

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SCENTAIR TECHNOLOGIES, LLC,
Petitioner,

v.

PROLITEC, INC.,
Patent Owner.

IPR2021-00012
Patent 9,162,004 B1

Before GRACE KARAFFA OBERMANN, KRISTINA M. KALAN, and
BRIAN D. RANGE, *Administrative Patent Judges*.

OBERMANN, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining Some Challenged Claims Unpatentable
35 U.S.C. § 318(a)

I. INTRODUCTION

A. Background

Petitioner¹ filed a Petition (Paper 2, “Pet.”) supported by the Declaration of Dr. Timothy L. Morse (Ex. 1003 (corrected)), requesting *inter partes* review of claims 1–24 of U.S. Patent No. 9,162,004 B1 (Ex. 1001, “the ’004 patent”). Patent Owner² filed a Preliminary Response. Paper 8. On April 26, 2021, in our Institution Decision (Paper 10 (“Dec.”)), we granted Petitioner’s request for an *inter partes* review of all challenged claims based on all asserted grounds as follows.

Ground	Claims Challenged	35 U.S.C. §	References/Basis
I	1, 2, 4, 5, 7–11, 14, 16–18, 22, 23	103	Rosener, ³ Knoch ⁴
II	3, 6, 13, 15, 24	103	Rosener, Knoch, Dautrebande ⁵
III	6, 15 ⁶	103	Rosener, Knoch, Svoboda ⁷

¹ ScentAir Technologies, LLC and ScentAir Holdings, Inc. are the real parties-in-interest for Petitioner. Pet. 5.

² Prolitec Inc. is the real party-in-interest for Patent Owner. Paper 4, 2.

³ US 2011/0089252 A1, published Apr. 21, 2011 (Ex. 1004).

⁴ US 5,309,900, issued May 10, 1994 (Ex. 1006).

⁵ US 2,605,089, issued July 29, 1952 (Ex. 1007).

⁶ Petitioner identifies Ground III as asserted against claims 6 and 24. Pet. 7 (grounds chart), 47 (argument heading). However, the arguments presented in the Petition relating to Ground III, including the claim charts, exclusively relate to claims 6 and 15. *Id.* at 47–49. Taking account of the arguments presented, we determine that Ground III is asserted against claims 6 and 15.

⁷ US 4,746,067, issued May 24, 1988 (Ex. 1008).

Ground	Claims Challenged	35 U.S.C. §	References/Basis
IV	1–22	103	Rubin, ⁸ Knowledge of the Person of Ordinary Skill in the Art
V	24	103	Rubin, Dautrebande

Pet. 7–8 (grounds chart). Thereafter, in timely sequence, Patent Owner filed a Response (Paper 12, “Resp.”), Petitioner filed a Reply (Paper 14, “Reply”), and Patent Owner filed a Sur-reply (Paper 15, “Sur-reply”). The Response is supported by the Declaration of Dr. Michael Mello. Ex. 2002. The Reply is supported by a second Declaration of Dr. Morse. Ex. 1015.⁹

The parties presented final arguments in a hearing held by video on February 1, 2022. *See* Paper 21 (“Tr.” (hearing transcript)).

B. Summary

We have jurisdiction under 35 U.S.C. § 6. The evidentiary standard is a preponderance of the evidence. *See* 35 U.S.C. § 316(e) (2018); 37 C.F.R. § 42.1(d) (2019). We issue this Final Written Decision pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73.¹⁰ For reasons that follow, we determine that

⁸ WO 2012/026963 A2, published Mar. 1, 2012 (Ex. 1005).

⁹ Based on their statements of qualifications and curricula vitae, we determine that both Dr. Morse and Dr. Mello are qualified to provide testimony concerning the knowledge, understanding, and opinions of the hypothetical person of ordinary skill in the art at the time of the invention. Ex. 1003 ¶¶ 2–5, App’x pp. 69–73; Ex. 2002 ¶¶ 4–14, App’x A. We discuss Dr. Morse’s qualifications in more detail below in our assessment of Patent Owner’s arguments that Petitioner has not shown adequately that Dr. Morse is competent to provide testimony in this proceeding. *See* Resp. 79–80.

¹⁰ The parties identify as related matters that may affect, or be affected by, this Final Written Decision: *Prolitec Inc. v. ScentAir Technologies, LLC*, No. 1:20-cv-00984-RGS (D. Del.) (“District Court Action”); IPR2021-00013, in which we denied institution of *inter partes* review; and IPR2021-00014

Petitioner has shown by a preponderance of the evidence that claims 5, 6, 8–10, 13–16, 18 and 22 are unpatentable but does not establish that claims 1–4, 7, 11, 12, 17, 19–21, 23, and 24 are unpatentable.

C. Overview of the Claimed Subject Matter

The '004 patent is titled “Removable Cartridge for Liquid Diffusion Device and Cartridge Insert Thereof.” Ex. 1001, code (54). The claimed invention covers an insert and cartridge for use with a liquid diffusing device, the insert having a body, an inlet, and outlet zone, and a tortuous passage extending between the inlet zone and the outlet zone. *Id.* at code (57) (Abstract); *see id.* at 18:16–32, 18:39–55, 18:62–19:9, 19:9–22 (independent claims 1, 5, 8, and 9). A diffusion device has the ability to dispense scent or other liquids throughout a desired space. *Id.* at 1:15–17.

We reproduce below Figure 4 from the '004 patent.

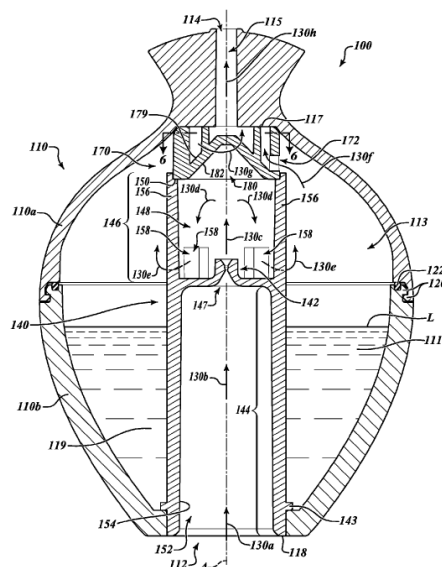


FIG. 4

(“IPR014”), in which we file concurrently herewith a final written decision. Pet. 5; Paper 4 at 2. Petitioner states it filed a related petition for *inter partes* review of U.S. Patent No. 8,885,827. Pet. 5. We identify no such petition filed in our forum.

Figure 4 is cross-sectional view showing the internal components and structures of a cartridge for a diffusion device. *Id.* at 2:66–67, 7:9–64. Cartridge 100 includes housing 110, which defines a fluid receptacle having internal cavity 113 partially filled with liquid 111. *Id.* at 6:12–17. Arrows labeled 130a–130h show the flow path of gas through cartridge 100. *Id.* at 6:62–7:8. Pressurized gas enters cartridge inlet 112 and flows through diffusion head 140, which includes venturi device 142 for drawing liquid 111 into the moving gas stream. *Id.* at 7:15–21.

A gas-liquid mixture of atomized liquid (i.e., diffused liquid) discharges from venturi device 142 into expansion chamber 148. *Id.* at 7:21–46. At least some of the diffused liquid collects on impact surface 182 and is routed back to remaining fluid 111 in the fluid reservoir for reintroduction into the gas stream by venturi device 142. *Id.* Other diffused liquid in expansion chamber 148 redirects down through passageways 158 into a portion of internal cavity 113 above fluid level L of liquid 111. *Id.* at 7:35–46. Diffused liquid may then be propelled into inlet 172 of cartridge insert 170. *Id.* at 7:46–48. From inlet 172, diffused liquid proceeds through a tortuous passage before passing through outlet passageway 115 that leads to cartridge outlet 114, where the diffused liquid discharges from cartridge 100. *Id.* at 7:49–54.

A convoluted path of diffused fluid from expansion chamber 148 to cartridge outlet 114, including the tortuous passage, may refine the liquid particle size distribution so that only fine particles discharge from cartridge 100, whereas larger particles collect on inner surfaces of

cartridge 100 and precipitate out of the gas to rejoin remaining liquid 111.
Id. at 7:54–64.

“[T]he tortuous passage may spiral between the inlet and the outlet zone.” *Id.* at 1:65–66. Figure 6 of the '004 patent is reproduced below.

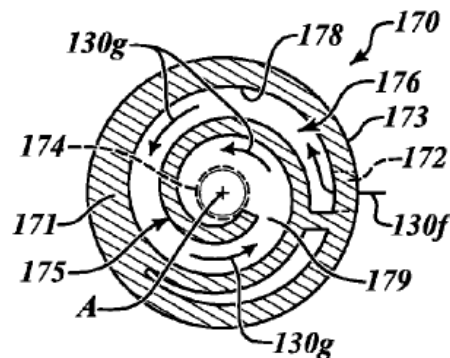


FIG. 6

Figure 6 is a cross-sectional view of cartridge insert 170 showing the flow path of diffused liquid. *Id.* at 3:4–6. Insert 170 includes body 171, which contains tortuous passage 176. *Id.* at 9:65–66. In “the illustrated embodiment, tortuous passage 176 is helical and makes at least one full revolution about the central axis.” *Id.* at 10:30–33. Elsewhere, the '004 patent explains, the tortuous passage “may spiral or otherwise extend in a convoluted manner between the inlet” and the outlet zone. *Id.* at 9:34–37.

The '004 patent explains that the tortuous passage may take forms other than a helix or spiral. *Id.* at 10:32–36. For example, “tortuous passage 176 may include a path with a plurality of straight segments angled relative to each other” or “may include a path that combines linear and non-linear path segments.” *Id.* at 10:36–41. When summarizing the invention, the '004 patent informs: “The tortuous passage may follow a non-linear path that assists in preventing liquid from leaking from the cartridge when the cartridge is upended.” *Id.* at 2:7–10. “Irrespective of particular

configuration,” however, “tortuous passage 176 follows a non-linear path that, among other things, assists in preventing liquid 111 from leaking from the cartridge 100 when the cartridge 100 is upended.” *Id.* at 10:49–52.

D. Challenged Claims

Petitioner challenges claims 1–24 of the ’004 patent. Pet. 4. Claims 1, 5, 8, and 9 are independent claims. We reproduce below claim 9, which is the only independent claim directed to a cartridge (as opposed to an insert for a cartridge) used with a liquid diffusing device.

9. A cartridge for use with a liquid diffusing device, the cartridge comprising:

- a cartridge housing defining an internal housing cavity partially filled with a liquid to be diffused;
- a diffusion head positioned within the internal housing cavity, the diffusion head including a venturi device for generating a diffused liquid from the liquid contained in the internal housing cavity; and
- an insert positioned downstream of the diffusion head, the insert including an inlet to receive the diffused liquid generated by the venturi device, an outlet zone through which to discharge the diffused liquid toward an external environment, and a tortuous passage extending between the inlet and the outlet zone.

Ex. 1001, 19:10–23. The three other independent challenged claims specify an insert for a cartridge and, among other things, recite additional limitations relating to the tortuous passage. *Id.* at 18:16–32, 18:39–55, 18:62–19:9 (claims 1, 5, and 8). For example, claim 1 is directed to an “insert” wherein “the tortuous passage spirals between the inlet and outlet zone.” *Id.* at 18:17, 31–32. We provide additional discussion of the terms of the challenged claims as necessary in our analysis of the patentability challenges.

For reasons that follow, we determine Petitioner shows by a preponderance of the evidence that each of claims 5, 8–10, 13–16, 18, 22, and 24 is unpatentable. We further find none of claims 1–4, 6, 7, 11, 12, 17, 19–21, and 23 is proven unpatentable.

II. PRELIMINARY MATTERS

A. Level of Ordinary Skill in the Art

The level of ordinary skill in the art at the time of the invention is a factual determination that provides a primary guarantee of objectivity in an obviousness analysis. *Al-Site Corp. v. VSI Int'l Inc.*, 174 F.3d 1308, 1324 (Fed. Cir. 1999) (citing *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966); *Ryko Mfg. Co. v. Nu-Star, Inc.*, 950 F.2d 714, 718 (Fed. Cir. 1991)). Petitioner asserts that a person of ordinary skill in the art “would typically have a bachelor’s degree in mechanical or chemical engineering as well as at least three years of experience working with, designing, or studying liquid diffusion devices or similar devices.” Pet. 16; Ex. 1003 ¶ 13. Patent Owner does not dispute that definition or advance an alternative definition. *See* Resp. 79 (repeating Petitioner’s definition).

The prior art asserted in the Petition, on this record, is representative of the level of ordinary skill in the art. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001). To the extent a more specific definition is required, we adopt Petitioner’s unopposed definition (Pet. 16) because it is consistent with the disclosures of the ’004 patent and the prior art references that form the basis for Petitioner’s challenges. *See, e.g.*, Ex. 1001, 1:7–43 (abstract and overview of technical field of invention of the ’004 patent); Ex. 1004, code (57), ¶ 3 (abstract and background of Rosener’s invention); Ex. 1005, code (57), 1:1–13:12 (abstract and background of Rubin’s invention).

B. Claim Interpretation

We interpret claims using the same standard applied in a civil action under 35 U.S.C. § 282(b), “including construing the claim in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent.” 37 C.F.R. § 42.100(b) (2020). Under that standard, we interpret the claim language as it would be understood by one of ordinary skill in the art in light of the specification. *In re Suitco Surface, Inc.*, 603 F.3d 1255, 1260 (Fed. Cir. 2010); *see In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007) (“The ordinary and customary meaning ‘is the meaning that the term would have to a person of ordinary skill in the art in question.’”) (quoting *Phillips v. AWH Corp.*, 415 F.3d 1303, 1313 (Fed. Cir. 2005)). We construe only terms in controversy and then only to the extent necessary to resolve the controversy. *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017).

When addressing the meanings that the Board should assign to the words of the challenged claims, Petitioner argues only, “all terms should be construed to have their ordinary and customary meaning.” Pet. 16. Patent Owner, by contrast, requests the Board to construe the word “toward.” Resp. 6–11. Specifically, Patent Owner argues that “toward” should be construed to mean “aimed in the direction of.” Resp. 6–7.

The term “toward” appears in each independent claim and is inherited by every dependent challenged claim. Resp. 6–11; *see* Ex. 1001, 18:23 (claim 1), 18:46 (claim 5), 19:2 (claim 8), 19:20 (claim 9). Claim 1, for example, recites “an outlet zone defined at least in part by the body through which to discharge the diffused liquid *toward* an external environment.

Ex. 1001, 18:22–24 (emphasis added). The other claims similarly recite an outlet zone through which to discharge liquid “toward an external environment.” *Id.* at 18:46–47, 19:2–3, 19:20–21.

We determine that “toward” in the context of these claims means “in the direction of.” Ex. 2003, 3. That definition is consistent with the dictionary definition advanced by Patent Owner. Resp. 7–11; Ex. 2003, 3 (ordinary dictionary defining toward as “in the direction of” or, alternatively, as “along a course leading to”). Patent Owner argues that the ’004 patent describes embodiments supporting Patent Owner’s construction of “toward,” but directs us to no disclosure that requires “aiming.” *Id.* To the contrary, the ’004 patent suggests that liquid moves “toward” something, such as an end point, so long as it advances along a path leading to the end point. Reply 1–4 (Petitioner collecting examples). For example, in the ’004 patent, Figures 5 and 6 illustrate fluid taking a spiral flow pattern to outlet zone 174. The specification explains that the liquid takes a “curvilinear path . . . as it moves from the inlet 172 *toward* the outlet zone 174.” Ex. 1001, 10:34–36; *see* Ex. 1015 ¶¶ 8–16 (Dr. Morse providing testimony regarding this and other ’004 patent embodiments). Thus, contrary to Patent Owner’s position, the specification uses the word “toward” to describe liquid that moves in the direction of the outlet—without reference to aiming—and even where the liquid’s movement encounters obstacles or otherwise fails to travel in a straight line to the outlet.

We agree with Petitioner that “‘aimed’ is found nowhere in the intrinsic evidence and is contrary to the specification” of the ’004 patent. Reply 1. Further, Patent Owner’s own extrinsic evidence does not include the word “aimed” in the definition of “toward.” Ex. 2003, 3. Against that

backdrop, for reasons stated above, we determine that “toward” in the context of the challenged claims means “in the direction of.”

To the extent that the scope of the word “toward” or any other claim term requires further discussion, we provide it in our analysis of Petitioner’s challenges.

C. Overview of Principal Prior Art References

The challenges rest on five principal prior art references—Rosener, Knoch, Dautrebande, Svoboda, and Rubin. Pet. 7–8. Patent Owner does not challenge the prior art status of those references, but addresses the merits of Petitioner’s challenges as if they qualify as prior art. *See generally* Resp.

1. Rosener

Rosener is titled “Fragrance Nebulizer with Drainer System.” Ex. 1004, code (54). Rosener discloses a reservoir assembly for storing fragrance oil and an atomizer that converts that oil into a scented mist. *Id.* ¶ 24. The atomized fragrance oil includes particles of various sizes, some of which are too large to be used as output. *Id.* ¶ 26.

Rosener separates small atomized particles, which are suitable for output, from larger atomized particles through impaction by “forcing the airstream” containing the particles of various sizes “to go around tight bends and corners.” *Id.* ¶¶ 26–27; Ex. 1003 ¶ 37; Pet. 17. This “expose[s] the stream of entrained particles to a lot of surfaces.” *Id.*

2. Knoch

Knoch pertains to an atomizer used in inhalation therapy to deliver medicinal substances, carried in metered doses of vaporized liquid, “deep into the respiratory tracts” of patients to ensure “an effective absorption of the active substance” on “the surface of the lungs.” Ex. 1006, code (57), 1:6–

24, 2:48–53. Knoch describes a device in which, during a “suction step,” a spiral vortex—representing the flow path of aerosolized liquid particles—is formed as a result of physical structures in the device. *Id.* at 4:6–16.

In particular, the physical structures that form the spiral vortex, which forms only during normal operation of Knoch’s device, are two openings in the ends of a cylindrical atomizing space places in a particular “arrangement” and “position.” *Id.* at 3:30–49. To be clear, the spiral vortex is not a physical structure, but is a flow path of aerosolized particles that forms during normal use of Knoch’s device, and it is this transient spiral vortex that ensures “homogenization of the vaporized liquid,” provides “an even distribution and a deceleration of the liquid droplets,” avoids “an undesirably strong aerosol stream,” and “makes available a volume sufficient for the inhalation act.” *Id.* at 2:48–53, 3:26–29, 4:6–16.

3. Dautrebande

Somewhat similar to Knoch, Dautrebande relates to “aerosol therapy” in which “it is very important to obtain aerosols of very low particle size” to achieve the “desired” effect of having “the aerosol penetrate to the innermost passages or zones in the lungs.” Ex. 1007, 1:6–10. Dautrebande discloses an “apparatus for obtaining improved aerosols of relatively high stability by obligatory filtration through a turbulent body of liquid” and, in particular, “to aerosols having a mean particle size or diameter of not over about 0.5 micron.” *Id.* at 1:1–5.

A primary objective in Dautrebande “is to produce improved aerosols having a mean particle size of not over 0.5 micron.” *Id.* at 1:24–26. In Dautrebande’s device, “larger and unstable particles are removed from” a liquid that is “dispersed in the form of a cloud or a mist.” *Id.* at 2:41–3:1.

Those “unstable particles” in the aerosol “tend to deposit and coalesce” in “[a] somewhat S-shaped tapered tubular aerosol conduit member” positioned “directly over the aerosol generating zone 2.” *Id.* at 2:4–7, 2:41–3:9.

4. Svoboda

Svoboda describes a “device and method for aerosolizing a liquid” by mixing “a gas under pressure and a liquid so that the liquid is formed in minute droplets and is carried on the stream of gas.” Ex. 1008, code (57) (Abstract), 1:5–10. The device of Svoboda includes, among other structures, a container that holds a liquid, a venturi tube having an upstream opening, a discharge opening, and a deflector surface. *Id.* at Fig. 1, 2:4–25. The upstream opening is “adapted for connection to a source of pressurized gas.” *Id.* at 2:6–8.

Svoboda’s venturi tube is “dimensioned and positioned to withdraw” liquid from a container through a liquid conduit means and “project a mixture of liquid and gas out” at high velocity in a directed stream in a first direction. *Id.* at 2:12–16. A deflector surface intersects the directed stream, “causing a dispersion of the liquid and gas forming a flow mass in a second direction,” namely, “at an angle to the first direction,” which “causes further reduction in liquid droplet size.” *Id.* at 2:18–23, 2:35–36. The aerosolized air strikes concentric projection rings to further add turbulence to the flow mass and reduce the size of the particles of aerosolized liquid. *Id.* at 2:35–57. Svoboda explains that gas will travel faster through a “necked down portion” of its venturi tube. *Id.* at 4:4–8, Fig. 1.

5. Rubin

Rubin relates to systems and methods “for aerosolizing and delivering therapeutic substances in a device” with airflow regulation. Ex. 1005,

code 57 (Abstract). Rubin is concerned with an “aerosol” that is a “nebulous collection of atomized liquid droplets or fine powder particles that can be available for inhalation.” *Id.* at 2:8–11.

In the “aerosolized therapy” method of Rubin, “medicament” formulations, containing “aerosol particles with a mass median aerodynamic diameter” of “between 0.5 and 5 micrometers,” are employed “for lung delivery.” *Id.* at 2:12–25. “When in use, a high-pressure air jet passes through” a “jet nozzle” then “out through” a “tapered air outlet,” which causes liquid to flow into a fluid introducing gap. *Id.* at 22:10–13. “Liquid becomes nebulized into aerosol as high-pressure forces this liquid through” a restricted opening of the device. *Id.* at 22:14–16.

“Newly generated aerosol is dispersed as it comes in contact with a diffuser dispersing baffle” at high velocity. *Id.* at 22:16–18. An interior chamber “contains a conical section,” which Rubin describes as a “chimney.” *Id.* at 22:19–20. Extension guides protrude from the walls of the chimney and “cause ambient air entering the device to take a more tortuous flow path through” the device, thereby ensuring “that an adequate amount of aerosol is entrained in this airflow to reduce particle size” or “prevent particles from colliding and growing.” *Id.* at 22:22–23, 22:30–35.

Rubin discloses that the extension guides of the chimney “may be curved or spiral-shaped to cause cyclonic action of aerosol entrained airflow.” *Id.* at 22:35–23:3. During an inhalation step, particles are carried out of the device through an air outlet. *Id.* at 23:25–33.

III. ANALYSIS OF THE CHALLENGES

The following analysis explains why we determine that Petitioner establishes that claims 5, 8–10, 13–16, 18, and 22 are unpatentable but fails

to establish that claims 1–4, 6, 7, 11, 12, 17, 19–21, 23, and 24 are unpatentable. As an initial matter, we observe, neither party raises evidence of secondary considerations of nonobviousness, therefore, such considerations do not weigh against Petitioner’s prior art showing of unpatentability.

We organize our analysis into three main sections, addressing, in turn, the grounds that assert Rosener, the grounds that assert Rubin, and Patent Owner’s arguments about the qualifications of Dr. Morse. *See* Pet. 7–8 (Petitioner’s identification of Grounds I, II, and III, which assert Rosener, and Grounds VI and V, which assert Rubin); Resp. 79–80 (Patent Owner’s arguments about the qualifications of Dr. Morse).

A. Grounds That Assert Rosener

Petitioner identifies three obviousness grounds that assert Rosener. Pet. 7 (identification of Grounds I, II, and II). Collectively, these grounds challenge the patentability of claims 1–11, 13–18, and 22–24. *Id.*

We address together, in a first group, claims 5, 6, 8–10, 13–16, 18, and 22, which we refer to collectively as the “claims proven unpatentable.” We then address together, in a second group, claims 1–4 and 11, which require a tortuous passage that “spirals between the inlet and the outlet zone.” *Id.* at 18:29–32, 19:21–22, 19:31–34. We refer to claims 1–4 and 11 collectively as the “spiraling tortuous passage claims.” Finally, in a third and final group, we address claims 7, 17, 23, and 24. We refer to claims 7, 17, 23, and 24 collectively as the “leakage retarding claims.”

2. Claims Proven Unpatentable

In this section, we address claims 5, 6, 8–10, 13–16, 18, and 22. Petitioner asserts that claims 5, 8–10, 14, 16, 18, and 22 are unpatentable as

obvious over Rosener and Knoch, that claims 6, 13, and 15 are unpatentable as obvious over Rosener, Knoch, and Dautrebande, and that claims 6 and 15 are unpatentable as obvious over Rosener, Knoch, and Svoboda. Pet. 7; *see supra* 2 n.6. Notwithstanding the identification of references in Petitioner's grounds chart, however, the arguments advanced in the Petition make plain that Petitioner does not assert Knoch in connection with any limitation of any claim among the claims proven unpatentable. Pet. 7, 23–49. Petitioner asserts Knoch only in connection with the spiraling tortuous passage claims, none of which is among the claims proven unpatentable. *Id.* at 23, 31. For that reason, in the following analysis of the claims proven unpatentable, we need not, and do not, assess Knoch or Petitioner's asserted reasons for combining Knoch with any other prior art reference.

Independent Claim 5

Claim 5 is directed to “[a]n insert of a cartridge for use with a liquid diffusing device” where the insert comprises a body, an inlet provided in the body, an outlet zone, and a tortuous passage having various recited features. Ex. 1001, 18:39–55. We address each limitation of claim 1 in turn below.

The preamble of claim 5 recites: “An insert of a cartridge for use with a liquid diffusing device, the insert comprising.” *Id.* at 18:39–40. To the extent that the preamble is limiting, we find that Rosener teaches an insert of a cartridge for use with a liquid diffusing device. Pet. 26, 33; Ex. 1004 ¶¶ 21, 26–27, 31. Patent Owner does not contest that point. *See* Resp. 21–43.

The insert of claim 5 includes “a body.” Ex. 1001, 18:41. Rosener teaches such a body. Pet. 26–27, 33; Ex. 1004, Fig. 2E, ¶¶ 26–27 (liquid leaves venturi device through orifice 401 into a structure that separates small airborne particles from big ones through impaction). Rosener's cylindrical

section 404 and funnel-shaped assembly 5 (both of which are highlighted green in the illustration that follows) are “a body” of “an insert” within the meaning of claim 5. Pet. 26, 33. Petitioner refers us to an annotated version of Rosener’s Figure 2D (cropped), which we reproduce below.

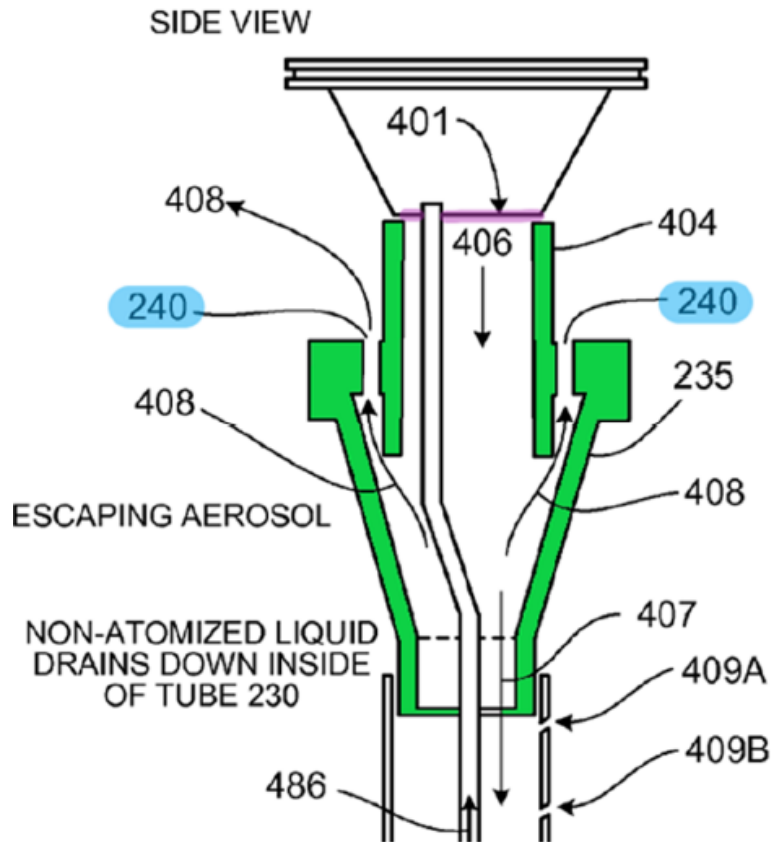


FIGURE 2D, CROPPED AND ANNOTATED

Pet. 28, 31. Rosener’s Figure 2E illustrates a side view of “an example of implementation of a scent delivery system that includes a reservoir assembly for storing fragrance oil and an atomizer complex.” Ex. 1004 ¶ 14. Petitioner crops Figure 2E and annotates the figure to highlight cylindrical section 404 and funnel-shaped assembly 235 (both shaded green), orifice 401 (shaded magenta), and holes 240 (shaded blue). Patent Owner does not dispute that Rosener’s cylindrical section 404, in combination with Rosener’s funnel-

shaped assembly 235, together represent an insert of a cartridge within the scope of claim 5. *See* Resp. 21–43.

The insert of claim 5 includes “an inlet provided in the body to receive diffused liquid generated within the cartridge during operation of the liquid diffusing device.” Ex. 1001, 18:42–44. We agree with Petitioner’s view that cylindrical section 404 includes “an inlet opening at the top (orifice 401, magenta) provided in the body of the insert (green),” where shading refers to the above illustration. Pet. 27–28, 33; Ex. 1004 ¶¶ 26–30. In particular, “orifice 401,” shaded magenta in the above illustration, represents an inlet within the meaning of claim 5. Pet. 27–28, 33. Patent Owner does not dispute that point. *See* Resp. 21–43.

Claim 5 also recites that the insert of the cartridge includes “an outlet zone defined at least in part by the body through which to discharge the diffused liquid toward an external environment.” Ex. 1001, 18:45–47. We agree with Petitioner’s argument that holes 240 (shaded blue in the above illustration) represent “an outlet zone” as specified in claim 5. *Id.* at 28–30, 33. Petitioner directs us to the following disclosure from Rosener in support of that proposition.

The path of the airflow through the device is shown by arrows 408, which turns and flows upwards through the holes 240 carrying with it the entrained aerosol particles of desirable small size. These particles then enter the interior of the atomizer complex 215 and are discharged through nozzle 227.

Pet. 28 (quoting Ex. 1004 ¶ 30), 33.

In addition, Petitioner directs us to the following version of Rosener’s Figure 2B (cropped), which provides another perspective of holes 240 and indicates the location of nozzle 227.

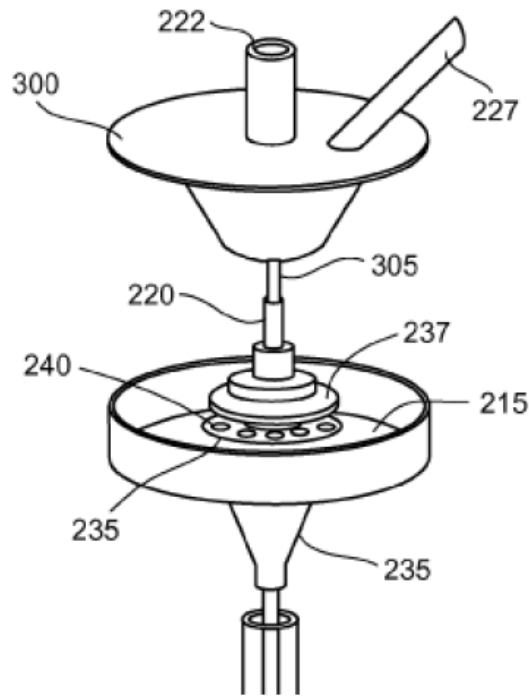


FIGURE 2B, CROPPED

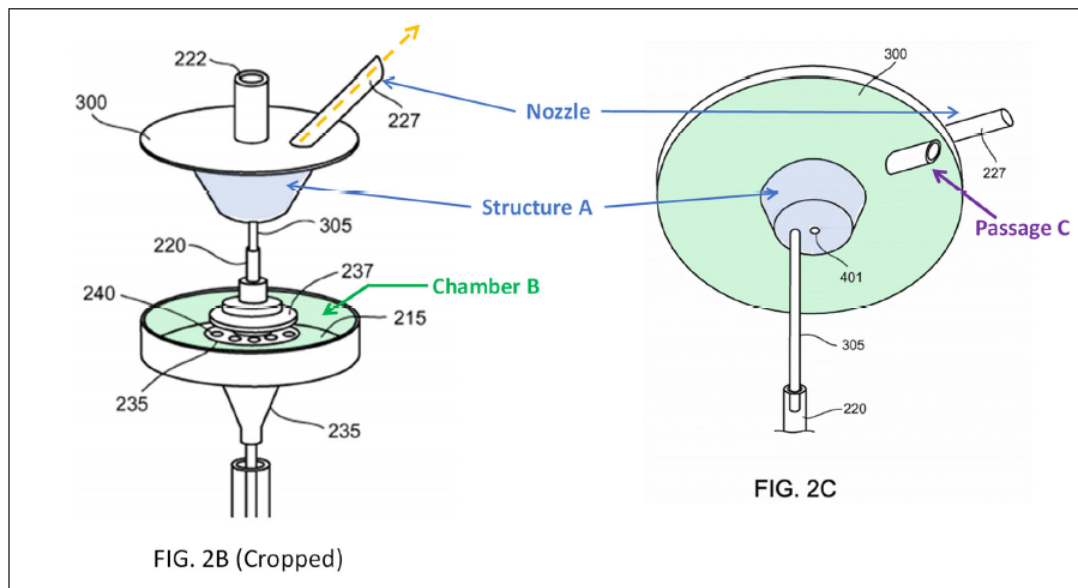
Pet. 29, 33. Figure 2B is a cropped illustration of “an example of implementation of a scent delivery system that includes a reservoir assembly for storing fragrance oil and an atomizer complex.” Ex. 1004 ¶ 14.

In Petitioner’s view, “Rosener discloses an outlet zone (interior of holes 240) which is defined in part by the body” of the insert, that is, “cylindrical section 404 and funnel-shaped assembly 235) through which the diffused liquid is discharged into the external environment through the nozzle 227.” Pet. 30, 33. Patent Owner counterargues that Petitioner does not explain how the Rosener device is capable of “discharging diffused liquid *toward* an external environment.” Resp. 23 (Patent Owner’s emphasis). As we explain above in our discussion of claim construction, however, the term “toward” does not require aiming. Petitioner shows that air flows through the outlet zone defined by holes 240 in Rosener’s devices, as illustrated in Figures 2B and 2D, reproduced above. Rosener discloses

that air moves in the direction of—and along a course leading to—the external environment. Ex. 1004 ¶ 30 (“The path of the airflow through the device is shown by arrows 408, which turns and flows upwards through the holes 240 carrying with it the entrained aerosol particles of desirable small size. These particles then enter the interior of the atomizer complex 215 and are discharged through nozzle 227.”); *see* Reply 7–9.

Alternatively, even if we were to adopt Patent Owner’s view that claim 5 requires that diffused liquid exiting holes 240 must be “**aimed in the direction of** the external environment,” we would find that Rosener’s holes 240 meet the limitation. Resp. 25 (emphasis in original). Specifically, under that “aimed” interpretation, Petitioner identifies Rosener’s outlet zone as “interior holes 240” and “defined in part by the body (cylindrical section 404 and funnel-shaped assembly 235) through which the diffused liquid is discharged into the external environment through the nozzle 227.” Pet. 30, 33. Petitioner reproduces Rosener Figure 2D, which illustrates via the upper-left arrow 408 that the structure past hole 240 aims airflow up and to the left. *Id.* at 29. This direction is “toward the external environment” because the arrows point in a direction leading outside of the device.

Patent Owner argues that the “toward the external environment” recitation is not met because an ordinarily skilled artisan would have recognized that, in Rosener’s device, “aerosol changes direction multiple times before it enters nozzle 227 to get discharged into the external environment.” Resp. 26. In making this argument, Patent Owner refers to annotated versions of Rosener’s Figures 2B (cropped) and 2C, which we reproduce below.



Resp. 25. Figure 2B and 2C illustrate an example implementation of Rosener's scent delivery system. Ex. 1004 ¶ 14. Patent Owner annotates Figure 2B by labeling the area above atomizer complex 215 as Chamber B and coloring that area green. Patent Owner labels the frustum-shaped structure below top portion 300 as Structure A and colors that area blue. Patent Owner labels output nozzle 227 as a “nozzle” and draws a dotted yellow line extending up and to the right through the nozzle to indicate air flow out of the structure.

Patent Owner's arguments, in that regard, are unavailing. As explained above, the outlet zone that Petitioner identifies directs diffused liquid along a path; that path may involve bends and turns, but it ultimately exits into an external environment. Thus, the path proceeds toward the external environment. Moreover, even under Patent Owner's “aimed” claim construction, the outlet zone aims liquid toward an external environment (i.e., in the direction of, or along a path leading to, the external environment) even if the structure prevents a straight-line flow between the outlet zone and ultimate escape from Rosener's device.

Claim 5 further requires “a tortuous passage extending between the inlet and the outlet zone to aid in further reducing an average particle size of the diffused liquid as the diffused liquid moves through the tortuous passage.” Ex. 1001, 18:48–51. Petitioner shows that Rosener discloses such a tortuous passage. Pet. 30, 33; Ex. 1004, Figs. 2B, 2D, ¶ 27. In particular, Petitioner cites paragraph 27 of Rosener, which explains that “physical impaction may be achieved by forcing the airstream with entrained particles to go around tight bends and corners or through small holes.” Pet. 30 (quoting Ex. 1004 ¶ 27). This method may tend “to expose the stream of entrained particles to a lot of surfaces.” *Id.*

Petitioner further explains that Rosener describes physical impaction for the purpose of separating small airborne particles from big particles. *Id.*; see Ex. 1004 ¶ 30 (“The path of the airflow through the device is shown by arrows 40-8, which turns and flows upwards through the holes 240 carrying with it the entrained aerosol particles of desirable small size.”). Patent Owner does not dispute that Rosener discloses a tortuous passage within the scope of claim 5. See Resp. 21–43 (disputing only whether Knoch would have prompted a modification of Rosener’s tortuous passage to spiral between the inlet and outlet zone, a limitation not required by claim 5).

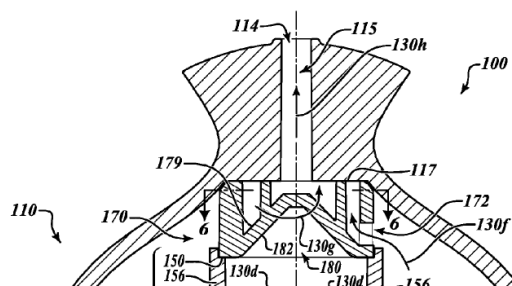
Claim 5 also requires that “a lower portion of the body includes an indentation having an impaction surface to be impinged upon by diffused liquid during operation of the liquid diffusing device.” Ex. 1001, 18:52–55. Petitioner argues that Rosener teaches a lower portion of the body of the insert that is funnel-shaped (a frustoconical or cone shape with an open bottom) and that particles collide with this funnel-shaped section. Pet. 34–35 (citing, *e.g.*, Ex. 1004 ¶ 30). Patent Owner argues that the funnel-shaped

portion of assembly 235 is not an “indentation” because an “indentation” is “an angular cut in an edge” or a “recess in a surface.” Resp. 41.

We agree with Petitioner. The frustoconical lower portion of Rosener’s insert is a recessed surface that satisfies the “indentation” limitation of claim 5. *See* Reply 10–11; Ex. 1004, Fig. 2E, ¶¶ 25, 30. Rosener explains this structure’s purpose: “Excess oil . . . drains . . . into the funnel-shaped structure 235.” Ex. 1004 ¶ 25. The ’004 patent describes the purpose of the indentation in similar terms:

[T]he insert 170 may include a lower portion having an indentation or depression 180 that includes an impact surface 182 to be impinged upon by the diffused liquid generated by the venturi device 142 during operation. In some instances, the impact surface 182 may be concave and may diverge in a downward direction to direct liquid condensed or collected thereon radially outward and downward. In some embodiments, the impact surface 182 may be a conical or frustoconical surface.

Ex. 1001, 9:6–14. We reproduce below Figure 4 (cropped) from the ’004 patent, which depicts impact surface 182 as a frustoconical surface.



Ex. 1001, Fig. 4. Figure 4 is a cropped illustration of the top portion of cross-sectional view showing internal components and structures of a cartridge for a diffusion device as disclosed in the ’004 patent. *Id.* at 2:66–67, 7:9–64. Among other features, Figure 4 illustrates “impact structure or surface 182” on which “at least some of the diffused liquid impacts and

collects” then “is routed back to any remaining fluid in the reservoir. *Id.* at 7:31–34.

The ’004 patent discloses that, as shown in Figure 4, “impact surface 182 may be a conical or frustoconical surface.” *Id.* at 9:13–14. Patent Owner, however, argues that an ordinarily skilled artisan would have recognized that the indentation that includes impact surface 182 is a “hollow of any size on a plain surface having no natural outlet for surface drainage,” which would exclude Rosener’s funnel-shaped structure 235 because drainage flows through the structure. Resp. 42–43. That argument is based on extrinsic opinion testimony keyed to a dictionary definition of “depression,” not the claim term “indentation.” *Id.* (citing Ex. 2004, 3). As Petitioner points out: “The term in the challenged claims is ‘indentation,’ not ‘depression.’” Reply 11 (quoting Ex. 1001, 18:52).

The ’004 patent allows that “the insert may include an ‘indentation *or* depression,’ not that the indentation must be a depression.” Reply 11 (quoting Ex. 1001, 9–6, 14:44–45) (Petitioner’s emphasis). Against that backdrop, we determine that the indentation limitation of claim 5 encompasses Rosener’s funnel-shaped impact surface 235, which is a “frustoconical” impact surface as disclosed in the ’004 patent. Ex. 1001, Fig. 4, 9:13–14; Reply 10–11.

On this record, Petitioner establishes by a preponderance of the evidence that the subject matter of claim 5 of the ’004 patent would have been obvious over Rosener.

Dependent Claim 6

Claim 6 depends from claim 5 and requires a cartridge “wherein the impact surface diverges in a downward direction to direct liquid

condensed thereon radially outward and downward.” *Id.* at 18:56–58.

Petitioner asserts that claim 6 is obvious over Rosener in view of Dautrebande or Svoboda. Pet. 7; *see supra* 2 n.6.

Petitioner argues that a lower end of Dautrebande’s aerosol conduit member 6 has a larger diameter than its upper end. Pet. 45–46 (citing Ex. 1007, 2:13–15, 2:47–55). Petitioner further argues that an ordinarily skilled artisan would have had reason to incorporate principles of Dautrebande’s aerosol conduit member 6 into Rosener (in conjunction with Rosener’s “tight bends and corners”) to help achieve Rosener’s desired sufficiently small airborne particles. Pet. 42–44.

Patent Owner argues that a person of ordinary skill in the art would not incorporate Dautrebande’s conduit member 6 into Rosener’s device because doing so would render Rosener’s device inoperable. Resp. 45–46. It is well established that “it is not necessary that the inventions of the references be physically combinable to render obvious the invention under review.” *In re Sneed*, 710 F.2d 1544, 1550 (Fed. Cir. 1983). In addition, “[c]ombining the *teachings* of references does not involve an ability to combine their specific structures.” *In re Nievelt*, 482 F.2d 965, 968 (CCPA 1973) (emphasis in original). On this record, we find Patent Owner’s position argues bodily incorporation, rather than considering what the combined disclosures of Rosener and Dautrebande fairly would have suggested to an ordinarily skilled artisan.

The preponderance of the evidence better supports Petitioner’s arguments. Petitioner proposes that a particular feature of Dautrebande’s aerosol conduit member 6 be incorporated into Rosener’s tortuous passage. Pet. 42–46. The references support a suggestion to do so. Air flows upward

through the tortuous passage of Rosener just as it flows upward through Dautrebande's aerosol conduit member 6. Reply 14–15; Ex. 1004, Fig. 2E; Ex. 1007. Both devices concern creating atomized droplets of a sufficiently small dimension. Ex. 1004 ¶ 18, Ex. 1007, 1:1–14. A person of ordinary skill in the art would have expected, therefore, that Rosener's tortuous passage likewise would benefit from a divergent shape, as specified in claim 6, for the same reason Dautrebande benefits from such a shape. Ex. 1003 ¶ 58; *see KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 417 (2007).

Against that backdrop, we are not persuaded that Petitioner argues for a modification in which conduit member 6 of Dautrebande physically replaces Rosener's tortuous passage. Pet. 40–46. Petitioner argues, and we agree on this record, that an ordinarily skilled artisan “viewing Rosener would have looked to Dautrebande (and vice versa) to inform possible or alternative approaches to perform the same functions within the same general structure.” *Id.* at 43; Ex. 1003 ¶ 55. The modification Petitioner proposes “uses a known element for its known purpose to yield a predictable result,” namely, attaining small airborne particles through surface impaction. Pet. 40–46. Petitioner identifies persuasive evidence that an ordinarily skilled artisan “would have improved Rosener's funnel-shaped assembly with the general structure taught by Dautrebande” by taking account of Dautrebande's suggestion for inclusion of a divergent shape as specified in claim 6. Reply 15; Ex. 1003 ¶ 56.

Petitioner also challenges claim 6 based on Rosener in view of Svoboda. Pet. 7, 48–49. Here again, Petitioner demonstrates that an ordinarily skilled artisan would have considered “an impaction surface that diverges in a downward direction” as an “alternative” approach for use in

Rosener's device, as suggested by Svoboda. Pet. 47–49. Patent Owner's counterarguments are based on the erroneous assumption that Petitioner argues for a bodily incorporation of Svoboda's deflector member into Rosener's device. Resp. 51–53. Like the ground based on Dautrebande, the ground based on Svoboda is based on suggestions of interchangeable “alternative approaches,” rather than physical incorporation of components into Rosener's device. Pet. 43, 48. On this record, we determine that Patent Owner's counterarguments do not take account of what the combined disclosures of Rosener and Svoboda fairly would have suggested to an ordinarily skilled artisan. Resp. 51–53.

For the above reasons, we determine that Petitioner has established by a preponderance of the evidence that the subject matter of claim 6 would have been obvious over Rosener in view of Dautrebande or Svoboda.

Independent Claim 8

Independent claim 8 includes many recitations that are the same as those recited in claim 5. Our reasoning above, provided in connection with claim 5, applies with equal force to those limitations of claim 8.

Claim 8 differs from claim 5 in two material respects. Claim 8 lacks the indentation limitation of claim 5, therefore, our determination that claim 8 is proven unpatentable does not depend on our reasoning above concerning that limitation. Claim 8, however, adds an additional requirement to the tortuous passage of the insert. *Compare* Ex. 1001, 18:39–55 (claim 5), *with id.* at 18:62–19:9 (claim 8). Specifically, claim 8 requires that “a cross-sectional profile of at least a portion of the tortuous passage” is “narrowing in a downstream direction.” *Id.* at 19:7–9. Rosener illustrates and describes funnel-shaped structure 235 as narrowing in a downstream direction.

Ex. 1004, Figs. 2D, 2E, ¶ 29; Pet. 36–37. Patent Owner does not raise arguments specifically disputing that point. *See* Resp. 21–43.

On this record, we determine that Petitioner establishes by a preponderance of the evidence that the subject matter of claim 8 would have been obvious over Rosener.

Independent Claim 9

The preamble of claim 9 recites “[a] cartridge for use with a liquid diffusing device.” Ex. 1001, 19:9–10. We agree with Petitioner that “Rosener discloses a reservoir assembly 205 and atomizer complex 215 (which together comprise a cartridge) as part of scent delivery system 200 (liquid diffusing device).” Pet. 37; Ex. 1004 ¶¶ 24, 45.

Claim 9 further requires “a cartridge housing defining an internal housing cavity partially filled with liquid to be diffused.” Ex. 1001, 19:12–13. Petitioner shows that Rosener discloses such a cartridge housing by directing us, for example, to Figure 2A, which we reproduce below.

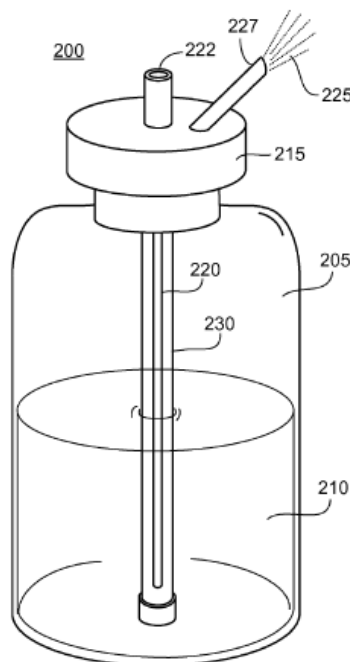


FIG. 2A

Pet. 37 (reproducing Ex. 1004, Fig. 2A). Figure 2A illustrates an example of an implementation of Rosener's scent delivery system, including reservoir assembly 205 for storing fragrance oil 210 and atomizer complex 215.

Ex. 1004, ¶¶ 14, 24. Petitioner does not dispute that these structures define “an internal housing cavity partially filled with liquid (fragrance oil 210).”

Pet. 37–38; *see* Resp. 21–43.

Claim 9 further requires “a diffusion head positioned within the internal housing cavity, the diffusion head including a venturi device for generating a diffused liquid from the liquid contained in the internal housing cavity.” Ex. 1001, 19:13–16. Petitioner directs us to disclosure in Rosener that teaches this limitation. Pet. 39; *see* Ex. 1004, Fig. 2C (annotated version reproduced above). As illustrated in Rosener's Figure 2C, “the top portion of the atomize[r] complex 215 includes a structure inside of which” a “venturi chamber is formed.” Pet. 30; Ex. 1004 ¶ 26. “[I]nlet structure 222 leads to this venturi chamber as does oil intake assembly 305.” Pet. 30; Ex. 1004 ¶ 26. Here again, Patent Owner directs us to no evidence contesting Petitioner's well-supported factual assertions. *See* Resp. 21–43.

On this record, Petitioner establishes by a preponderance of the evidence that the subject matter of claim 9 of the '004 patent would have been obvious over Rosener.

Dependent Claim 10

Claim 10 depends from claim 9 and specifies that “the tortuous passage of the insert is configured to aid in further reducing an average particle size of the diffused liquid as the diffused liquid moves through the tortuous passage.” *Id.* at 19:23–26.

Petitioner demonstrates that Rosener discloses such a tortuous passage. Pet. 39; Ex. 1004, Figs. 2B, 2D, ¶ 27. In particular, Petitioner cites paragraph 27 of Rosener as stating, “in some implementations, physical impaction may be achieved by forcing the airstream with entrained particles to go around tight bends and corners or through small holes.” Pet. 39. Petitioner further explains that Rosener describes physical impaction for the purpose of separating small airborne particles from big particles. *Id.*; see Ex. 1004 ¶ 30 (“The path of the airflow through the device is shown by arrows 408, which turns and flows upwards through the holes 240 carrying with it the entrained aerosol particles of desirable small size.”).

The '004 patent indicates that a tortuous passage “follows a non-linear path” that may include “a plurality of straight segments angled relative to each other to provide a number of turns.” Ex. 1001, 10:36–39, 10:49–50. It is worth noting, again, that Petitioner does not rely solely on the single sharp turn, illustrated in Rosener’s Figure 2D by arrows 406 and 408. *See* Pet. 28, 31 (reproducing Rosener’s Figure 2D, cropped and annotated). Rosener’s textual description refers to the “forcing of the airstream with entrained particles to go around tight bends and corners or through small holes,” which indicates that Rosener, at minimum, suggests the plurality of turns described in the '004 patent. Pet. 39; Ex. 1004 Fig. 2B, 2D, ¶ 27. We agree with Petitioner that Rosener discloses a tortuous passage within the scope of claim 10 based on evidence not disputed by Patent Owner. *See* Resp. 21–43.

On this record, Petitioner establishes by a preponderance of the evidence that the subject matter of claim 10 of the '004 patent would have been obvious over Rosener.

Dependent Claim 13

Claim 13 depends from claim 9 and specifies that the body of the insert “is formed as a single, unitary piece that includes the tortuous passage.” Ex. 1001, 19:35–36. Petitioner agrees that Rosener does not explicitly teach that its insert is formed as a single unitary piece. Petitioner argues that Dautrebande is directed toward an apparatus for obtaining improved aerosols and teaches a single, unitary piece aerosol conduit member 6 that includes a tortuous passage. Pet. 20–22, 37–39, 44–46; Ex. 1007, Fig. 1. Petitioner further argues that a person of ordinary skill in the art would have combined the teachings of Rosener and Dautrebande and provides citations to both references to support this argument. Pet. 42–44.

Patent Owner argues that Petitioner has not established adequately that an ordinarily skilled artisan would have had a reason to combine the teachings of Rosener and Dautrebande. Resp. 42–44. We disagree. Both Rosener and Dautrebande concern aerosolizing liquid particles of sufficiently small size. Pet. 42–43; Ex. 1004 17–18; Ex. 1007 1:1–14, Ex. 1003 ¶ 58. Both references teach the use of a tortuous passage to separate small particles from undesirable large particles by surface impaction. Pet. 41–42; Ex. 1004 ¶ 27; Ex. 1007 1:24–28, 1:35–42, 3:2–9 (explaining that after going through turns, unstable particles “will tend to deposit and coalesce . . . at the right angle turns”).

We agree with Petitioner that Dautrebande’s use of a single, unitary body would have suggested a modification in which the two-section body of Rosener is formed as a unitary body in which the “outlet zone (interior of holes 240)” is defined by a single piece that includes both “cylindrical section 404 and funnel shaped assembly 235.” Pet. 30. That suggestion does

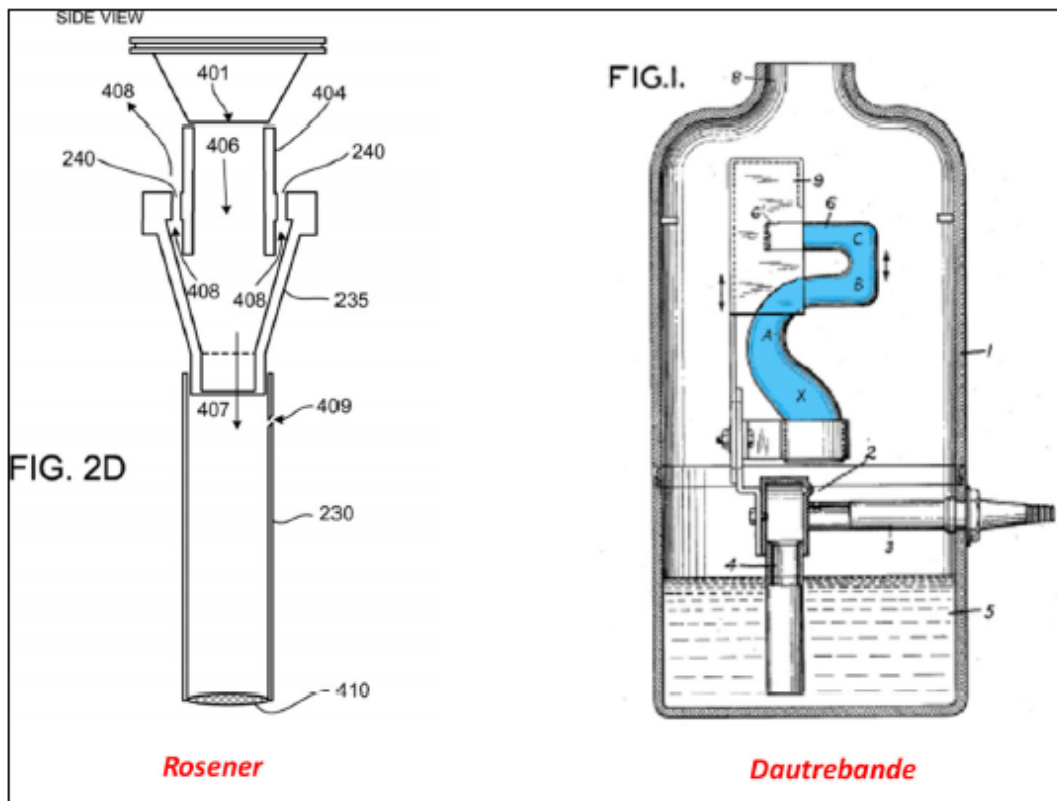
not command a physical incorporation of Dautrebande's conduit member 6 into Rosener's device. Petitioner shows that a person of ordinary skill in the art "would have been motivated to incorporate that 'basic approach' of Dautrebande" into Rosener's device. Reply 13–14; Ex. 1003 ¶¶ 55–56.

Dautrebande teaches, for example, that formation and use of turbulent liquid masses (created by turns in a curved conduit) "is critical in the production of aerosol of the preferred small size and uniformity." Ex. 1007, 3:14–20. A person of ordinary skill in the art would have recognized that Dautrebande's approach toward the insert—constructed of a single piece with curved zones—is useful for achieving small aerosolized liquid particles and, from that teaching, would have viewed the single-piece construction of Dautrebande, in particular, as an interchangeable, alternative approach for modifying Rosener's two-piece tortuous passage as a single piece. Pet. 43–46. The proposed modification represents no more than a "predictable" use of a prior art element according to its established function. *Id.* at 43. Patent Owner's argument that Petitioner fails to explain "why" an ordinarily skilled artisan would have applied the single-piece approach of Dautrebande to the two-piece approach of Rosener is answered by the interchangeability of those two approaches to achieve the same result. Resp. 46 (Patent Owner's emphasis).

We disagree with Patent Owner's somewhat related argument that Petitioner does not explain adequately "how" a person of ordinary skill in the art would have incorporated Dautrebande's conduit member 6 into Rosener's device. *Id.* (Patent Owner's emphasis). Here again, Patent Owner misconstrues the proposed modification as requiring a bodily incorporation of the physical structure of Dautrebande's conduit member 6 to replace

Rosener's tortuous passage. *Id.*; Reply 13 (Petitioner, refuting that the modification requires "an improper bodily incorporation"). But Petitioner argues, and we agree, that an ordinarily skilled artisan would have consulted Dautrebande when considering improvements to Rosener's device, including the alternative approach of forming a two-piece structure as a single piece. *Id.* at 43 (ordinarily skilled artisan "would have looked to Dautrebande . . . to inform possible improvements or alternative approaches" in Rosener "to perform the same functions within the same general structure"); see *In re Mouttet*, 686 F.3d 1322, 1332 (Fed. Cir. 2012) ("a determination of obviousness based on teachings from multiple references does not require an actual, physical substitution of elements").

We reproduce below Patent Owner's illustration, which is useful in assessing the challenge and the parties' respective contentions.



Resp. 45. The above illustration shows Rosener's Figure 2D on the left and Dautrebande's Figure 1 (cropped) on the right. The above illustration further shows Petitioner's annotation to Dautrebande's Figure 1, in which s-shaped conduit 6 is shaded blue. Petitioner asserts that unitary s-shaped conduit 6 in Dautrebande would have suggested the use of a single, unitary body in place of the two-section body, or insert, of Rosener's device. Pet. 26–27, 42–46.

We agree with Petitioner that Dautrebande's use of a single, unitary body would have suggested a modification in which the two-section body of Rosener is provided as a single, unitary body. Pet. 42–46. That suggestion does not require a physical incorporation of Dautrebande's conduit 6 into Rosener's device. Petitioner shows that a person of ordinary skill in the art would have been led to incorporate the “basic approach” of Dautrebande into Rosener's device. Reply 13; Ex. 1003 ¶¶ 55–56. In other words, forming the two pieces of Rosener's tortuous passage (namely, cylindrical section 404 and funnel-shaped assembly 235) from a single piece appears, on this record, as an obvious substitution of one approach for an interchangeable alternative. Reply 13.

On this record, therefore, we determine that Petitioner has established by a preponderance of the evidence that the subject matter of claim 13 would have been obvious over Rosener in view of Dautrebande.

Dependent Claim 14

Claim 14 depends from claim 9 and specifies that “a lower portion of the insert” of the cartridge “includes an indentation having an impaction surface to be impinged upon by the diffused liquid generated by the venturi device during operation of the liquid diffusing device.” Ex. 1001, 19:37–40. Claim 14 recites the same limitation as claim 5. Both parties rely on the

same arguments, regarding claim 5, in connection with claim 14. Pet. 40; Resp. 44. Our reasoning above, pertaining to the substantially similar indentation limitation of claim 5, applies with equal force to claim 14.

On this record, Petitioner shows by a preponderance of the evidence that the subject matter of claim 14 would have been obvious over Rosener.

Dependent Claim 15

Claim 15 depends from claim 14 and specifies an “impaction surface” that “diverges in a downward direction to direct liquid condensed thereon radially outward and downward.” Ex. 1001, 19:41–43. Claim 15 recites the same limitation as claim 6. Both parties rely on the same arguments, regarding claim 6, in connection with claim 15. Pet. 46; Resp. 49–51. Our reasoning above, pertaining to the substantially similar impaction surface limitation of claim 6, applies with equal force to claim 15.

On this record, Petitioner shows by a preponderance of the evidence that the subject matter of claim 15 would have been obvious over the combined disclosures of Rosener and Dautrebande.

Dependent Claim 16

Claim 16 depends from claim 9 and requires that “the tortuous passage is at least partially defined by a vertical sidewall of the insert.” *Id.* at 20:1–2. Petitioner argues that the interior and exterior walls of Rosener’s cylindrical section 404, having vertical side walls as illustrated in Figure 2D, “necessarily would define the tortuous passage.” Pet. 29.

A preponderance of the evidence supports Petitioner’s position. In particular, Rosener’s Figure 2D illustrates vertical side walls of cylindrical section 404. Ex. 1004, Fig. 2D. The airstream path is guided by a physical structure that may include tight bends and corners, that is, a tortuous passage

within the meaning of claim 16. *Id.* at Fig. 2D, ¶ 27. Patent Owner raises no arguments in connection with claim 16 in particular. *See* Resp. 44–51.

On this record, we determine that Petitioner establishes by a preponderance of the evidence that the subject matter of claim 16 of the '004 patent would have been obvious over Rosener.

Dependent Claim 18

Claim 18 depends from claim 9 and specifies that the insert of the cartridge “is sandwiched between the cartridge housing and the diffusion head.” *Id.* at 20:6–7. Petitioner directs us to persuasive evidence that Rosener discloses the limitations of claim 18. Pet. 38, 40–41.

Specifically, the tapered structure above element 401, as illustrated in Rosener’s Figure 2C, would have been “understood as a diffusion head” and, further, the insert (shaded green in Petitioner’s annotated and cropped version of Rosener’s Figure 2D, reproduced *supra* at 17) “is between the tapered structure above” element 401 “and the reservoir containing the liquid, which makes up a portion of the cartridge housing.” Pet. 41 (and citations to the record therein). Patent Owner does not contest Petitioner’s arguments and evidence on this point. *See* Resp. 21–43.

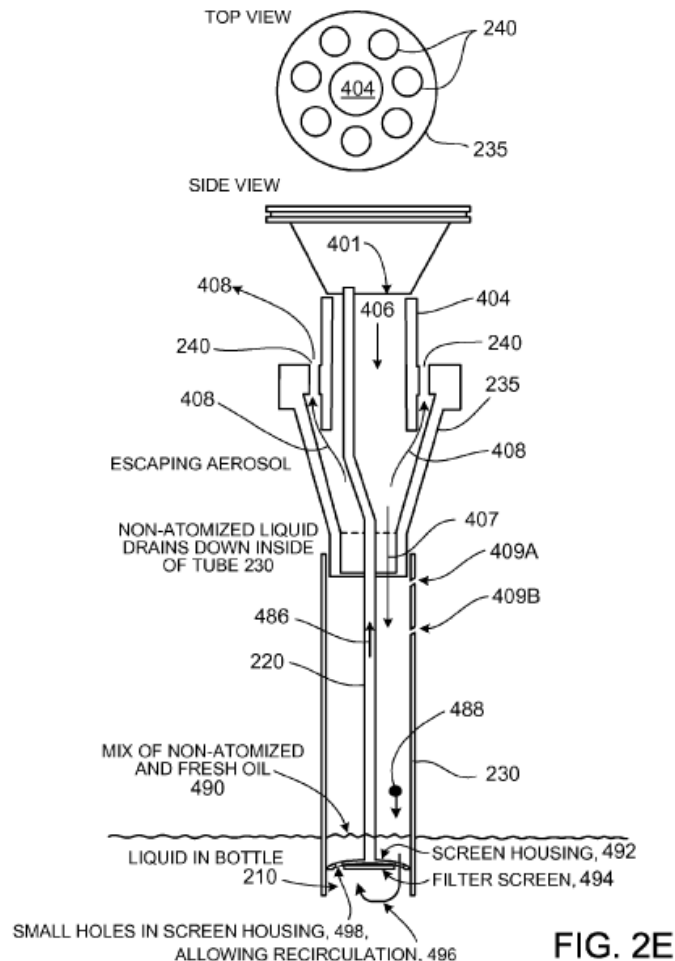
On this record, Petitioner establishes by a preponderance of the evidence that claim 18 is unpatentable as obvious over Rosener.

Dependent Claim 22

Claim 22 provides: “The cartridge of claim 9 wherein the tortuous passage of the insert provides the sole passage for the diffused liquid generated by the venturi device to exit the cartridge.” Ex. 1001, 20:27–29. We agree with Petitioner that “the flow of air (arrows 406 and 408)” in Rosener’s device “passes through a tortuous passage between the inlet of the

hollow cylindrical section 404 and the outlet hole 240 before it exits the cartridge.” Pet. 41; *see id.* at 37–39 (claim chart for claim 9); Ex. 1004, Figs. 2D, 2E.

Rosener’s Figure 2E, reproduced below, supports Petitioner’s view that “any non-atomized liquid drains down the inside of the tube 230,” therefore, “any diffused liquid that exits the cartridge through holes 240 and output nozzle 227 must pass through the tortuous passage” defined by cylindrical section 404 and funnel-shaped structure 235.



Ex. 1004, Fig. 2E. Figure 2E illustrates an example of Rosener’s scent delivery system and “includes a reservoir assembly for storing fragrance oil and an atomizer complex.” *Id.* ¶ 14.

Patent Owner raises no arguments specific to claim 16. *See* Resp. 21–43. On this record, Petitioner shows by a preponderance of the evidence that the subject matter of claim 16 would have been obvious over Rosener.

3. Spiraling Tortuous Passage Claims

For reasons that follow, we determine that Petitioner fails to establish the unpatentability of claims 1–4 and 11 by a preponderance of the evidence. Petitioner asserts that these claims are unpatentable as obvious over Rosener and Knoch. Pet. 7 (identification of Ground I).¹¹

Independent Claim 1

Among other features, independent claim 1 requires an insert that includes “a tortuous passage extending between the inlet and the outlet zone” wherein “the tortuous passage spirals between the inlet and the outlet zone.” Ex. 1001, 18:25–26, 18:29, 18:31–32. For reasons explained above in our analysis of claim 5, Petitioner directs us to persuasive evidence, and Patent Owner does not dispute, that Rosener’s device includes a tortuous passage that extends between an inlet and outlet zone. *See* Pet. 30, 33; Ex. 1004 Fig. 2B, 2D, ¶ 27; *see* Resp. 21–43 (nowhere disputing that factual contention). A genuine dispute, however, surrounds whether an ordinarily skilled artisan would have modified Rosener’s device in view of Knoch to attain a tortuous passage that “spirals between the inlet and outlet zone” as

¹¹ Petitioner asserts that Patent Owner does not dispute that Rosener combined with Knoch renders obvious claims 2 and 4. Pet. 7. That is not correct. Those claims inherit the spiraling tortuous passage limitation of claim 1, and Patent Owner makes clear arguments against both Petitioner’s asserted reasons to combine the references and the proposition that the combination would have led to the subject matter of the spiraling tortuous passage claims, including claims 2 and 4. Resp. 27–39.

required by claim 1. Pet. 23–25, 30–32; *see* Resp. 21–43 (disputing whether Knoch would have prompted a modification of Rosener’s tortuous passage to spiral between the inlet and outlet zone).

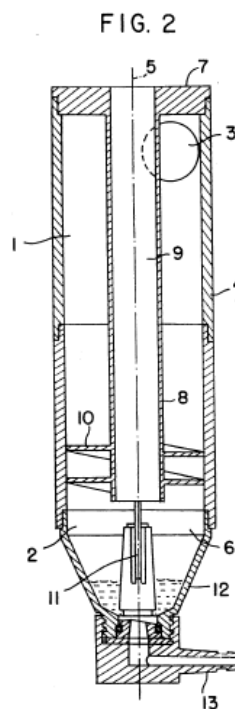
Petitioner acknowledges that Rosener does not disclose a tortuous passage “spiraling between the inlet and the outlet zone” in the manner specified. Pet. 23. Petitioner argues that “Knoch cures this deficiency and provides a rationale for” an ordinarily skilled artisan “to incorporate such spiraling into the device of Rosener.” *Id.* For reasons explained below, we have concerns about whether Knoch “provides a rationale for” the proposed modification. *Id.* Even if we set aside those concerns, however, for reasons also explained below, we find Petitioner falls short of showing that “Knoch cures this deficiency” in the disclosure of Rosener by suggesting a modification based on an “alternative” approach “to perform the same functions within the same general structure.” *Id.* at 23–24.

Petitioner argues that “both Rosener and Knoch address the problem of creating desirably small airborne particles through impaction on a surface area in a tortuous passage,” but directs us to evidence insufficient to establish that an impaction surface in Knoch’s device spirals as required by the challenged claims. *Id.* at 24; *see* Ex. 1003 ¶ 23 (Dr. Morse, explaining the manner in which particles are separated by size in the “type of inertial impactor” known as “the cyclone,” which forms a transient flow path, or “spiral vortex,” of airborne liquid particles in “a cyclone chamber”).

Knoch discloses an atomizer used in inhalation therapy to deliver medicinal substances, which are carried in metered doses of vaporized liquid “deep into the respiratory tracts” of patients to ensure “effective absorption of the active substance via the surface of the lungs.” Ex. 1006, code (57),

1:6–24, 2:48–53. “For the reliable intake of this active substance, it is required that the vaporized liquid, and the active substance carried with it, is transported by the flow of breath far into the respiratory tracts without it depositing prematurely in the mouth or throat area.” *Id.* at 1:17–21.

Petitioner asserts that Knoch’s “guiding surfaces 10” represent “a tortuous passage that spirals between” an inlet and outlet zone. Pet. 31. We reproduce below Knoch’s Figure 2, which illustrates guiding surfaces 10.



Ex. 1006, Fig. 2. Figure 2 illustrates an embodiment of Knoch’s atomizer, including cylindrically-shaped atomizing space 1 and wall 4. *Id.* at 3:4–6, 5:3–6. Wall 4 includes “opening 3 for the withdrawal of the vaporized liquid.” *Id.* at 5:6–7. Opening 3 “is arranged laterally displaced with respect to the longitudinal axis 5 so that a spiral vortex is formed about the longitudinal axis 5 during the withdrawal of the liquid vapor.” *Id.* at 5:7–10. Figure 2 also illustrates guiding surfaces 10 which extend “helically in the manner of the ensuing spiral vortex.” *Id.* at 5:28–32.

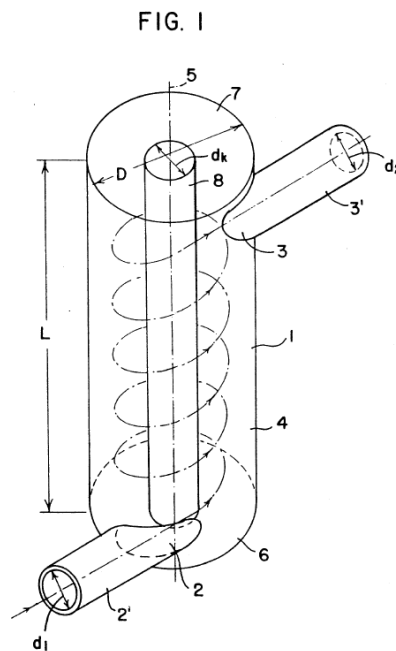
Petitioner asserts that an ordinarily skilled artisan would have been “motivated to incorporate the helical guiding surfaces 10 of Knoch into the cylindrical section 404 of Rosener.” Pet. 31. The reason, according to Petitioner, would have been an understanding that the modification “would lead to improved homogenization of the vaporized liquid.” *Id.* at 31–32 (citing Ex. 1006, 3:26–3:29; Ex. 1003 ¶ 53 (Dr. Morse’s written testimony, repeating that conclusory reason to combine, without further elaboration, in the claim chart that appears on page 34 of his declaration)).

As an initial matter, Patent Owner asserts and, critically, Petitioner does not dispute, that “Petitioner erroneously assumes that ‘homogenization’” of Knoch’s vaporized liquid “is the same as separating large liquid droplets from diffused liquid by impaction.” Resp. 33–35; *see generally* Reply (nowhere disputing that factual assertion). In Knoch, homogenization, in fact, “refers to creating an ‘even distribution’ of liquid droplets in the liquid vapor so that the strength of the medication is constant in the vapor during inhalation.” Resp. 34 (citing Ex. 1006, 1:10–24, 3:27–29). An ordinarily skilled artisan, therefore, “would have recognized that homogenization of liquid droplets in the diffused liquid is different from separating large droplets from small ones.” *Id.* (citing Ex. 2002 ¶ 94). Consequently, for reasons that follow, we find unpersuasive Petitioner’s view that Knoch suggests an “alternative” approach “to perform the same functions within the same general structure” as Rosener. Pet. 23–24.

During a “suction step,” a spiral vortex—representing the flow path of aerosolized liquid particles—is formed about central axis 5 in Knoch’s device. Specifically, the spiral vortex of Knoch is “a very long path” of “liquid droplets” generated during an atomizer “filling step,” in which “a

homogenous vaporized liquid of suspended liquid droplets forms within the atomizing space 1 which is sucked off completely in” a “breathing-in phase of the inhalation act.” *Id.* at 3:50–64. It is this transient air flow path, which exists only during normal operation of Knoch’s device, that spirals and ensures “homogenization of the vaporized liquid,” that is, “an even distribution and a deceleration of the liquid droplets” to avoid “an undesirably strong aerosol stream” but, at the same time, “makes available a volume sufficient for the inhalation act.” *Id.* at 2:48–53, 3:26–29, 4:6–16.

Knoch illustrates that transient “spiral vortex” flow path in Figure 1, reproduced below.



Id. at Fig. 1. Figure 1 illustrates an embodiment of Knoch’s atomizer. *Id.* at 3:1–2. Figure 1 illustrates “cylindrical atomizing space 1 which consists of opening 2 for the supply of a vaporized liquid vapor and opening 3 for the withdrawal of the vaporized liquid.” *Id.* at 3:11–14.

To the extent we can discern the actual shape of guiding surfaces 10, we must resort to our own examination of the device illustrated in Knoch’s

Figure 2, reproduced *supra* at 40. Critically, the Petition is devoid of analysis explaining how or why guiding surfaces 10 would have suggested in Rosener's device a permanent structural feature of an insert, namely, a tortuous passage, that spirals from inlet to outlet zone. Pet. 31. Furthermore, Petitioner does not show that guiding surfaces 10 have anything to do with the formation of the transient spiral vortex of airflow in Knoch's device. *Id.*

In that regard, Knoch explains, opening 3 is provided in "wall 4 in the vicinity of one end 7 of" atomizing space 1. Ex. 1006, 5:10–12. "[A] central part 8 in the form of a cylindrical hollow body is provided, the longitudinal axis of which coincides with the longitudinal axis 5 of the atomizing space." *Id.* at 5:19–22. "Guiding surfaces 10," which Petitioner highlights in the challenges (Pet. 31), by contrast, "are arranged at the end of the central part 8 on its outer wall and project into the atomizing space 1, the guiding surfaces extending helically in the manner of the ensuing spiral vortex about the central part 8" (*id.* 5:29–33).

In Patent Owner's view, "separation of large liquid particles from the aerosol occurs **before** the aerosol enters" the "helical passage formed by guiding surfaces 10." Resp. 34 (Patent Owner's emphasis). That view is supported by the disclosure of Knoch and casts significant doubt on Petitioner's challenges as to all the claims that require a spiraling tortuous passage. Ex. 1006, Figs. 1, 2; 5:56–63.

On that point, as Patent Owner asserts, Knoch discloses:

On account of the fact that [a] helical guiding element 10 closes [an] atomizing space 1, the further advantage ensues whereby liquid droplets which are too large are already separated in the lower region of the arrangement and the liquid collects again together with the substance in the conical end section.

From here, it again approaches [a] spray diffuser 11 and goes back into the atomizing circulation.

Id. at 5:56–63¹²; *see* Resp. 35 (quoting part of this disclosure). Although guiding surfaces 10 are described as projecting or “extending helically in the manner of the ensuing spiral vortex,” Knoch does not describe the *surface shape* of guiding surfaces 10 as spiraling or explain how those structures pertain, if at all, to the formation of the spiral vortex.¹³ *Id.* at 5:29–33; *see id.* at 5:56–63 (explaining function of guiding surfaces 10); Resp. 35 (citing this disclosure in Knoch).

Instead, Knoch informs, “[T]he formation of the spiral vortex is ensured on account of the arrangement of both openings 2 and 3.” *Id.* at 3:30–32. “The position of the openings 2 and 3, in the direct vicinity of the ends 6 and 7 of the cylindrical atomizing space 1” is the structural feature of Knoch’s device that “ensures an optimal utilization of the available volume of the atomizing space 1 and *a path*”—that is, the spiral

¹² The challenge stated in the Petition does not raise this disclosure or any disclosure in Knoch suggesting a size separation of particles by impaction with any surface. Pet. 31–32. Petitioner’s attempt to raise this disclosure in support of the challenge comes, too late, at the final oral hearing. Tr. 48:7–50:20, 81:6–87:22. The challenge stated in the Petition is based on arguments that an ordinarily skilled artisan would have imported “guiding surfaces 10 of Knoch into cylindrical section 404 of Rosener because it would lead to improved homogenization of the vaporized liquid.” *Ibid.*

¹³ These facts distinguish the instant case from those in related IPR014, where Petitioner advances a reference (referred to as King) that discloses a physical tortuous passage wherein droplets are size separated by impaction on a physical surface that spirals. In this case, by contrast, the only feature in Knoch that “spirals” is a transient airflow path that is not shown to separate particles by size. Pet. 32; *see* Ex. 1006, code (57) (Abstract), Figs. 1–2, 2:59, 3:22–53, 4:5–25, 4:45–56, 5:3–33, 5:47–63 (relevant disclosures in Knoch).

path of travel, indicated by the arrows that define the “spiral vortex” in Figure 2—“which is as long as possible with the same sojourn time for the liquid droplets.” *Id.* at 3:44–49 (emphasis added); *see id.* at 2:48–60 (“at least one of the openings” in the cylindrical atomizing space “is arranged in such a manner that a spiral vortex extending about the longitudinal axis of the atomizing space is formed within the atomizing space”).

It is not clear, on this record, that guiding surfaces 10 are formed as spirals, as opposed to flat surfaces arranged to “project” and “extend[]” into the atomizing space in a helical pattern. *Id.*; *see* Resp. 37–38. Nor is it clear, on this record, how guiding surfaces 10 relate, if at all, to the formation of the transient airflow path defined by the “spiral vortex” described in Knoch, which forms only during normal operation of the device. *Id.*

Knoch indicates that the spiral vortex is formed as a result of the placement and orientation of openings 2 and 3, and that “homogenization” of the aerosolized particles occurs, not via impaction with guiding surfaces 10, but rather, as a result of particles traveling a transient airflow path defined by the spiral vortex. Ex. 1006, Figs. 1, 2, 2:48–61, 3:10–4:25, 5:14–38, 5:56–63; *see* Pet. 31–32 (relying on “homogenization” that occurs when “vaporized liquid” traverses a transient airflow path defined by the “spiral vortex” in Knoch’s device) (quoting Ex. 1006, 3:26–29 5:28–32); *see supra* 44 n.13. To be clear, Knoch’s spiral vortex is a transient path of airflow that forms only during normal operation of the device, and Petitioner directs us to no persuasive information that Rosener employs any comparable approach “to perform the same functions within the same general structure.” Pet. 24. The lack of analysis provided in the Petition on

that key point undermines this challenge. *Id.* at 23–25, 31–32; Reply 9–10 (totality of Petitioner’s information on that point); *see supra* 44 n.13.

Even if we set aside that problem, however, we find, in the alternative, that Petitioner fails to explain adequately how or why Knoch would have suggested a tortuous passage (as opposed to a transient airflow path) that spirals between the inlet and outlet zone of Rosener’s insert. Without adequate analysis, Petitioner merely refers us to Figure 2E of Rosener, which shows a tortuous passage extending from inlet 401 to outlet zone 240, then directs us to guiding surfaces 10 illustrated in Knoch’s Figure 1. Pet. 31–32. The paucity of analysis provided in the Petition, particularly on the question of where, how, and why an ordinarily skilled artisan would have included a spiraling impaction surface extending from Rosener’s inlet 401 to outlet zone 240 in view of Knoch, persuades us that the proposed modification is driven, not by any suggestion in the prior art, but rather, by an impermissible hindsight reconstruction of the claimed invention. *Id.*; *see* Resp. 27–39 (Patent Owner’s arguments on that point).

Petitioner does not establish that Knoch teaches a spiraling “impaction” surface structure. Pet. 17, 24, 26, 30. To the contrary, Knoch consistently describes only a transient vortex, representing the flow path of aerosolized liquid particles, as having a “spiral” shape. Ex. 1006, code (57) (Abstract), Figs. 1–2, 2:59, 3:22–53, 4:5–25, 4:45–56, 5:3–33, 5:47–63.

In sum, Petitioner’s view that Knoch would have suggested the inclusion in Rosener’s device of a spiraling impaction surface structure, where the only feature shown to spiral in Knoch’s device is a transient flow path of aerosolized liquid particles, is undeveloped and unpersuasive on this record. Pet. 23–25, 30–32; Reply 9–10 (totality of analysis and evidence

advanced by Petitioner on this critical issue). Accordingly, we determine that Petitioner does not establish by a preponderance of the evidence that the subject matter of claim 1 would have been obvious over Rosener and Knoch.

Dependent Claims 2–4 and 11

Claims 2–4 depend from claim 1 and, thereby, inherit the spiraling tortuous passage limitation discussed above. Similarly, claim 11 depends from claim 9 and requires that “the tortuous passage spirals between the inlet and the outlet zone.” Ex. 1001, 19:28–31.

Our analysis above, provided in the context of dependent claim 1, applies with equal force to claims 2–4 and 11. For reasons stated above, Petitioner fails to establish by a preponderance of the evidence that claims 2–4 and 11 are unpatentable as obvious over Rosener and Knoch.

4. Leakage Retarding Claims

For reasons that follow, we determine that Petitioner fails to establish the unpatentability of claims 7, 17, 23, and 24 by a preponderance of the evidence. Petitioner asserts claims 7, 17, and 23 are unpatentable as obvious over Rosener and Knoch, whereas claim 24 is unpatentable as obvious over Rosener, Knoch, and Dautrebande or Svoboda. Pet. 7 (identification of Grounds I, II, and III).

Claim 7 depends from claim 5 and recites, “The insert of claim 5 wherein the tortuous passage follows a non-linear path that assists in preventing liquid from leaking from the cartridge when the cartridge is upended.” Ex. 1001, 19:19–22. Claim 17 contains similar language but depends from claim 9. *Id.* at 20:3–5. Claim 23 also depends from claim 9 and specifies a tortuous passage “configured to provide a convoluted flow

path that retards a flow of the liquid to be diffused through the insert when the cartridge is temporarily held upside-down.” *Id.* at 20:30–33.

Claims 7, 17, and 23 include functional language; the claims recite structure that must be capable of performing the recited language. *See In re Swinehart*, 58 C.C.P.A. 1027, 439 F.2d 210, 212 (CCPA 1971) (“[T]here is nothing intrinsically wrong with [defining something by what it does rather than what it is] in drafting patent claims.”). The written description explains what is meant by the claim phrase, “assist in preventing liquid from leaking,” namely, that a tortuous passage may assist in preventing liquid from leaking when it slows progression of fluid toward the outlet zone:

Irrespective of particular configuration, the tortuous passage 176 follows a non-linear path that, among other things, assists in preventing liquid 111 from leaking from the cartridge 100 when the cartridge 100 is upended. For example, if the cartridge 100 is temporarily held upside down, the tortuous passage will assist in slowing the progression of liquid 111 within the cartridge 100 toward the outlet zone 174 and hence the outlet 114 of the cartridge.

Ex. 1001, 10:49–57.

As explained above, Petitioner argues, and Patent Owner does not contest, that Rosener teaches a tortuous passage with “tight bends and corners.” Pet. 30 (quoting Ex. 1004 ¶ 27); *see* Resp. 21–43 (disputing only whether Knoch would have prompted a modification of Rosener’s tortuous passage to spiral between the inlet and outlet zone).

But as to whether this tortuous passage would meet the leakage retarding limitations of claims 7, 17 or 23, Petitioner’s explanation is inadequate:

A POSA would understand that if the cartridge of Rosener was upended, the tortuous path consisting of the tight bend from the

inside of the cylindrical section 404 into the narrow channel between the cylindrical section 404 and the funnel-shaped assembly 235, through the small holes 240 and along the tapered structure above 401 incorporated in Rosener would assist in preventing the liquid from leaking.

Pet. 35. To support this statement, Petitioner cites the declaration of Dr. Morse, whose written testimony mirrors this same language without further explanation. Ex. 1003, 38.

Patent Owner argues that Petitioner's assertions are inadequately supported. Resp. 13–14. As Patent Owner explains, if Rosener's device were upended, liquid would be able to flow through holes 240 and out of the device. *Id.* at 14–16; *see* Ex. 2002 ¶¶ 63–73, 108, 109 (Dr. Mello explaining why a Rosener tortuous passage would not assist in preventing leaking as required by the leakage retarding claims). As Patent Owner further points out, Rosener suggests using “enhancements,” such as a valve, to prevent leaking if its device is inverted. Resp. 16–17; Ex. 1004 ¶ 33.

Claim 24 contains somewhat different limitations, but the result is the same. Claim 24 depends from claim 9, recites “an initial fill level of liquid,” and requires that, “when the cartridge is upended and rests sideways,” the tortuous passage “is configured to provide a convoluted flow path that includes a portion above” a central axis of the cartridge housing “to prevent the liquid to be diffused from traversing the entirety of the tortuous passage.” *Id.* at 20:34–42. Like claims 7, 17, and 23, claim 24 includes functional language not addressed adequately in the Petition. Pet. 46–47. Our reasoning as to claims 7, 17, and 23 applies equally to Petitioner's assertions that claim 24 is obvious over Rosener in view of Dautrebande.

Petitioner also asserts that claim 24 is obvious over Rosener in view of Svoboda. Pet. 47–49. Although Petitioner identifies claim 24 in the grounds chart and an argument heading, Petitioner’s arguments, including the information provided in the claim charts, are directed not to claim 24, but to claim 15. *Id.* at 7, 47–49. On this record, it is not clear that Patent Owner has been provided adequate notice of the basis for this ground to the extent that it is directed to claim 24. *Id.* at 47–49. In any event, the Petition lacks analysis keyed to the limitations of claim 24. *Id.* Under these circumstances, we determine that Petitioner does not show that claim 24 is unpatentable as obvious based on the ground that asserts Svoboda. *Id.*; *see supra* 2 n.6.

Petitioner fails to address adequately how or why the combination of asserted prior art references would have made obvious the subject matter of claims 7, 17, 23, or 24. Ultimately, to determine whether Rosener’s tortuous passage is a structure capable performing the functionality of claims 7, 17, 23, or 24, we would need to determine that, because of Rosener’s tortuous passage, liquid would take more time to leak when the device is upended (claims 7 and 17), temporarily held upside-down (claim 23), or upended and resting sideways (claim 24) than if the tortuous passage was not present. The record before us does not adequately support such a finding. Here again, the paucity of information provided by Petitioner, who bears the burden of showing unpatentability, tips against a conclusion that these claims are proven unpatentable. Pet. 35–36, 40–41, 46–47.

Although tight bends and corners *might* make the flow take longer, as Petitioner urges (Reply 4–6), Petitioner directs us to no evidence that this is the case and, moreover, does not refute adequately the record evidence indicating that tight bends and corners might make the liquid take *less* time

to leak from the cartridge. As Patent Owner argues, where a channel narrows in a direction of flow, a fluid's speed may increase in accordance with Bernoulli's principle. Sur-reply 6–7.¹⁴

That principle is supported by the disclosure of Svoboda, which explains that gas will travel faster through the “necked down portion 29” of its venturi tube. Ex. 1008, 4:4–8; *see id.* at Fig. 2 (illustrating necked down portion 29). Accordingly, the record is unclear whether the tight bends and corners would speed up or slow down the flow of liquid from the cartridge. Additionally, Rosener does not refer to its tortuous passage as preventing leaking and, if the tortuous passage were capable of doing so, it is unclear on this record why the valve would be necessary. *See generally* Ex. 1004; *see also* Ex. 2002 ¶ 68 (Dr. Mello's written testimony on point).

In any event, we agree with Patent Owner that Petitioner's analysis, regarding the path and speed of liquid flow when Rosener's device is upended, is insufficient to support the unpatentability of the leakage retarding claims (Sur-reply 1–11), at least because Petitioner fails to take account of leakage through orifice 401 or Rosener's express need for a valve to provide for a device that “may be inverted without causing the fragrance oil to pour out of the system” (*id.* at 11; Ex. 1016, 163:14–22)). *See* Ex. 1004, Fig. 2D (illustrating position of orifice 401), ¶ 33 (describing Rosener's valve); Resp. 16–17 (Patent Owner's arguments); Pet. 35–36, 40–41, 46–47; Reply 4–5 (Petitioner's analysis).

¹⁴ The record also lacks evidence regarding to what extent other factors such as fluid viscosity, pressure differentials, and friction losses could potentially also affect flow speed. That lack of evidence, again, underscores Petitioner's failure to meet its burden to show unpatentability of these claims.

Petitioner carries the burden of proving that the tortuous passage of Rosener's device, for example, "assists in preventing leaking from the cartridge when the cartridge is upended." Ex. 1001, 19:59–61 (claim 7). For reasons explained above, Petitioner does not meet that burden. Accordingly, we determine that Petitioner does not establish the obviousness of any leakage retarding claim.

B. Grounds That Assert Rubin

Petitioner asserts two obviousness grounds based on Rubin. *See* Pet. 7–8 (grounds chart, identifying Grounds IV and V). Specifically, Petitioner challenges claims 1–22 based on Rubin in view of the knowledge of an ordinarily skilled artisan and claim 24 based on Rubin and Dautrebande. *Id.* Collectively, these grounds challenge the patentability of claims 1–22 and 24. *Id.*

As explained below, Petitioner fails to show by a preponderance of the evidence that any claims are obvious based on these two grounds. In particular, Petitioner fails to establish that Rubin teaches or suggests the limitations of independent claim 1, requiring an insert that includes "a tortuous passage extending between the inlet and the outlet zone." Ex. 1001 18:25–26. Petitioner also fails to adequately show that Rubin teaches or suggests the similar limitations of the other independent challenged claims. *Id.* at 18:48–49 (claim 5), 19:4–5 (claim 8), 19:21–22 (claim 9).

As a threshold matter, we clarify that the tortuous passage specified in the challenged claims must be, as Patent Owner argues, a permanent, physical structure of the insert (as opposed to, for example, a transient airflow path formed only during normal operation of the device). *See, e.g.*, Sur-reply 23–28; Ex. 1001, Figs. 1–10 (consistently illustrating the tortuous

passage as a permanent, physical structure of the apparatus). To the extent Petitioner argues that a transient airflow *path* satisfies the tortuous *passage* structure required by the challenged claims, we reject this new argument for two independent reasons: it comes too late (in the Reply) and, in any event, it is not persuasive on this record. Reply 21–22.

As to timing, to the extent Petitioner argues that a transient airflow path may satisfy the tortuous passage structure required by the challenged claims, Petitioner does so for the first time in Reply. Reply 17–22 (Petitioner’s new arguments about Rubin’s alleged tortuous passage); *see* Sur-Reply 23–27 (Patent Owner’s view that Petitioner’s arguments, on that point, are newly-raised in the Reply). A “petitioner may not submit new evidence or argument in reply that it could have presented earlier, e.g., to make out a prima facie case of unpatentability.” Consolidated Trial Practice Guide (Nov. 2019), *available at* <https://www.uspto.gov/TrialPracticeGuide> Consolidated, 73; *see* 37 C.F.R. § 42.23(b).

Here, Petitioner’s alternative arguments about how Rubin allegedly satisfies the “tortuous passage” limitation comes too late in the Reply because it would change the theory of Petitioner’s case. *Compare* Pet. 51–52, 55 (arguing that separation of particles by size occurs when “an impact surface (chimney 121)” is “impinged upon by diffused liquid”), *with* Reply 17–22 (seeming to argue that Rubin’s transient airflow path may meet the “tortuous passage” limitation). Petitioner provides no explanation as to why it did not earlier make an argument that equates a transient flow path of aerosolized particles to a tortuous passage structure of an insert and, even in the Reply, Petitioner is unclear as to whether it affirmatively takes such a position. Reply 17–22.

As to the merits, Petitioner’s new theory is not adequately supported by the claim language or written description. *Id.* (and evidence cited therein). To the contrary, we agree with Patent Owner that that an ordinarily skilled artisan “would recognize that a ‘tortuous flow path’ is different from a ‘tortuous passage.’” Sur-reply 28 (citing Ex. 2002 ¶¶ 129–133, Dr. Morse’s written testimony, keyed to disclosures in the ’004 patent).

The language of the claims clarifies that the tortuous passage of the claimed invention is a physical structure of the insert. Claim 1 recites an “[a]n insert of a cartridge” that includes “a body,” “an inlet provided in the body,” “an outlet zone defined at least in part by the body,” “and a tortuous passage.” Ex. 1001 18:16–28. The other independent claims include similar recitations. *Id.* at 18:39–48 (claim 5), 18:62–19:4 (claim 8), 19:10–21 (claim 9). The insert is part of the cartridge, which is a physical apparatus. Ex. 1001, code (57). The insert is a physical apparatus because it is part of a cartridge and includes physical structures, such as a body, an inlet, and an outlet zone. *See, e.g., id.* at 18:16–32, 18:39–55, 18:62–19:9 (independent claims 1, 5, and 8). Given this context, an ordinarily skilled artisan would have recognized that the “tortuous passage” specified in the claims must also be a physical structure of the insert.

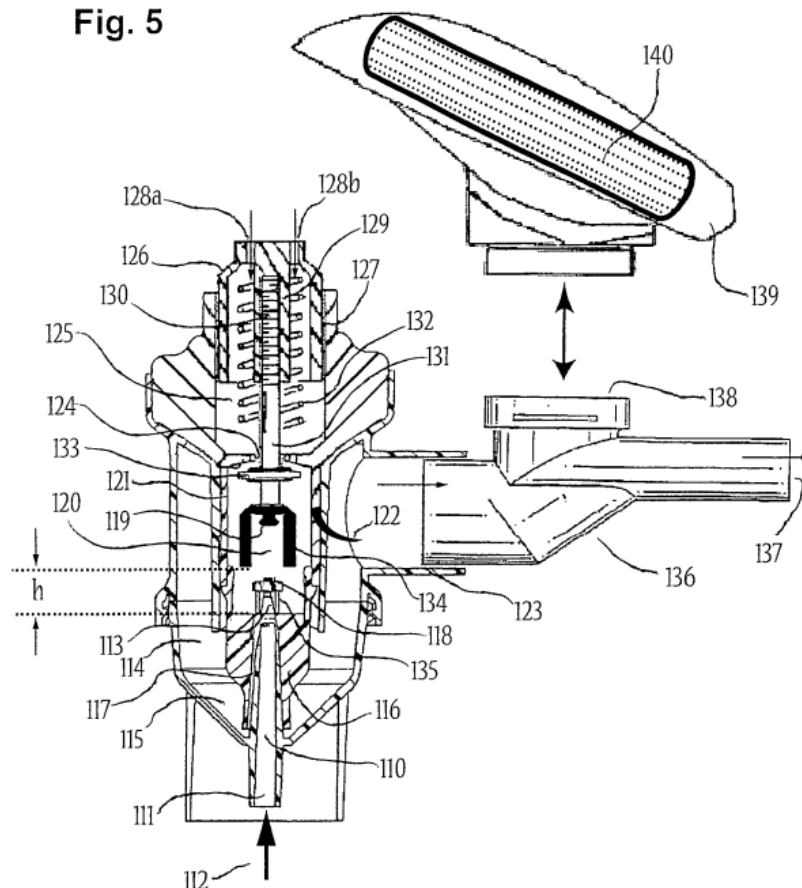
The dependent claims further confirm that the tortuous passage of the claimed invention is a physical structure of the insert, by requiring, for example, that the “body” of the insert “is formed as a single, unitary piece that includes the tortuous passage” (claims 3 and 13), that “the tortuous passage is at least partially defined by a vertical sidewall of the body” (claims 4 and 16), that the “tortuous passage is partially capped by the cartridge housing to enclose a portion of the tortuous passage” (claim 12), or

that the tortuous passage is configured to assist in preventing liquid from leaking when the cartridge is upended (claims 7 and 17), temporarily held upside-down” (claim 23), or “upended” to rest “sideways” (claim 23).

Ex. 1001, 18:16–42). Petitioner directs us to no persuasive evidence that any challenged claim is written in terms broad enough to allow that a transient flow path of aerosolized particles, which forms only during normal operation of the device, represents a tortuous passage within the scope of the claimed invention.

We next turn to Petitioner’s identification of an alleged tortuous passage in Rubin. In particular, Petitioner refers to various labeled parts of Rubin’s Figure 5 when comparing claim 1 to Rubin. We reproduce Rubin Figure 5 below.

Fig. 5



Ex. 1005, Fig. 5. Rubin’s Figure 5 illustrates a preferred embodiment of Rubin that “serves as a breath actuated jet nebulizer with a calibrated airflow resistance control element adjustable by hand, along with filter accessory.”

Ex. 1005, 13:1–4.

Petitioner identifies “the bottom opening of interior chamber 120” as an inlet of an insert as specified in claim 1. Pet. 51. Petitioner identifies air outlet 123 as the required outlet zone. *Id.* Petitioner argues that Rubin discloses “a tortuous passage (bounded by chimney 121 and its extension guides 122) between the inlet (the bottom opening of interior chamber 120) and the outlet zone (air outlet 123).” *Id.* at 52. Patent Owner counterargues, however, and we agree, that Rubin nowhere discloses “that its chimney 121 and/or extension guides 122 includes or bounds any passage,” much less “a ‘tortuous passage [that] extend[s] between the inlet and the outlet zone.’” Resp. 56; *see* Sur-reply 23–28 (Patent Owner’s additional arguments about Petitioner’s shifting positions on that point); *see generally* Ex. 1005 (Rubin’s disclosure).

We emphasize that claim 1, and every other independent challenged claim, requires a “tortuous passage *extending between* the inlet and the outlet zone.” Ex. 1001, 18:25–26, 18:48–49, 19:4–5, 19:22–23 (emphasis added). Petitioner identifies “the bottom opening of interior chamber 120” as being an inlet and “air outlet 123” as being an outlet, but directs us to no information about how or why Rubin teaches a tortuous passage extending between those two points. Pet. 51–52 (claim chart). We agree with Patent Owner that Rubin does not explain how air travels from the alleged inlet to the alleged outlet zone. Resp. 55–61; Sur-reply 23–28. In particular, although Rubin states that it has an airflow passage between its inlet and

outlet (Ex. 1005, 10:1–4), it is unclear on this record, and Petitioner does not demonstrate persuasively, the path by which aerosol entrained air travels between “the bottom opening of interior chamber 120” and “air outlet 123” (Pet. 51–52).

Patent Owner’s declarant, Dr. Mello, testifies that Rubin does not explain how its aerosolized liquid particles travel from the bottom opening of interior chamber 120 (the alleged inlet) to air outlet 123 (the alleged outlet). Ex. 2002 ¶ 127. We find Dr. Mello’s testimony credible and agree that Rubin is silent in this regard. Petitioner does not persuasively dispute this point. *See* Tr. 22:20–23:5 (counsel for Petitioner agreeing that Rubin does not disclose the specifics of a passage from inlet to outlet); 34:4–36:20 (counsel for Petitioner stating that “Rubin does not explicitly disclose . . . how the aerosolized liquid gets from chamber 120 out to the outlet zone 123”). Rubin’s uncertainty regarding the path traveled by aerosol entrained air from alleged inlet to alleged outlet is fatal to the grounds based on Rubin; if Petitioner cannot establish what path the aerosolized particles take between inlet and outlet, Petitioner cannot satisfy its burden of showing that any structure *extending between* the inlet and outlet constitutes a tortuous passage. We agree with Dr. Mello that Petitioner’s witness, Dr. Morse, simply quotes “several passages” in Rubin then “perfunctorily asserts,” without adequate analysis, that the reference meets this requirement of the challenged claims. Ex. 2002 ¶ 128; *see* Ex. 1003 ¶ 65 (Dr. Morse’s opinions regarding how structures in Rubin’s device meet the “tortuous passage” feature of the claimed invention).

Rubin distinguishes the path of aerosolized liquid particles (that is, the path of flow taken by aerosol entrained air from alleged inlet to alleged

outlet) from the path of ambient air (that is, air that does not include entrained liquid, which enters interior chamber 120 via central aperture 124 located opposite the alleged inlet). When referring to a tortuous flow path, Rubin explains its chimney 121 and extension guides 122 “cause *ambient air* entering the device to take a more tortuous flow path.” Ex. 1005, 22:29–35. It is the flow of ambient air through a tortuous flow path that results in “cyclonic action of aerosol entrained airflow” to control particle size:

The interior chamber 120 of the device contains a conical section or chimney 121, which extends downward and surrounds the jet nozzle 110. Jacket 116 may be adjoined to chimney 121. Extension guides 122 may protrude from the walls of the chimney 121. Chimney 121 and its extension guides 122 prevent undesirable, larger droplets from exiting the device, and instead, cause such droplets to condense and return to the liquid reservoir 114. In this manner, smaller particles with a mass median aerodynamic diameter, MMAD, ideal for inhalation are able to freely exit the device through air outlet 123. Furthermore, chimney 121 and its extension guides 122 cause ambient air entering the device to take a more tortuous flow path through device to ensure that an adequate amount of aerosol is entrained in this airflow to reduce particle size and/or to prevent particles from colliding and growing. Extension guides 122 of the chimney 121, or other baffles residing in the device, may be curved or spiral-shaped to cause cyclonic action of aerosol entrained airflow.

Ex. 1005, 22:19–22:3. From this key passage of Rubin, we know that ambient air takes a downward path through chimney 121 and past extension guides 122. Thus, the *ambient* air may traverse what could be called a physical tortuous passage. This point, however, does not establish that a physical tortuous passage necessarily extends between the asserted inlet (“the bottom opening of interior chamber 120”) and outlet (“air outlet 123”) or that *aerosol entrained airflow* encounters a physical tortuous passage.

The flow of ambient air through chimney 121 and past extension guides 122 ultimately results in “cyclonic action of aerosol entrained airflow” and, further, “prevent[s] undesirable, larger droplets from exiting the device.” Ex. 1005, 22:19–22:25. While the “[e]xtension guides 122 of the chimney . . . may be [shaped] to cause cyclonic action of aerosol entrained airflow,” Rubin does not indicate whether or not aerosol entrained air, in fact, impacts a surface of either chimney 121 or extension guides 122. In other words, Rubin leaves open the question whether ambient air, taking a more tortuous path, causes the described cyclonic action and size-separation of entrained particles *without* causing aerosol entrained air to flow from the inlet, through the chimney, past the extension guides, and to the outlet. *See* Ex. 2002 ¶¶ 125–133 (Patent Owner’s witness, Dr. Mello, explaining Rubin teaches that the chimney and baffles induce a spiral vortex of ambient air rather than a tortuous passage traveled by aerosolized liquid particles from inlet to outlet); Ex. 1005, Fig. 5, 21:22–23:33 (relevant disclosure of Rubin describing operation of device).

Against that backdrop, we determine that Petitioner does not meet its burden of establishing by a preponderance of the evidence that aerosolized liquid particles, which enter Rubin’s device at the bottom of chamber 120, flow upward through chimney 121 and past extension guides 122 to outlet zone 123 and, thus, Petitioner fails to demonstrate that chimney 121 and extension guides 122 meet the claimed requirement of an insert that includes a tortuous passage extending between the inlet and outlet zone. Pet. 51–52; *see* Ex. 1005, Fig. 5 (Rubin’s illustration of these structures).

We recognize that, based on Rubin Figure 5, liquid particles entrained in air will flow directly upward through jet nozzle 110 and through bottom

opening of interior chamber 120 (the alleged inlet) and, although the path is not described in Rubin, may eventually turn rightward toward air outlet 123 (the alleged outlet). Ex. 1005, Fig. 5; *see id.* at 22:3–18 (explaining jet nozzle 110), 22:26–29 (explaining that ideal sized droplets exit the device through air outlet 123). As explained above, however, Petitioner has not met its burden of identifying a tortuous passage extending between the inlet and outlet points. In particular, Rubin does not explain whether particles are separated by size as a result of the transient cyclonic action, which forms only during normal operation of Rubin’s device, or by physical impaction with chimney 121 or extension guides 122. Pet. 51–52; *compare* Ex. 1003 ¶ 41 (Dr. Morse’s opinion), *with* Ex. 2002 ¶ 133 (Dr. Mello’s opinion); *see* Ex. 1005, 22:19–35 (relevant passage in Rubin). Rubin fails to explicitly address this point either way. Sur-reply 23–28. Petitioner does not identify persuasive evidence to the contrary. Pet. 50–51; Reply 17–22.

Petitioner’s use of Dautrebande as a secondary reference to address claim 24 does not cure the deficiency discussed above. Petitioner argues that it would have been obvious to combine Dautrebande’s curved zones into Rubin because both references make use of a tortuous passage to separate airborne particles. Pet. 65–67. As explained above, however, Rubin makes use of ambient air to “to cause cyclonic action,” and Petitioner does not establish that Rubin uses a tortuous passage to separate large from small particles between inlet and outlet. Ex. 1005, 23:2. Therefore, Petitioner’s reasoning that an ordinarily skilled artisan would have used Dautrebande’s curved zones in Rubin is not supported by a preponderance of the evidence.

Petitioner has the burden of establishing obviousness by a preponderance of the evidence. Here, as explained above, Rubin is too

ambiguous as to whether it has a tortuous passage structure between the alleged inlet and the alleged outlet for Petitioner to meet that burden. Accordingly, Petitioner does not establish by a preponderance of the evidence that any claim is unpatentable based on Rubin.

C. Patent Owner's Arguments About the Qualifications of Dr. Morse

Patent Owner argues that the '004 patent has an earliest priority date of April 22, 2014, and that Petitioner's declarant, Dr. Morse, incorrectly reviewed the '004 patent in light of the general knowledge in the art as of February 2, 2015. Resp. 79–81. Petitioner explains that this date difference was due to typographical errors. Reply 30.

Dr. Morse, in his Reply Declaration, confirms that the opinions in the original declaration would not change based on the April 22, 2014, priority date. Ex. 1015 ¶ 7; Reply 31. Patent Owner identifies no relevant events that took place between April 22, 2014, and August 25, 2015, and Patent Owner makes no argument why an ordinarily skilled artisan would have viewed anything differently on those two dates. As such, we find that any error regarding the date in Dr. Morse's declaration is immaterial to our analysis.

Patent Owner also argues that Petitioner has not established “that Dr. Morse is qualified to testify” about the level of ordinary skill at the time of the invention, given that Dr. Morse “was a graduate student without the requisite experience” at that time. Resp. 79 (citing Ex. 1003, 3, 69). Patent Owner directs us to no authority that a witness must qualify as an ordinarily skilled artisan *at the time of the invention* in order to testify about the perspective of such a person. *Id.*

We recognize, in that regard, that a witness “must at minimum possess ordinary skill in the art” in order to opine about the level of skill in

the art. *Kyocera Secco Indus. Tools Inc. v. ITC*, 22 F.4th 1369, 1377 (Fed. Cir. 2022). Dr. Morse has at least the qualifications of an ordinarily skilled artisan and is qualified to provide opinions as to what an ordinarily skilled artisan would have understood as of April 22, 2014. Based on Dr. Morse’s statement of qualifications and curriculum vitae, as well as his stated familiarity with the state of the prior art at the time of the invention, we find Petitioner has shown by a preponderance of the evidence that Dr. Morse is qualified to provide opinions keyed to the level of ordinary skill in the art at the time of the invention. Ex. 1003 ¶¶ 2–5, 9, 11, App’x pp. 69–73.

In any event, to the extent we agree that Petitioner establishes unpatentability as explained above, the prior art references themselves are adequate for Petitioner’s showing of unpatentability even if we were to provide little or no weight to Dr. Morse’s testimony.

III. CONCLUSION

Based on the record presented, we determine that claims 5, 8–10, 13, 14, 16, 18, and 22 are proven unpatentable but that claims 1–4, 6, 7, 11, 12, 15, 17, 19–21, 23, and 24 are not proven unpatentable, as follows:

Claims	35 U.S.C. §	References/Basis	Claims Shown Unpatentable	Claims Not Shown Unpatentable
1, 2, 4, 5, 7–11, 14, 16– 18, 22, 23	103	Rosener, Knoch	5, 8–10, 14, 16, 18, 22	1, 2, 4, 7, 11, 17, 23
3, 6, 13, 15, 24	103	Rosener, Knoch, Dautrebande	6, 13, 15	3, 15, 24

Claims	35 U.S.C. §	References/Basis	Claims Shown Unpatentable	Claims Not Shown Unpatentable
6, 15	103	Rosener, Knoch, Svoboda	6, 15 ¹⁵	
1–22	103	Rubin, Knowledge of the Person of Ordinary Skill in the Art		1–22
24	103	Rubin, Dautrebande		24

IV. ORDER¹⁶

It is

ORDERED that claims 5, 6, 8–10, 13–16, 18 and 22 of the '004 patent have been proven unpatentable on this record;

¹⁵ Petitioner identifies claims 6 and 24 as the claims challenged in this ground, but presents arguments pertaining exclusively to claims 6 and 15. Pet. 7, 47–49. For reasons explained above, we construe this challenge as directed to claims 6 and 15, not claims 6 and 24. *See supra* 2 n.6

¹⁶ Should Patent Owner wish to pursue amendment of the challenged claims in a reissue or reexamination proceeding subsequent to the issuance of this decision, we draw Patent Owner's attention to the April 2019 *Notice Regarding Options for Amendments by Patent Owner Through Reissue or Reexamination During a Pending AIA Trial Proceeding*. See 84 Fed. Reg. 16,654 (Apr. 22, 2019). If Patent Owner chooses to file a reissue application or a request for reexamination of the challenged patent, we remind Patent Owner of its continuing obligation to notify the Board of any such related matters in updated mandatory notices. *See* 37 C.F.R. § 42.8(a)(3), (b)(2).

FURTHER ORDERED that claims 1–4, 7, 11, 12, 17, 19–21, 23, and 24 of the '004 patent have not been proven unpatentable on this record; and

FURTHER ORDERED that, because this is a Final Written Decision, parties to this proceeding seeking judicial review of this decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

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