

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ENTEGRIS, INC.,

Petitioner,

v.

GUDENG PRECISION INDUSTRIAL CO., LTD.,

Patent Owner

Case PGR2026-00037

Patent 12,347,711

**PETITION FOR POST GRANT REVIEW OF
U.S. PATENT NO. 12,347,711**

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<i>Kennametal, Inc. v. Ingersoll Cutting Tool Co.</i> , 780 F.3d 1376 (Fed. Cir. 2015)	19
<i>Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co. Ltd. Matal</i> , 868 F.3d 1013 (Fed. Cir. 2017)	10
<i>Solomon v. Kimberly–Clark Corp.</i> , 216 F.3d 1372 (Fed.Cir.2000)	123
<i>Univ. of Rochester v. G.D. Searle & Co.</i> , 358 F.3d 916 (Fed. Cir. 2004)	124

Statutes

35 U.S.C. §112	123, 124
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EXHIBIT LIST

Ex#	Description
1001	U.S. Patent No. 12,347,711
1002	File History of U.S. Patent No. 12,347,711 (Application No. 17/882,703)
1003	U.S. Provisional Application No. 63/233,878
1004	U.S. Provisional Application No. 63/284,105
1005	U.S. Provisional Application No. 63/316,391
1006	Declaration of Dr. Alexander Glew
1007	Curriculum Vitae of Dr. Alexander Glew
1008	U.S. Patent Pub. No. 2023/0128154 A1 (“ Smith ’154 ”)
1009	File History of U.S. Patent Pub. No. 2023/0128154 A1 (Application No. 17/973,309)
1010	U.S. Provisional Application No. 63/272,282
1011	U.S. Patent No. 10,347,517 (“ Smith ’517 ”)
1012	U.S. Patent No. 10,923,373 (“ Ogawa ”)
1013	U.S. Patent No. 11,551,957 (“ Eggum ”)
1014	Taiwanese Patent No. TW I606534
1015	Machine Translation of Taiwanese Patent No. TW I606534
1016	U.S. Patent Pub. No. 2004/0004079 A1
1017	<i>SEMI E47.1-1101, Provisional Mechanical Specification for Boxes and Pods Used to Transport and Store 300 mm Wafers, Semi (2001)</i>
1018	VICTREX, <i>VICTREX PEEK 150G/151G</i> , June 2009, available at < https://web.archive.org/web/20100331212618/http://www.victrex.com:80/docs/datasheets-docs/150G_151G.pdf >

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Ex#	Description
1019	VICTREX, <i>Product Summary</i> , June 2009, available at < https://web.archive.org/web/20101122064448/http://www.victrex.com:80/docs/Product%20Summary_June09_UK.PDF >
1020	Entegris, <i>A300 FOUPs</i> , June 7, 2021, available at < https://www.entegris.com/shop/en/USD/products/wafer-handling/wafer-processing/300-mm-front-opening-unified-pods-(foups)/A300-FOUPs/p/A300FOUPs >
1021	U.S. Patent No. 8,783,463

CLAIM LISTING

Ref. #	Listing of Challenged Claims
1[pre]:	A gas diffusion device, installed in a wafer container having an accommodating space, the gas diffusion device comprising:
1[a][1]:	a buffering gas chamber, configured at a bottom portion of the wafer container,
1[a][2]:	the bottom portion provided with at least one coupling structure, the coupling structure defining a through channel having a center axis,
1[a][3]:	the buffering gas chamber having at least one gas intake channel, the gas intake channel, the buffering gas chamber, the through channel and the accommodating space communicating with one another; and
1[b][1]:	at least one porous tube, having a longitudinal space, the porous tube installed to the coupling structure of the wafer container, the longitudinal space of the porous tube communicating with the buffering gas chamber, the buffering gas chamber providing a gas to pass through the porous tube and enter the accommodating space,
1[b][2]:	a gas intake center axis of the gas and a center axis of the coupling structure being coaxial.
2:	The gas diffusion device according to claim 1, wherein the coupling structure is formed as extending from the bottom portion of the wafer container, an open end of the porous tube has a center axis, and the longitudinal space of the porous tube has a center axis; the center axis of the coupling structure, the center axis of the open end of the porous tube and the gas intake center axis are coaxial.
3:	The gas diffusion device according to claim 1, wherein the coupling structure is formed as extending from the bottom portion of the wafer container, an open end of the porous tube has a center axis, and the longitudinal space of the porous tube has a center axis; the center axis of the coupling structure, the center axis of the open end of the porous tube and the gas intake center axis are coaxial; the center axis of the longitudinal space of the porous tube is offset from the center axis of the coupling structure, the center axis of the open end of the porous tube and the gas intake center axis.

Ref. #	Listing of Challenged Claims
4:	The gas diffusion device according to claim 1, wherein the longitudinal space of the porous tube has a closed end and an open end, and the open end receives the corresponding coupling structure, so that the gas enters the longitudinal space by passing through the buffering gas chamber and the open end.
5:	The gas diffusion device according to claim 1, wherein a shape of a horizontal cross section of the porous tube is an ellipsoid or an elongated narrow shape having a long axis and a short axis, or a circle having a diameter.
6:	The gas diffusion device according to claim 5, further comprising: a first collar, arranged in the open end, the first collar located between the open end and the coupling structure.
7:	The gas diffusion device according to claim 6, further comprising: a second collar, located between the first collar and the coupling structure when the second collar is disposed on the coupling structure so as to reinforce airtightness.
8:	The gas diffusion device according to claim 6, wherein a material of the first collar is softer than a material of the porous tube to prevent breaking of the open end.
9:	The gas diffusion device according to claim 7, wherein the second collar and the porous tube are sintered or bonded into an integral structure to prevent breaking of the open end.
10:	The gas diffusion device according to claim 8, wherein the coupling structure, the porous tube, the first collar and/or the second collar are/is made of a thermal resistant material which is one or a combination of at least two selected from a group consisting of PEEK, HTPC, FKM, PPS, PPO, chlorinated polyether, POB, TORLON, EP, PF, PEI, PI and LCP.
11:	The gas diffusion device according to claim 1, further comprising: an airflow guiding member, arranged adjacent to one side of the porous tube, the airflow guiding member configured to adjust an airflow direction of the gas entering the accommodating space.
12:	The gas diffusion device according to claim 1, further comprising: at least one gas intake module, communicatively coupled to the buffering gas chamber, the gas intake module having the gas intake center axis, supplying the gas in one single gas intake direction to pass through the gas intake channel and enter the buffering gas chamber.

Ref. #	Listing of Challenged Claims
13 <pre>[pre]:</pre>	A gas diffusion device, installed in a wafer container having an accommodating space, the gas diffusion device comprising:
13[a][1]:	a gas cartridge, configured at a bottom portion of the wafer container to define a buffering gas chamber,
13[a][2]:	the bottom portion provided with at least two coupling structures, each of the coupling structures defining a through channel having a center axis,
13[a][3]:	the buffering gas chamber having at least one gas intake channel, the gas intake channel, the buffering gas chamber, the through channel and the accommodating space communicating with one another; and
13[b]:	at least two porous tubes, each of the porous tubes having a longitudinal space, the at least two porous tubes respectively installed to corresponding coupling structures of the wafer container, the longitudinal spaces of the two porous tubes communicating with the buffering gas chamber, the buffering gas chamber providing a gas to pass through the at least two porous tubes and enter the accommodating space.
14:	The gas diffusion device according to claim 13, wherein the at least two coupling structures are formed as extending from the bottom portion of the wafer container, an open end of the longitudinal space of each of the porous tubes has a center axis, and the longitudinal space has a center axis; the center axis of each of the through channels, the center axis of the open end of each of the porous tubes, the center axis of the longitudinal space of each of the porous tubes and a gas intake center axis along which the gas passes are coaxial.
15:	The gas diffusion device according to claim 13, wherein the at least two coupling structures are formed as extending from the bottom portion of the wafer container, an open end of each of the porous tubes has a center axis, and the longitudinal space of each of the porous tubes has a center axis; the center axis of each of the through channels, the center axis of the open end of each of the porous tubes and a gas intake center axis along which the gas passes are coaxial; the center axis of the longitudinal space of each of the porous tubes is offset from the center axis of the through channel, the center axis of the open end of the porous tube and the gas intake center axis.

Ref. #	Listing of Challenged Claims
16:	The gas diffusion device according to claim 13, wherein the at least two coupling structures are formed as extending from the bottom portion of the wafer container, an open end of the longitudinal space of each of the porous tubes has a center axis, and the longitudinal space of each of the porous tube has a center axis; the center axis of each of the through channels, the center axis of the open end of each of the porous tubes, and the center axis of the longitudinal space of each of the porous tubes are coaxial; a position of a gas intake center axis along which the gas passes is offset from the center axis of the through channel, the center axis of the open end and the center axis of the longitudinal space that are coaxial.
17:	The gas diffusion device according to claim 13, wherein the at least two coupling structures are formed as extending from the bottom portion of the wafer container, an open end of each of the porous tubes has a center axis, and the longitudinal space of each of the porous tubes has a center axis; the center axis of each of the through channels and the center axis of the open end of each of the porous tubes are coaxial; a gas intake center axis along which the gas passes and the center axis of the longitudinal space are both offset from the center axis of the through channel and the center axis of the open end that are coaxial.
18:	The gas diffusion device according to claim 13, wherein the gas cartridge has a bottom portion and a sidewall extending from the bottom portion, and the gas intake channel is formed at the bottom portion of the gas cartridge.
19:	The gas diffusion device according to claim 13, wherein the gas cartridge is installed at the bottom portion of the wafer container, such that a bottom portion and a sidewall of the gas cartridge and the bottom portion of the wafer container define the buffering gas chamber.

Ref. #	Listing of Challenged Claims
20:	The gas diffusion device according to claim 13, wherein a plurality of annular sidewalls further extend from a lower surface of the bottom portion of the gas cartridge, each of the annular sidewalls defines an installation space for filling with a gas intake module, and the gas intake module has the gas intake center axis; the installation space, the gas intake channel at the bottom portion of the gas cartridge and the buffering gas chamber communicate with one another, such that the gas in one single air intake direction supplied by the gas intake module passes through the gas intake channel and enters the buffering gas chamber.
21:	The gas diffusion device according to claim 13, wherein the wafer container comprises a base plate installed at the bottom portion of the wafer container, and the buffer gas chamber is between the bottom portion and the base plate of the wafer container.
22:	The gas diffusion device according to claim 21, wherein the base plate is made of a material comprising a self-lubricating material.
23[pre]:	A wafer container, comprising:
23[a]:	a shell, comprising a bottom portion, the bottom portion configured with a plurality of coupling structures, the coupling structures defining a plurality of through channels;
23[b]:	a buffering gas chamber, formed below the bottom portion, the buffering gas chamber having a plurality of gas intake channels, the gas intake channels communicating with the corresponding through channels; and
23[c]:	a plurality of porous tubes, each of the porous tubes having an open end, the open end correspondingly connecting with the coupling structure at the bottom portion and communicating with the buffering gas chamber via the corresponding through channel, allowing a gas to pass through the porous tubes and enter an accommodating space of the shell.
24:	The wafer container according to claim 23, wherein the porous tube has a longitudinal space, the longitudinal space has a closed end and an open end, and the gas in the buffering gas chamber is capable of passing through the open end to enter the longitudinal space.

Ref. #	Listing of Challenged Claims
25:	The wafer container according to claim 23, further comprising: a collar, arranged between the open end and the coupling structure, a material of the collar being softer than a material of the porous tube to prevent breaking of the open end.
26:	The wafer container according to claim 23, further comprising: a gas cartridge, having a bottom portion and a sidewall extending from the bottom portion, the bottom portion of the gas cartridge having the gas intake channels formed thereon.
27:	The wafer container according to claim 26, wherein the gas cartridge is installed at the bottom portion of the shell, such that the gas cartridge and the bottom portion of the shell define the buffering gas chamber.
28:	The wafer container according to claim 26, wherein a plurality of annular sidewalls further extend from the bottom portion of the gas cartridge, and each of the annular sidewalls defines an installation space for filling with a gas intake module.
29:	The wafer container according to claim 23, wherein the wafer container further comprises a door detachably combined with the shell, and a pair of support portions configured on an inner side of the shell, and the wafer container is made of a thermal resistance material, which is one or a combination of at least two selected from a group consisting of PEEK, HTPC, FKM, PPS, PPO, chlorinated polyether, POB, TORLON, EP, PF, PEI, PI and LCP.
30:	The wafer container according to claim 23, further comprising: a base plate, connected below the shell to support the shell; wherein the buffering gas chamber is between the bottom portion and the base plate of the shell.
31:	The wafer container according to claim 30, wherein the base plate is made of a material comprising a self-lubricating material.

PETITIONER'S MANDATORY NOTICES

I. REAL PARTIES-IN-INTEREST (37 C.F.R. §42.8(B)(1))

The real party in interest is the Petitioner, Entegris, Inc. No other parties exercised control over, funded, or otherwise directed this Petition.

II. RELATED MATTERS (37 C.F.R. §42.8(B)(2))

As of the filing date of this Petition, Petitioner is not aware of any judicial or administrative matters that would affect, or be affected by, a decision in this proceeding concerning U.S. Patent No. 12,347,711.

III. LEAD AND BACK-UP COUNSEL (37 C.F.R. §42.8(B)(3))

Petitioner provides the following designation of counsel:

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IV. SERVICE INFORMATION (37 C.F.R. §42.8(B)(4))

Service information is provided in the designation of counsel above. Petitioner consents to service of all documents via electronic mail to DLBBEntegrisGudengPGR@BakerBotts.com.

PETITION

I. INTRODUCTION

Petitioner requests institution of post grant review (“PGR”) of claims 1-31 (“Challenged Claims”) of U.S. 12,347,711 (“’711 Patent”) (Ex1001). Petitioner, a U.S. company, has recently made significant investments to develop manufacturing facilities in Colorado Springs, Colorado for building complex semiconductor wafer containers. Petitioner also owns numerous patents related to wafer containers.

The ’711 Patent issued to Patent Owner (“PO”), a Taiwanese company, on July 1, 2025 and relates to a purportedly new semiconductor wafer container. The patent, however, issued due to material error by the Examiner, who overlooked multiple invalidating references owned by Petitioner. Petitioner’s prior art references were before the Examiner, but their disclosures were ignored. The erroneous issuance of the ’711 Patent harms proper competition in this industry, and Petitioner timely seeks institution of this PGR to correct the Examiner’s errors.

II. REQUIREMENTS FOR A PETITION FOR POST GRANT REVIEW

A. Standing (§42.204(a))

The ’711 Patent is available for PGR and Petitioner is not barred or estopped. The ’711 Patent issued within the past nine months, and all claims have an effective filing date after March 16, 2013. *See* §IV.

B. Identification Of Challenge (§42.204(b))

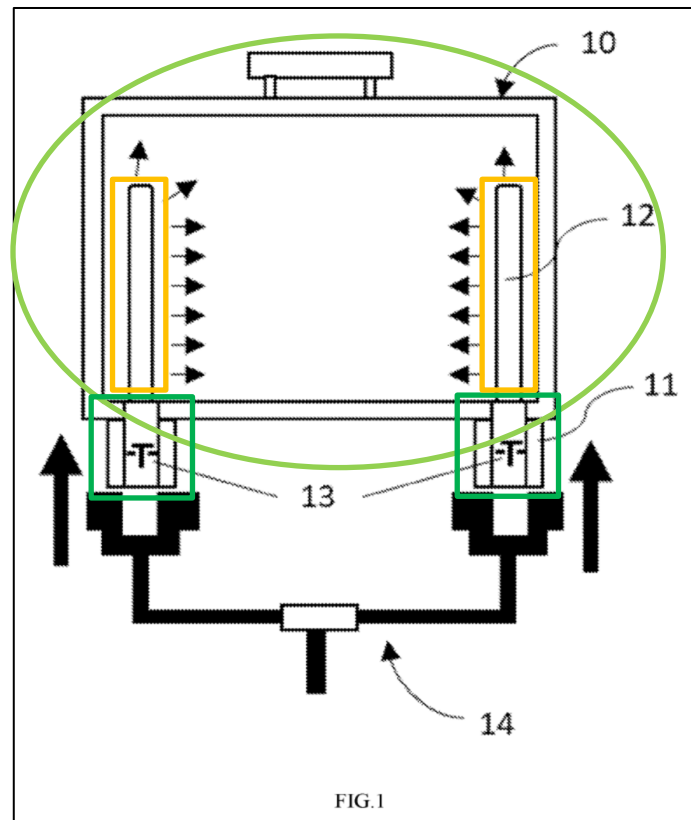
Petitioner challenges the Challenged Claims as follows:

Ground	Claims Challenged	Basis	References
1	23-24, 26-27, 30 & 13, 18-19, 21	35 U.S.C. §102	Smith '154
2	23-24, 26-28, 30 & 13, 18-21	35 U.S.C. §103	Smith '154
3	23-24, 26-31 & 13, 18-22	35 U.S.C. §103	Smith '154 + Ogawa
4	1-9, 12-21, 23-28, 30	35 U.S.C. §103	Smith '517 + Smith '154
5	1-31	35 U.S.C. §103	Smith '517 + Smith '154 + Ogawa
6	1-9, 12	35 U.S.C. §103	Smith '517
7	1-12	35 U.S.C. §103	Smith '517 + Ogawa
8	1-12	35 U.S.C. §112	—

Petitioner’s proposed claim constructions and the precise reasons for unpatentability are provided below. The evidence relied upon is listed in the Exhibit List above, including an expert declaration by Dr. Alexander Glew, Ph.D. (Ex1006).

III. THE '711 PATENT AND PROSECUTION HISTORY

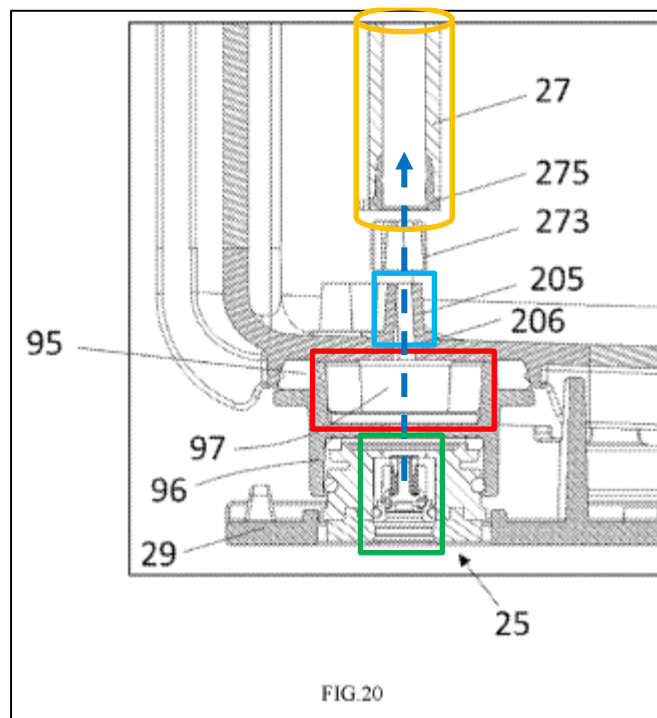
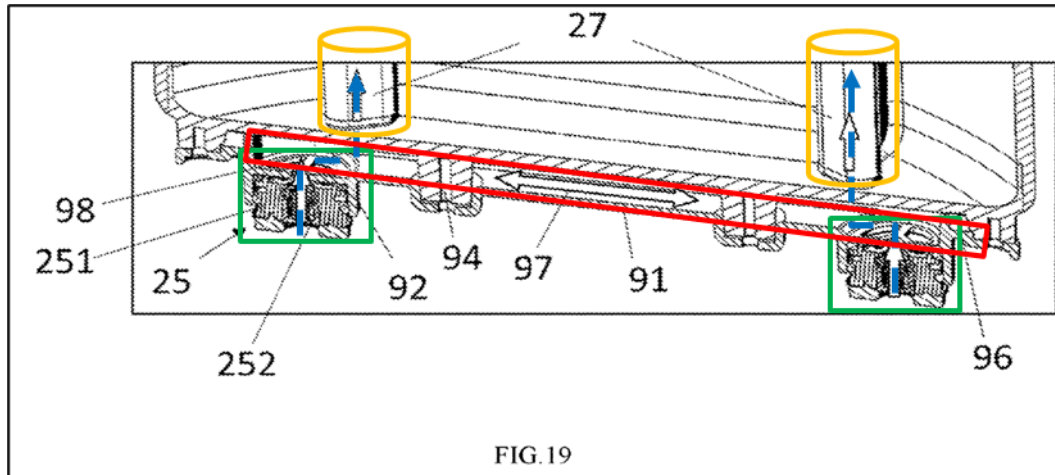
The '711 Patent discloses a wafer container (light green, below) for transporting semiconductor wafers in a fabrication facility. Known wafer containers included a “gas diffusion device” with gas intake modules 13 (dark green, below) and porous tubes 12 (orange) for diffusing gas inside the container. Ex1001, 2:5-30; Ex1006 ¶¶56-57, §IV.



Ex1001, Fig. 1 (annotated); Ex1006 ¶¶56-57.

The '711 Patent purports to improve this known structure with a so-called “buffering gas chamber (97)” (red below, in front-view (Figure 19) and cross-section (Figure 20)). According to patentee, prior art structures had “uneven airflow entering the interior of the container or an insufficient total flow caused by a difference in the incoming air of a conventional diffuser.” Ex1001, Abstract, 15:4-8. The buffering gas chamber purports to solve this problem by (a) receiving gas from one or more gas intake modules (dark green, below), and (b) “balancing air pressures” so that gas is provided at “a balanced air pressure that travels from the through channel (206) of each of multiple coupling structures (205) [light blue].” Ex1001, 14:57-15:8. The

gas then enters multiple porous tubes (orange) for diffusing in the container. Ex1001, 14:57-15:8; Ex1006 ¶¶58-62.



Ex1001, Figs. 19 and 20 (annotated); Ex1006 ¶¶58-62.

The '711 Patent also addresses the alleged problem of “an increase of flow time and poor fluency due to the winding during the traveling process of the gas”

caused by an “offset configuration” of the gas intake modules and the porous tubes. Ex1001, 1:47-53. As shown in Figure 20, the ’711 Patent purports to solve this problem by implementing coaxial alignment of components such as the “gas intake” (dark green), the “coupling structure” (light blue), and/or the “open end[] of the porous tube” (orange). Ex1001, 1:44-53, 9:7-13, 9:23-32, 9:39-43. This configuration purportedly “provides a shortest path for the gas to directly purge the wafers...enhancing purging efficiency. *Id.*, 9:32-39, *see also id.* Fig. 21A; Ex1006 ¶¶63-65. Coaxial alignment, however, was not new, and even the ’711 Patent depicts it as one of a finite set of predictable options for aligning gas diffusion elements. Ex1001, Figs. 21A-D (coaxial and offset alternative configurations); Ex1006 ¶¶63-65.

During prosecution, patentee distinguished the claims from the prior art based on the “buffering gas chamber” recited in independent claims 13 and 23 and the “coaxial” limitation recited in claim 1. Ex1002, 167, 169, 171-172; Ex1006 ¶¶70-72. The Examiner allowed the claims after applicant’s argument. Ex1002, 19, 24-25. That allowance was in error. Petitioner’s intellectual property, U.S. Pat. Pub. 2023/0128154 (“Smith ’154”) and U.S. 10,347,517 (“Smith ’517”), was before the Examiner at the time and plainly discloses each of the purportedly novel features. Examiner erred by overlooking these references and failing to appreciate their impact on the issued claims. Ex1006 ¶¶73-75; §VIII.A-F.

IV. PRIORITY DATE

A. Correct Priority Date Of The Challenged Claims

The '711 Patent claims priority to provisional applications 63/233,878 filed on August 17, 2021 ("878 Application," Ex1003), 63/284,105 filed on November 30, 2021 ("105 Application," Ex1004), and 63/316,391 filed March 3, 2022 (Ex1005).

None of the Challenged Claims are entitled to an August 17, 2021 priority of the 878 Application, for at least two reasons. First, the 878 Application fails to convey to a person of ordinary skill in the art ("POSITA") that the inventors had possession of the "buffering gas chamber" recited in every Challenged Claim. Ex1006 ¶¶79-82. The 878 Application never refers to, or discloses a "buffering gas chamber" or "buffering" functionality and is instead directed to different issues relating to changed pipe shapes, flow path, and baffles. Ex1003, 4 (describing present invention); *id.*, 18 (proposed claims have similar coverage), 5-17 (same for embodiments); Ex1006 ¶¶79-81. A POSITA would not have understood these disclosures to depict or convey a buffering gas chamber—by name, functionality, structurally, or otherwise. Ex1006 ¶¶79-82.

Second, the 878 Application also fails to disclose at least two/a plurality of "porous tubes" communicating with a "buffering gas chamber" or at least two/a plurality of "coupling structures" with through channels communicating with the

“buffering gas chamber,” as recited in Challenged Claims 13-31. Ex1001, cls. 13, 23; Ex1002, 169-172 (distinguishing claims 13 and 23 based on prior art failing to disclose a “buffering gas chamber” communicating with multiple porous tubes); Ex1006 ¶¶82. The 878 Application fails to disclose a “buffering gas chamber” at all, much less a plurality of coupling structures or porous tubes communicating with the “buffering gas chamber.” Ex1006 ¶¶80-82, 90.

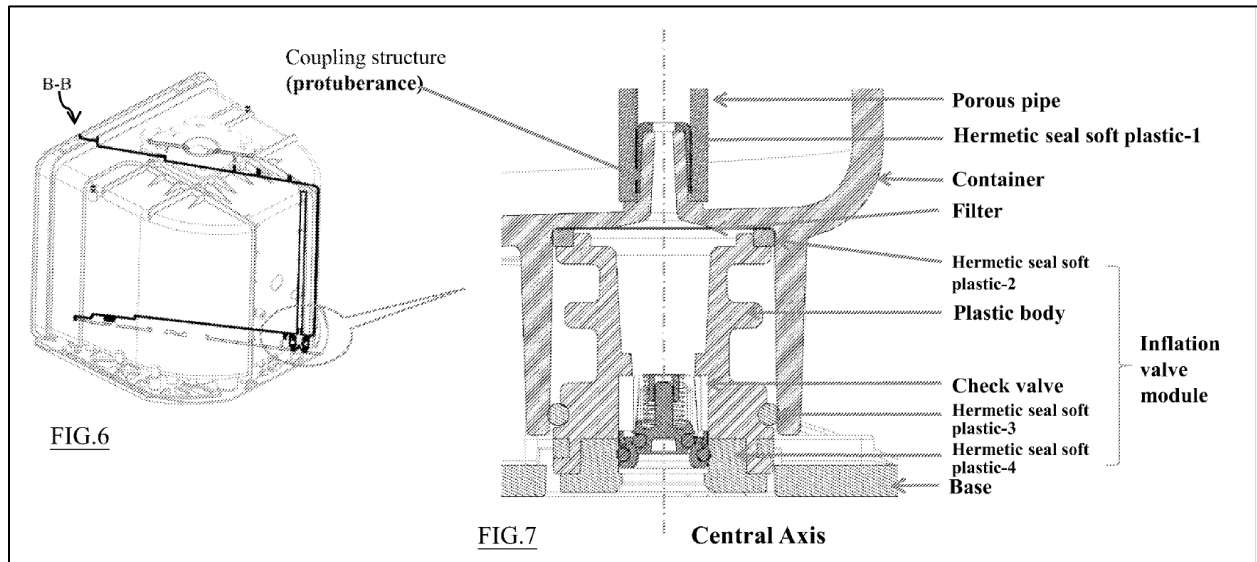
In contrast to the 878 Application, the later 105 Application, filed on November 30, 2021, expressly discloses a “buffer air chamber” and “air cartridge,” as well as multiple porous tubes communicating with that chamber. Ex1004, 4, 12; *id.*, 14 (claims), 5-12 (embodiments); Ex1006 ¶¶84-85. Accordingly, under any reasonable interpretation of the Challenged Claims, they are at best entitled to a priority of November 30, 2021, the filing date of the 105 Application.

B. Any PO Argument That The Challenged Claims Have An Earlier Priority Date Is Based On An Incorrect Claim Construction

PO may argue that, despite its silence regarding a “buffering gas chamber,” the 878 Application nonetheless discloses Challenged Claims 1-12¹ based on an incorrect and overly broad definition of “buffering gas chamber.” More specifically, PO may argue that the upper region of Figure 7 of the 878 Application (below)

¹This potential PO argument does not apply to Challenged Claims 13-31, which additionally recite multiple porous tubes or coupling structures, neither of which is disclosed in the 878 Application regardless of the construction of “buffering gas chamber.” Ex1006 ¶¶82, 90.

discloses a “buffering gas chamber” given its similarity to Figure 6 of the ’711 Patent, which the specification describes as having a “buffering gas chamber.” Ex1001, 8:6-12. But such a construction, to the extent advocated by PO, is incorrect, contradicts the intrinsic record, and must be rejected.



Ex1003, 7.

First, a POSITA would not have understood Figure 7 to depict a “buffering gas chamber” because the 878 Application simply never describes any aspect or component of Figure 7 as a “buffering gas chamber.” §IV.A; Ex1006 ¶¶80-82, 86-88, 91-93. And, without any such reference, a POSITA would not have recognized any component of that figure as a “buffering gas chamber,” as it does not depict a component with a recognizable “buffering” function. Ex1006 ¶¶80-82, 86-88, 91-93.

Second, a construction of “buffering gas chamber” that covers Figure 7 of the

878 Application contradicts the intrinsic record, because PO disclaimed such an interpretation of “buffering gas chamber.” Indeed, during prosecution of the Challenged Claims, the patentee elected the species of Figures 20, 21a-21d (which discloses a buffering gas chamber with multiple tubes and coupling elements) and specifically *excluded* the embodiment of Figure 6 from the scope of the Challenged Claims. Ex1002, 233, 240; Ex1006 ¶¶91; *see Focus Prods. Grp. Int’l, LLC v. Kartri Sales Co.*, 156 F.4th 1259, 1273-76 (Fed. Cir. 2025) (holding that patentee’s unambiguous election of certain species during prosecution operated as a disclaimer). A POSITA would therefore have understood claims 1-12 to *exclude* any type of “buffering gas chamber” depicted in Figure 6 of the ’711 Patent, or any similar depiction in Figure 7 of the 878 Application. Ex1006 ¶¶91-94.

In short, any interpretation of “buffering gas chamber” in the Challenged Claims that covers Figure 7 of the 878 Application (or Figure 6 of the ’711 Patent) lacks support and is incorrect. For that reason, the Challenged Claims cannot claim priority to the 878 Application. Nonetheless, for completeness, Grounds 6-7 also demonstrate prior art invalidity of claims 1-12 assuming that earlier priority.

V. PERSON OF ORDINARY SKILL IN THE ART (“POSITA”)

A POSITA in the field of the ’711 Patent in 2021 would have had an advanced degree in mechanical engineering, microcontamination, materials science, or a related degree and four years of experience in semiconductor wafer manufacturing.

Ex1006 ¶¶35-36. Additional training can substitute for educational or research experience, and vice versa.

VI. CLAIM CONSTRUCTION

As explained in §IV, there is a potential dispute between the parties regarding the meaning of “buffering gas chamber” in the Challenged Claims. Under a correct interpretation of the Challenged Claims, those claims have a priority date of November 30, 2021, at the earliest, and are invalid as set forth in Grounds 1-5. Under PO’s potential incorrect interpretation of “buffering gas chamber” and argument that the Challenged Claims 1-12 have an earlier priority date, those claims are also invalid over prior art as set forth in Grounds 6-7; Ex1006 ¶¶95-97.

Petitioner submits that all other terms do not require construction, and the claims are invalid regardless of their precise construction. *See* 37 C.F.R. §42.200; *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co. Ltd. Matal*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (“we need only construe terms ‘that are in controversy, and only to the extent necessary to resolve the controversy[.]’”) (citations omitted); Ex1006 ¶¶95-97.

VII. OVERVIEW OF PRIOR ART

A. Smith '154 (Ex1008)

Smith '154 was filed on October 25, 2022 and claims priority to a provisional patent filed on October 27, 2021. Ex1008, (22), (60). Although Smith '154 was the subject of a third-party submission during prosecution of the '711 Patent, Smith '154 was not cited or discussed during prosecution. *See* Ex1002. As explained below, Smith '154 discloses a buffering gas chamber, as claimed in the '711 Patent. *See* §VIII.A.1.

1. Status As Prior Art

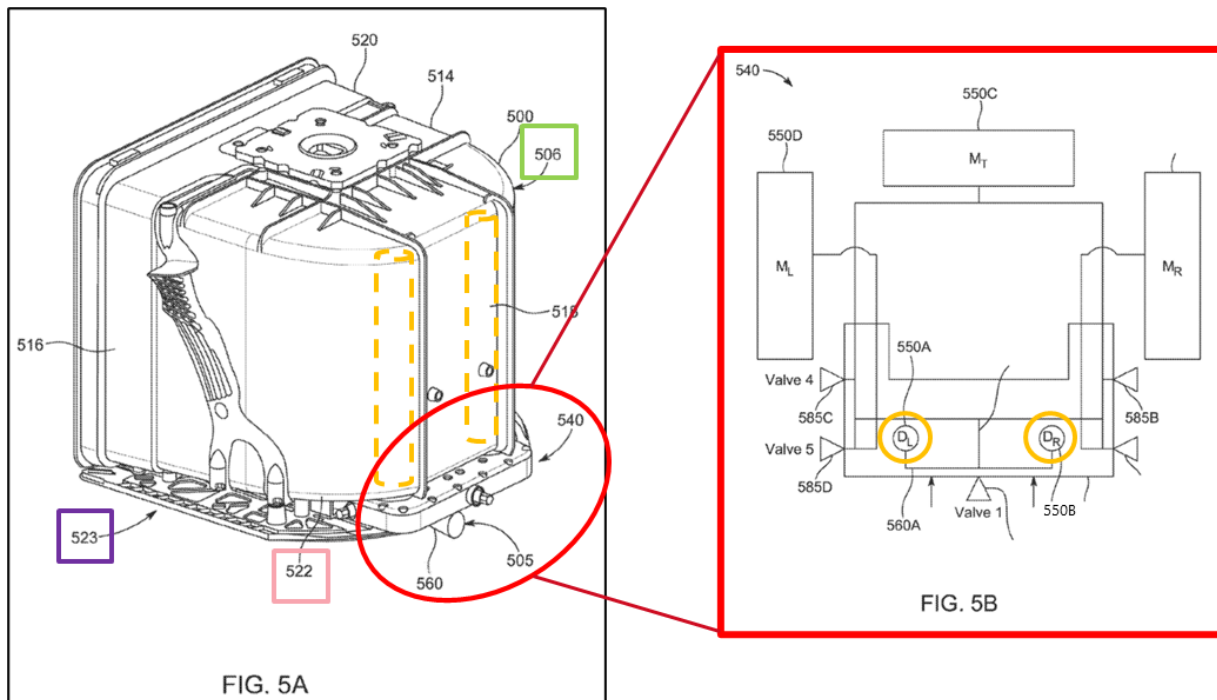
Smith '154 is entitled to the October 27, 2021 filing date of the Smith '154 Provisional (Ex1010). Ex1006 ¶¶99-101. Smith '154 claims priority to and was filed within 12 months of the provisional. Ex1008, (60). The text of Smith '154 is identical to text of the Smith '154 Provisional. *Compare* Ex1008, *with* Ex1010, 45-79. Each of the figures, claims, embodiments, and background disclosures of Smith '154 are identical to the figures, claims, embodiments, and background disclosures of Smith '154 Provisional. Ex1006 ¶100. Accordingly, all subject matter from Smith '154 relied on herein is found identically in Smith '154 Provisional. Ex1006 ¶¶99-101.

Because the '711 Patent is entitled to, at best, a November 30, 2021 priority date (*see* §IV), Smith '154 is prior art under 35 U.S.C. §102(a)(2). Ex1006 ¶101.

2. Relevant Disclosure

Smith '154 discloses an improved “substrate container [] used to store and transport the in-process wafers.” Ex1008 ¶1; Ex1006 ¶102. Smith '154 also describes a “purge flow distribution system” which acts as a buffering gas chamber and distributes purge gas to the interior of the substrate container. Ex1008 ¶¶1, 5; Ex1006 ¶102. The “purge flow distribution system,” includes a “supply line” including “piping, tubing, plumbing” “connected to the inlet port that receives the purge gas and is used to divide and supply the purge gas” to gas distributing devices, such as tubular diffusers. Ex1008 ¶¶5, 18; Ex1006 ¶103.

Figure 5A (top left, below), for example, discloses a “purge flow distribution system” 540 (red). Ex1008 ¶¶49-50; Ex1006 ¶¶104-106. As shown in more detail in Figure 5B (right, below), the purge flow distribution system includes a manifold base 560 that “is configured to divide the stream of purge gas to the network of gas distribution devices,” including “left and right diffusers 550A and 550B” (orange). Ex1008 ¶¶40, 49-50, 53; Ex1006 ¶¶104-106. Diffusers 550A and 550B then distribute “the purge gas” from the “purge flow distribution system” into the interior of the substrate container. Ex1008 ¶47; Ex1006 ¶¶104-106.



Ex1008, Figs. 5A, 5B (annotated); Ex1006 ¶¶104-106.

B. Smith '517 (Ex1011)

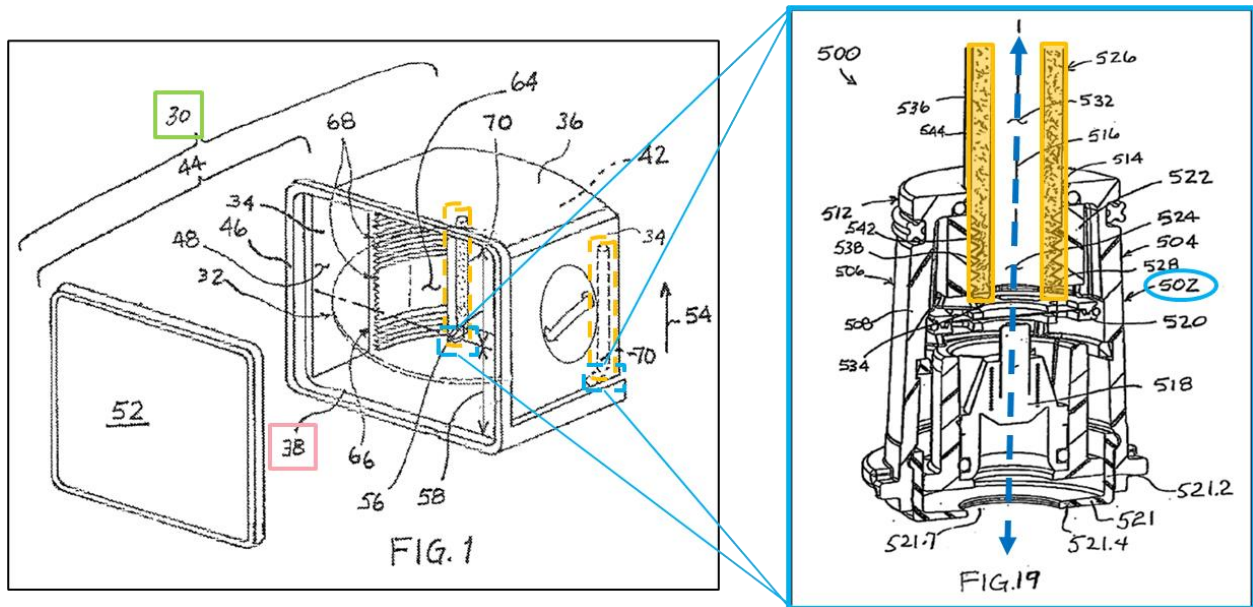
Smith '517 was filed on April 14, 2014 and issued July 9, 2019. Ex1011, (22), (45). Smith '517 was first published at U.S. Pat. Pub. No. 2016/0276190 A1. This publication was cited during prosecution but not substantively discussed, and the Examiner failed to appreciate its disclosures. Ex1001, (56); Ex1002, 14; Ex1006 ¶107.

1. Status As Prior Art

Smith '517 issued more than a year before the '711 Patent's earliest alleged priority date. Smith '517 is thus prior art under 35 U.S.C. §102(a)(1).

2. Relevant Disclosures

Smith '517 also discloses a substrate container, including diffuser assemblies for distributing purge gas in a container. Ex1011, 1:16-32; Ex1006 ¶109. The “diffuser assemblies can be tailored to provide a desired flow profile” based on the “plenum charge effect.” Ex1011, 11:27-31; Ex1006 ¶109. Smith '517 specifically describes various diffuser assembly configurations that can facilitate desirable air flow to prevent the introduction of impurities or humidity into the container. *E.g.*, Ex1011, Figs. 9-15. In Smith '517, the diffuser assemblies can also be “retrofit[]” in “existing front opening wafer containers” with various disclosed couplings. Ex1011, Abstract, 1:60-62; Ex1006 ¶¶109-113. For example, Figure 1 (below left) depicts substrate container 30 with one or more tubular diffusers 70 (orange) for introducing a gas into the container. Ex1011, 5:53-57; Ex1006 ¶¶109-113. Figure 19 (below right) depicts an exploded view of a tubular diffuser (526, orange), as well as its coaxial connection (“coupling 522”) at the bottom of the wafer container. Ex1006 ¶¶109-113.



Ex1011, Figs. 1, 19 (annotated); Ex1006 ¶110.

C. Ogawa (Ex1012)

U.S. Patent No. 10,923,373 (“Ogawa”) was filed on August 2, 2017 and issued February 16, 2021. Ex1012, (22), (45). Ogawa was first published as PCT Pub. No. WO2018/047541 on March 15, 2018. This publication was considered by the Examiner during prosecution, but the Examiner failed to consider its relevant teachings in light of the Smith ’154 and Smith ’517 disclosures. Ex1001, (56); Ex1002, 178-188; Ex1006 ¶114.

1. Status As Prior Art

Ogawa was filed and issued before the ’711 Patent’s earliest alleged priority date. Ogawa is therefore prior art under 35 U.S.C. §102(a)(1).

2. Relevant Disclosures

Like Smith '154 and Smith '517, Ogawa discloses a substrate container for storing or transporting semiconductor wafers. Ex1012, 1:16-18; Ex1006 ¶116. Ogawa also describes specific materials for wafer containers that can handle the substantial heat generated during wafer manufacturing. For example, Ogawa teaches that the container and associated components may be made of “resin molding material,” including “thermoplastic resins such as polycarbonate, cyclic olefin polymer, polyether imide, polyether ketone, polyether ether ketone, polybutylene terephthalate, polyacetal, liquid crystal polymer, or alloys thereof.” Ex1012, 5:14-23, 5:24-28; Ex1006 ¶¶117-120.

VIII. ARGUMENT

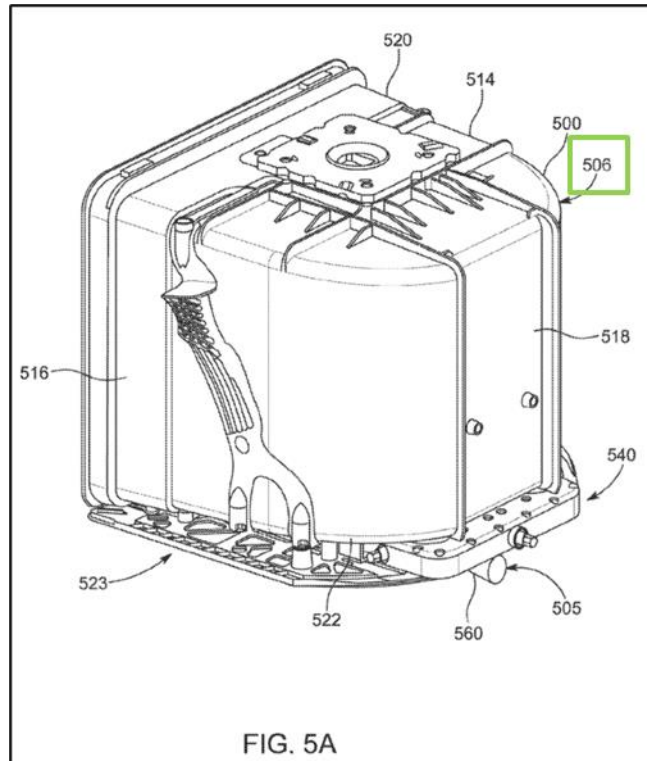
A. Grounds 1 And 2: Anticipation Of Claims 23-24, 26-27, 30 And Claims 13, 18-19, 21 And Obviousness Of Claims 23, 24, 26-28, 30 And Claims 13, 18-21 In View Of Smith '154

1. Independent Claim 23

a. 23[pre]

To the extent the preamble is limiting, Smith '154 anticipates or at least renders obvious 23[pre]. As shown below in Figure 5A, Smith '154 includes *a wafer container* [e.g., substrate container with shell 506/406]. See Ex1008, Abstract; Ex1006 ¶128. Smith '154 for example explains that “[a] substrate container is used to store and transport the in-process wafers.” Ex1008 ¶2; Ex1006 ¶128. The wafer

container (e.g., shell 506/406) defines an interior (*accommodating*) space to store and transport the wafers. Ex1008 ¶49; Ex1006 ¶128.

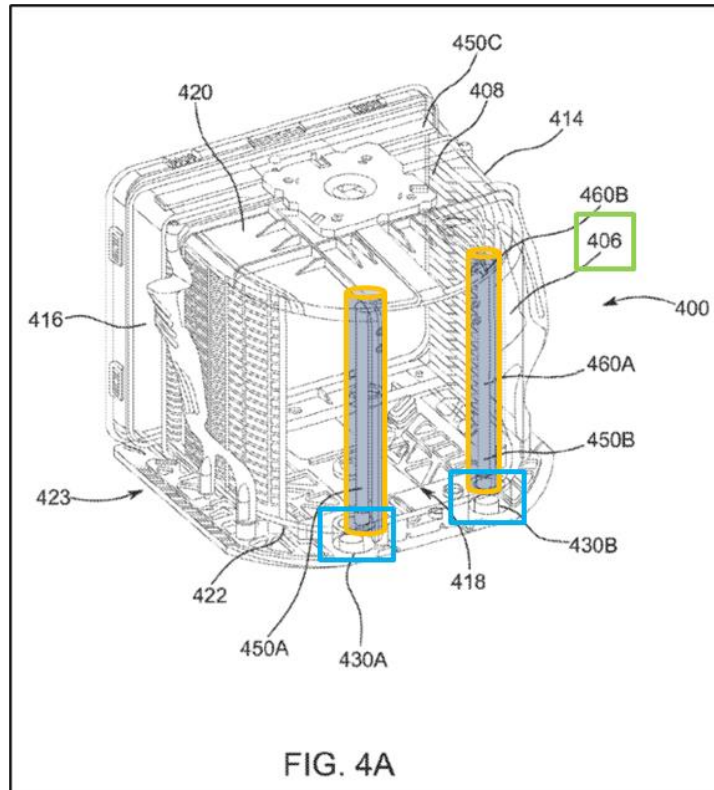


Ex1008, Fig. 5A (annotated); *see also* Fig. 4A; Ex1006 ¶128.

b. 23[a]

Smith '154 anticipates or at least renders obvious limitation 23[a]. As shown in Figures 4A and 5A, Smith '154 has *a shell* [e.g., shell 406/506], *comprising a bottom portion* [e.g., bottom wall 422/522], *the bottom portion configured with a plurality of coupling structures* [e.g., inlet ports 430A/430B (light blue)], *the coupling structures defining a plurality of through channels* [e.g., inlet ports 430A/430B define flow paths for purge gas to enter tubular diffusers 450A/B or

550A/B (orange) for distributing the purge gas in the interior space of the shell 406/506]. Ex1006 ¶¶129-130.



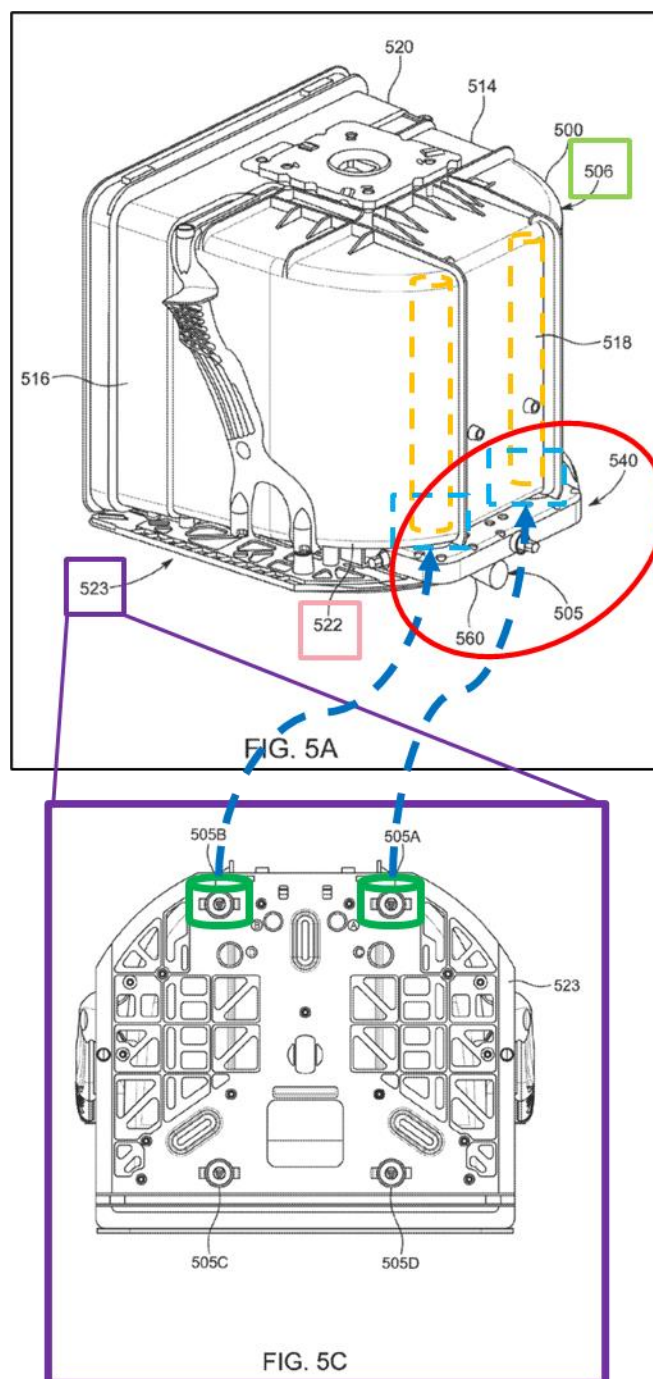
Ex1008, Fig. 4A (annotated); Ex1006 ¶129.

For example, for Figure 4A, Smith '154 describes: “The purge flow distribution system includes at least one supply line that is connected to at least one inlet purge port 430A, 430B on the bottom wall 422. The supply line includes a first flow path 460A connected to the inlet purge ports 430A, 430B for supplying purge gas to the rear gas tubular diffusers 450A, 450B, in which the rear gas distributing devices can include at least two diffusers. The at least two diffusers 450A, 450B include a plurality of openings for distributing the purge gas at the rear of the substrate container 400.” Ex1008 ¶46; Ex1006 ¶130.

As applicable to the entirety of Grounds 1 and 2, Figures 4A-B and 5A-C of Smith '154 describe the same embodiment, and both depict the claimed arrangement. Both have the same general structure of a wafer container with a shell, inlet ports, and a “purge flow distribution system.” Ex1008 ¶¶11-15, 45-50; Ex1006 ¶¶129-130. Figure 4A simply depicts an interior view of the same disclosed components of Figures 5A-5C, and a POSITA would “at once envisage” the claimed arrangement from these figures and their description. *Kennametal, Inc. v. Ingersoll Cutting Tool Co.*, 780 F.3d 1376, 1381 (Fed. Cir. 2015) (holding “a reference can anticipate,” when the reference discloses limited options, and thus a POSITA “would ‘at once envisage’ the claimed arrangement or combination[.]”) (citation omitted); *see also Blue Calypso, LLC v. Groupon, Inc.*, 815 F.3d 1331, 1344 (Fed. Cir. 2016) (“[A] reference need not always include an express discussion of the actual combination to anticipate.”). To the extent PO argues that Figures 4A-B and 5A-C disclose different arrangements, it would have been obvious to implement the disclosed interior components of Figure 4A-B as the interior portions of Figures 5A-C because they are standard interior components already disclosed in the reference, and a POSITA would have expected success in that implementation given their substantial similarities and goals. Ex1006 ¶¶129-130.

c. 23[b]

Smith '154 anticipates or at least renders obvious limitation 23[b]. Smith '154 discloses *a buffering gas chamber [e.g., purge flow distribution system 540 with manifold base 560 (red)], formed below the bottom portion [e.g., bottom wall 522], the buffering gas chamber having a plurality of gas intake channels [e.g., channels formed by inlet supply ports 505A-B in Figure 5C (green)], the gas intake channels communicating with the corresponding through channels [e.g., channels formed by inlet supply ports 505A-D communicate with flow paths through 430A/430B (annotated in light blue dashed outline)].* Ex1006 ¶¶131-134.



Ex1008, Figs. 5A, 5C (annotated); Ex1006 ¶131.

The purge flow distribution system 540 in Smith '154 is a buffering gas chamber and distributes purge gas to the interior of the substrate container. Ex1008 ¶¶1, 5, 37; Ex1006 ¶¶47 (“Balancing the pressure, and thus flow, between multiple

flow outlets by using a large reservoir of pressurized gas is a well-understood concept.”), 132. Like the buffering gas chamber in the ’711 Patent, the purge flow distribution system balances gas pressure, allowing gas to flow through each diffuser (*e.g.*, orange above) at “a balanced air pressure.” *See* Ex1001, 14:57-15:3; Ex1006 ¶132. The purge flow distribution system 540 has a buffering function. Ex1006 ¶132. For example, it can, using adjustable valves, set “the amount of purge gas that flows” to different diffusing devices. Ex1008 ¶¶50, 51-52, 37; Ex1006 ¶132. In addition, the purge flow distribution system can combine purge gas from multiple inlet ports. Ex1008 ¶¶53, 37; Ex1006 ¶132. In this way, “the amount of purge gas can also be controlled or set using any combination of different structures that allow setting the pressure drop or flow rate....” Ex1008 ¶54; Ex1006 ¶132.

The purge flow distribution system 540 also is formed at the bottom of the wafer container 522. Ex1006 ¶133. For example, the purge flow distribution system 540 (red above) is installed between the bottom portion of the shell 522 and base plate 523. Ex1008 ¶¶49-50; *see also* Ex1008 ¶5 (“the shell includes...a bottom wall”); Ex1006 ¶133.

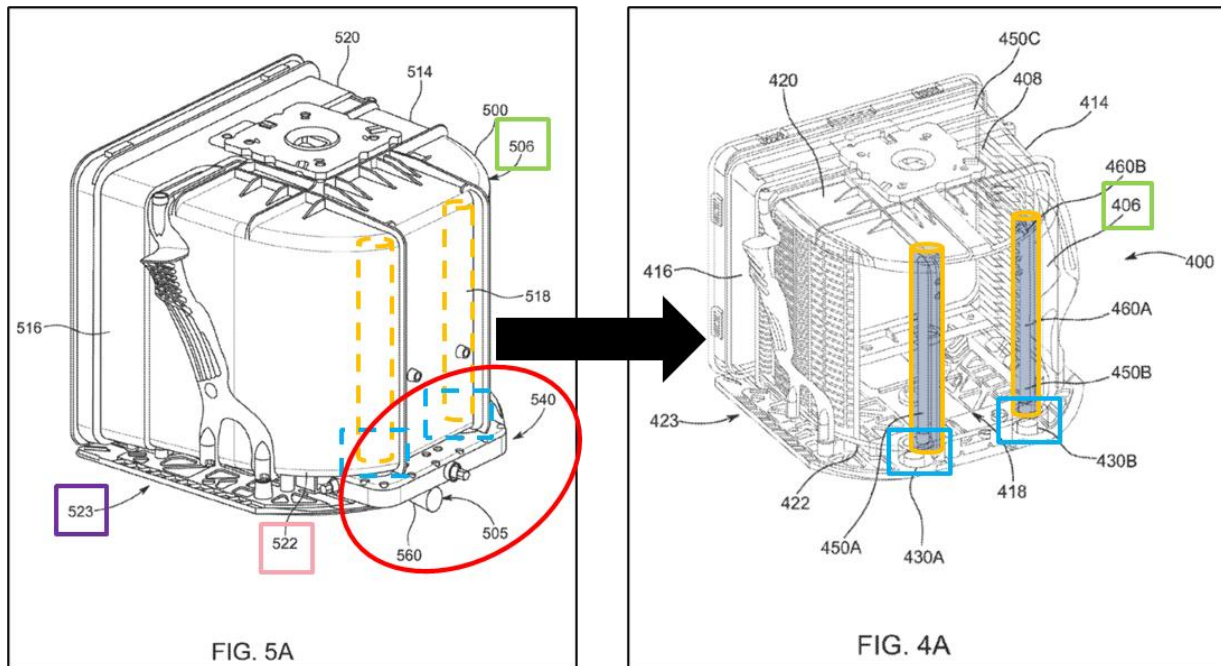
The purge flow distribution system 540 also has gas intake channels formed by 505A-505D. Ex1006 ¶133. For example, Smith ’154 states that “the purge gas can be supplied to a number of inlet port(s) (or outlet port(s)) 505A, 505B, 505C, 505D provided through the carrier plate 523 depending on the nature of the

application/docking arrangement for the substrate container.” Ex1006 ¶133. “It is appreciated that the purge gas from the inlet ports 505A, 505B, 505C, 505D can be combined before being supplied to manifold base 560 or provided/combined as necessary to supply different purge flow distribution systems in the substrate container.” Ex1008 ¶53; Ex1006 ¶133. The gas intake channels formed by 505A-505D communicate with flow paths through inlet ports 430A/430B. Ex1006 ¶134. For example, inlet ports 430A/430B are “connected to a purge gas supply system” (via gas intake channels 505A-505D) for supplying the purge gas to the network of separate gas distributing devices. Ex1006 ¶134.

d. 23[c]

Smith ’154 anticipates or at least renders obvious limitation 23[c].

First, Smith ’154 discloses *a plurality of porous tubes [e.g., tubular diffusers 450A/450B or 550A/B (orange)], each of the porous tubes having an open end, the open end correspondingly connecting with the coupling structure at the bottom portion [e.g., inlet purge port 430A/430B (light blue) on bottom wall 422/522]*. For example, as shown in Figure 4A, which depicts an interior view of the container in Figure 5A, the tubular diffusers 450A/450B are connected to inlet purge ports 430A/430B on bottom wall 422. Ex1008 ¶46; Ex1006 ¶135. The tubular diffusers have an open end at the connection point “for supplying purge gas to the rear gas distributing devices” (e.g., 450A/B and 550A/B. Ex1008 ¶46; Ex1006 ¶135.



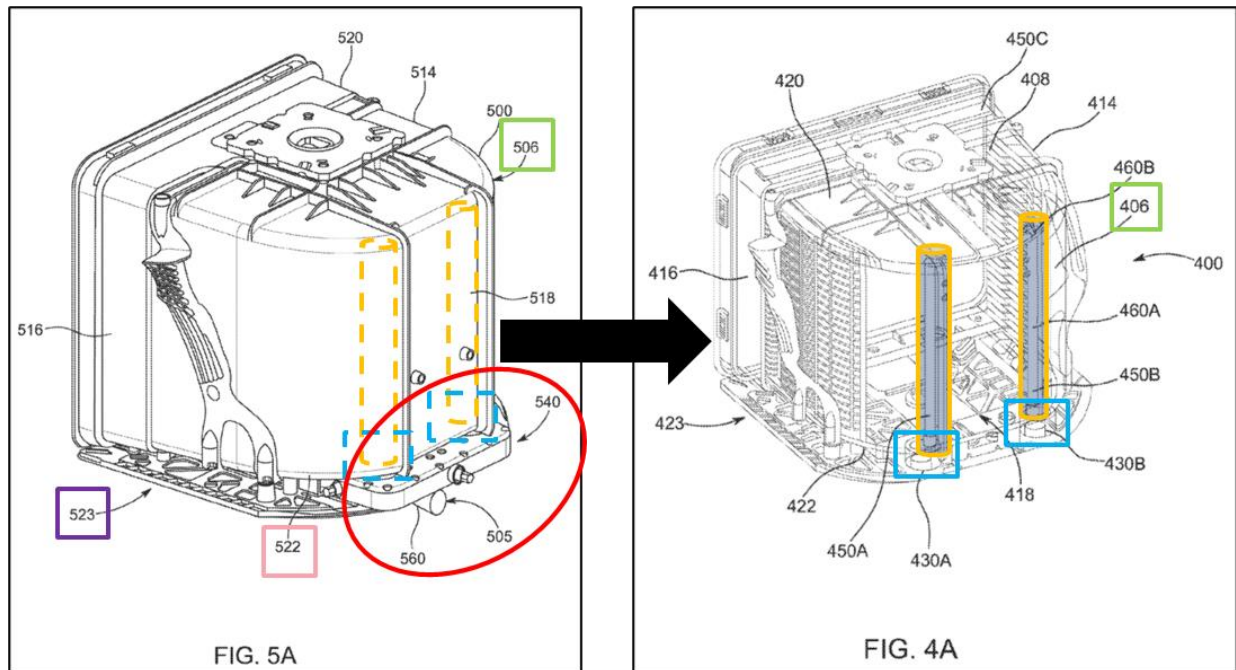
Ex1008, Figs. 5A, 4A (annotated); Ex1006 ¶135.

Second, the tubular diffusers are *communicating with the buffering gas chamber via the corresponding through channel* [e.g., flow paths through 430A/430B], *allowing a gas to pass through the porous tubes and enter an accommodating space of the shell* [e.g., interior space 408]. The flow paths through 430A/430B are “for supplying purge gas to the rear gas distributing devices 450A, 450B.” Ex1008 ¶46; Ex1006 ¶136. And rear gas tubular diffusers 450A/B then “distribut[e] the purge gas into the interior of the substrate container 400.” Ex1008 ¶47; Ex1006 ¶¶136-137. This is true whether the claim term “correspondingly connecting” means fluidly connected or directly or physically connected. Ex1006 ¶137.

2. Claim 23 Dependents

a. Claim 24

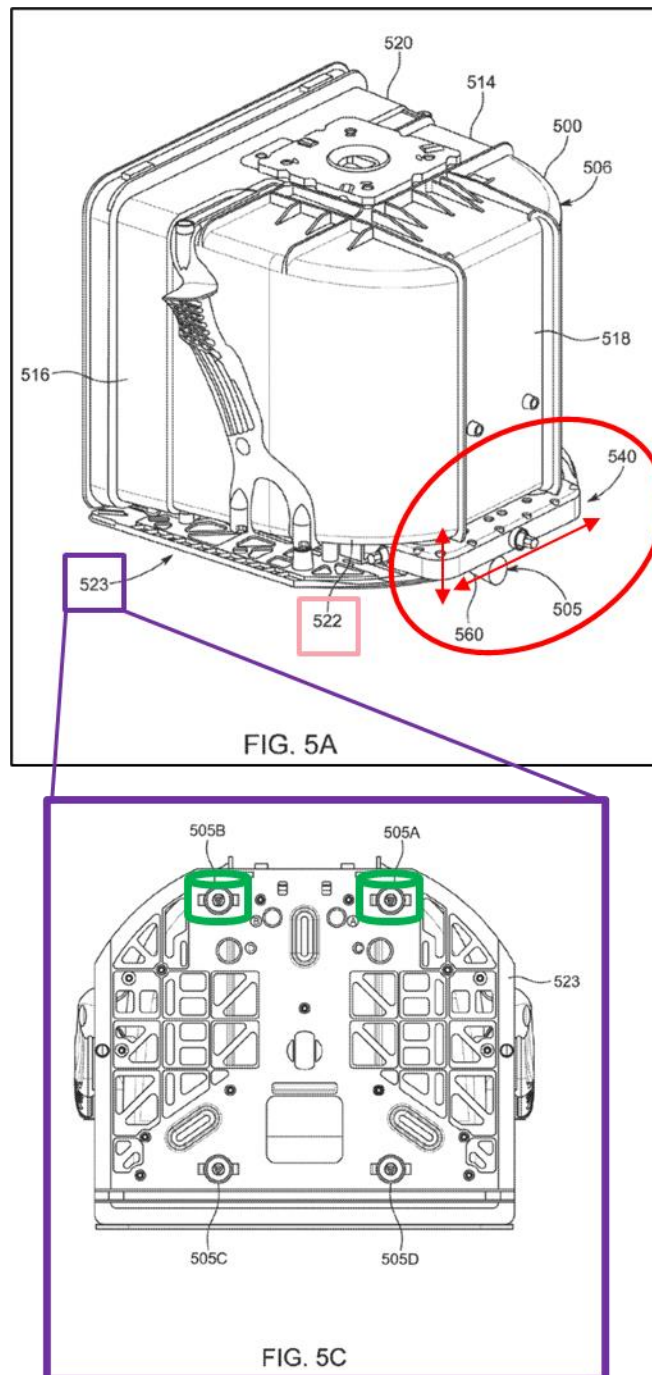
Smith '154 anticipates or at least renders obvious claim 24. As shown in Figures 4A and 5A below and described for limitation 23[c], *the porous tube [e.g., a tubular diffuser 450A/450B or 550A/550B (orange)] has a longitudinal space [e.g., internal space of the tubular diffuser (shaded)], the longitudinal space has a closed end and an open end, and the gas in the buffering gas chamber [e.g., purge flow distribution system 540 with manifold base 560 (red)] is capable of passing through the open end to enter the longitudinal space [as described for limitation 23[c].* Ex1006 ¶138; §VIII.A.1.d. The tubular diffuser has an open end, as described for limitation 23[c]. §VIII.A.1.d. Smith '154 also teaches that some of the tubular diffusers would have a closed end. Ex1008 ¶46; Ex1006 ¶138. For example, Smith '154 describes that a tubular diffuser alternatively has an “open end” near the top wall of the substrate container *if* it is connected to another gas distributing device, which a POSITA would have recognized means, or at least renders obvious, that the end would be “closed” near the top wall if there is no such connection. Ex1008 ¶46; Ex1006 ¶138.



Ex1008, Figs. 5A, 4A (annotated); Ex1006 ¶138.

b. Claim 26

Smith '154 anticipates or at least renders obvious claim 26. For example, Smith '154 discloses *a gas cartridge having a bottom portion and a sidewall extending from the bottom portion [e.g., purge flow distribution system 540 with manifold base 560 (red), with bottom portion (horizontal red arrow) and sidewall (vertical red arrow)], the bottom portion of the gas cartridge having the gas intake channels formed thereon [e.g., bottom portion of purge flow distribution system 540 with manifold base 560 has inlet ports, e.g., 505A-D (green), defining intake channels formed on the gas cartridge].* Ex1006 ¶¶139-142.



Ex1008, Figs. 5A, 5C (annotated); Ex1006 ¶139.

The purge flow distribution system is a gas cartridge. Ex1006 ¶140. It forms a buffering gas chamber, as described in limitation 23[b], with a structure having a sidewall between a bottom portion of shell 522 and bottom portion of purge flow

distribution system 540, as depicted in Figure 5A. Ex1006 ¶140; §VIII.A.1.c. Figure 5A further shows that purge flow distribution system 540 is a unit separable from the container body. Ex1006 ¶140. This structure is consistent with the description of a “gas cartridge” in the ’711 Patent. *See* Ex1001, 13:49-52; Ex1006 ¶140.

The bottom portion of the purge flow distribution system 540 has gas intake channels formed thereon: “The purge flow distribution system 540 is connected to at least one inlet port 505 that is connected to a purge gas supply system for supplying the purge gas to the network of separate gas distributing devices.” Ex1008 ¶49; Ex1006 ¶141. As shown in Figures 5A and 5C, gas inlet ports define channels formed on the bottom portion of purge flow distribution system 540 with manifold base 560. Ex1008 ¶53; Ex1006 ¶141.

In the preferred embodiment of the ’711 Patent, the gas cartridge is also detachable. Ex1006 ¶142. To the extent PO argues that the claimed gas cartridge must also be detachable, that would have been obvious because a POSITA would have constructed separate structures attached to a wafer container, such as purge flow distribution system 540, as detachable elements for maintenance, replacement, and cleaning. Ex1006 ¶142. The benefits and implementation of detachable elements were well known in the art by 2021. Ex1006 ¶142. For example, Eggum, which is prior art and also describes a wafer container and is analogous art to the ’711 Patent and Smith ’154, discloses a detachable base: “[p]urge connectors and modules for a

substrate container” “including a plate, a shell, a connector and a seal, where the connector is threaded and secured via a nut.” Ex1013, (54), Abstract; Ex1006 ¶¶121-127, 142. Eggum discloses that this connectivity enables a “removable purge module.” Ex1013, (54), Abstract; Ex1006 ¶142. A POSITA would have been motivated to use the same teachings and connectors with the purge flow distribution system of Smith ’154, with a reasonable expectation of success, using the same threaded connector mechanism disclosed in Eggum. Ex1006 ¶142.

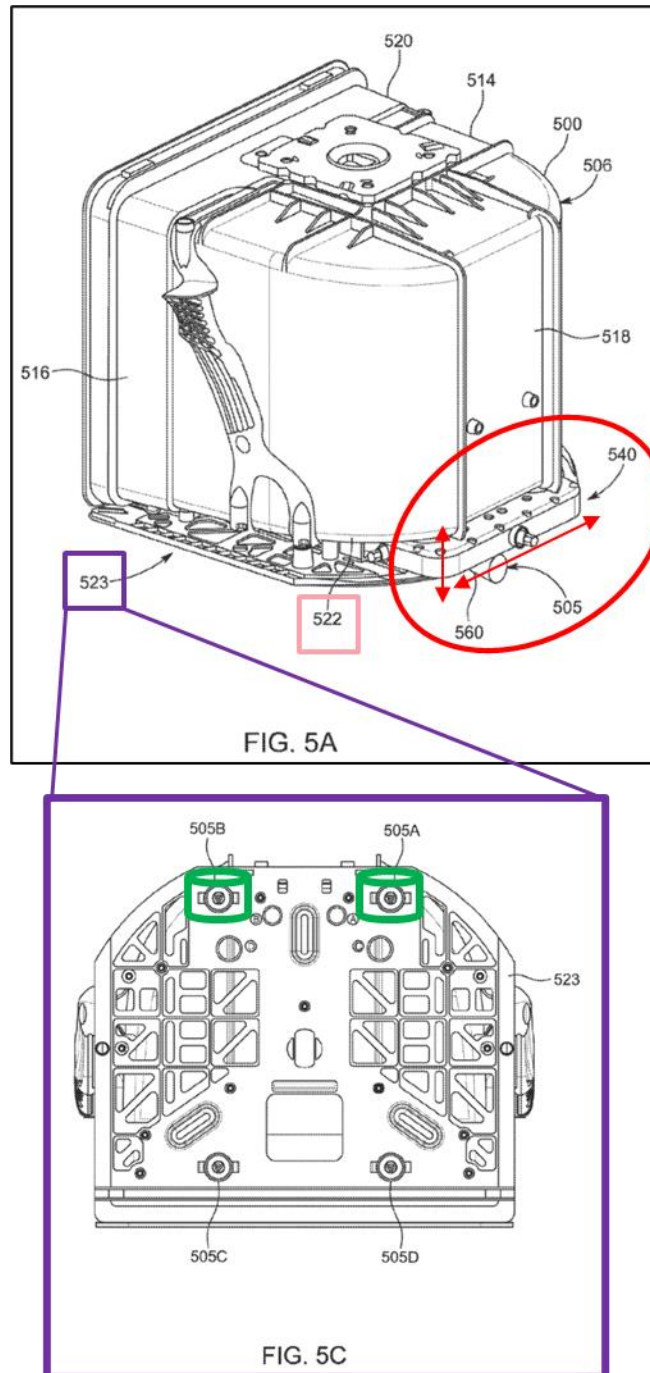
c. Claim 27

Smith ’154 anticipates or at least renders obvious claim 27. Smith ’154 discloses *a gas cartridge installed at the bottom portion of the shell, such that the gas cartridge and the bottom portion of the shell define the buffering gas chamber [e.g., purge flow distribution system 540 with manifold 560 (red) installed at the bottom portion 522 of shell 506 to define the buffering chamber]*. Ex1006 ¶¶143-145. As described for claim 26 and limitation 23[b], Figure 5A depicts a gas cartridge at the bottom portion of the container shell defining a buffering gas chamber between a bottom portion of shell 522 and bottom portion of purge flow distribution system 540. *See* Ex1008 ¶49; Ex1006 ¶144; §§VIII.A.1.c, VIII.A.2.b.

d. Claim 28

Smith ’154 renders obvious claim 28. As described for claims 26 and 27, Smith ’154 discloses *an installation space for filling with a gas intake module [e.g.,*

purge flow distribution system 540 (red) that connects to inlet ports, *e.g.*, 505A-D (green)]. Ex1006 ¶¶146-150; §§VIII.A.2.b-VIII.A.2.c. The bottom portion of the purge flow distribution system 540 has gas intake channels formed thereon; as shown in Figure 5C, inlet ports 505A-D supply purge gas to the manifold 560 of the gas cartridge 540. Ex1008 ¶¶49, 53; Ex1006 ¶146.



Ex1008, Figs. 5A, 5C (annotated); Ex1006 ¶146.

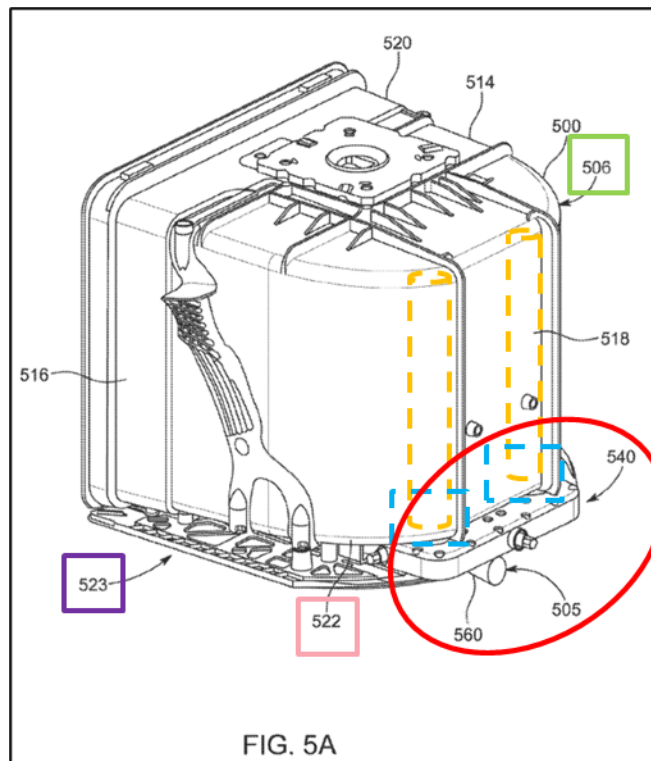
Smith '154 also renders obvious *a plurality of annular sidewalls further extend from the bottom portion of the gas cartridge, and each of the annular sidewalls defines an installation space*. Ex1006 ¶¶147-149. Although the shape of

the connections from the purge flow distribution system 540 to input ports 505A-D is not explicitly disclosed in Smith '154, it would have at least been obvious for a POSITA to implement them with annular sidewalls extending from the bottom portion of the purge flow distribution system 540 to define installation spaces for filling with a gas intake module, particularly in view of the fact that the input ports 505A-D are themselves annular. Ex1006 ¶¶148-149.

Indeed, Smith '154 further motivates this configuration, as it depicts annular sidewalls for connecting to inlet purge ports 430A/B on the top of the purge flow distribution systems. *See* Ex1008, Fig. 4A, ¶46; Ex1006 ¶149. A POSITA would have understood that using the same connection mechanism to connect to the input ports 505A-D on the bottom of the gas cartridge as well would have been the most efficient implementation because it entails using the same structure disclosed by Smith '154 to perform a similar function in the device. Ex1006 ¶149.

e. Claim 30

Smith '154 anticipates or at least renders obvious claim 30. As shown in Figure 5A, Smith '154 has a *base plate* [e.g., carrier plate 523 (purple)], *connected below the shell to support the shell* [e.g., shell 506 (light green)]; *wherein the buffering gas chamber* [e.g., purge flow distribution system 540 with manifold base 560 (red)] *is between the bottom portion* [e.g., bottom wall 522 of shell 506 (pink)] *and the base plate of the shell* [e.g., carrier plate 523 (purple)]. Ex1006 ¶¶151-152.



Ex1008, Fig. 5A (annotated); Ex1006 ¶151.

In Smith '154, “a carrier plate 523 [purple]” “can provide a base that the shell 506 can be attached to” [e.g., base plate]. Ex1008 ¶48; Ex1006 ¶152. And as described for limitation 23[b], the purge flow distribution system 540 is installed between the bottom portion of the shell 522 and base plate 523. Ex1008 ¶¶49-50; Ex1006 ¶152; §VIII.A.1.c; Ex1008 ¶5.

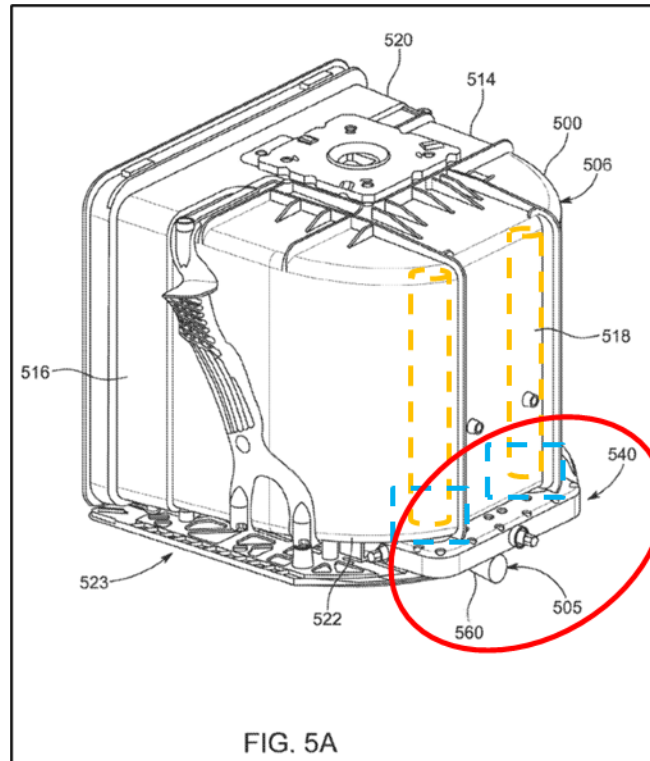
3. Independent Claim 13

a. 13[pre]

To the extent the preamble is limiting, Smith '154 anticipates or at least renders obvious 13[pre]. Smith '154 has a *gas diffusion device* [e.g., purge flow distribution system 540 (red) and tubular diffusers 550A/550B or 450A/450B

(annotated in orange)] installed in a *wafer container* [e.g., substrate container with shell 506] *having an accommodating space* [e.g., interior space in the shell 506].

Ex1008 ¶¶2, 49; Ex1006 ¶153.



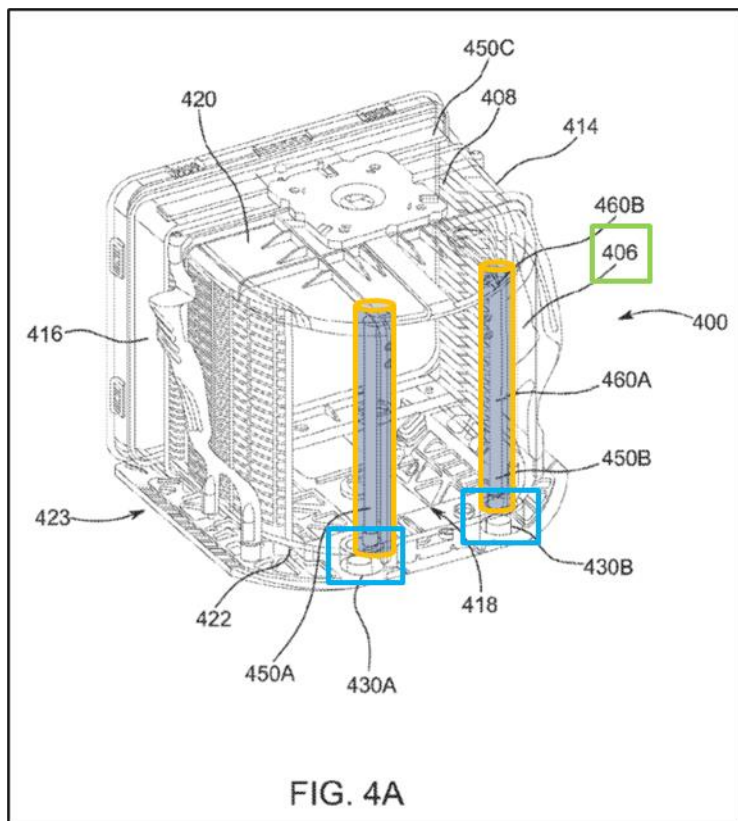
Ex1008, Fig. 5A (annotated); Ex1006 ¶153.

b. 13[a][1]

Smith '154 anticipates or at least renders obvious limitation 13[a][1]—*a gas cartridge, configured at a bottom portion of the wafer container to define a buffering gas chamber* [e.g., purge flow distribution system 540 with manifold 560], for the same reasons described for claims 26 and 27. §VIII.A.2.b-VIII.A.2.c; Ex1006 ¶154.

c. 13[a][2]

Smith '154 anticipates or at least renders obvious limitation 13[a][2]—*the bottom portion provided with at least two coupling structures [e.g., 430A and 430B], each of the coupling structures defining a through channel having a center axis*” [e.g., center of coupling structures], for the same reasons as limitation 23[a]. §VIII.A.1.b; Ex1006 ¶155. As shown below, each of the coupling structures (e.g., 430A and 430B, light blue) at the bottom portion of the wafer container (e.g., 422) are annular structures that have a center axis defining flow paths for purge gas to enter tubular diffusers 450A/B or 550A/B (orange). Ex1006 ¶¶155, 161.



Ex1008, Fig. 4A (annotated); Ex1006 ¶155.

d. 13[a]/[3]

Smith '154 anticipates or at least renders obvious limitation 13[a][3]—*the buffering gas chamber having at least one gas intake channel [e.g., inlet ports 505A-D (green), defining intake channels], the gas intake channel, the buffering gas chamber, the through channel and the accommodating space communicating with one another*, as described in 23[b] and 23[c]. §§VIII.A.1.c-VIII.A.1.d; Ex1006 ¶156.

e. 13[b]

Smith '154 anticipates or at least renders obvious 13[b] for the reasons discussed with respect to limitation 23[b], 23[c] and 24. §§VIII.A.1.c-VIII.A.2.a; Ex1006 ¶157.

4. Claim 13 Dependents

a. Claim 18

Smith '154 anticipates or at least renders obvious claim 18 for the reasons described for claim 26. Ex1006 ¶158; §VIII.A.2.b.

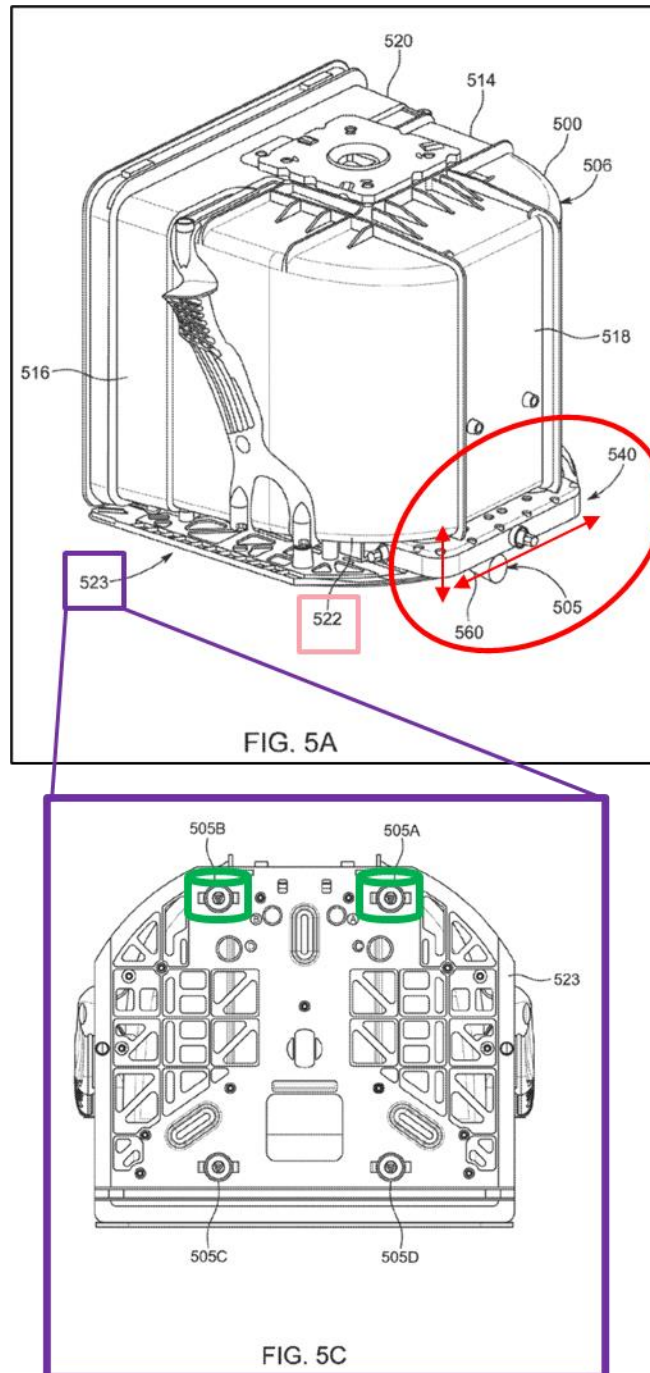
b. Claim 19

Smith '154 anticipates or at least renders obvious claim 19 for the reasons described for claim 27. Ex1006 ¶159; §VIII.A.2.c.

c. Claim 20

Smith '154 renders obvious claim 20, in part for the reasons discussed for claim 28. Ex1006 ¶160; §VIII.A.2.d.

In addition, a POSITA would also have understood that the *gas intake module* [e.g., inlet supply ports 505A/B (green)] has a *gas intake center axis* because all such structures necessarily have a center axis. Ex1006 ¶¶160-162. As explained above, Smith '154 also discloses *the installation space, the gas intake channel at the bottom portion of the gas cartridge and the buffering gas chamber* [e.g., purge flow distribution system 540 with manifold base 560 (red)] *communicate with one another*. §VIII.A.1.c; Ex1006 ¶¶161-162. Moreover, based on the configuration of inlet supply ports 505A/B (green), a POSITA would have understood that the most efficient means of supplying gas from *the gas intake module* would be to pass *through the gas intake channel and enter the buffering gas chamber in one single air intake direction* because it entails using the same structure disclosed by Smith '154 without the need for additional piping or other connections between the gas intake module and the buffering gas chamber. §VIII.A.1.c; Ex1008 ¶53; Ex1006 ¶162.



Ex1008, Figs. 5A, 5C (annotated); Ex1006 ¶162.

d. Claim 21

Smith '154 anticipates or at least renders obvious claim 21 for the reasons discussed for claim 30. §VIII.A.2.e; Ex1006 ¶163.

B. Ground 3: Obviousness Of Claims 23-24, 26-31 And Claims 13, 18-22 In View Of Smith In Further View Of Ogawa

Grounds 1-2 demonstrated that Smith '154 anticipates or renders obvious claims 23-24, 26-28, 30 and claims 13, 18-21. Dependent claims 29, 31, and 22 are further rendered obvious in view of Smith '154 and Ogawa.

1. Motivation to Combine Smith '154 with Ogawa

Smith '154 does not discuss the materials used to construct the substrate container. Ex1006 ¶167. A POSITA would have been motivated to look to Ogawa's material-related teachings to implement the wafer container system of Smith '154. Ex1006 ¶¶165-169.

Indeed, in 2021, a POSITA would have recognized that the process of manufacturing wafers generates substantial heat, and it can be unsafe to place hot wafers on certain plastic materials as there is a “non-trivial risk of fire in such facilities associated with polycarbonate wafer carriers.” Ex1016 ¶4; Ex1006 ¶168. Because a fire poses “a risk of significant property loss and hazards to the life safety of occupants in the facility...[and] may cause extreme disruption to the semiconductor production,” a POSITA would have been motivated to use “a fire retardant wafer container.” Ex1016 ¶¶4, 8; Ex1006 ¶168.

Ogawa's teachings would have addressed these concerns, as they describe thermally resistant materials for “the container body 2” and associated components, including “bottom plate 26” that may be made of “resin molding material,” including

“thermoplastic resins such as polycarbonate, cyclic olefin polymer, polyether imide, polyether ketone, polyether ether ketone, polybutylene terephthalate, polyacetal, liquid crystal polymer, or alloys thereof.” Ex1012, 5:14-23; Ex1006 ¶168. Ogawa further explains that “additional conductive substances composed of carbon fibers, carbon powders, carbon nanotubes, conductive polymers or the like, or antistatic agents such as anions, cations, nonionic additives or the like can be added as required to these resins.” Ex1012, 5:24-28; Ex1006 ¶168. A POSITA would have understood that thermally resistant polymers such as PEEK would ensure that the known risk of fire is minimized, and would have been motivated to use them. Ex1006 ¶168; *see also* Ex1018; Ex1020, §IV.C.

The combination would have been well within the level of skill, as taught by Smith '154, Ogawa, and the knowledge of a POSITA. Ex1006 ¶169. Smith '154 and Ogawa are analogous art to the '711 Patent, each being directed to “distributing purge gas to the interior of the substrate container.” Ex1008 ¶1; Ex1012, 3:18-22; Ex1006 ¶¶166, 169. A POSITA would have understood that Ogawa’s disclosures would be entirely complementary to the purge flow distribution system disclosed by Smith '154. Ex1006 ¶¶166, 169. Thus, a POSITA would have successfully implemented the combination, where the purge flow distribution system disclosed by Smith '154 is constructed according to Ogawa’s material-related teachings. Ex1006 ¶169. This straightforward combination uses a known technique (*e.g.*,

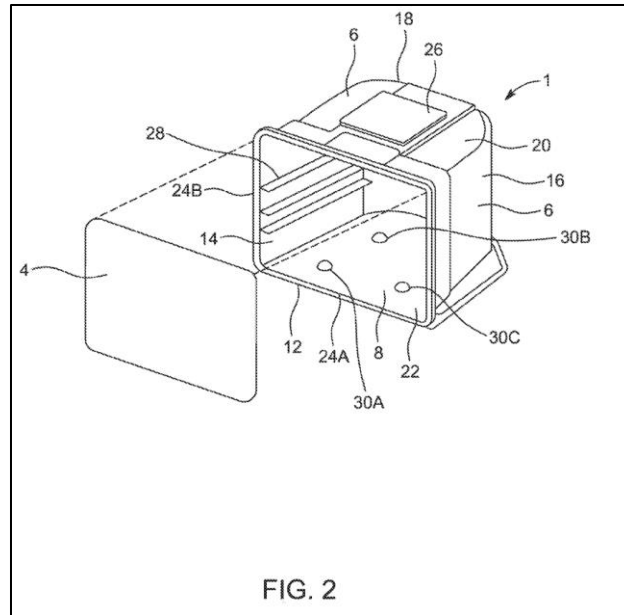
Ogawa's material-related teachings) to improve a similar device (*e.g.*, the purge flow distribution system disclosed by Smith '154) by reducing the risk of a fire, while providing predictable results (*e.g.*, a thermally resistant substrate container). Ex1006 ¶169.

2. Claim 23 Dependents

a. Claim 29

Smith '154 in view of Ogawa discloses claim 29. Ex1006 ¶¶170-172.

For example, as shown in Figure 2, Smith '154 discloses that *the wafer container* [*e.g.*, substrate container 1] *further comprises a door* [*e.g.*, door 4] *detachably combined with the shell* [*e.g.*, substrate container 1], *and a pair of support portions* [*e.g.*, plurality of shelves 28] *configured on an inner side* [*e.g.*, side wall 14/16] *of the shell* [*e.g.*, substrate container 1]. Ex1006 ¶171. Smith '154 teaches that “substrate container 1 can be accessed by moving (*e.g.*, opening, removing) the door 4” and “includes a first side wall 14, a second side wall 16.” Ex1008 ¶¶25-26; Ex1006 ¶171. The “substrate container 1 can include a plurality of shelves 28 for holding substrates (not shown) in the interior space 8” which are located side wall 14/16 “(*e.g.*, slots in the substrate container).” Ex1008 ¶28; Ex1006 ¶171.



Ex1008, Fig. 2; Ex1006 ¶171.

Additionally, Ogawa discloses that *a wafer container is made of a thermal resistance material, which is one or a combination of at least two selected from a group consisting of PEEK, HTPC, FKM, PPS, PPO, chlorinated polyether, POB, TORLON, EP, PF, PEI, PI and LCP [e.g., resin molding material, including thermoplastic resins such as PEEK].* Ex1012, 5:14-23; Ex1006 ¶172; §VIII.B.1.

b. Claim 31

Smith '154 in view of Ogawa also renders obvious claim 31. Smith '154 discloses a baseplate. §VIII.A.2.e. And Ogawa discloses that *a base plate is made of a material comprising a self-lubricating material [e.g., resin molding material, including thermoplastic resins such as PEEK with additional conductive substances composed of carbon powders, or the like].* Ex1006 ¶¶173-176; §VIII.B.1.

For example, Ogawa teaches that the container and associated components,

including “bottom plate 26” may be made of “resin molding material,” including “thermoplastic resins such as polycarbonate, cyclic olefin polymer, polyether imide, polyether ketone, polyether ether ketone, polybutylene terephthalate, polyacetal, liquid crystal polymer, or alloys thereof.” Ex1012, 5:14-23; Ex1006 ¶175. Ogawa further explains that “additional conductive substances composed of carbon fibers, carbon powders, carbon nanotubes, conductive polymers or the like, or antistatic agents such as anions, cations, nonionic additives or the like can be added as required to these resins.” Ex1012, 5:24-28; Ex1006 ¶175; *see also* Ex1018; Ex1019.

A POSITA would have understood that the inclusion of at least the carbon powders additives in the disclosed resin would result in *a self-lubricating material* as disclosed by the '711 Patent, which describes that a *self-lubricating material* “is fundamentally a composite material including at least two materials” wherein “the coefficient of friction of part or all of the base plate (29) is lower than the coefficient of friction of a contact interface of the load port, so as to more readily move the base plate (29) on the interface of the load port.” Ex1001, 8:46-53; Ex1006 ¶176; *see also* Ex1018 (PEEK was well-known in the art); Ex1019 (self-lubricating compound PEEK products were well known in the art); Ex1020 (Entegris A300 FOUP discloses carbon filled materials).

3. Claim 13 Dependents

a. Claim 22

Smith '154 in view Ogawa renders obvious claim 22 for the reasons explained for claim 31. Ex1006 ¶177; §VIII.B.2.b.

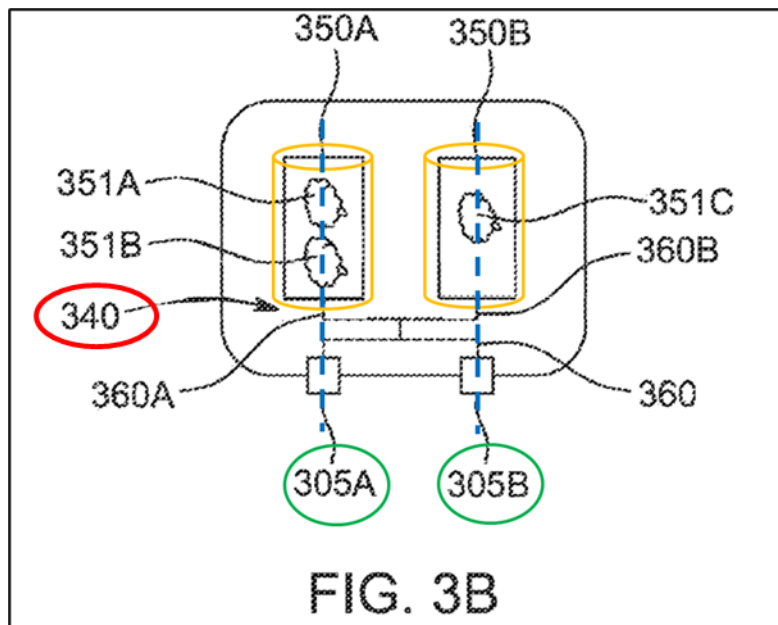
C. Ground 4: Obviousness Of Claims 1-9, 12, 13-21, 23-28, And 30 In View Of Smith '517 In Further View Of Smith '154

Claims 1-9, 12, 13-21, 23-28, and 30 would have been obvious in view of Smith '517 in further view of Smith '154. Ex1006 ¶178.

1. Motivation to Combine Smith '517 (Ex1011) with Smith '154 (Ex1008)

Like Smith '154 in Grounds 1-3, Smith '517 discloses a wafer container that includes multiple diffusers for distributing purge gas to control the internal container environment, while maintaining a “low profile so as to not interfere with the wafer slots.” Ex1011, 1:16-21, 1:25-32, 1:62-64, 2:4-17; Ex1006 ¶¶178-202. Smith '517 further teaches the benefits of components providing a “plenum charge effect” (Ex1011, 11:27-31) to buffer and regulate the flow into a diffuser and to direct the flow of purge gas to particular areas of a container (Ex 1011, 3:4-8). Ex1006 ¶181. Smith '517, however, does not describe a system that can regulate, buffer, and distribute purge gas across different diffusers spread throughout a container. Ex1006 ¶181. A POSITA would have looked to Smith '154 for components with such additional buffering function that do not impact the wafer slots, so as to enhance the plenum charge effect already disclosed in Smith '517. Ex1006 ¶¶186-202.

Smith '154 specifically teaches a flexible “purge flow distribution system for distributing purge gas” that can be installed with a standard front-opening wafer container such as that disclosed in Smith '517. Ex1008 ¶1, Fig. 5A; Ex1006 ¶¶186-202. As shown in Figure 3B, for example, the purge flow distribution system includes a network of piping and valves (360/360A) that buffers purge gas from inlet ports 305A/B and allows tailored flow of the purge gas across a network of tubular diffusers (350A/B). Ex1008, Abst., ¶¶38-39, 50-52; Ex1006 ¶¶186-202; *see also id.*, ¶47. The purge flow distribution system can be implemented as a gas cartridge exterior to the wafer chamber. Ex1008, Fig. 5A (element 54); Ex1006 ¶¶186-202.



Ex1008, Fig. 3B (annotated); Ex1006 ¶¶186-202.

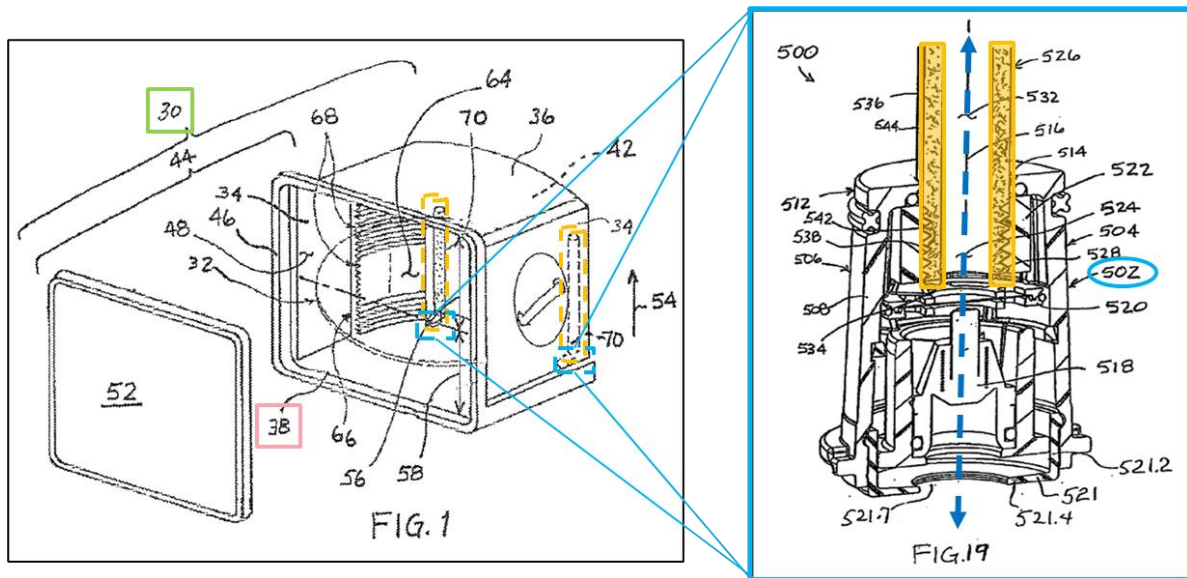
A POSITA would have recognized that the purge flow distribution system of Smith '154 would be particularly useful for the system in Smith '517. Ex1006 ¶¶188-202. As an initial matter, a POSITA starting with Smith '517 would have been well

aware of the teachings of Smith '154. Ex1006 ¶196. Smith '517 and Smith '154 are analogous art to the '711 Patent, each being directed to substrate containers with mechanisms for “distributing purge gas to the interior” of a front-opening substrate container. Ex1008 ¶1; Ex1011, 1:16-21; Ex1001, 1:18-22; Ex1006 ¶¶179; *see also id.* ¶¶180-202. Both Smith references also share a common lead inventor, Mark V. Smith, as well as a common applicant and assignee, Entegris, Inc. Ex1006 ¶196.

Moreover, given the goal of Smith '517 to direct the flow of purge gas to particular areas and “effectively purge the high flow of air entering the substrate container at those locations” (Ex 1011, 3:4-8), a buffering system like Smith '154's that can tailor flow to each diffuser would have been beneficial. *See* Ex1006 ¶¶179-202. As noted, the '517 already discusses the benefits from a “plenum charge effect,” Ex1011, 11:27-31, which similarly seeks to buffer and regulate the flow into a diffuser. Ex1006 ¶181. Given Smith '517's goal of maintaining a “low profile so as to not interfere with the wafer slots” inside the container, Ex1011, 1:63-64, a POSITA would have been particularly motivated to look to Smith '154's *exterior* purge flow distribution system which does not interfere with the wafer slots. Ex1006 ¶¶188, 194-202.

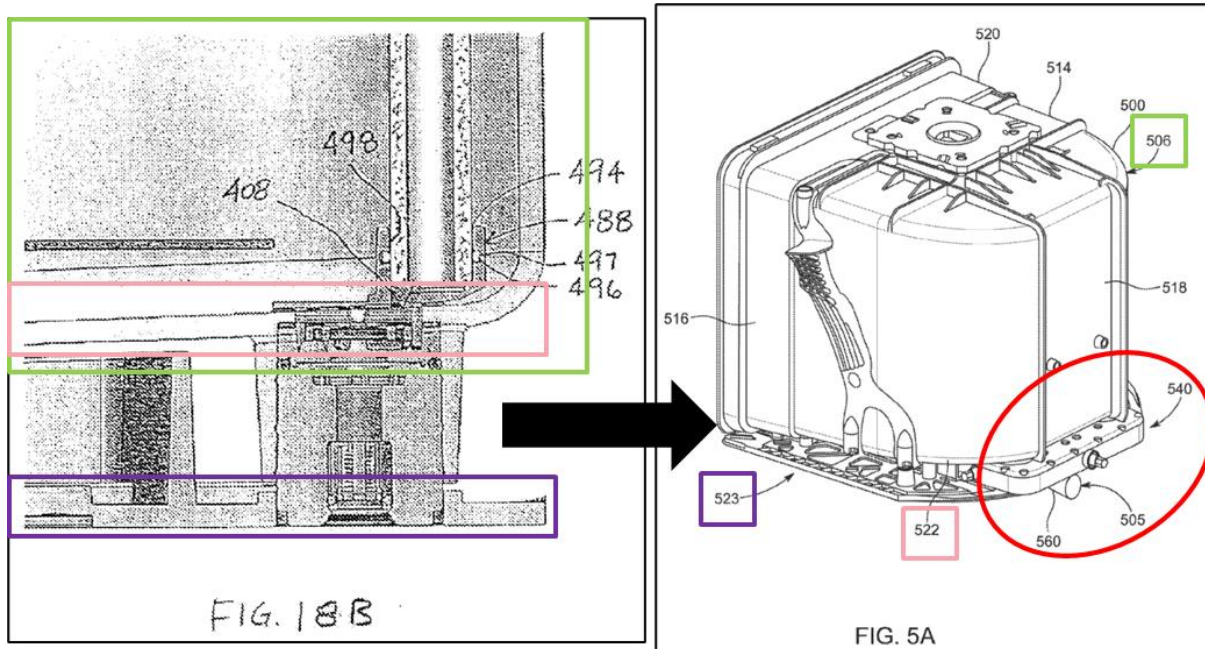
A POSITA would have been able to implement the combination of the purge flow distribution system in Smith '154 with the wafer container of Smith '517 with a reasonable expectation of success. Ex1006 ¶¶179-202. Indeed, Smith '517

expressly describes a mechanism for adding new components (such as Smith '154's exterior purge flow distribution system) to an existing wafer container—specifically, Smith '517's "kit for retrofitting existing front opening wafer containers" using various couplings between "diffuser tube[s]" and a purge port assembly. Ex1011, Abstract, 1:60-62; Ex1006 ¶¶181-182. For example, Smith '517 teaches several different couplings (or inlet fittings) that can be used to retrofit the wafer container with new components. *See* Ex1011, Abstract, 5:43-52; Ex1006 ¶¶181-185. The couplings can have various alignments and "may include structure that enhances purge characteristics near the base" of the tubular diffusers, to "effectively purge the high flow of air entering the substrate container at these locations." *E.g.*, Ex1011, Abstract, 3:4-8. One such coupling for retrofitting is shown in Figure 19 (below) and is structured so that a threaded connection between the tubular diffuser (orange) and inlet port assembly (check valve 518) is "concentric" with a central axis 516 (blue dashed line below). Ex1011, 16:28-58; Fig. 19; Ex1006 ¶¶181-185. Other coupling options are also disclosed. Ex1011, 15:7-31, Figs. 17A-17D; Ex1006 ¶¶184-185.



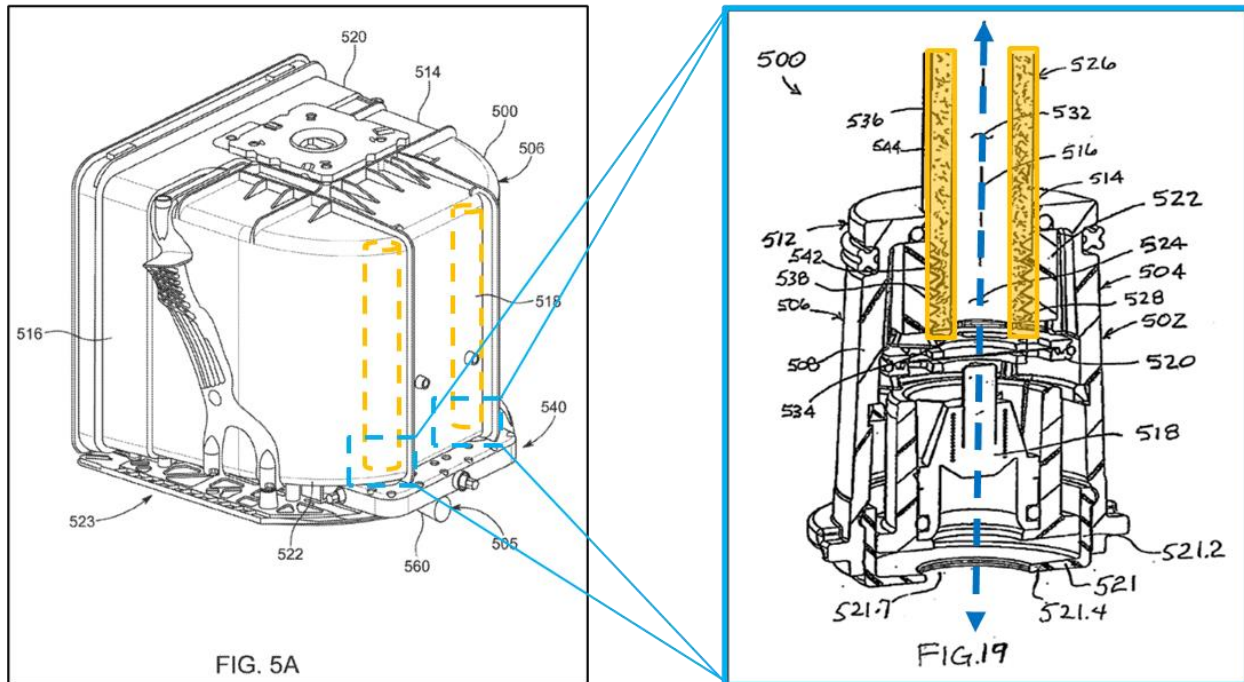
Ex1011, Figs. 1, 19 (annotated); Ex1006 ¶182.

A POSITA would have easily been able to use these couplings to add the purge flow distribution system of Smith '154, while maintaining a low profile inside the existing container, as desired by Smith '517. Ex1006 ¶¶188-199. For example, beginning with an unmodified container that lacks a purge flow distribution system, similar to Figure 18B of Smith '517, a POSITA would have retrofitted the container (using the retrofitting kit of Smith '517) by removing its base carrier plate (purple box, and a known feature of a wafer container), exposing a bottom wall (pink box) of a shell (green). Ex1006 ¶189. Next, the purge flow distribution system 540 of Smith '154 would have been inserted below the bottom wall and above the carrier plate to secure the buffering gas chamber to the wafer container. Ex1006 ¶189. The resulting combined wafer container would resemble the depiction in Figure 5A of Smith '154. Ex1006 ¶189.



Ex1011, Fig. 18B (annotated); Ex1008, Fig. 5A (annotated); Ex1006 ¶189.

Then, each tubular diffuser in the wafer container would have been retrofitted with a connection to the purge flow distribution system using Smith '517's couplings. Ex1006 ¶¶190-191. For example, the coupling 522 of Smith '517 Figure 19 could have been used at the bottom of each tubular diffuser to create a connection with the newly installed purge flow distribution system. Ex1006 ¶¶190-191.



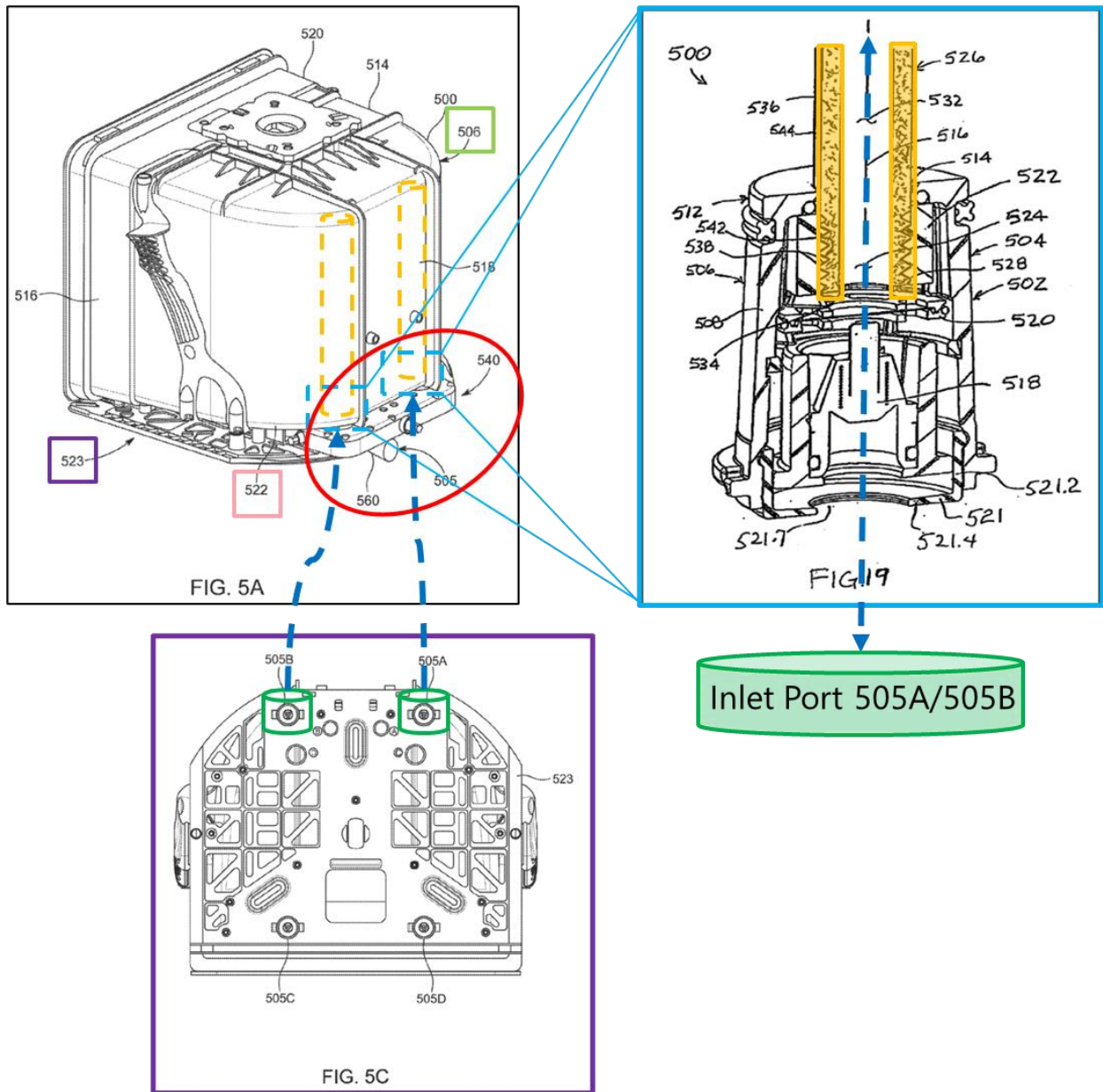
Ex1008, Fig. 5A (annotated); Ex1011, Fig. 19 (annotated); Ex1006 ¶190.

Finally, the gas inlet ports to the overall device would maintain their position directly below the newly installed purge gas distribution system. Ex1006 ¶192. Because a POSITA would have been retrofitting an existing container, it would have been important to ensure that existing connections and ports are utilized. Ex1006 ¶¶192; *id.*, ¶¶193202. Therefore, when retrofitting the existing container of Smith '517 to add the purge flow distribution system of Smith '154, the existing inlet ports would remain aligned with newly installed coupling members in step 2. Ex1006 ¶192. This eliminates the need to make new holes in either carrier plate or bottom wall. Ex1006 ¶192.

The resulting system, shown below (“**Combined Smith Distribution System**”) includes the Smith '154's purge flow distribution system 540,

implemented as an exterior plenum with aligned connections from Smith '517 (*e.g.*, Figure 19). Ex1006 ¶193. Specifically, the combined structure includes (a) two tubular diffusers (orange); (b) each diffuser connected to coupling 522 (light blue); (c) each coupling 522 connected to purge flow distribution system 540 (red); (d) purge flow distribution system 540 (red) connected to inlet port 505A or 505B (green cylinders), which introduce purge gas similar to the check valve 518 in Smith '517; wherein all elements align coaxially along “central axis 516” (blue dashed line on right, below). Ex1011, 16:28-58; Fig. 19; Ex1006 ¶193.

Combined Smith Distribution System

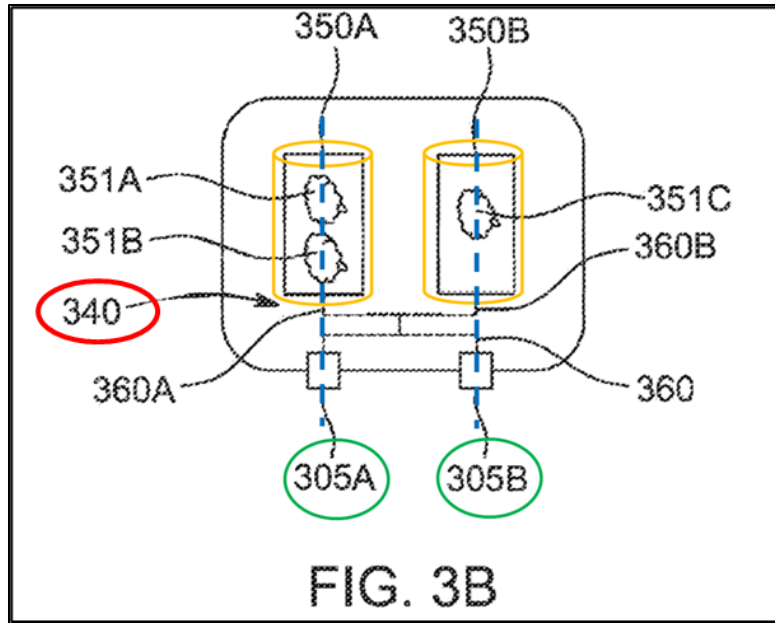


Ex1008, Figs. 5A, 5C (annotated); Ex1011, Fig. 19 (annotated); Ex1006 ¶193.

The Combined Smith Distribution System would have the benefits of both systems: a flexible mechanism for buffering and distributing purge gas, as in Smith '154, and the flexible and robust couplings in Smith '517. Ex1006 ¶¶193-202.

Smith '517's "robust" connections "between a diffuser tube and an upwardly facing fitting of a purge port assembly," Ex1011, 1:60-64, would have ensured the overall robustness of the wafer container, which is required to "transport [] in-process wafers between process steps," with repeated movement throughout the facility. Ex1008 ¶2; Ex1011, 1:16-21; Ex1006 ¶198.

This combination would also have been well within the level of skill, with a reasonable expectation of success, as taught by Smith '154, Smith '517, and the knowledge of a POSITA. Ex1006 ¶¶188-202. A POSITA would have understood that the couplings of Smith '517 would be complementary to Smith '154's purge flow distribution system. Ex1006 ¶¶200-202. Indeed, Smith '154's Figure 3B already indicates a coaxial alignment showing purge flow distribution system 340 (red), with aligned (blue dashed line) inlet ports 305A-B (green) and diffusers 350A-B (orange). Ex1008, Fig. 3B; Ex1006 ¶201.



Ex1008, Fig. 3B (annotated); Ex1006 ¶201.

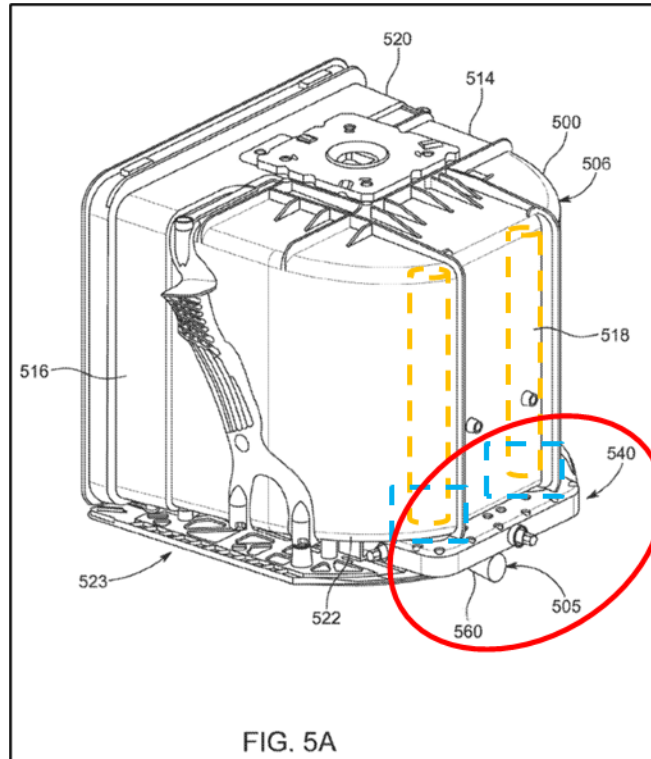
Thus, a POSITA would have been motivated to implement the Combined Smith Distribution System with a reasonable expectation of success. This straightforward combination simply uses known techniques (*e.g.*, Smith '154's purge flow distribution system) to improve a similar device (*e.g.*, Smith '517's existing containers) in the same way (*e.g.*, benefiting from the plenum charge effect), while providing predictable results (*e.g.*, maximizing efficient use of space and providing "robust" connections using Smith '517's retrofitting kit). Ex1011, 1:60-64). Ex1006 ¶202.

2. Independent Claim 1

a. 1[pre]

To the extent the preamble is limiting, the Combined Smith Distribution discloses 1[pre]. The Combined Smith Distribution System includes *a gas diffusion*

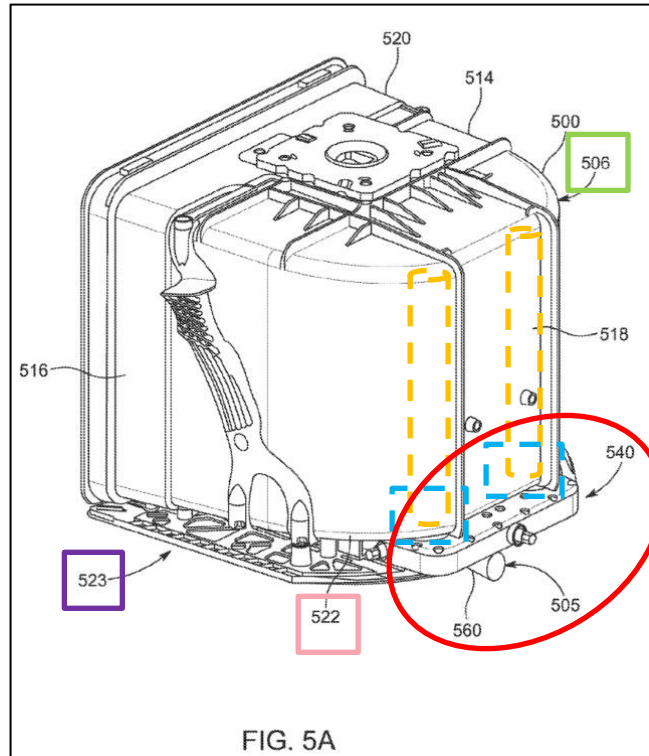
device [e.g., purge flow distribution system 540 (red) and tubular diffusers 550A/550B or 450A/450B (annotated in orange)], installed in a wafer container [e.g., substrate container with shell 506/406] having an accommodating space [e.g., interior space in the shell 506/406]. Ex1008, Abstract, ¶2; Ex1006 ¶203; §VIII.C.1.



Ex1008, Fig. 5A (annotated); Ex1006 ¶203.

b. 1[a][1]

The Combined Smith Distribution System discloses limitation 1[a][1]. The Combined Smith Distribution System has *a buffering gas chamber [e.g., purge flow distribution system 540 with manifold base 560 (red) from Smith '154], configured at a bottom portion of the wafer container [e.g., bottom wall 522 or 422 from Smith '154].* Ex1006 ¶¶204-207; §VIII.C.1.



Ex1008, Fig. 5A (annotated); Ex1006 ¶204.

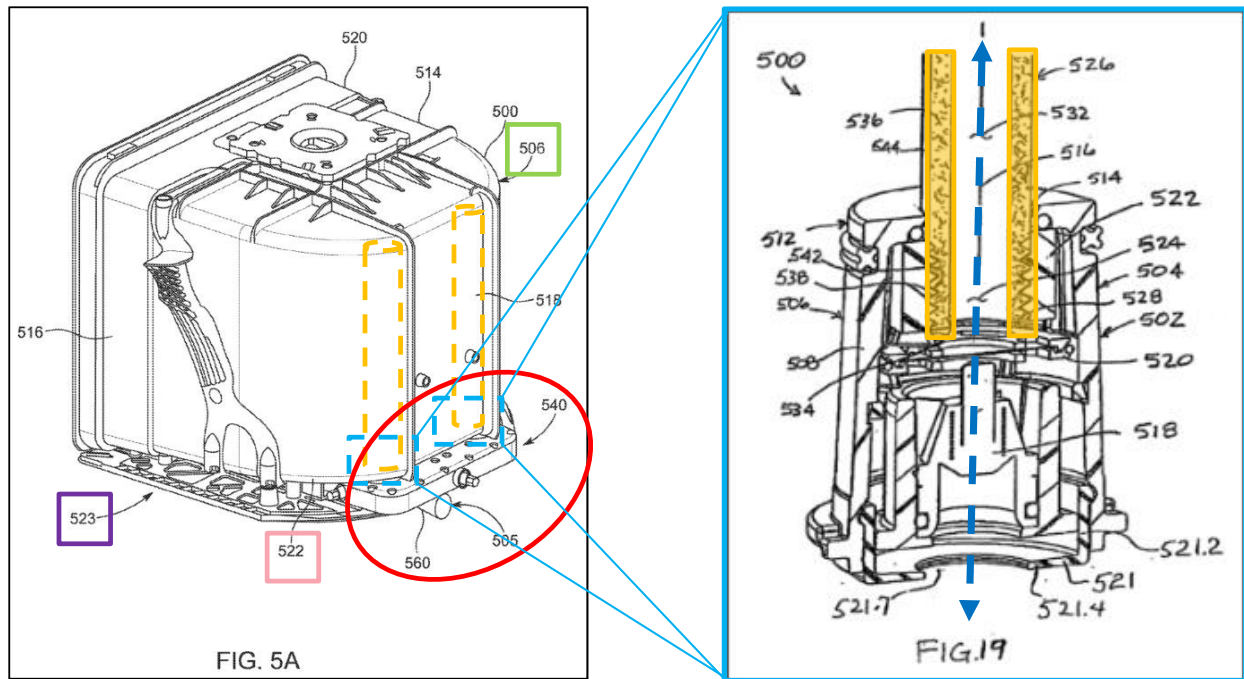
The purge flow distribution system 540 in Smith '154 is a buffering gas chamber and distributes purge gas to the interior of the substrate container. Ex1008 ¶¶1, 5, 37; §VIII.C.1; Ex1006 ¶205; *see also id.*, ¶47; §VIII.A.1.c. Like the buffering gas chamber in the '711 Patent, the purge flow distribution system balances gas pressure, allowing gas to flow through each diffuser (orange above) at “a balanced air pressure.” *See* Ex1001, 14:57-15:3; Ex1006 ¶¶47, 205. The purge flow distribution system 540 has a buffering function. Ex1006 ¶¶47, 205. For example, it can, using adjustable valves, set “the amount of purge gas that flows” to different diffusing devices. Ex1008 ¶¶50, 51-52, 37; Ex1006 ¶¶105, 205. In addition, the purge flow distribution system can combine purge gas from multiple inlet ports.

Ex1008 ¶¶53, 37; Ex1006 ¶¶105, 205. In this way, “the amount of purge gas can also be controlled or set using any combination of different structures that allow setting the pressure drop or flow rate based on the conservation of energy.” Ex1008 ¶54; Ex1006 ¶¶105, 205.

Moreover, the purge flow distribution system 540 is configured at the bottom of the wafer container 522 in Smith ’154. Ex1006 ¶206. In an embodiment, the purge flow distribution system 540 (red) is installed between the bottom portion of the shell 522 and base plate 523. Ex1008 ¶¶49-50; *see also* Ex1008 ¶5; Ex1006 ¶¶206-207.

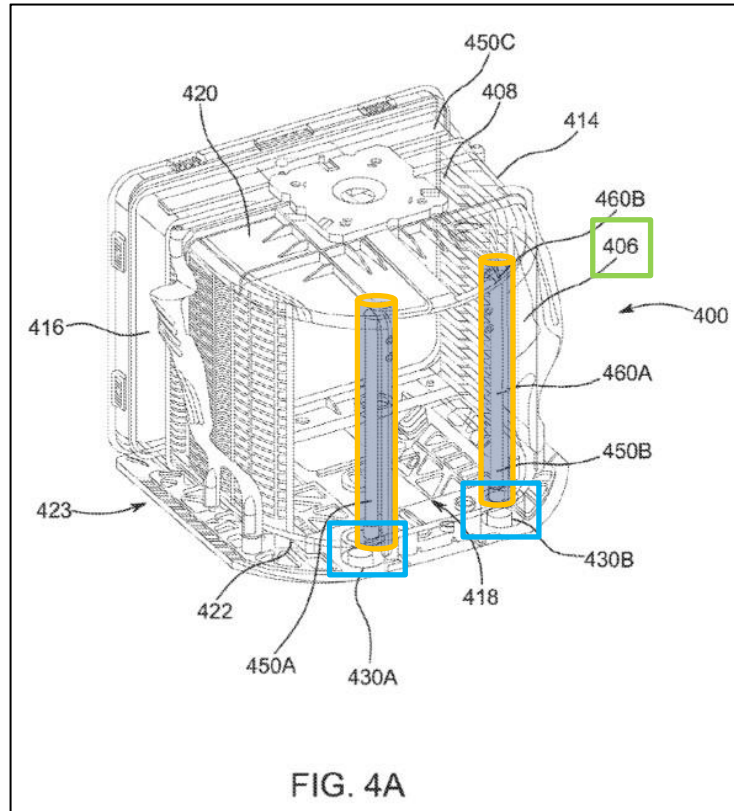
c. 1[a][2]

The Combined Smith Distribution System discloses limitation 1[a][2]. The Combined Smith Distribution System has *a bottom portion [e.g., bottom wall 422/522 of shell 406/506 from Smith ’154] provided with at least one coupling structure [e.g., coupling 522 from Smith ’517, light blue box below], the coupling structure defining a through channel having a center axis [e.g., flow path along center axis 516 (blue dashed line on right, below) in Smith ’517]*. Ex1006 ¶¶208-210; §VIII.C.1.



Ex1008, Fig. 5A (annotated); Ex1011, Fig. 19 (annotated); Ex1006 ¶208.

As described above, a POSITA would have been motivated to use the couplings 522 from Smith '517 (which are configured around central axis 516) to connect input ports to the tubular diffusers (orange) in Smith '154. Ex1006 ¶¶178-202; §VIII.C.1. And as shown in Figure 4A below (which depicts the same internal components of Figures 5A-5C, Ex1006 ¶130), input ports 430A and 430B are provided on the bottom surface of the container shell (*e.g.*, 422), and each coupling 522 would also be provided on the bottom surface of the container shell (*e.g.*, 422) to connect each port to a diffuser. Ex1006 ¶¶209-210. The coupling 522 defines a through channel along center axis 516, which allows purge gas to flow through the coupling structure to the tubular diffuser into the interior of the container. Ex1006 ¶¶209-210.



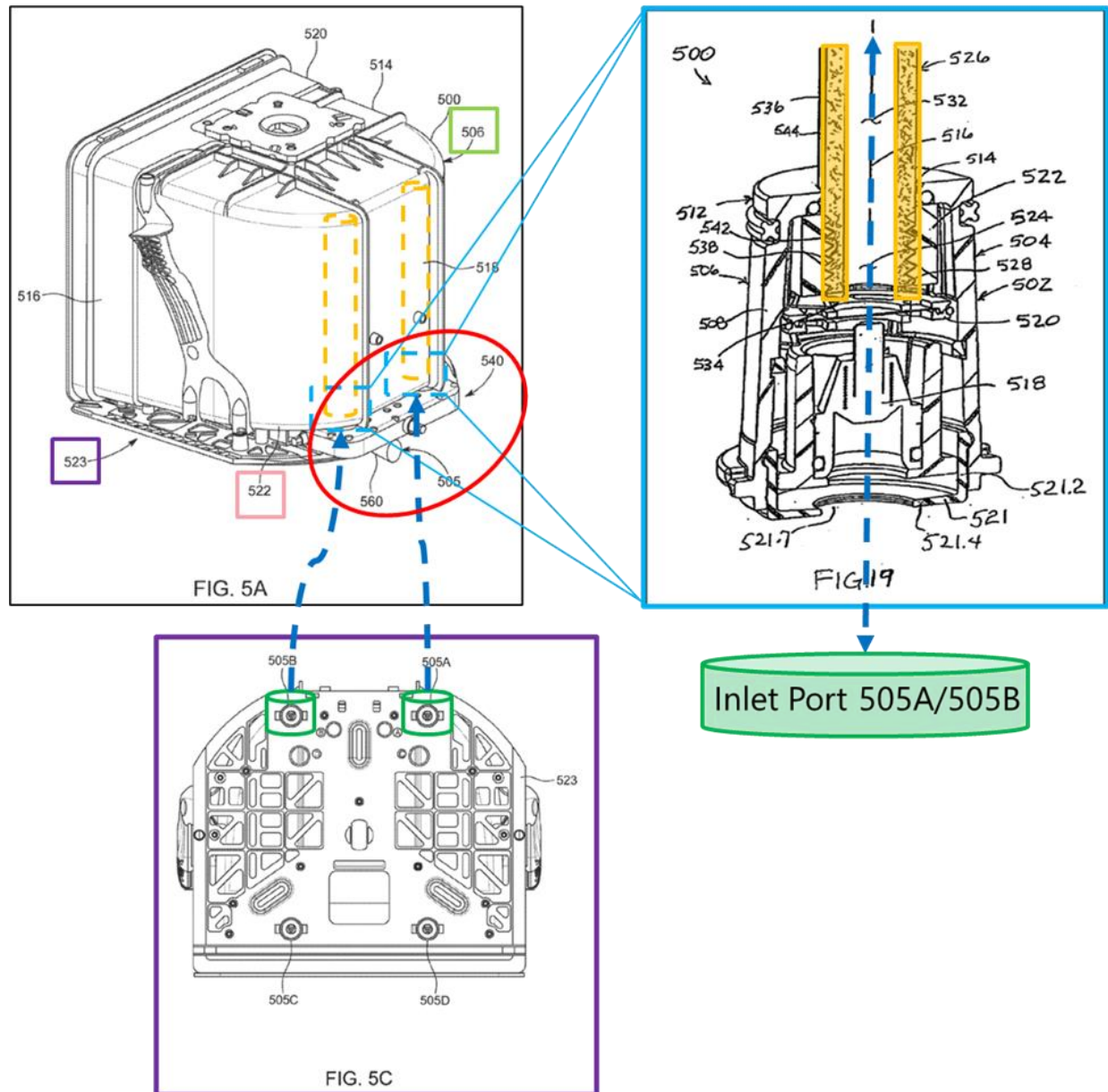
Ex1008, Fig. 4A (annotated); Ex1006 ¶¶209-210.

d. 1[a][3]

The Combined Smith Distribution System discloses limitation 1[a][3]. As shown below, the Combined Smith Distribution System has *the buffering gas chamber* [e.g., purge flow distribution system 540 with manifold base 560 (red) from Smith '154] *having at least one gas intake channel* [e.g., inlet supply ports 505A or 505B (green)], *the gas intake channel, the buffering gas chamber, the through channel* [e.g., flow path along center axis 516 (blue dashed line on right, below) in Smith '517] *and the accommodating space* [e.g., interior of the container shell

506/406] *communicate with one another*. §§VIII.C.1, VIII.C.2.b-VIII.C.2.c; Ex1006 ¶¶211-213.

Combined Smith Distribution System



Ex1008, Figs. 5A, 5C (annotated); Ex1011, Fig. 19 (annotated); Ex1006 ¶¶211.

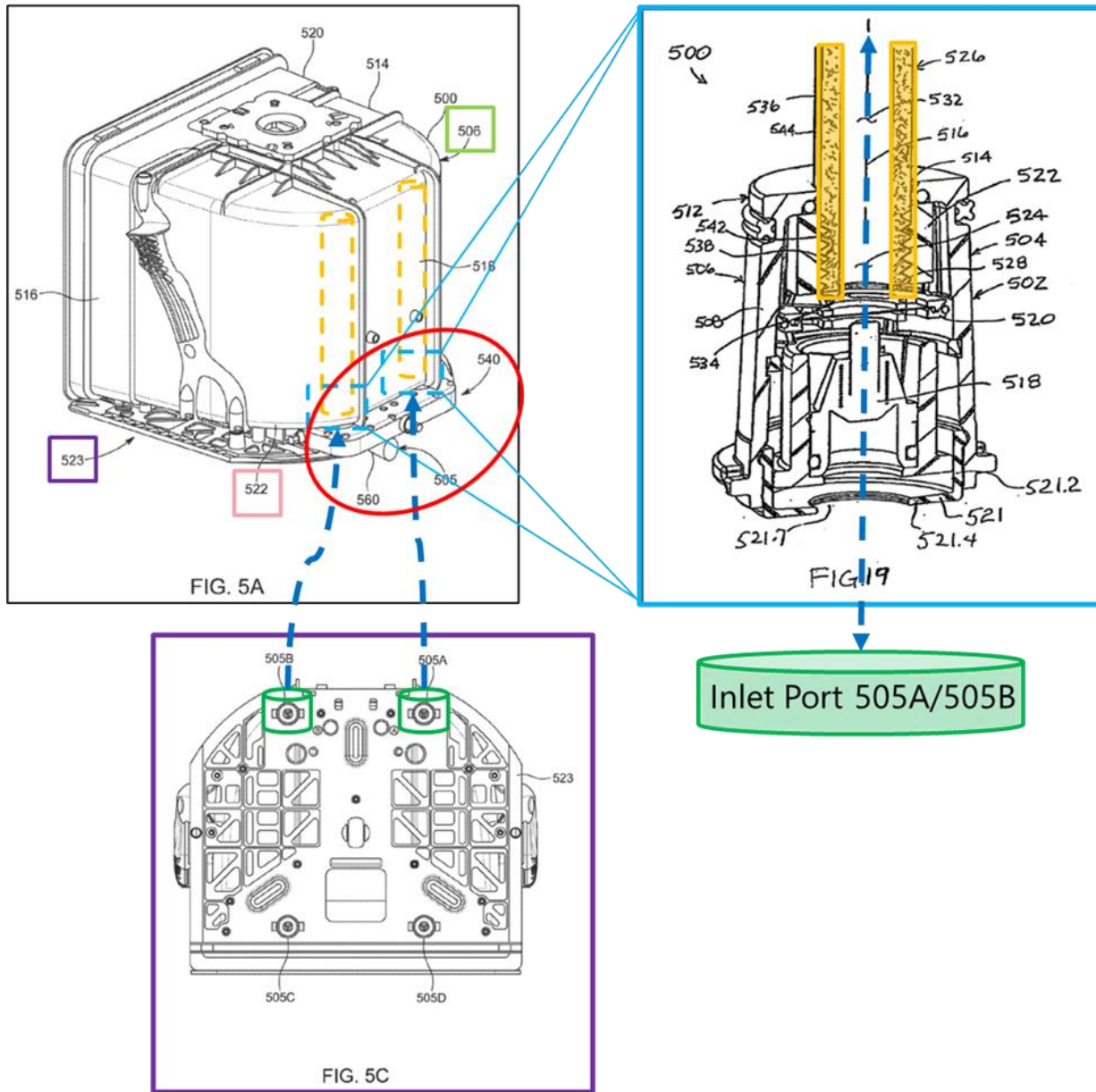
For example, inlet ports 505A and 505B are gas intake channels to the purge flow distribution system 540. As Smith '154 describes, “[t]he purge flow distribution system 540 is connected to at least one inlet port 505 that is connected to a purge gas supply system for supplying the purge gas to the network of separate gas distributing devices.” Ex1008 ¶49; *see also id.* ¶53; Ex1006 ¶212. And the inlet ports 505A and 505B (green), purge flow distribution system 540, flow path along center axis 516 in Smith '517 (blue dashed line), and interior of the container shell 506 all communicate with each other. Indeed, the design of the Combined Smith Distribution System is intended to allow purge gas to flow from the inlet ports 505A and 505B receiving purge gas, through the coupling structure 522, to the tubular diffusers, to efficiently introduce purge gas to the interior of the container. Ex1006 ¶¶212-213. In addition, Smith '154 specifically describes that “[t]he manifold base 560 includes a first flow path 560A...and a second flow path 560B connected to inlet purge port(s)” to allow communications to different tubular diffusers. Ex1008 ¶50, Figs. 3A-3C; Ex1006 ¶213.

e. 1[b][1]

The Combined Smith Distribution System discloses limitation 1[b][1]. As shown below, the Combined Smith Distribution System has *at least one porous tube, having a longitudinal space, the porous tube installed to the coupling structure of the wafer container* [e.g., tubular diffusers 450A/450B or 550A/550B extending the

height of the container (orange) connected to coupling 522 (light blue)]. Ex1006 ¶214; §§VIII.C.1, VIII.C.2.c-VIII.C.2.d. Moreover, as described in §VIII.C.1 and VIII.C.2.b, *the longitudinal space of the porous tube communicating with the buffering gas chamber* [e.g., purge flow distribution system 540 with manifold base 560 (red) from Smith '154], *the buffering gas chamber providing a gas to pass through the porous tubes and enter an accommodating space* [e.g., interior of container shell 506/406]. Ex1006 ¶¶214-215; §§VIII.C.1, VIII.C.2.b.

Combined Smith Distribution System



Ex1008, Figs. 5A, 5C (annotated); Ex1011, Fig. 19 (annotated); Ex1006 ¶214.

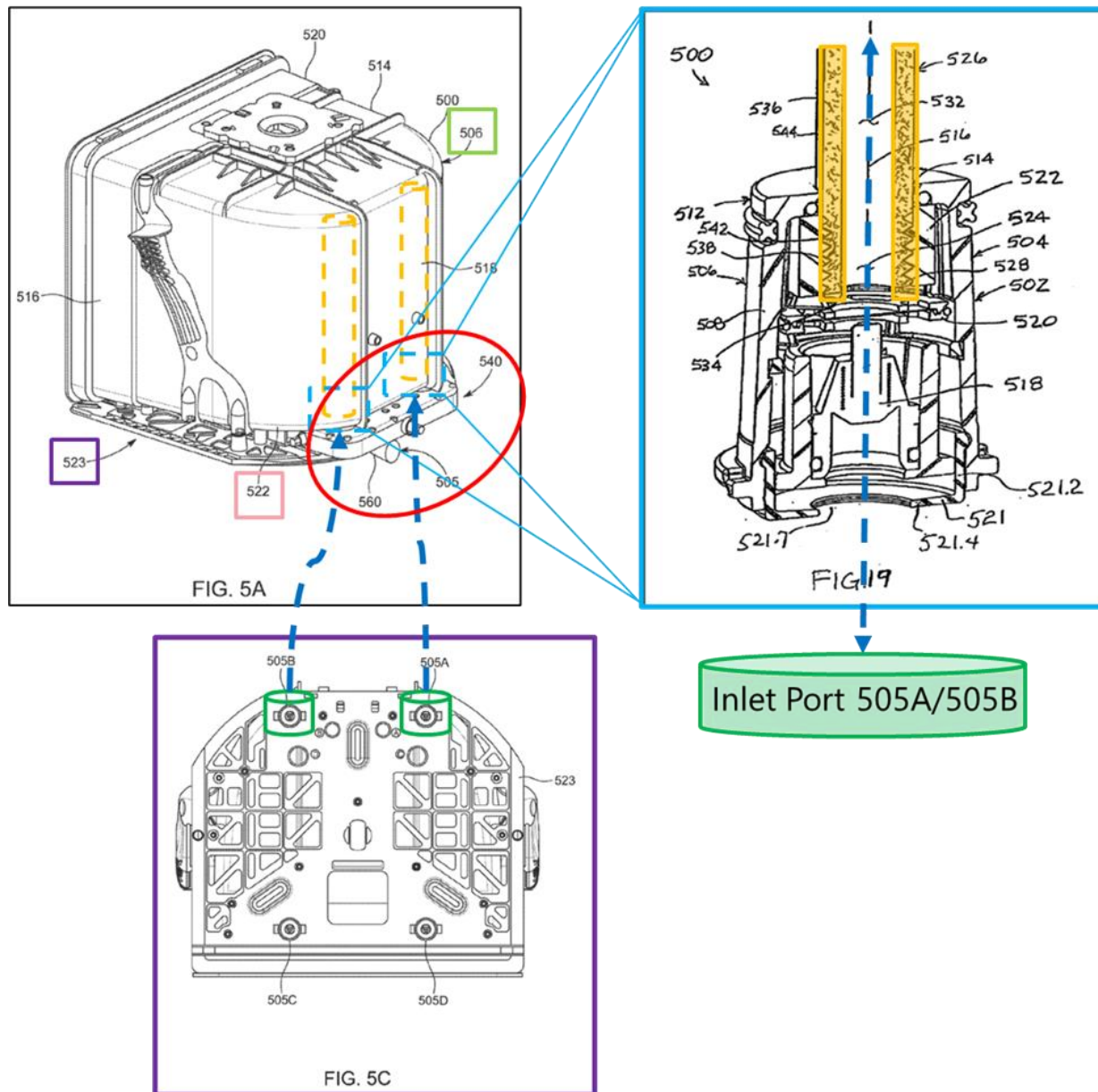
For example, as previously discussed, Smith '154 teaches a purge flow distribution system 540, with manifold base 560, that includes a plurality of flow paths connected to inlet purge port(s). Ex1008 ¶50; Ex1006 ¶215; §§VIII.A.1.c,

VIII.C.1. Smith '154 also teaches “two diffusers 450A, 450B which include a plurality of openings for distributing the purge gas” into the interior of the container. Ex1008 ¶¶33, 46, 50; Ex1006 ¶215. The two porous diffusers (orange) are shown as tubes in the figures of Smith '154. *e.g.*, Ex1008, Fig. 4A.

f. 1[b][2]

The Combined Smith Distribution System discloses limitation 1[b][2]. For example, in the Combined Smith Distribution System, shown below, the *gas intake* [*e.g.*, inlet supply ports 505A or 505B, green] has a *center axis of the gas* [*e.g.*, center axis of inlet supply ports 505A or 505B] *and a center axis of the coupling structure* [*e.g.*, center axis of 522 coupling in Smith '517, light blue]. Ex1006 ¶¶216-218; §VIII.C.1. Moreover, the two center axes are *coaxial* [*e.g.*, concentric with the central axis 516 (blue dashed line on right, below)]. §VIII.C.1.

Combined Smith Distribution System



Ex1008, Figs. 5A, 5C (annotated); Ex1011, Fig. 19 (annotated); Ex1006 ¶216.

For example, as discussed, Smith '517 teaches that check valve 518 and coupling 522 are “concentric with the central axis 516” [*e.g., coaxial*] (blue dashed line on right, above), and a POSITA would have been motivated to align these

structures coaxially by the teachings of Smith '154, Smith '517, and the knowledge of a POSITA, with a reasonable expectation of success. Ex1006 ¶¶217-218; §VIII.C.1; Ex1011, 16:28-58, Fig. 19.

3. Claim 1 Dependents

a. Claim 2

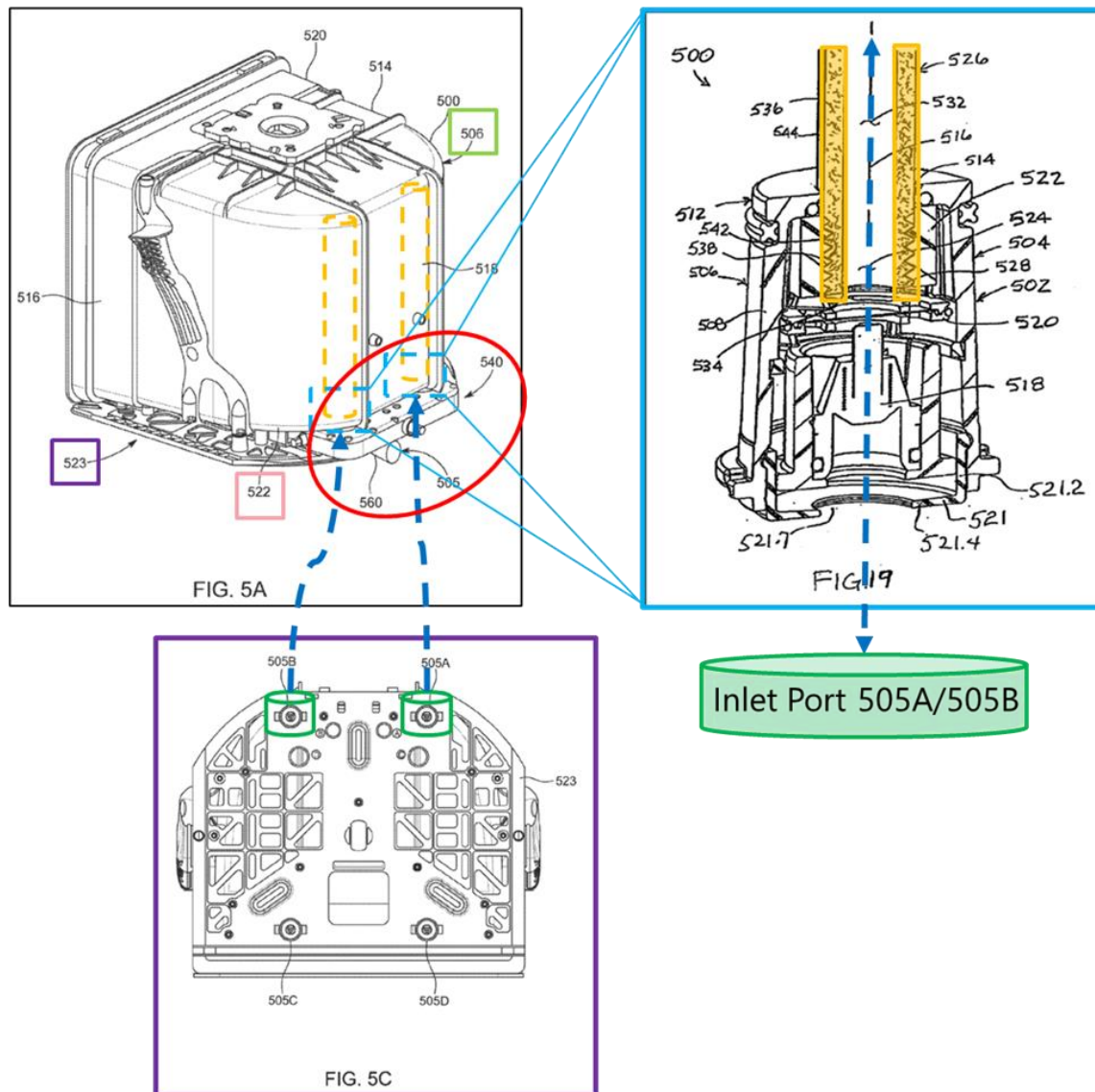
The Combined Smith Distribution System discloses claim 2. For example, as described in §VIII.C.1 and §VIII.C.2, the Combined Smith Distribution System has:

- *the coupling structure formed as extending from the bottom portion of the wafer container [e.g., a coupling 522 from Smith '517, light blue box below, extending from bottom wall 422/522 from Smith '154 of the wafer container].* Ex1006 ¶¶208-210; §VIII.C.2.c.
- *an open end of the porous tube has a center axis and the longitudinal space of the porous tube has a center axis [e.g., open ends and longitudinal space of tubular diffusers 450A/450B or 550A/550B (orange) have a center axis 516].* Each tubular diffuser has an open end and an elongated space extending into the container for distributing gas interior to the container, as shown below. *See also* Ex1011, 16:64-66 (describing opening 534 at proximal end 528); Ex1008 ¶46 (describing flow through inlet ports into open end of tubular diffusers); Ex1006 ¶219. As described in §VIII.C.1 and shown below, the openings and elongated portions of each tubular diffuser are centered about

axis 516 (blue dashed line on right, below). Ex1006 ¶¶189-193.

- *the center axis of the coupling structure the center axis of the open end of the porous tube and the gas intake [e.g., inlet supply port(s) 505A and B] center axis are coaxial [e.g., concentric about the central axis 516]. As described in §VIII.C.1 and shown below, inlet supply port(s) 505A and 505B are also concentric about central axis 516. Ex1006 ¶¶189-193; see also id. ¶¶178-202.*

Combined Smith Distribution System



Ex1008, Figs. 5A, 5C (annotated); Ex1011, Fig. 19 (annotated); Ex1006 ¶219.

b. Claim 3

The Combined Smith Distribution System renders obvious claim 3. As described in §VIII.C.1, the Combined Smith Distribution System has:

- *the coupling structure is formed as extending from the bottom portion of the*

wafer container, an open end of the porous tube has a center axis, and the longitudinal space of the porous tube has a center axis, for the reasons described for claim 2. §VIII.C.3.a; Ex1006 ¶¶219-220.

- *the center axis of the coupling structure, the center axis of the open end of the porous tube and the gas intake center axis are coaxial, for the reasons described in claim 2. §VIII.C.3.a; Ex1006 ¶¶219-220.*

Regarding the requirement of claim 3 that the center axis of the longitudinal space of the porous tube is offset from the center axis of the coupling structure, the center axis of the open end of the porous tube and the gas intake center axis, the Combined Smith Distribution System does not expressly disclose a configuration in which the opening of the porous tube and coupling structure are coaxial but the longitudinal space of the porous tube is offset, but that configuration would have been obvious to a POSITA. Ex1006 ¶¶221.

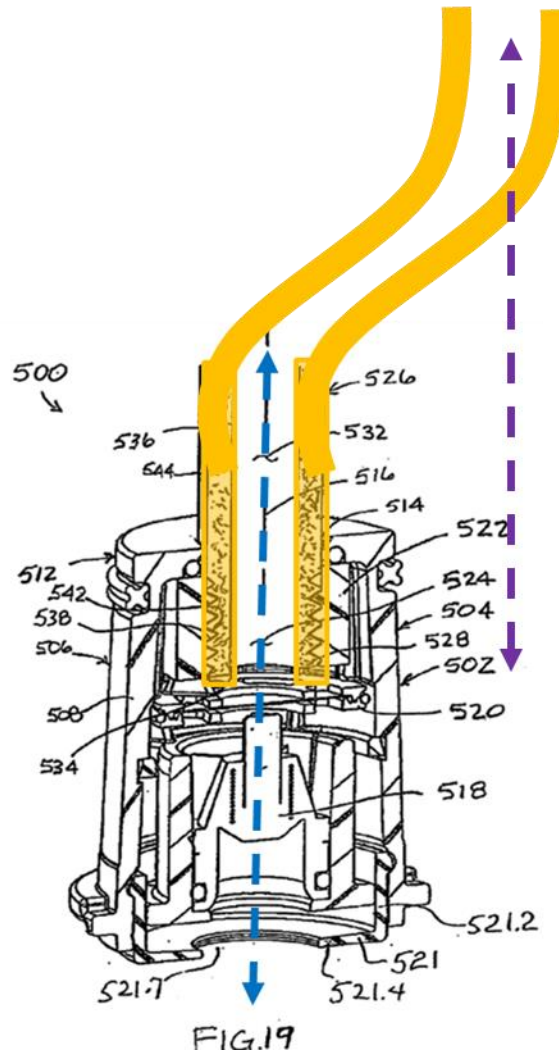
As described in the '711 Patent, this configuration may be met by an asymmetric tubular diffuser that extends radially in one direction more than the other. *See* Ex1001, 16:9-27, Fig. 21C; Ex1006 ¶222. A POSITA would similarly have understood that this configuration would be achieved by including, for example, a porous tube with an elbow bend or an s-curve. Both of these options would necessitate that the axis of the open end be off-center of the longitudinal axis inside the tube. Ex1006 ¶222.

As a general matter, a POSITA would have understood that there were a finite set of predictable shapes and alignments of the porous tubes in a wafer container, and any particular alignment would have been determined in part by the space available inside the container. Ex1006 ¶223. A POSITA, for example, would have been aware of the exclusion zone, or exclusion volume, inside the container that must be reserved for the wafers, *e.g.*, Ex1017, 1, 3, 9, 16; Ex1021, 3:3-12, which would have motivated a particular shape and alignment of porous tubes for a given container. Ex1006 ¶223. A POSITA would have known that, when retrofitting components to an existing shell, any known shape (such as a porous tube with an elbow-bend or s-curve) could have been used to meet the specific constraints of the current project and thus would have been motivated to use the alignment that was most applicable to the current project. Ex1006 ¶223.

Here, a POSITA would have been motivated to use an asymmetric diffuser when retrofitting a wafer container to maximize the internal space inside the container and satisfy the structure and design needs of any particular wafer container, such as avoiding the exclusion zone. Ex1006 ¶224, §IV.A; *see* Ex1017; Ex1021, 3:3-12. A POSITA would have in fact been motivated by both Smith '154 and Smith '517 to use such an asymmetric diffuser. Ex1006 ¶224. For example, Smith '154 discloses the need for a flow path to extend up a rear wall and bend across a top wall of a wafer container, to distribute gas at the front of the container.

Ex1008 ¶46; Ex1006 ¶¶221-227. Smith '517 also discloses that a tubular diffuser can be offset from a coupling and that the internal space of the porous media diffuser, termed the “central passageway” “can define a second axis [] that is substantially parallel to...[and] is radially offset from the first axis.” Ex1011, 14:53-56; Ex1006 ¶224. In this regard, Smith '517 discloses that a coupling and tubular diffuser has separate axes: first axis 436, second axis 438, and aperture axis 409 defined by axial aperture 408 that is point at which gas enters the open end of the porous tube. Ex1011, 14:5-8, 14:49-55, Fig. 16B; Ex1006 ¶224.

A POSITA would thus have recognized that the Combined Smith Distribution System would have accommodated a tubular diffuser that had two axes—one at its opening (blue dotted line) and one offset and remote from the opening (purple dotted line), as shown below. Ex1006 ¶¶225-227. Such an alignment would have satisfied the desire of Smith '154 to extend along the rear wall of the wafer container, and would have fit within the constraints of Smith '154. Ex1006 ¶¶225-227; *see, e.g.*, Ex1008, Figs. 4A-4B.



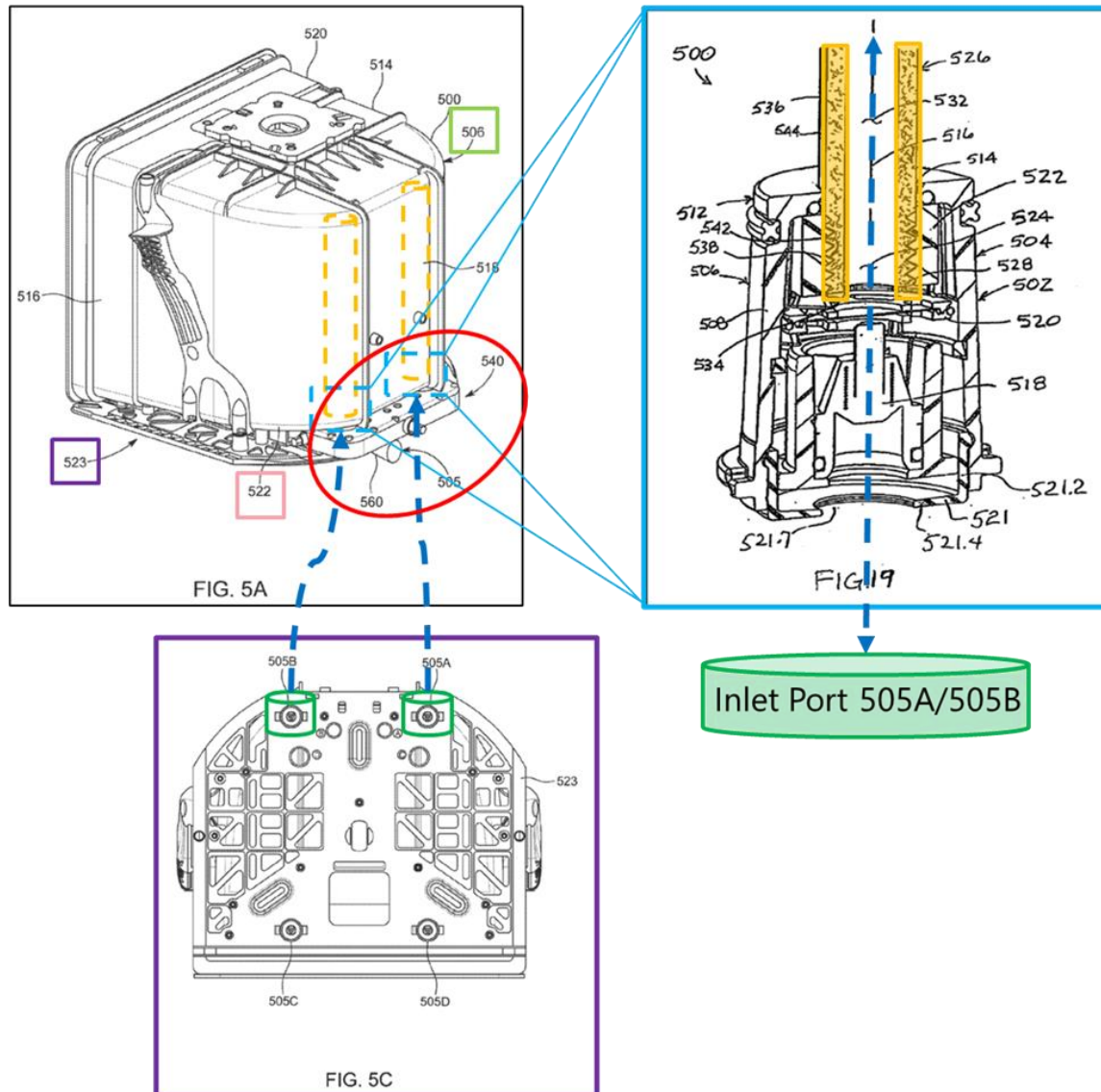
Ex1011, Fig. 19 (modified and annotated); Ex1006 ¶227.

c. Claim 4

The Combined Smith Distribution System discloses Claim 4. For example, the Combined Smith Distribution System has *the longitudinal space of the porous tube has an open end, and the open end receives the corresponding coupling structure so that the gas enters the longitudinal space by passing through the buffering gas chamber and the open end* for the reasons described for claim 2.

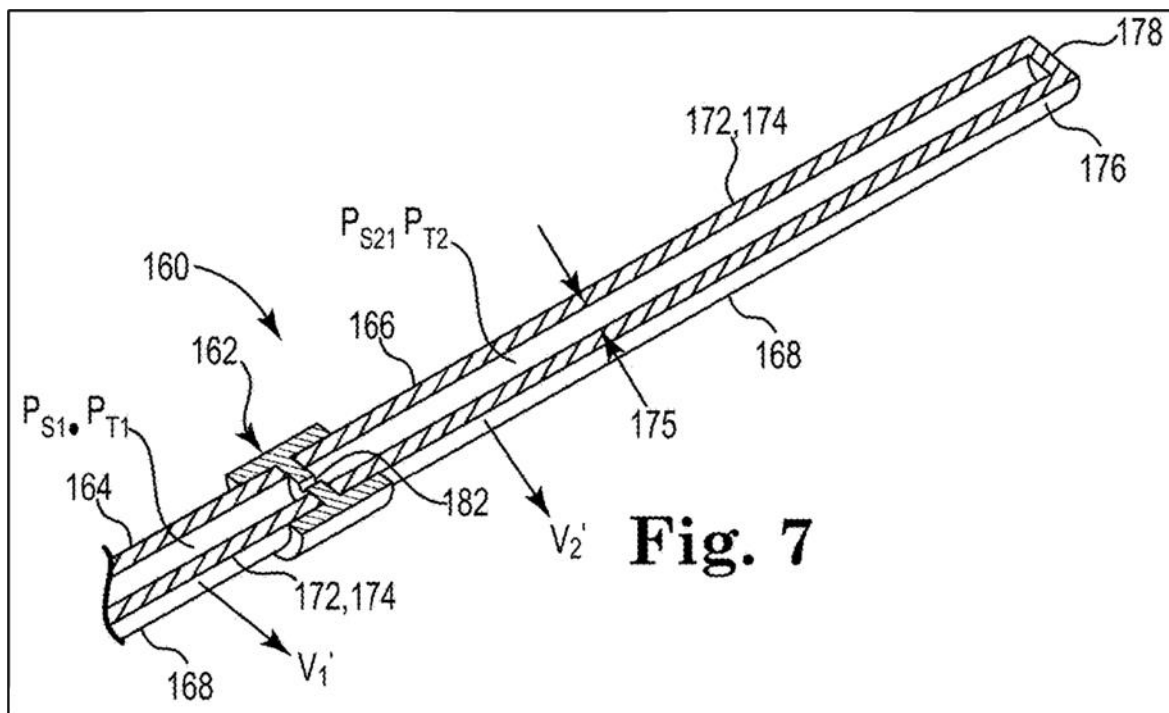
Ex1006 ¶¶228-229; §VIII.C.1. As shown below, the purge flow distribution system 540 (red) distributes purge gas to the coupling structures (light blue) into the longitudinal space of the tubular diffusers (orange).

Combined Smith Distribution System



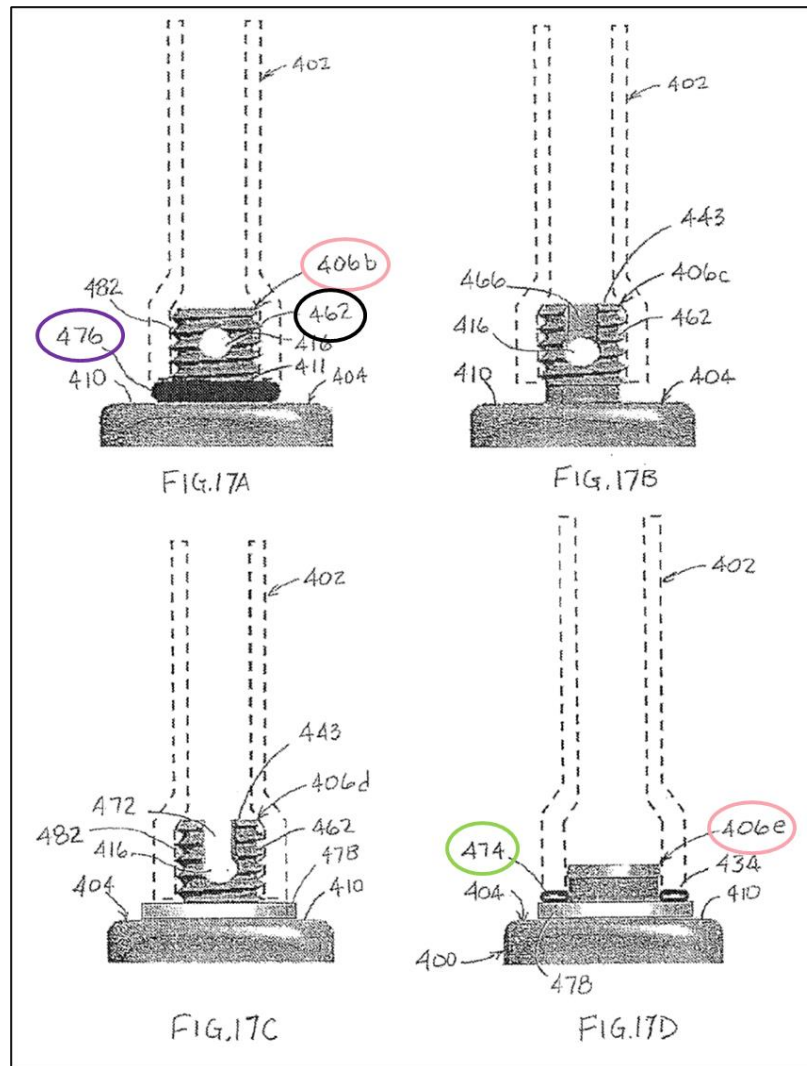
Ex1008, Figs. 5A, 5C (annotated); Ex1011, Fig. 19 (annotated); Ex1006 ¶228.

Regarding the requirement of claim 4 *that the longitudinal space of the porous tube has a closed end*, as shown in Figure 7, Smith '517 describes a “blind end 178” that can be “solid and impermeable,” i.e., closed. Ex1011, 8:49-58; Ex1006 ¶229. A POSITA would have been motivated to use such a tube with the buffering gas chamber and container in the Combined Smith Distribution System, with a reasonable expectation of success. Ex1006 ¶229. Indeed, Smith '154 already teaches that a tubular diffuser would have a closed end, for example, if the tubular diffuser is intended to distribute gas in a rear portion of a container. Ex1008 ¶46; Ex1006 ¶229. In this configuration, the tubular diffuser has a “plurality of openings arranged along” its length but a closed end to ensure that the gas is distributed to the wafers in the interior of the container. *See* Ex1008 ¶36; Ex1006 ¶229.



e. Claim 6

The Combined Smith Distribution System renders obvious claim 6. As shown in Figure 17A-D from Smith '517, it would have been obvious for the tubular diffuser to have *a first collar [e.g., nipple 406b-e], arranged in the open end [e.g., open end of tubular diffusers], the first collar located between the open end and the coupling structure [e.g., coupling 522]*. For example, the Combined Smith Distribution System includes coupling 522 from Smith '517's Figure 19, and it would have been obvious that this coupling structure can be implemented with a variety of known coupling mechanisms such as those depicted in Figures 17A-17D (below). Ex1011, 15:7-31, Figs. 17A-17D; Ex1006 ¶231; §VIII.C.1. The coupling mechanism in Figures 17A and 17D include nipple 406b-e, which is *in the open end* of the tubular diffuser and would be *located between the open end and the coupling structure*—i.e., the portion of coupling 522 connecting to intake valve 518. See Ex1011, Fig. 19; Ex1006 ¶231; §VIII.C.1.



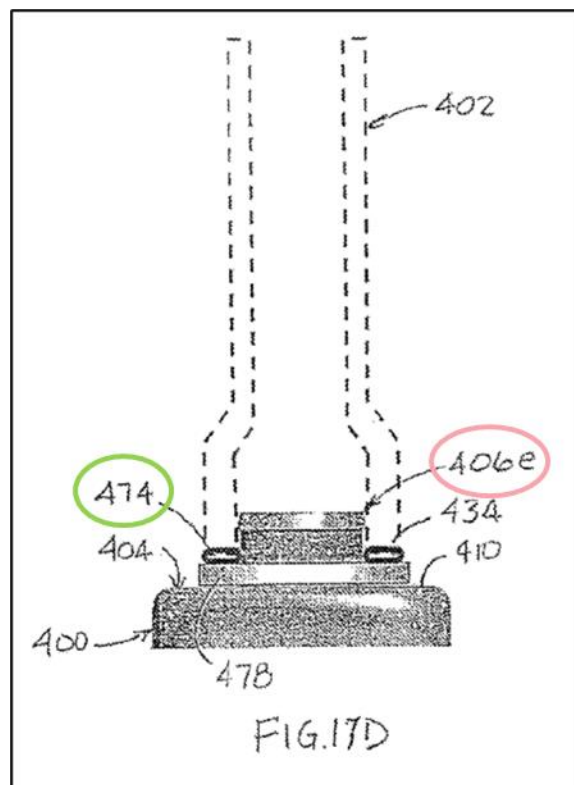
Ex1011, Figs. 17A-D (annotated); Ex1006 ¶231.

A POSITA would have known that the teachings of Figures 17A-D are interchangeable methods for coupling to the porous diffuser. Ex1006 ¶¶184-185. And, when retrofitting, a POSITA would have been motivated, with a reasonable expectation of success, to select the most applicable coupling structure. Ex1006 ¶¶184-185. For example, Figure 19's coupling 522 with internal threads 538 could be replaced with the external threads and O-ring of Figure 17A. Ex1006 ¶¶184-185.

This may have been required in situations where the porous diffuser lacks the matching external threads 542 and has internal threads instead. Alternatively, the short nipple and weld joint of Figure 17D may have been required by applications where the porous diffuser does not have any threads at all. Ex1006 ¶¶184-185.

f. Claim 7

The Combined Smith Distribution System discloses claim 7. For example, it would have been obvious for the Combined Smith Distribution System to have a *second collar* [e.g., weld joint 474 (light green)], *located between the first collar* [e.g., nipple 406e (pink)] *and the coupling structure* [e.g., coupling 522] *when the second collar is disposed on the coupling structure so as to reinforce airtightness*. Ex1006 ¶¶232-233; §§VIII.C.1, VIII.C.3.e.

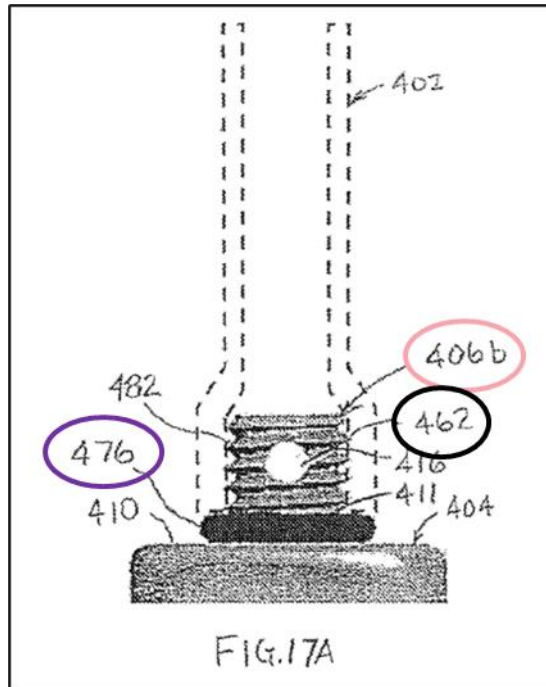


Ex1011, Fig. 17D (annotated); Ex1006 ¶232.

It would have been obvious for the Combined Smith Distribution System to implement the coupling structure in Figure 17D. Ex1006 ¶233; §§VIII.C.1, VIII.C.3.e. Figure 17D further discloses a “weld joint 474 [*e.g., second collar*] disposed between the proximal end 434 [*e.g., open end*]” of *the porous tube*, nipple 406e (pink), and the remainder of the *coupling structure*—i.e., the portion of coupling 522 connecting to intake valve 518. Ex1011, 15:29-31, Fig. 17D; Ex1006 ¶233. A POSITA would have understood that the welding structure reinforces *airtightness* and security of the coupling. Ex1006 ¶¶233.

g. Claim 8

The Combined Smith Distribution System discloses claim 8. For example, it would have been obvious for the Combined Smith Distribution System to have *a material* [*e.g., O-ring 476 (purple)*] of *the first collar* [*e.g., nipple 406b (pink)*] that *is softer than a material of the porous tube to prevent breaking of the open end*. Ex1006 ¶¶234-237; §§VIII.C.1, VIII.C.3.e.



Ex1011, Fig. 17A (annotated); Ex1006 ¶234.

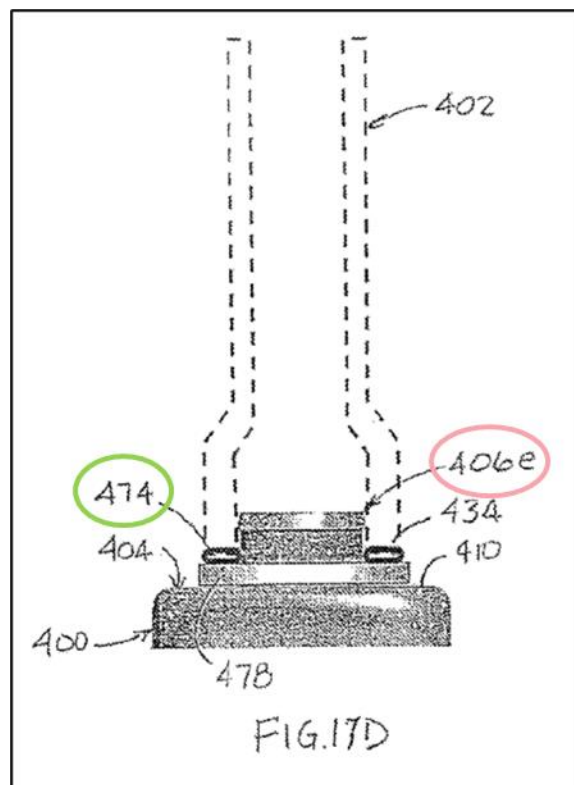
As described in §VIII.C.1, and §VIII.C.3.e, it would have been obvious for the Combined Smith Distribution System to implement the coupling structure in Figure 17A. Ex1006 ¶235; §§VIII.C.1, VIII.C.3.e. For example, it would have been obvious to a POSITA that the connection would include “O-ring 476 mounted at the base of the nipple 406b” [*e.g., first collar*]. Ex1011, 16:16-18. This may have been required in situations where the porous diffuser lacks the matching external threads and has internal threads instead. Ex1006 ¶235.

Additionally, it would also have been obvious to a POSITA based on the disclosures of Smith '517 that an O-ring is made of a softer material than the material used for the *porous tube*. Ex1006 ¶236. Indeed, Smith '517 explains that “O-ring 476 can also be compressed between the proximal end 434” of *the porous tubes* and

the coupling structure. Ex1011, 16:18-24; Ex1006 ¶236. A POSITA would have understood that compressibility indicates that the compressed material (*e.g.*, the O-ring) is softer than the material doing the compressing (*e.g.*, the porous tube and coupling structure). Ex1006 ¶236. Further, a POSITA would have known that a softer material such as bronze, or even an O-ring are typically used at one end of a fitting to ensure a better seal. Ex1006 ¶¶236-237.

h. Claim 9

The Combined Smith Distribution System discloses claim 9. For example, it would have been obvious for the Combined Smith Distribution System to have *a second collar [e.g., weld joint 474] that bonds to the open end of the porous tube*. Ex1011, 15:29-31, Fig. 17D. Ex1006 ¶238; §§VIII.C.1, VIII.C.3.f.



Ex1011, Fig. 17D; Ex1006 ¶238.

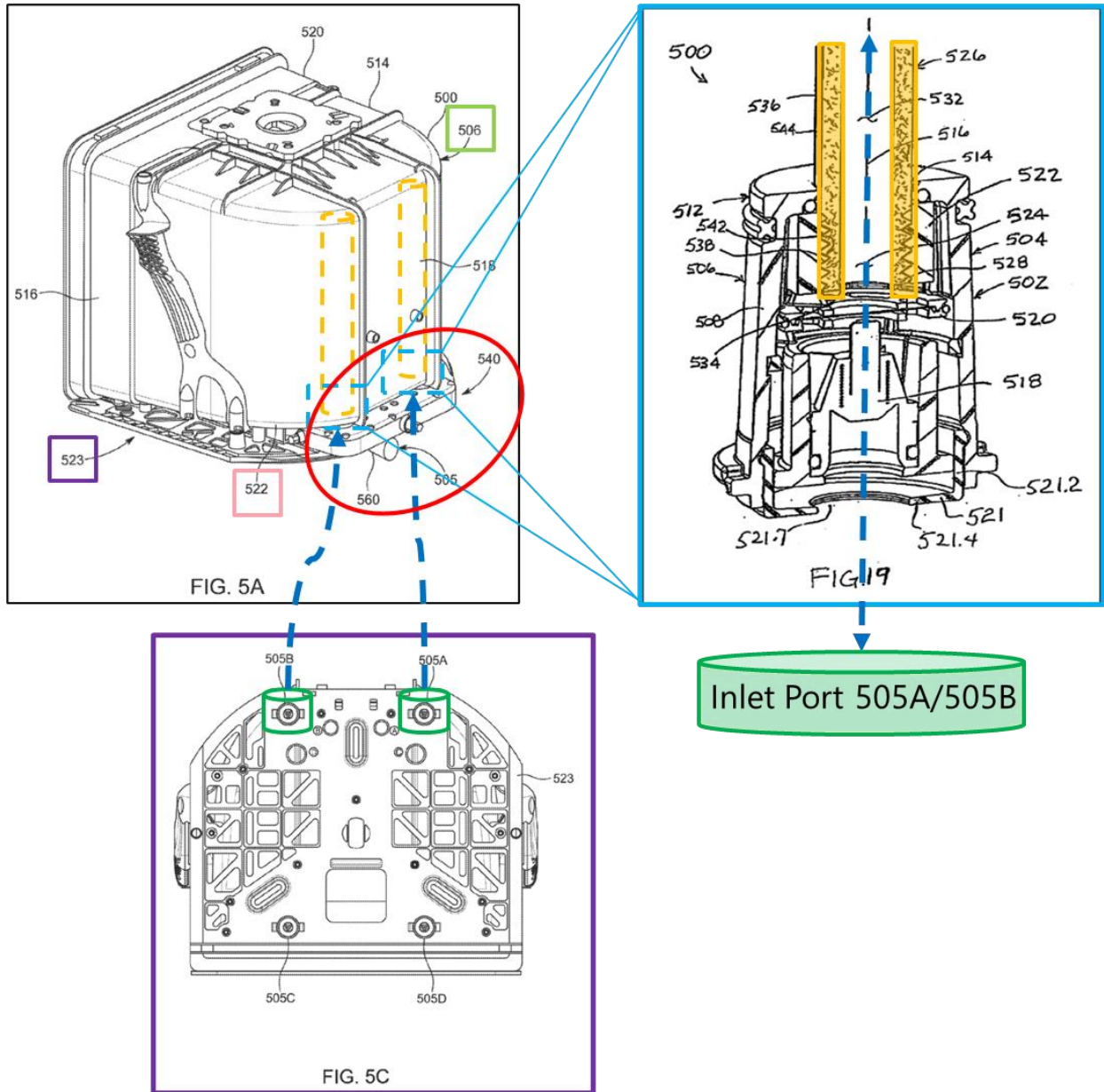
i. Claim 12

The Combined Smith Distribution System discloses claim 12. Ex1006 ¶239; §§VIII.C.1, VIII.C.2. For example, the Combined Smith Distribution System has:

- *at least one gas intake channel [e.g., inlet supply ports 505A or 505B (green)] communicatively coupled to the buffering gas chamber [e.g., purge flow distribution system 540 with manifold base 560 (red)].* Ex1006 ¶¶211-213; §VIII.C.2.d.
- *the gas intake module [e.g., inlet supply ports 505A or 505B, green] having the gas intake center axis [e.g., concentric with the central axis 516 (blue dashed line on right, below)].* Ex1006 ¶¶216-218; §VIII.C.2.f.
- The gas intake *suppl[ies] the gas in one single gas intake direction to pass through the gas intake channel and enter the buffering gas chamber.* For example, Smith '154 describes the gas intake channels as “inlet” ports connected to the purge flow distribution system 540. Ex1008 ¶53; Ex1006 ¶¶135-137. Based on the configuration of inlet supply ports 505A/B (green), a POSITA would have understood that the most efficient means of supplying gas from *the gas intake module* would be to pass *through the gas intake channel and enter the buffering gas chamber in one single air intake direction* because it entails using the same structure disclosed by Smith '154 without

the need for additional piping or other connections between the gas intake module and the buffering gas chamber. §VIII.A.1.c; Ex1008 ¶53; Ex1006 ¶¶135-137.

Combined Smith Distribution System



Ex1008, Figs. 5A, 5C (annotated); Ex1011, Fig. 19 (annotated); Ex1006 ¶239.

4. Independent Claim 13

a. 13[pre]

To the extent the preamble is limiting, the Combined Smith Distribution System renders limitation 13[pre] obvious for the reasons discussed for limitation 1[pre]. §VIII.C.2.a; Ex1006 ¶240.

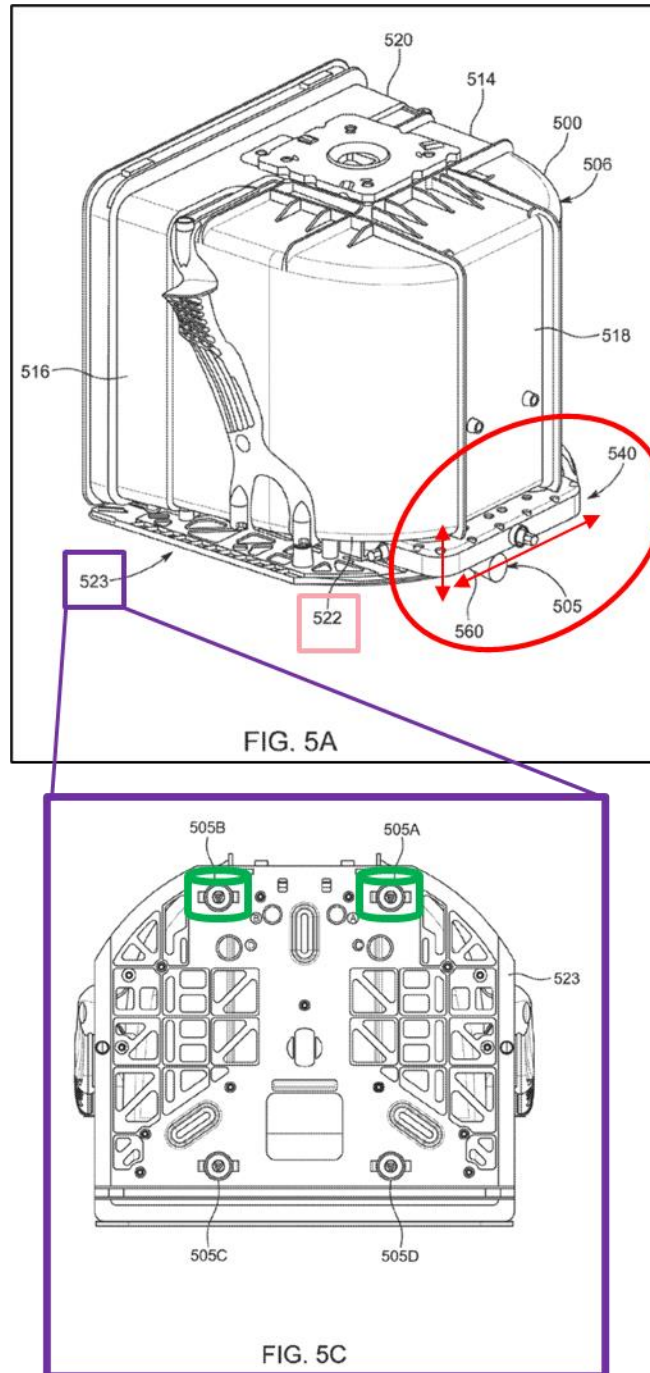
b. 13[a][1]-13[a][3]

The Combined Smith Distribution System discloses limitations 13[a][1]-[3]. Limitations 13[a][1]-[3] are nearly identical to limitations 1[a][1]-[3], with the exceptions of the term “a gas cartridge” and the disclosure of a second coupling structure. As discussed, the Combined Smith Distribution System discloses limitation 1[a][1]-[3] as well as a second coupling structure. §§VIII.C.2.b-VIII.C.2.d; Ex1006 ¶¶241-244.

As discussed for Grounds 1-2, the purge flow distribution system 540 in Smith '154 is a “gas cartridge.” Ex1006 ¶¶139-142; §VIII.A.2.b. As shown below, it is a buffering gas chamber, with a structure having a sidewall between a bottom portion of shell 522 and bottom portion of buffering gas chamber 540. Ex1006 ¶¶242-243. This is consistent with the description of a “gas cartridge” in the '711 Patent. *See* Ex1001, 13:49-52; Ex1006 ¶¶242-243. The bottom portion of the purge flow distribution system 540 also has gas intake channels formed thereon. *See, e.g.*, Ex1008 ¶49; Ex1006 ¶¶242-243. For example, as shown in Figure 5C above, gas

intake channels supply purge gas to the manifold 560 of the gas cartridge 540.

Ex1008 ¶53; Ex1006 ¶¶242-243.



Ex1008, Figs. 5A, 5C (annotated); Ex1006 ¶241.

To the extent PO argues that a gas cartridge must be detachable, that would also have been obvious. Ex1006 ¶¶242-244. The Combined Smith Distribution System implements a retrofitting kit. §VIII.C.1; Ex1006 ¶¶242-244. The retrofitted gas cartridge would be easy to install in a detachable manner as it could not, by definition, be a molded portion of the container. Ex1006 ¶¶242-244. Further, a POSITA would have constructed separate structures attached to a wafer container, such as purge flow distribution system 540, as detachable elements for maintenance, replacement, and cleaning. Ex1006 ¶¶242-244.

The benefits and implementation of detachable elements were well known in the art by 2021. Ex1006 ¶¶242-244. For example, Eggum, which also describes a wafer container and is analogous art to the '711 Patent and Smith '154, specifically discloses a detachable base. Ex1013, (54), Abstract; Ex1006 ¶¶242-244. Eggum discloses that this connectivity enables a “removable purge module.” Ex1013, (54), Abstract; Ex1006 ¶¶242-244. A POSITA would have been motivated to use the same teachings and connectors with the purge flow distribution system of Smith '154, with a reasonable expectation of success, using the same threaded connector mechanism. Ex1006 ¶¶242-244.

c. 13[b]

The Combined Smith Distribution System discloses limitation 13[b] for the reasons discussed for limitation 1[b][1]. §§VIII.C.1; VIII.C.2.e; Ex1006 ¶245.

5. Claim 13 Dependents

a. Claim 14

The Combined Smith Distribution System discloses claim 14 for the reasons discussed for claim 13 and claim 2. §VIII.C.3.a; Ex1006 ¶¶219, 240-245. Claim 14 is similar to claim 2, except claim 14 requires multiple coupling structures with through channels, each of which is coaxial with the center axis of the open ends and the longitudinal space and the center axis of the gas intake. As described above, the Combined Smith Distribution System has multiple couplings with through channels, and each is coaxial with the claimed elements. §§VIII.C.1; VIII.C.3.a; Ex1006 ¶246.

b. Claim 15

The Combined Smith Distribution System renders obvious claim 15 for the reasons discussed for claim 13 and claim 3. §VIII.C.3.b; Ex1006 ¶¶220, 240-245. Claim 15 is similar to claim 3, except claim 15 requires multiple coupling structures with through channels, each of which is coaxial with the center axis of the open ends and the center axis of the gas intake, but offset from the longitudinal space. As described above, the Combined Smith Distribution System has multiple couplings with through channels, and it would have been obvious to further modify it to have the configuration of claim 15. §VIII.C.1; VIII.C.3.b; Ex1006 ¶247.

c. Claim 16

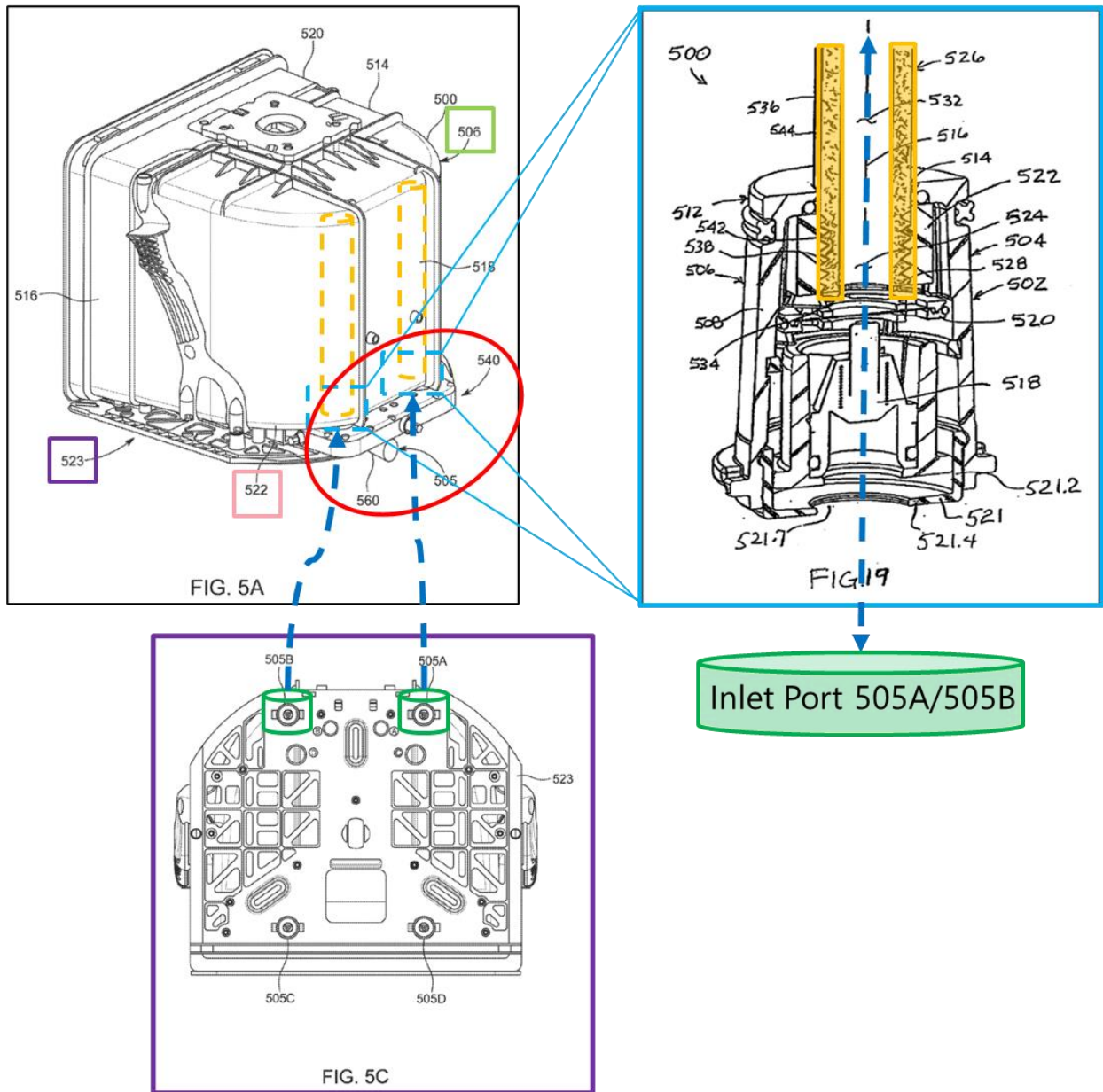
The Combined Smith Distribution System renders obvious claim 16. For example, the Combined Smith Distribution System has:

- *at least two coupling structures are formed as extending from the bottom portion of the wafer container, an open end of the longitudinal space of each of the porous tubes has a center axis, and the longitudinal space of each of the porous tube has a center axis; the center axis of each of the through channels, the center axis of the open end of each of the porous tubes, and the center axis of the longitudinal space of each of the porous tubes are coaxial, for the same reasons as claim 14. Ex1006 ¶248; §VIII.C.5.a.*

Regarding the requirement of claim 16 that a position of a gas intake center axis along which the gas passes is offset from the center axis of the through channel, the center axis of the open end and the center axis of the longitudinal space that are coaxial, the Combined Smith Distribution System does not expressly disclose a configuration in which the gas intake center axis is offset from the center axis of the through channel and open space/longitudinal space of the diffuser. Ex1006 ¶249. But that configuration would have been obvious to a POSITA. Ex1006 ¶249.

The claimed configuration would be met by the Combined Smith Distribution System if elements 505A and 505B (below green) were radially offset slightly from their locations shown below in any direction. Ex1006 ¶250.

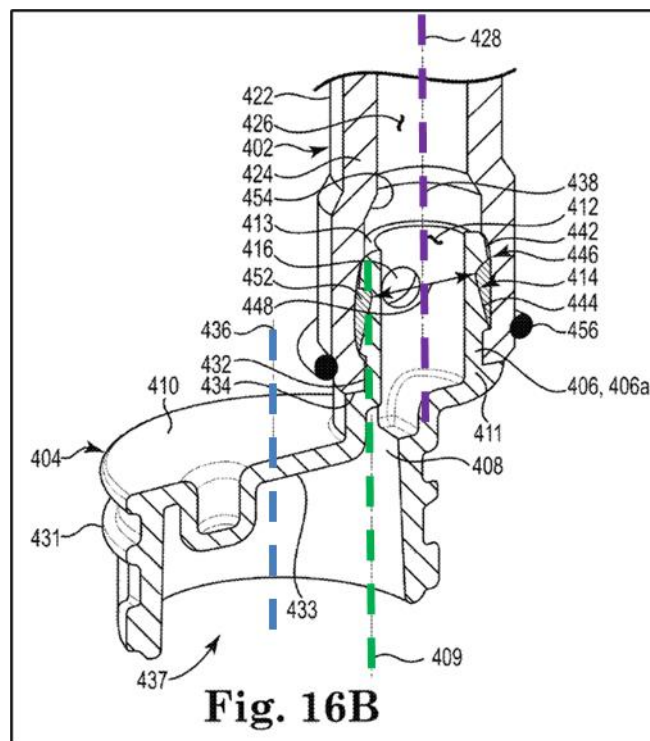
Combined Smith Distribution System



Ex1008, Figs. 5A, 5C (annotated); Ex1011, Fig. 19 (annotated); Ex1006 ¶250.

A POSITA would have been motivated to implement such an offset when retrofitting a wafer container to add a purge flow distribution system, as described in this Ground. Ex1006 ¶251. For example, the alignment of elements in a wafer

container is largely motivated by the existing position of inlet ports in an existing container that must be retrofit to accommodate the purge flow distribution system. *See* §VIII.C.1; Ex1006 ¶192; *see also id.* ¶¶178-202. If the base plate in the existing wafer contained inlet ports slightly offset from tubular diffusers, then the retrofit system would include the same offset. Ex1006 ¶251. A POSITA would have understood that such offset alignments were well known. Ex1006 ¶251. Smith '517 for example discloses that a tubular diffuser (purple dashed line) can be radially offset from an inlet port (blue dashed line). Ex1006 ¶251.



Ex1011, Figs. 16B (annotated) and 19 (annotated); Ex1006 ¶251.

In view of these disclosures, a POSITA would have recognized, with a reasonable expectation of success, that the Combined Smith Distribution System

would have accommodated an input port (505A/B) offset from the coupling and tubular diffuser. Ex1006 ¶252. Indeed, a main point of Smith '517 is that the existing mechanical configuration in a wafer container can be retrofitted in a variety of ways using the flexible couplings disclosed in that patent. Ex1006 ¶252.

d. Claim 17

The Combined Smith Distribution System renders obvious claim 17. Ex1006 ¶253. For example, the Combined Smith Distribution System has:

- *at least two coupling structures are formed as extending from the bottom portion of the wafer container, an open end of each of the porous tubes has a center axis, and the longitudinal space of each of the porous tubes has a center axis; the center axis of each of the through channels and the center axis of the open end of each of the porous tubes are coaxial, for the same reasons as claim 14. §VIII.C.5.a; Ex1006 ¶246.*

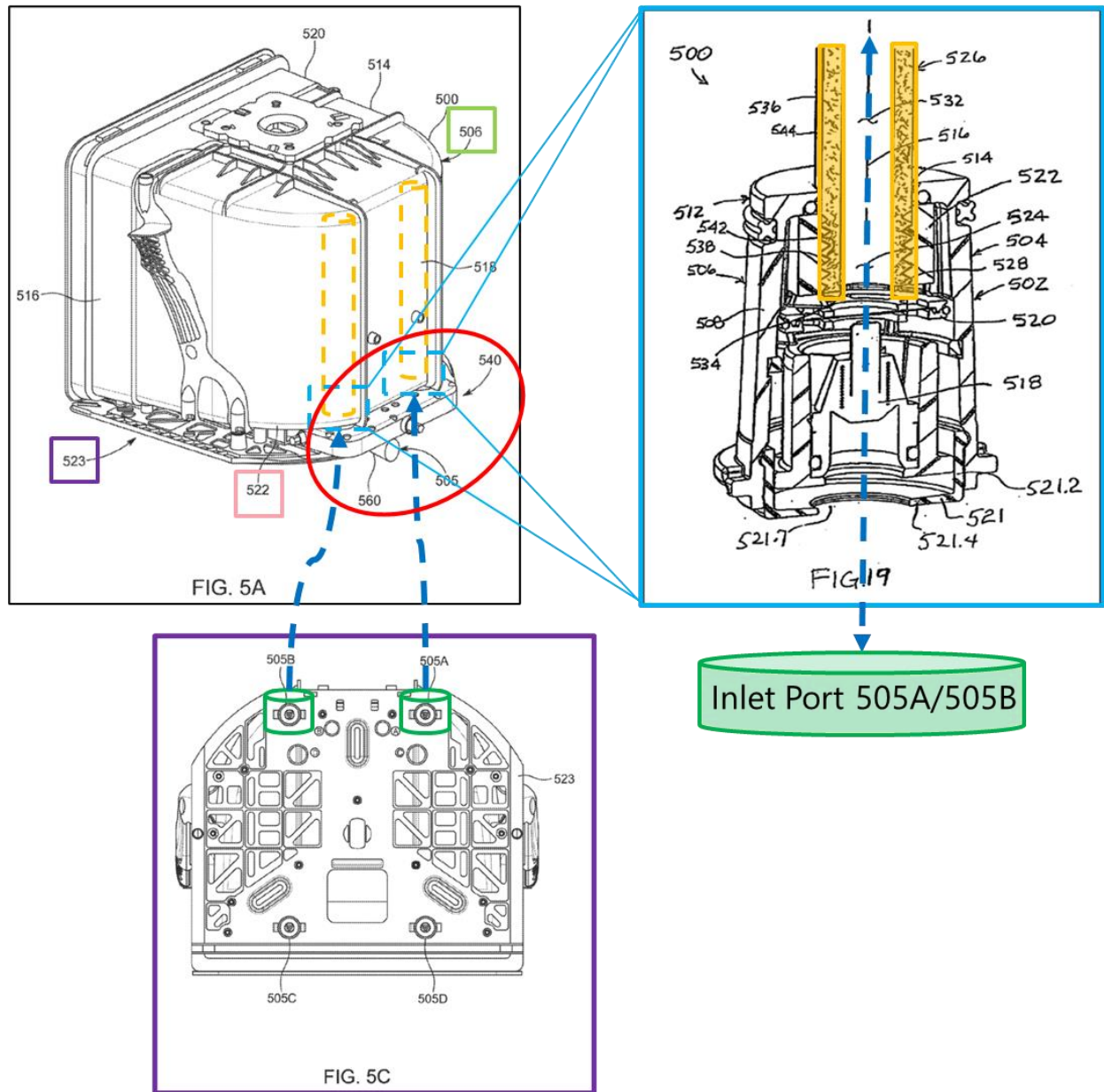
Moreover the Combined Smith Distribution System renders obvious:

- *a gas intake center axis along which the gas passes is offset from the center axis of the through channel and the center axis of the open end that are coaxial, for the same reasons as claim 16. §VIII.C.5.c; Ex1006 ¶¶248-252.*
- *the center axis of the longitudinal space is offset from the center axis of the through channel and the center axis of the open end that are coaxial, for the same reasons as claim 15. §VIII.C.5.b; Ex1006 ¶247.*

e. Claim 18

The Combined Smith Distribution System discloses claim 18. Ex1006 ¶255. *The gas cartridge has a bottom portion and a sidewall extending from the bottom portion, [e.g., bottom portion and sidewall of purge flow distribution system 540 with manifold base 560 (red)], and the gas intake channel is formed at the bottom portion of the gas cartridge [e.g., bottom portion of purge flow distribution system 540 has inlet ports, e.g., 505A-D (green below)], for the reasons described for Grounds 1-2, claim 18. §VIII.A.4.a; Ex1006 ¶158.*

Combined Smith Distribution System



Ex1008, Figs. 5A, 5C (annotated); Ex1011, Fig. 19 (annotated); Ex1006 ¶255.

f. Claim 19

The Combined Smith Distribution System discloses claim 19. Ex1006 ¶256.

The gas cartridge is installed at the bottom portion of the wafer container, such that

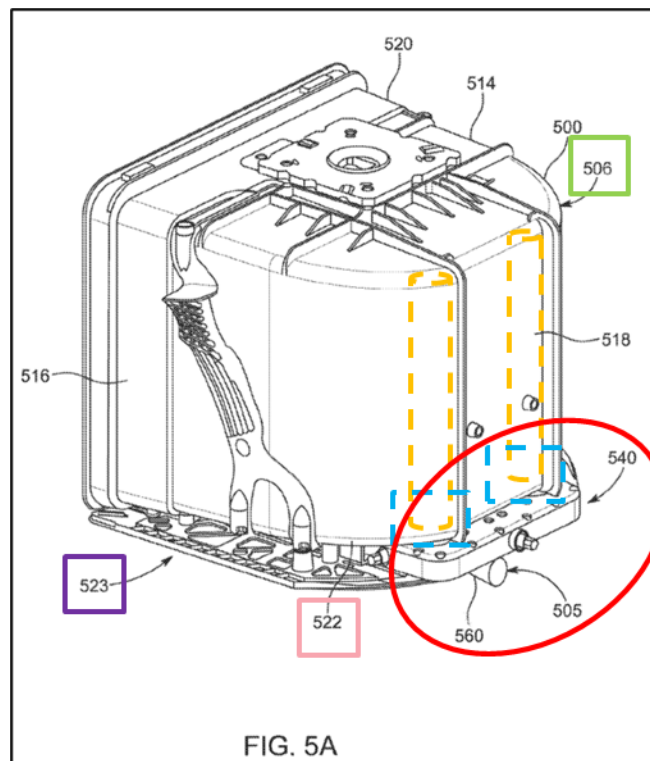
a bottom portion and a sidewall of the gas cartridge and the bottom portion of the wafer container define the buffering gas chamber [e.g., purge flow distribution system 540 with manifold 560 installed at the bottom portion 522/422 of shell 506/406 to define the buffering chamber], for the reasons described for Grounds 1-2, claims 18-19. §VIII.A.4.a-VIII.A.4.b; Ex1006 ¶¶159-162.

g. Claim 20

The Combined Smith Distribution System renders claim 20 obvious. Ex1006 ¶257. First, the Combined Smith Distribution System renders obvious *plurality of annular sidewalls further extend from a lower surface of the bottom portion of the gas cartridge, each of the annular sidewalls defines an installation space for filling with a gas intake module, and the gas intake module has the gas intake center axis, for the same reasons described regarding the gas cartridge in Ground 1, claim 28. §VIII.A.2.d; Ex1006 ¶¶146-150. Second, the gas intake module has the gas intake center axis; the installation space, the gas intake channel at the bottom portion of the gas cartridge and the buffering gas chamber communicate with one another, such that the gas in one single air intake direction supplied by the gas intake module passes through the gas intake channel and enters the buffering gas chamber, for the reasons described for claim 12. §VIII.C.3.i; Ex1006 ¶239.*

h. Claim 21

The Combined Smith Distribution System discloses claim 21. Ex1006 ¶258. For example, the Combined Smith Distribution System has, as shown in Figure 5A, has a *base plate* [e.g., carrier plate 523 (purple square)], *connected below the shell to support the shell* [e.g., shell 506/406]; *wherein the buffering gas chamber* [e.g., purge flow distribution system 540 with manifold base 560 (red) from Smith '154] *is between the bottom portion* [e.g., bottom wall 522/422 (pink square)] *and the base plate of the shell* [e.g., carrier plate 523 (purple square)]. Ex1006 ¶¶188-193; *see also id.* ¶¶178-202, 258; §VIII.C.1.



Ex1008, Fig. 5A (annotated); Ex1006 ¶258.

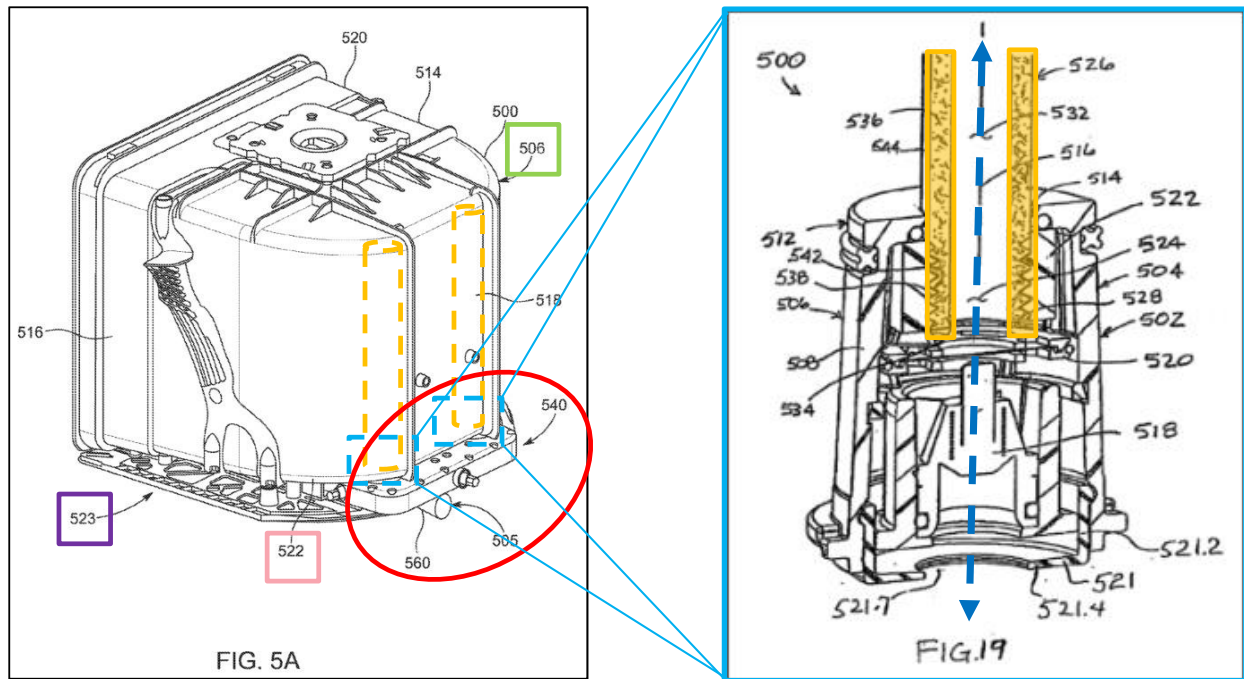
6. Independent Claim 23

a. 23[pre]

To the extent the preamble is limiting, the Combined Smith Distribution discloses 23[pre]. The Combined Smith Distribution System includes *a wafer container* [e.g., substrate container with shell 506/406]. Ex1006 ¶259; §§VIII.C.1-VIII.C.2.

b. 23[a]

The Combined Smith Distribution System discloses limitation 23[a]. For example, the Combined Smith Distribution System includes *a shell* [e.g., shell 506/406], *comprising a bottom portion* [e.g., bottom wall 522/422], *the bottom portion configured with a plurality of coupling structures* [e.g., couplings 522 from Smith '517]], *the coupling structures defining a plurality of through channels* [e.g., flow paths along center axis 516 (blue dashed line) for each coupling structure], for the reasons described for claim 1[a][2]. §§VIII.C.1, VIII.C.2.c; Ex1006 ¶260.



Ex1008, Fig. 5A (annotated); Ex1011, Fig. 19 (annotated); Ex1006 ¶260.

c. 23[b]

The Combined Smith Distribution System discloses limitation 23[b]. Ex1006 ¶261. For example, the Combined Smith Distribution System has *a buffering gas chamber [e.g., purge flow distribution system 540, with manifold base 560], formed below the bottom portion [e.g., bottom wall 522/422], the buffering gas chamber having a plurality of gas intake channels [e.g., inlet supply ports 505A/B], the gas intake channels communicating with the corresponding through channels [e.g., communicating flow paths along center axis 516 in Smith '517], for the same reasons described for limitations 1[a][1], 1[a][3]. §§VIII.C.1, VIII.C.2.b-VIII.C.2.d; Ex1006 ¶¶188-193; see also id. ¶¶178-202, 204-213.*

d. 23[c]

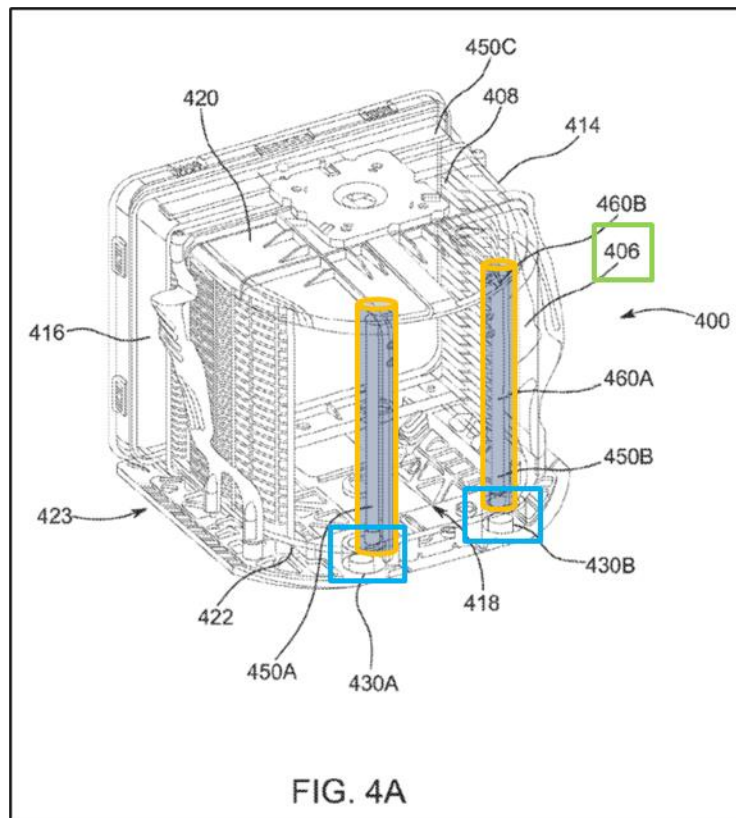
The Combined Smith Distribution System discloses limitation 23[c]. Ex1006 ¶262. For example, the Combined Smith Distribution System has *a plurality of porous tubes [e.g., tubular diffusers 450A/450B or 550A/550B], each of the porous tubes having an open end, the open end correspondingly connecting with the coupling structure at the bottom portion [e.g., tubular diffusers have open ends connected to couplings 522] and communicating with the buffering gas chamber [e.g., purge flow distribution system 540, with manifold base 560] via the corresponding through channel [e.g., corresponding flow path along each center axis 516], allowing a gas to pass through the porous tubes and enter an accommodating space of the shell [e.g., interior of the container shell 506/406], for the reasons described for claims 1 and 2. §§VIII.C.1, VIII.C.2.b-VIII.C.2.d, VIII.C.3.a; Ex1006 ¶¶178-202, 204-213, 219. Further, this is true whether the claim term “correspondingly connecting” means fluidly connected or directly or physically connected. Ex1006 ¶262.*

7. Claim 23 Dependents

a. Claim 24

The Combined Smith Distribution System discloses claim 24. Ex1006 ¶263. For example, in the Combined Smith Distribution System, *the porous tube [e.g., tubular diffusers 450A/450B or 550A/550B (orange)] has a longitudinal space [e.g., internal space (shaded)], the longitudinal space has a closed end and an open end,*

and the gas in the buffering gas chamber [e.g., purge flow distribution system 540, with manifold base 560] is capable of passing through [e.g., via flow path along center axis 516 in Smith '517] the open end to enter the longitudinal space [e.g., internal space (shaded)], for the reasons described for claim 4. §§VIII.C.1, VIII.C.3.c; Ex1006 ¶¶188-193; see also id. ¶¶178-202, 228-229.



Ex1008, Fig. 4A (annotated); Ex1006 ¶263.

b. Claim 25

The Combined Smith Distribution System discloses claim 25. Ex1006 ¶264. For example, the Combined Smith Distribution System has *a collar [e.g., nipple 406b-e], arranged between the open end and the coupling structure [e.g., coupling*

522] *a material [e.g., O-ring 476] of the collar [e.g., nipple 406b-e] being softer than a material of the porous tube [e.g., tubular diffusers 450A/450B or 550A/550B] to prevent breaking of the open end*, for the reasons described for claims 6 and 8. §§VIII.C.1, VIII.C.3.e, VIII.C.3.g; Ex1006 ¶¶178-202, 231, 234-237.

c. Claim 26

The Combined Smith Distribution System discloses claim 26 for the reasons discussed with respect to claims 13, 18 and 23. §§VIII.C.1, VIII.C.4, VIII.C.5.e, VIII.C.6; Ex1006 ¶¶178-202, 240-245, 255, 259-262, 265.

d. Claim 27

The Combined Smith Distribution System discloses claim 27 for the reasons discussed with respect to claims 19 and 26. §§VIII.C.1, VIII.C.5.f, VIII.C.7.c; Ex1006 ¶¶178-202, 256, 265-266.

e. Claim 28

The Combined Smith Distribution System discloses claim 28 for the reasons discussed with respect to claims 20 and 26. §§VIII.C.1, VIII.C.5.g, VIII.C.7.c; Ex1006 ¶¶178-202, 258, 265, 267.

f. Claim 30

The Combined Smith Distribution System discloses claim 30 for the reasons as claim 21. §§VIII.C.1, VIII.C.5.h; Ex1006 ¶¶178-202, 257, 265, 268.

D. Ground 5: Obviousness Of Claims 1-31 In View Of Ground 4 In Further View Of Ogawa

Ground 4 demonstrated that Smith '517 and Smith '154 render obvious claims 1-9, 12, 13-21, 23-28, 30. Dependent claims 10-11, 22, 29, 31, are further rendered obvious with Ogawa.

1. Motivation to Combine Ground 4 with Ogawa

A POSITA would be motivated to combine Ground 4 with Ogawa for the reasons discussed in Ground 3 and would have the same reasonable expectation of success. §VIII.B.1, Ex1006 ¶¶165-169, 270. Nothing about the Ground 4 system changes the relevant teachings or POSITA understandings from Ground 1-2 or from Ogawa, and benefits and reasons for modifying Ground 1-2 in view of Ogawa also apply to Ground 4. Ex1006 ¶¶165-169, 270.

2. Claim 1 Dependents

a. Claim 10

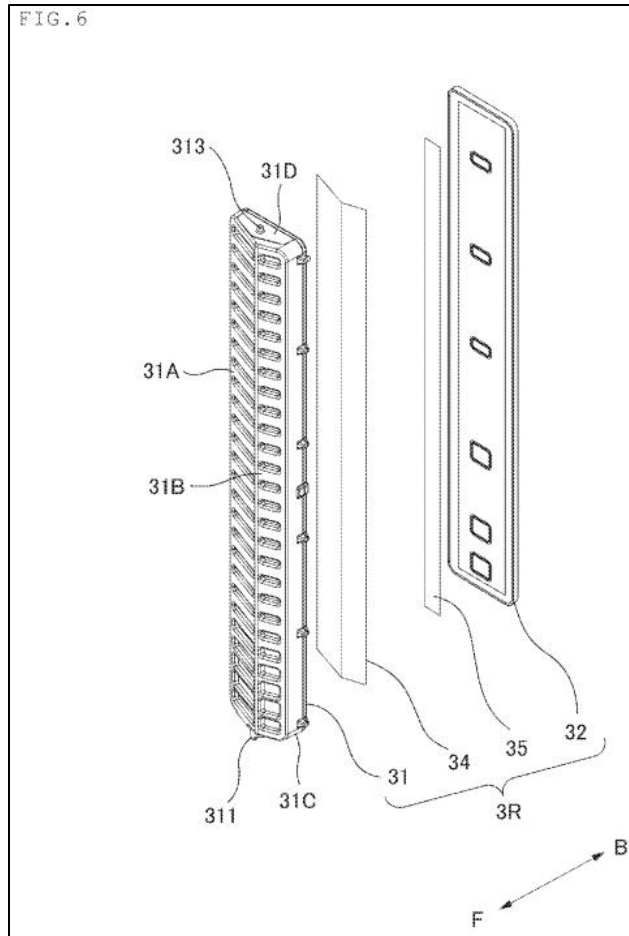
As discussed with respect to Ground 3, claim 29, and Ground 4, claim 2, the Combined Smith Distribution System in view of Ogawa renders obvious claim 10. §§VIII.B.2.a, VIII.C.2., VIII.C.3.a; Ex1006 ¶¶170-172, 203-219, 271. For example, when *the coupling structure is formed as extending from the bottom portion of the wafer container* as discussed for Ground 4, Claim 2, a POSITA would have understood that the same material used for the wafer container (*e.g.*, PEEK) would

also have been used to form the coupling structure. §§VIII.B.2.a, VIII.C.3.a; Ex1006 ¶¶170-172, 219, 271.

b. Claim 11

The Combined Smith Distribution System in view of Ogawa discloses *an airflow guiding member [e.g., housing member 31 and cover member 32], arranged adjacent to one side of the porous tube [e.g., tubular diffusers 450A/450B or 550A/550B], the airflow guiding member configured to adjust an airflow direction of the gas entering the accommodating space [e.g., interior of the container shell 506/406].* Ex1006 ¶¶272-277; §VIII.C.2.

For example, as shown in Figure 6, Ogawa discloses that “gas G passes through the filter members 34, 35, and is blown out from the first group blowout holes 31a-z, [and] the second group blowout holes 32a–f...into the internal space of the container body 2.” Ex1012, 9:15-20; Ex1006 ¶273.



Ex1012, Fig. 6; Ex1006 ¶273.

A POSITA would have understood that air permeable filter members 34/35 taught by Ogawa are functional equivalents to the tubular diffusers 450A/450B or 550A/550B from Smith '154. *See* Ex1012, 9:8-20; Ex1008 ¶35; Ex1006 ¶274. Because Ogawa does not disclose the shape formed by the filter members, a POSITA would have understood that the tubular filter members in the Combined Smith Distribution System could be used as the air permeable filter members 34/35 of Ogawa. Ex1006 ¶274. Combining housing member 31 and cover member 32 with tubular diffusers 450A/450B or 550A/550B would have been an obvious design

choice, and a POSITA would have had a reasonable likelihood of success. Ex1006 ¶274.

A POSITA would have been motivated to combine the tubular diffusers of Smith '154 with the housing and cover member of Ogawa. Ex1006 ¶¶275-276. Indeed, Smith '517 provides the motivation and discusses the benefits of “direct[ing] the gaseous working fluid toward the opening 48” of the shell, but it does not explicitly disclose a method for ensuring the gas is consistently adjusted to accomplish this goal. Ex1006 ¶¶275-276. Thus, a POSITA would be motivated to look to Ogawa’s components to improve the efficiency of the system by directing the gaseous working fluid toward the opening of the shell as taught by Smith '517. Ex1006 ¶¶275-276.

Such a combination would have been well within the skill of a POSITA, who would have had a reasonable expectation of success in combining the tubular diffusers of Ground 4 with Ogawa’s housing member 31 and cover member 32. Ex1006 ¶277. Smith '517, Smith '154, and Ogawa are analogous art to the '711 Patent. §§VIII.B.1, VIII.C.1; Ex1006 ¶277. A POSITA would have understood that Ogawa’s components would be entirely complementary to the purge flow distribution system disclosed by the Combined Smith Distribution System. Ex1006 ¶277. The straightforward combination uses a known technique (*e.g.*, Ogawa’s housing member 31 and cover member 32) to improve a similar device (*e.g.*, the

tubular diffusers of the Combined Smith Distribution System) in the same way, while providing predictable results. Ex1006 ¶277.

3. Claim 13 Dependents

a. Claim 22

The Combined Smith Distribution System further renders obvious claim 22 in view of Ogawa, for the reasons discussed for Ground 3. §VIII.B.3.a; Ex1006 ¶¶278.

4. Claim 23 Dependents

a. Claim 29

The Combined Smith Distribution System renders claim 23 obvious and includes a detachable door combined with the shell, and a pair of support portions configured on an inner side of the shell, §VIII.C.1, and §VIII.C.6.a, and in further view of Ogawa also renders obvious claim 29, for the reasons discussed for Ground 3. §VIII.B.2.a; Ex1006 ¶279.

b. Claim 31

The Combined Smith Distribution System further renders claim 31 obvious in view of Ogawa, for the reasons discussed for Ground 3. §VIII.B.2.b; Ex1006 ¶280.

E. Ground 6: Claims 1, 2-9 And 12 Are Obvious In View Of Smith '517

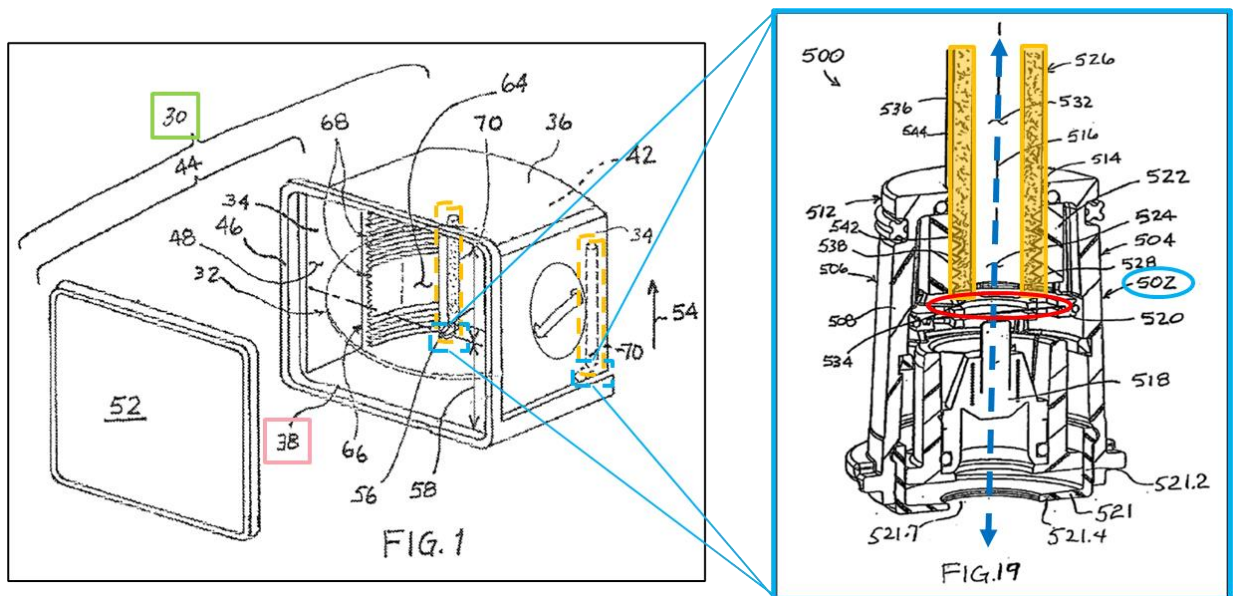
PO may argue that Challenged Claims 1-12 have a priority date of August 2021 based on an overly broad potential construction of buffering gas chamber (§IV). Petitioner disagrees with this construction but, as explained in Grounds 6-7,

nonetheless shows the claims would have been obvious under this incorrect construction in view of Smith '517, which is prior art even under the earlier (incorrect) priority date.

1. Independent Claim 1

a. 1[pre]

To the extent the preamble is limiting, Smith '517 discloses *a gas diffusion device [e.g., porous tower diffuser assembly 70 or 500], installed in a wafer container [e.g., substrate container 30] having an accommodating space [e.g., microenvironment 64].* Smith '517 is directed towards a “diffuser assemblies 70 [”] that “direct the gaseous working fluid...to purge the substrate container 30.” Ex1011, 5:57-60, 1:16-21; Ex1006 ¶¶282-283.



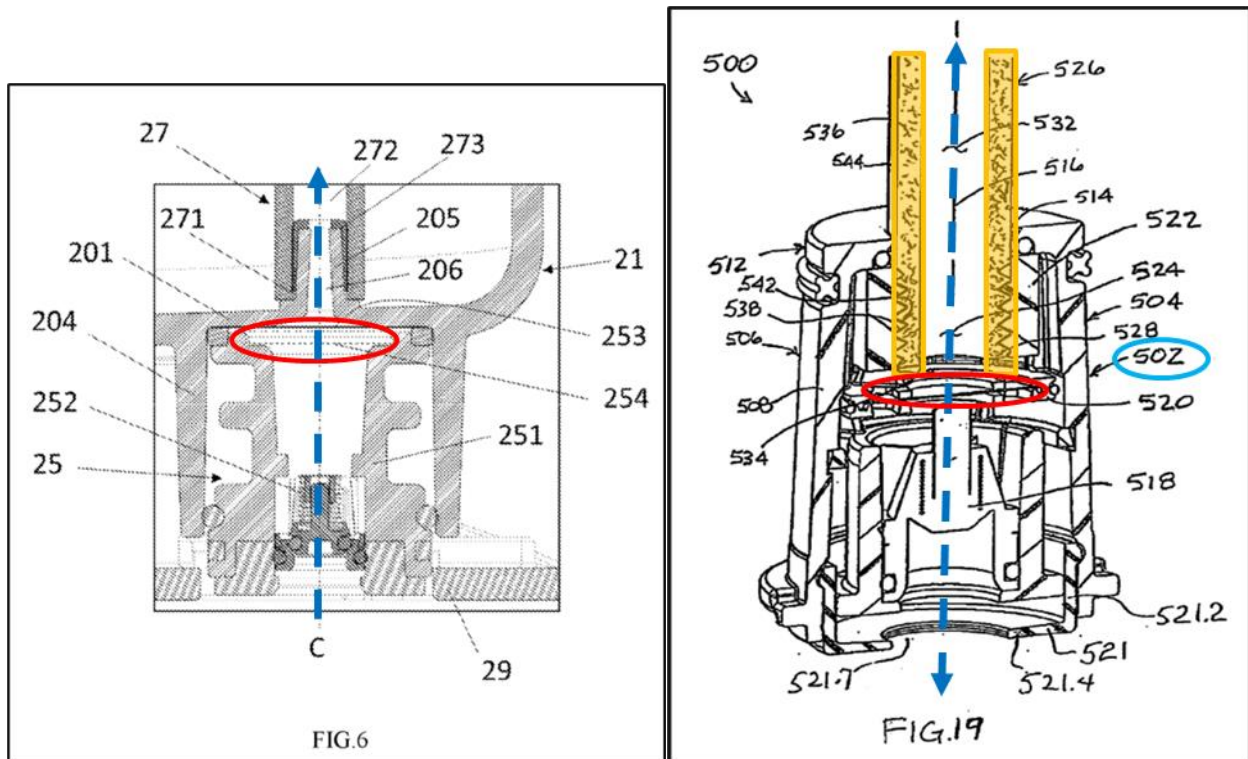
Ex1011, Figs. 1 and 19 (annotated); Ex1006 ¶282.

As applicable to the entirety of Grounds 6 and 7, Figure 1 and the coupling in Figure 19 describe the same embodiment. Ex1011, 16:34-37 (coupling of Figure 19 implemented in wafer container 30 of Figure 1). Ex1006 ¶¶283.

b. 1[a][1]

Smith '517 discloses limitation 1[a][1]. For example, under PO's potential incorrect interpretation of "buffering gas chamber," Smith '517 discloses *a buffering gas chamber [e.g., increased diameter before filter assembly 520 (light blue)], configured at a bottom portion [e.g., bottom portion 38] of the wafer container [e.g., substrate container 30]*. Ex1006 ¶¶284-285.

For example, '711 Patent states, with regard to Figure 6, that when "elastic sleeve (251) has a larger diameter" than "filter membrane (253)" "a buffering gas chamber (254) [light blue] is formed between the gas intake channel and the filter membrane (253)." §IV; Ex1006 ¶¶76-94, 285. To the extent this structure meets the "buffering gas chamber" of claim 1 (a position Petitioner disagrees with), it is also disclosed in Smith '517. As shown in Figure 19, Smith '517 discloses the same increased diameter (*e.g., buffering gas chamber*) between the *gas intake channel* (*e.g., check valve 518*) and the filter assembly 520. Ex1006 ¶285.

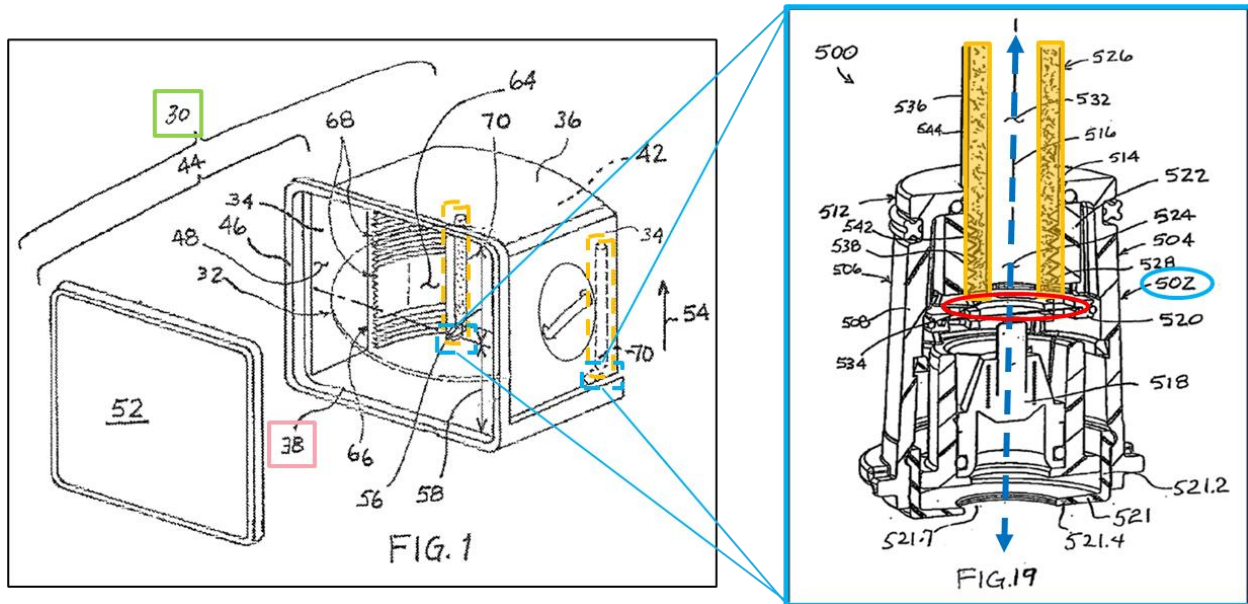


Ex1001, Fig. 6 (annotated); Ex1011, Fig. 19 (annotated); Ex1006 ¶285.

c. 1[a][2]

Smith '517 discloses limitation 1[a][2]. Smith '517 discloses *the bottom portion [e.g., bottom portion 38] provided with at least one coupling structure [e.g., coupling 522], the coupling structure defining a through channel having a center axis [e.g., central axis 516 (blue dashed line); Ex1006 ¶286. For example, Figure 19 shows coupling 522 (e.g., coupling structure) that defines central axis 516 (blue dashed line) (e.g., a through channel having a center axis). Ex1006 ¶286. Smith '517 also discloses that the purge module 502 depicted in Figure 19, including coupling 522 (e.g., coupling structure), is “configured for installation in the bottom*

portion 38 of the substrate container 30” (e.g., *bottom portion of the wafer container*). Ex1011, 16:34-36; Ex1006 ¶286.



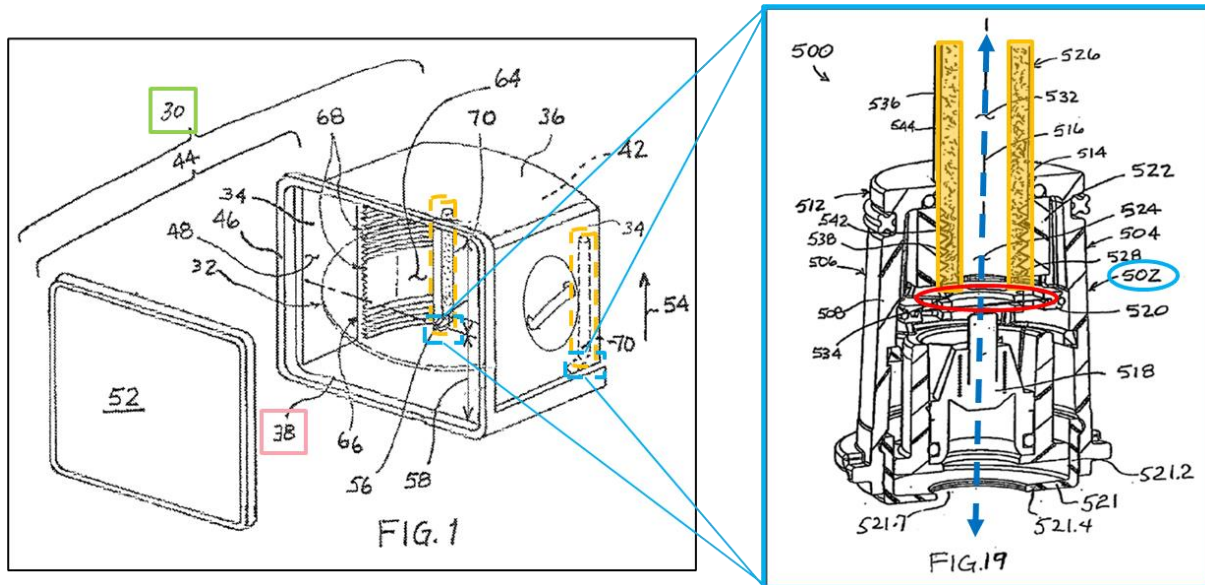
Ex1011, Figs. 1 and 19 (annotated); Ex1006 ¶286.

d. 1[a][3]

Smith '517 discloses limitation 1[a][3]. Under PO's potential incorrect interpretation of "buffering gas chamber," Smith '517 discloses *the buffering gas chamber* [e.g., increased diameter before filter assembly 520 (light blue)] *having at least one gas intake channel* [e.g., check valve 518], *the gas intake channel, the buffering gas chamber, the through channel* [e.g., central axis 516 (blue dashed line)] *and the accommodating space* [e.g., microenvironment 64] *communicating with one another*. Ex1006 ¶287. For example, Figure 19 of Smith '517 shows check valve 518 below the change in diameter and coaxial with the coupling through channel and all communicating with one another and microenvironment 64 (e.g.,

accommodating space), thereby enabling “flow to enter the substrate container 30.”

Ex1011, 16:40-43; Ex1006 ¶287.

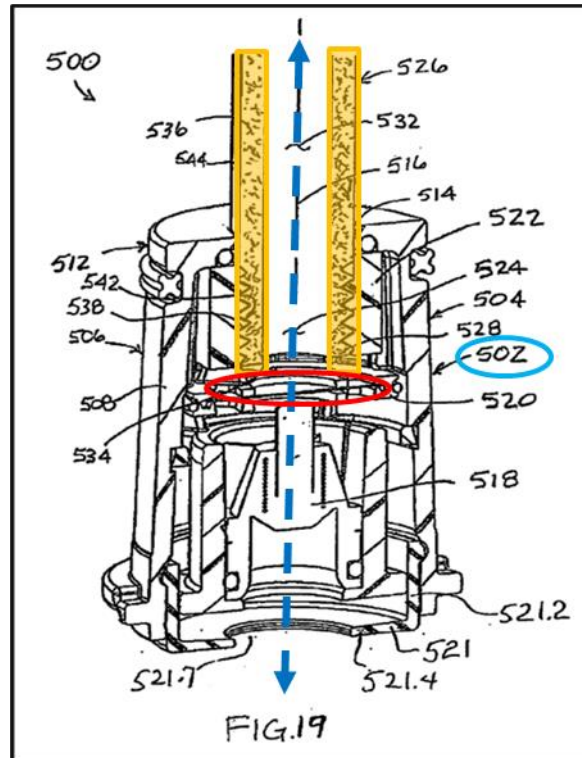


Ex1011, Figs. 1 and 19 (annotated); Ex1006 ¶287.

e. 1[b][1]

Smith '517 discloses limitation 1[b][1]. Ex1006 ¶¶288-289. Under PO's potential incorrect interpretation of “buffering gas chamber,” as shown in Figure 19, Smith '517 discloses *at least one porous tube* [e.g., porous media diffuser 526], *having a longitudinal space* [e.g., diffuser passageway 532], *the porous tube* [e.g., porous media diffuser 526] *installed to the coupling structure* [e.g., coupling 522] *of the wafer container* [e.g., substrate container 30], *the longitudinal space of the porous tube communicating with the buffering gas chamber* [e.g., increased diameter before filter assembly 520 (light blue)], *the buffering gas chamber providing a gas*

to pass through the porous tube and enter the accommodating space [e.g., microenvironment 64]. Ex1006 ¶288.



Ex1011, Fig. 19 (annotated); Ex1006 ¶288.

For example, Smith '517 teaches that “a porous tower diffuser assembly 500” includes “[a] porous media diffuser 526 [e.g., *porous tube*]...operatively coupled with the coupling 522 [e.g., *coupling structure*]...defining a diffuser passageway 532 [e.g., *longitudinal space*].” Ex1011, 16:59-64; Ex1006 ¶289. As shown in Figure 19, diffuser passageway 532 [e.g., *longitudinal space*] is in communication with the increased diameter before filter assembly 520 [e.g., *buffering gas chamber*]. Ex1006 ¶289. Figure 19 also shows the increased diameter before filter assembly 520 allowing gas to pass through and enter porous media diffuser 526 (e.g., *porous*

tube) for diffusion into microenvironment 64 (*e.g., accommodating space*). Ex1006 ¶289.

f. 1[b][2]

Smith '517 discloses limitation 1[b][2]. As shown in Figure 19, Smith '517 discloses *a gas intake [e.g., check valve 518] center axis of the gas and a center axis of the coupling structure [e.g., coupling 522] being coaxial [e.g., concentric with the central axis 516]*. Ex1006 ¶290. Smith '517 expressly discloses “a check valve 518 that permits flow to enter the substrate container” and a “coupling 522” that are “concentric with the central axis 516.” Ex1011, 16:28-58; Ex1006 ¶290. Smith '517 thereby discloses enabling “flow to enter the substrate container 30.” Ex1011, 16:40-43; Ex1006 ¶290.

2. Dependent Claims 2-9, and 12

a. Claim 2

Smith '517 discloses claim 2. For example, as described for claim 1, Smith '517 has:

- *the coupling structure formed as extending from the bottom portion of the wafer container [e.g., a coupling 522 extending from bottom portion 38].* Ex1006 ¶286; §VIII.E.1.c.
- *an open end of the porous tube has a center axis and the longitudinal space of the porous tube has a center axis [e.g., porous media diffuser 526 having*

diffuser passageway 532 and a center axis 516]. *See* Ex1011, 16:64-66 (describing opening 534 at proximal end 528); Ex1006 ¶¶288-289.

- *the center axis of the coupling structure the center axis of the open end of the porous tube and the gas intake [e.g., check valve 518] center axis are coaxial [e.g., concentric about the central axis 516]. See §VIII.E.1.f; Ex1011 Fig. 19; Ex1006 ¶¶290-291.*

To the extent that PO argues that “*the coupling structure is formed as extending from the bottom portion of the wafer container*” requires a component of the coupling structure to be attached to or molded from the bottom portion, that would have been obvious. Ex1006 ¶292. Figure 19 shows that coupling 522 is included in porous tower diffuser assembly 500 that includes top portion 512, which is “substantially flush with the interior surface 40 of the bottom portion 38.” Ex1011, 16:34-37; Ex1006 ¶292. For this assembly 500 to be flush with bottom portion 38 and be securely installed in the container, there must be a component of the bottom portion of the container that is formed to enable assembly 500 and coupling 522 to securely attach to bottom portion 38. Ex1006 ¶292. A POSITA would have understood this attachment to be part of *the coupling structure [] formed as extending from the bottom portion of the wafer container*. Ex1006 ¶292.

b. Claim 3

Smith '517 renders obvious claim 3. Smith '517 has:

- *the coupling structure is formed as extending from the bottom portion of the wafer container, an open end of the porous tube has a center axis, and the longitudinal space of the porous tube has a center axis, for the reasons described for claim 2. §VIII.E.2.a; Ex1006 ¶¶291-293.*
- *the center axis of the coupling structure, the center axis of the open end of the porous tube and the gas intake center axis are coaxial, for the reasons described for claim 2. §VIII.E.2.a; Ex1006 ¶¶291-293.*

Regarding the requirement of claim 3 that the center axis of the longitudinal space of the porous tube is offset from the center axis of the coupling structure, the center axis of the open end of the porous tube and the gas intake center axis, Smith '517 does not expressly disclose a configuration in which the opening of the porous tube and coupling structure are coaxial but the longitudinal space of the porous tube is offset, but that configuration would have been obvious to a POSITA. Ex1006 ¶294.

As described in the '711 Patent, this configuration is met by an asymmetric tubular diffuser that extends radially in one direction more than the other. *See* Ex1001, 16:9-27, Fig. 21C; Ex1006 ¶295. A POSITA would have understood that this configuration would be achieved by including, for example, a porous tube with an elbow bend or an s-curve, Ex1006 ¶295, which would necessitate that the axis of the open end be off-center of the longitudinal axis inside the tube. Ex1006 ¶295.

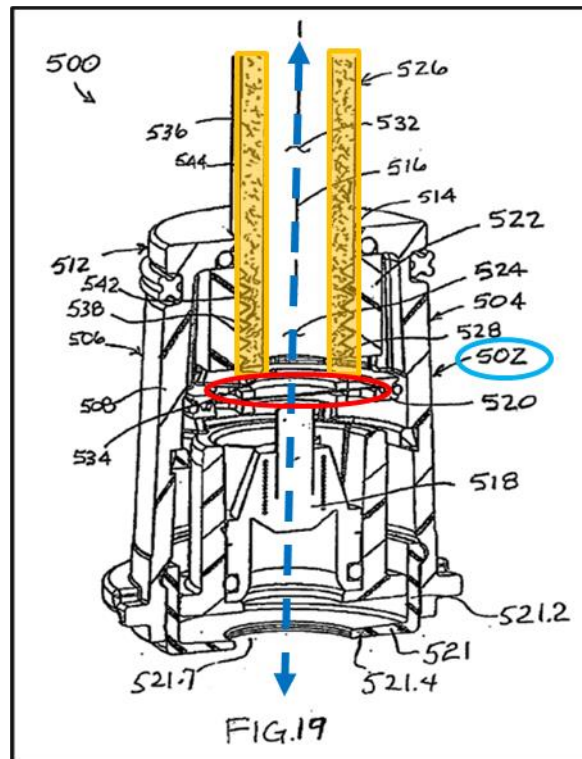
A POSITA would have been motivated to use such an asymmetric diffuser. Ex1006 ¶296. A POSITA would have understood that there were a finite number of options for aligning how a pipe is shaped and coupled to a gas inlet. Ex1006 ¶296. A POSITA, for example, would have been aware of the exclusion zone, or exclusion volume, inside the container that must be reserved for the wafers, *e.g.*, Ex1017, 1, 3, 9, 16; Ex1021, 3:3-12, which would have motivated a particular shape and alignment of porous tubes for a given container. Ex1006 ¶296. A POSITA would have known that, when retrofitting components to an existing shell, as described in Smith '517, any known shape (such as a porous tube with an elbow-bend or s-curve) could be used to meet the specific constraints of the current project and thus would have been motivated to use the alignment that was most applicable to the current project. Ex1006 ¶296.

A POSITA would have specifically been motivated to use an asymmetric diffuser when retrofitting a wafer container to maximize the internal space inside the container and satisfy the structure and design needs of any particular wafer container, such as avoiding the exclusion zone. Ex1006 ¶297; *see* Ex1017; Ex1021, 3:3-12. For example, a project may need a flow path to extend up a rear wall and bend across a top wall of a wafer container, to distribute gas at the front of the container, which would require a tubular diffuser with two axes. Ex1008 ¶46; Ex1006 ¶297.

Moreover, Smith '517 already discloses that a tubular diffuser can be offset from a coupling and that the internal space of the porous media diffuser, termed the “central passageway” “can define a second axis [] that is substantially parallel to...[and] is radially offset from the first axis.” Ex1011, 14:53-56; Ex1006 ¶298. In this regard, Smith '517 discloses that a coupling and tubular diffuser has separate axes: first axis 436, second axis 438, and aperture axis 409 defined by axial aperture 408 that is point at which gas enters the open end of the porous tube. Ex1011, 14:5-8, 14:49-54, Fig. 16B; Ex1006 ¶298. In view of these disclosures, a POSITA would have been motivated to use and could have readily implemented Smith '517 with a tubular diffuser that had two axes—one at its opening and one offset and remote from the opening. Ex1006 ¶298.

c. Claim 4

Smith '517 discloses claim 4. Ex1006. ¶¶299-300. Under PO's potential incorrect interpretation of “buffering gas chamber,” Smith '517 discloses *the longitudinal space [e.g., diffuser passageway 532] of the porous tube [e.g., porous media diffuser 526] has an open end [e.g., opening 534 at proximal end 528 of the porous media diffuser 526], and the open end receives the corresponding coupling structure [e.g., coupling 522], so that the gas enters the longitudinal space by passing through the buffering gas chamber [e.g., increased diameter before filter assembly 520 (red)] and the open end*, as shown in Figure 19. Ex1006 ¶299.



Ex1011, Fig. 19 (annotated); Ex1006 ¶299.

Regarding the requirement of claim 4 *that the longitudinal space of the porous tube has a closed end*, as shown in Figure 7, Smith '517 describes a “blind end 178” that can be “solid and impermeable,” i.e., closed. Ex1011, 8:49-58; Ex1006 ¶300. A POSITA would have been motivated to use such a tube with Figure 19, with a reasonable expectation of success. Ex1006 ¶300.

d. Claim 5

For the reasons discussed for Ground 4, Smith '517 discloses claim 5. §VIII.C.3.d; Ex1006 ¶301.

e. Claim 6

For the reasons discussed for Ground 4, Smith '517 discloses claim 6. §VIII.C.3.e; Ex1006 ¶302.

f. Claim 7

For the reasons discussed for Ground 4, Smith '517 discloses claim 7. §VIII.C.3.f; Ex1006 ¶303.

g. Claim 8

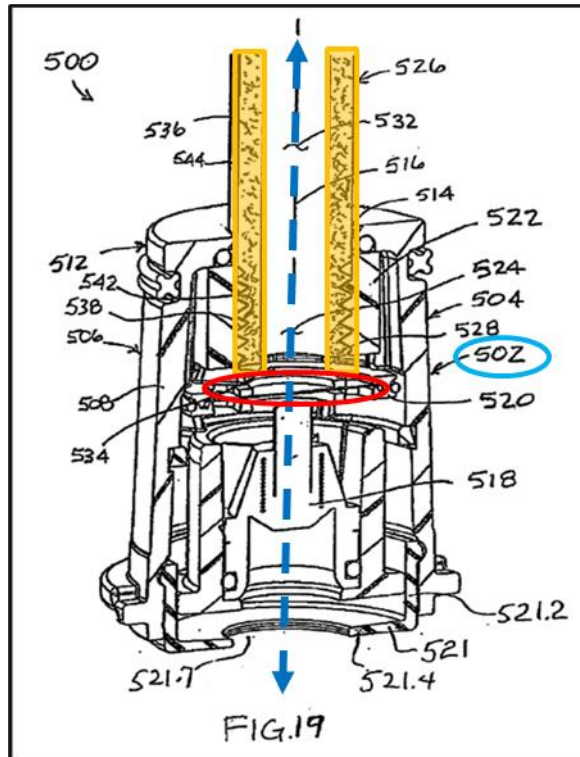
For the reasons discussed for Ground 4, Smith '517 discloses claim 8. §VIII.C.3.g; Ex1006 ¶304.

h. Claim 9

For the reasons discussed for Ground 4, Smith '517 discloses claim 9. §VIII.C.3.h; Ex1006 ¶305.

i. Claim 12

Under PO's potential incorrect interpretation of "buffering gas chamber," Smith '517 discloses claim 12. Ex1006 ¶¶306-307. For example, as shown below in Figure 19, Smith '517 discloses *at least one gas intake module [e.g., check valve 518], communicatively coupled to the buffering gas chamber [e.g., increased diameter before filter assembly 520 (red)], the gas intake module [e.g., check valve 518] having the gas intake center axis, supplying the gas in one single gas intake direction [e.g., an inlet] to pass through the gas intake channel and enter the buffering gas chamber [e.g., increased diameter before filter 520]*. Ex1006 ¶306.



Ex1011, Fig. 19 (annotated); Ex1006 ¶306.

Smith '517 for example teaches that “check valve 518 that permits flow to enter the substrate container” via filter assembly 520 which necessitates the gas flowing through the increased diameter space between check valve 518 and filter assembly 520. Ex1011, 16:28-58; Ex1006 ¶307. Smith '517 further discloses that each of these elements are “concentric with the central axis 516” (blue dashed line); Ex1006 ¶307. Check valve 518, by nature of being a check valve, necessarily *suppl[ies] the gas in one single gas intake direction*. Ex1006 ¶307.

F. Ground 7: Obviousness Of Claims 1-12 In View Of Smith '517 In Further View Of Ogawa

Ground 6 demonstrated that Smith '517 alone renders obvious claims 1-9, 12. Dependent claims 10-11 are further rendered obvious with Ogawa.

1. Motivation to Combine Ground 6 with Ogawa

A POSITA would be motivated to combine Smith '517 with Ogawa for the reasons discussed for Ground 3 in view of Ogawa and would have the same reasonable expectation of success. §VIII.B.1; Ex1006 ¶309. Nothing about Smith '517 changes the relevant teachings or POSITA understandings from Ground 3 or from Ogawa. Ex1006 ¶309.

2. Claim 10

For the same reasons discussed with respect to Ground 5, Smith '517 in view of Ogawa renders obvious claim 10. §VIII.D.2.a; Ex1006 ¶310.

3. Claim 11

For the reasons described for Ground 5, Smith '517 in view of Ogawa renders claim 11 obvious. §VIII.D.2.b; Ex1006 ¶311.

G. Secondary Considerations

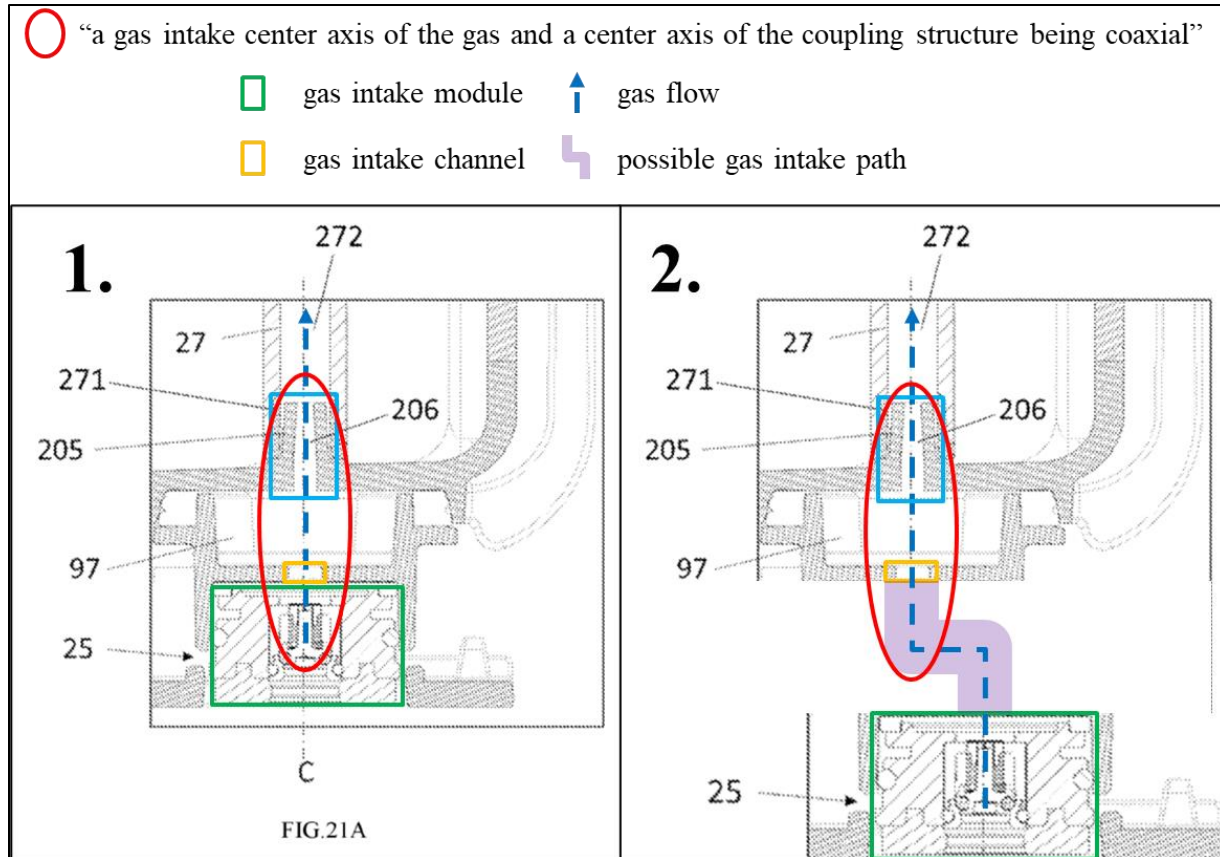
Petitioner is aware of no evidence of secondary considerations that would meaningfully rebut a finding of obviousness. Ex1006 ¶¶312-313. Petitioner reserves the right to rebut any purported objective evidence of non-obviousness raised by PO.

H. Ground 8: Claims 1-12 Are Invalid Under Section 112

Claims 1-12 are invalid under §112 for indefiniteness, or lack of written description.

1. Claim 1

Claim 1 includes the limitation “*a gas intake center axis of the gas* and a center axis of the coupling structure being coaxial.” Ex1001, 17:56-57 (emphasis added). This limitation can be interpreted in at least two ways as shown in the drawings below: (1) in Figure 21A, below left, the “gas intake center axis of the gas” (red) could be the center axis of the entire gas intake module (green), and the claim could require that that axis is coaxial with the center axis of the coupling structure (light blue); or (2) in modified Figure 21A, below right, the “gas intake center axis of the gas” (red) could be the center axis of the gas intake channel (i.e., the opening of the buffering channel receiving the gas from the gas intake channel) (orange), and the claim could require that that axis is coaxial with the center axis of the coupling structure (light blue). Ex1006 ¶315. Given the different potential interpretations, a POSITA could not know if the claim is met by a gas intake module (green) offset from the coupling structure (light blue) with a path (purple) between the gas intake module (green) and gas intake channel (orange). Ex1006 ¶¶315-316.



Ex1001, Fig. 21A (modified and annotated); Ex1006 ¶¶315-316.

Nothing in the specification could resolve this ambiguity either. On the one hand, a POSITA would not have limited claim 1 to the first interpretation at least because it would render claim 12 superfluous. Ex1006 ¶317. Indeed, claim 12 tracks Figure 21A (left above) and recites that the “gas intake module” has “the gas intake center axis” and supplies “the gas in one single gas intake direction to pass through the gas intake channel.”

On the other hand, a POSITA would also not have understood claim 1 to cover the second interpretation at least because there is no written description support for it. Ex1006 ¶318. Instead, the specification appears to teach away from such an

embodiment, for example, teaching that the prior art's "offset configuration of the gas intake module and the porous tube further suffer from drawbacks of being difficult to install," that a "winding path" is susceptible to "breaking or damage...hence affecting the quality of airflow," and that there could be "poor airflow quality caused by such conventional non-straight-through structure." Ex1001, 1:62-67, 2:23-30; Ex1006 ¶318. Therefore, the second interpretation, while a plausible reading of the claims, directly contradicts the stated purpose of the patent.

Because the claim specifies only a "gas intake center axis of the gas," without more, a POSITA would not have known the boundaries of the claim. Ex1006 ¶¶315-319. With two equally plausible interpretations of the scope of this limitation, the claim is indefinite. 35 U.S.C. §112(b) (claims must "particularly point[] out and distinctly claim[] the subject matter which the inventor or joint inventor regards as the invention."); *IBSA Institut Biochimique, S.A. v. Teva Pharms. USA, Inc.*, 966 F.3d 1374, 1379 (Fed. Cir. 2020) (finding claim indefinite where a POSITA could not ascertain the boundaries of a term); *Allen Eng'g Corp. v. Bartell Indus., Inc.*, 299 F.3d 1336, 1348-1349 (Fed. Cir. 2002) (finding claim indefinite, pre-*Nautilus*, because "it is impossible to discern the scope of" a limitation) (citing *Solomon v. Kimberly-Clark Corp.*, 216 F.3d 1372, 1377 (Fed.Cir.2000)). Moreover, if claim 1 is construed to cover the second interpretation described above, claims 1-12 would be invalid for lack written description, as the specification does not set forth enough

detail to allow a POSITA to recognize the inventors invented what is claimed. Ex1006 ¶¶318-319; *Univ. of Rochester v. G.D. Searle & Co., Inc.*, 358 F.3d 916, 923 (Fed. Cir. 2004) (“[I]t ‘is well settled that claims in an application which are broader than the applicant’s disclosure are not allowable.’”) (quoting *In re Moore*, 155 F.2d 379, 382 (C.C.P.A. 1946)).

Because independent claim 1 is invalid, dependent claims 2-12 would also have been indefinite or lacking written description for the same reasons. Ex1006 ¶320. *See* 35 U.S.C. §112(d).

2. Claims 2, 3, 12

In addition to the indefiniteness of claim 1, dependent claims 2, 3, and 12 also are indefinite because they lack the proper antecedent basis for the term “gas intake center axis.” Ex1006 ¶321. Claim 1 states: “a gas intake center axis of the gas;” however claims 2, 3 and 12 all discuss “the gas intake center axis,” without reference to the “of the gas” qualifier. Given the difference with claim 1, POSITA would not have understood with reasonable certainty what “gas intake center axis” means in these claims, and whether it is the same or different than “the gas intake center axis of the gas” in claim 1. Ex1006 ¶321; *Bushnell Hawthorne, LLC v. Cisco Sys., Inc.*, 813 F. App’x 522, 527 (Fed. Cir. 2020) (finding that the meaning of a term that lacked antecedent basis “is entirely unclear” and rendered claim indefinite).

IX. CONCLUSION

Petitioner respectfully requests that trial be instituted and that claims 1-31 be canceled as unpatentable.

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CERTIFICATE OF COMPLIANCE

I hereby certify that this petition complies with the type-volume limitations of 37 C.F.R. §42.24(a)(1)(ii) (“18,700 words”) because it contains 18,684 words (as determined by the Microsoft Word word-processing system used to prepare the petition), excluding the parts of the petition exempted by 37 C.F.R. §42.24(a)(1).

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I hereby certify that on this 31st day of March, 2026, a copy of this Petition, including all exhibits, has been served in its entirety by overnight mail on the following counsel of record for Patent Owner:

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