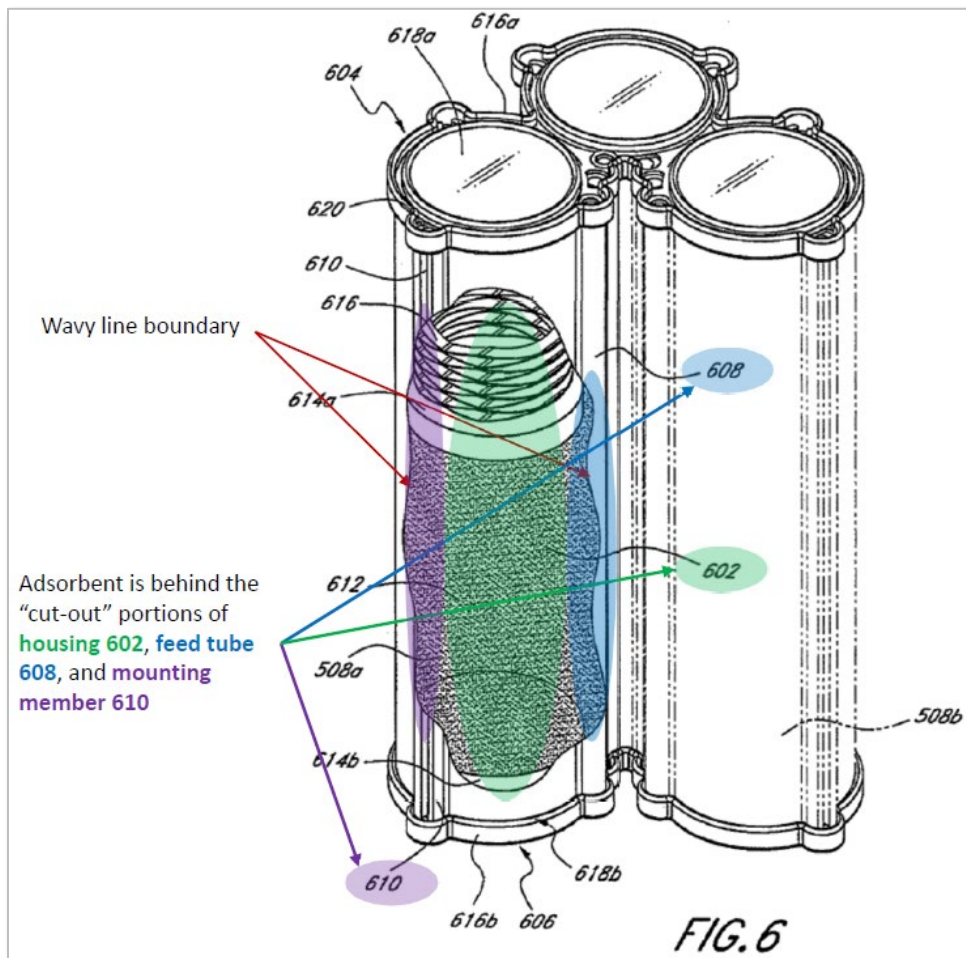
Knaebel's **green line** in feed tube 608 passes through adsorbent, contrary to [1e]'s requirements. POR, 54-55. This is a nonsensical



reading of FIG. 6, particularly given *Deane's* remaining teachings in, *e.g.*,

¶¶[0059], [0062], [0066], [0068], [0070], FIG. 7A. EX1078, ¶175.

FIG. 6 does not show adsorbent 612 extending into feed tube 608. EX1078, ¶176. FIG. 6 is a "cut-out" view of housing 602 showing its components (*e.g.*, adsorbent 612, restraining disks 614a/b, spring 616) installed **inside** its outer walls by cutting away portions of: (i) housing 602's outer walls; (ii) feed tube 608; and (iii) mounting member 610. EX1078, ¶¶176-177. *See* annotated FIG. 6 below.



A POSITA looking at FIG. 6 would conclude it shows adsorbent 612 in the main portion of housing 602 but not in either feed tube 608 or mounting member 610 (EX1078, ¶178) and thus that Dr. Knaebel's **green line** in feed tube 608 ([1e]'s second line) does not contact any adsorbent material, let alone the recited "adsorbent material of the bed" through which the **blue line** ([1e]'s first line) passes (*id.*). EX1003, ¶¶349-351.

Deane's Remaining Teachings Confirm Petitioner's FIG. 6 Analysis:

Deane's ¶¶[0062], [0066], [0068], [0070], and FIG. 7A confirm feed tube 608 does

not include adsorbent. EX1078, ¶180. FIG. 7A shows the portion of housing 602 with adsorbent *is separate* from feed tube 608, such that the adsorbent therein could not physically extend into feed tube 608. EX1078, ¶¶181, 183. To illustrate adsorbent in feed tube 608, FIG. 6 would have to portray two separate adsorbent masses; it does not. EX1078, ¶182. *Deane* also teaches “feed gas” passes through feed tube 608 into the bottom of housing 602, and *then upward to pass through the adsorbent*, as shown in FIG. 7A. EX1004, ¶[0070]; EX1078, ¶¶183-184. *Deane*’s “feed gas” is gas *supplied to* adsorbent (“product gas” is what *exits*). *See, e.g.*, EX1004, ¶¶[0008], [0032]-[0056], [0062], [0064], [0070]; EX1003, ¶10; EX1078, ¶184. This indicates adsorbent is provided in the main portion of housing 602 but not in feed tube 608. EX1078, ¶¶184-185. Finally, *Deane*’s housing 602 retains adsorbent 612 in columns 508a/b using restraining disks 614a-b. EX1004, ¶[0068]; EX1078, ¶186. *Deane*’s feed tubes 608 have no such disks, suggesting no adsorbent is present. EX1078, ¶¶186-187.

PO’s Citations to Other Documents Are Irrelevant: PO argues feed tubes 608 could be pre-beds. POR, 57. But feed tubes 608 are not called pre-beds (EX1004, ¶[0066]). EX1078, ¶¶188-189. Moreover, even if feed tubes 608 were pre-beds, [1e] requires adsorbent contact/non-contact for the first/second lines with regard *to one bed, not two separate beds* (*i.e.*, even if the second line (**green line**))

passes through a pre-bed in feed tube 608, it does not pass through the same bed as the first line (**blue line**)). EX1078, ¶190.

VI. DEANE OR DEANE/HILL '719 TEACHES CLAIMS 2/15

Per the Petition, *Deane* in view of a POSITA's knowledge or in view of *Hill* '719 teaches claims 2/15. Pet., 51-53, 65-70.

PO argues a POSITA would not place a spring at the bottom of *Deane*'s beds 508a/b, alone or paired with a top spring, in view of a POSITA's knowledge (Ground 1) or *Hill* '719 (Ground 2), because it is "difficult, if not impossible" to load *Deane*'s columns with adsorbent due to the effects of such a bottom spring, and because it would add complexity/cost. POR, 62-64. PO's arguments are wrong and the only support offered for them is Dr. Talu's *ipse dixit*. EX2001, ¶¶163-165, 169.

First, the assertion it is difficult to load adsorbent in a column with a spring at the opposite end is contradicted by Petitioner's cited references demonstrating the general art knowledge, e.g., *Bassine* (EX1026, FIG. 6), *Appel* '928 (EX1015, FIG. 3B), and *Hill* '719, each of which teaches such loading. EX1078, ¶197. For Ground 2, a POSITA would have understood the most straightforward way of loading *Hill* '719's adsorption vessel 24 was from the top, at the end ***opposite*** where spring 36 is arranged. EX1078, ¶225.

Second, *Deane* itself contradicts PO's argument because housing 602 is self-contained with restraining disks 614a/b that hold adsorbent. EX1078, ¶198. A POSITA would have understood that adsorbent can be loaded from either end and held by disks 614a/b before housing 602 is fully assembled (e.g., before the spring and other components are installed). *Id.*

Third, even assuming PO's assertions regarding *Deane*'s adsorbent loading process were correct, any alleged difficulties are vastly overblown; such operations were common in the art. EX1078, ¶199.

Fourth, any complexity/cost increases are speculative (EX1078, ¶200) and do not demonstrate non-obviousness. *Intel Corp. v. Pact XPP Schweiz AG*, 2023 U.S. Dist. LEXIS 4436, at *12-13 (Fed. Cir. Feb. 24, 2023).

VII. SECONDARY CONSIDERATIONS

PO asserts a purported Inogen license that is not of record somehow demonstrates secondary considerations. POR, 65. But PO demonstrates no nexus between the license and the challenged claims, making it irrelevant. *Stratoflex, Inc. v. Aeroquip Corp.*, 713 F.2d 1530, 1539 (Fed. Cir. 1983).

VIII. CONCLUSION

Petitioner requests cancellation of the Challenged Claims.

Dated: December 21, 2023

Respectfully submitted,

/s/ Robert M. Masters

Robert M. Masters (Reg. No. 35,603)

Timothy Cremen (Reg. No. 50,855)

Roy D. Jung (Reg. No. 80,281)

**SHEPPARD, MULLIN, RICHTER &
HAMPTON LLP**

2099 Pennsylvania Avenue, NW, Suite
100

Washington, DC 20006-6801

Tel.: 202.747.1900

Fax: 202.747.1901

legaltm-gce-ipr@sheppardmullin.com

Eric K. Gill (Reg. No. 71,709)

**SHEPPARD, MULLIN, RICHTER &
HAMPTON LLP**

12275 El Camino Real, Suite 100

San Diego, CA 92130-4092

Telephone: (858) 720-8900

Fax: (858) 509-3691

*Counsel for Petitioner GCE Gas
Control Equipment Inc.*

CLAIM APPENDIX

[1a] 1. A portable oxygen concentrator, comprising:

[1b] *[1b(i)]* a separation cartridge selectively removable from a receptacle by movement relative to the receptacle in a first direction, *[1b(ii)]* the separation cartridge comprising an inlet oriented in a second direction opposite the first direction, an outlet oriented in the second direction, and a bed of adsorbent material configured to preferentially adsorb nitrogen;

[1c] wherein a first line extending parallel to the first and second directions passes through the outlet,

[1d] wherein a second line spaced-apart from the first line and extending parallel to the first line passes through the inlet, and

[1e] wherein the separation cartridge is configured such that, when fluid flows through the separation cartridge, fluid flowing along the first line contacts the adsorbent material of the bed and fluid flowing along the second line does not contact the adsorbent material of the bed.

[2a] 2. The portable oxygen concentrator as recited in claim 1, wherein:

[2b] the outlet is arranged adjacent a first end of the bed, and

[2c] adjacent a second end of the bed opposite the first end, the separation cartridge includes a spring configured to hold the bed in place.

[3a] 3. The portable oxygen concentrator as recited in claim 2, wherein:

[3b] adjacent the second end of the bed, the separation cartridge includes a porous filter, and

[3c] the spring contacts the second end of the bed via the porous filter.

[4a] 4. The portable oxygen concentrator as recited in claim 1, further comprising:

[4b] a power pack removable from the portable oxygen concentrator;

[4c] a pump electrically coupled to the power pack, the pump operable to cause a flow of fluid to move relative to the bed of adsorbent material;

[4d] a user interface configured to allow a patient to adjust and monitor operation of the portable oxygen concentrator; and

[4e] a carrying device for transporting the portable oxygen concentrator.

5. The portable oxygen concentrator as recited in claim 1, wherein the bed comprises a bed of zeolite which provides preferential adsorption of nitrogen.

6. The portable oxygen concentrator as recited in claim 5, wherein the zeolite is an LiLSX adsorbent.

7. The portable oxygen concentrator as recited in claim 1, wherein the first and second lines are straight lines.

8. The portable oxygen concentrator as recited in claim 1, wherein the separation cartridge is configured such that, when fluid flows through the separation cartridge, fluid flows along the first line in the second direction and fluid flows along the second line in the first direction.

9. The portable oxygen concentrator as recited in claim 1, wherein the separation cartridge includes at least one additional outlet oriented in the second direction and spaced-apart from the second line.

10. The portable oxygen concentrator as recited in claim 1, wherein the first line intersects adsorbent material of the bed and the second line does not intersect adsorbent material of the bed.

11. The portable oxygen concentrator as recited in claim 1, wherein the inlet is configured to receive ambient air and the outlet is configured to expel product gas.

[12a] 12. A separation cartridge for a portable oxygen concentrator, comprising:

[12b] an inlet oriented in a direction;

[12c] an outlet oriented in the direction;

[12d] a bed of adsorbent material configured to preferentially adsorb nitrogen; and

[12e] wherein a first line extending parallel to the direction passes through the outlet,

[12f] wherein a second line spaced-apart from the first line and extending parallel to the first line passes through the inlet, and

[12g] wherein the separation cartridge is configured such that, when fluid flows through the separation cartridge, fluid flowing along the first line contacts the adsorbent material of the bed and fluid flowing along the second line does not contact the adsorbent material of the bed.

[13a] 13. A portable oxygen concentrator, comprising:

[13b] a first bed of adsorbent material configured to preferentially adsorb nitrogen;

[13c] a first inlet oriented in a direction, wherein the first inlet is configured to direct a flow of ambient air to the first bed;

[13d] a first outlet oriented in the direction, wherein the first outlet is configured to expel product gas flowing downstream of the first bed;

[13e] a second bed of adsorbent material configured to preferentially adsorb nitrogen;

[13f] a second inlet oriented in the direction, wherein the second inlet is configured to direct a flow of ambient air to the second bed;

[13g] a second outlet oriented in the direction, wherein the second outlet is configured to expel product gas flowing downstream of the second bed;

[13h] a power pack removable from the portable oxygen concentrator;

[13i] a pump electrically coupled to the power pack, the pump operable to cause a flow of fluid to move relative to the first and second beds of adsorbent material;

[13j] a user interface configured to allow a patient to adjust and monitor operation of the portable oxygen concentrator;

[13k] a carrying device for transporting the portable oxygen concentrator;

[13l] wherein a first line extending parallel to the direction passes through the first outlet,

[13m] wherein a second line spaced-apart from the first line and extending parallel to the first line passes through the first inlet,

[13n] wherein the portable oxygen concentrator is configured such that, during use, fluid flowing along the first line contacts the adsorbent material of the first bed and fluid flowing along the second line does not contact the adsorbent material of the first bed,

[13o] wherein a third line extending parallel to the direction passes through the second outlet,

[13p] wherein a fourth line spaced-apart from the third line and extending parallel to the third line passes through the second inlet, and

[13q] wherein the portable oxygen concentrator is configured such that, during use, fluid flowing along the third line contacts the adsorbent material of the second bed and fluid flowing along the fourth line does not contact the adsorbent material of the second bed.

[14a] 14. The portable oxygen concentrator as recited in claim 13, wherein the portable oxygen concentrator is configured such that, during use:

[14b] fluid flows along the first line in the direction,

[14c] fluid flows along the second line opposite the direction,

[14d] fluid flows along the third line in the direction, and

[14e] fluid flows along the fourth line opposite the direction.

[15a] 15. The portable oxygen concentrator as recited in claim 14, wherein:

[15b] the first outlet is arranged adjacent a first end of the first bed,

[15c] a first spring is arranged adjacent a second end of the first bed opposite the first end,

[15d] the first spring is configured to hold the first bed in place,

[15e] the second outlet is arranged adjacent a first end of the second bed,

[15f] a second spring is arranged adjacent a second end of the second bed opposite the first end, and

[15g] the second spring is configured to hold the second bed in place.

16. The portable oxygen concentrator as recited in claim 13, wherein the first and second beds are contained within a common separation cartridge.

CERTIFICATE OF COMPLIANCE

Pursuant to 37 C.F.R. §42.24(c) and (d), Petitioner certify that this petition complies with the type-volume limitation of 5,600 words, as it includes 5,548 words, as measured by Microsoft Word, exclusive of the table of contents, table of authorities, a listing of facts which are admitted, denied, or cannot be admitted or denied, a certificate of service or word count, or an appendix of exhibits

Additionally, this petition complies with 37 C.F.R. § 42.6(a) and has been prepared using Microsoft® Word 2016 in 14-point Times New Roman.

Date: December 21, 2023

2099 Pennsylvania Avenue, NW
Suite 100

Washington, DC 20006-6801

Tel.: 202.747.1900

Fax: 202.747.1901

legaltm-gce-ipr@sheppardmullin.com

/s/ Robert M. Masters

Robert M. Masters (Reg. No. 35,603)

Counsel for Petitioner GCE Gas

Control Equipment Inc.

EXHIBIT LIST

Exhibit No.	Description
1001	U.S. Patent No. 11,389,614 ('614 patent)
1002	File History of U.S. Patent No. 11,389,614 (U.S. Application No. 15/931,716) ('614 patent FH)
1003	Declaration of Kent S. Knaebel, Ph.D. (Knaebel Declaration)
1004	U.S. Patent Application Publication No. 2005/0072306 to Deane, Taylor, Bare, Sargent, and Scherer (<i>Deane</i>)
1005	U.S. Patent No. 6,520,176 to Dubois, Bodelin and Vigor (<i>Dubois</i>)
1006	PCT International Patent Application Publication No. WO 2005/009590 to Berntson (<i>Berntson</i>)
1007	U.S. Patent Application Publication No. 2005/0028868 to Basset, Jean and Schmutz (<i>Basset</i>)
1008	U.S. Patent No. 6,311,719 to Hill, Hill and Hansen (<i>Hill '719</i>)
1009	U.S. Patent Application Publication No. 2003/0167924 to McCombs, Casey, Chimiak and Klimaszewski (<i>McCombs '924</i>)
1010	U.S. Patent Application Publication No. 2006/0117957 to McCombs, Bosinski, Casey and Valvo (<i>McCombs '957</i>)
1011	U.S. Provisional Application No. 60/617,834 to McCombs and Bosinski (<i>McCombs '835 Prov</i>)
1012	U.S. Patent Application Publication No. 2002/0033095 to Warren (<i>Warren '095</i>)
1013	U.S. Patent No. 6,651,658 to Hill, Radtke, Schneider and Bixby (<i>Hill '658</i>)
1014	U.S. Patent Application Publication No. 2006/0283325 to Sugano (<i>Sugano</i>)
1015	U.S. Patent Application Publication No. 2003/0005928 to Appel, Winter, Sward, Sugano, Salter and Bixby (<i>Appel '928</i>)
1016	U.S. Patent No. 4,802,899 to Vrana and Bansal (<i>Vrana</i>)
1017	U.S. Patent No. 4,404,005 to Hamlin and Taylor (<i>Hamlin</i>)

Exhibit No.	Description
1018	U.S. Patent No. 4,065,272 to Armond (<i>Armond</i>)
1019	U.S. Patent No. 7,144,446 to Lessi (<i>Lessi</i>)
1020	U.S. Patent No. 5,578,115 to Cole (<i>Cole</i>)
1021	U.S. Patent No. 4,584,001 to Dechene (<i>Dechene</i>)
1022	U.S. Patent No. 4,094,755 to Mueller (<i>Mueller</i>)
1023	U.S. Patent No. 4,530,706 to Jones (<i>Jones</i>)
1024	U.S. Patent No. 6,149,138 to Birdsell (<i>Birdsell</i>)
1025	U.S. Patent Application Publication No. 2006/0000223 to Dickerson (<i>Dickerson</i>)
1026	U.S. Patent No. 5,275,642 to Bassine (<i>Bassine</i>)
1027	U.S. Patent No. 4,916,630 to Miller (<i>Miller '630</i>)
1028	U.S. Patent Application Publication No. 2006/0137522 to Nishimura, Makari, Motoki and Kobayashi (<i>Nishimura</i>)
1029	U.S. Patent No. 6,471,744 to Hill (<i>Hill '744</i>)
1030	U.S. Patent No. 6,344,069 to Smolarek, Sinicropi and Schaub (<i>Smolarek '069</i>)
1031	U.S. Patent No. 5,429,666 to Agrawal, Kumar, Naheiri and Watson (<i>Agrawal '666</i>)
1032	U.S. Patent No. 5,906,672 to Michaels, Birangi and Polaseck (<i>Michaels '672</i>)
1033	U.S. Patent No. 6,547,851 to Warren (<i>Warren '851</i>)
1034	U.S. Patent Application Publication No. 2002/0144596 to Dee, Chiang, Miller and Whitley (<i>Dee '596</i>)
1035	U.S. Patent No. 5,114,440 to Reiss (<i>Reiss '440</i>)
1036	U.S. Patent No. 4,449,990 to Tedford (<i>Tedford '990</i>)
1037	U.S. Patent No. 6,544,318 to Dee, Chiang, Miller and Whitley (<i>Dee '318</i>)
1038	U.S. Patent No. 7,135,059 to Deane, Taylor, Bare, Sargent and Scherer (<i>Deane '059</i>)

Exhibit No.	Description
1039	U.S. Patent No. 7,438,745 to Deane, Taylor and Li (<i>Deane '745</i>)
1040	U.S. Patent No. 7,250,073 to Keefer, McLean and Babicki (<i>Keefer '073</i>)
1041	U.S. Patent No. 6,585,804 to Kleinberg, Pillarella and Guro (<i>Kleinberg '804</i>)
1042	U.S. Patent No. 6,143,056 to Smolarek and Kun (<i>Smolarek '056</i>)
1043	U.S. Patent No. 5,827,358 to Kulish and Swank (<i>Kulish</i>)
1044	U.S. Patent No. 6,802,889 to Graham, Occhialini and Puri (<i>Graham</i>)
1045	U.S. Patent No. 6,691,702 to Appel, Winter, Sward, Sugano, Salter and Bixby (<i>Appel '702</i>)
1046	U.S. Patent No. 4,687,573 to Miller and Verrando (<i>Miller '573</i>)
1047	U.S. Patent Application Publication No. 2005/0072426 to Deane, Taylor, Bare, March, Merchant and Smith (<i>Deane '426</i>)
1048	U.S. Patent Application Publication No. 2005/0045041 to Hechinger and Zarate (<i>Hechinger</i>)
1049	File History of U.S. Patent No. 7,954,490 (U.S. Application No. 11/054,341) (<i>'490 patent FH</i>)
1050	File History of U.S. Application No. 13/096,362 (<i>'362 application FH</i>)
1051	File History of U.S. Application No. 13/795,977 (<i>'977 application FH</i>)
1052	File History of U.S. Patent No. 10,702,669 (<i>'669 patent FH</i>)
1053	File History of U.S. Patent No. 10,357,628 (<i>'628 patent FH</i>)
1054	U.S. Patent No. 10,357,628 (<i>'628 patent</i>)
1055	U.S. Patent No. 7,954,490 (<i>'490 patent</i>)
1056	U.S. Patent No. 10,702,669 (<i>'669 patent</i>)

Exhibit No.	Description
1057	Atmosphere National Geographic Society, https://education.nationalgeographic.org/resource/atmosphere Retrieved December 2, 2022 (<i>National Geographic</i>)
1058	U.S. Patent No. 4,859,217 to Chao (<i>Chao</i>)
1059	The American Heritage Dictionary of the English Language, Fourth Edition, Houghton Mifflin Company, 2000, selected pages (<i>American Heritage</i>)
1060	New Oxford American Dictionary, Oxford University Press, 2001, selected pages (<i>New Oxford</i>)
1061	<i>Bloomsbury English Dictionary, Second Edition, Bloomsbury Publishing, 2004, selected pages (Bloomsbury)</i>
1062	<i>Webster's Third New International Dictionary, Merriam-Webster Inc., 2002, selected pages (Webster)</i>
1063	<i>Plaintiff/Counter-Defendant GCE Gas Control Equipment Inc.'s Stipulation of Invalidity Contentions</i> , filed in <i>GCE Gas Control Equip., Inc. v. 3B Medical Mfg., LLC</i> , No. 22-cv-02550 (D. Md.) (Dkt. 28) (<i>D. Ct. Sotera Stipulation</i>)
1064	United States Courts, <i>U.S. D. Ct.—Judicial Caseload Profile: Maryland</i> (reporting period ending June 30, 2022), https://www.uscourts.gov/sites/default/files/fcms_na_distprofil e0630.2022_0.pdf (<i>Judicial Caseload Profile for D. Md.</i>)
1065	<i>Order</i> , filed in <i>In re CTP Innovations, LLC, Patent Litigation</i> , No. 14-cv-2581 (D. Md.) (Dkt. 38)
1066	<i>Order</i> , filed in <i>Paice LLC v. BMW AG</i> , No. 19-cv-03348 (D. Md.) (Dkt. 98)
1067	U.S. Patent Provisional Application No. 60/489,674 to Berntson (<i>Berntson Provisional</i>)
1068	Ruthven et al., Pressure Swing Adsorption (1994)
1069	April 21, 2023 Email from Board Authorizing Reply to POPR
1070	3B's May 22, 2023 Opening Claim Construction Brief (Dkt. 36) in Related District Court Matter

Exhibit No.	Description
1071	GCE's May 22, 2023 Opening Claim Construction Brief (Dkt. 38) in the Related District Court Matter
1072	3B's June 21, 2023 Responsive Claim Construction Brief (Dkt. 41) in the Related District Court Matter
1073	GCE's June 21, 2023 Responsive Claim Construction Brief (Dkt. 42) in the Related District Court Matter
1074	Deposition Transcript of Dr. Orhan Talu (December 1, 2023).
1075	File History of U.S. Patent No. 7,604,005 (Application No. 11/054,615).
1076	3B's Infringement Contentions for U.S. Patent No. 10,357,628 in Related District Court Matter
1077	Excerpts from Newtonian Physics by Benjamin Crowell, Edition 2.0 (August 13, 2000) (including internet archive copies of web version available as of April 2001)
1078	Declaration of Kent S. Knaebel, Ph.D., December 21, 2023

CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. § 42.6(e), the undersigned hereby certifies that the foregoing Petitioner's Reply To Patent Owner Response To Petition and Exhibits 1070-1078 were filed with the PTAB through P-TACTS and served via email on attorneys of record at the following addresses:

Timothy J. Murphy tmurphy@cgolaw.com

David L. Atallah datallah@cgolaw.com

Jessica Fleetham jfleetham@cgolaw.com

Date: December 21, 2023

/s/ Robert M. Masters

Robert M. Masters (Reg. No. 35,603)

Sheppard, Mullin, Richter &
Hampton LLP
2099 Pennsylvania Avenue, NW
Suite 100
Washington, DC 20006-6801
Tel.: 202.747.1900
Fax: 202.747.1901
legaltm-gce-ipr@sheppardmullin.com

*Counsel for Petitioner GCE Gas
Control Equipment Inc.*