

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

**Declaration of Kent S. Knaebel, Ph.D. in Support of Petitioner's Reply to
Patent Owner's Response**

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I, Kent S. Knaebel, Ph.D., declare as follows:

1. My name is Kent S. Knaebel. I am the President of Adsorption Research Inc. and, as described in my declaration supporting the Petition in this matter, am an expert in portable oxygen concentrators and related technologies.

2. I have prepared this Declaration as an expert witness retained by GCE Gas Control Equipment Inc. (“GCE”). I previously prepared a Declaration in support of GCE’s Petition for Inter Partes Review (the “Petition”) of certain claims of U.S. Patent No. 11,389,614 (“the ’614 patent”), opining that each of the challenged claims was unpatentable (“*Knaebel Dec.*”). I incorporate my opinions from that Declaration here.

3. Since that time, Patent Owner VBOX, Inc., filed a Patent Owner Preliminary Response (“POPR,” Paper 06), GCE filed a Reply to the POPR (Paper 07), Patent Owner filed a Sur-Reply (Paper No 09), the PTAB issued a Decision Granting Institution of Inter Partes Review (“ID,” Paper 10), and Patent Owner filed its Patent Owner Response (“POR,” Paper 13) along with the Declaration of Orhan Talu, Ph.D. (EX2001; “*Talu Dec.*”). I have reviewed these documents, along with the other exhibits submitted with the POR.

4. My review of the POPR, ID, POR, and Dr. Talu’s Declaration has not changed my opinion that the challenged claims are unpatentable based on the Grounds discussed in my original Declaration. In the present Declaration I respond

to the arguments advanced by Patent Owner and Dr. Talu and comments in the ID, and give my additional opinions as to why the challenged claims of the '614 patent are unpatentable. I provide technical bases for these opinions as appropriate.

5. This Declaration contains statements of my opinions formed to date and the bases and reasons for those opinions. I may offer additional opinions based on further review of materials in this matter, including opinions and/or testimony of other expert witnesses and material from related matters. I make this declaration based upon my own personal knowledge and, if called upon to testify, would testify competently to the matters contained herein.

I. SUMMARY OF MY OPINIONS

6. The *Knaebel Dec.* demonstrates how each Challenged Claim of the '614 patent is unpatentable.

7. The only substantive dispute raised by the POPR as to the opinions in the *Knaebel Dec.* was as to *Deane's* teachings of the so-called “non-contact limitations” (elements [1c]-[1e], [12e]-[12g], [13l]-[13q]) in each independent claim. Patent Owner and Dr. Talu essentially repeat that argument in the POR (pp. 51-61) and Talu Declaration (EX2001, ¶¶139-150). As explained below in §V.A.1.[1c]-[1e], this argument is wrong and based on a misreading of *Deane*.

8. Regarding claims 1-11, although not argued in the POPR, the Institution Decision (“ID,” Paper 10) indicates the Board has concerns regarding

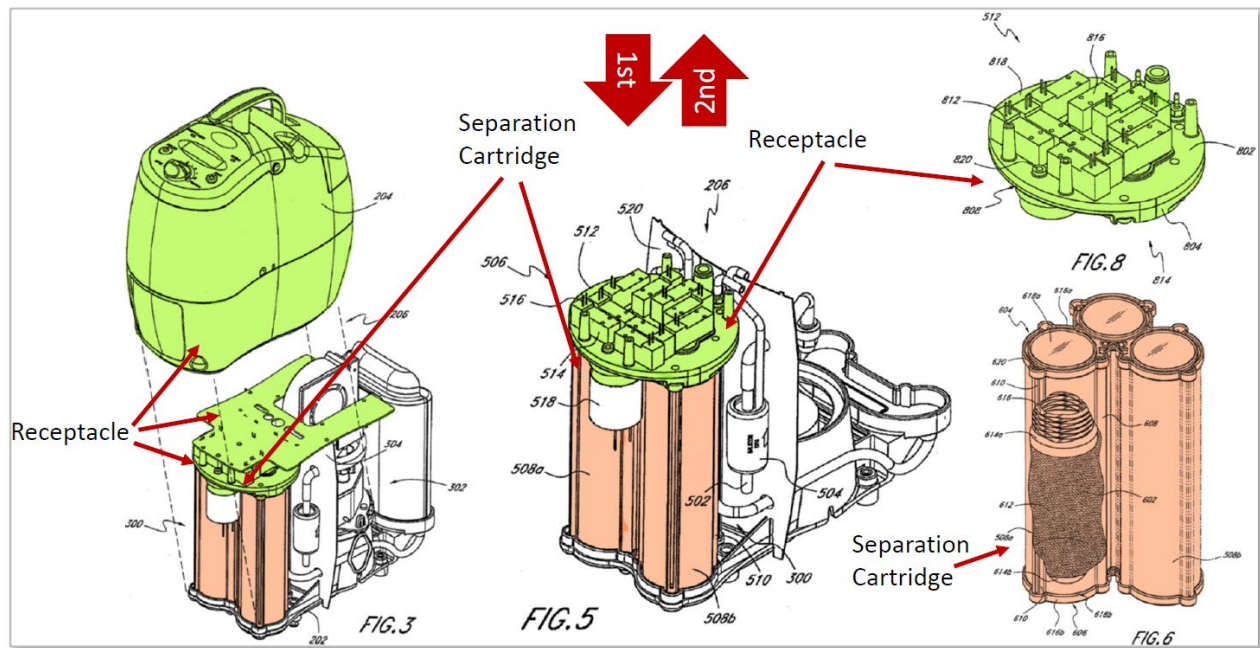
Petitioner’s showing of “a separation cartridge selectively removable from a receptacle by movement relative to the receptacle in a first direction” in element [1b] (herein element [1b(i)]) because it did not see how the Petition and the *Knaebel Dec.* show how *Deane*’s housing 602 (cartridge) can be moved downwardly away from its manifold 512 (receptacle). ID, 34-36. Patent Owner and Dr. Talu now advance arguments based on the ID’s identified concerns in the POR (pp. 33-45) and *Talu Dec.* (¶¶111-138).

9. As explained in §§IV and V.A.1.[1b(i)] below, I disagree with the ID and POR’s narrow reading of *Deane*—including my explanation of its teachings—and narrow interpretation of element [1b(i)] for several reasons.

10. First, Patent Owner and Dr. Talu focus extensively on what specific steps must allegedly be employed to disassemble *Deane*’s components. But element [1b(i)] does not require a specific method of POC disassembly or place limits as to a permissible number of disassembly steps. Rather, as Dr. Talu agreed during deposition, element [1b(i)] only requires that the structure of the cartridge/receptacle interface provide the **capability** for the cartridge to be removable from the **receptacle** (not the POC generally) by the recited movement.

11. *Deane* certainly teaches the claimed structure and capability. For example, even under the narrow reading of element [1b(i)] suggested by the ID and POR, *Deane* teaches its housing 602 (cartridge) can move downwardly away from

its manifold 512 (receptacle) after both components are removed from chassis 202. Specifically, as explained in detail in §II below, manifold 512 and housing 602 are part of PSA unit 108/508, which a POSITA would have understood to be removable from *Deane*'s chassis 202 as a unit and subsequently disassembled. It



was my intent to describe this disassembly methodology in the *Knaebel Dec.*, as shown in, for example, the image embedded in ¶319 (EX1003, ¶319) and reproduced here, which shows, from left to right: (i) removal of the shell 204; (ii) removal of the circuit board 1314; and (iii) separation of manifold 512 from housing 602 *after* both have been removed from chassis 202 as PSA unit 108/508 (note the rightmost image does not include chassis 202). In this separation step, a POSITA would have recognized that manifold 512 would be held in one hand, housing 602 would be held in the other, and they would be separated along the

long axis of the separation cartridge as dictated by the physical configuration of the manifold 512 / housing 602 interface (*see Knaebel Dec.*, ¶¶335-342). It would have been obvious in this regard 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. This movement **capability** would have been readily apparent to a POSITA and meets all the requirements of element [1b(i)].

12. Second, construing element [1b(i)] as reading **only** on the downward movement of housing 602 (cartridge) away from a stationary manifold 512 (receptacle) in *Deane* is incorrect (*see* ID at 35-36, POR at 36-38 and *Talu Dec.* at ¶¶111-119). The plain meaning of “movement relative to” includes within its scope: (i) the movement of housing 602 (cartridge) away from stationary manifold 512 (receptacle) in the annotated Figures above; (ii) the movement of manifold 512 (receptacle) away from stationary housing 602 (cartridge); and (iii) the movement of both away from each other. A POSITA would have understood that each of these methodologies would have been employed in *Deane* after removal of PSA unit 108/508 from chassis 202, for the reasons above and below.

13. Third, even if a POSITA would have understood *Deane* as **only** being capable of disassembly by moving the manifold 512 (receptacle) up away from

stationary housing 602 (cartridge) that remains mounted in chassis 202 in the manner argued in the POR and Dr. Talu (a POSITA would not), that would still teach element [1b(i)] under the correct interpretation of “movement relative to” as inclusive of the movement of manifold 512 (receptacle) away from a stationary housing 602 (cartridge).

14. The POR also argues that claim 1 is patentable because *Deane* does not teach claim 1’s “receptacle” and that claims 2/15 are patentable because *Deane* or *Deane/Hill* does not teach claim 2/15’s spring placement. As explained in §§V.A.1.[1c]-[1e], V.A.2, and V.B.1 below, I disagree with both arguments.

15. Thus, it remains my opinion that all challenged claims should be found unpatentable.

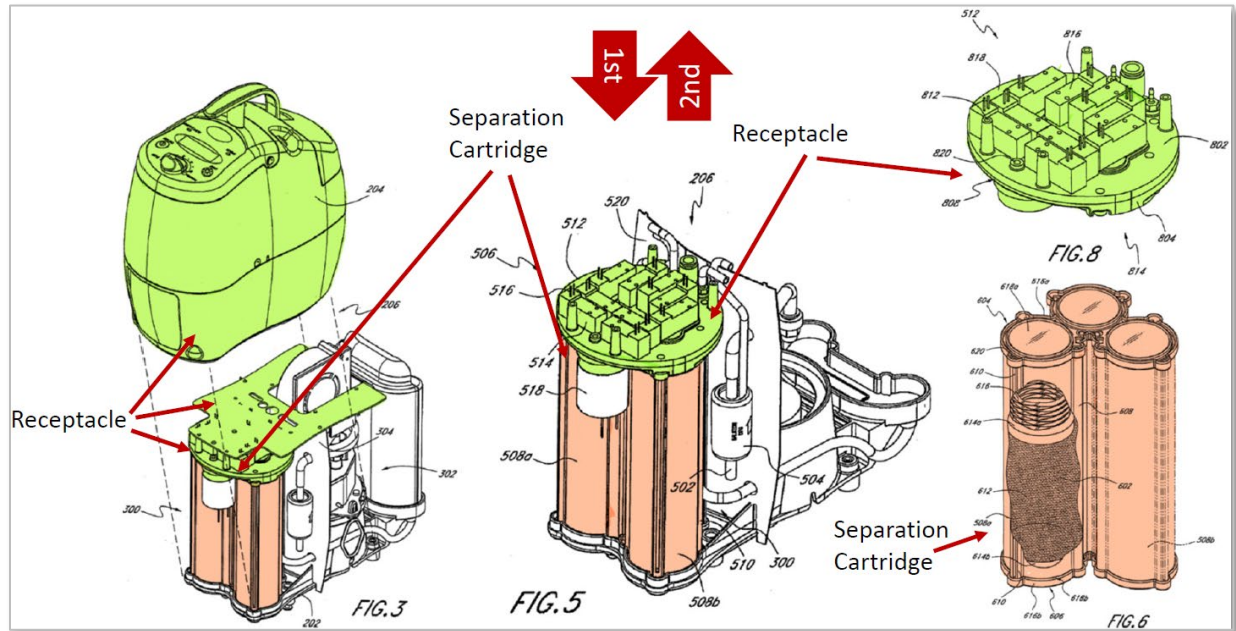
II. DEANE’S ASSEMBLY/DISASSEMBLY TEACHINGS

A. The Disassembly Teachings of Deane

16. A POSITA would have recognized that *Deane*’s teachings encompass several different assembly/disassembly methodologies and capabilities.

17. For example, as discussed above, a POSITA would have understood *Deane*’s configuration to be disassembled in the manner shown in the annotated drawing set forth in ¶319 of the *Knaebel Dec.* (reproduced below). First, moving from left to right in my annotated drawing, shell 204 would be removed. Second,

circuit board 1314 would be removed (although that is not necessary in view of



*Deane's teachings*¹). Third, PSA unit 108/506 would be unmounted and removed from chassis 202. Fourth, while the person that removed PSA unit 108/506 holds it, manifold 512 would be separated from housing 602, such as by holding manifold 512 in one hand and housing 602 in the other and moving housing 602 away from manifold 512.

¹ *Deane* teaches that circuit board 1314 is “mounted horizontally on the PSA unit 506, above the valves 816 on the manifold 512 which “advantageously simplifies the assembly process.” EX1004 (*Deane*), ¶¶[0063], [0086]. Because circuit board 1314 is directly mounted to manifold 512 it can be removed as part of PSA unit 108/506 as discussed herein without an additional step. Patent Owner and Dr. Talu assert circuit board 1314 is also connected to the structure surrounding fan 1102, citing *Deane's* FIGS. 11, 13 (POR, 40; EX2001, ¶126). But a POSITA would have understood the illustrated features they identify to be locating pins, not fasteners. Patent Owner and Dr. Talu identify no teaching in *Deane's* specification that states or even implies circuit board 1314 is fastened to the structure surrounding fan 1102.

18. A POSITA would have understood that this was the most straightforward understanding of how *Deane*'s device would have been disassembled, for a number of reasons.

19. First, as noted in, e.g., ¶¶201, 321, 322, 331, 336, 339, 343, and 351 of the *Knaebel Dec.*, *Deane* teaches a PSA unit 108/506 that includes both housing 602 with adsorbent columns 508a, 508b and manifold 512. *See, e.g.*, EX1004 (*Deane*), ¶¶[0032] (PSA unit 108 is shown in FIG. 1, which illustrates manifold 512 and adsorbent columns 508a, 508b together within a dashed borders), [0036] ("PSA unit 108 ... includes two adsorbent beds 118a, 118b"), [0062] ("PSA unit 506 generally includes a pair of adsorbent bed columns 508a, 508b, a product gas storage column 510, and an integrated manifold 512"), [0065] ("PSA unit 506 has many novel features which, individually and in combination, contribute to a lighter, more compact and reliable apparatus" and "PSA unit 506 is mounted in the first compartment"). Thus, a POSITA would have understood that *Deane*'s PSA unit 108/506 is a discrete assembly.

20. Second, as set forth in ¶319 (including my annotated drawing) and ¶328 of the *Knaebel Dec.*, *Deane* teaches: (i) that its individual components can be connected and disconnected from its POC after removal of shell 204; and (ii) that PSA unit 108/506 is such a discretely mountable component. *See, e.g.*, EX1004 (*Deane*), ¶¶[0057] (teaching *Deane*'s system includes "chassis 202 (see also FIG.

3) and a shell 204 that together form a housing 206 in which various components are mounted”), [0058] (teaching the internal components of *Deane*’s system “can be assembled outside the confines of the shell 204” and “the shell can be conveniently removed to provide access for testing, repair, or maintenance of the components”), [0059] (FIG. 4 shows recesses 400a-c in chassis 202 “for mating with a PSA unit.”), and [0065] (“PSA unit 506 is mounted in the first compartment”).

21. Indeed, in ¶299 of the *Knaebel Dec.*, I pointed out that *Deane* (and *Berntson*) teaches “easily accessible adsorbent-containing units for repair/maintenance purposes.” The unit I was referring to in this regard in *Deane* is PSA unit 108/506. This understanding is based on *Deane*’s teachings and, as explained in ¶¶296-297 of the *Knaebel Dec.*, a POSITA’s general understanding that modularity (*e.g.*, combining components into subassemblies to reduce the amount of assembly/disassembly steps) was important in POCs. *Deane* reflects this, teaching that simplifying assembly is a goal. EX1004 (*Deane*), ¶¶[0060] (teaching integrated features “reduce assembly time”), [0063] (teaching mounting circuit board directly to PSA unit 506 simplifies assembly), [0065] (same), [0070] (teaching its configuration “simplifies assembly”). A POSITA would have understood *Deane* in this context, reinforcing the understanding that PSA unit 108/506 is such a discretely mountable component.

22. *Third*, as set forth in ¶¶318-329 of the *Knaebel Dec.*, a POSITA would have understood that, after PSA unit 108/506 is unmounted and removed from chassis 202 in *Deane*, manifold 512 and housing 602 (with adsorbent columns 508a, 508b) would have been separated (*e.g.*, housing 602 is removable from manifold 512).

23. In particular, *Deane* repeatedly teaches its separation cartridge (*e.g.*, adsorbent housing 602 / adsorbent bed columns 508a, 508b) releasably interfaces with manifold 512. *See, e.g.*, EX1004 (*Deane*), Abstract, ¶¶[0007] (“integral fluid flow manifold mounted on one end of the columns”), [0062] (“integrated manifold 512 can be mounted horizontally on the upper end of the columns 508 a-b”), [0063] (the integrated manifold 512 is mounted on the upper end of the columns 508 a-b), [0065] (“integrated manifold mounted horizontally on one end of the columns”) and [0070].

24. Based at least on these teachings, as I set forth in ¶¶326-327 of the *Knaebel Dec.*, a POSITA would have understood that adsorbent housing 602 / adsorbent bed columns 508a, 508b and manifold 512 would have been connectable to and disconnectable from each other as a matter of basic engineering, and therefore that adsorbent housing 602 / adsorbent bed columns 508a, 508b is removable from manifold 512. In this separation step, as discussed above, a POSITA would have recognized that manifold 512 would be held in one hand,

housing 602 would be held in the other, and they would be separated along the long axis of the separation cartridge as dictated by the physical configuration of the manifold 512/ housing 602 interface (*see Knaebel Dec.*, ¶¶335-342). It would have been obvious in this regard 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.

25. The reading of *Deane* that I set forth above would also have been informed by, or obvious in view of, a POSITA's knowledge of the art as of 2004-2005. At this time, removability of an assembly of adsorbent cartridges and a manifold from a POC housing was an art-recognized disassembly methodology. For example, as set forth in the *Knaebel Dec.* at ¶¶17-20 and 297, *McCombs '957* teaches a "compact unit" made up of adsorbent beds 30, 32, manifolds 120, 122 and compressor 24 held together by a single elongated bolt 130 that is assembled as a unit and then attached to (or released from) central chassis 108 such that it is "readily assembled" and "readily accessed for servicing." EX1010 (*McCombs '957*), ¶¶[0028]-[0030], FIGS. 7-9. As I explained in the *Knaebel Dec.* at ¶297, *McCombs '957* "inform[] a POSITA's general understanding as of 2004-2005 that it was desirable for adsorbent-containing units in oxygen concentrators to be easily removable/accessible from the concentrators for maintenance purposes and for

ease of assembly/disassembly.” *Berntson* also teaches this concept, as discussed below in §V.A.1.[1b(i)].

26. Taking these teachings together, it remains my opinion, as shown in my annotated Figure reproduced above, that a POSITA would have understood *Deane* to teach that PSA unit 108/506 is removable as a unit from chassis 202 before its individual components (*e.g.*, manifold 512 and housing 602) are separated.

B. Patent Owner and Dr. Talu’s Assertions Regarding How *Deane*’s Manifold 512 and Housing 602 Are Separated Are Not the Most Straightforward Reading of *Deane*

27. To support each of their patentability arguments², Patent Owner and Dr. Talu advocate that *Deane* employs a different disassembly methodology. But, as discussed below, their asserted methodology is not and would not have been the most straightforward reading of *Deane* by a POSITA.

28. Patent Owner and Dr. Talu first argue that *Deane*’s manifold 512 “must be completely removed” before housing 602 can be moved/accessed “at all.” POR, 39; EX2001, ¶121. This is not accurate. As described above, a POSITA would have understood PSA unit 108/506 to be removable from *Deane*’s chassis

² I do not understand Patent Owner to have any patentability arguments as to element [1b(i)] when *Deane* is correctly understood as I set forth above.

202 as an assembly before it is subsequently disassembled. Thus, housing 602 can be moved as part of PSA unit 108/506 before manifold 512 is separated therefrom.

29. Patent Owner and Dr. Talu next argue that “[w]hile *Deane’s* disclosure does not describe a removal process, the teachings of *Deane* suggest that the adsorbent columns 508a, 508b could only be accessed ... after a near full tear down of *Deane’s* gas fractionalization apparatus 200.” POR, 39; EX2001, ¶122. This is again not accurate. As described above, a POSITA would have understood from *Deane* that its housing 602 (including adsorbent columns 508a, 508b) to be removable from manifold 512 after just two steps: (i) removal of shell 204; and (ii) removal of PSA unit 108/506 that includes manifold 512 and housing 602 (including adsorbent columns 508a, 508b). A POSITA would have understood that a majority of *Deane’s* structure, including everything illustrated in, e.g., FIG. 11, would remain in place while PSA unit 108/506 was removed. This is hardly a “near full tear down.”

30. Patent Owner and Dr. Talu then assert that *Deane’s* POC would have been disassembled in a particular way different from the manner I describe (*i.e.*, the manner that would have been apparent to a POSITA). POR, 39-45. EX2001, ¶¶123-132. While I do not disagree that PSA unit 108/506 would be removed after removal of cover 204, circuit board 1314 (although circuit board removal is not appear necessary as discussed above), and the fasteners holding PSA unit 108/506

to *Deane*'s chassis 202, I disagree with the assertions by Patent Owner and Dr. Talu regarding the subsequent steps.

31. Specifically, I disagree that, after the fasteners holding PSA unit 108/506 to *Deane*'s chassis 202 are removed, manifold 512 would "pop-up" and/or "split" into separate pieces due to the action of spring 616 inside adsorbent housing 602 as asserted by Patent Owner and Dr. Talu. POR, 42-43. EX2001, ¶¶128-129, 137. Adsorbent housing 602 is shown in FIG. 6 as a self-contained assembly. A POSITA would have understood FIG. 6 as showing spring 616 held in compression by the structure of housing 602 and/or other components such as gasket 616 / filter 618 assembly. Such retention structures were well-known in the art by 2004-2005. Because adsorbent housing 602 is self-contained, spring 616 would not act on manifold 512 when the fasteners holding PSA unit 108/506 to chassis 202 are removed; rather, spring 616 would remain in compression in place in housing 602 as shown in FIG. 6. Neither Patent Owner nor Dr. Talu cite any teachings of *Deane* that would support their contrary reading.

32. I also disagree with Patent Owner and Dr. Talu's argument that, if one tried to lift housing 602 out of chassis 202 (either alone or as part of PSA unit 108/506), the adsorbent material would somehow "fall out" of the bottom of columns 508a/b. POR, 44. EX2001, ¶¶130-131. Again, adsorbent housing 602 is shown in FIG. 6 as a self-contained assembly, with adsorbent material 602 retained

therein by restraining disks 614a/b and gaskets 616a/b / filter 618a/b assembly.

EX1004 (*Deane*), ¶¶[0068]-[0069]. *Deane* also specifically teaches that restraining disks 614a/b are provided “for inhibiting movement of adsorbent material 612” and are designed with an “interference fit with the internal walls of the housing 602.”

EX1004 (*Deane*), ¶[0068]. A POSITA would therefore have understood the restraining disks 614a/b to retain the adsorbent 612 in place in the self-contained adsorbent housing 602 shown in FIG. 6 when it is removed from chassis 202 (as part of PSA unit 108/506). A POSITA would also have understood these features would also retain the adsorbent 612 in place while adsorbent housing 602 is subsequently removed from manifold 512 (and, in reverse, for assembly to manifold 512 and then chassis 202). Otherwise, adsorbent 612 would leak pre-installation or during service and replacement of housing 602.

33. Moreover, as set forth below in §IV.A, various Examiners have confirmed during prosecution of the '614 patent family that housing 602 with adsorbent beds 508a/b is a removable cartridge. This provides independent confirmation of my conclusion that *Deane* teaches a self-contained cartridge in FIG. 6 that would not simply fall apart and leak as Patent Owner and Dr. Talu assert.

34. As an aside, I note that Dr. Talu has never worked in industry, has only torn down a handful of POCs over his career, and has been involved in the

design of only one POC that was never commercialized. EX1074 (*Talu Deposition Transcript*), 9:14-15, 14:9-21:9. Thus, his experience with designing and working with POCs and their components is limited. In contrast, I have designed and built oxygen concentrators and other PSA units since the mid-1980s. They have ranged in size from POCs (dimensions measured in inches or centimeters) to large commercial systems, having diameters and heights of 10 to 12 feet. When there have been problems with military aircraft that use POCs to supply oxygen to the aircrew, *e.g.*, related to the B1 bomber and more recently to the F18 fighter, I have been invited to participate on the committees to identify the root-causes, and then to recommend remedial actions.

35. And, in any event, even if Patent Owner and Dr. Talu's identified methodology was another *possible* way to disassemble *Deane's* system, it does not affect the ultimate analysis here because, as discussed in §§IV.C, IV.D, and V.A.1.[1b], a POSITA would have understood element [1b(ii)] to require only that the claimed structure provide the *capability* for the claimed cartridge and receptacle to be separated as specified. I have amply demonstrated here how a POSITA would have understood that *Deane's* housing 602 and manifold 512 have the capability to be separated as claimed. It matters not that there are other ways they could have been disassembled.

III. LEVEL OF ORDINARY SKILL IN THE ART

36. Neither Patent Owner (POR, 11) nor Dr. Talu (*Talu Dec.*, 66) dispute my definition of a POSITA as having at least a bachelor's degree, or the equivalent degree, in mechanical engineering, chemical engineering, or a related field, and 2-3 years of experience in the research, design, or development of portable oxygen concentrators and related hardware, software, and firmware, or equivalent experience. A person with less education but more relevant practical experience, or more education and less experience, may also meet this standard. I maintain my opinion in this regard and utilize this definition to form my opinions herein.

IV. CLAIM CONSTRUCTION

A. "Separation Cartridge"

37. As set forth in ¶¶232-258 of the *Knaebel Dec.*, it is my opinion that a POSITA would have understood "separation cartridge" in the context of the challenged claims of the '614 patent as "a housing that holds multiple adsorbent columns for gas separation and provides separate inlet and outlet ports for each adsorbent column."

38. It is also my understanding that Petitioner has proposed a slightly different definition in the related District Court matter: "a housing/container that holds multiple adsorbent columns for gas separation and provides separate inlet and outlet ports for each adsorbent column." EX1073 (*GCE Responsive Claim*

Construction Brief), p. 12. This is also an appropriate definition for the reasons set forth in ¶¶232-258 of the *Knaebel Dec.*

39. ***Patent Owner's Construction Is Overbroad:*** Patent Owner and Dr. Talu disagree with the above constructions, and propose that “separation cartridge” means “a cartridge configured to separate gas” in view of the ’614 patent’s specification and the fact that the claims recite the presence of adsorbent in the cartridge. POR, 13-14; EX2001, ¶¶68-71.

40. While Patent Owner and Dr. Talu’s construction is partially correct in terms of the bare function of the separation cartridge, it does not properly define “separation cartridge” according to the intrinsic record of the ’614 patent and is therefore overbroad. As set forth in the *Knaebel Dec.*, and as Dr. Talu agrees, “separation cartridge” was not a term of art in 2004-2005. EX1074 (*Talu Deposition Transcript*), 94:4-13. Thus, a POSITA would have looked to the ’614 patent to understand the meaning of “separation cartridge.” In this regard, each and every embodiment of the ’614 patent consistently describes the separation cartridge of the alleged invention as a case having multiple adsorbent columns, each having a dedicated inlet and outlet. Moreover, the ’614 patent specifically indicates that its Figures depicting a multi-bed separation cartridge are the “present invention.” EX1001, 2:60-63; 3:41-44. Thus, a POSITA would have understood

“separation cartridge” as “a housing that holds multiple adsorbent columns for gas separation and provides separate inlet and outlet ports for each adsorbent column.”

41. ***Petitioner’s Construction Is Not Inconsistent With the Claims:***

Patent Owner and Dr. Talu argue that Petitioner’s construction is inconsistent with the claim language because claim 1 recites only “a bed of adsorbent” as being present in the separation cartridge. POR, 14; EX2001, ¶75. But I see nothing logically inconsistent with requiring the separation cartridge to include multiple beds of adsorbent material, inlets, and outlets, and then identifying one bed/inlet/outlet set to define a particular feature found in each of the bed/inlet/outlet sets. For example, in claim 1, the expressly recited adsorbent column, inlet, and outlet set provides an antecedent basis for the claims’ later recitations of the arrangement of the first and second lines. In other words, in order to recite the lines in relation to a particular inlet, outlet, and adsorbent column set forth in later claim elements, the claim first identifies an inlet, outlet, and adsorbent column.

42. ***The ’614 Patent Shows Only Multi-Bed Cartridges:*** Patent Owner and Dr. Talu next argue that Petitioner’s construction is wrong because only “some” of the embodiments of the ’614 patent have separation cartridges with multiple beds. POR, 15-16; EX2001, ¶73-74.

43. But the only evidence of any non-multi-bed “embodiment” that is identified by Patent Owner and Dr. Talu is a single sentence in a paragraph at 7:13-19 of the ’614 patent (emphasized in the paragraph reproduced below) that states:

“This constitutes the general principles of vacuum swing adsorption (VSA) for gas separation. *All phases can be accomplished with a single column, or with a plurality of columns.* If a plurality of columns are used, it is preferable to have a multiple of three (illustrated as 130 a-130 c in FIG. 5) that are sequenced out of phase for the different cycle phases in order to maintain constant product flow.”

44. Patent Owner and Dr. Talu’s argument that there are any single-bed cartridge embodiments in the ’614 patent, including that this single sentence shows that the separation cartridge of the ’614 patent can have just a single column, are wrong for several reasons.

45. First, multi-bed cartridges are not merely disclosed in “some embodiments” of the ’614 patent, they are shown in each and every embodiment of the invention, in every figure, described repeatedly in the specification, and explicitly described as the “present invention” by the ’614 patent (EX1001, 2:60-63; 3:41-44). In no case are the multi-bed cartridges of the ’614 patent described as example separation cartridges or an exemplary embodiment of a separation cartridge. While it is my understanding that a patent’s claim scope should generally not be limited to its exemplary embodiments, I do understand there to be

exceptions where a patent clearly and repeatedly describes its invention in a particular way. Such is the case here as to the multi-bed nature of the separation cartridge.

46. Second, the paragraph (7:13-19) cited by Patent Owner and Dr. Talu as allegedly teaching a single-bed embodiment is not directed to explaining the separation cartridge of the '614 patent at all. Rather, the paragraph is the conclusion of a section of the '614 patent titled "Vacuum Swing Adsorption (VSA) Process-Overview" and extending over 6:37-7:19 of the '614 patent. The cited paragraph confirms it relates to the general principles of VSA discussed in the preceding paragraphs, and then indicates that *the general VSA process* can be implemented using one or multiple columns (beds). It does not say that *the separation cartridge* of the '614 patent's POC could be implemented using one or multiple columns.

47. Third, a POSITA would not have otherwise understood "[a]ll phases can be accomplished with a single column, or with a plurality of columns" to indicate that the particular separation cartridge of the '614 patent's POC could have been implemented using a single bed, as a POSITA would have understood that was not a workable configuration. Specifically, a POSITA would have understood that, while single-bed systems were used in *industrial VSA processes*, they were not (and still are not) a functional alternative for *portable* oxygen

concentrators (POCs). Single-bed POCs are unknown in the art because they cannot provide the requisite performance metrics, particularly as to weight. All known POCs use two or more beds.

48. As I described in the *Knaebel Dec.*, the adsorbent has finite capacity to split the nitrogen from the oxygen in air, which (as described in conjunction with the diagram here) means a bed can only be fed with compressed air, during which it produces enriched oxygen (e.g., see bed A above), for a limited time before it cannot adsorb any more nitrogen. Then that adsorbent must be regenerated by reducing the pressure and then purging with enriched oxygen (e.g.,

see bed B above);

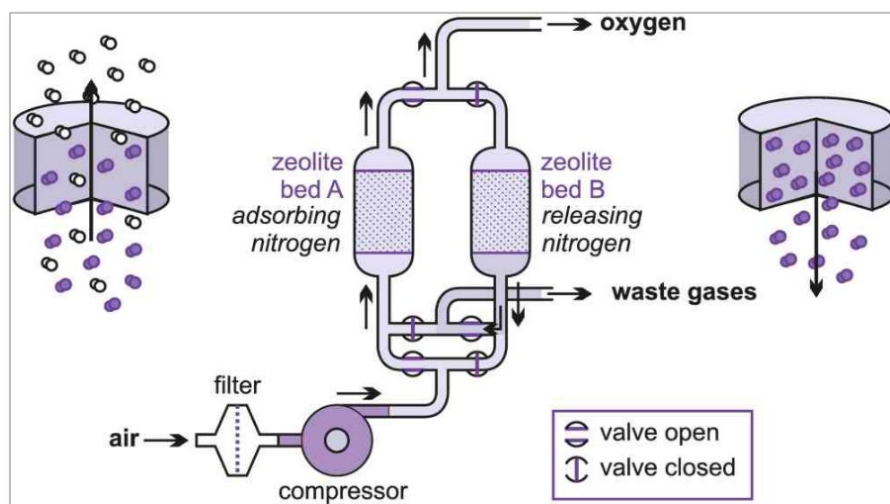
hence, the name

Pressure Swing

Adsorption. Thus,

for a POC to

produce a



continuous flow of oxygen to a patient, multiple beds must be used such that there is always at least one bed in the adsorption step (e.g., one bed is producing oxygen while a parallel adsorbent bed is undergoing regeneration). A POSITA would have recognized this to be true even with the use of a reservoir between the adsorbent

beds and the patient that holds some of the oxygen produced by the adsorbent beds, due to the design constraints I discuss in the following paragraph.

49. In contrast to portable systems, a POSITA would have understood that it was possible to implement a single-bed concentrator in an industrial, hospital, or home concentrator system by providing a very large reservoir that could hold enriched oxygen produced by a single bed and deliver it to a patient while the single bed was undergoing regeneration. However, as compared to a 2-bed system, a POSITA would have recognized that, to produce an equivalent oxygen flow for the patient, the single bed would have to be roughly twice as large as those used in a 2-bed system and a reservoir of significantly larger volume would be required to supply enriched oxygen while the single bed is undergoing regeneration. A POSITA would have recognized that these design aspects (*e.g.*, a single larger bed and much larger reservoir) would not have been possible to implement in a POC due to its inherent size and weight restrictions. Moreover, depending on the design, a larger battery might also be necessary. The combination of all of these impacts would have made any resultant theoretical single-bed POC far too heavy (*e.g.*, it would not have met the necessary weight requirements such as those set forth by the Fifth Oxygen Consensus Conference discussed below). Indeed, neither Patent Owner nor Dr. Talu have provided any evidence that a single-bed POC would have been possible in 2004-2005, and Dr. Talu confirmed during deposition that he is

unaware of *any single-bed commercial POC implementation at all*. EX1074 (*Talu Deposition Transcript*), 57:19-58:3, 63:21-64:4.

50. This understanding is made clear by the other requirements for the “present invention” set forth in the ’614 patent. Specifically, the ’614 patent states:

“The industry has developed a set of recommendations for systems targeted to provide portable oxygen for ambulatory patients. The Fifth Oxygen Consensus Conference set forth the following standards for long-term oxygen therapy ambulatory equipment: 1) equipment must weigh less than 10 lbs., 2) *equipment must provide the equivalent of 2 liter/min of continuous flow O₂*, and 3) the flow rate must be maintained for four hours or more. . . . *The present invention, whereby oxygen rich gas is provided to a patient from a wearable oxygen concentrator, meets and exceeds these standards.*”

EX1001, 2:33-50 (emphasis added). Further, the ’614 patent confirms that:

The device of the present invention with the described components weighs less than three pounds (1.36 kg). The compact size (less than about 61 cu. In. (1000 cc)) allows for easy portability.

EX1001, 24:1-6 (emphasis added).

51. Read together, these portions of the ’614 patent explicitly state its invention is less than 3 lbs. and 61 cu. In. and provides the equivalent of 2 liters/minute of continuous flow O₂. A POSITA would have understood that the *only* way to do that with the technology of 2004-2005 (and even today) was to use multiple beds.

52. *Fourth*, even if a POSITA would have read the paragraph as aspirational as to a single-bed POC, it is my understanding that such aspirational language alone cannot provide support for an overbroad claim scope. In other words, because single-bed POCs were unknown in the art in 2004-2005, it is my understanding that the '614 patent would have had to explain how such an advance was possible to support claims covering the use of such a single-bed arrangement, such as by detailing the single-bed process layout, dimensions, and function, *e.g.*, performance data for specific operating conditions and dimensions. The '614 patent does not do so.

53. ***The Prosecution History Supports Petitioner's Construction:*** Patent Owner (but not Dr. Talu) argues that the prosecution history of the '614 patent and its family do not limit the claims to multi-bed cartridges and that I misrepresented the prosecution history in this regard. POR, 16-17. I disagree as to both points.

54. *First*, as I pointed out in ¶¶250-252 of the *Knaebel Dec.*, multiple Examiners in the '614 patent's family (correctly) compared "cartridge" and/or "separation cartridge" to modules with more than one adsorbent bed. Moreover, multiple Examiners specifically (correctly) identified *Deane's* multi-bed housing 602 as a "separation cartridge" just as I have done in this matter.

55. For example, Examiner Ali rejected original claim 1 of U.S. Application 11/054,615, which recited "[a] removable gas separation cartridge for

use in an oxygen concentrator,” as anticipated by *Deane* '059 (EX1038, the issued patent version of *Deane*), finding that it teaches “a removable gas separation cartridge.” EX1075, 107 (citing FIG. 6 and 203). Patent Owner did not dispute this finding, instead choosing to amend the claims and argue *Deane* did not teach three adsorbent columns according to that claim 1. EX1075, 97.

56. Similarly, Examiner Patel rejected claim 1 of the '362 Application that recited “a cartridge containing an adsorbent material” as obvious in view of *Deane* '745 (EX1039) and *Hill* '658 (EX1013), taking the position that *Deane* '745 (equivalent in relevant part to *Deane*) discloses a “gas separation system comprising a cartridge 118a and 118b containing an adsorbent material for producing oxygen (see col. 4 lines 4-15).” EX1050 ('362 Application FH), 58-59, 500. Patent Owner did not try to distinguish claim 1 from *Deane*, instead choosing to cancel it. EX1050 ('362 Application FH), 50.

57. And in the '669 patent prosecution, Patent Owner advanced the two claims that led to issuance of the '669 patent: claim 24 directed to “[a] cartridge configured for use with an oxygen concentrator and configured to be removable from the oxygen concentrator” and claim 38 directed to a “cartridge selectively removable from [a] receptacle.” EX1052 ('669 Patent FH), 149-155. Examiner Vasat found these claims did not differentiate from *Deane* '426 (EX1047), which has the same relevant disclosure as *Deane* (EX1004), and required amendment.

EX1052, 19. Specifically, Examiner Vasat stated “[t]he closest prior art to new claims 24-42 is considered to be prior art to Deane (US 20050072426). Deane is considered to disclose an oxygen concentrator cartridge, best shown in Figure 6.” EX1052, 16.

58. Second, Patent Owner cannot seriously dispute that it argued that a single-bed cartridge was not a “separation cartridge” during prosecution of the ’669 patent. Specifically, the Examiner there found that *Warren ’095* “discloses a gas separation cartridge 12.” EX1052, 297. As shown in its FIG. 7, *Warren ’095*’s sieve bed 12 is constructed of a cylindrical pipe housing with end caps 82 and a single bed of zeolite 48 sandwiched between porous backing plates 88, porous membranes 86, and a helical spring 90. EX1052 (*Warren ’095*), FIG. 7, ¶[0073]. This construction is a “cartridge” in the context of the art, one of two separate cartridges in *Warren ’095* that provides its multi-bed POC system.

59. But Patent Owner argued in an Appeal Brief that the Examiner: (i) did “not even identify a ‘separation cartridge,’ in Warren, and instead generally refers to Figures 7 and 8” (EX1052, 271); and (ii) did “not identify a separation cartridge in Warren, and there is no way to tell from Warren’s Figures 7 and 8 what is the bottom (or top or sides, for that matter).” Because *Warren ’095*’s sieve bed 12 identified by the Examiner is quite clearly one of two single-bed cartridges in *Warren ’095*, the only reasonable interpretation of this argument is that Patent

Owner was arguing that: (i) *Warren '095*'s separate sieve beds 12 and 14 are not individually akin to a multi-bed separation cartridge; and (ii) have no connective structure therebetween that can be understood to be a cartridge (*e.g.*, the Examiner had not explained how there was a ***single*** cartridge with ***multiple*** beds in FIGS. 7/8 such that one can determine its bottom).

60. Patent Owner asserts the foregoing analysis is a “blatant mischaracterization” (POR, 17) and that it was actually arguing that the Examiner had not explained how he was proposing modifying *Warren '095* to meet the claims (POR, 17-18). I disagree. Even if Patent Owner’s argument could be characterized as motivation-related (*e.g.*, even if Patent Owner was arguing at EX1052, 271-272 that a POSITA would not have combined *Warren '095* and *Bassine* as the Examiner alleged), Patent Owner also was clearly describing what it viewed as being missing from *Warren '095* (*e.g.*, *Warren '095*'s two single bed cartridges do not individually or together teach a single “separation cartridge” with multiple beds) as part of the argument.

61. ***Dependent Claim 16 Supports Petitioner’s Construction and the '628 Claim Set Cannot Change the Plain Meaning of “Separation Cartridge”***

Here: Patent Owner and Dr. Talu also argue that Petitioner’s construction is improper because it: (i) allegedly renders claim 16 of the '614 patent “completely meaningless;” and (ii) would allegedly be inconsistent with dependent claims in

the '628 patent if applied to “separation cartridge” therein. POR, 17-18; EX2001, ¶78. I disagree. *First*, claim 16 of the '614 patent actually **supports** Petitioner’s construction, as it specifies that the two adsorbent beds recited in claim 13 (without any connective structure recited) from which claim 16 depends are “contained within a common separation cartridge.” *Second*, as for the claims of the '628 patent, they are not at issue here. Here, what is supported by the '614 patent is Petitioner’s construction.

62. *It Would Also Have Been Obvious to Provide a Three-Bed Cartridge in Deane:* To the extent the Board finds that the '614 patent’s description of its “present invention” operates to limit the claims to the specific three-bed cartridge shown in the '614 patent’s figures, as opposed to a cartridge having two or more beds, a POSITA would have considered it obvious to provide a third bed in *Deane*’s housing 602 in view of the knowledge in the art that any number of multiple phased beds can be used to provide constant product flow (*see, e.g.,* EX1008 (*Hill* '719), FIG. 1; EX1014 (*Sugano*), FIG. 1; and EX1015 (*Appel* '928), FIG. 3A).

B. “Receptacle”

63. As set forth in ¶¶259-269 of the *Knaebel Dec.*, it is my opinion that a POSITA would have understood “receptacle” in the context of the challenged claims of the '614 patent as “a structure that releasably interfaces with the inlet(s)

and outlet(s) of the separation cartridge and at least partially contains the separation cartridge.”

64. It is also my understanding that Petitioner has proposed a slightly different compromise definition in the related District Court matter: “a structure configured to releasably receive and at least partially contain the separation cartridge.” EX1073 (*GCE Responsive Claim Construction Brief*), p. 29. As “releasably receive” is another way to describe “releasably interfaces with the inlet(s) and outlet(s) of the separation cartridge,” this is also an appropriate definition for the reasons set forth in ¶¶259-269 of the *Knaebel Dec.*

65. ***Patent Owner’s Construction Is Incorrect Because It Introduces Ambiguity and Does Not Comport With the Intrinsic Record:*** Patent Owner and Dr. Talu disagree with the above constructions, and propose that “receptacle” means “a space configured to receive and contain something” in view of the ’614 patent specification’s identification of two different receptacles (one for the separation cartridge and one for the battery) and a dictionary definition. POR, 20-21; EX2001, ¶¶80-85.

66. I disagree, for a number of reasons.

67. First, “receptacle” must be defined as a structure. It cannot be defined as some vague “space” as Patent Owner and Dr. Talu propose because “space” provides no border as to what is or is not part of the “receptacle.”

68. For example, the parties appear to agree that a typical use of “receptacle” outside the ’614 patent is an electrical wall receptacle. When one refers to an electrical wall receptacle, one is referring to the structure that defines the volume into which a male plug is inserted, not to some ambiguous volume in or near the device.

69. Moreover, the claim language defines movement in a first direction *vis-à-vis* the receptacle. Thus, the receptacle must be defined to have some structural aspect and orientation from which to measure the movement against. Movement *vis-à-vis* an undefined space or volume is not measurable and the same motion can be in different directions based on the point in the “space” chosen for measurement.

70. Second, a POSITA would have understood “receptacle” to provide a “releasable” interface with / reception of the separation cartridge, not simply reception or proximity as proposed by Patent Owner and Dr. Talu. “Releasable” reflects the releasability/removability of the separation cartridge from the receptacle, which a POSITA would have understood to be among the basic functions of the receptacle.

71. Third, a POSITA would have understood the receptacle to “at least partially contain” the separation cartridge, not that the receptacle must fully “contain” the separation cartridge. The ’614 patent’s only embodiment (*see, e.g.,*

EX1001, FIGS. 2 and 7) shows partial containment of the cartridge in the receptacle, and there is no discussion in the '614 patent or its prosecution history that would lead a POSITA to understand full containment was contemplated or required.

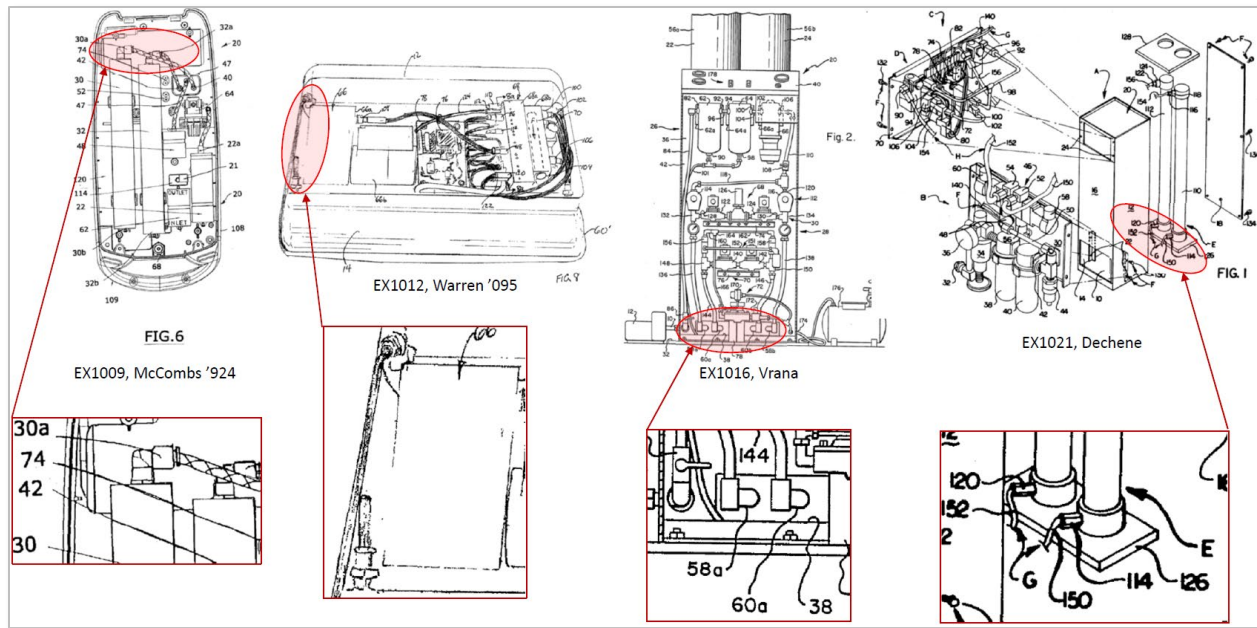
72. Partial containment also reflects the normal use of “receptacle” outside the '614 patent. Returning to the electrical wall receptacle example, only the blades of the male plug are “contained” within the receptacle structure, while the remaining portions of the plug remain outside the receptacle.

73. ***The Claim Language Does Not Require the “Receptacle” Be Accessible from Outside a POC or Arranged in any Fixed Position:*** Based on Patent Owner and Dr. Talu’s arguments discussed in detail below, it appears they are asserting the claimed “receptacle” must be fixed to a POC housing and be directly accessible from outside the housing. But that is not supported by the '614 patent.

74. *First*, the language of claim 1 does not require the “receptacle” to be directly accessible from outside a POC housing. Rather, the claim requires only that the “receptacle” be included in a POC. Thus, a POSITA would have understood the claim language to include within its scope receptacles inside a POC that are only accessed after one or more disassembly steps, as discussed below.

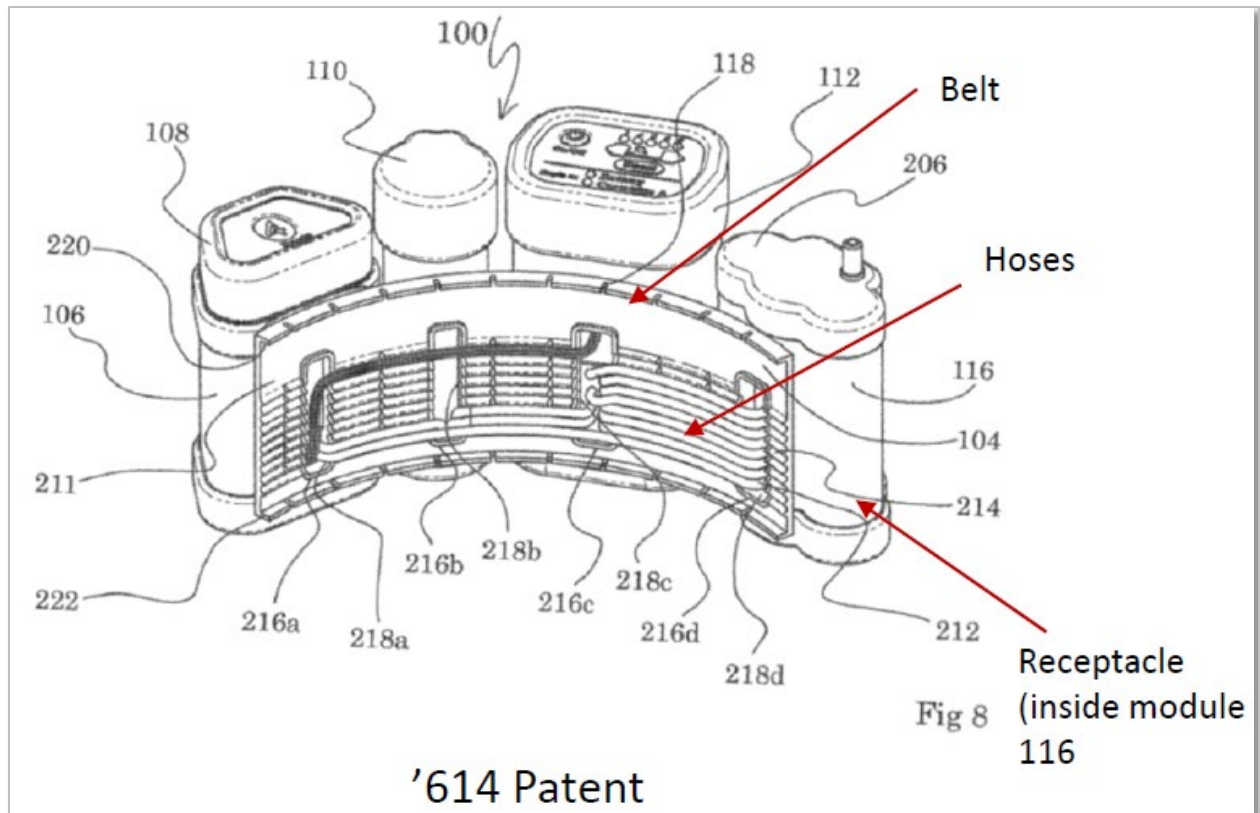
75. Second, the language of claim 1 also does not require the “receptacle” to be structurally fixed within the POC housing. The claim requires only that a POC include a “receptacle.” Thus, a POSITA would have understood the claim language to include within its scope “receptacles” provided anywhere in the POC structure.

76. As a matter of example, a POSITA would have understood “receptacle” to cover receptacles that are themselves removable from a POC as the ’614 Patent teaches this capability. EX1001 (*’614 Patent*), 13:34-46 (teaching module 116 with receptacle is snapped or otherwise quick-connected to belt 104 such that it can be removed for maintenance). “Receptacle” would also cover receptacles at the end of a flexible hose such as those shown in FIG. 6 (*e.g.*, fittings at inlets 30a, 32a) of *McCombs ’624* (EX1009), FIG. 8 of *Warren ’095* (EX1012), FIG. 2 (*e.g.*, fittings at inlets/outlets 58/60) of *Vrana* (EX1016), and FIG. 1 (*e.g.*, quick-connect fitting 114) of *Dechene* (EX1021) to the extent such “receptacles” meet the other limitations of claim 1.



77. In other words, as long as the structure of the receptacle at the end of a hose provides the required connection and partial containment discussed above, that is all that is required.

78. Indeed, this must be the understanding applied to “receptacle” as it appears in challenged claim 1 because the receptacle portrayed in FIG. 15 of the ’614 patent (upon which “receptacle” must read) is not contained within a single POC housing containing all the POC’s components. Instead, it is provided in a separate, removable, belt-mounted module at the end of flexible tubing.



79. In sum, Patent Owner chose to recite “receptacle” in claim 1 in isolation without any structural requirements. Patent Owner has elsewhere in the ’614 patent family specified that the receptacle be located in a housing, such as in the claims of the ’628 and ’669 patents (*see* EX1054 and 1056) but chose a broader recitation here.

C. “Selectively Removable [From A Receptacle]”

80. As set forth in ¶¶270-284 of the *Knaebel Dec.*, it is my opinion that a POSITA would have understood “selectively removable [from a receptacle]” in the context of the challenged claims of the ’614 patent as “withdrawable or separable as a whole from a receptacle.”

81. It is also my understanding that Petitioner has proposed a slightly different definition in the related District Court matter: “can be individually chosen to be withdrawn.” EX1073 (*GCE Responsive Claim Construction Brief*), p. 31. As “can be individually chosen” is another way to say “as a whole,” this is also an appropriate definition for the reasons set forth in ¶¶270-284 of the *Knaebel Dec.*

82. ***The Claims Are Unpatentable Under Either Party’s Construction:*** Patent Owner and Dr. Talu disagree with the above constructions, and propose that “selectively removable” means “can be chosen to be removed.” POR, 23-24; EX2001, ¶¶90-93.

83. The Parties appear to agree that “selectively removable” means that a particular component (in this case the separation cartridge) can be chosen to be withdrawn from the receptacle. In this regard, “as a whole” and “individually chosen” in Petitioner’s constructions mean the same thing – selection of a particular cartridge independently from other components and as a whole rather than part-by-part.

84. I believe Petitioner’s constructions to be more accurate, but do not believe that the dispute between the parties’ constructions (at least as I presently understand it) affects the patentability analysis of the challenged claims. In other words, *Deane* and *Deane/Berntson* teach a selectively removable cartridge under

either party's construction. And once released from the receptacle, either one or both columns would be replaced or refilled with fresh adsorbent.

85. ***“Selectively Removable” Does Not Require the Cartridge to be Removable from the POC, Let Alone Removable from the POC (Or Receptacle) in Any Particular Number of Steps:*** Based on Patent Owner and Dr. Talu's arguments discussed in detail below, it appears they are asserting “selectively removable” requires the cartridge to be directly accessible/removable from outside the POC, or accessible/removable from the POC (or receptacle) in less than a particular number of steps, although they do not expressly state how many steps would change something from “selectively removable” to not “selectively removable.”

86. I disagree with Patent Owner and Dr. Talu's arguments. A POSITA would not have read any such restrictions into “selectively removable,” for a number of reasons.

87. First, “selectively removable” does not require that the cartridge be removable from ***the POC***. All claim 1 requires is that the cartridge be removable from ***the receptacle***, which is just a component of the claimed POC (with no structural requirements recited therebetween, as discussed above). In other words, whether a cartridge is: (i) removable from a receptacle; and (ii) removable from a POC that includes a receptacle component are separate questions. As discussed

below and in the *Knaebel Dec.*, the claimed removal from a receptacle can be accomplished by separating *Deane*'s housing 602 and manifold 512 *after* they have been removed together as PSA unit 108/506 from chassis 202. Alternatively, it can be accomplished by removing manifold 512 from housing 602 while the latter is installed in chassis 202 as Patent Owner reads *Deane*. Alternatively still, this could also be accomplished by disconnecting a cartridge from a receptacle arranged at the end of a flexible hose while the cartridge and receptacle are inside the POC's housing, such as in the references cited above that teach connectors at the end of flexible hoses.

88. Indeed, it is clear from the prosecution history of the '614 patent's family that Patent Owner considers there to be a difference between "removability" from a receptacle and "removability" from the POC or cartridge module. For example, during prosecution of the '628 Patent, Patent Owner amended its original claim 1 to change "a separation cartridge selectively removable from the cartridge module" to "a separation cartridge selectively removable from the receptacle by movement relative to the receptacle in a first direction" (EX1053, 230) in an attempt to distinguish the claims from the teachings of *Warren '095* (EX1012), *Dechene* (EX1021), and *McCombs '924* (EX1009). EX1053, 253-255. Patent Owner then argued that, while *Warren '095* teaches its bed 12 can be removed from a housing, *Warren '095*'s inlets/outlets are not oriented opposite a direction

of removability from the receptacle. EX1053, 237. This shows Patent Owner considers removability from a housing and removability from a receptacle to be two different things, reinforcing that a POSITA would not find the claims to require the former.

89. Similarly, during prosecution of the '669 patent, Patent Owner simultaneously advanced two claims: claim 24 directed to a cartridge “configured to be removable from the oxygen concentrator by movement in a first direction” and claim 38 directed to a “cartridge selectively removable from [a] receptacle by movement relative to the receptacle in a first direction.” EX1052 ('669 Patent FH), 149-155. This also demonstrates Patent Owner knew the difference between the two recitations and that a POSITA would not have understood “selectively removable from a receptacle” to require cartridge removability from a POC.

90. Second, as for Patent Owner and Dr. Talu’s arguments related to the number of disassembly steps permissible for something to be “selectively removable,” a POSITA would have understood “removable” to have a broad scope and not impose an artificial limit as to an amount of steps or the ease of removal. Indeed, Dr. Talu confirmed during his deposition that everything in the POC devices at issue here is “removable.” EX1074 (*Talu Deposition Transcript*), 68:21-69:6, 122:18-123:4. The addition of the modifier “selectively” does not change this analysis, as the parties agree that “selectively” relates to the ability for an object to

be chosen to be removed/withdrawn. Even cartridges that require multiple steps to occur before removal can be chosen for removal (either before or after those steps occur). And neither Patent Owner nor Dr. Talu assert that “selectively” modifies “removable” to mean “directly removable by a user,” “easily removable,” or “removable in one or two steps.”

91. Further, while the ’614 patent does indicate in one line that its “adsorbent cartridge 206 and power pack 108 are easily removable to facilitate replacement,” (12:1-3), Patent Owner chose to use the broader concept of “removable” in the claims (*i.e.*, without the “easily” modifier) and should be held to that choice. Indeed, Dr. Talu confirmed during his deposition that “removable” and “easily removable” have different meanings. EX1074 (*Talu Deposition Transcript*), 68:21-69:6 (“Everything in these devices [is] removable. They are assembled by trained people in particular fashion, so everything in them is removable. So easily removable is quite different than removable in my opinion.”).

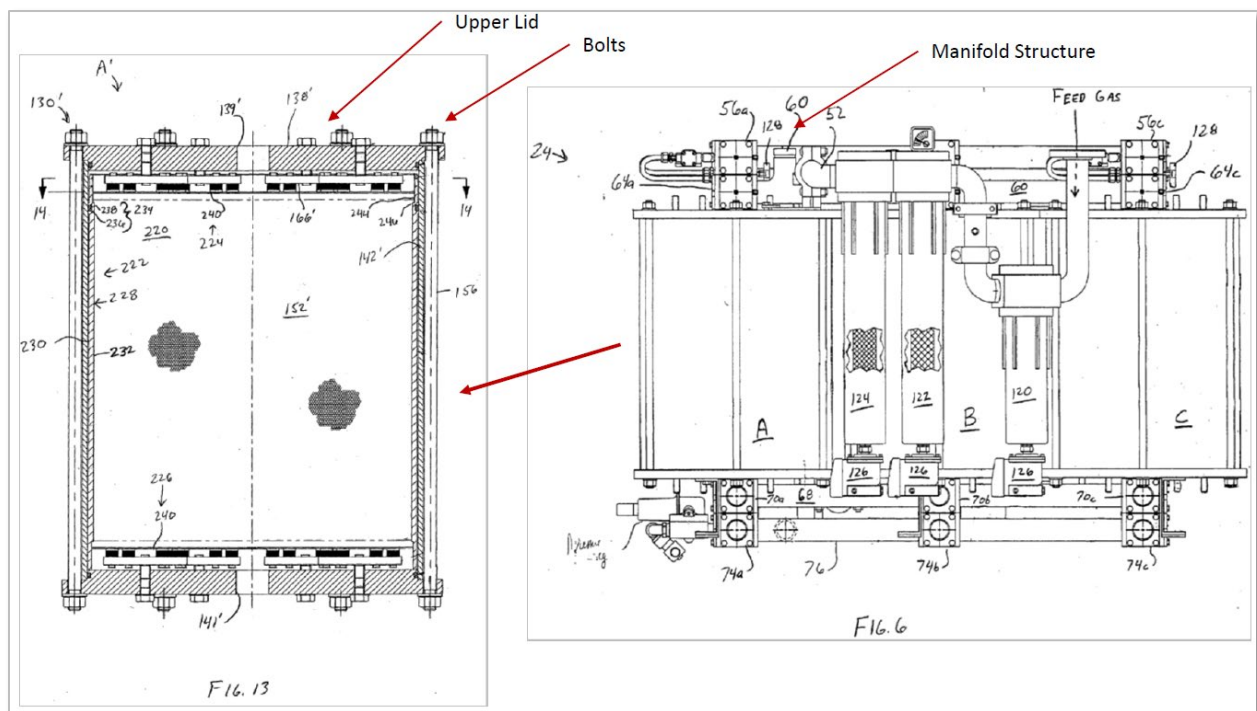
92. Moreover, a broad meaning of “removable” is confirmed by the ’614 patent’s family prosecution history, where multiple examiners considered cartridges to be removable even though multiple disassembly steps had to be performed to remove them, as discussed below. This includes at least two Examiners finding *Deane*’s housing 602 to be a removable cartridge.

93. For example, as discussed above, Examiner Ali rejected original claim 1 of U.S. Application 11/054,615, which recited “[a] removable gas separation cartridge for use in an oxygen concentrator,” as anticipated by *Deane* ’059 (EX1038, the patent version of *Deane*), finding *Deane* ’059 teaches “a removable gas separation cartridge.” EX1075, 107, citing FIG. 6 and 203. Patent Owner did not dispute this finding. EX1075, 97.

94. And, in the ’669 patent prosecution (as also discussed above), Patent Owner advanced two claims that led to issuance of the ’669 patent: claim 24 directed to a cartridge “configured to be removable from the oxygen concentrator by movement in a first direction” and claim 38 directed to a “cartridge selectively removable from [a] receptacle by movement relative to the receptacle in a first direction.” EX1052 (’669 Patent FH), 149-155. Examiner Vasat found these claims—including claim 38 that uses the same “selectively removable from [a] receptacle” language as challenged claim 1 here—did not differentiate from *Deane* ’426 (EX1047), which has the same relevant disclosure as *Deane* (EX1004), and required amendment. EX1052, 19.

95. Similarly, Patent Owner also initially sought claim 15 directed to “[a] removable gas separation cartridge” in the ’669 patent’s prosecution. EX1052 (’669 Patent FH), 1081-82. Examiner Vasat found this claim obvious in view of *Kulish* (EX1043) and *Hechinger* (EX1048), *Kulish* (EX1043), *Hechinger*

(EX1048), and *Dechene* (EX1021), or *Kulish* (EX143), *Bassine* (EX1026), and *Dechene* (EX1021), taking the position that, while *Kulish* does not teach a removable cartridge, *Hechinger* does. EX1052 ('669 Patent FH), 566-567, 503-505, 394-397. The removability of *Hechinger*'s cartridge only occurs after substantial disassembly (*see* EX1048, FIGS. 6-16 showing removable cartridge is installed under significant structure that has to be removed, as identified in the following annotated Figures).



96. In response, Patent Owner did not argue *Hechinger*'s cartridge was not "removable." EX1052 ('669 Patent FH), 540-549, 467-477. This is consistent with the broad meaning of "selectively removable" discussed above.

97. Indeed, the only instance I have been able to identify where Patent Owner disputed the teaching of “removability” during prosecution of the ’614 patent family was during prosecution of the ’669 patent where *Bassine*, which is silent on how its cartridge is connected to its POC, was applied alone. EX1052 (*’669 Patent FH*), 257-258.

98. Taking all of the above into consideration, a POSITA would not have understood: (i) “selectively removable” to require removability from a POC (as opposed to removability from a receptacle); and (ii) there to be any artificial limit as to the number of disassembly steps permitted by “selectively removable.”

D. “By Movement Relative To The Receptacle In a First Direction”

99. This term is found in element [1b(i)] as follows: “a separation cartridge selectively removable from a receptacle *by movement relative to the receptacle in a first direction.*” While I provided a construction for the term “receptacle,” I did not offer a separate construction for this entire term in the *Knaebel Dec.* because its meaning would have been clear to a POSITA. *See* EX1003, ¶231, where I explained that I applied the plain and ordinary meaning to terms unless otherwise stated. In other words, this term simply describes that the removability of the separation cartridge is effected by the cartridge’s “movement relative to the receptacle.”

100. Based on Patent Owner and Dr. Talu’s arguments discussed in detail below, it appears they are asserting (in conjunction with their arguments related to the scope of “receptacle” and “selectively removable” discussed above) that this limitation covers **only** absolute movement of the separation cartridge (*i.e.*, as to a fixed frame of reference such as the ground) in a first direction away from a stationary receptacle.

101. I disagree with Patent Owner and Dr. Talu’s interpretation(s). As explained in detail below, this limitation, read in conjunction with the remainder of element [1b(i)], is not so narrow. As set forth in the two sections below, “by movement relative to the receptacle in a first direction” in element [1b(i)] requires only the **capability** of **relative movement** of the cartridge in relation to the receptacle. The concept of relative movement between objects is quite different from, and much broader than, actual absolute movement of an object in a fixed frame of reference such as the ground.

102. ***“By Movement Relative to the Receptacle in a First Direction”, in the Context of [1b(i)], Requires Only the Capability of the Claimed Movement, Not Actual Movement:*** I understand that claim 1 is an apparatus claim, not a method claim. I further understand that, because claim 1 is an apparatus claim, functional language in the claims may, depending on their language, be interpreted as specifying that the apparatus has structure that merely must be **capable of**

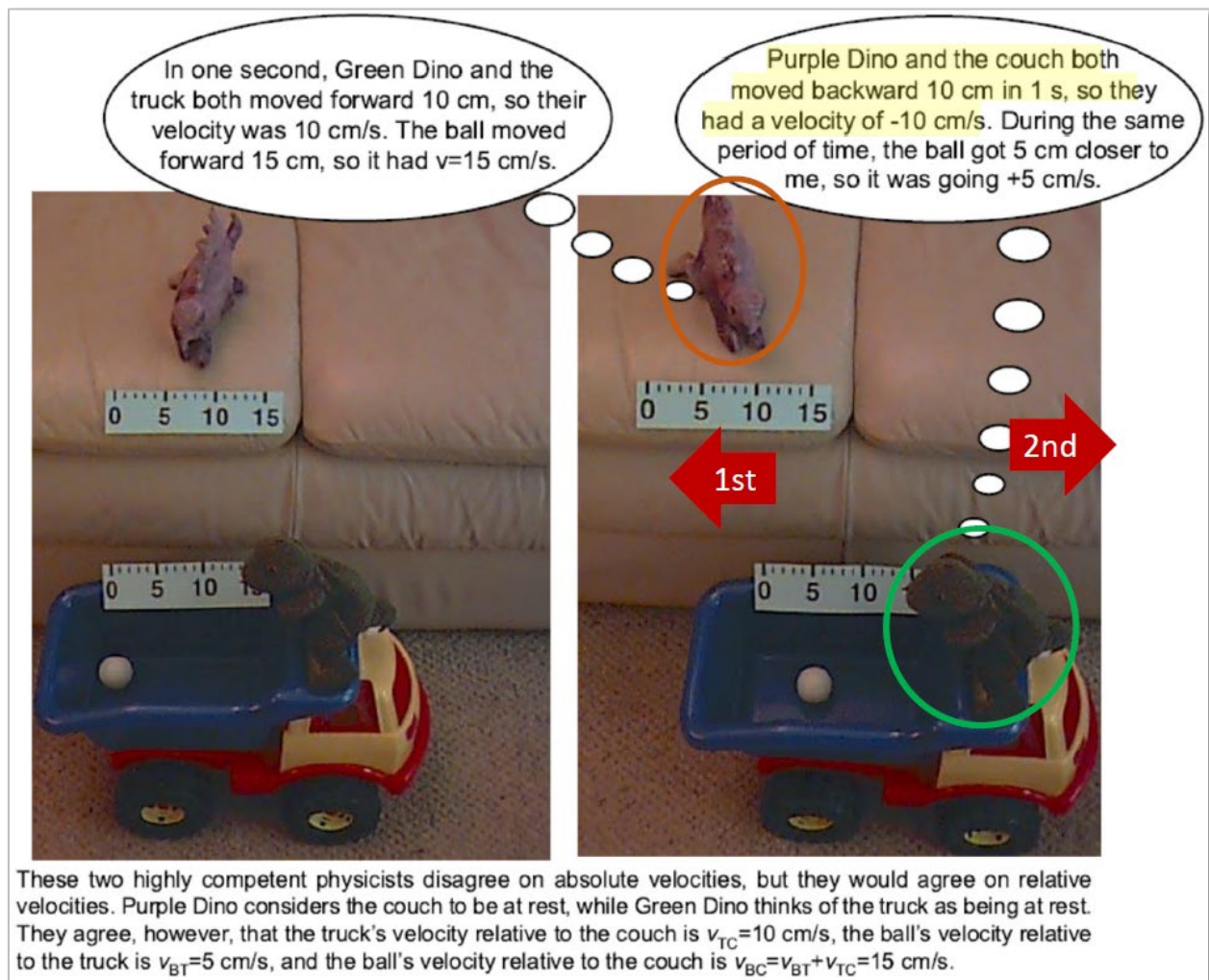
performing that function, not that the structure actually has to perform the function. Such is the case here, as the language of element [1b(i)] recites movement in terms of capability (*e.g.*, the cartridge is “selectively remov**able** ...” (emphasis added)) and in the passive voice (“by movement relative to ...”). Indeed, Dr. Talu agreed during his deposition that element [1b(i)] requires only the *capability* that the receptacle and cartridge can be separated in the claimed manner. EX1074 (*Talu Deposition Transcript*), 83:14-20. If Patent Owner intended the claim to require the functional language to be performed, it could have recited that the cartridge be “remov**ed**,” though in my understanding even this alteration might not achieve that intention.

103. ***“By Movement Relative to the Receptacle in a First Direction”, in the Context of Element [1b(i)], Requires Only the Capability of Relative, Not Absolute, Movement of the Cartridge in a First Direction:*** As stated above, a POSITA would have recognized that this language does not require the absolute movement of the cartridge at all. Rather, because the concept of *relative movement* is recited, a POSITA would have understood this language to cover three situations: (i) the movement of cartridge in the first direction away from a stationary receptacle; (ii) the movement of a receptacle in a second direction (opposite the first) away from a stationary cartridge; and (iii) the simultaneous movement of cartridge in the first direction and receptacle in a second direction

away from each other. In each instance, the cartridge moves “relative to the receptacle in a first direction.”

104. Relative movement is a commonly-used concept in physics and engineering that specifies movement relative to a particular *frame of reference*. In the context of two objects, 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. A good

explanation of this concept can be found in the following illustration from Section 2.5 of *Newtonian Physics* by Cromwell (EX1077), to which I have added some



annotations. In particular, from the blue truck dino's perspective (circled in green) as the truck it is in moves in the second direction (to the right at 10 cm/s), the purple couch dino (circled in orange) moves in the first direction (i.e., it moves to the left, backward, at -10 cm/s). As noted in the text under the illustration above, relative movement between objects is different from "absolute" movement

according to a fixed frame of reference, such as the ground, the couch, or the border of the pictures above.

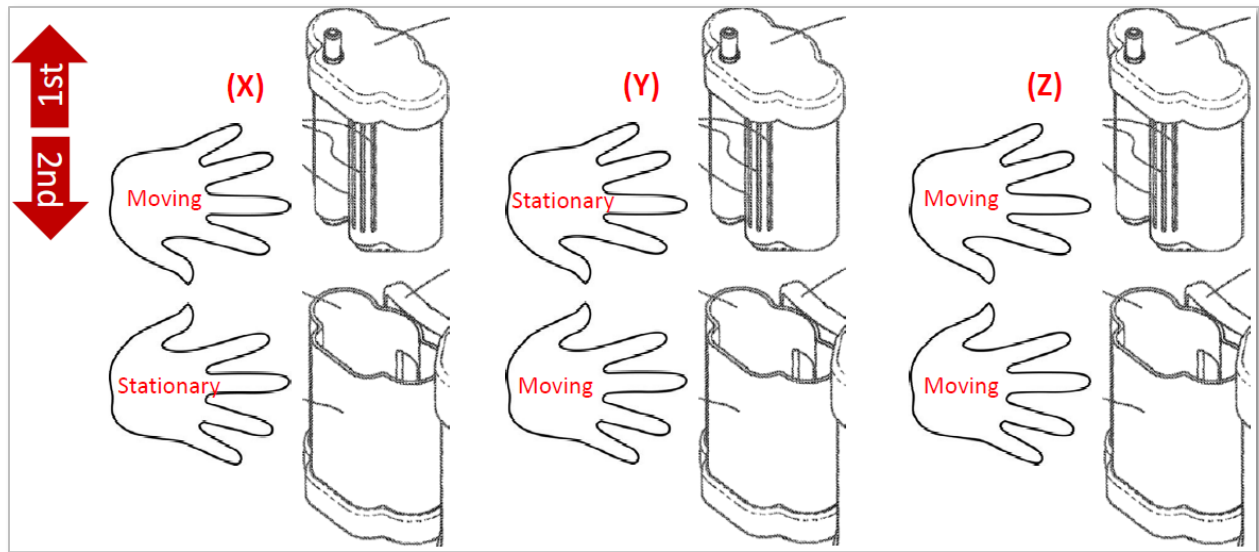
105. As discussed in detail below in the context of *Deane*'s configuration, Patent Owner and Dr. Talu appear to argue that this limitation would cover **only** absolute movement of the separation cartridge away from a receptacle in a first direction (when the receptacle is fixed in position), although neither Patent Owner nor Dr. Talu provides a formal claim construction analysis to support such a narrow reading. I disagree with Patent Owner and Dr. Talu's reading for several reasons.

106. First, restricting this limitation to absolute rather than relative movement of the cartridge away from the receptacle is incorrect because it ignores the plain meaning of "movement **relative** to" discussed above.

107. Second, restricting this limitation to absolute rather than relative movement of the cartridge away from the receptacle is incorrect because it makes the phrase "by movement relative to" superfluous, which I understand violates the basic tenets of claim construction. Specifically, Patent Owner and Dr. Talu's reading would mean that there is no difference between the claim language and a recitation of "separation cartridge selectively removable from the receptacle in a first direction" (*i.e.*, without "by movement relative to"). Adding "by movement relative to" must mean **something** and cannot just be ignored.

108. Third, there is nothing in the intrinsic record that supports restricting this limitation as proposed by Patent Owner and Dr. Talu. The '614 patent does not describe with any specificity how its cartridge and receptacle are separated. It only depicts these components as being separate *after* separation has occurred. See FIG. 7 and 11:61-12:3. Thus, a POSITA reading the '614 patent would not have understood a particular removal strategy, direction, etc. to be required by the '614 patent.

109. A POSITA would thus have understood Patent Owner to have utilized “by movement relative to” to provide broad coverage for the removability contemplated by the '614 patent and 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). Instead, a POSITA would have understood “movement relative to ...” to conceptually cover many removal methodologies, including examples “Y” (cartridge held stationary and receptacle pulled away, *which is analogous to the dino examples from Newtonian Physics (EX1077) I discuss above*) and “Z” (cartridge and receptacle pulled away from each other). In all three cases, the net effect of movement is the same: the cartridge and the receptacle are separated.



110. As discussed above, the '614 patent indicates its POC is quite small and light, so a POSITA would have understood its components to be easily manipulatable by hand in any of these methodologies.

111. Patent Owner offers no disclaimer of any of these methodologies in the POR as to the '614 Patent's claims.

112. *Fourth*, the prosecution history of the '614 patent's family confirms that this phrase should have a broad scope that encompasses at least *Deane's* configuration (as discussed below).

113. Specifically, as I discussed in ¶¶147-152 of the *Knaebel Dec.* (and as discussed above) Patent Owner advanced in the prosecution of the '669 patent claim 38 that recited a "cartridge selectively removable from [a] receptacle by movement relative to the receptacle in a first direction." EX1052 ('669 Patent FH), 149-155. But Examiner Vasat found this claim 38 did not differentiate from *Deane*

'426 (EX1047), which has the same relevant disclosure as *Deane* (EX1004), and required Patent Owner to amend the claim to include language reciting the separate planes in which the respective inlet/outlet ports are located. EX1052, 19. Examiner Vasat later stated, with regard to the amended version of claim 38, that “[t]he closest prior art to new claims 24-42 is considered to be prior art to *Deane* (US 20050072426). *Deane* is considered to disclose an oxygen concentrator cartridge, best shown in Figure 6... The amendment defines over *Deane* because *Deane* requires the aforementioned first and second ports to be located in a single plane with the manifold to reduce the number of tubing connections and potential leak points in the unit (par. 64).” EX1052, 16.

114. While, as noted by the ID (ID, 11), the original version of claim 38 was not formally rejected in view of *Deane*, a POSITA reading the above and looking to understand the scope of element [1b(i)] would have understood Examiner Vasat to be asserting that the above-described version of claim 38, including the limitation of a “cartridge selectively removable from [a] receptacle by movement relative to the receptacle in a first direction,” was taught by *Deane*, just as I showed in the *Knaebel Dec.* Patent Owner then chose to amend claim 38 to recite an unrelated feature rather than explain why *Deane*’s configuration was different. This, in conjunction with the way *Deane* was discussed by other

Examiners (as discussed above), is consistent with the way I applied *Deane* in the *Knaebel Dec.*

115. In view of the above, it is my opinion that a POSITA would have understood this limitation, read in conjunction with the remainder of element [1b(i)], to require: (i) only the **capability** of relative movement of the cartridge in relation to the receptacle, not actual movement; and (ii) only **relative movement** of the cartridge in the first direction *vis-à-vis* the receptacle, including each of the examples discussed above.

V. INVALIDITY

A. Ground 1: Claims 1-5 and 7-16 Are Rendered Obvious by *Deane* in view of *Dubois* and *Berntson*

1. Independent Claim 1

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

116. In the *Knaebel Dec.*, I opined that the combination of *Deane*, *Dubois*, and *Berntson* renders this limitation obvious. I maintain this opinion and incorporate it herein by reference. Neither Patent Owner nor Dr. Talu appears to dispute this opinion.

[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;

117. In the *Knaebel Dec.*, I opined that the combination of *Deane*, *Dubois*, and *Berntson* renders element [1b] obvious. I maintain this opinion and incorporate it herein by reference.

118. Neither Patent Owner nor Dr. Talu appears to dispute my opinion regarding the second portion of element [1b], which I have labeled [1b(ii)] for discussion purposes herein. However, Patent Owner and Dr. Talu dispute my opinion with regard to the first portion of element [1b], which I have labeled [1b(i)]. I have reviewed Patent Owner and Dr. Talu's arguments and find them to be incorrect, for at least the following reasons.

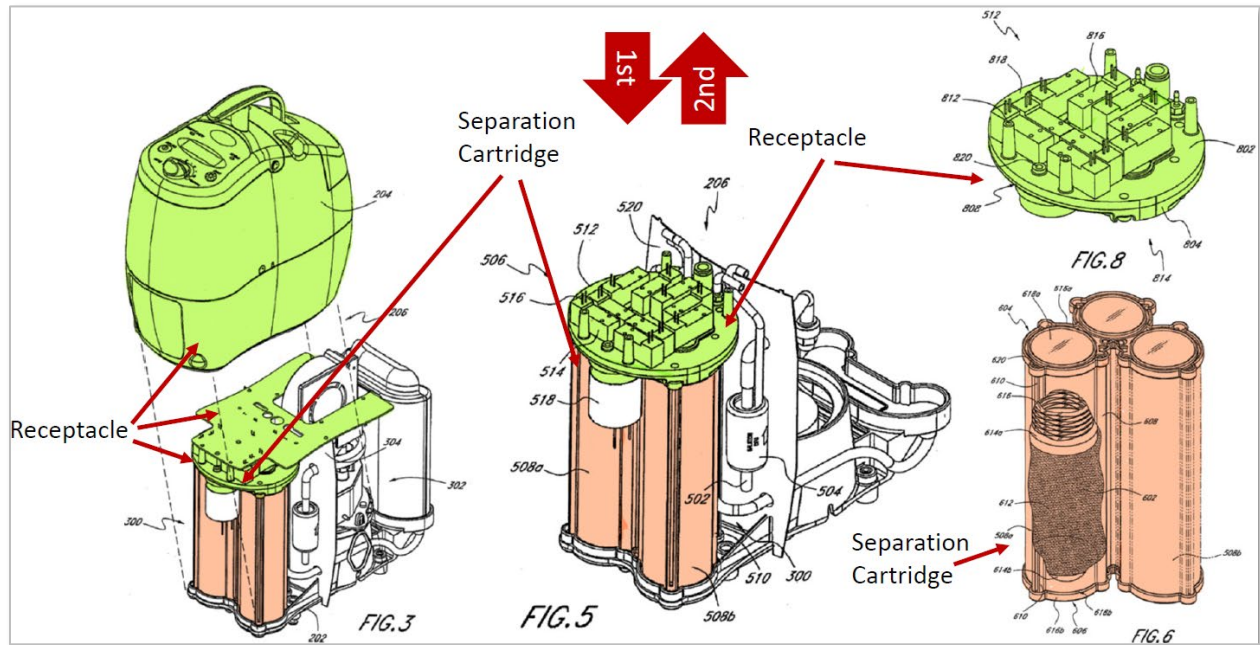
119. Regarding element [1b(i)], as set forth in ¶¶314-335 of the *Knaebel Dec.*, *Deane* teaches a separation cartridge (e.g., adsorbent housing 602 / adsorbent bed columns 508a, 508b, shaded in orange in the annotated drawings below) selectively removable from a receptacle (e.g., adsorbent housing 602 / adsorbent bed columns 508a, 508b is removable from manifold 512 or a combination of manifold 512 and shell 204, shaded green in the annotated drawings below, along with circuit board 1314) by movement relative to the receptacle in a first direction

(e.g., the direction labeled “1st” in the annotated figures below). EX1004 (*Deane*) at, e.g., ¶¶[0007], [0008], [0010], [0011], [0014], [0017], [0018], [0035], [0036], [0057], [0058], [0059], [0062], [0063], [0065], [0066], [0067], [0068], [0069], [0070], [0086], [0092], FIGS. 3, 6, 7. *Berntson* also teaches a “separation cartridge selectively removable from a receptacle.” EX1006 (*Berntson*), ¶¶[0011]-[0012].

120. ***Deane Teaches “A Separation Cartridge ...”***: As set forth in ¶¶316-317 of the *Knaebel Dec.*, *Deane* teaches a “separation cartridge” at least by the stand-alone adsorbent housing 602 / adsorbent bed columns 508a, 508b component shown in FIG. 6. This is confirmed by the fact that, as set forth in §IV.A above, multiple Examiners compared *Deane*’s adsorbent housing 602 / adsorbent bed columns 508a, 508b to a “cartridge” during prosecution of the ’614 patent’s family, a comparison to which Patent Owner never objected. And it appears that neither Patent Owner nor Dr. Talu specifically dispute that *Deane*’s stand-alone adsorbent housing 602 / adsorbent bed columns 508a, 508b is a “separation cartridge.”

121. ***Deane Teaches “... Selectively Removable from a Receptacle by Movement Relative to the Receptacle in a First Direction”***: As set forth in ¶¶318-342 of the *Knaebel Dec.*, *Deane* teaches that its adsorbent housing 602 / adsorbent bed columns 508a, 508b (the “separation cartridge” as discussed above and highlighted in orange in the annotated figures below) is withdrawable or separable

as a whole (e.g., is “selectively removable”) from manifold 512 (e.g., the “receptacle,” highlighted in green in the annotated figures) by movement of the adsorbent housing 602 / adsorbent bed columns 508a, 508b relative to manifold 512 in a first direction as shown in the following annotated drawings.



122. As discussed in §II above, a POSITA would have understood *Deane’s* configuration to be disassembled (or at least disassemble-able) in the manner shown in this annotated drawing. Namely, shell 204 would first be removed. Second, circuit board 1314 would be removed (although that is not strictly necessary in view of *Deane’s* teachings). Third, PSA unit 108/506 would be unmounted and removed from chassis 202. Fourth, a person disassembling the POC (e.g., the person that removed PSA unit 108/506) holds PSA unit 108/506 and separates manifold 512 from housing 602, such as by holding manifold 512 in one

hand and housing 602 in the other and either moving the housing 602 away from manifold 512, or moving the manifold 512 away from the housing 602, or some combination of these two movements.

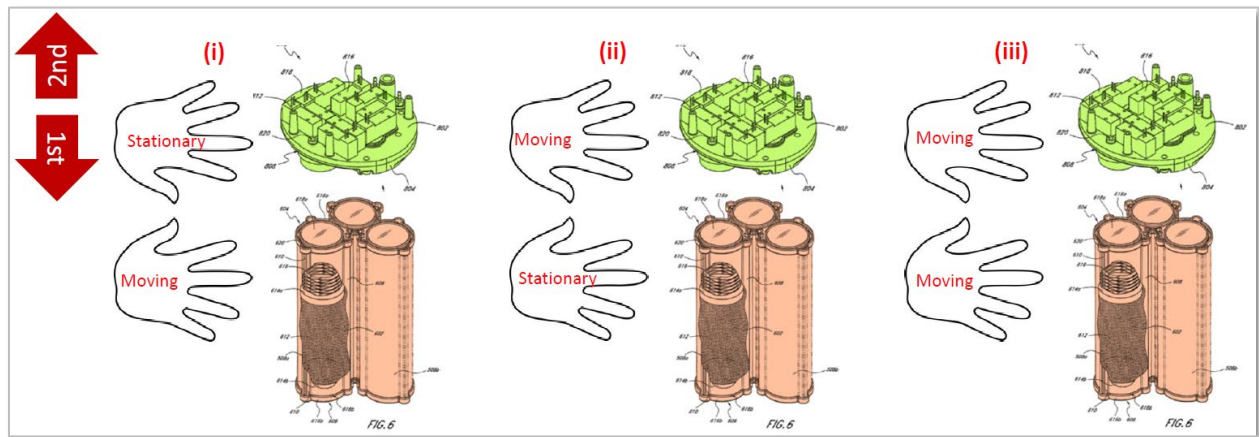
123. In this regard, a POSITA would have understood manifold 512 to be a receptacle for at least the reasons discussed in the “receptacle” section below.

124. Further, a POSITA would have understood that housing 602 could be individually chosen to be withdrawn from manifold 512 by the person disassembling PSA unit 108/506 as shown above, and thus that housing 602 is “selectively removable from” manifold 512 under either Party’s construction.

125. Finally, as set forth in ¶335 of the *Knaebel Dec.*, a POSITA would have understood the direction of the removal of housing 602 from manifold 512 would have been in the first direction along the axis of the housing 602 due at least to the geometry of the interface between housing 602 from manifold 512.

126. In this regard, as set forth in §IV.D above, a POSITA would have understood “selectively removable from a receptacle by movement relative to the receptacle in a first direction” to cover at least three procedures: (i) the movement of housing 602 (cartridge) in the first direction away from a stationary manifold 512 602 (receptacle); (ii) the movement of manifold 512 (receptacle) in a second direction (opposite the first) away from a stationary housing 602 (cartridge); and (iii) the simultaneous movement of housing 602 (cartridge) in the first direction

and manifold 512 (receptacle) in a second direction away from each other. Each of these examples is illustrated in the correspondingly-labeled annotated drawings below.



127. A POSITA would have understood that the PSA unit 108/506 would be disassembled by hand as shown in my annotated figures above using any of these methods. Each removal procedure meets all the requirements of “selectively removable from a receptacle by movement relative to the receptacle in a first direction,” as properly construed. Indeed, these options are no different conceptually from those taught by the ’614 Patent as I describe above in ¶109, particularly in view of the ’614 Patent’s teaching that its receptacle (in cartridge module 116) can be unsnapped from belt 104 for maintenance. EX1001 (’614 Patent), 13:34-46.

128. ***A POSITA Would Have Understood the Downward Movement of Deane’s Housing 602 Away from Manifold 512 After PSA Unit 108/506 Is***

Removed to Meet Element [1b(i)]: Patent Owner and Dr. Talu argue that *Deane* does not teach element [1b(i)] because “*Deane*’s housing 602 and adsorbent columns 508a, 508b cannot be moved downward in the alleged first direction for removal because the bottom of the alleged separation cartridge directly abuts and is supported on the chassis 202.” POR, 37-38; EX2001, ¶¶118-119.

129. As set forth above in §IV.D, this argument does not comport with the proper scope of “a separation cartridge selectively removable from a receptacle by movement relative to the receptacle in a first direction” and therefore is not correct. But even if Patent Owner and Dr. Talu’s construction could be considered correct (it cannot), I would disagree with their reading of *Deane* as not teaching that its housing 602 can be moved downwardly away from manifold 512.

130. For at least the reasons above, a POSITA would have understood *Deane* to teach unmounting and removing PSA unit 108/506 from chassis 202 and then disassembling housing 602 from manifold 512 as shown in my annotated figures of *Deane* and in any of the manners discussed in ¶126 above.

131. At least two of the procedures for disassembling housing 602 from manifold 512 demonstrate “downward movement” of housing *vis-à-vis* manifold 512, contrary to Patent Owner and Dr. Talu’s argument. Specifically, procedure (i) involves housing 602 moving downwardly away from manifold 512 and procedure (iii) involves housing 602 moving downwardly away from upwardly moving

manifold 512. Thus, either procedure teaches all the requirements of [1b(i)] even under Patent Owner and Dr. Talu’s narrow reading of “selectively removable from a receptacle by movement relative to the receptacle in a first direction.”

132. While Patent Owner and Dr. Talu appear to disagree that *Deane* teaches disassembly in the manner described in the *Knaebel Dec.* and herein, they do not appear to disagree that, when *Deane* is properly understood as I have explained above, that *Deane* would teach element [1b(i)] even under their reading of “selectively removable from a receptacle by movement relative to the receptacle in a first direction.”

133. ***A POSITA Would Have Understood the Upward Movement of Deane’s Manifold 512 Vis-à-vis Stationary Housing 602 to Meet Element [1b(i)]:*** Patent Owner and Dr. Talu argue that “Petitioner appears to assume, without any explanation or evidence in support, that movement of an alleged receptacle relative to a stationary cartridge reads on the claims.” POR, 36; EX2001, ¶¶118-119. But, other than citing the ID’s preliminary reading of element [1b(i)], neither Patent Owner nor Dr. Talu provide any evidence that its scope would **not** include movement of a receptacle away from a stationary cartridge. And they cannot, because a POSITA would have recognized that such movement is encompassed by the plain meaning of [1b(i)] for the reasons set forth above in §IV.D.

134. Thus, holding housing 602 stationary while moving manifold 512 away, such as is shown in procedure (ii) of disassembling PSA unit 108/506 after its removal from chassis 202 that I describe above, would also teach all the requirements of element [1b(i)], because moving manifold 512 in the second direction in relation to a stationary housing 602 would still result in the movement of housing 602 *relative to* manifold 512 in a first direction. In other words, in the manifold 512's frame of reference while it is moved, housing 602 moves away from manifold 512 in the first direction.

135. Additionally, even if Patent Owner and Dr. Talu's assertions that housing 602 could not be removed from chassis 202 in *Deane* until manifold 512 was removed were accurate (they are not for at least the reasons in §II.B, their purported disassembly procedure would also teach all the requirements of element [1b(i)] for the same reasons. Specifically, moving manifold 512 in the second direction relative to a housing 602 mounted to chassis 202 would still result in the movement of housing 602 *relative to* manifold 512 in a first direction, as housing 602 moves away from manifold 512 in the first direction in manifold 512's frame of reference.

136. Accordingly, under a proper construction, *Deane* teaches element [1b(i)] under either Party's assertion as to how manifold 512 and housing 602 are removed from each other.

137. *Element [1b(i)] Covers Removal After Some Disassembly:* Patent Owner and Dr. Talu appear to argue that *Deane* does not teach a “selectively removable” separation cartridge due to the number of steps required to remove housing 602 from manifold 512. POR, 44; EX2001, ¶132.

138. I disagree for a number of reasons.

139. First, for at least the reasons set forth above in §IV.C, “selectively removable” does not require the cartridge to be directly removable from the POC or removable from the POC or receptacle in any particular number of steps. Rather, the proper construction of element [1b(i)] includes cartridge removability from a receptacle after at least some POC disassembly.

140. Second, even if element [1b(i)] were somehow construed to imply some kind of limit as to a number of disassembly steps that would transform a POC component from “removable” to “non-removable,” I cannot see how the few steps I discuss above (for separation of housing 602 from manifold 512 after PSA unit 108/506 removal) would even come close to approaching a rational limit. From the standpoint of a POSITA, anything in *Deane* would be “removable,” as Dr. Talu agrees. EX1074 (*Talu Deposition Transcript*), 68:21-69:6, 122:18-123:4.

141. Further in this regard, despite proposing a definition for “selectively removable,” neither Patent Owner nor Dr. Talu sought to define “removable” to be limited to a particular number of steps, to mean “direct removability” without

tools, or to otherwise limit its scope to support their argument. That is because there is no intrinsic support for such a limiting interpretation, as set forth above in §IV.C.

142. *Third*, my understanding is confirmed by Patent Owner’s *Infringement Contentions* (EX1076) against Petitioner in the related district court matter as to the ’628 patent. The contentions assert that the ’628 patent’s removable cartridge limitation covers a cartridge removable from a receptacle *after* some disassembly of a concentrator. EX1076, p. 5 (showing removal of cover and installation and use of a removal tool before cartridge removal). Patent Owner’s explanations of “removability” as to the ’628 patent are applicable here because element [1b(i)] recites an even broader removability concept (*i.e.*, removability from a receptacle) as compared to the ’628 patent’s claims (*i.e.*, removability from a receptacle defined by a cartridge module). In other words, because the ’614 patent’s claims simply recite that the POC has a receptacle and that the cartridge is removable from the receptacle, the receptacle could be anywhere in the POC. In contrast, the 628 claims specify the receptacle is defined by the cartridge module, which is a narrower concept because the structure forming the receptacle is specified.

143. *Element [1b(i)] Was Previously Compared to Deane’s Teachings by Examiners:* As explained above in §IV.D and in the *Knaebel Dec.* at ¶¶147-155

and 187-194, Examiner Vasat found that the element [1b(i)] language did not differentiate the '669 Patent's independent claim 38 (which is of very similar scope to claim 1 here) from *Deane*'s teachings. Logically, this finding must include a reading of *Deane* similar to what I have discussed herein.

144. Additionally, as explained above in §IV.A, Examiner Ali found that *Deane* '059 (EX1038, the issued patent version of *Deane*) teaches “a removable gas separation cartridge.” EX1075, 107 (citing FIG. 6 and 203), a finding Patent Owner did not dispute. EX1075, 97.

145. ***Element [1b(i)] Is Broader Than the Element at Issue in the '628 Patent IPR:*** Patent Owner argues that the Board should come to the same conclusion as to element [1b(i)] that it did in denying institution of the Petition against the related '628 Patent (IPR2023-00527, Paper No. 9). POR, 34-35. But element [1b(i)] here recites a broader removability concept (*i.e.*, removability from a receptacle) as compared to the '628 patent's claims (*i.e.*, removability from a receptacle defined by a cartridge module). The receptacle in challenged claim 1 here is disembodied in the claimed POC and thus of a broader scope.

146. ***Element [1b(i)] Requires Only the Capability of Movement (Not Actual Movement) and Only Removal from the Receptacle (Not from the POC):*** As set forth in §IV.C above, element [1b(i)] requires only the capability that its cartridge (*e.g.*, housing 602) be removable from its receptacle (*e.g.*, manifold 512)

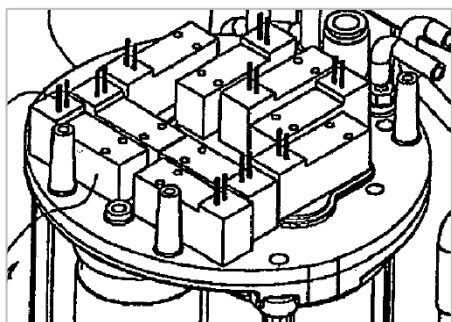
“by movement relative to the receptacle in a first direction.” Thus, even if the disassembly methodology for the *Deane* POC I explain above in §II.A would not have been utilized every time for its disassembly, a POSITA would still have understood that *Deane*’s POC is **capable** of being disassembled in that manner. In other words, *Deane*’s cartridge (*e.g.*, housing 602) is capable of being removed from its receptacle (*e.g.*, manifold 512) “by movement relative to the receptacle in a first direction,” which is all that is required by element [1b(i)].

147. Similarly, as set forth in §IV.C above, element [1b(i)] only requires the cartridge to be selectively removable from the **receptacle**, not from the POC. My explanation in §II.A above shows how cartridge (*e.g.*, housing 602) is removable from its receptacle (*e.g.*, manifold 512) “by movement relative to the receptacle in a first direction.” This removability is the only removability that is expressly required by the claims and therefore the only removability that matters. Thus, the number of removal steps required to be performed before one disassembles housing 602 from manifold 512 while holding PSA unit 108/506 is irrelevant to the specific removability covered by the claims.

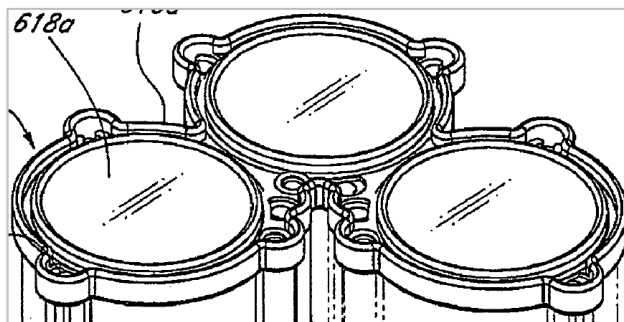
148. ***Deane Teaches a “Receptacle”***: In the *Knaebel Dec.*, I opined (as part of the *Deane/Dubois/Berntson* combination) that *Deane*’s manifold 512 (or manifold 512/shell 204) teaches a “receptacle.” EX1003, ¶¶318-334. I maintain this opinion and incorporate it herein by reference. Patent Owner and Dr. Talu

argue, however, that *Deane*'s manifold 512 (or manifold 512/shell 204) does not teach a "receptacle." I have reviewed Patent Owner and Dr. Talu's arguments and find them to be incorrect, for at least the following reasons.

149. As set forth in the *Knaebel Dec.*, *Deane* teaches a "receptacle" formed by manifold 512. First, *Deane* teaches its separation cartridge (e.g., adsorbent housing 602 / adsorbent bed columns 508a, 508b) may be connected to integrated manifold 512, which receives and/or releasably interfaces with the inlet(s) and outlet(s) on the upper end of adsorbent housing 602 / adsorbent bed columns 508a, 508b to provide gas flow within the adsorbent housing 602 / adsorbent bed columns 508a, 508b. *See, e.g.*, EX1004 (*Deane*), Abstract, ¶¶[0007], [0014], [0017], [0018], [0059], [0062], [0063], [0065]-[0067], [0070], [0086], FIGS. 3, 5, 6, 7. Second, *Deane* teaches that manifold 512 at least partially contains the end of adsorbent housing 602 / adsorbent bed columns 508a, 508b around its periphery, as shown by comparing FIGS. 5 and 6 such as is shown by the partial reproductions that follow.



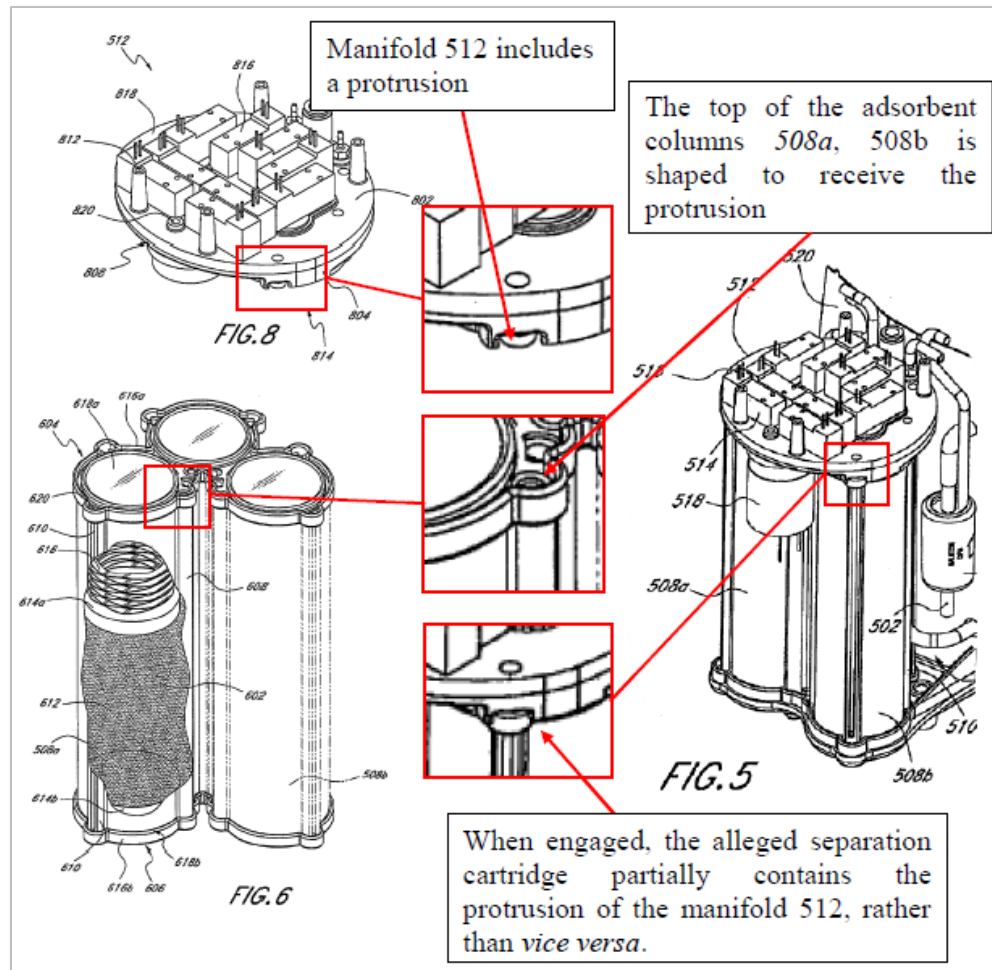
Deane FIG. 5



Deane FIG. 6

150. Specifically, as shown above (and described further below), when housing 602 / adsorbent bed columns 508a, 508b is mated with manifold 512, manifold 512 couples to and partially surrounds/contains housing 602 / adsorbent bed columns 508a, 508b, at least around the outer circumference of the end of housing 602.

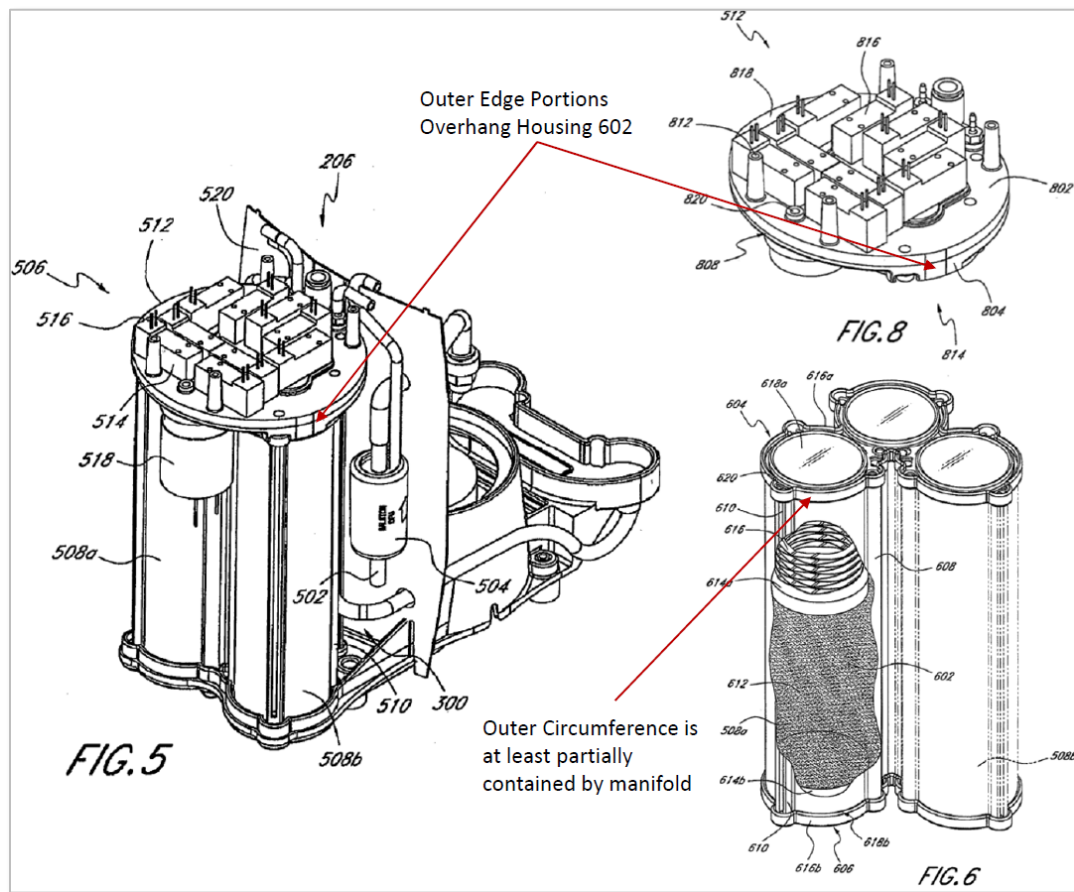
151. Patent Owner and Dr. Talu argue that the connection between manifold 512 and housing 602 does not show that manifold 512 “at least partially contains” housing 602 in accordance with Petitioner’s construction of “receptacle.” POR, 47-48; EX2001, ¶¶153-156. In particular, Patent Owner and Dr. Talu argue that “[m]anifold 512 only engages with the top of the adsorbent columns 508a, 508b” (POR, 48; EX2001, ¶153) and it is actually portions of the manifold that are received and contained within the adsorbent columns 508a, 508b (POR, 48; EX2001, ¶¶154-155). Their arguments are summarized in the annotated figures included in the POR and Dr. Talu’s Declaration, such as that at p. 49 of the POR reproduced below.



152. I disagree with Patent Owner and Dr. Talu’s interpretation of *Deane* and their resultant arguments above for multiple reasons.

153. *First*, as discussed in §IV.B above, the proper construction of “receptacle” would require only that it “at least partially contain” a cartridge. The geometry of the manifold 512 and housing 602 connection shown in FIGS. 5 and 6 of *Deane* teaches such partial containment of the end of housing 602 by manifold 512, and thus manifold 512 teaches a “receptacle.” Specifically, as shown in the following annotated Figures of *Deane*, it is clear that the outer edge portions of

manifold 512 overhang and surround the outer circumference of housing 602 and therefore manifold 512 “at least partially contains” housing 602.



154. In addition to this structure, manifold 512 has other features that extend into housing 602, as Patent Owner and Dr. Talu point out. While they assert these features are individually contained by portions of housing 602 (opposite the claimed arrangement), when the elements are considered together with the outer end portions of manifold 512 as a complete structure, it is clear that manifold 512 “at least partially contains” the upper end of housing 602 as portions of housing 602 are arranged between these features.

155. Indeed, as discussed above, the configuration of manifold 512/housing 602 interface is akin to the interface between a wall electrical receptacle and a male plug; only the parts of the male plug (*e.g.*, the blades) necessary to form a functional connection (*e.g.*, electrical) need be contained in the receptacle. The majority of the plug structure is retained in place by the connection but is not “contained” by the receptacle itself. This is exactly what is shown in the manifold 512 / housing 602 connection, as the fluid connection portion of the housing 602 is “contained” in manifold 512 while housing 602’s remaining structure extends beyond manifold 512. If the manifold 512 were only flush with the housing 602, there would be no gas-tight seal that could withstand the stresses of portability, *e.g.*, bumping, dropping, twisting, vibrating, and other rough treatment. To the contrary, the housing 602 must penetrate the manifold 512 in order for the seal between the two parts to be robust while the pressure inside the housing oscillates (*i.e.*, during Pressure Swing Adsorption).

156. Alternatively to manifold 512 alone being a “receptacle,” a POSITA would also have understood *Deane* to teach that a combination of manifold 512 and shell 204 (and any necessary intervening parts such as circuit board 1314) would form a “receptacle.” As set forth in ¶¶323, 331 of the *Knaebel Dec.*, *Deane* teaches that chassis 202 and shell 204 “together form a housing 206 in which various components are mounted.” EX1004 (*Deane*), ¶[0057]. While PSA unit

108/506 is mounted on chassis 202 in the illustrated embodiment of *Deane*, this teaching would have indicated to a POSITA that shell 204 could also support various components of *Deane*, including PSA unit 108/506. This understanding is buttressed by a POSITA's knowledge in the art, which includes an almost limitless variation of mounting structures. *See, e.g.*, references identified in §§I and II.B of the *Knaebel Dec.*.

157. 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. This would have provided an assembly of shell 204 and PSA unit 108/506 (with circuit board 1314) that in one approach would be installed/removed from chassis 202 in one step. Such a design was well within the capability of a POSITA in 2004-2005 and would have been an obvious variation or obvious design choice, particularly in view of the known desire in the art to make assemblies more modular. *See, e.g., Knaebel Dec.*, ¶¶51, 296-299. There would have been no change in functionality, only assembly methodology.

158. Moreover, 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 the requirements of

element [1b] and providing further lateral “containment” of housing 602 (*i.e.*, within shell 204).

159. Patent Owner and Dr. Talu argue that a POSITA would not have modified the configuration of *Deane* as I explained because *Deane* teaches that shell 204 and manifold 512 are independent structures with different functions and that shell 204 must be removed before manifold 512 can be accessed. POR, 50; EX2001, ¶157. Further, Patent Owner and Dr. Talu argue that combining these elements would result in loss of functionality because it would make *Deane* “impossible to disassemble.” POR, 50-51; EX2001, ¶¶158-159. I disagree for multiple reasons.

160. First, it is irrelevant to an assembly methodology that shell 204 and manifold 512 have different functions. My opinion that a POSITA would have considered it obvious to provide shell 204 and PSA unit 108/506 (with intervening circuit board) as an assembly that is removable from chassis 202 is simply a change in the manner of *Deane*’s component assembly. Because *Deane* teaches these components are arranged together in its POC, changing the way they are put together would have been obvious despite their difference in function. Second, my opinion that a POSITA would have considered it obvious to provide shell 204 and PSA unit 108/506 (with intervening circuit Board) as an assembly that is removable from chassis 202 would, by its nature, change the manner in which

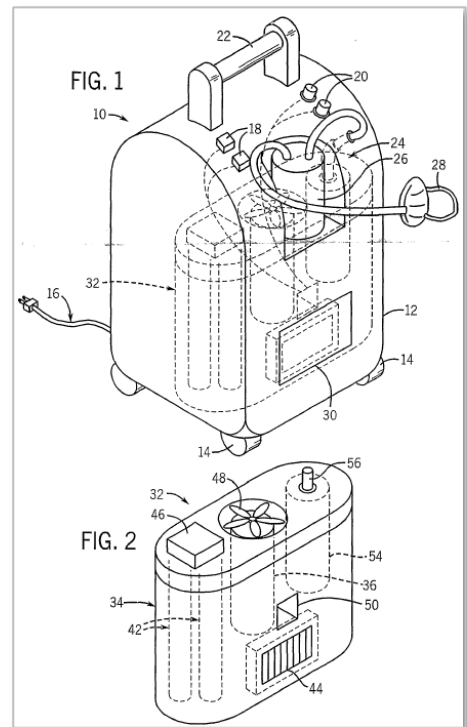
Deane's components are assembled as I discuss above. Thus, Patent Owner and Dr. Talu's argument that *Deane* would be "impossible to disassemble" is simply incorrect.

161. In view of the above, I maintain my opinion that *Deane* teaches a claimed "receptacle."

162. ***A POSITA Would Also Have Understood the Combination of Deane and Berntson to Teach Element [1b(i)]:*** As set forth in ¶¶294-300, 314, 332-334 of the *Knaebel Dec.*, in addition to the teachings of *Deane* discussed above, a POSITA would also have understood that *Berntson* teaches a "separation cartridge selectively removable from a receptacle"

(EX1006 (*Berntson*), ¶¶[0011]-[0012]) and that it would have been obvious to combine *Deane*'s and *Berntson*'s cartridge teachings.

163. Specifically, as set forth in the *Knaebel Dec.* at ¶215, *Berntson* teaches a self-contained cartridge (ORAG 32) that is removably provided in housing 12 of an oxygen concentrator 10, as shown in FIGS. 1 and 2 (reproduced here), and contains, *e.g.*, pump 36, adsorbent containers 42, valve system 46, and an oxygen tank. EX1006 (*Berntson*), ¶¶[0011]-[0013], FIGS. 1-2. *Berntson* also



teaches that “[s]ome components could be provided either as part of the ORAG 32 or not.” EX1006 (*Berntson*), ¶¶0017]. Thus, a POSITA would have understood the component listing of *Berntson*’s ORAG 32 to be adjustable or optional.

164. As set forth in the *Knaebel Dec.* at ¶¶332-333, to the extent *Deane* is found not to teach a “separation cartridge selectively removable from a receptacle” (it should not be), a POSITA would have provided this feature in view of *Berntson* for several reasons.

165. First, to the extent Patent Owner and Dr. Talu’s argument that *Deane*’s housing 602 is not self-contained (*e.g.*, that its spring would pop-off manifold 512 or that its adsorbent would fall out of the bottom) is accepted (though it should not be), a POSITA would have been motivated to utilize *Berntson*’s teachings of a self-contained cartridge that is removable from a receptacle (*i.e.*, removable as a whole from its housing) to provide a more easily removable self-contained cartridge, as set forth in the *Knaebel Dec.* at ¶¶294-296 (a POSITA would have been motivated to provide a “cartridge that is more modular and thus more easily and conveniently accessed and removed/replaced for maintenance, characteristics a POSITA would have recognized as highly desirable by 2004-2005”). In this combination, it is easy to understand that a POSITA would have been motivated to include the entire gas flow structure relevant to *Deane*’s cartridge within the *Deane/Berntson* cartridge to make it even more modular.

166. Second, to the extent Patent Owner and Dr. Talu’s argument that *Deane*’s manifold 512 cannot alone teach a receptacle because it does not fully contain a cartridge is accepted (but it should not be, because receptacles seldom fully contain their plug-ins), *Berntson* teaches that its cartridge is directly removable from its housing, which a POSITA would have understood, in conjunction with any fluid connections, to be a “receptacle” that fully contains the cartridge. In this regard, a POSITA would have understood the combination of *Deane/Berntson* to teach providing a receptacle formed of a structure such as the combination of *Deane*’s manifold 512 and shell 204 in the manner discussed above. This configuration, as stated above, would still provide the capability for housing 602 to be removable from manifold 512 while manifold 512 is retained in shell 204, thus otherwise meeting the requirements of element [1b] and providing full “containment” of housing 602.

167. Third, to the extent Patent Owner and Dr. Talu’s argument that *Deane* doesn’t teach disassembly by first removing a PSA unit 108/506 before separating manifold 512 from housing 602 is accepted (yet it should not be), *Berntson* teaches that these components should be provided in a single removable assembly, which a POSITA would have applied to *Deane*’s configuration to provide a more modular construction. *Knaebel Dec.* at ¶¶294-296. Specifically, *Berntson* teaches that ORAG 32 has, in at least one configuration, adsorbent containers 42, valve system

46, and an oxygen tank therein and is directly removable from its housing for maintenance. EX1006 (*Berntson*), ¶¶[0011]-[0013], FIGS. 1-2. A POSITA would have understood these to be components analogous to *Deane*'s adsorbent columns 508a/b, manifold 512, and gas storage column 510, and thus would have been motivated to provide these features together as a removable assembly corresponding to PSA unit 108/506 for maintenance.

168. Support and motivation for this understanding is, as set forth in the *Knaebel Dec.* at ¶297, also provided by *McCombs '957*, which teaches a “compact unit” made up of adsorbent beds 30, 32, manifolds 120, 122 and compressor 24 held together by a single elongated bolt 130 that is assembled as a unit and then attached to (or released from) central chassis 108 such that it is “readily assembled” and “readily accessed for servicing.” EX1010 (*McCombs '957*), ¶¶[0028]-[0030], FIGS. 7-9. In particular, I explained that *McCombs '957*, in addition to the other references cited in ¶297, “inform[] a POSITA’s general understanding as of 2004-2005 that it was desirable for adsorbent-containing units in oxygen concentrators to be easily removable/accessible from the concentrators for maintenance purposes and for ease of assembly/disassembly.”

169. ***It Would Have Been Obvious to Modify Deane in View of Berntson:*** Patent Owner and Dr. Talu argue that a POSITA would not have been motivated to modify *Deane* in view of *Berntson* because *Deane* teaches to provide thermal

separation of its motor and adsorbent columns and *Berntson* teaches to provide these features together in ORAG 32. POR, 46-47; EX2001, ¶134.

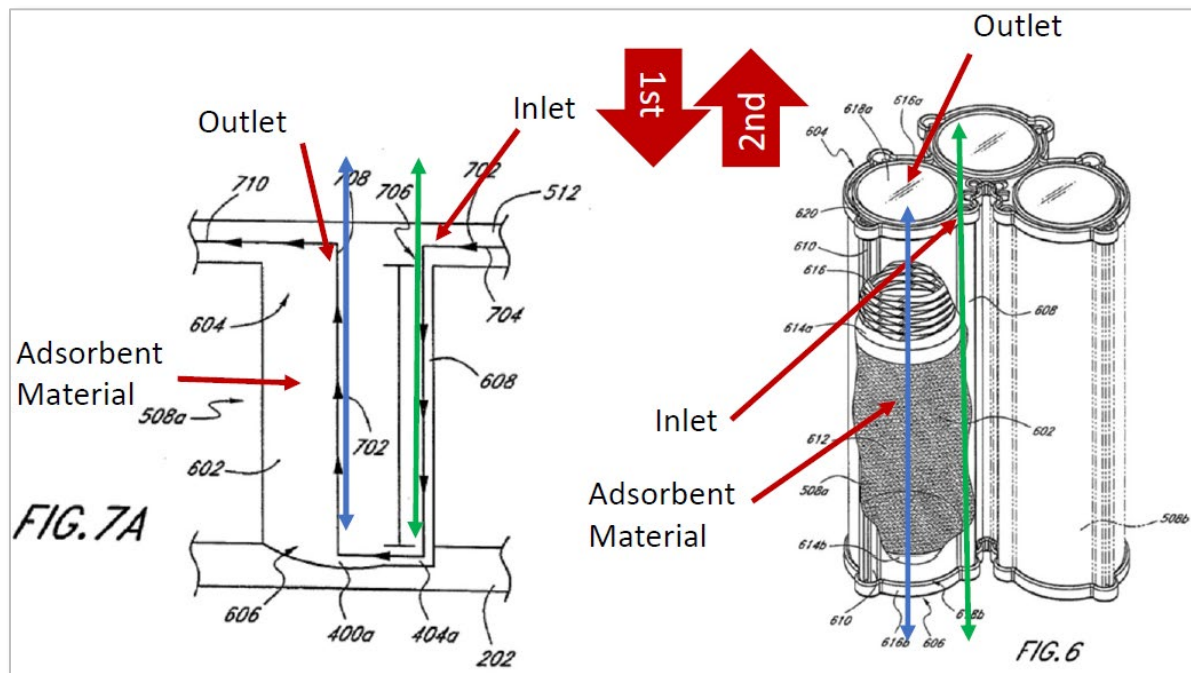
170. I disagree for at least two reasons. First, a POSITA would have understood the applicable teaching of *Berntson* in this context to be that various POC components should be included in a removable assembly to improve assemble-ability and serviceability. EX1006 (*Berntson*), ¶¶[0004]-[0006]. A POSITA would have known how to apply that teaching in *Deane* by selecting appropriate components to include in a removable assembly, such as the components in PSA unit 108/506. Indeed, *Berntson* explicitly teaches that its various components can be provided as part of its ORAG or not. EX1006 (*Berntson*), ¶[0017]. Second, *Deane* does not teach that its PSA unit 108/506 cannot be included in a removable assembly like *Berntson*'s ORAG with its motor. It simply teaches it is advantageous to thermally isolate PSA unit 108/506 from the motor. But, to the extent a POSITA was motivated to provide a removable assembly including PSA unit 108/506 and a motor, a POSITA would have known how to thermally isolate these components within the assembly. Indeed, *Deane* itself provides PSA unit 108/506 and its motor in one housing with thermal isolation.

- | |
|---|
| <p>[1c] wherein a first line extending parallel to the first and second directions passes through the outlet,</p> <p>[1d] wherein a second line spaced-apart from the first line and extending parallel to the first line passes through the inlet, and</p> <p>[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.</p> |
|---|

171. In the *Knaebel Dec.*, I opined that the combination of *Deane, Dubois*, and *Berntson* renders these limitations obvious. EX1003, ¶¶348-354. I maintain this opinion and incorporate it herein by reference. Neither Patent Owner nor Dr. Talu appears to dispute this opinion with regard to elements [1c] and [1d]. They do, however, argue element [1e] is not obvious in view of *Deane, Dubois*, and *Berntson*. I have reviewed Patent Owner and Dr. Talu's arguments and find them to be incorrect, for at least the following reasons.

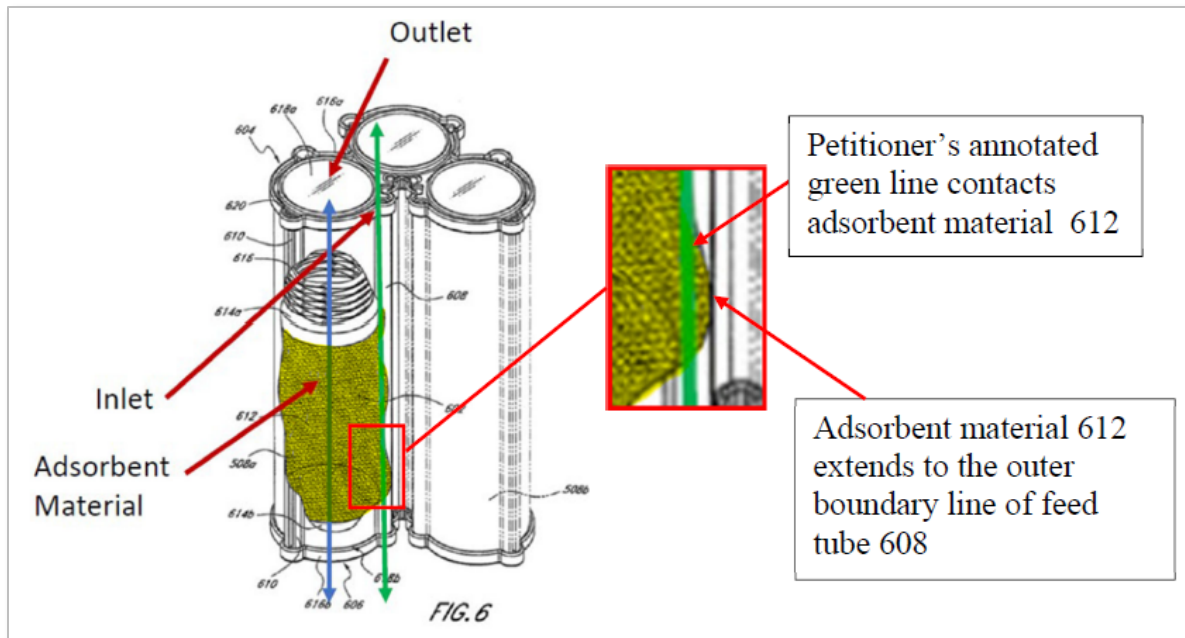
172. Regarding element [1e], as set forth in ¶¶348-354 and the annotated versions of *Deane's* FIGS. 6 and 7A provided in the *Knaebel Dec.*, *Deane* teaches its separation cartridge (e.g., adsorbent housing 602 / adsorbent bed columns 508a, 508b) is configured such that, when fluid flows through the separation cartridge, fluid flowing along the first line (as defined in element [1c]) contacts the adsorbent

material of the bed (e.g., fluid flowing along the **blue line** in the annotated figures below passes through adsorbent material 612) and fluid flowing along the second line (as defined in element [1d]) does not contact the adsorbent material of the bed



(e.g., fluid flowing along the **green line** in the annotated figures below flows through feed tube 608 that does not contain adsorbent material 612). I pointed to at least EX1004 (*Deane*) at, e.g., ¶¶[0059], [0062], [0066], [0068], [0070], FIGS. 6, 7A as teaching this configuration.

173. ***Deane's FIG. 6 Configuration Teaches [1e]:*** Patent Owner and Dr. Talu argue that, contrary to the above, annotated FIG. 6 actually shows **green line** passing through adsorbent in feed tube 608, as shown in Dr. Talu's further annotated version of my drawing (reproduced below). POR, 52-54; EX2001, ¶¶141-144.

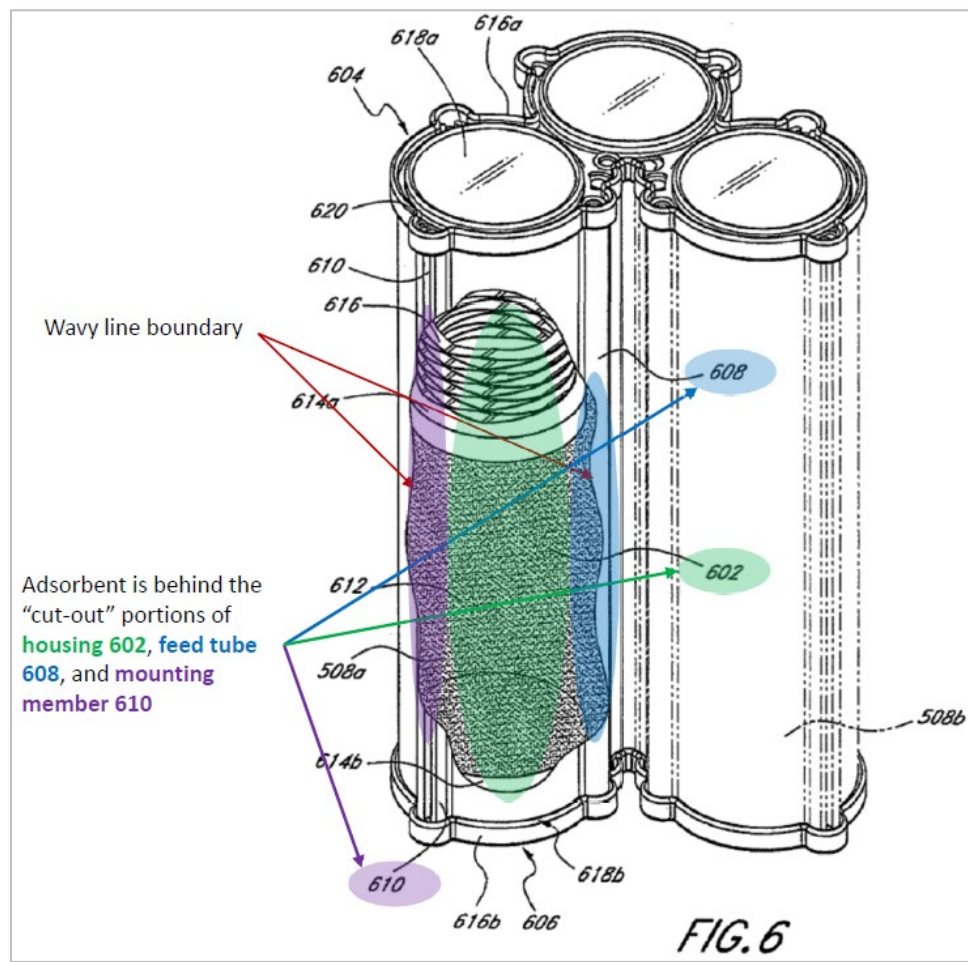


174. More particularly, Patent Owner and Dr. Talu argue that FIG. 6 shows that “adsorbent material 612 extends to the outer boundary line of the feed tube 608, which demonstrates that the adsorbent is in the feed tube 608” (POR, 54-55; EX2001, ¶144) and thus that the **green line** passes through adsorbent.

175. This is a recycled argument from the POPR (POPR, 29-35) that the ID did not find persuasive (ID, 24-31). As set forth in Petitioner’s Reply to the POPR (Paper No. 07), this is an unreasonable reading of FIG. 6, particularly in view of the remaining teachings of *Deane*, for example, in ¶¶[0059], [0062], [0066], [0068], [0070], and FIG. 7A. This argument seeks to manufacture an ambiguity out of a well-known drawing style and should be rejected.

176. With respect to FIG. 6 particularly, a POSITA would not have understood it as showing adsorbent 612 extending into feed tube 608. FIG. 6 is

clearly a “cut-out” or section view of housing 602 (removed from *Deane’s* POC) that intends to show housing 602’s components (e.g., adsorbent 612, restraining disks 614a-b, spring 616) installed in place *inside* its outer walls by cutting away, for example, portions of: (i) housing 602’s outer walls; (ii) feed tube 608; and (iii) mounting member 610. See my annotated version of FIG. 6 below.



177. This understanding is evident by the boundary of the cut-away portion being a wavy line, the shape of the visible portion of adsorbent 612 conforming to that wavy line (adsorbent in column 508a in actuality would be in a cylindrical

shape), and the fact that the visible portion of spring 616 does not extend upward to the top of housing 602. In other words, a POSITA would have understood the boundary of the cut-away portion, shown as a wavy line, to be cylindrical with a diameter that coincides with the inner diameter of the cylindrical adsorbent housing 602. Within the wavy line, portions of housing 602, feed tube 608, and mounting member 610 are removed (cut-out) so there is nothing left to obscure the interior. Within the figurative opening created by these removed portions some, but not all, of the adsorbent and other internal components are visible. For example, the cylindrical surfaces of the upper and lower restraining disks 614a, 614b are shown, as is the cylindrical/helical shape of spring 616. But, due to the artist's rendering, the revealed part of spring 616 does not extend upward to the top of housing 602 and the complete forms of these components are not visible. These are classic features of a cut-away drawing.

178. Thus, a POSITA looking at FIG. 6 would have concluded that it shows adsorbent 612 in the main portion of housing 602 via a cut-away, but does not portray adsorbent 612 extending into either feed tube 608 at the right hand side or mounting member 610 on the left hand side. Thus, as set forth in the *Knaebel Dec.*, it is clear that *Deane* teaches that fluid flowing along the second line (the **green line**) in my annotated version (which I explained passes through feed tube 608 at EX1003, ¶¶349-351) does not contact any adsorbent material at all, let alone

the recited “adsorbent material of the bed” through which the first line (the **blue line**) passes as required by element [1e]. No POSITA would believe that the wavy line boundary of the cut-out represents a physical attribute of the adsorbent housing 602, or that it represents reality. Similarly, no POSITA would believe that the circle that represents the circular top edge of the lower restraining disk 614b, which is buried beneath the shown adsorbent, would be visible, yet it is shown in this section view. It is merely shown for reference.

179. Moreover, even if there is a question of FIG. 6’s teachings (or my annotations) due to the limitations of representing a three-dimensional structure in two dimensions (there is not), it is resolved by *Deane*’s other teachings of an adsorbent-free tube 608 discussed below.

180. ***Deane’s Remaining Teachings Confirm My FIG. 6 Analysis:***

Beyond the FIG. 6 illustration, *Deane*’s ¶¶[0062], [0066], [0068], and [0070] and FIG. 7A confirm feed tube 608, through which the second line (the **green line**) in my annotated figures passes, does not include adsorbent.

181. First, as shown in my annotated version above, FIG. 7A shows the portion of housing 602 with adsorbent *is separate* from feed tube 608, such that the adsorbent in that portion could not physically extend into feed tube 608. In particular, a wall separates the main portion of housing 602 (with adsorbent) from tube 608.

182. Moreover, due to the presence of this wall, if FIG. 6 were truly illustrating adsorbent in feed tube 608, it would have to portray two separate masses of adsorbent; one in the main portion of housing 602 and the other in feed tube 608. But that is not what is shown in FIG. 6, which shows only one mass of adsorbent. This confirms adsorbent 602 in FIG. 6 is shown via a “cut-out” view.

183. Patent Owner and Dr. Talu criticize the technical accuracy of FIG. 7 and assert Petitioner cannot rely on it. POR, 57-58; EX2001, ¶¶145-146. But it is my understanding that the relevant question related to a reference’s teachings is how a POSITA would interpret them. In this case, a POSITA would have understood by viewing FIGS. 6 and 7A in tandem that the main portion of housing 602 and feed tube 608 are separate volumes and that adsorbent in the main portion of housing 602 does not extend into feed tube 608. A POSITA would have understood that FIGS. 7A and 7B are flow schematics. They do not show adsorbent 612, but they do identify the adsorbent housing 602 and feed tube 608. More importantly, they show the various streams that occur during the PSA cycle: feed gas 702, feed stream 704 in manifold 512, as well as product gas 708, purge gas 712, and waste stream 718.

184. Second, *Deane* teaches with regard to FIG. 7 that feed gas 702 passes downward through feed tube 608 into the bottom of housing 602, and ***then upward to pass through the adsorbent material***. EX1004, ¶[0070] (“feed gas 702 travels

downwardly through the tube 608 and is diverted ... into a recess 400a ... feed gas 702 flows upwardly from the recess 400a through the lower end 606 of the housing 602 and upwardly through the adsorbent material contained in the housing 602”). A POSITA would have understood these teachings to indicate that adsorbent is provided in the main portion of housing 602 only, not in feed tube 608. Moreover, the fact that the gas is consistently referred to as a “feed gas” both as it travels through feed tube and *after* it exits feed tube 608 and is redirected upward confirms it has yet to pass through adsorbent. “Feed gas” in *Deane* is gas *supplied to* an adsorbent bed (“product gas” is what *exits*). See, e.g., EX1004, ¶¶[0008], [0032]-[0056], [0062], [0064], [0070]; EX1003, ¶10.

185. Patent Owner and Dr. Talu argue that there is no evidence to support a “contention that ‘feed gas’ is commonly understood to refer to gas that has not passed through adsorbent,” and cites references that use “feed gas” differently. POR, 58-59; EX2001, ¶149. But those arguments miss the point of my explanation above. As I stated, *Deane* consistently uses “feed gas” to describe the gas that is provided for adsorption and not post-adsorption, when it uses “product gas.” This usage would lead a POSITA to conclude that there is no adsorbent in feed tube 608. Just because a different reference uses “feed gas” in a different manner does not change how “feed gas” is used internally in *Deane*.

186. *Third*, in *Deane*, housing 602 retains adsorbent 612 in columns 508a, 508b using restraining disks 614a-b. EX1004, ¶[0068]. *Deane*'s feed tubes 608 have no such disks. Thus, a POSITA would have understood that adsorbent is not present in feed tubes 608. Besides, a POSITA would have known that, as explained in ¶[0067] of *Deane*, "the feed tube 608 has an internal diameter of about 0.125 inch and the adsorbent housing 602 has a diameter of about 1.5 inch." It would be foolish to purposely load adsorbent into feed tube 608 because to do so would result in such a great flow restriction that the POC would not work. It would be like trying to drink a beverage through a straw that is filled with sand. *Deane*'s design recognizes that by the presence of the upper and lower restraining disks 614a, and 614b. Those keep the adsorbent where it belongs, in the adsorbent housing 602.

187. Patent Owner and Dr. Talu argue this is not determinative because "monolithic adsorbents" could be used that would not require restraining disks. POR, 60; EX2001, ¶150. But there is no teaching in *Deane* of the use of such "monolithic adsorbents" and neither Patent Owner nor Dr. Talu provide evidence that "monolithic adsorbents" were a known alternative used in POCs as of 2004-2005, or that a POSITA would have understood them to be utilized in *Deane* in any way.

188. *Fourth*, feed tube 608 is called a "feed tube" or "gas passageway," not

a bed or pre-bed. EX1004, ¶[0066]. This would also lead a POSITA to conclude there is no adsorbent present therein.

189. ***Patent Owner's Citations to Other Documents Are Irrelevant:***

Without any support in *Deane*, and contrary to its teachings identified above, Patent Owner and Dr. Talu also argue that feed tubes 608 could actually be pre-beds containing adsorbent, citing such arrangements in my papers. POR, 57. But, as discussed above, *Deane* does not refer to its feed tubes 608 as beds or pre-beds and thus a POSITA would not have understood them as such.

190. Moreover, even if feed tubes 608 could be considered pre-beds, it is irrelevant to patentability. Element [1e] requires 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***.” Thus, line contact for both the first and second lines is determined with regard ***to one bed, not two separate beds***. Accordingly, even if the second line (the **green line**) were to pass through a separate pre-bed arranged in feed tube 608, that does not show it passes through the same bed as the first line. Thus, even if feed tube 608 could be considered a pre-bed, *Deane* would still teach element [1e].

191. ***Conclusion:*** In view of the above, I maintain my opinion that the combination of *Deane*, *Dubois*, and *Berntson* renders claim 1 obvious.

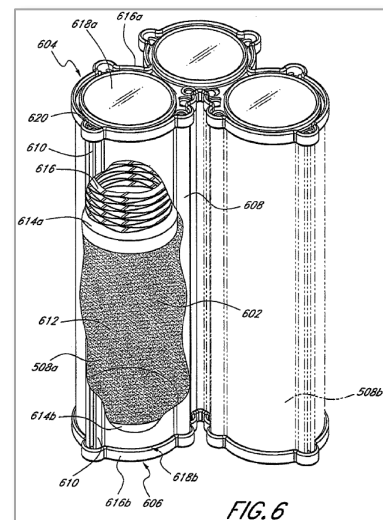
2. Dependent Claim 2

- [2a] 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.

192. In the *Knaebel Dec.*, I opined that the combination of *Deane, Dubois*, and *Berntson* renders claim 2 obvious. I maintain this opinion and incorporate it herein by reference.

193. Neither Patent Owner nor Dr. Talu appears to dispute this opinion with regard to elements [2a] and [2b]. However, Patent Owner and Dr. Talu argue that element [2c] is not obvious in view of *Deane, Dubois*, and *Berntson*. I have reviewed Patent Owner and Dr. Talu's arguments and find them to be incorrect, for at least the following reasons.

194. Regarding element [2c], as set forth in ¶358 of the *Knaebel Dec.*, while *Deane's* FIG. 6 shows spring 616 adjacent a first end in contact with restraining disk 614a, it would have been obvious to a POSITA to have also or alternatively placed a spring adjacent a second end of the cartridge in contact with restraining disk 614b because *Deane* teaches that spring 616 is provided to apply pressure to keep restraining disk 614a in position, a



teaching that a POSITA would have recognized to be applicable to either end of *Deane*'s adsorbent columns. EX1004 (*Deane*) ¶[0068], FIG. 6. Alternatively, as set forth in ¶359 of the *Knaebel Dec.*, it would have been obvious to provide a spring on either or both ends of *Deane*'s adsorbent columns based on the common knowledge of a POSITA as exemplified by the teachings of, for example, EX1012 (*Warren '095*) at ¶[0073] (teaching biasing adsorbent material to one end of bed), EX1026 (*Bassine*), FIG. 6 (teaching springs at both ends), and EX1015 (*Appel '928*), ¶[0105], FIG. 3A (teaching spring 810 at the bottom end of an adsorbent bed that pushes “upwards to hold the packed bed of adsorbent material firmly in place”).

195. The POR argues a POSITA would not have placed a spring at the bottom of *Deane*'s adsorbent beds 508a, 508b, either singly or paired with a spring at the top, because it would be “difficult, if not impossible” to load column 508a with adsorbent material 612 due to the effects of such a bottom spring. POR, 62-63. Moreover, the POR argues that adding a second spring at the bottom would add unnecessary complexity. POR, 63. The only support offered for these arguments is Dr. Talu's opinions that do not refer to any documents. EX2001, ¶¶163-165.

196. I disagree with Patent Owner and Dr. Talu's arguments for numerous reasons.

197. First, Dr. Talu's opinion that it is difficult or impossible to load adsorbent in a column with a spring at the opposite end is not supported by any documents and would have been contrary to a POSITA's knowledge (and my experience). Dr. Talu's opinion is also contradicted by the teachings of the references I cited above that demonstrate the general knowledge in the art. For example, *Bassine* provides springs at both ends of its adsorbent beds (EX1026 (*Bassine*), FIG. 6), and at least one of these springs would logically be in place while the adsorbent is being loaded. Similarly, in *Appel '928*, a POSITA would have recognized that loading the adsorbent from the top after assembling the bottom structure including spring 810 was a straightforward operation. EX1015 (*Appel '928*), FIG. 3B). *Hill '719*, discussed in Ground 2, also teaches arranging a spring opposite the end adsorbent is loaded, as discussed in Ground 2.

198. Second, the alleged assembly method for *Deane's* columns 508a, 508b discussed by Dr. Talu is entirely speculative. Because, as discussed above, *Deane's* housing 602 is self-contained as shown in FIG. 6 and has restraining disks 614a, 614b at either end, a POSITA would have understood that adsorbent can be loaded from either end and held by restraining disks 614a, 614b before housing 602 is fully assembled (*e.g.*, before the spring and other components are installed) and connected to manifold 512 during assembly of PSA unit 506.

199. Third, even if one were to assume the adsorbent loading direction asserted by Patent Owner and Dr. Talu were correct, any alleged difficulties in loading adsorbent from the top when a bottom spring is present in *Deane* are vastly overblown. It would have been well within the capability of a POSITA to select a spring or springs for use in a cartridge that provided the requisite functionality but still allowed assembly (*e.g.*, allowed the components to be installed without underfilling or spillage as alleged by Dr. Talu). Installing adsorbent and a top restraining disk on a bottom restraining disk biased upward by a spring is a common and manageable task in the art.

200. Fourth, Dr. Talu's argument that it would add complexity and costs to *Deane* to provide springs both above and below adsorbent columns 508a, 508b, such as taught by *Bassine*, is correct to the extent that two springs would cost more than one, but otherwise it is not necessarily correct and is merely speculative. A two-spring design might be more cost-effective in relation to a single spring arrangement in particular arrangements due to other corresponding changes. Moreover, it is my understanding that a modification is not considered non-obvious merely because it may result in a more complex or costly resultant configuration. Rather, the fact that a POSITA would have recognized the modification as a design option in the art is, in my understanding, enough to show obviousness.

201. In view of the above, I maintain my opinion that the combination of *Deane, Dubois*, and *Berntson* renders claim 2 obvious.

3. Dependent Claim 3

- [3a] 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.**

202. In the *Knaebel Dec.*, I opined that the combination of *Deane, Dubois*, and *Berntson* renders claim 3 obvious. I maintain this opinion and incorporate it herein by reference. Neither Patent Owner nor Dr. Talu appears to dispute this opinion.

4. Dependent Claim 4

- [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.**

203. In the *Knaebel Dec.*, I opined that the combination of *Deane, Dubois*, and *Berntson* renders claim 4 obvious. I maintain this opinion and incorporate it

herein by reference. Neither Patent Owner nor Dr. Talu appears to dispute this opinion.

5. Dependent Claim 5

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

204. In the *Knaebel Dec.*, I opined that the combination of *Deane, Dubois*, and *Berntson* renders claim 5 obvious. I maintain this opinion and incorporate it herein by reference. Neither Patent Owner nor Dr. Talu appears to dispute this opinion.

6. Dependent Claim 7

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

205. In the *Knaebel Dec.*, I opined that the combination of *Deane, Dubois*, and *Berntson* renders claim 7 obvious. I maintain this opinion and incorporate it herein by reference. Neither Patent Owner nor Dr. Talu appears to dispute this opinion.

7. Dependent Claim 8

[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.

206. In the *Knaebel Dec.*, I opined that the combination of *Deane, Dubois*, and *Berntson* renders claim 8 obvious. I maintain this opinion and incorporate it herein by reference. Neither Patent Owner nor Dr. Talu appears to dispute this opinion.

8. Dependent Claim 9

[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.

207. In the *Knaebel Dec.*, I opined that the combination of *Deane, Dubois*, and *Berntson* renders claim 9 obvious. I maintain this opinion and incorporate it herein by reference. Neither Patent Owner nor Dr. Talu appears to dispute this opinion.

9. Dependent Claim 10

[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.

208. In the *Knaebel Dec.*, I opined that the combination of *Deane, Dubois*, and *Berntson* renders claim 10 obvious. I maintain this opinion and incorporate it

herein by reference. Neither Patent Owner nor Dr. Talu appears to dispute this opinion.

10. Dependent Claim 11

[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.

209. In the *Knaebel Dec.*, I opined that the combination of *Deane, Dubois*, and *Berntson* renders claim 11 obvious. I maintain this opinion and incorporate it herein by reference. Neither Patent Owner nor Dr. Talu appears to dispute this opinion.

11. Independent Claim 12

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

210. In the *Knaebel Dec.*, I opined that the combination of *Deane, Dubois*, and *Berntson* renders this limitation obvious. I maintain this opinion and incorporate it herein by reference. Neither Patent Owner nor Dr. Talu appears to dispute this opinion.

- [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**

211. In the *Knaebel Dec.*, I opined that the combination of *Deane, Dubois*, and *Berntson* renders these limitations obvious. I maintain this opinion and incorporate it herein by reference. Neither Patent Owner nor Dr. Talu appears to dispute this opinion.

- [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.**

212. In the *Knaebel Dec.*, I opined that the combination of *Deane, Dubois*, and *Berntson* renders these limitations obvious. I maintain this opinion and incorporate it herein by reference. Patent Owner and Dr. Talu dispute that *Deane, Dubois*, and *Berntson* teach the features of at least element [12g] for the reasons discussed above as to element [1e]. Patent Owner and Dr. Talu's arguments are incorrect for at least the reasons set forth in element [1e].

12. Independent Claim 13

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

213. In the *Knaebel Dec.*, I opined that the combination of *Deane, Dubois*, and *Berntson* renders this limitation obvious. I maintain this opinion and incorporate it herein by reference. Neither Patent Owner nor Dr. Talu appears to dispute this opinion.

[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;

214. In the *Knaebel Dec.*, I opined that the combination of *Deane, Dubois*, and *Berntson* renders these limitations obvious. I maintain this opinion and incorporate it herein by reference. Neither Patent Owner nor Dr. Talu appears to dispute this opinion.

- [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;**

215. In the *Knaebel Dec.*, I opined that the combination of *Deane, Dubois*, and *Berntson* renders these limitations obvious. I maintain this opinion and incorporate it herein by reference. Neither Patent Owner nor Dr. Talu appears to dispute this opinion.

- [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.**

216. In the *Knaebel Dec.*, I opined that the combination of *Deane*, *Dubois*, and *Berntson* renders these limitations obvious. I maintain this opinion and incorporate it herein by reference. Patent Owner and Dr. Talu dispute that *Deane*, *Dubois*, and *Berntson* teach the features of at least elements [13n] and [13q] for the reasons discussed above as to element [1e]. Patent Owner and Dr. Talu's arguments are incorrect for at least the reasons set forth in element [1e].

13. Dependent Claim 14

- [14a] 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.**

217. In the *Knaebel Dec.*, I opined that the combination of *Deane, Dubois*, and *Berntson* renders claim 14 obvious. I maintain this opinion and incorporate it herein by reference. Neither Patent Owner nor Dr. Talu appears to dispute this opinion.

14. Dependent Claim 15

- [15a] 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.**

218. In the *Knaebel Dec.*, I opined that the combination of *Deane, Dubois*, and *Berntson* renders claim 15 obvious. I maintain this opinion and incorporate it herein by reference. Patent Owner and Dr. Talu dispute that *Deane, Dubois*, and *Berntson* teach the features of at least elements [15c] and [15g] for the reasons

discussed above as to element [2c]. Patent Owner and Dr. Talu's arguments are incorrect for at least the reasons set forth in element [2c].

15. Dependent Claim 16

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

219. In the *Knaebel Dec.*, I opined that the combination of *Deane, Dubois*, and *Berntson* renders claim 16 obvious. I maintain this opinion and incorporate it herein by reference. Neither Patent Owner nor Dr. Talu appears to dispute this opinion (at least beyond the dispute regarding claim 1).

B. Ground 2: Claims 2, 3, and 15 Are Rendered Obvious by *Deane* in view of *Dubois, Berntson*, and *Hill '719*

1. Dependent Claim 2

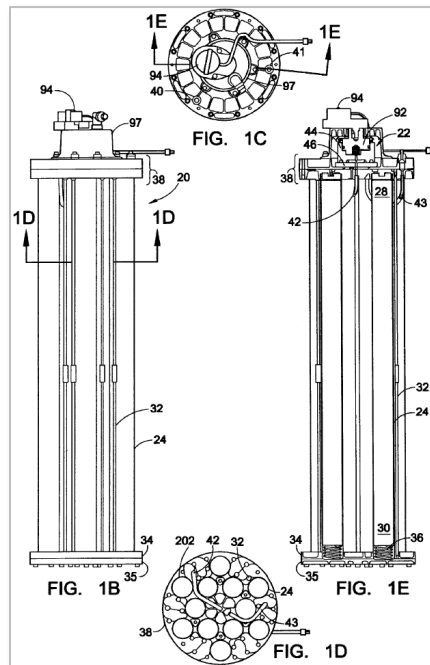
**[2a] The portable oxygen concentrator as recited in claim 1, wherein:
[2b] the outlet is arranged adjacent a first end of the bed, and
[2c] adjacent a second end of the bed opposite the first end, the separation cartridge includes a spring configured to hold the bed in place.**

220. In the *Knaebel Dec.*, I opined that the combination of *Deane, Dubois, Berntson*, and *Hill '719* renders claim 2 obvious. I maintain this opinion and incorporate it herein by reference.

221. Neither Patent Owner nor Dr. Talu appears to dispute this opinion with regard to elements [2a] and [2b]. However, Patent Owner and Dr. Talu argue that the combination of *Deane, Dubois, Berntson*, and *Hill '719* does not teach

element [2c]. I have reviewed Patent Owner and Dr. Talu's arguments and find them to be incorrect, for at least the following reasons.

222. Regarding element [2c], as set forth in ¶¶437-438 of the *Knaebel Dec.*, should *Deane* somehow be found to not render element [2c] obvious as set forth in Ground 1, *Hill '719* teaches spring 36 at the bottom end of an adsorbent column, where feed gas enters, opposite the top end of the column, where product gas exits the column. EX1008 (*Hill '719*), 5:7-11, FIG. 1E. This construction where feed gas is routed to the bottom of an adsorbent column, passes through the adsorbent, and exits the top is very similar to the *Deane* configuration. Thus, a POSITA would have considered it obvious, *e.g.*, as an obvious design choice, to provide a spring at the bottom of *Deane*'s columns 508a, 508b to effect the necessary pressure on the adsorbent therein.



223. Similar to their argument regarding the obviousness of claim 2 in Ground 1 (*e.g.*, over *Deane*'s teachings), Patent Owner and Dr. Talu argue that a POSITA would not have provided a spring at the bottom of *Deane*'s columns 508a, 508b in view of *Hill '719* because, in Dr. Talu's opinion, springs are only

properly utilized on the end of a cartridge where the adsorbent is loaded, which is the top in *Deane*. POR, 64, EX2001, ¶169. In an effort to buttress this opinion (which as set forth above is devoid of citations to any documents), they both also assert that *Hill '719* teaches its spring is arranged at the end of adsorption vessel 24 into which adsorbent is loaded. *Id.*

224. I disagree with Patent Owner and Dr. Talu's opinions regarding whether a POSITA would have been motivated to arrange a spring on the bottom end of the columns 508a, 508b of *Deane* (including how a POSITA would understand *Deane*'s adsorption columns 508a, 508b to be loaded with adsorbent) for at least the reasons discussed above for claim 2 in Ground 1.

225. I also disagree with Patent Owner and Dr. Talu's reading of *Hill '719*. Contrary to their argument, a POSITA would have recognized that *Hill '719*'s adsorption vessel 24 would have been loaded at the end *opposite* the end where its spring 36 is arranged. There are no indications otherwise in the specification or the claims of *Hill '719*. While it would have been possible to load adsorbent from the end with the springs and then flip the assembly for installation, a POSITA would have considered it a more straightforward operation (*e.g.*, in terms of simplicity and due to the size of the vessels) to fill these adsorption vessels from the top as they are installed as shown in FIG. 1E. In that methodology, spring 36 would be in

place (under a restraining disk) when the adsorbent is loaded, contrary to Patent Owner and Dr. Talu's position.

226. In view of the above, I maintain my opinion that the combination of *Deane, Dubois, Berntson*, and *Hill '719* renders claim 2 obvious.

2. Dependent Claim 3

- [3a] 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.**

227. In the *Knaebel Dec.*, I opined that the combination of *Deane, Dubois, Berntson*, and *Hill '719* renders claim 3 obvious. I maintain this opinion and incorporate it herein by reference. Neither Patent Owner nor Dr. Talu appears to dispute this opinion (beyond the disputes identified regarding claim 2 above).

3. Dependent Claim 15

- [15a] 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.

228. In the *Knaebel Dec.*, I opined that the combination of *Deane, Dubois, Berntson*, and *Hill '719* renders claim 15 obvious. I maintain this opinion and incorporate it herein by reference. Patent Owner and Dr. Talu dispute that *Deane, Dubois, Berntson*, and *Hill '719* teach the features of at least elements [15c] and [15g] for the reasons discussed above as to element [2c]. Patent Owner and Dr. Talu's arguments are incorrect for at least the reasons set forth in element [2c].

C. Ground 3: Claim 6 Is Rendered Obvious by *Deane* in view of *Dubois, Berntson*, and *Basset*

229. In the *Knaebel Dec.*, I opined that a POSITA would have found claim 6 obvious based on the combination of *Deane, Dubois, Berntson*, and *Basset* pursuant to Ground 3. I maintain this opinion and incorporate it herein by reference. Neither Patent Owner nor Dr. Talu appears to dispute this opinion.

D. Grounds 4-6

230. In the *Knaebel Dec.*, I opined that, alternatively, (i) claims 1-5 and 7-16 are obvious based on the teachings of *Deane* (EX1004) (Ground 4); (ii) claims

2, 3, and 15 are obvious based on the combination of *Deane* (EX1004) and *Hill* '719 (EX1008) (Ground 5); and (iii) claim 6 is obvious based on the combination of *Deane* (EX1004) and *Basset* (EX1007) (Ground 6) for at least the reasons in Grounds 1, 2, and 3, respectively. I maintain these opinions and incorporate them herein by reference. Neither Patent Owner nor Dr. Talu appears to dispute these opinions for any reasons separate to those I address above as to Grounds 1 and 2.

VI. SECONDARY CONSIDERATIONS

231. Patent Owner and Dr. Talu assert Inogen, a third party POC manufacturer, has taken a license to the patent family including the '614 patent, and that this demonstrates the non-obviousness of the challenged claims.

232. I disagree for several reasons. First, the alleged Inogen license is not of record, so I have not been able to review it to determine if it is relevant at all. Second, it is my understanding that secondary considerations must be demonstrated with specificity in conjunction with the claimed invention. Here, neither Patent Owner nor Dr. Talu explain whether Inogen's (alleged) decision to license the family of the '614 patent was due to features of the challenged claims as opposed to features of one of the '614 patent's ancestors. In other words, Inogen might have been concerned with the scope of another family member rather than the '614 patent. Third, to the extent the Inogen license does relate directly to the '614 patent, it is important to note that *Deane* reflects the configuration of a popular

Inogen product, the Inogen One G1. Thus, should the '614 patent be understood to cover Inogen's products, as it appears Patent Owner is asserting, this further demonstrates the relevance of *Deane* to the challenged claims, as properly construed. Furthermore, it is unreasonable to deduce that Inogen's (alleged) decision to license the family of the '614 patent constitutes an endorsement. If the assertion is true, it does not preclude the possibility that those responsible for the decision at Inogen are unaware of the inadequacies of the '614 patent.

VII. CONCLUSION

233. Patent Owner's arguments have not changed my opinion that the '614 patent is an obvious combination of prior art teachings.

VIII. BACKGROUND AND QUALIFICATIONS

234. A summary of my educational background, career history, publications, and other relevant qualifications is provided in my Declaration submitted in support of the Petition, and my full curriculum vitae is attached as Appendix 1 to that Declaration.

B. Compensation

235. For my efforts in connection with the preparation of this declaration I have been compensated at my standard rate for this type of consulting activity. My compensation is in no way contingent on the results of these or any other proceedings relating to the above-captioned patents.

C. Materials and Other Information Considered

236. I have considered information from various sources in forming my opinions. I have reviewed and considered each of the exhibits listed in the attached Appendix 2 (Materials Considered in the Preparation of This Declaration) in forming my opinions, as well as the other documents mentioned herein.

IX. UNDERSTANDING OF THE LAW

237. I am not an attorney. In forming my opinions in this Declaration, I applied the relevant legal principles provided to me by counsel, which are summarized in Appendix 4 to my original Declaration. I also note relevant legal principles as applicable herein.

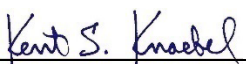
X. RESERVATION OF RIGHTS

238. My opinions are based upon the information that I have considered to date. I reserve the right to supplement my opinions in the future to respond to any arguments raised by the Patent Owner and to take into account new information that becomes available to me.

239. I declare that all statements made herein of my knowledge are true, and that all statements made on information and belief are believed to be true, and that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code.

Executed on December 21, 2023.

By:



Kent S. Knaebel

APPENDIX 2: MATERIALS CONSIDERED IN THE PREPARATION OF THIS DECLARATION

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. in Support of the Petition
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>)

Exhibit No.	Description
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>)
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>)

Exhibit No.	Description
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>)
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>)

Exhibit No.	Description
1055	U.S. Patent No. 7,954,490 ('490 <i>patent</i>)
1056	U.S. Patent No. 10,702,669 ('669 <i>patent</i>)
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>
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 and Sur-Reply to POPR
1070	3B's May 22, 2023 Opening Claim Construction Brief (Dkt. 36) in Related District Court Matter
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

Exhibit No.	Description
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)

APPENDIX 3: CHALLENGED CLAIMS

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

[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.