

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

JUUL LABS, INC.,

Petitioner,

v.

NJOY, LLC,

Patent Owner.

Inter Partes Review No.

IPR2024-00161

Patent 10,334,881

Title: Electronic Vaporizer

Filing Date: December 13, 2016

Issue Date: November 15, 2022

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

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PETITIONER’S EXHIBIT LIST

Petitioner’s Exhibit	Description
1001	U.S. Patent No. 10,334,881 (“’881 Patent”)
1002	Patent Prosecution History of the ’881 Patent
1003	<i>NJOY, LLC v. JUUL Labs, Inc.</i> , C.A. No. 1:23-cv-00917 (D. Del.), Complaint filed on August 22, 2023.
1004	Certified English Translation and Chinese Patent Publication No. CN201238610 (“Xia”)
1005	Certified English Translation and Chinese Patent Publication No. CN101366554 (“Wang”)
1006	Certified English Translation and Chinese Patent No. CN 201085044Y (“Fang”)
1007	Declaration of Robert Sturges and CV
1008	Chinese National IP Association (“CNIPA”) Database Search Results (For Xia);
1009	Global Dossier - United States Patent and Trademark Office Search Results for Xia
1010	European Patent Office Search Results Espacenet (For Xia)
1011	Chinese National IP Association (“CNIPA”) Database Search Results for Fang
1012	Global Dossier - United States Patent and Trademark Office Search Results for Fang
1013	European Patent Office Search Results Espacenet for Fang
1014	<i>Fuma International LLC v. R.J. Reynolds Vapor Company</i> , Case No. 1:19-cv-260, D.I. 122 (M.D.N.C., October 20, 2020) (RJR Brief)
1015	<i>Fuma International LLC v. R.J. Reynolds Vapor Company</i> , Case No. 1:19-cv-260, D.I. 139 (M.D.N.C., May 24, 2021) (MSJ Order)

Petitioner's Exhibit	Description
1016	August 22, 2006 Tariff Classification for Nicotine Inhaler and Parts From China
1017	<i>Fuma International LLC v. R.J. Reynolds Vapor Company</i> , Case No. 1:19-cv-260, D.I. 76-47 (December 20, 20109) (Declaration of Wang Shanhong)
1018	<i>Fuma International LLC v. R.J. Reynolds Vapor Company</i> , Case No. 1:19-cv-260, D.I. 83 (January 13. 2020) (Fuma CC Brief)
1019	1013-2023_NJOY Email_Re_Alleged Priority Date (See <i>In Re Vaporizer Devices, Cartridges Used Therewith, and Components Thereof</i> , before the International Trade Commission, 337-TA-1372)
1020	<i>Fuma International LLC v. R.J. Reynolds Vapor Company</i> , Case No. 1:19-cv-260, D.I. 95 (March 23. 2020) (Markman Order)
1021	<i>Fuma International LLC v. R.J. Reynolds Vapor Company</i> , Case No. 1:19-cv-260, D.I. 133 (November 25. 2020) (Fuma SJ Brief)
1022	<i>In Re Vaporizer Devices, Cartridges Used Therewith, and Components Thereof</i> , 337-TA-1368, NJOY's Initial Invalidity Contentions and Exhibits
1023	<i>Fuma International LLC v. R.J. Reynolds Vapor Company</i> , Case No. 1:19-cv-260, Conley Deposition Transcript
1024	<i>Fuma International LLC v. R.J. Reynolds Vapor Company</i> , Case No. 1:19-cv-260, Conley Deposition Ex. 2A
1025	<i>Fuma International LLC v. R.J. Reynolds Vapor Company</i> , Case No. 1:19-cv-260, Dkt. 120 (Fuma Brief)
1026	Affidavit for Certified English Translation of Chinese Patent Publication No. CN201238610 ("Xia")

Petitioner's Exhibit	Description
1027	Chinese Patent Publication No. CN201238610 ("Xia")
1028	Affidavit for Certified English Translation and Chinese Patent Publication No. CN101366554 ("Wang")
1029	Chinese Patent Publication No. CN101366554 ("Wang")
1030	Affidavit for Certified English Translation and Chinese Patent No. CN 201085044Y ("Fang")
1031	Chinese Patent No. CN 201085044Y ("Fang")
1032	337-TA-1372 NJOY's Initial Domestic Industry Contentions Ex. 4
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1043	Vallee ITC Demonstratives Excerpts (CDX-2C)
1044	CDC publication on E-cigarette Unit Sales

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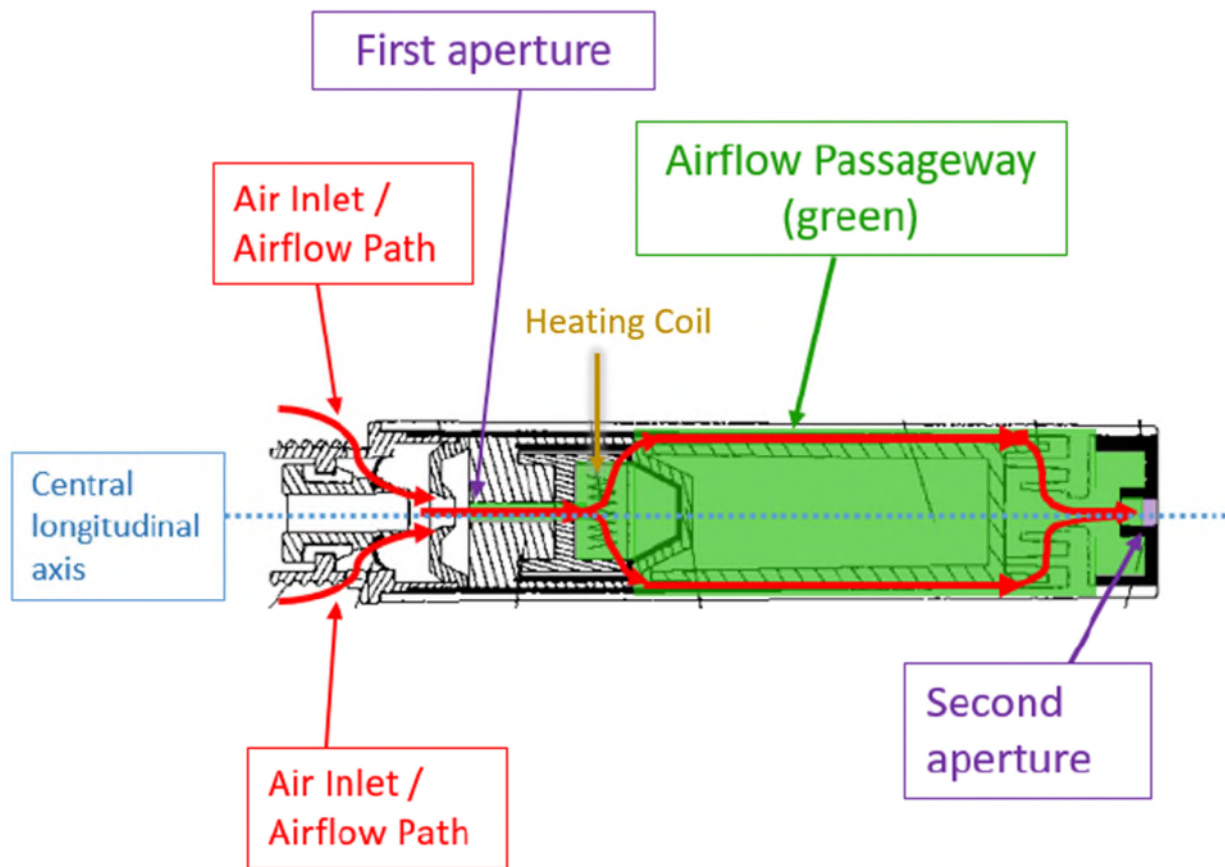
Omega Patents, LLC v. BMW of North Am., LLC.

No. 2022-2012, 2024 WL 227801 (Fed. Cir. Jan. 22, 2024).....5, 35

I. INTRODUCTION

The Board should find unpatentable all claims of U.S. Patent 10,334,881 (the “’881 Patent”) under Ground 1, based on Xia, and Ground 2, based on Wang.

Regarding Ground 1, Xia describes an electronic cigarette that discloses all claim limitations:



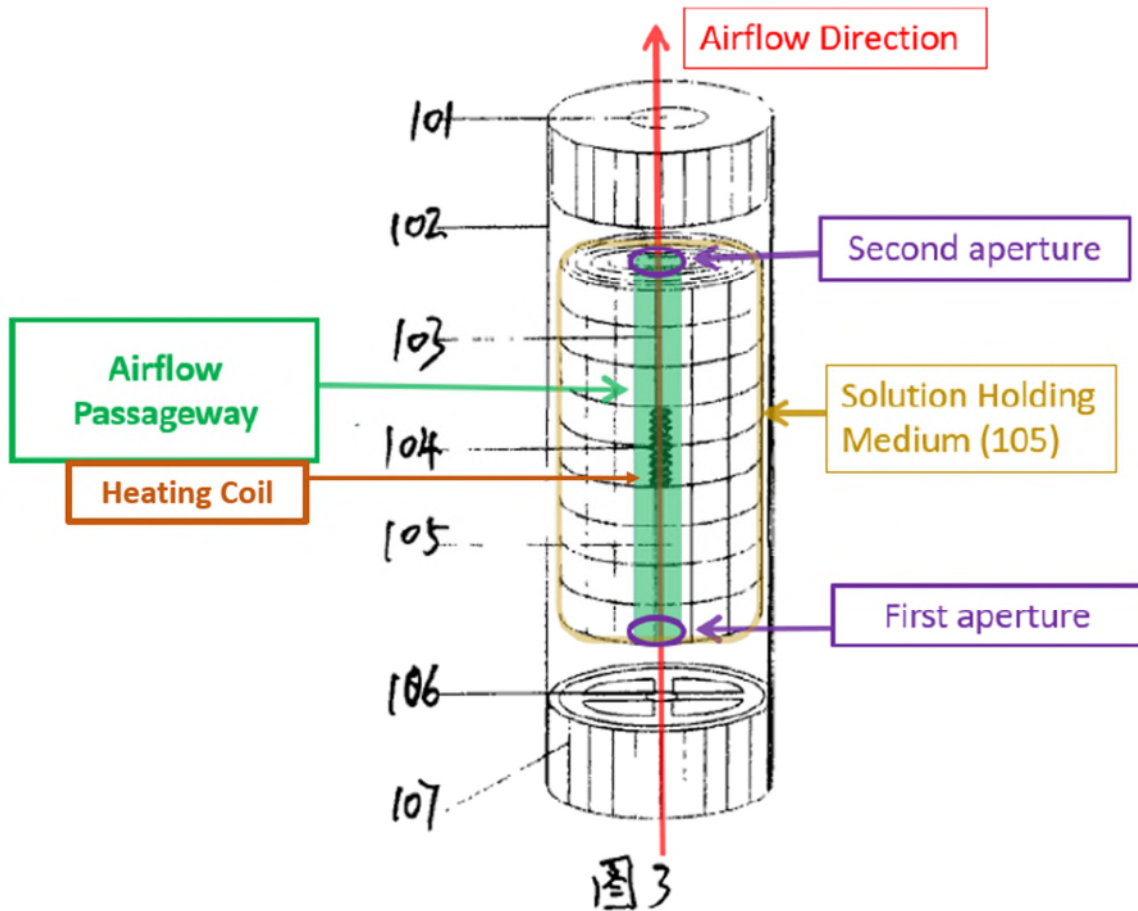
Ex. 1004, Fig. 2 (annotated); Pet., 43.

Patent Owner’s three arguments regarding Xia are: (1) there is an inner housing around the heating element that prevents the outer housing from being the claimed housing, and thus there is no cartridge, which is incorrect at least because

there is no prohibition in the claims regarding additional, inner housings, as NJOY's own expert admitted; (2) the identified first aperture is internal to the cartridge, rather than being in the housing as NJOY argues is required, which is incorrect at least because it conflicts with how NJOY reads the claims for infringement and domestic industry purposes at the International Trade Commission; and (3) that the air in the airflow passageway flows around obstacles and thus the passageway itself is not central and not axial, which is incorrect at least because (a) it conflicts with how NJOY reads the claims in the ITC wherein air flows around numerous obstacles in accused devices, and (b) it aligns with the prior district court ruling on the same issue holding that obstacles that divert airflow do not prevent the passageway itself from being central and axial.

NJOY's responses regarding obviousness based on Xia alone or in combination with Wang and Fang also fail. NJOY argues that the modifications would make the device have less optimal liquid retention. But NJOY ignores three key issues: the modification accounts for liquid retention; NJOY misunderstands the law as excluding all but the highest-performance design; and NJOY ignores the fact that the modifications would make the devices cheaper and simpler to manufacture, which its own expert agreed is a motivation for the design change.

Regarding Ground 2, Wang describes an electronic cigarette that discloses all claim limitations:



Exs. 1005 and 1029, Fig. 3 (annotated); Pet., 92.

Patent Owner's arguments as to Wang also fail. NJOY's first argument that the air does not flow down the middle of the rolled-fiber/paper solution-holding medium, defies logic and requires an impossibly strained understanding of the design's function. Under NJOY's concocted interpretation, rather than the common-sense (and Wang-inventor-endorsed) view that the vapor travels through the path in the rolled fiber that is visible in Wang's s Figure 5, the vapor created by the heating coil allegedly travels through the liquid-soaked fiber. NJOY's second

argument posits that the apertures are not in the housing, which is incorrect for the same reasons as above regarding Xia. NJOY's third argument, that Wang allegedly lacks "a transverse heating element," ignores the actual claim language because the coils of Wang's heating element "extend[] transversely across the airflow passageway," as the patent's inventor conceded during deposition.

As to the last point, inventor Daniel Hillenbrandt testified that in the image below, the heating element *does* extend transversely. In that image, Figure 2 has a modified heating element that winds back and forth across the passageway multiple times, like Wang's coil:

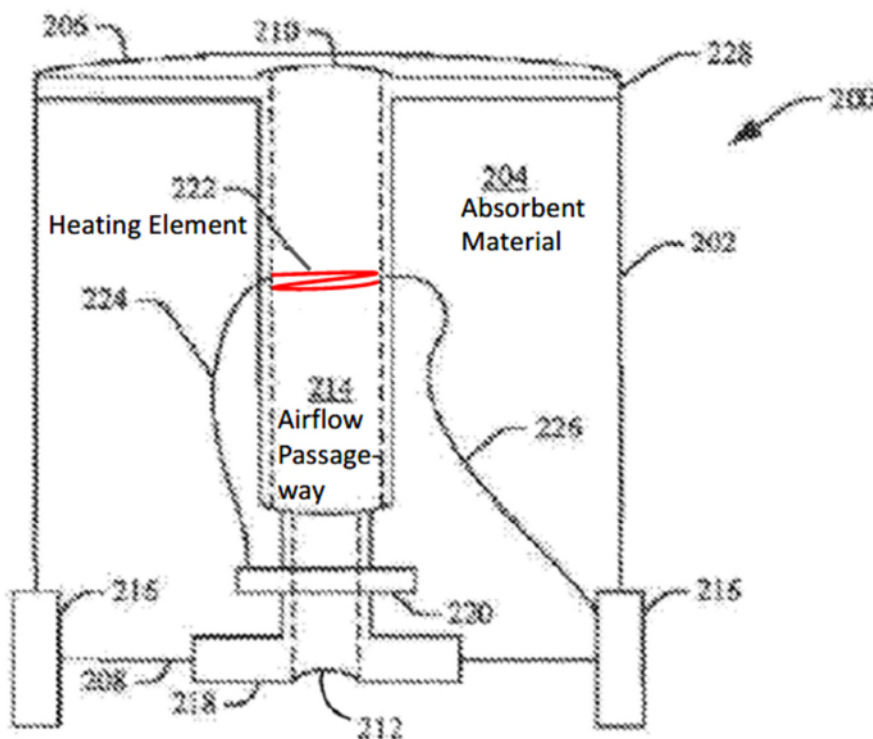


FIG. 2
Version 3

Ex. 1040, 3. Wang's heating element also extends transversely, as the heating element's wire traverses the airflow passageway and touches the inner part of the solution-holding fiber, as NJOY and its expert concede.

NJOY's responses regarding obviousness based on Wang alone or in combination with Fang also fail. NJOY's primary argument is that the prior art devices are allegedly too different. However, this argument is rooted in a misrepresentation of the proposed modification of Wang. To make its argument, NJOY inserts a modified image of the passageway and other structures from Fang into an image from Wang, but this is incorrect. The law is clear that literal substitution of elements is not required in an obviousness combination, so even if Wang as disclosed lacks a central airflow passageway, the concept of one is what is rendered obvious by combination with Fang. *Omega Patents, LLC v. BMW of North Am., LLC*. No. 2022-2012, 2024 WL 227801 at *3 (Fed. Cir. Jan. 22, 2024) ("Obviousness is determined based on what the combined teachings of the references would have suggested to those having ordinary skill in the art and does not require an actual, physical substitution of elements."). The main question posed by the modification is whether it would have been obvious to turn the coil in Wang 90 degrees in view of Fang for better air-to-coil contact and thus better vaporization. NJOY's expert admitted that it would be, testifying that those

benefits would have been obvious to a POSITA at the time of invention as a matter of basic fluid dynamics. Ex. 1035, 55:15-58:9.

NJOY's secondary consideration arguments also fail. The alleged praise (from a single person), is directed to unclaimed features, and thus legally irrelevant as there is no nexus between the claimed features and the alleged praise. Nor is there any reason to think the claimed features were innovative, successful, praised, or copied. Similarly, NJOY fails to prove commercial success.

NJOY asserts the invention is the "arrangement of a transverse heating element in the airflow" (POR, 3) and an inventor testified that "[t]he invention is vaporization within the central airflow passageway." Ex. 1041, 58:14-19. As depicted above and explained further below, each of the prior art references—Xia, Wang, and although not a base reference here, Fang—has all of those things.

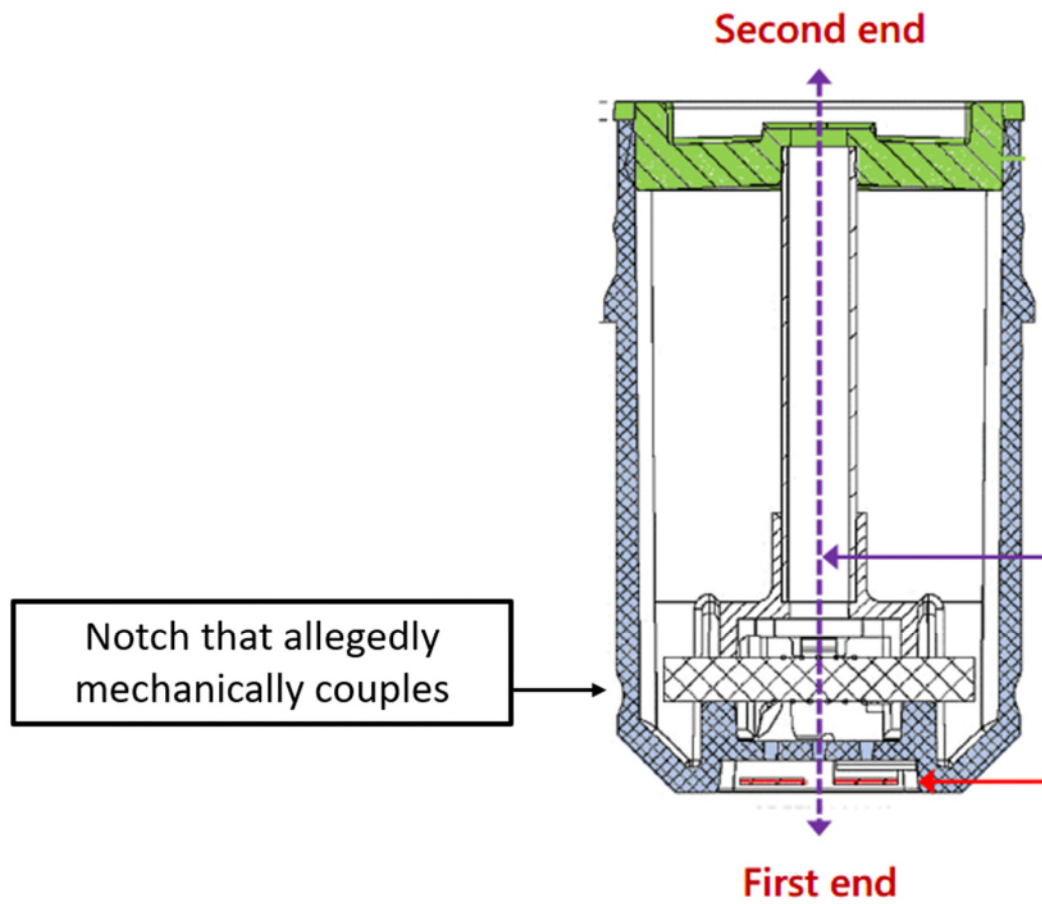
II. CLAIM CONSTRUCTION

A. "end"

The POR argues that "end" means the "extreme part of an object" (essentially a two-dimensional plane) and thus the identified first apertures in Xia and Wang are allegedly not "on" the end. POR, 20. That is too narrow in view of the specification and extrinsic evidence, as NJOY's own expert conceded. Dr. Singhose testified that "a part or *place* at or *adjacent to an extremity*" was a correct definition of "end," which makes sense, as it came from a dictionary he and NJOY cited. Ex. 1035,

104:7-11; Ex. 2021 (third definition re “end”); Ex. 2022, ¶ 72 (relying on fourth definition in Ex. 2021). He further testified the “end” is “fundamentally a three-dimensional thing” and agreed “there would be a range of distances from the very end somewhere inward towards the center of the cartridge that you would call the end.” Ex. 1035, 95:12-96:6.

The ’881 patent—related to the ’864 Patent at issue and having the same specification—includes claims that require that the “the first end of the housing includes an electrically conductive portion that is adapted to mechanically and electrically couple to the electrically conductive portion of the power source.” Ex. 1001, cl. 1. That the “end” includes a “portion” that mechanically couples indicates there is dimension to the “end” that extends toward the center of the cartridge. And in alleging infringement at the ITC, NJOY asserted that the “end” reaches to the notches in the diagram below that perform the alleged mechanical coupling:



Ex. 1043, CDX-2C.151 (left text box annotation added).



Ex. 1033, 5.

NJOY and its expert thus agree that the definition of end should be “a part or place at or adjacent to an extremity.”

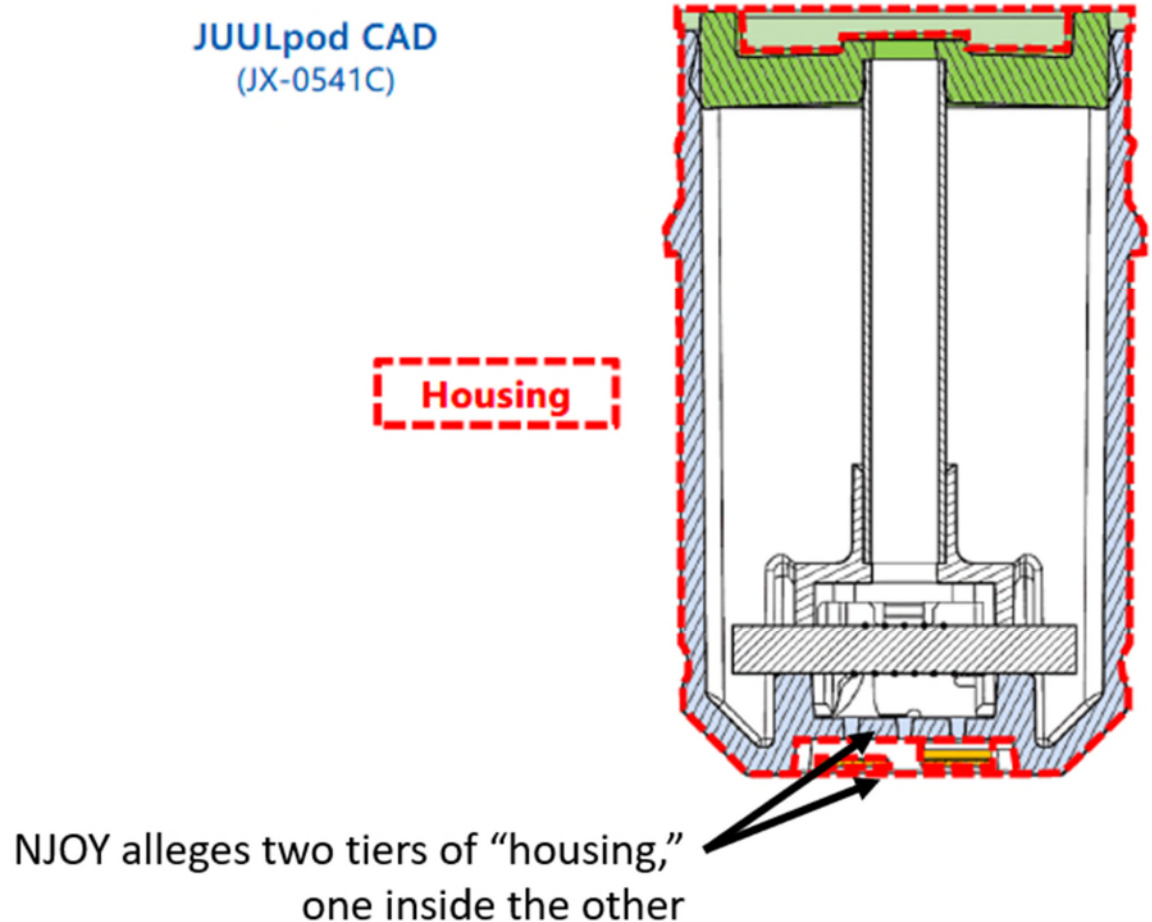
B. “housing includes a first aperture on the first end”

Despite the Institution Decision noting that the claims do not recite that the apertures must be in the housing, NJOY continues to argue the contrary. POR, 28-37.

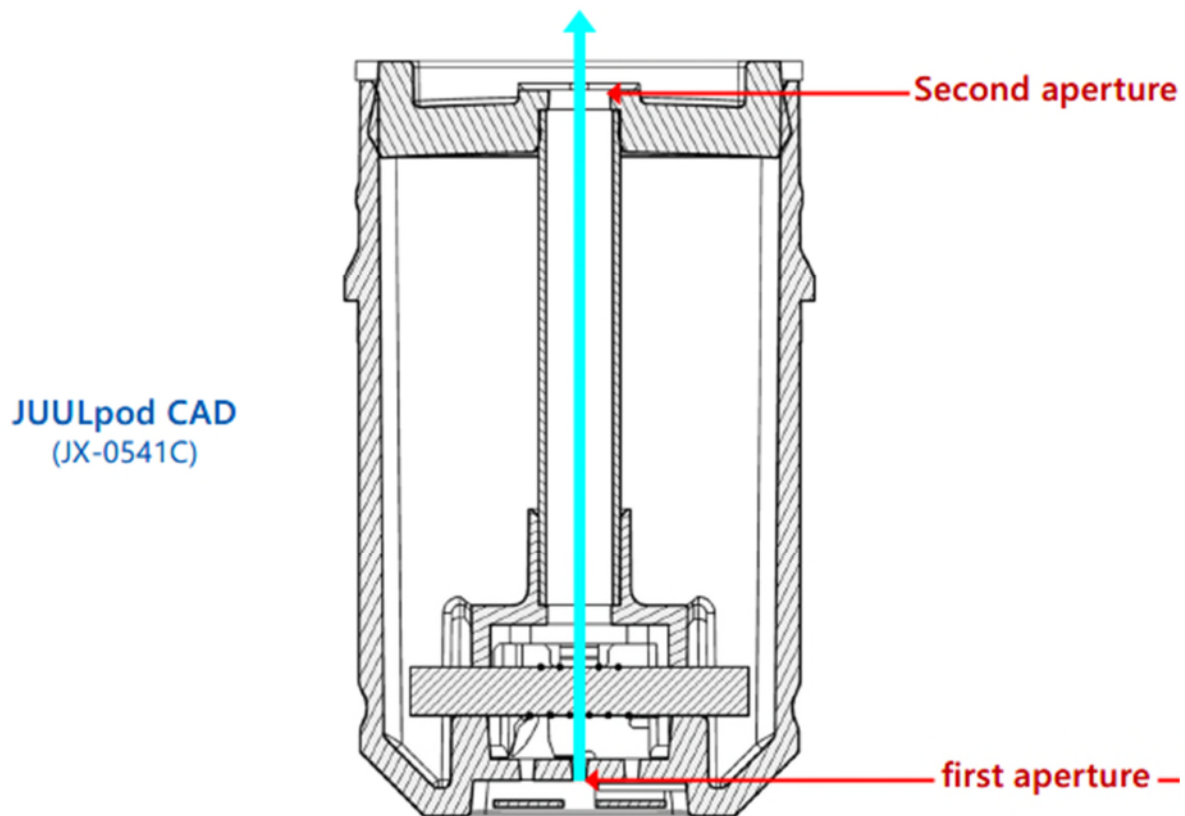
Moreover, NJOY’s infringement and domestic industry contentions at the ITC pointed to internal apertures as the claimed apertures. Under NJOY’s

contentions, either the claimed apertures do not need to be in the housing or internal structure can be the housing in which the apertures are. Either way, the apertures disclosed in Xia and Wang satisfy the claims.

In the ITC, NJOY argued that two tiers of “housing” of the JUUL device serve as the claimed housing, with one inside the other (because it pointed to the electrical contacts as also being part of the claimed “housing”).

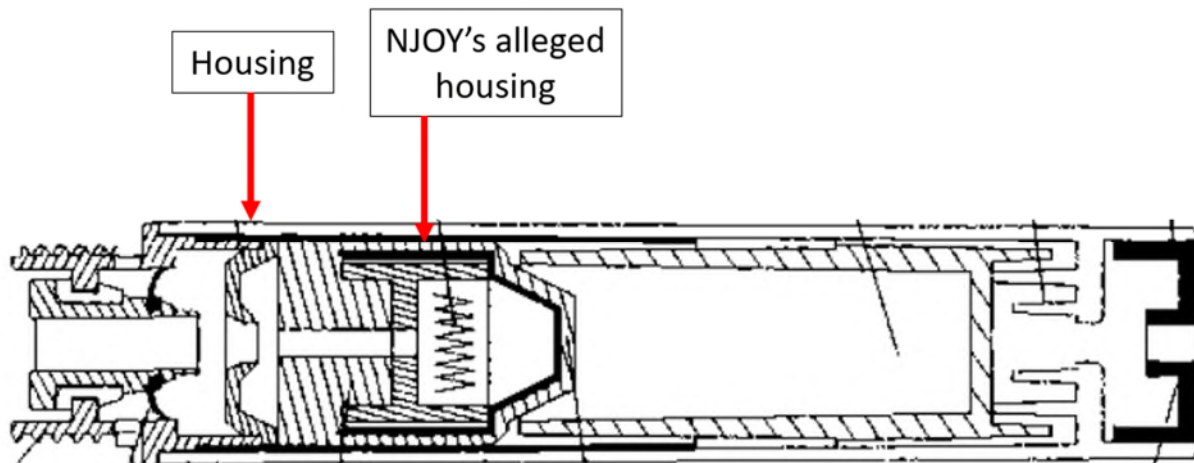


Ex. 1043, CDX-0002C.021 (bottom annotation added). The first and second apertures NJOY points to are within the internal tier of the two alleged “housings”:



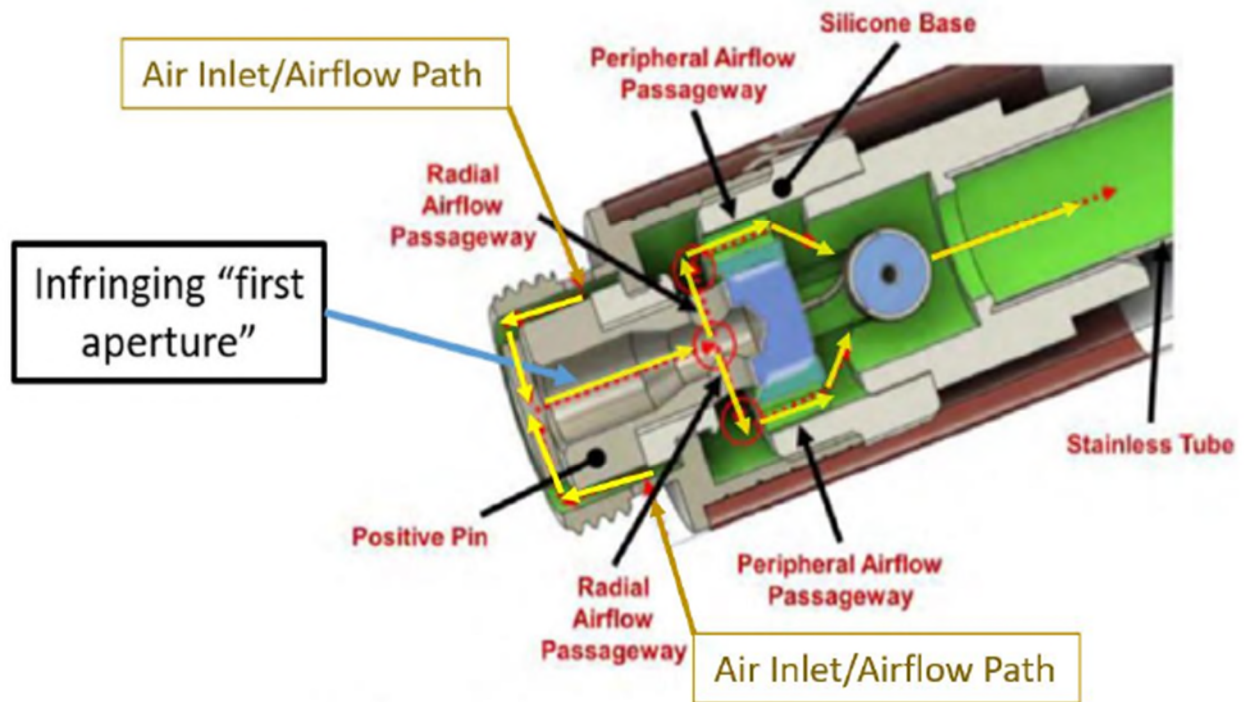
Ex. 1043, CDX-0002C.034.

NJOY doubled down on its position that internal structures can serve as “housings” in other contexts as well. For example, NJOY’s argument that Xia lacks the claimed “cartridge” relies on its position that *only* the inner alleged “housing” contains the heating element, and the outer housing does not:

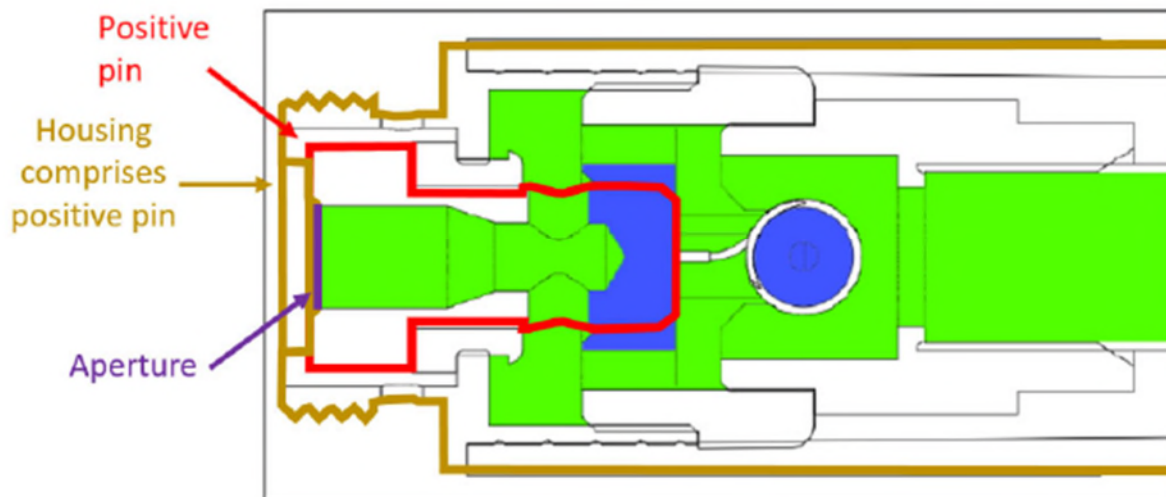


Ex. 1035, 60:2-85:1. NJOY’s alleged housing is purely internal to Xia’s cartridge. NJOY’s expert similarly testified that “[y]ou could put it deep inside of a product, and it would still be recognized as the housing of that internals.” Ex. 1035, 84:11-85:1; *see also id.*, 68:16-20 (“Q. So the -- you can have a structure that's a housing even if it's not the outermost structure then? For example, in figure 2, generator? THE WITNESS:· Yeah...”). Thus, under NJOY’s interpretation, fully internal structures can be the housing. Moreover, the structures Xia’s and Wang’s apertures are in “contain the device internals” (NJOY’s definition of housing, POR, 69)—at least as much as the alleged “housing” NJOY points to above does.

The same is true of NJOY’s domestic industry contentions as to the Vuse Ciro, which mirrored the allegations Fuma made in the M.D.N.C. litigation discussed in the Petition—NJOY points to an aperture in the “positive pin,” which its own expert conceded is fully internal to the outer threaded screw:



Pet., 40.

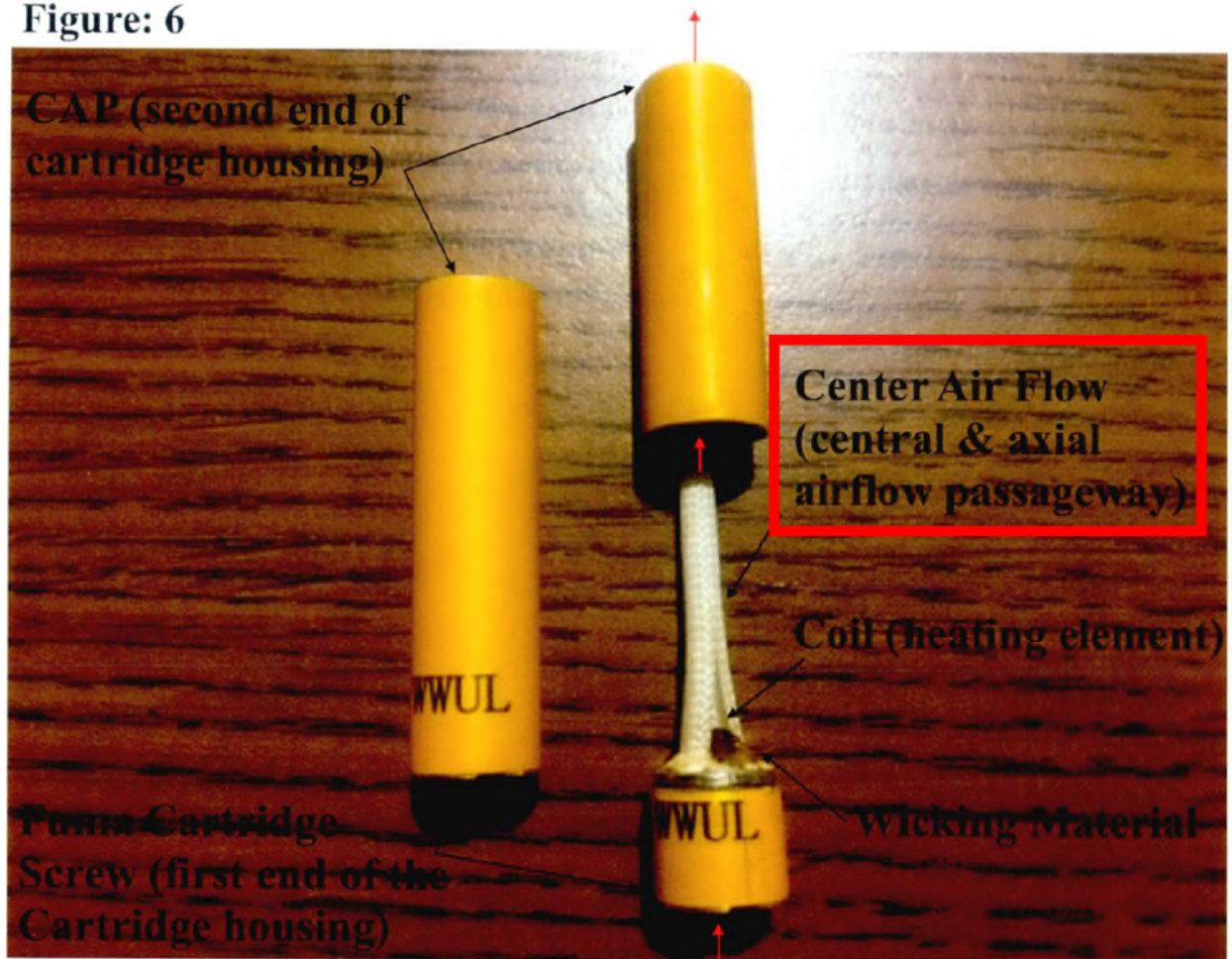


POR, 34; Ex. 1035, 88:11-22.

Additionally, the Fuma device, which the inventors represented during examination meets all the claims, as does NJOY's expert (Ex. 2022.221-263)

demonstrates NJOY's belief that the claimed apertures can be internal. The "airflow passageway extends centrally and axially from the first aperture to the second aperture," meaning the apertures are at the ends of the airflow passageway. In the Fuma device, the airflow passageway (the woven tube) identified by the inventors during prosecution is internal to the cartridge, and does not extend all the way to the extreme ends thereof, meaning the apertures are also internal.

Figure: 6



Ex. 1029.021. Thus, the apertures between which the passageway extends are internal. Inventor Daniel Hillenbrandt confirmed that the passageway is the woven tube. Ex. 1038, 67:21-68:24.

NJOY and its predecessor-in-interest, Fuma, have consistently taken the position (during examination, in Federal District Court, and at the ITC) that internal apertures can satisfy the claims, and should be held to that claim scope.

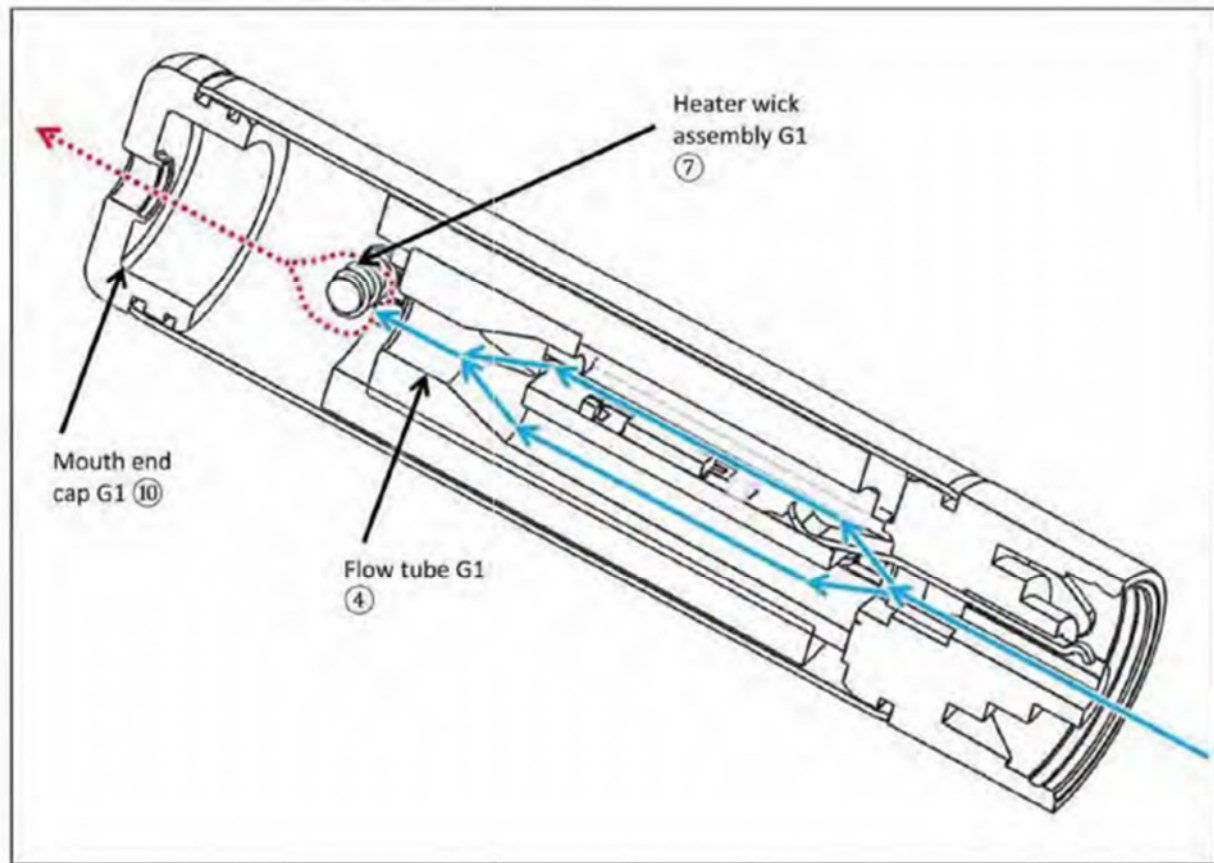
C. “wherein the airflow passageway extends centrally and axially from the first aperture to the second aperture”

The POR argues that the passageway term “encompasses only small obstructions (i.e., heating element and corresponding structures that do not alter the direction of airflow any more than the heating element) but excludes large obstructions that define the airflow passageway.” POR, 27.

There is no principled distinction between large and small obstacles. Nothing in the claims, specification, or other intrinsic evidence precludes large obstacles that deflect airflow a large amount while permitting (as NJOY concedes) small obstacles that deflect airflow a small amount. Nor is there any evidence supporting a way to identify which obstacles are large or small.

NJOY fabricates this distinction because in the ITC hearing it argued devices with obstacles in the airflow path meet the claims. For example, NJOY

asserts that the Vuse Solo G1 cartridge embodies the claims, but that device has a long PC board diverting airflow away from the center:



Ex. 2022.267; Ex. 2036, Fig. H-14.

This is in addition to the Vuse Ciro device that NJOY argued in the ITC embodies the claims, as explained in the Petition, even though airflow is diverted. Pet., 11-15, 39-41.

Under NJOY's and the M.D.N.C.'s view that obstacles are permitted, there is no evidence supporting a limitation on the degree to which airflow gets diverted or the size of the obstacle, much less the limitation NJOY proposes (that it is tied to

the size of the heating element). NJOY's proposed limitation misreads the M.D.N.C. decision, which instead stated that obstacles by their nature do not change the direction of the *passageway* any more than the heating element obstacle (that is to say, not at all), not that only if they do not change the direction of the *airflow* any more than the heating element they are permitted. POR, 72.

Moreover, as NJOY's expert admitted, the claims have no limit on the size of the heating element, or how much it can divert airflow, so even comparison to the heating element does not provide a limitation. Ex. 1035, 135:6-12.

III. GROUND 1 IN VIEW OF XIA WITHOUT MODIFICATION

A. Cartridge

Xia has a cartridge, called the "generator," that contains the claimed elements:

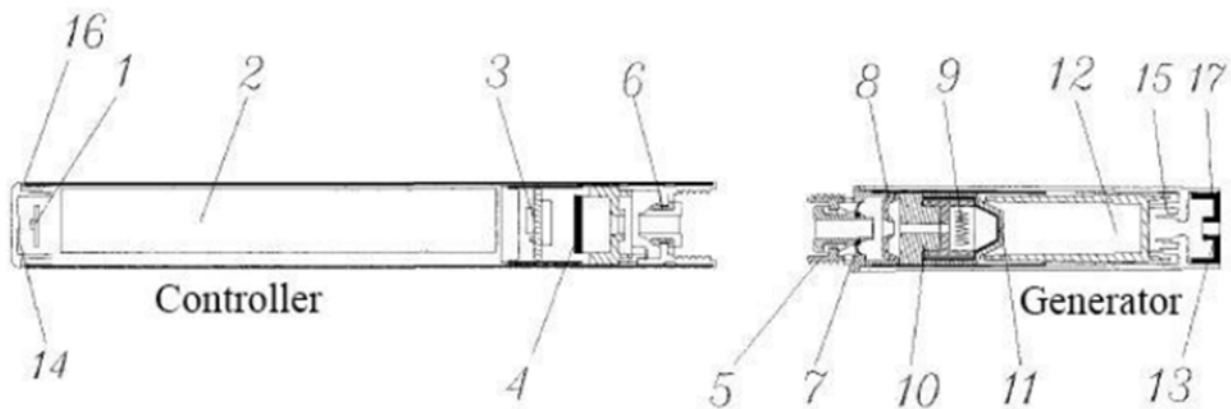


Fig. 2

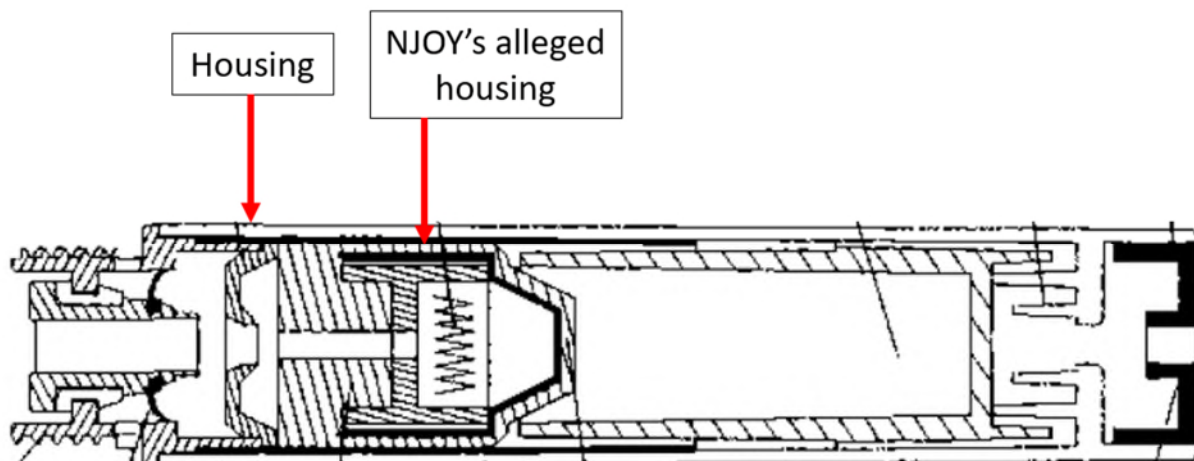
Ex. 1004, Fig. 2.

NJOY argues Xia lacks the claimed “cartridge” because “Xia’s heating element and solution holding medium are in separate cartridges.” POR, 67. That is incorrect: Xia repeatedly discloses and describes that they are both in the generator, which has a housing. Ex. 1004, Abstract (“the inner part of the generator is provided with ... a secondary liquid storage chamber, a heater, a liquid guiding mechanism, a liquid storage chamber”). NJOY’s argument is based on an incorrect restriction that the claims are directed to a “two-piece” e-cigarette design (*i.e.*, the cartridge is one piece and the battery portion another) and do not cover a “three-piece design” (where the cartridge is two pieces). But the claims do not distinguish between “two-piece” and “three-piece” designs. Further, the specification affirmatively states that what NJOY calls a “three-piece design” is covered: “the cartridge can be manufactured as a multi-piece assembly.” Ex. 1001, 1:48-50. With reference to Figure 2, which NJOY asserts is the claimed embodiment, the specification states that the cartridge “may or may not be able to be unassembled by the end user,” *i.e.*, it may comprise multiple pieces. Ex. 1001, 6:20-24.

NJOY also argues that the identified housing does not satisfy the claims, because Xia’s “stainless steel shell” is allegedly internal rather than external. *Id.* NJOY appears to be discussing the dark-lined structure depicted in Figure 4, which

sits inside the lighter colored shell in Figure 2. POR, 69. But that is not the only stainless steel shell disclosed. Xia states that “[S]tainless steel shells are arranged on an outer surface of the controller and *an outer surface of the generator*[.]” Ex. 1004, 3. So the outer shell of the generator may be polypropylene, Xia also states that it may be stainless steel, and Petitioner clearly pointed to the outside shell of the generator, not the internal one of Figure 4. Pet., 31-33. NJOY’s expert also admitted the generator’s outer shell may be made of a variety of materials. 1035, 65:4-6.

NJOY appears to argue Xia’s heating element is not within the outer shell of the generator. For example, NJOY asserts that an internal shell is the *only* thing that contains the heating element, and that the outer shell does not. Ex. 1035, 60:2-85:1.



That is wrong. The outer shell also contains the heating element. NJOY argues “[h]ousing’ means “an outside structure containing device internals.” POR, 69. The outer shell satisfies this definition. The darker-lined alleged internal shell NJOY points to is not an external structure; the lighter-colored shell is. Even if the former were a housing, it and the heating element are still within the outer shell. . As NJOY’s expert conceded, there is no prohibition in the claims on having a second internal housing that might further contain the device internals in addition to the external-most housing. Ex. 1035, 64:22-65:3, 79:10-21.

Dr. Singhose seemed to agree that Xia’s generator is a cartridge: “Q. And your view is that that is not a cartridge, correct? A Well, I think it's two cartridges connected. *So it is a -- a cartridge*, but actually there's two cartridges there.” Ex. 1035, 61:22-62:1.

B. Apertures

NJOY argues that the apertures must be in the housing, not inside the housing. POR, 70. That is incorrect under NJOY’s representations to the ITC and the Board’s interpretation of the claims. See Section II.B.

C. Airflow Passageway

As explained above in Section II.C, Xia has a central and axial airflow passageway, under NJOY’s interpretation. NJOY argues that Xia fails because liquid storage chamber 12 diverts airflow and the claim “excludes structures that

divert the airflow more than a heating element.” POR, 72. However, this restriction has no basis in the claim language or the specification, and contradicts NJOY’s infringement and domestic industry contentions, as explained above. NJOY’s distinction between Xia’s liquid storage chamber because it “substantially diverts” the airflow, and the Vuse Ciro’s positive pin and the Vuse Solo G1’s PC Board has no basis in the claim language or specification, as explained above. POR, 70. Further, though the applicant argued against the Han reference during examination by pointing to an obstacle in Han (POR, 23-27), since then, both the applicant (Fuma) and the current Patent Owner (NJOY) have argued the exact opposite, and NJOY should be bound to that latter—broader—interpretation.

IV. GROUND 1 IN VIEW OF XIA ALONE OR IN CONJUNCTION WITH WANG AND/OR FANG

A. Motivation to Modify

NJOY’s main criticism of the proposed modifications to Xia is that they are not obvious to make. However, the proposed modifications are all simplifying, obvious choices that are well within a POSITA’s knowledge. The modifications result in a cheaper and simpler device, which NJOY’s expert concedes is a reason to make them, especially for disposable cartridges. Indeed, he recognized that customers prefer cheaper devices, especially for e-cigarettes, as the rise of disposable devices has proven. Ex. 1041, 1 (“during January 2020–December

2022, unit shares of prefilled cartridges decreased from 75.2% to 48.0%, and disposable e-cigarette unit share increased from 24.7% to 51.8% of total unit sales”). The modifications’ benefits render them obvious, even if there are some potential downsides that could exist as NJOY asserts, which are largely incorrect as explained below. *Axonics, Inc. v. Medtronic, Inc.* 73 F.4th 950, 957 (Fed Cir. 2023) (“a skilled artisan may be motivated to combine particular features of different references, e.g., to secure some benefits at the expense of others”).

The first proposed change is to continue the central airflow path that exists in the area of the heating element, from end to end of the cartridge. Wang and Fang both provide examples of such an obvious airflow path.¹ Pet., 43-52. A central tube has clear benefits, including reduced airflow resistance and thus better airflow. Pet., 43-44, 48-49. NJOY’s expert conceded a POSITA would have known a central straight path has less airflow resistance than a circuitous one. Ex.

¹ NJOY is incorrect that there is a “wall” in Fang’s central airflow passageway. POR, 51-52. The “fuming device control switch 4” contains a “silicon film-coated tablet 11” that senses suction and uses a magnet to relay the signal. Ex. 1006, 5. The switch and tablet are on the other side of the alleged wall from the air exit hole. Ex. 1006, Fig. 1. There cannot be a “wall” in Fang because when the user sucks, “the smoking channel 10 generates a negative pressure in atomizer control switch 4 by a suction force of a user, the silicon film-coated tablet 11 bulges,” causing the circuit board 12 to power the battery. Ex. 1006, 5-6. The illustrated structure does therefore not block airflow, and the airflow channel thus reaches from the user’s mouth to the tablet 11 to convey the suction effect.

1035, 127:15-128:9. Inventor Daniel Hillenbrandt, who was not a person of skill in the art (as he has no college degree had no experience with electromechanical devices at the time of alleged invention) knew this, as anyone would, further demonstrating that it is merely common-sense obviousness. Ex. 1041, 34:2-17. Additionally, this style of airflow passageway would go through the liquid storage chamber in Xia, meaning that the solution holding medium would surround the airflow passageway, and would be adjacent to an exterior thereof.

The second proposed change is to extend the passageway, reaching very end of the cartridge. This simplification creates greater solution-holding capacity, which NJOY's expert agrees is beneficial. Ex. 1035, 58:21-59:4. As Dr. Sturges explained, another benefit is the removal of the over-complicated and error-prone flapping-diaphragm-based suction detection disclosed in Xia, and instead using a simpler, cheaper, traditional pressure sensor (as in Wang and Fang), making the cartridge cheaper and more reliable. Ex. 1007, ¶¶ 95-99.

NJOY argues the modified Xia would allow liquid to flow back into the battery portion, but does not explain how or why that would be the case. POR, 61. That is incorrect; as explained in the Petition and by Dr. Sturges, the modification prevents such reverse liquid flow using the same approach already disclosed in Xia, merely moving it to the center of the passageway from the outside. Ex. 1007, ¶¶91-100; 137-160; 307-317; Pet., 36-37.

NJOY’s other main argument is that liquid droplets would flow to the user’s mouth due to removing liquid blocking features. Dr. Singhose asserts that “[w]ithout the liquid-guiding mechanism ...there would be no structure to trap and reabsorb large-diameter droplets.” Ex. 2022.138. However, this misrepresents the modification. For example, as illustrated, the heating cavity and surrounding solution holding medium act to trap and reabsorb potential droplets, as they do in Xia. Indeed, Dr. Singhose asserts that the airflow would swirl and “be stagnant,” providing more opportunity for reabsorption. Ex. 2022.123. And as Dr. Sturges explains, there is no need for the “liquid blocking tank 15 and the liquid blocking sealing cover 17,” because there is an “impermeable barrier . . . to prevent liquid droplets from entering into the airflow channel from the storage container.” *Id.* ¶ 151. Further, even if NJOY were correct, contemporary evidence demonstrates droplet inhalation was common. For example, it would be no more prevalent in the modification than in the ’881 patent. Neither claim 1 nor Figure 2 requires a wick, meaning they operate in the same way as the last stage of the liquid flow in Xia, *i.e.*, liquid droplets get sucked in the airflow and vaporized, with potential unvaporized droplets continuing to the user.

Moreover, NJOY’s argument ignores the modification based on Fang, in which a wick is used to draw liquid to the heating element. Ex. 1007, ¶¶ 152-160;

Pet., 48-52. This technique does not rely on liquid droplets, instead using capillary action.

NJOY's expert Dr. Singhose asserts that there would be other issues that NJOY does not raise; all fail. Dr. Singhose asserts that there would be reduced airflow around the coil because less air flows over the internal part of a cavity structure. Ex. 2022.122. But he ignores the fact that the straight flow passageway modification increases overall airflow, as he admits, so at best he points to a small reduction in an overall large increase of airflow.

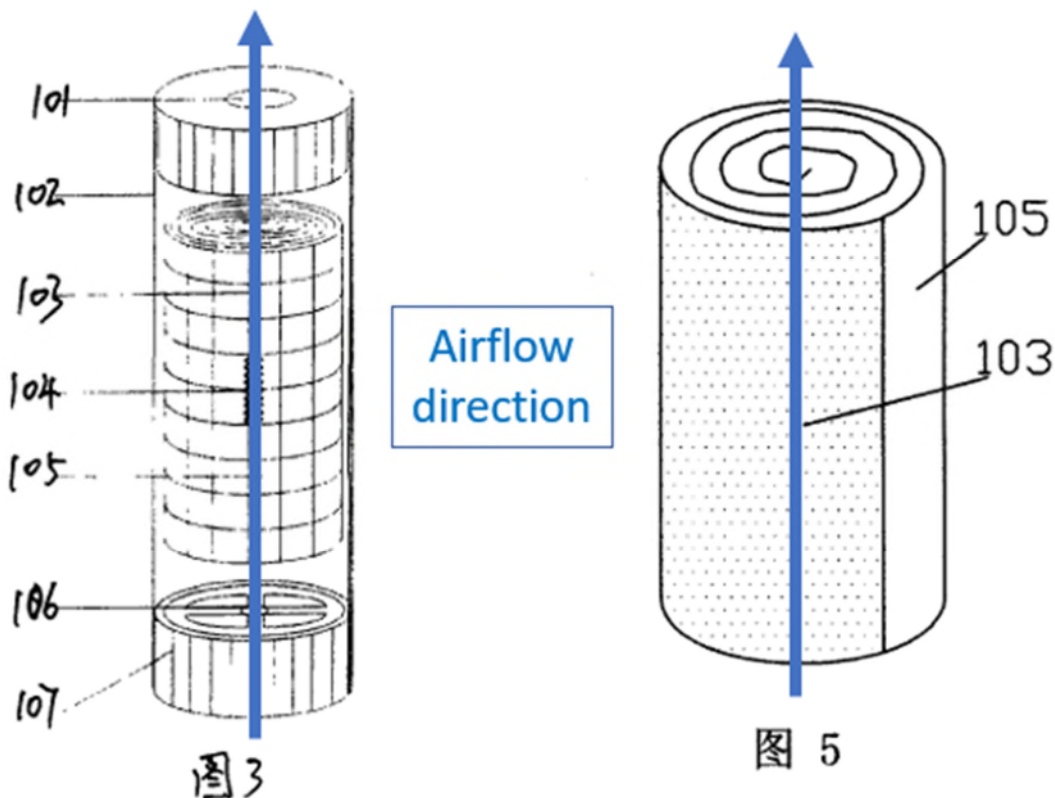
Dr. Singhose asserts that there would be a loss of liquid storage capacity, Ex. 2022.128, but ignores that the modified design extends the storage medium into what were gaps at the ends of the cartridge. He further does not use any numbers in his analysis, just arguing that "the value of r^2 can be quite large," without saying why it would be, or how large. Ex. 2022.131-132. His analysis contradicts the basic fact that the volume around the outer edge of a cylinder is larger than the volume in the middle, because the radius is larger. He is incorrect that the "heat control system" is disabled (Ex. 2022.13-136): an ordinary pressure sensor as in Fang and/or Wang is used, and uses common-knowledge electrical connections to bring the electrical signal from the pressure sensor, which outputs an electrical signal, to trigger the battery. Ex. 1007, ¶¶ 93-96. There is also no evidence to

suggest that a diaphragm could not be used internally as Dr. Sturges alternatively proposed, other than Dr. Singhose's say-so. Ex. 2022.136-138.

V. GROUND 2 IN VIEW OF WANG WITHOUT MODIFICATION

A. Airflow Passageway

Wang depicts an airflow passageway extending through the middle of the rolled fiber/paper 105, in which the heating element sits. The airflow through the passageway is vital to the functioning of the device, as it draws the vapor to the user. It is illustrated in Figures 3 and 5, which depict heating coil 104 within the gap created by rolling the fiber/paper 105:



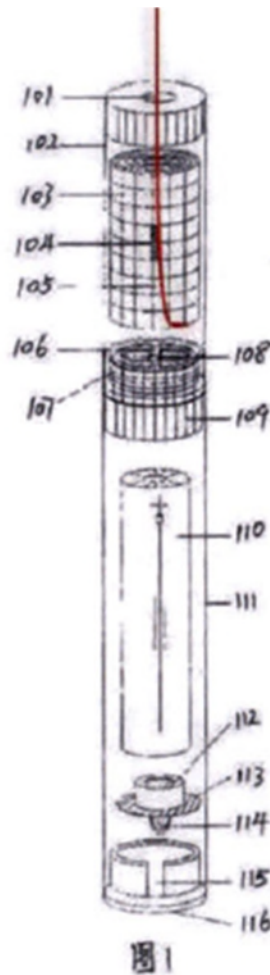
Ex. 1005, Fig. 3, 5 (annotated). Additionally, the heating element, illustrated as a coil with a diameter, would necessarily create a channel of at least the coil's diameter within the fiber "wound" around it. EX1005, 7. NJOY's theory is that air exclusively flow around the outside of the fiber/paper 105:



Ex. 2022, ¶¶ 297-301; POR, 88-89. But that makes no sense—how would the vapor created at the coil be delivered to the user? The POR argues “[v]apor permeates through the fiber.” POR, 89. But the fiber is soaked in liquid—vapor cannot merely “permeate” through it. The answer from NJOY’s expert strains

credulity: his theory is that as the liquid is sitting in the fiber/paper 105, all of it boils such that vapor can travel through the soaked fiber to reach the alleged airflow path. Ex. 1035, 25:2-26:22. No reasonable person would believe that is the method of operation of the device in Wang.

Mr. Wang himself testified that air flows centrally in his deposition by Fuma and R.J. Reynolds. Using his cellular phone and finger, he drew the below red line indicating the airflow direction:



Ex. 1036, 41, 49-55 (being asked “Can the witness draw where the air flows through this device – through the cartridge,” doing so, and testifying “of course it went through the center . . . it has to go through the airflow channel. Once it does so, it will go through the heater and bring up the smoke or fumes or vapors.”); Ex. 1017, 4-5.

NJOY’s view is predicated on Dr. Singhose’s opinion that “paper can be rolled up without leaving a channel in the middle.” Ex. 2022.88. That is incorrect, and even he could not do so during deposition:



Ex. 1035, 51:1-53:3; Ex. 1037, 2:28.

Though Wang does not state in text that there is a central gap in the fiber, it is shown in the figures, it would be known by a POSITA, and there is nothing in the text of Wang to support NJOY's position. Ex. 1035, 20:11-23, 22:13-17.

Moreover, the same channel is present in the Smoke 51 cartridge, the device that the inventors Hillenbrandt and Conley distributed, disassembled, and copied. Ex. 1038, 421:22-45:10. As seen in the expert report from district court litigation, there is a defined channel down the middle of fibrous batting material, just as in Wang. Ex. 1039, 28, 30, 31.

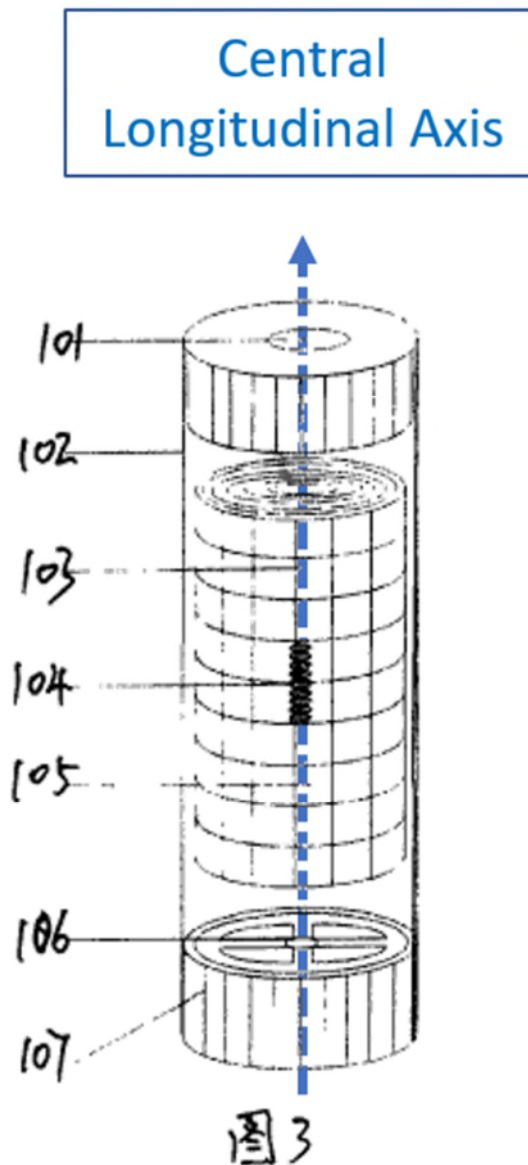
B. Apertures

The POR also argues that the identified apertures in Wang are not in the housing. That argument fails as explained above in Section II.B.

C. Heating Element Extending Transversely

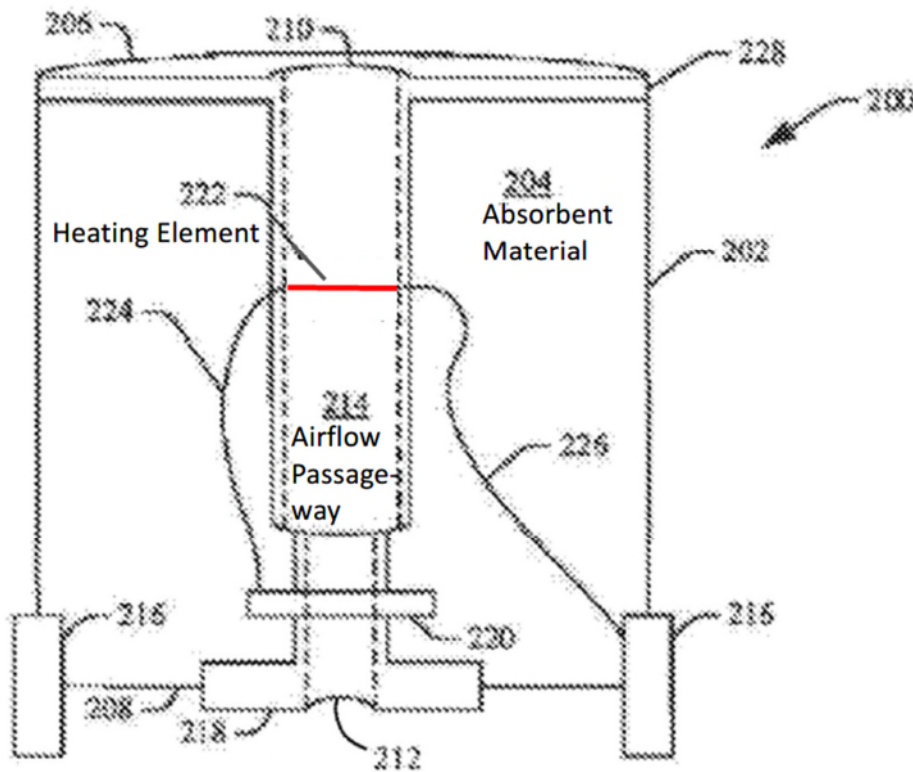
NJOY argues that Wang's heating element does not extend transversely across the airflow passageway, but instead extends *only* longitudinally. However, NJOY's expert conceded a heating element could be considered to extend both longitudinally and transversely, and is not restricted to being characterized as only extending one way or another. Ex. 1035, 49:5-15. That is the correct view of Wang's coil.

The coils of Wang's heating element 104 extend transversely, to reach either side of the airflow passageway and contact the fiber, to vaporize the liquid contained therein:



That the heating element is longer in the longitudinal direction is irrelevant, as neither the specification nor the claims impose a relative length requirement.

Inventor Daniel Hillenbrandt agreed, testifying that a heating element that traverses the passageway once, such as the one below in modified Figure 2, would extend transversely as claimed:



Ex. 1040, 2; Ex. 1038, 88:16-89:24. When asked whether a heating element that goes back and forth three times also extends transversely, he confirmed it does as well:

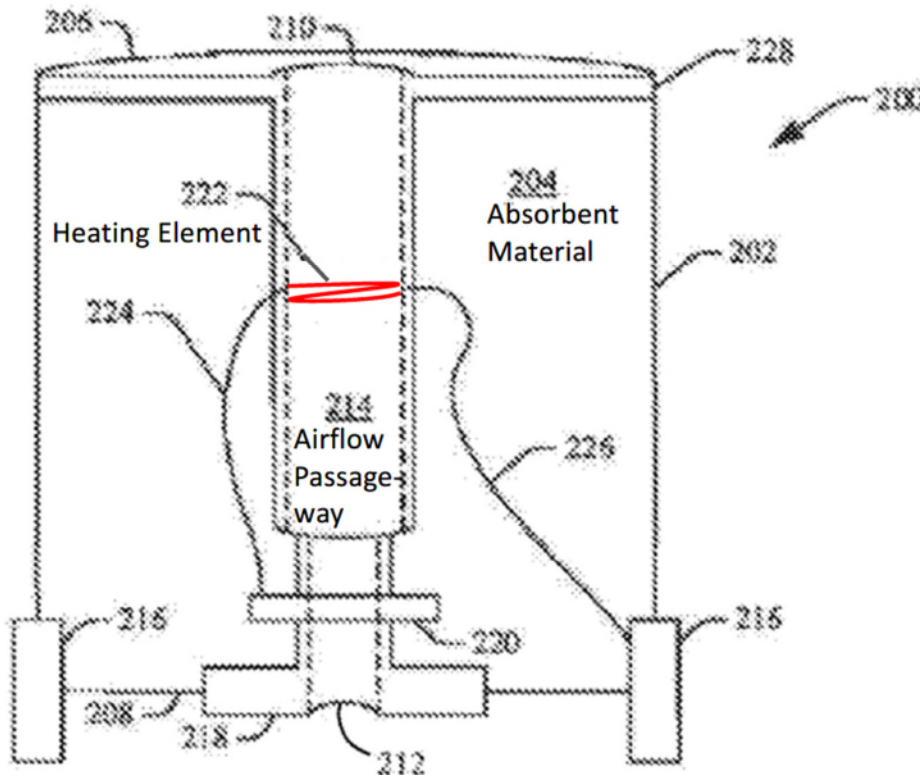
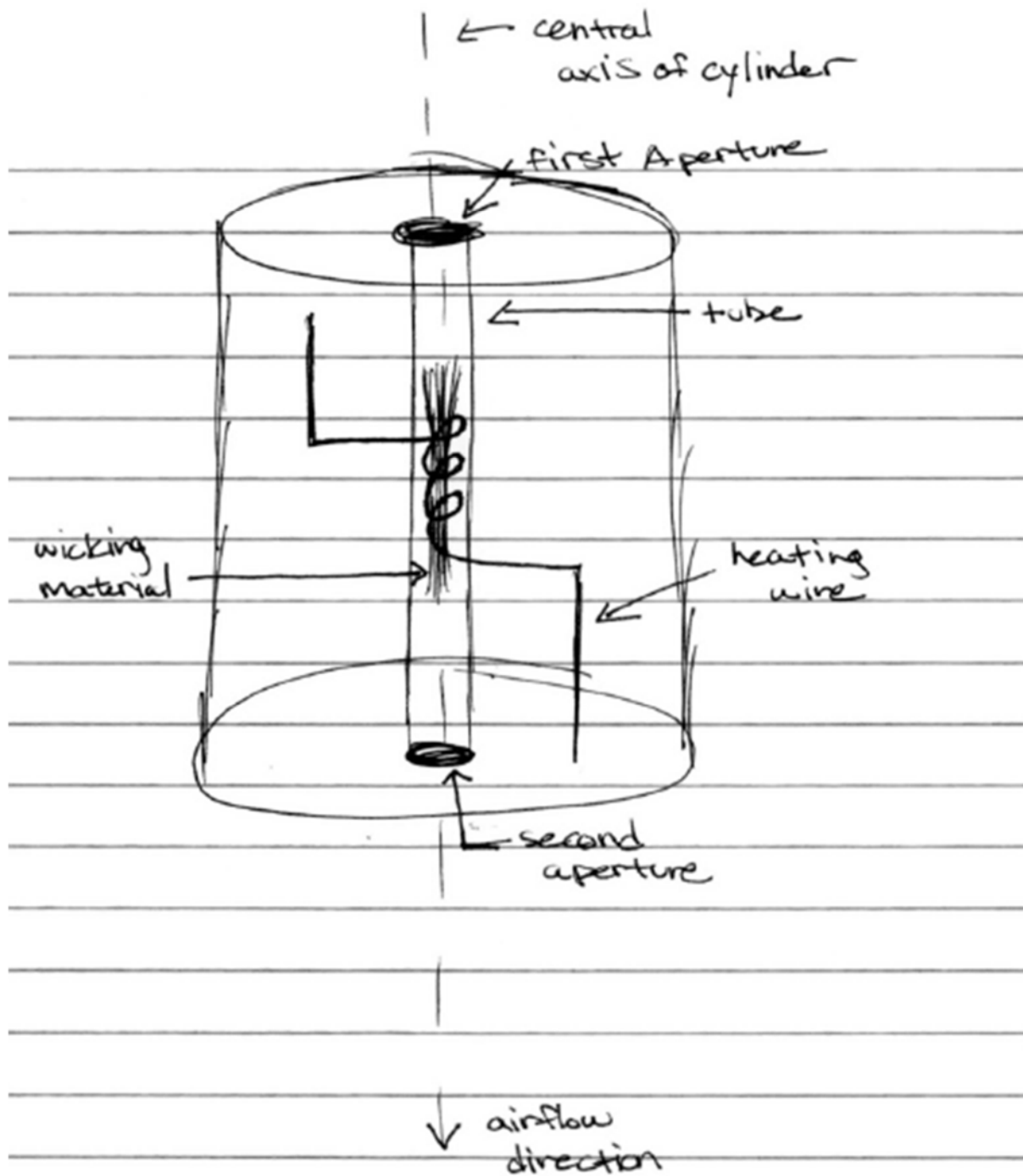


FIG. 2
Version 3

Ex. 1040, 3; Ex. 1038, 90:1-92:1. By the same logic, Wang’s coil, which traverses the passageway many times over, extends transversely across the airflow passageway.

In the parallel ITC case, inventor Hillenbrandt similarly agreed that a design such as the below, similar to Wang, “does extend transversely across the passageway.”



Ex. 1041, 240:12-242:15, Ex. 1042.

VI. GROUND 2 IN VIEW OF WANG ALONE OR WITH FANG

The main modification of Wang in view of Fang is to turn the heating element and wrap it around a wick. As the Petition explained, rotating the heating element results in greater contact between the airflow and the heating element, and thus better vaporization. Pet. 100-102. NJOY's expert agrees that the benefit is "something that a person of skill in the art would recognize as a basic principle of fluid dynamics." Ex. 1035, 57:6-58:9. Using a wick is also a straightforward way to bring liquid to the heating element, as done in Fang. Fang's wick, similar to Wang's fiber 105, is "made of cotton yarn," leading to a simple combination without undue experimentation. Ex. 1006, 6. Contrary to NJOY's assertion, there is no "complex wicking mechanism" in Fang; it is simply a fiber that draws liquid.²

NJOY's counterargument is that the prior art devices are too different. NJOY inserts a modified image of Fang's passageway into an image from Wang, but literal substitution of elements is not required in an obviousness combination. *Omega*, 2024 WL 227801 at *3 ("Obviousness . . . does not require an actual, physical substitution of elements."). The main question is whether it would have been obvious to turn the coil in Wang 90 degrees in view of Fang for better air-to-

² Even if Fang discloses a more complex wicking mechanism, it also at least discloses a simpler fiber by its illustration.

coil contact and thus better vaporization. NJOY's expert admitted that it would be. Ex. 1035, 55:15-58:9.

As to the location of the apertures, NJOY's expert agrees it would be beneficial to extend the solution-holding medium bringing the apertures to the very edge of the housing (as NJOY argues is required), resulting in beneficial increased liquid storage capacity. Ex. 1035, 58:10-59:4.

VII. DEPENDENT CLAIMS

The dependent claims add nothing meaningful and are rendered obvious by Grounds 1 and 2 as explained in the Petition. Inventor Daniel Hillenbrandt was unable to identify a single innovative concept that any dependent claim adds or how he conceived of them. Ex. 1038, 115:18-133:5. Dr. Singhose further admitted that the dependent claims represent nothing novel, *e.g.*, confirming that increasing the size of the second aperture (claims 4, 12, 20, 23) would be known by a POSITA as a simple matter of fluid dynamics to increase airflow. Ex. 1035, 157:16-169:6.

VIII. SECONDARY CONSIDERATIONS

The asserted claims do not solve any problems in the e-cigarette space, much less the ones NJOY identifies. POR, 105-107.

NJOY's first alleged problem, prevention of non-atomized droplet inhalation, is not solved by the claims. Neither claim 1, nor Figure 2 (allegedly the

claimed embodiment) requires a wick to deliver liquid to the heating element, thus relying on droplets being sucked into the passageway and only some being vaporized or a separate mechanism for absorbing droplets in the airflow. Thus, unvaporized droplets would reach the user's mouth in the preferred embodiment .

NJOY's second alleged problem, reduction in burnt taste, is also not solved by the claims. In Figure 2 (allegedly the claimed embodiment), un-insulated lead wires 224 and 226 would create the same burnt taste for the same reasons as the inventor alleged the prior art did (once the liquid is used up, the wires burn absorbent material 204 through which the wires run). NJOY's expert conceded the wires are not insulated, and insulation would prevent the leads from burning the batting material. Ex. 1035, 45:23-46:4. Inventor Daniel Hillenbrandt testified the burn mark that he saw in the Smoke 51 device was around the outside edge of the interior of the Smoke 51 cartridge, *i.e.*, where the lead wires are. Ex. 1038, 47:8-48:12; Ex. 1039, 10-34. The same thing would happen in the '881 patent's preferred embodiment.

Moreover, neither the claims nor the specification comment in any way on the alleged points of novelty NJOY now argues for.

Nor is there nexus between the claims and the Fuma product, which NJOY relies on here. The Fuma device is not coextensive with the claims. Indeed, the very aspects that were allegedly praised are unclaimed features: "the absence of

the sweet aftertaste,” metal construction, cartridge sealing, protective covers, and lack of a “time delay cutoff.” Ex. 2027.001. Other Reynolds materials comment on the U.S. manufacturing, alleged IP coverage, “heavier-gauge heating element,” that it “does not appear to have timed cutoff,” and that it can “accept competitor’s battery,” none of which is claimed. Ex. 2032.17-19. The one allegedly claimed item, “new central airflow design,” was not in fact new, as seen above in Wang, Fang, Xia, and Smoke 51.

There is also no evidence that any of the sales of Fuma devices were due to the claimed features, as neither NJOY nor its expert provided any evidence as to why any customer made even a single purchase. Ex. 1035, 14:6-16:6.

There is no evidence of commercial success. NJOY cites sales numbers, which peaked and then declined quickly, but fails to put them in context by comparing them to any other e-cigarette maker’s sales. Ex. 1035, 11:13-13:9. *See* M.P.E.P. 716.03(b) (“Gross sales figures do not show commercial success absent evidence as to market share.”).

There is no evidence of copying. There is no evidence that any of the alleged copiers were aware of Fuma or its patents, nor any evidence about when the products entered the marketplace. POR, 100-119; Ex. 2039 (not providing any analysis of first sale date).

IX. CONCLUSION

The Board should find the claims of the '881 patent unpatentable.

Dated: November 20, 2024

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CERTIFICATE OF COMPLIANCE

Pursuant to 37 C.F.R. § 42.24(d), Petitioner hereby certifies, in reliance on the word count of the word-processing system (Microsoft Office Word 2010) used to prepare this petition, that the number of words in this paper is 5,435. This word count excludes the tables of contents, tables of authorities, mandatory notices under 37 C.F.R. § 42.8, certificate of word count, certificate of service, or appendix of exhibits or claim listing. Petitioner certifies that this Petition for *Inter Partes* Review does not exceed the applicable type-volume limit of 37 C.F.R. § 42.24(a).

Dated: November 20, 2024

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CERTIFICATE OF SERVICE

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