

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

AROMA360, LLC,

Petitioner,

v.

AIR ESSCENTIALS, INC.,

Patent Owner.

IPR 2025-00707

U.S. Patent No. 10,092,918

DECLARATION OF CHRISTOPHER WHITE, Ph.D.

I, Dr. Christopher White, declare as follows:

I. INTRODUCTION

1. Aroma360, LLC (“Aroma360”) has retained my services in connection with the above captioned *Inter Partes* Review (IPR) of U.S. Patent No. 10,092,918 (’918 Patent). I have been asked to study and provide my opinions as an independent expert witness regarding technology described in the ’918 Patent. I am being compensated at my usual and customary rate for my time. Such compensation, however, does not influence my opinion nor does the outcome of this proceeding impact my compensation.

A. Qualifications

2. My qualifications and professional experience are described in my curriculum vitae. I have been informed that a copy of my curriculum vitae will be submitted with my declaration. The following is a summary of my relevant qualifications and professional experience.

3. I received my PhD in Mechanical Engineering from Yale University in 2001. Prior to that I received my M.S. in Mechanical Engineering from Yale University in 1999. I received B.S. and M.S. degrees in Mechanical Engineering from Stony Brook University in 1994 and 1996, respectively.

4. I have over 20 years of experience conducting fundamental research in fluid dynamics and thermodynamics. Many of these research studies required custom designed fluid engineering systems employing, individually or in

combination, air pumps, air compressors, fans, blowers, atomizers, flow restriction devices (e.g., venturis, orifices) and flow conditioning devices (e.g., baffles, screens, honeycomb structures).

5. I have designed oil atomization systems and used commercial oil atomization systems. These systems are used in my research to “seed” air flows with oil droplets to visualize the fluid flow and to measure fluid velocities using lasers and cameras.

6. I have designed chambers in atomization systems that are equivalent of the diffusion chamber disclosed in the '918 Patent to mix air and oil droplets in my experimental studies described above. In these chambers, I have used baffles and other flow obstructions to reduce turbulence, direct the flow in a certain direction, and improve mixing. See, e.g., Biles, D., Ebadi, A., Allard, M. & White, C.M., *The Design and Validation of a Thermal Boundary Layer Wall Plate*. ASME J. Fluids Eng. 141:121403-1:10 (2019). DOI: 10.1115/1.4043773.

7. I worked as a heating ventilation and air-conditioning (HVAC) contractor during my undergraduate studies and hold a certified HVAC license. In these work activities, I have installed and serviced compressors, fans, blowers, and air handlers. Additionally, to reduce air flow noise in existing air duct systems, I performed retrofit installation of sound dampers and flow obstructions to reduce/prevent flow turbulence.

8. For my Master of Science Research Program at Stony Brook University, I designed and tested a compressed air liquid atomization system to increase the power output of a commercial gas turbine generator. See White C. M., Raghu, S., Giannotti G. & Giannotti H., *Power boost of gas turbines by inlet air cooling*. Proceedings of the 31st Intersociety Energy Conversion Engineering Conference, Washington, DC, USA, (1996), pp. 725-729 vol.2, DOI: 10.1109/IECEC.1996.553787.

9. My prior and visiting research positions include Postdoctoral Research Associate, Stanford University (2001-2003), Senior Member of the Technical Staff, Combustion Research Facility, Sandia National Laboratories (2003-2006), Visiting Scientist, Combustion Research Facility, Sandia National Laboratories (2007), Consultant, Combustion Research Facility, Sandia National Laboratories (2007-2009), and University Visitor (2014 and 2018), University of Melbourne, Australia. The research I performed in all these positions related to the fundamental study of fluid systems.

10. I am currently Professor and Chair of the Department of Mechanical Engineering at the University of New Hampshire in Durham, New Hampshire. My research focuses on fluid mechanics, thermodynamics, energy conversion technologies, turbulence and unsteady flows, complex fluids, multi-phase flows, and drag reduction.

11. I have taught undergraduate and graduate courses in Fluid Mechanics; Thermodynamics; Experimental Measurements and Data Analysis; Systems Modeling, Simulation, and Control; Experimental Fluid Dynamics, Renewable Energy Technologies; and Fluid Turbulence. In my academic instruction, I have used air pumps, air compressors, fans, blowers, atomizers, and flow restriction devices (e.g., venturis and orifices) and provided instruction on the fundamental principles that underlie the kinematics and dynamics of these fluid systems.

12. I have expertise in mechanics, fluid dynamics, thermodynamics, combustion, systems control, and energy conversion technologies.

13. Over the last 20 years, I have authored or co-authored a wide range of book chapters, journal articles, conference papers, and technical reports in the thermal-fluid sciences. I have had two papers designated by the Thomson Reuters Essential Science Indicators (ESI) as a Highly Cited Paper. Highly Cited Papers are those that rank among the top 1% of most cited papers in their subject field. I have published invited research papers and given invited talks on fluid dynamics and fluid engineering systems. A detailed record of my professional qualifications, including a list of publications, awards, and professional activities, is set forth in my curriculum vitae. See EX1003.

II. MATERIALS REVIEWED

14. In reaching the conclusions described in this declaration, I have relied on the documents and materials cited herein as well as those identified in the List of Exhibits set forth in the Petition. These materials comprise patents, related documents, and printed publications. Each of these materials is a type of document that experts in my field would have reasonably relied upon when forming their opinions and would have had access to either through the applicable patent offices and/or well-known libraries, conferences, publications, organizations, and websites in the field as further discussed herein. My opinions are also based upon my education, training, research, knowledge, and personal and professional experience.

III. SUMMARY OF MY OPINIONS

15. The following table lists the ground of rejection I have considered in this declaration:

Ground	Prior Art	Basis	Claims
1	Goubet	Obviousness	1 and 3-8
2	Goubet in view of Kaiser	Obviousness	1 and 3-8
3	Gao-2	Obviousness	1 and 3-8
4	Gao-2 in view Goubet	Obviousness	1 and 3-8

16. After reviewing the '918 Patent and the prior art, it is my opinion that claims 1 and 3-8 are invalid under the proposed grounds. My opinions and the bases therefore are detailed throughout this Declaration.

IV. LEGAL PRINCIPLES

A. Understanding of Patent Law

17. I am not an attorney and will not be offering legal conclusions. I have been informed, however, of several principles concerning legal issues relevant to my analysis of the Challenges to the claims of the '918 Patent, and I relied on these principles to arrive at my conclusions.

18. I understand a claim is anticipated under 35 U.S.C. § 102 if all limitations are found in a single prior art reference, arranged as in the claim. The identical invention must be shown in complete detail as is contained in the patent claim.

19. I understand a prior art reference can disclose an element not expressly identified in a reference if the element is “inherently present” in the reference. To be “inherent,” I understand the missing element must necessarily be present in the reference. An element is not “inherent” if the missing element is only probably present or if there is merely a possibility it is present.

20. I understand a claim is invalid as obvious under 35 U.S.C. § 103 if the differences between the subject matter sought to be patented and the prior art are such that the subject matter of the claim as a whole would have been obvious at the time of the patent’s filing date to a Person of Ordinary Skill in The Art (POSITA). It is my understanding that the following factors are used to determine whether the

claimed subject matter would have been obvious: (i) the scope and content of the prior art; (ii) the differences between the prior art and the claimed invention; (iii) the level of ordinary skill in the field of the invention; and (iv) any relevant objective considerations of non-obviousness.

21. I understand a party asserting obviousness based on a combination of prior art references must demonstrate that one of ordinary skill in the art would have been motivated to combine the teachings of those references to achieve the claimed invention with a reasonable expectation of success. It is my understanding that it is not sufficient to show that one of ordinary skill in the art *could* combine elements of multiple references. Instead, there must be a rational reason that would have prompted a POSITA to combine the elements in the way the claimed invention does; and the reason should be explained or articulated.

22. I understand that a patent claim is obvious when it does no more than combine familiar elements according to known methods to yield predictable results. I understand that when a work is available in one field of endeavor, design incentives and other market forces can prompt variations of it, either in the same field or a different one. If a POSITA can implement a predictable variation, section 103 may bar its patentability. Similarly, if a technique has been used to improve one device, a POSITA would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill.

23. I understand that a POSITA is often able to fit the teaching of multiple patents together like pieces of a puzzle. When there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions, a POSITA has good reason to pursue the known options within his or her technical grasp. If this leads to the anticipated success, it is likely the product not of innovation but of ordinary skill and common sense.

24. I understand that a prior art inventor need not conceive of its invention using the same words as the patentee uses in its later drafted claims.

25. I understand that obviousness may be shown based on a combination of references or based on a single reference. I further understand that prior art is analogous where either: (1) the art is from the same field of endeavor, regardless of the problem addressed; or (2) even if the reference is not within the same field of endeavor, the reference is still reasonably pertinent to the particular problem with which the inventor is involved. A reference is reasonably pertinent even though it may be in a different field from that of the inventor's endeavor if it is one which, because of the matter with which it deals, logically would have commended itself to the inventor's attention in considering this problem. That is, familiar items may have obvious uses beyond their primary purposes.

26. I understand a combination of references would not have been obvious if the alleged modification(s) to be made to the reference(s) are inconsistent with the

stated goals of the reference(s). I understand a combination of references would not have been obvious if the modification of the reference(s) to derive what is claimed would render the reference(s) unsatisfactory or inoperable for their intended purpose. I further understand the party asserting obviousness must explain why a POSITA would have selected components for combination in the manner claimed.

27. It is my further understanding that an invention would not have necessarily been obvious simply because all the elements of the invention may have been known separately in the prior art; there must be a reason to combine the separately known elements. Obviousness cannot be based on a hindsight combination of components selectively picked from the art using the claims as guide.

B. Claim Construction

28. I understand that claim construction in an IPR proceeding is a legal question for the Patent Trial and Appeal Board (PTAB or Board) to decide. In general, I understand that claim terms are to be given their ordinary and customary meaning to a POSITA in the context of the patent at the time the patent was filed.

29. I also understand that in construing claim terms, the Board asks what the claim terms would mean to a person of ordinary skill in the relevant art in view of the plain claim language and the disclosures of the patent and prosecution history. I understand that while the Board may also consider other external evidence, such

as dictionaries, the disclosures in the patent and prosecution history carry more weight than external evidence.

30. As such, any claim term not construed should be given its ordinary and customary meaning as would be understood by one of ordinary skill in the art.

31. I understand that the best source for determining the meaning of a claim is intrinsic evidence—the claims themselves, the written description, and the prosecution history. I also understand that extrinsic evidence, which consists of all evidence external to the patent and prosecution history, may be considered to determine the meaning of a claim term.

32. In view of the principles described above and the materials I have reviewed, I do not believe any limitations in the claims addressed herein require a specific construction to support the opinions I provide in this declaration.

33. I note that Patent Owner has taken certain positions with respect to claim construction in a parallel proceeding in the U.S. District Court for the Southern District of Florida, *Air Essentials, Inc. v. Aroma360, LLC*, No. 24-cv-20594-KMW (S.D. Fla.) (the “Litigation”). Specifically, Patent Owner has taken the following claim construction positions:

Claim Term	Proposal	Relevant Claims
Preambles	Not Limiting	Claims 1, 5
Compressed Air Source	Plain and Ordinary Meaning	Claims 1, 3-8

Claim Term	Proposal	Relevant Claims
	Alternatively: a source of air that is above ambient pressure	
Mixing Chamber	Plain and Ordinary Meaning Alternatively: a region where the operative fluid is combined with the compressed air.	Claims 1, 3-4, 6-8
Diffusion Chamber	Plain and Ordinary Meaning Alternatively: a region that is structured to facilitate the formation of the fluid dispersion prior to discharge.	Claims 1, 3-8

EX1018, Exhibit B.

34. In addition to the positions Patent Owner has taken above, the Parties in the Litigation have agreed to stipulate to the meaning of the four terms below:

Claim Term	Stipulated Construction	Relevant Claims
Fluid Dispersion	“mixture of an operative fluid in air comprising a plurality of substantially uniform droplets (having substantially the same diameter) of the operative fluid dispersed throughout the air”	Claims 1, 3-8

EX1018, Exhibit A.

35. For purposes of this Declaration, I have been asked by Petitioner’s counsel to assume that Patent Owner’s proposed constructions and the Parties’ stipulated constructions apply. If Patent Owner or the Board argues that a different construction applies, then I reserve the right to supplement my opinions in this Declaration to address those constructions.

C. Level of Ordinary Skill in the Art

36. I understand that certain issues in an IPR, such as claim construction and whether a claim is invalid as obvious, are assessed from the view of a hypothetical person of ordinary skill in the relevant art at the time of the invention. I understand there are multiple factors relevant to determining the level of ordinary skill in the art, including: (1) the level of education and experience of persons working in the field at the time of the invention; (2) the sophistication of the technology; (3) the rapidity with which innovations are made; (4) the types of problems encountered in the field; and (5) the prior art solutions to those problems.

37. I understand that a person of ordinary skill in the art is a person of ordinary creativity and not an automaton.

38. To determine the characteristics of a hypothetical POSITA at the time of the claimed invention, I have considered a variety of factors. I have considered the prior art (referred to in the “Materials Considered” section of this declaration) and the various approaches to address fluid dispersion assemblies disclosed in those prior art documents, the types of problems encountered in the art and the solutions to those problems, the alleged problems encountered by the inventor as described in the ’918 Patent, the sophistication of the technology involved, and the educational background and experience of those actively working in the relevant field at the time of the invention.

39. Additionally, I considered the technology available in 2012, immediately before the August 29, 2012, filing of provisional patent application No. 61/694,500 to which I understand Patent Owner contends the '918 Patent may claim the benefit of. *See* EX1001.

40. I also considered the professionals with whom I worked during that time, including their levels of education, sophistication, and activities in professional associations. I am informed that such considerations are in accordance with factors identified in case law and typically considered to determine the level of skill in the art.

41. The field of “art” for the '918 Patent is fluid dispersion assemblies. EX1001, Abstract.

42. In view of the above and based on my experience and knowledge, I believe a hypothetical Person of Ordinary Skill in The Art (POSITA) with regard to the '918 Patent would have either: (1) a bachelor's degree in mechanical engineering, aerospace engineering, chemical engineering, or a closely related field, and at least two years of work experience designing or developing products involving fluid dynamics; or (2) a master's degree in mechanical engineering, aerospace engineering, chemical engineering, or a closely related field, and at least one year of work experience in fluid dynamics or fluid systems engineering.

43. Although I describe the POSITA as of August 2012, it is my further opinion that the fundamental qualifications, attributes, and skills of the person of ordinary skill in the art would have been the same for many years prior to August 2012 and presently remain the same.

44. Based on my education, experience, and background, I believe I qualify as at least a person of ordinary skill in the art.

V. THE '918 PATENT

A. Priority of '918 Patent

45. The '918 Patent was filed on November 17, 2016 as Application No. 15/353,951 (“the '951 Application”). EX1001, INID Codes (21), (22). The '951 Application is a Continuation-In-Part (“CIP”) of Application No. 14/844,650, filed on September 3, 2015 (now Patent No. 9,527,094), which is a continuation of Application No. 13/838,634, filed on March 15, 2013 (now Patent No. 9,126,215), which claims priority to Provisional Application No. 61/694,500 (“the Provisional Application”), filed on August 29, 2012.¹ EX1001, INID Codes (21), (22).

46. While the challenged claims of the '951 and '373 Applications (*i.e.*, the '918 and '449 Patents) rely on new matter that was first introduced in the November

¹ The '094 Patent is subject to a concurrently filed Petition for *inter partes* review along with a Petition seeking review of related Patent No. 10,583,449. The '215 Patent was not asserted in the parallel district court proceeding and is not being challenged at this time.

17, 2016 application, the references relied upon in this Petition, with one exception, are prior art even assuming the claims are entitled to claim priority to August 29, 2012.

47. The one exception that I discuss in greater detail below is Chinese Utility Model Patent 204072864 to Gao (“Gao-2”). EX1042, INID Codes (10), (72). Gao was filed on August 6, 2014 and published at least by January 7, 2015, the date it issued as patent. EX1042, INID Codes (22), (45).

48. Based on my review of the ’918 Patent, its prosecution history, the challenged claims, and the prosecution histories of its parent applications, it is my opinion that the earliest date the challenged claims find support is in the specification filed on November 17, 2016. In particular, all challenged claims recite an “upper chamber” and a “lower chamber.” See EX1001, 12:3, 25-27, 39-40.² The specification of the ’918 Patent is substantively identical to that of the earlier-issued ’094 Patent, but for the addition of a new figure—Figure 6—and additional, new corresponding written description. See EX1001, Fig. 6, 2:65-67, 7:58, 11:28. Figure 6 of the ’918 Patent, reproduced below, depicts a new embodiment not disclosed in any of the earlier filings. As noted above, the specification explains that Figure 6 “is illustrative of an alternative embodiment of a diffusion unit 100 having a modified

² The challenged claims also recite “an atomizer exhaust aperture,” which is likewise a limitation that only finds support in the November 17, 2016 filing.

diffusion chamber” and “in particular, the modified diffusion chamber 112” is configured to suppress and/or dampen sound waves generated during operation . . . without the need for a separate suppression chamber, as in previously disclosed embodiments.” *Id.*, 10:46-56, 10:57-59.

49. More specifically, “the modified diffusion chamber 112” comprises a lower chamber 114” which is disposed below and adjacent to the discharge of a fluid dispersion through the atomizer exhaust aperture 228”” and “an upper chamber 115” . . . disposed above the diffusion assembly 200 . . . substantially opposite to the direction of flow of a fluid dispersion from atomizer exhaust aperture 228”.” *Id.*, 10:59-67. According to the ’918 patent, “[m]ore importantly, the fluid dispersion discharged from the atomizer assembly 220 through atomizer exhaust aperture 228” into diffusion chamber 112” is interrupted and redirected by virtue of lower chamber 114” and upper chamber 115”.” *Id.*, 11:1-5. This feature is designed to suppress sound waves generated in the fluid dispersion assembly. *Id.*, 11:5-10.) The specification further teaches that the compressed air flowpath through the atomizer assembly 200 of Figure 6 “extends horizontally through the . . . atomizer air inlet channel 222 . . . and out through the atomizer exhaust aperture 228”.” *Id.*, 10:17-24.

50. The specification further explains that “[a]fter being discharged from the mixing chamber 226 through the atomizer exhaust aperture, 228”, the fluid dispersion is at least partially deflected into the freeboard above the liquid in the

fluid container.” *Id.*, 11:15-18. Further, “[a] portion of the fluid dispersion is also deflected against the bottom surface of the lower chamber 114” of the modified diffusion chamber 112” and upwardly into the upper chamber 115” of the modified diffusion chamber 112” before being discharged through discharge port 132 into the airspace surrounding the fluid dispersion assembly 10.” *Id.*, 11:22-28.

51. It is my understanding that the difference between a continuation application and a continuation-in-part application is that a continuation contains the same disclosure found in an earlier application, whereas a continuation-in-part contains a portion or all of the disclosure of an earlier application together with added matter that was not present in the earlier application. I also understand that a CIP generally adds new matter on which at least one claim relies for support. I therefore understand that a patent application is entitled to the benefit of the filing date of an earlier filed application only if the disclosure of the earlier application provides support for the claims of the later application. Accordingly, I understand that different claims of a CIP application may receive different effective filing dates and subject matter that arises for the first time in a CIP application does not receive the benefit of the filing date of the parent application.

52. Based on my review of the challenged claims and various prosecution histories, it is clear that the challenged claims all rely on new matter for support, and

are, thus, are only entitled to the benefit of the filing date of the application that provided support for such claims, which is the November 17, 2016 filing. *Compare* EX1004 (disclosing new matter on which all challenged claims rely for support), *with* EX1043 (prosecution history of the '650 application, which fails to provide support for the full scope of the challenged claims, including the “upper chamber,” “lower chamber,” and “atomizer exhaust aperture;” the '918 Patent is a CIP of the '650 application), EX1005 (prosecution history of the '634 application, which fails to provide support for the full scope of the challenged claims, including the “upper chamber,” “lower chamber,” and “atomizer exhaust aperture;” the '094 Patent is a continuation of the '634 application), and EX1006 (prosecution history of the Provisional Application, which fails to provide support for the full scope of the challenged claims, including the “upper chamber,” “lower chamber,” and “atomizer exhaust aperture”). Thus, it is my opinion that the earliest priority date afforded the challenged claims is November 17, 2016.

B. Summary of the '918 Patent Prosecution History

53. The chain of filings of the '918 Patent are discussed above. In addition, I note that a single office action was issued during prosecution of the '918 Patent. EX1004, pg. 52. The Examiner rejected all independent claims in that office action on the ground of non-statutory double patenting over each of the priority patents, including the '094 and '918 Patents. *Id.*, 53-58. The Examiner also found that

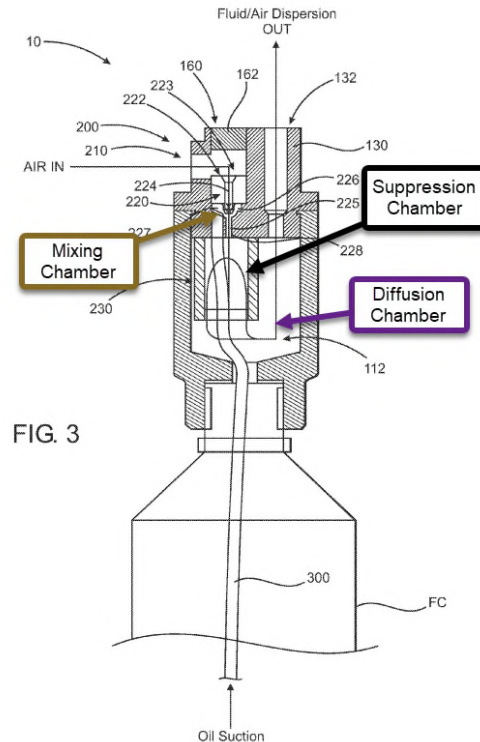
dependent claims 2, 7, and 12 contained allowable subject matter if rewritten in independent form including all of the limitations of the base claim and any intervening claims. *Id.*

54. In response, Patent Owner filed Terminal Disclaimers with respect to the priority patents and incorporated the allowable subject matter into independent claims. *Id.*, pgs. 29-37, 41-43. A Notice of Allowance was then mailed and the '918 Patent ultimately issued on October 9, 2018. *Id.*, pgs. 1, 20-23.

C. Summary of the '918 Patent

55. The '918 Patent describes several embodiments of the fluid dispersion assembly, each with distinct configurations designed to disrupt the flow of fluid dispersion and, as a result, reduce noise generated during operation. EX1001. In a first embodiment, as annotated in FIG. 3, the fluid dispersion assembly includes “a suppression chamber.” *Id.*, 6:8-10. “[T]he suppression chamber 232 receives the fluid dispersion from the mixing chamber 226 ... [and] helps to suppress the noise generated during operation of the fluid dispersion assembly 10 as it *disrupts the path of flow of the fluid dispersion* out of atomizer assembly 200 and into diffusion

chamber 112, and therefore, *disrupts and dampens sound waves associated therewith.*” (emphasis added)³. *Id.*, 6:11-18.

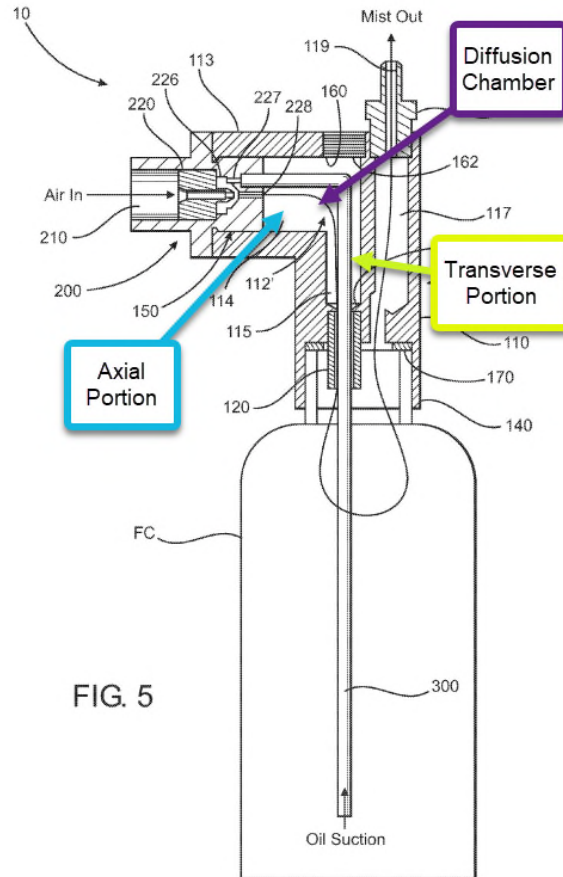


EX1001, FIG. 3

56. In a second and alternative embodiment, shown below in FIG. 5, fluid dispersion assembly 10 has a “modified diffusion chamber 112” that is structured in an “upside down L-shaped configuration” defining an “axial portion 114” and a “transverse portion 115.” *Id.*, 7:10-21. “[F]luid dispersion discharged ... into diffusion chamber 112’ is interrupted and redirected by virtue of axial portion 114 and transverse portion 115 ... [and] *serves to suppress or dampen sound waves*

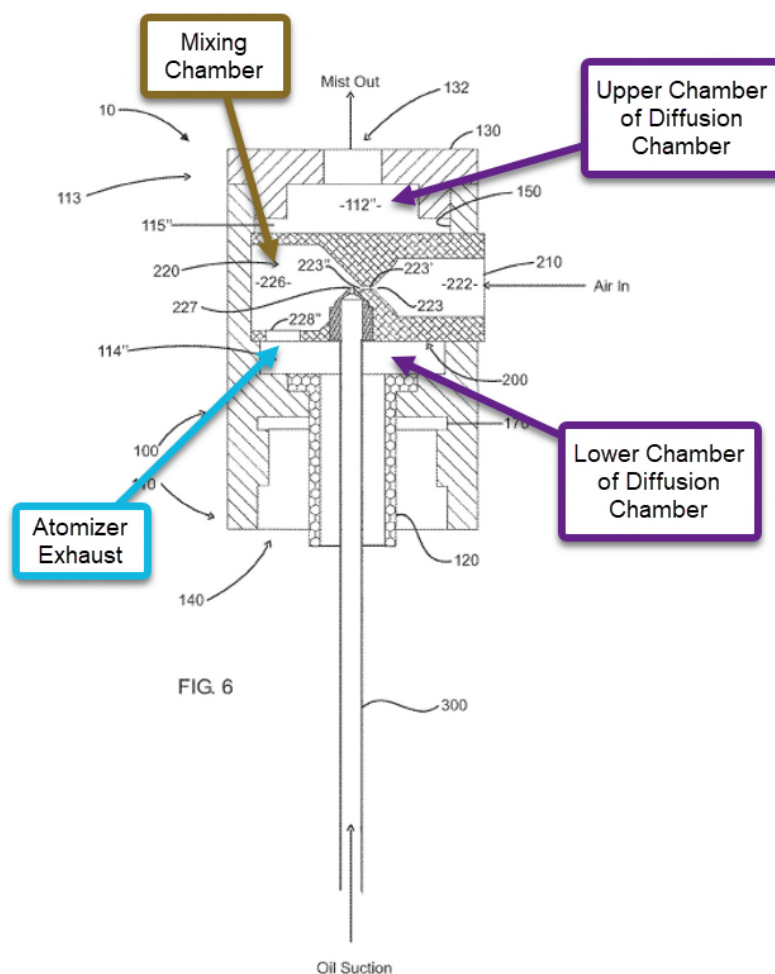
³ All emphasis is mine unless otherwise noted.

generated therein, in a similar manner as the suppression chamber 232 of the previously disclosed embodiments.” *Id.*, 7:33-42.



EX1001, FIG. 5

57. In a third alternative embodiment, diffusion unit 100 has another “modified diffusion chamber 112.” *Id.*, 10:46-48. “[T]he modified diffusion chamber 112 of the embodiment of FIG. 6 serves to suppress and/or dampen sound waves generated during operation . . . without the need for a separate suppression chamber, as in previously disclosed embodiments.” *Id.*, 10:52-56.



EX1001, FIG. 6

58. As depicted, “the modified diffusion chamber 112” comprises a lower chamber 114” which is disposed below and adjacent to the discharge of a fluid dispersion through the atomizer exhaust aperture 228”” and “an upper chamber 115” . . . disposed above the diffusion assembly 200 . . . substantially opposite to the direction of flow of a fluid dispersion from atomizer exhaust aperture 228”.” *Id.*, 10:59-64. The ’918 Patent recites, “[m]ore importantly, the fluid dispersion

discharged from the atomizer assembly 220 through atomizer exhaust aperture 228" into [modified] diffusion chamber 112" *is interrupted and redirected by virtue of lower chamber 114" and upper chamber 115".*" *Id.*, 11:1-5. This feature is designed to suppress sound waves generated in the fluid dispersion assembly. *Id.*, 11:5-14.

59. According to the '918 Patent, each of the three alternative embodiments discussed above reduce noise during operation by disrupting the flow of fluid dispersion through the fluid dispersion assembly. EX1001.

60. It is thus my opinion that a POSITA would thus understand that the '918 Patent teaches that the noise reduction (*e.g.*, dampening of sound waves) is a byproduct of disrupting the flow of fluid dispersion.

VI. OVERVIEW OF THE STATE OF THE ART

61. Before providing a detailed analysis of how the prior art discloses or teaches the limitations of the challenged claims, I provide a brief summary of the state of the art and the individual prior art references. As summarized below, the subject matter described in the '918 Patent was well-known in the scientific literature at the time of the alleged invention.

A. Summary of State of the Art and Knowledge of POSITA

1. Fluid Dispersion Assemblies

62. Fluid dispersion in general and in the context of the '918 Patent refers to the mixing of at least two fluids, which takes place when one fluid displaces

another. Fluid dispersion may be caused by molecular diffusion or by macroscale mixing due to random and chaotic time dependent motions of the bulk flow.

63. In general, a dispersion is a mixture where one substance (the dispersed phase) is distributed as small particles, bubbles, or droplets throughout another substance (the continuous phase). *See, e.g.,* EX1020 at 110 (“dispersion”). A suspension is a mixture of solid particles or liquid droplets suspended in a fluid, a subset of a dispersion. *See, e.g., id.* at 368 (“suspension”). Sufficiently large particles will sediment out of the suspension under the influence of gravity. *See, e.g., id.* Small colloidal particles will remain suspended for long times. An aerosol is a dispersion of droplets or particles colloidal in size dispersed within a gas. *See, e.g., id.* at 7 (“aerosol”).

64. A homogenous suspension exists when solid particles or liquid droplets are distributed uniformly within the continuous phase. *See, e.g., id.* at 240 (“mixture”). What this means is that any sample taken from this system is fully representative of the suspension. *See generally, e.g.,* EX1038. In principle, a homogenous suspension exists only for small uniform particle or droplet size. *See generally, e.g., id.* For polydisperse non-Brownian particles, differences in sedimentation and inertia cause particle size segregation, leading to a non-uniform distribution. *See generally, e.g., id.* Similarly, for Brownian particles, variations in

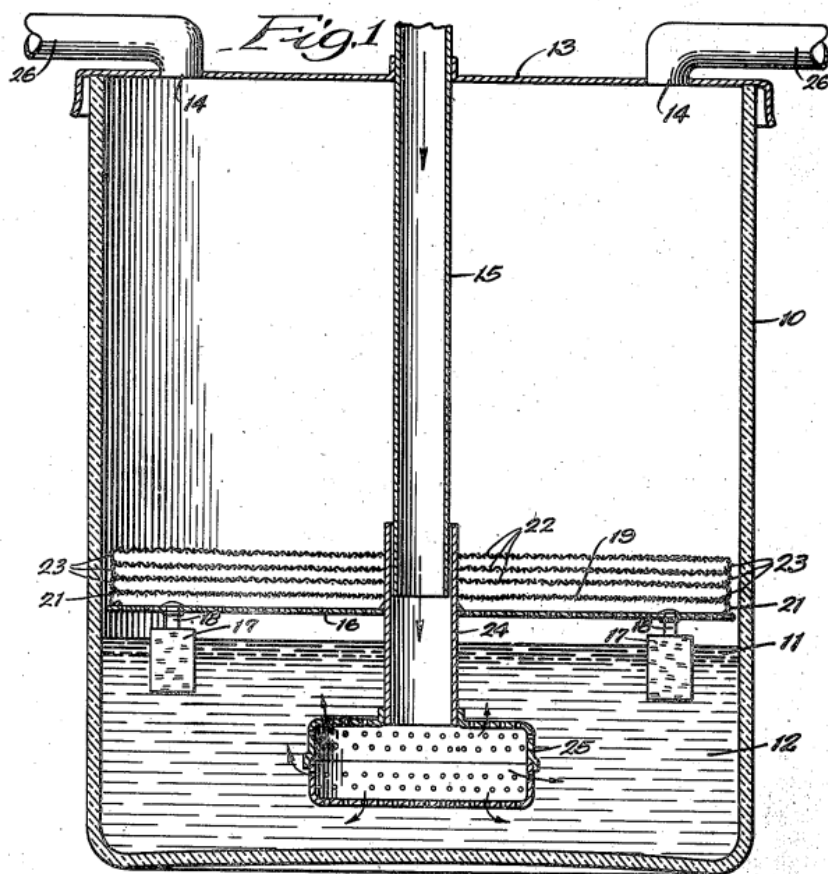
diffusion due to Brownian motion result in size segregation and a non-uniform distribution. *See generally, e.g., id.*

65. Fluid dispersion assemblies have been used for decades, if not longer, to disperse deodorizing fluids, such as fragrant oils, essential oils, and the like, into a generally enclosed airspace. *See, e.g.,* EX1021. For example, Dupuy, filed on March 29, 1944, teaches an apparatus to treat air by adding water and other volatile liquid vapors into the surrounding airspace for humidification, deodorization, sterilization, medication and the like. EX1021, 1:1-5. Dupuy discloses a fluid dispersion assembly that is interconnected to a container of a body of liquid and an air source, such as a blower or pump. Figure 1 of Dupuy illustrates the air treating apparatus with air being added through air inlet pipe 15.

Aug. 6, 1946.

C. F. J. DUPUY
AIR TREATING APPARATUS
Filed March 29, 1944

2,405,494



EX1021, Fig. 1

66. A 2004 publication by Joseph Kaye explains that, “[f]undamentally, there are only a few methods to get scent into the air from a source.” EX1022, 53. “To produce the greatest amount of scent diffused in the shortest period of time, one method is to spray the actual liquid scent into the air, in a manner similar to that of an airbrush, using a supply of compressed air to provide the impetus.” *Id.*, 54. Kaye explains that such an approach was already “in use in prototypes built by British Telecom, and was used in the inStink project at the MIT Media Lab.” *Id.* Such a

device using a source of compressed air “is easy to build”. *Id.* Kaye identifies several other technologies for emitting a scent, and further explains that “[w]hen scenting larger spaces, it can be useful to incorporate a scent output device based on one of the foregoing [technologies] into the air conditioning or ventilation system of the space to be scented.”

67. In short, fluid dispersion assemblies have long been known and used to scent the air in enclosed spaces, and such assemblies have long been powered by compressed air.

2. Dampening Sound Waves in Fluid Dispersion Assemblies

68. Although the challenged claims do not recite any explicit sound dampening features, because the '918 Patent emphasizes the need for a fluid dispersion assembly that minimizing the noise associated therewith, I briefly discuss the knowledge of a POSITA at the time of the invention as it relates to sound dampening in fluid dispersion assemblies. Dampening sound waves has long been a common consideration in air dispersion and diffusion assemblies. *See, e.g.*, EX1023. Air dispersion and diffusion assemblies patented as early as the 1950's contemplate novel ways “to provide an improve air outlet device [or diffuser] which is constructed and arranged in such a manner as to minimize the generation of objectionable noises upon the discharge of the air therethrough.” *See, e.g.*, EX1023, 1:20-29 (explaining that it is desirable to provide diffusion devices with “means by

which the noise conditions are materially reduced and to an extent where the noise is relatively negligible”). Inventors in the field of air diffusion and dispersion assemblies explored concerns of “noise and vibration due to air impact” and sought to address the problem by using structural components selected specifically to minimize noise. *See, e.g., id.*, 2:5-9.

69. A common solution for dampening sound waves is through the use of a baffle. One solution patented in 1958 was a “baffle or deflecting wall” intended to limit “the turbulence of the air stream and materially reduce[] the noise level of the device.” *Id.*, 3:3-5. “By the employment of a perforated semi-circular wall or baffle, a substantially similar channeling action is attained for the air flow as would be secured by an imperforate plate, but by the use of a perforated wall or baffle, the sound waves are permitted to pass through such wall or baffle and become absorbed by the sound absorbing material located behind the baffle.” *Id.*, 3:5-12.

70. Additionally, another patented technology of the 1990’s introduces “[a] noise reducing diffuser which reduces the sound energy created by a pressurized gas while it is being expelled through a nozzle.” EX1024, Abstract. Awad’s “diffuser consists of an elongated enclosure with openings at each end that is attached to the output of the gas nozzle. The dimensions of the enclosure, particularly its distance from the sound source, effective diameter and length, are chosen to specifically eliminate audible noise created by the escaping gas by conversion of a portion of the

longitudinal component of the sound energy to an increased radial component that can be dissipated by repeated contact with the wall of the elongated enclosure.” *Id.*

71. Further, “[p]revious systems have employed techniques such as mufflers, where baffles extend into the path of the sound waves, in an effort to reduce noise.” *Id.*, 1:31-33. “Upon contact with the baffles, the sound waves lose some of their energy, which the baffles dissipate through vibrating.” *Id.*, 1:333-35.

72. In addition, it was long known that an “orifice baffle plate”, containing one or more orifices, creates a pressure drop, redirects flow, conditions flow, suppresses upstream turbulence, enhances local mixing, and suppresses downstream turbulence. *See generally, e.g.*, EX1025.

73. A POSITA at the time of the invention of the ’918 Patent would also be familiar with the concept of flow noise, defined as sound generated aerodynamically, which is a by-product of an airflow and distinct from sound produced by the vibration of solids. A generalized theory of flow noise was derived in 1952. *See generally* EX1026. This theory published by Lighthill in Exhibit 1026, states that “[p]hysically, the mechanism of conversion of energy from kinetic to acoustic is based on the fluctuations in the flow of momentum across fixed surfaces.” EX1026, Abstract. A POSITA would know that flow noise depends on flow turbulence, where turbulence can be colloquially characterized by flow irregularity or randomness producing three-dimensional velocity fluctuations, stresses, and

forces. A POSITA would understand that strategies that reduce flow turbulence also reduce flow noise.

74. A POSITA would be aware of strategies used to control flow noise: “The noise generated by air/gas handling/consuming equipment, such as fans, blowers, and internal combustion engines, is controlled through the use of two types of devices: (1) passive silencers and lined ducts whose performance is a function of the geometric and sound-absorbing properties of the their components and (2) active noise control silencers whose noise cancellation features are controlled by various electromechanical feed-forward and feedback techniques.” EX1027, 279-280.

75. The silencer assembly described in the '918 Patent serves as a combination reactive and dissipative silencer that contains elements of an expansion chamber muffler and perforated muffler and reduces flow generated noise using flow resistance as described in the Noise Control Book. *See, e.g.*, EX1027, 286 (“These silencers reduce the radiated acoustical power primarily through impedance mismatch, that is, through the use of acoustical impedance discontinuities to reflect sound back toward the source. In essence, the more pronounced the discontinuities, the higher the amount of reflected power. Acoustical impedance discontinuities are commonly achieved through (a) sudden cross-sectional changes (i.e., expansions or contractions), (b) wall properties changes (i.e., transition from a rigid-wall pipe to an equal diameter absorbing wall pipe), or (c) any combination thereof.”).

76. A POSITA would know that acoustical impedance discontinuities and flow resistance can be achieved by a tortuous flow path using flow obstructions such as baffles, perforated plates, or honeycomb-like structures. Flow obstructions in the '918 Patent and asserted prior art references constitute perforated-element mufflers as described in the Noise Handbook. EX1027, 301.

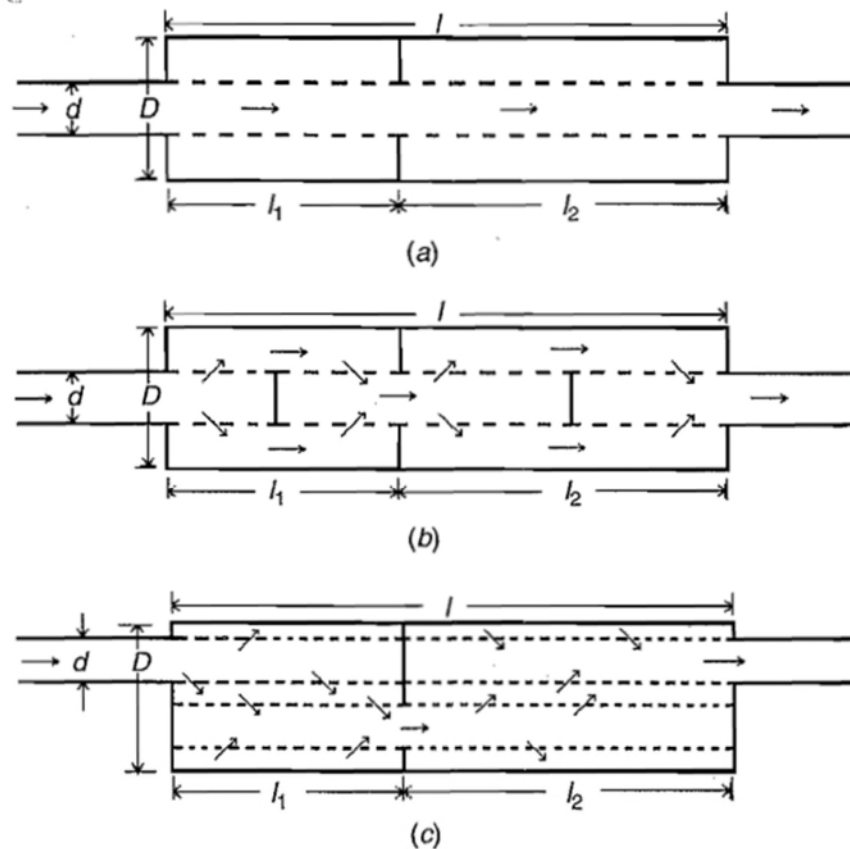


FIGURE 9.11 Schematic of the two-chamber configurations of three types of perforated-tube mufflers: (a) Concentric-tube resonator; (b) plug muffler; (c) three-duct cross-flow muffler.

EX1027, Figure 9.11

77. A POSITA would know that flow obstructions such as baffles, perforated plates, or honeycomb-like structures will reflect most and absorb some of

the source-generated sound. Further, a POSITA would know that flow obstructions cause flow restrictions (*i.e.*, a pressure drop) that reduces turbulence and flow-generated noise.

78. A POSITA would also know that by splitting a passage or chamber into smaller section with reduced width, “low frequency performance may be significantly improved.” EX1037, 115.

79. The foregoing designs and teachings of the 1950’s – 1990’s added advantages to air dispersion assemblies and would have been well known to those of skill in the art at the time of the invention of the ’918 Patent.

3. Uniform Droplets in Fluid Dispersion

80. It has long been known in the field of fluid dispersion that there are advantages to producing small and substantially uniform droplets in various fluid dispersion applications. For example, it is advantageous to have small and substantially uniform droplets in fluid dispersion assemblies used to deodorize an enclosed area because, all else being equal, uniform dispersion of aroma is a function of droplet uniformity.

81. More specifically, it is advantageous to have small and uniform droplets after discharge from a fluid dispersion assembly into the surrounding airspace because small droplets will follow the air flow in the room and spread more quickly and uniformly. In addition, uniform droplets will evaporate at the same rate after

discharge. Thus, when the droplets are small and uniform, they provide a more evenly distributed and more quickly dispersed odor.

82. In the context of the '918 Patent, "fluid dispersion" is defined to "mean a mixture of an operative fluid in air comprising a plurality of substantially uniform droplets of the operative fluid dispersed throughout the air." EX1001, 3:18-22. Further, the '918 Patent defines "substantially uniform droplets" as "droplets having substantially the same diameter. In at least one embodiment, the plurality of 'substantially uniform droplets' each have a diameter in the range of about one micron (1 μm), in another embodiment, the diameter of the droplets is in the range of about three microns (3 μm), and, in one further embodiment, droplet diameter is in the range of about five microns (5 μm)." EX1001, 3:24-31; *see also id.*, 12:4-7.

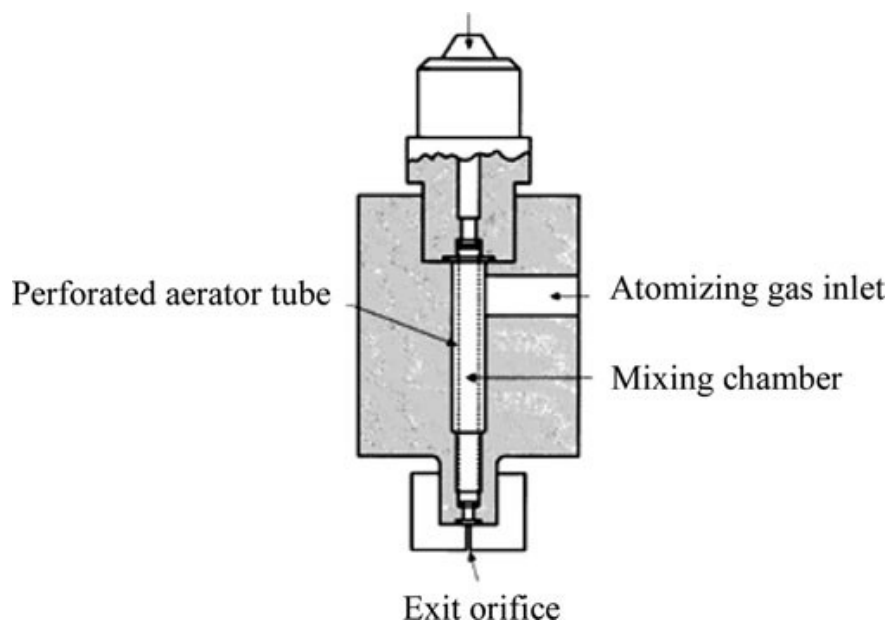
83. "[T]he instability and breakup of liquid jets into drops," as is generally discussed and claimed in the '918 Patent, "has been a subject of interest since the early nineteen century and has continued to this date." EX1028, 3-4.

84. The Handbook of Exhibit 1028 provides sufficient information such that a POSITA would know how to design a diffusion chamber to facilitate the formation of a plurality of substantially uniform droplets, as defined in the '918 Patent. For example, the Handbook describes a twin-fluid nozzle: "In these nozzles a high velocity gas stream is brought in contact with a liquid stream." EX1028, 500. The Handbook further describes that some twin-fluid nozzles use the venturi effect:

“The siphon principle is also used in some twin-fluid atomizing nozzles where the liquid source is self-aspirating.” *Id.*, 500.

85. The Handbook describes that “gas and liquid can be brought in contact either within the nozzle (internal mix) or outside of the nozzle (external mix). In addition, nozzles can be categorized based on the flow rate of the atomizing gas and the way the gas is brought in contact with the liquid.” *Id.*, 501.

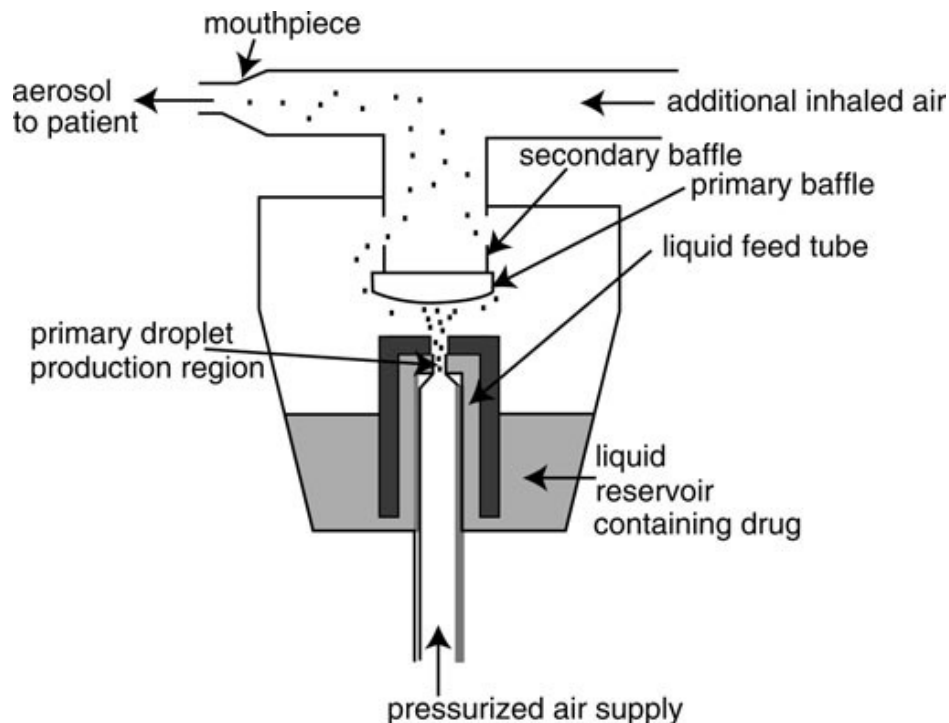
86. The Handbook describes that some twin-fluid nozzles use a mixing chamber: “A typical effervescent atomizer [a twin-fluid nozzle type] is shown in Fig. 24.21. It consists of liquid and gas supply ports, a mixing chamber where the gas is bubbled into the liquid stream and an exit orifice.” *Id.*, 515.



EX1028, Fig. 24.21 Schematic design of a typical effervescent atomizer

87. The Handbook also describes that baffles strategically placed within the diffusion chamber (See Fig. 41.3 below) can be used with twin-fluid nozzles to (a)

produce smaller droplets, (b) restrict movement of the fluid dispersion, (c) filter out large droplets from the fluid dispersion: “In a typical design, a converging nozzle accelerates the air to high speed. This air then flows across water in the primary droplet production region, which induces viscosity-induced instabilities at the air–water interface whose subsequent nonlinear growth leads to primary production of droplets [3]. These droplets are too large for inhalation into the lungs. Instead, they are entrained in the high speed airflow downstream of the nozzle and impact on a primary baffle, from which splashing occurs, resulting in the production of droplets with smaller sizes. Secondary baffles obstruct the flow on its way to the mouthpiece and cause further size reduction by inertial impaction of droplets which then return to the reservoir for subsequent reaerosolization.” EX1028, 903.



EX1028, Fig. 41.3 (Schematic of jet nebulizer)

88. A POSITA would know that droplet separation methods, like that disclosed in the '918 Patent and the asserted prior art references, for removing large diameter liquid droplets of the operative fluid from the air stream have long been used in industrial, manufacturing, environmental, and healthcare applications. *See, generally, e.g.,* EX1029 (“The Perry Handbook”).

89. The Perry Handbook describes droplet separation mechanisms relevant to the '918 Patent and asserted prior art references, including gravity settling and inertial impaction. *See* EX1029, 14-84. The latter “employs direct impact and inertial forces between particles, the gas streamlines, and target bodies to provide capture.” *Id.*

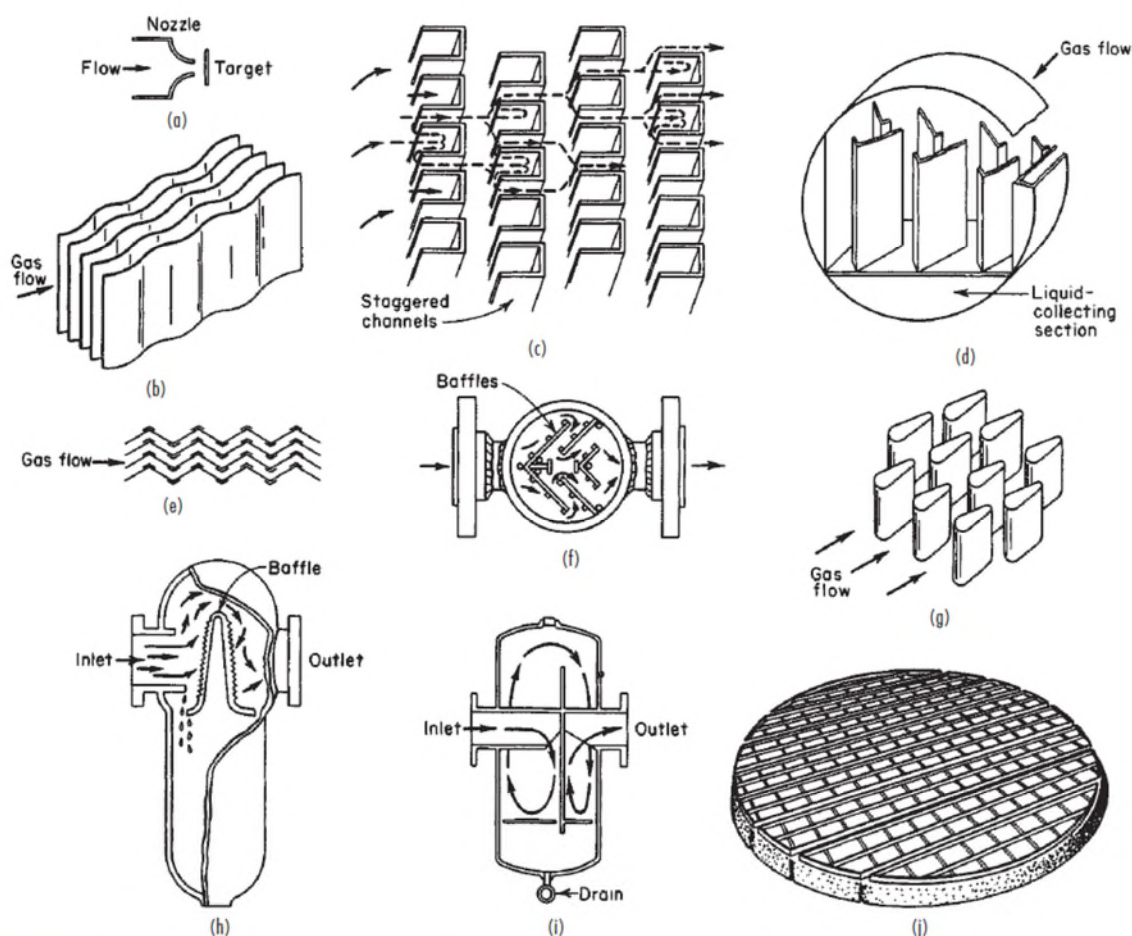


FIG. 14-110 Typical impingement separators. (a) Jet impactor. (b) Wave plate. (c) Staggered channels. (Blaw-Knox Food & Chemical Equipment, Inc.) (d) Vane-type mist extractor. (Maloney-Crawford Tank and Mfg. Co.) (e) Peerless line separator. (Peerless Mfg. Co.) (f) Strong separator. (Strong Carlisle and Hammond.) (g) Karbate line separator. (Union Carbide Corporation) (h) Type E horizontal separator. (Wright-Austin Co.) (i) PL separator. (Ingersoll Rand.) (j) Wire-mesh demister. (Otto H. York Co.)

EX1029, FIG. 14-110

90. The Perry Handbook states that, “[p]article collection as a function of size may be estimated by using the target-efficiency correlation in Fig. 17-39 [below]. Since target efficiency will be low for systems with separation numbers below 5 to 10 (small particles, low gas velocities), the mist will frequently be subjected to a number of targets in series as in Fig. 14-110c, d, and g.” EX1029, 14-

84. $D_{p,th}$ is the droplet diameter with a 50% collection efficiency and a function of separator size, gas velocity, viscosity, and droplet density. *Id.*

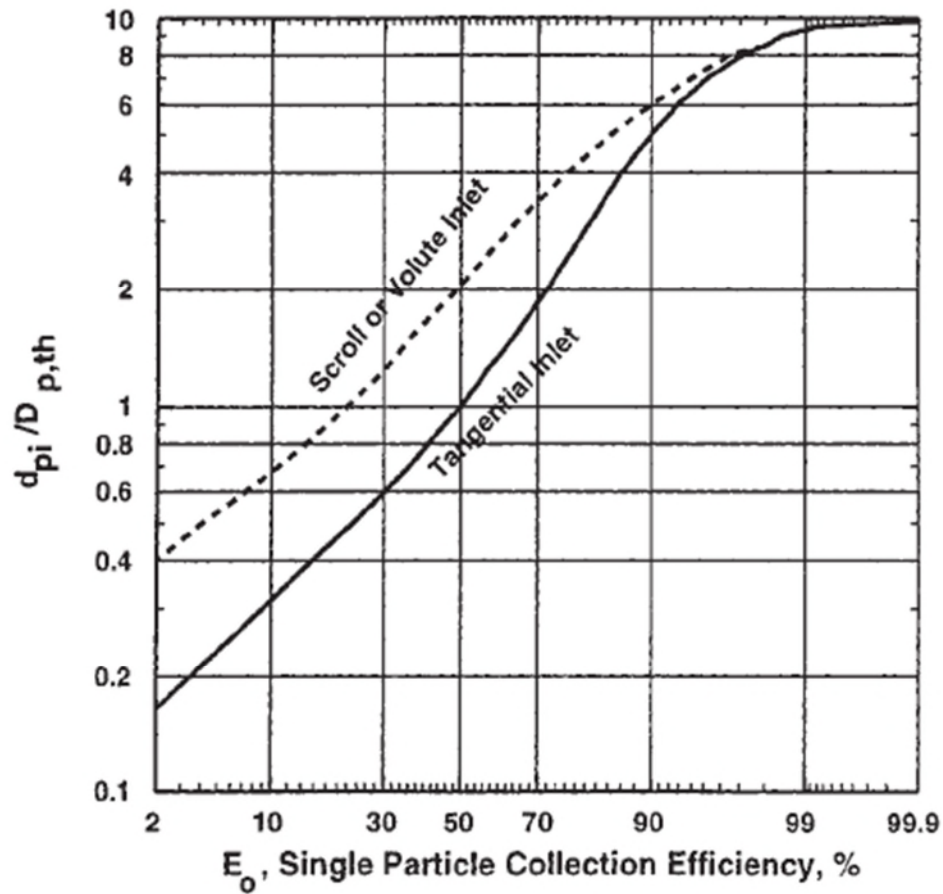


FIG. 17-39 Single particle collection efficiency curve. (Courtesy of PSRI, Chicago.)

EX1029, FIG. 17-39

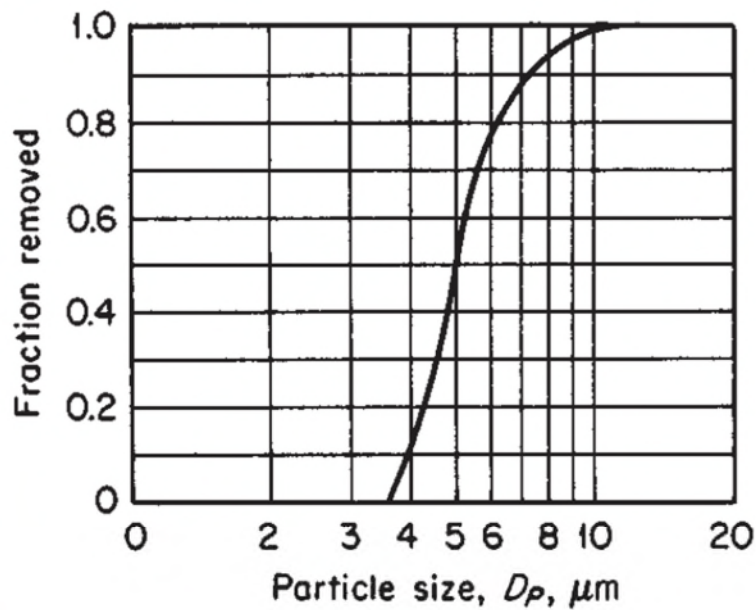


FIG. 14-114 Collection efficiency of Karbate line separator, based on particles with a specific gravity of 1.0 suspended in atmospheric air with a pressure drop of 2.5 cm water gauge. (*Union Carbide Corporation Cat. Sec. S-6900, 1960.*)

EX1029, FIG. 14-114

91. A POSITA would also know that, relevant to inertial impaction separation processes, droplet impact on a solid surface results in either the formation of a liquid film on the solid surface or, for more energetic impacts, droplet breakup and the formation of smaller secondary droplets. *See generally, e.g.,* EX1030, Fig. 8

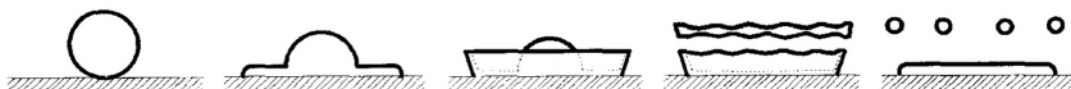


Figure 8. Schematic view of the splashing process.

EX1030, Fig. 8

92. In addition, a POSITA would know the control parameters governing the relative velocity between an atomized droplet and airflow. *See generally* EX1033. A POSITA would also know that droplet diameters less than 5 μm would follow the air flow in the room, i.e., the relative velocity (drift velocity) between an atomized droplet and the air flow is approximately zero. *See, e.g.,* EX1034, Fig. 3.

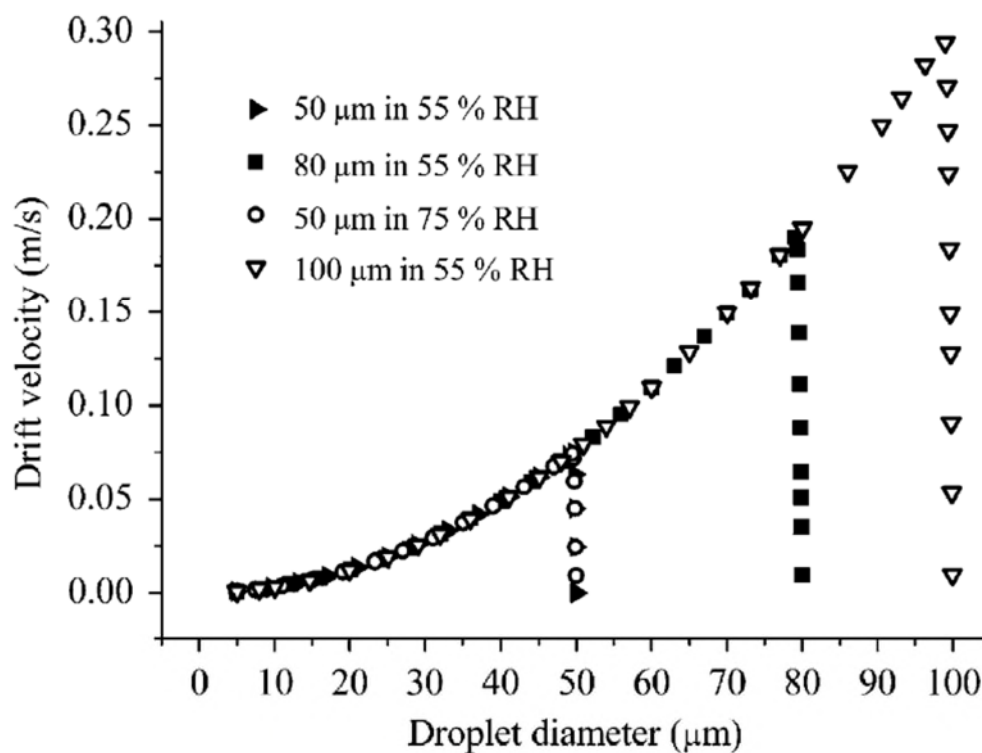


Fig. 3. Droplets drift velocity changes as the droplet diameter reduces from their different initial diameters in the 55% and 75% relative humidity (RH) air.

EX1034, Fig. 3

93. A POSITA would understand that smaller droplets will follow the air flow in the room and thus spread throughout the environment of a room more

quickly. For example, Figure 4 of Exhibit 1034 shows smaller droplets without drift velocity (aerosol particles) are more uniformly distributed in the room relative to larger droplets.

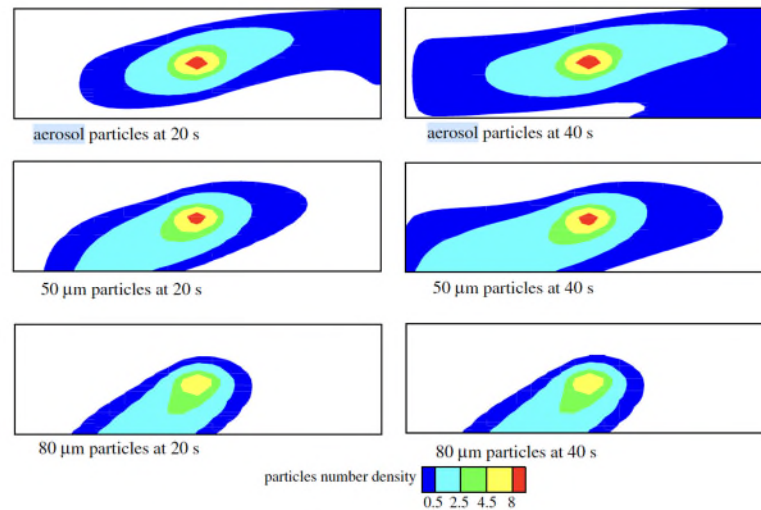


Fig. 4. Distribution of solid particles in the central X plane of the test room at 20 and 40 s after the particles are released at the room center. For top figures, "aerosol particles" refer to those neutral particles without gravitational settling.

EX1034, Fig. 4

94. Moreover, it has long been known that the evaporation rate of droplets depends on several factors including the size (*e.g.*, surface area) of the droplet. *See, e.g.*, EX1035, EX1036. A POSITA would know that the droplet evaporated mass rate is a quadratic function of the droplet diameter: $\frac{\partial m}{\partial t} = a_1 + a_2 d + a_3 d^2$

95. Where m is droplet mass, t is time, d is the droplet diameter and coefficients a_1 , a_2 , and a_3 depend on vapor pressure of material and local concentration.

96. Thus, a POSITA would understand that a “better atomization” in the context of the ’918 Patent means a smaller and more uniform droplet, resulting in droplets spreading more quickly throughout the room and evaporating at a uniform rate. A POSITA would also understand that spreading droplets more quickly and evenly throughout a room and allowing them to evaporate into vapor more quickly and at the same rate will result in a more consistent and evenly spread scent in the surrounding area.

97. In addition to the foregoing publications, there are numerous prior art references that disclose the use and creation of small and substantially uniform droplets in fluid dispersion assemblies.

98. As another example, Sevy discloses “[a]n atomizer provides a control of duty cycle or a motor driving a diaphragm pump. By providing precise, high-speed flow through an eductor nozzle, improved atomization occurs.” EX1009, Abstract. Sevy teaches an atomizer that “provides a better atomization or a smaller mean or average size of droplet in the distribution of atomized droplets compared with prior art devices capable of atomizing.” EX1009, ¶ [0009]. Sevy’s atomizer uses a separator that “separates the droplets by size, the smaller droplets moving with the air, and the larger ones drifting out or agglomerating at walls and other obstructions. . . . Comparatively smaller droplets are passed from the atomizer out through the separator chamber and associated obstructions with the flow of air. The

method simultaneously limits net outflow of the liquid and decreases mean droplet size.” EX1009, ¶¶ [0014]-[0015].

99. As another example, Goubet discloses a “specific arrangement [for a] diffuser [that] enables the size of the oil microdroplets diffused into the ambient air to be reduced to a minimum.”⁴ EX1015 and EX1016, 2:4-6. “As a result, the oil mist diffused at the outlet of the diffuser is not harsh.” EX1016, 2:6. “Furthermore, due to the fineness of the microdroplets, this mist is non-flammable.” EX1016, 2:7. “The diffusion is controlled, gentle, and particularly quiet.” EX1016, 2:8. Goubet’s diffuser “may operate within a compressed air pressure range of 0.05 bar to 0.5 bar.” EX1016, 2:13-14. “In particular, very low-pressure operation 15 significantly reduces the noise of the diffusion. . . . Thus, due to the particular circular shape and the specific arrangement of the inlet, passage, and outlet of the two enclosures, the droplets follow a very particular path, allowing their size to be reduced as much as possible and subsequently controlling their diffusion into the ambient air.” EX1016, 2:14-29. “[T]his reduction in droplet size enables a non-harsh, highly atomized oil mist or vapour to be silently diffused.” EX1016, 2:29-30.

100. As another example, Rajala discloses a “device and a method for producing nanoparticles, in which method starting materials for nanoparticles are

⁴ All citations to Goubet herein are to the certified translation, EX1016, unless otherwise noted.

mixed at least as liquid droplets and optionally also as gases and/or vapours with at least combustion gases in a premixing chamber and the mixture is separated for liquid drops larger than size d , whereafter the mixture is conducted to at least one burner, in which the combustion gases are ignited such that a heavily mixing flame is generated, in which the starting materials react and optional solvents evaporate and generate through nucleation and/or sintering and/or agglomeration particles having a diameter of 1 to 1000 micrometres.” EX1007, Abstract. Rajala explicitly teaches “[r]elatively narrow size distribution (mono-dispersity), anti-agglomeration and homogeneity are required of the nanoparticles” in various applications. *Id.*, ¶ [0002].

101. As another example, Dorendorf (US 2009/0025794), which was also cited during prosecution of the ’215 Patent, was published on January 29, 2009, and thus is prior art to the ’918 Patent under 35 U.S.C. §102(b). EX1008. Dorendorf is directed to an ultra-low volume fluid delivery system and discloses “before the air travels to nozzle 15, the air can travel through a system of baffles 44 for additional noise dampening.” EX1008, ¶ [0001] and FIG. 6 (reproduced below).

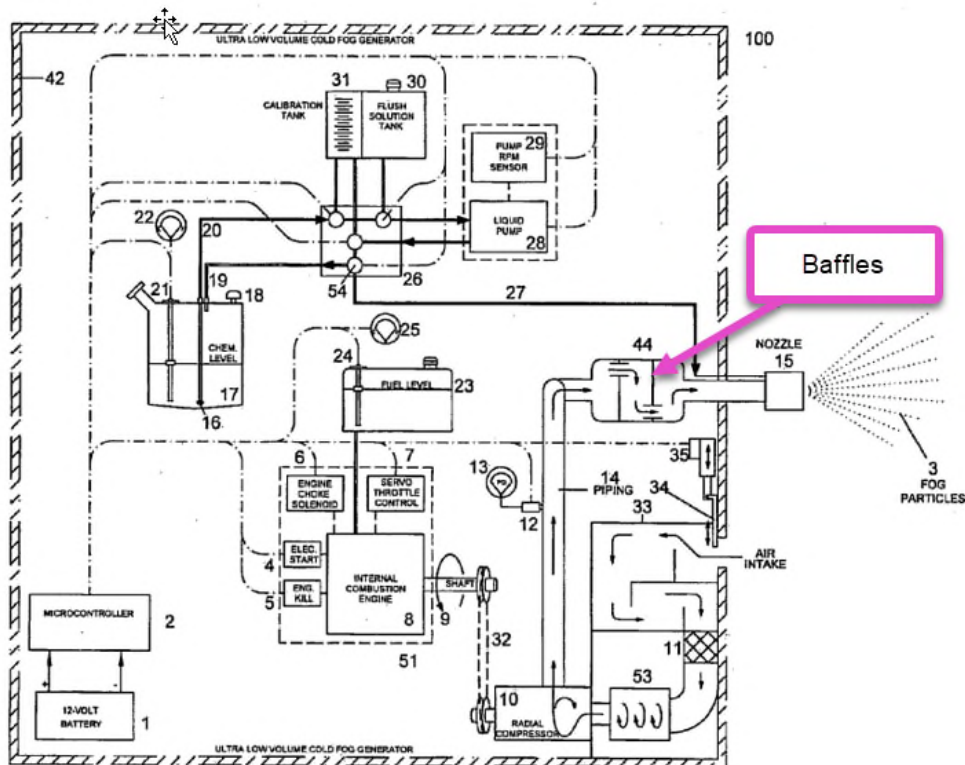


FIG. 6

102. In short, it was well known in the art that there are significant advantages to using small and substantially uniform droplets in fluid dispersion assemblies, and it was well known in the art how to produce such droplets in the manner disclosed in the '918 Patent.

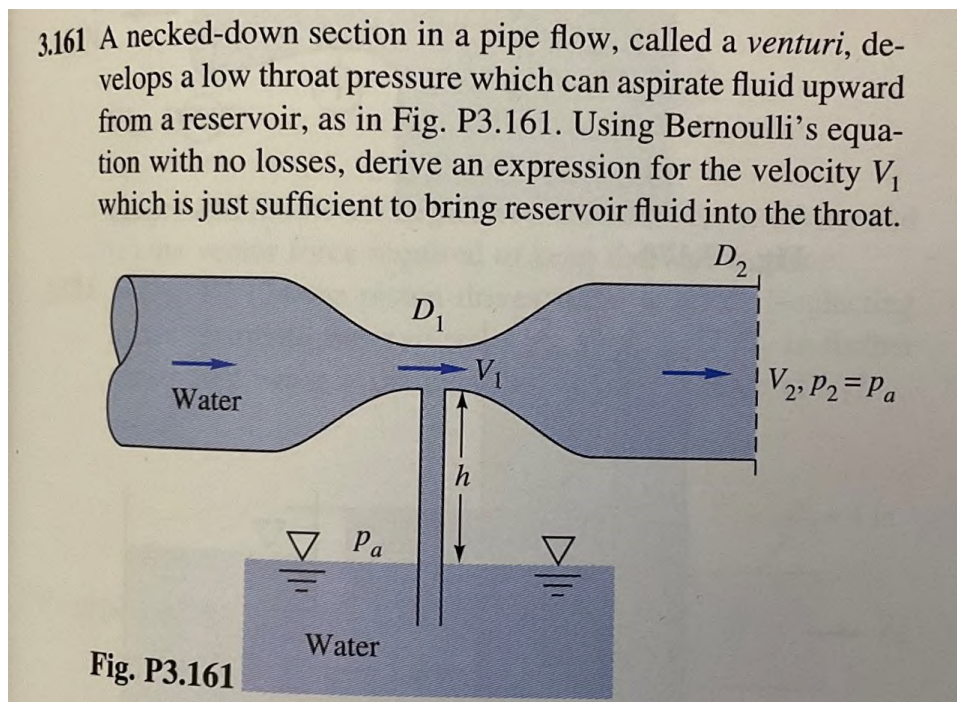
4. Venturi Effect

103. The Venturi effect is the reduction in fluid pressure that results when a moving fluid speeds up as it flows through a constricted section (or choke) of a pipe.

104. The fundamental physics describing the so-called "venturi-effect" referenced in the '918 Patent (5:51-56) was derived by Daniel Bernoulli and first published in Bernoulli, D. (1738) *Hydrodynamica*, ETH-Bibliothek Zürich. See

generally EX1031. The derivation is known as Bernoulli's principle or Bernoulli's equation. Bernoulli's equation is taught in introductory fluid mechanics courses required by undergraduate mechanical engineering programs worldwide.

105. The venturi effect to aspirate fluid upward from a reservoir as described in the '918 Patent is covered, for example, in White, F.M. (1994), Fluid Mechanics (3rd Edition), New York, NY: McGraw-Hill Higher Education, Problem 3.161 (shown below). See EX1032; see also EX1001, 5:41-56 ("As such, when compressed air is supplied to the diffusion assembly 200, a corresponding amount of operative fluid is drawn into the mixing chamber 226 through the fluid delivery tube 300 as a result of the venturi effect of the compressed air flowing past the opening of the fluid inlet 227 into the mixing chamber 226.").



EX1032, Problem 3.161⁵

106. Problem 3.161 is intended to be solved by either second- or third-year undergraduate mechanical engineering students enrolled in an introductory fluid mechanics course.

107. The solution to Problem 3.161 would provide the needed information for a POSITA to design a system such that “at each different compressed air flowrate, i.e., each ‘predetermined amount’ of compressed air which is dictated and fixed by a compressed air operating pressure supplied to diffusion assembly 200, a different corresponding and substantially constant amount, *i.e.*, a ‘preselected amount’ of an operative fluid corresponding to each different predetermined amount of compressed air, will be drawn into the mixing chamber.” EX1001, 5:56-66.

5. Final Remarks

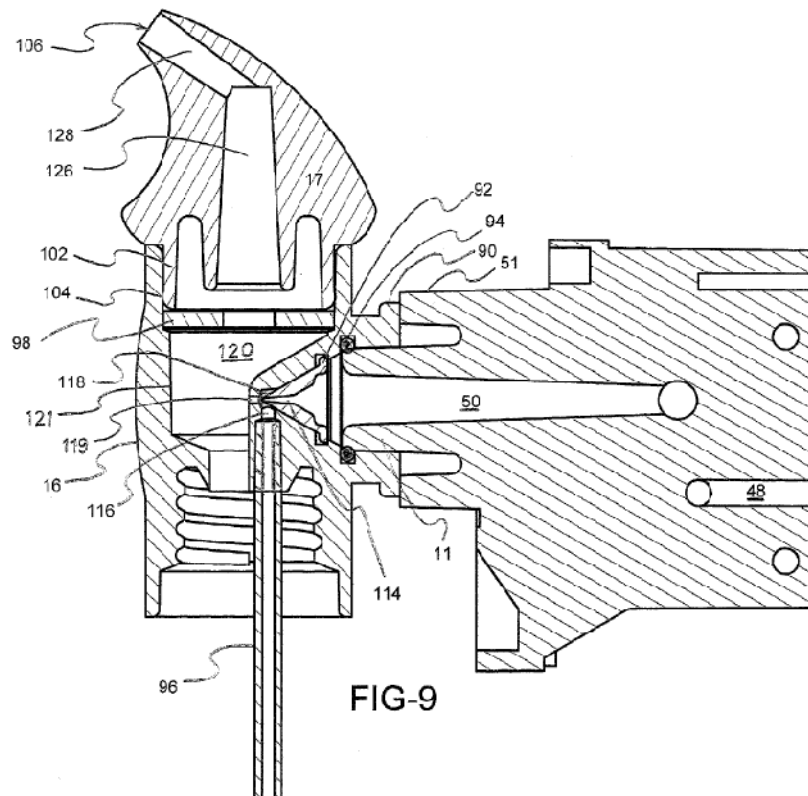
108. A POSITA would have been well aware of these concepts as of August 29, 2012, and they would have formed part of a POSITA’s background knowledge. I have applied this background knowledge in providing my opinions below on what is obvious to a POSITA in view of the teachings of the prior art.

B. Summary of Asserted Prior Art References

1. Summary of Sevy

⁵ Note that the variable form of the solution is independent of the choice of the aspirated fluid and the working fluid through the venturi. Such that the aspirated fluid can be chosen as fragrant oil and the fluid through the venturi can be chosen as compressed air.

109. Sevy (US 2010/0084484) was published on April 8, 2010, and, thus, I understand is prior art to the '918 Patent. Sevy discloses an integrated, essential-oil atomizer. EX1009. The essential-oil atomizer of Sevy includes a separator plate 98 (*e.g.*, a baffle) defining apertures 99 for restricting droplets of a certain size, thereby limiting, or disrupting, the flow of fluid dispersion. See FIG. 9, and ¶ [0070]. A cross-section of Sevy's essential-oil atomizer with separator plate 98 is shown in FIG. 9 below.



EX1009, FIG. 9

2. Summary of Goubet

110. French Patent FR2886160A1 to Didier Goubet (“Goubet”) is titled Essential Oil Diffuser. EX1015, EX1016 (certified translation of Goubet), INID Codes (54), (71). Goubet was published on December 1, 2006, and, thus, I understand is prior art to the ’918 Patent. EX1016, INID Code (43).

111. Goubet generally relates to an essential oil diffuser that uses the venturi effect to mix air and essential oil and create a flow of oil droplets that exit the diffuser and diffuse into the ambient air in the form of microdroplets. EX1016, INID Code (57), pgs. 4-5. In particular, Goubet relates to a diffuser of essential oil comprising an oil tank, a diffuser head comprising a mixing chamber in which oil droplets are produced and which comprises an inlet of compressed air, a venturi cone, and an oil inlet. *Id.* The mixing chamber (referred to in Goubet as a diffusion chamber) is arranged to initially direct the flow of oil droplets created therein to the interior of the tank. *Id.* The diffuser head also comprises vaporization means arranged to break the oil droplets into smaller microdroplets and silently diffuse the microdroplets into the ambient air. *Id.*

112. Goubet teaches that the vaporization means comprise at least two concentric circular enclosures, an outer enclosure and an inner enclosure, communicating with each other via a passage. EX1016, 2:16-19. The chambers and the passage break the droplets into fine microdroplets and diffuse the microdroplets in the ambient air in the form of an oil vapor. EX1016, pg. 6 (claim 1).

113. The essential oil diffuser of Goubet includes a diffusion head defining an outer enclosure 12 and an inner enclosure 13 that communicate with each other through a passage 14, which forms at least one baffle. *Id.* The configuration and communication forms a baffled path through which atomized droplets flow. EX1016, pgs. 4-5. The baffled path, as illustrated in FIGS. 2 and 3 below, breaks the atomized oil droplets into micro-droplets and diffuses the micro-droplets into ambient air. *Id.*, pgs. 4-5.

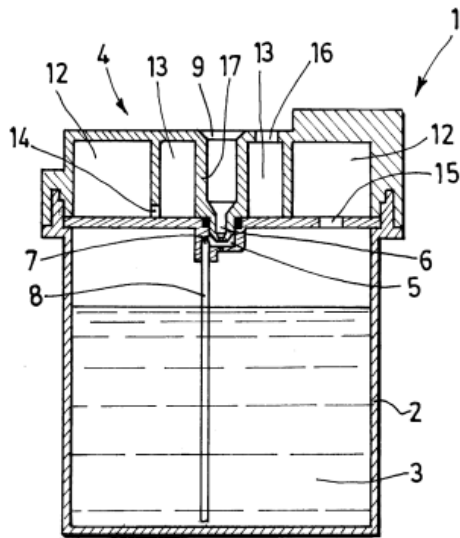


FIG.1

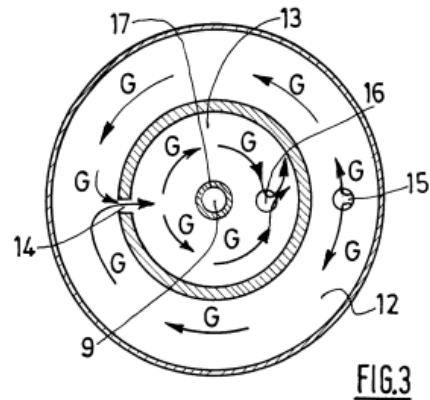


FIG.3

EX1016, FIGS. 1 and 3

114. Goubet addresses several problems faced by “[k]nown essential oil diffusers ... fitted with a diffuser head to which a compressed air supply is connected to trigger the diffusion.” EX1016, 1:8-9.

115. For example, Goubet explains that “due to its pressurized state, compressed air generally arrives in the diffuser head rather abruptly, with the result that a large quantity of oil droplets is rapidly and abruptly diffused into the ambient atmosphere under high pressure with no real control over this diffusion,” and, moreover, “such diffusion is also noisy.” EX1016, 1:10-13.

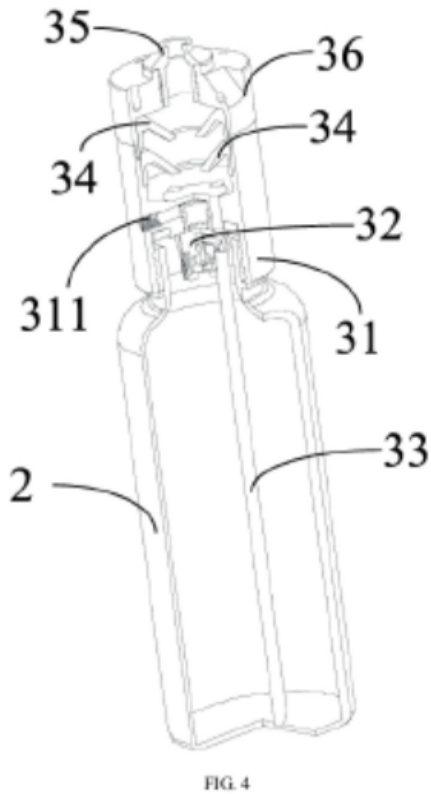
116. Goubet further explains that such “diffusion may be felt as harsh by those present and is detrimental to establishing a refreshing, relaxing atmosphere. In this way, the oil diffusion system and process run counter to the beneficial effects expected from the intrinsic properties of the oil itself.” EX1016, 1:14-17.

117. Goubet addresses these problems by teaching “an essential oil diffuser which diffusion, although triggered by a compressed air supply, is controlled, in particular by enabling the oil to be diffused in the form of an oil vapour, for example in the form of particularly fine microdroplets.” EX1016, 1:18-21.

3. Summary of Gao-2

118. Chinese Utility Model Patent 204072864 to Gao (“Gao-2”) was filed on August 6, 2014 and published by January 7, 2015. EX1042, INID Codes (10), (22), (45), (72). It is thus my understanding that Gao-2 is prior art to at least the challenged claims because the earliest date to which the challenged claims may claim priority is November 17, 2016, as discussed in detail above. *Supra*, ¶¶ 43-50.

Gao-2 discloses an atomization device 3, as shown in FIG. 4 below, that can be connected to an air pump 4 and an essential oil bottle 2. EX1042, ¶[0027].



EX1042, FIG. 4

119. As depicted, atomization device 3 includes an atomization core 32 for atomizing the essential oil and a mist outlet 351, formed in cover 36, through which the atomized mist is discharged into the surrounding airspace. *Id.*, ¶¶[0032], [0034]. When air pump 4 is operated, a negative pressure is created within the device, drawing essential oil from bottle 2, through the liquid suction tube 33, and into the atomization core 32. *Id.*, ¶[0036]. Within atomization core 32, “[t]he essential oil then mixes with the airflow and is atomized” before it is sprayed downward, toward

the reservoir. *Id.* ¶¶ [0030], [0036]. In this regard, “only the fine fragrant mist” is capable of being carried upwardly by the airflow and discharged from mist outlet 351. EX1042, ¶ [0030].

4. Sebastian Kaiser et al., The Electrospray and Combustion at the Mesoscale, (“Kaiser”) (EX1014)

120. Kaiser was published in 2003 (several years before the earliest priority date of the '918). EX1014, Cover. Therefore, Kaiser is prior art to the '918 Patent under 35 U.S.C. §102(b). Kaiser describes that the correlation between uniform droplet size and droplet evaporation rate was a well understood phenomenon in the field, at the time of the invention. EX1014, pg. 43 (“critical to uniform evaporation and burning is a good control of the size distribution of the resulting aerosol”).

VII. REASONS THE CHALLENGED CLAIMS OF THE '918 PATENT ARE UNPATENTABLE

A. GROUND 1: Claims 1 and 3-8 are Unpatentable Under 35 U.S.C. § 103 as Obvious Over Goubet

Claim 1. [PRE] A fluid dispersion assembly operatively engages a container of an operative fluid and a compressed air source and generates and discharges a fluid dispersion into a surrounding airspace, said fluid dispersion assembly comprising:

121. Patent Owner has contended that the preamble is not limiting. *See* EX1018, Exhibit B. However, to the extent the preamble is limiting, it is taught by Sevy. The essential oil diffuser of Goubet is designed to break oil droplets into microdroplets and diffuse them into the ambient air in the form of an oil vapor. EX1016, 2:1-3.

the upper end 10 of a dip tube 8 connected to the essential oil 3 contained in the reservoir 2.” *Id.*, 3:31-4:2. Accordingly, Goubet teaches a fluid dispersion assembly (*e.g.*, diffuser head 4) that is operatively engaged to a container (*e.g.*, reservoir 2) of operative fluid (*e.g.*, oil 3).

124. Goubet further discloses, “[c]ompressed air is supplied by a compressor, not shown, [that] penetrates the diffuser head 4 via an air inlet channel 9, connected to said diffusion chamber 5.” EX1016, 4:15-16; *see also* FIG. 2 (where arrows F illustrate the path of compressed air through diffuser head 4). Thus, Goubet teaches a compressed air source (*e.g.* the compressor (not shown)) that is operatively interconnected to the fluid dispersion assembly (*e.g.*, diffuser head 4).

125. In operation, “[w]hen the compressed air flows into the diffusion chamber 5, the essential oil 3 is drawn into the diffusion chamber 5 by the vacuum created ... [a]ir and essential oil are mixed within the diffusion chamber 5 and a flow of oil droplets is created.” EX1016, 4:19-22. The microdroplets are eventually discharged from diffuser head 4 into ambient air through outlet 16. *Id.*, 4:10-11.

126. Consequently, Goubet teaches a fluid dispersion assembly (*e.g.*, diffuser head 4) that operatively engages a container (*e.g.*, reservoir 2) of an operative fluid (*e.g.*, oil 3) and a compressed air source (*e.g.*, air compressor described but not illustrated in Goubet) to generate and discharge a fluid dispersion (*e.g.*, microdroplets) into a surrounding airspace (*e.g.*, the ambient air).

1[A] a diffusion unit at least partially defining an enclosed diffusion chamber,

127. Goubet discloses or renders a diffusion unit at least partially defining an enclosed diffusion chamber.

128. The diffuser head 4 of Goubet comprises “vaporization means, arranged to break the oil droplets into microdroplets and to diffuse said microdroplets into the ambient air in the form of an oil vapor.” EX1016, 2:1-3. In one preferred embodiment, shown in FIGS. 1 and 3, the “vaporization means comprise at least two concentric circular enclosures, an outer enclosure [12] and an inner enclosure [13], communicating with each other through a passage [14], said two enclosures and said passage forming at least one baffle.” *Id.*, 2:16-19.

129. Goubet goes on to disclose, “[w]ithin this outer enclosure 12, [the droplets] collide with the walls separating the outer enclosure 12 from the inner enclosure 13 and . . . the droplets are broken up into microdroplets.” EX1016, 4:28-5:4. Thereafter, “[t]he microdroplets are diffused into the ambient air in the form of essential oil vapour.” EX1016, 5:6-7.

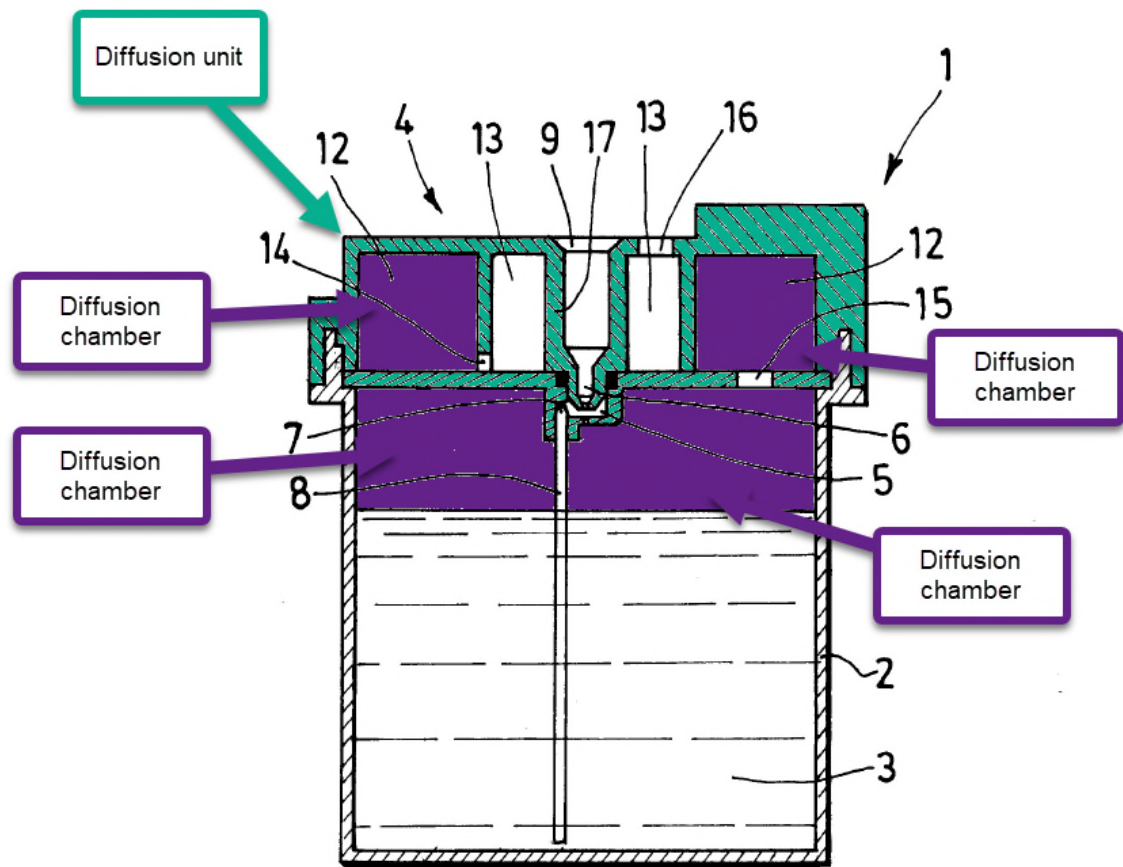
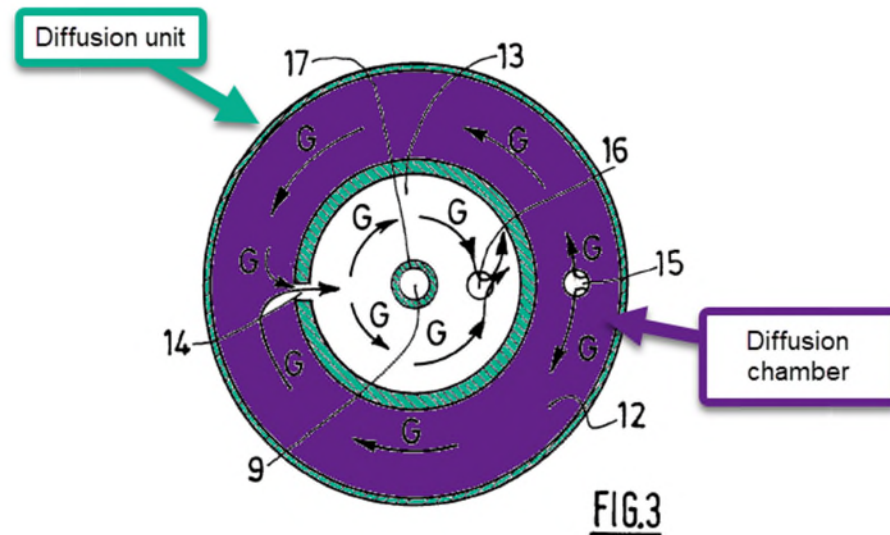


FIG.1

EX1016, FIG. 1



EX1016, FIG. 3

130. Therefore, the walls of diffuser head 4 (*e.g.*, including the walls separating the outer enclosure 12 from the inner enclosure 13) meet the limitation of a diffusion unit. As described with respect to the fluid flow path and depicted above, the diffusion unit at least partially defines a diffusion chamber (*e.g.*, shaded purple in FIGS. 1 and 3) within which the droplets are broken into microdroplets. As illustrated above, the diffusion chamber is enclosed, for example, by reservoir 2 and diffuser head 4, such that Goubet teaches a diffusion unit at least partially defining an enclosed diffusion chamber.

1[B] wherein said diffusion chamber comprises an upper chamber and a lower chamber,

131. It is my opinion that Goubet discloses or renders obvious wherein said diffusion chamber comprises an upper chamber and a lower chamber.

132. Diffuser head 4 includes an upper chamber and a lower chamber, as annotated in FIG. 1 below.

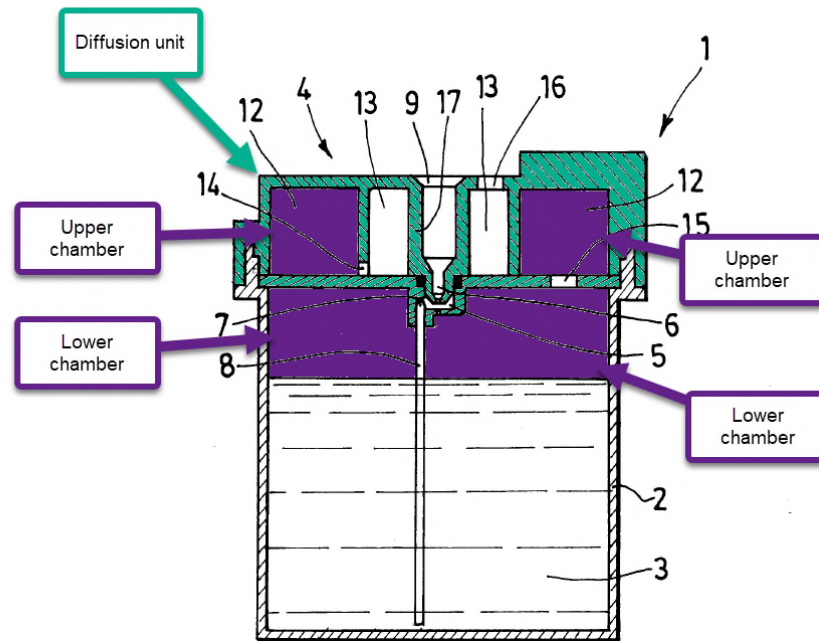


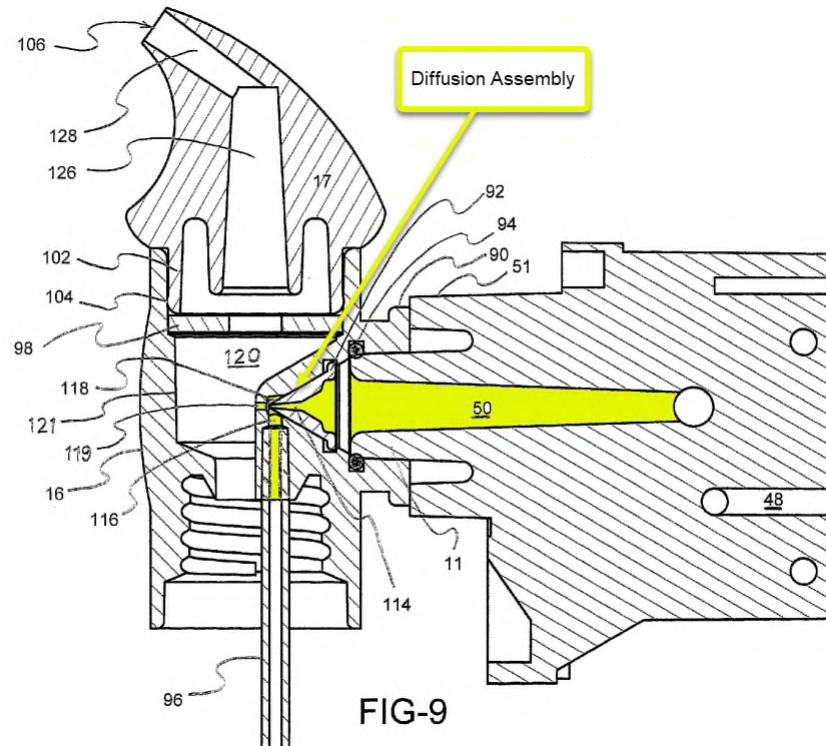
FIG.1

EX1016, FIG. 1

1[C] a discharge port disposed in fluid communication between said diffusion chamber and the surrounding airspace,

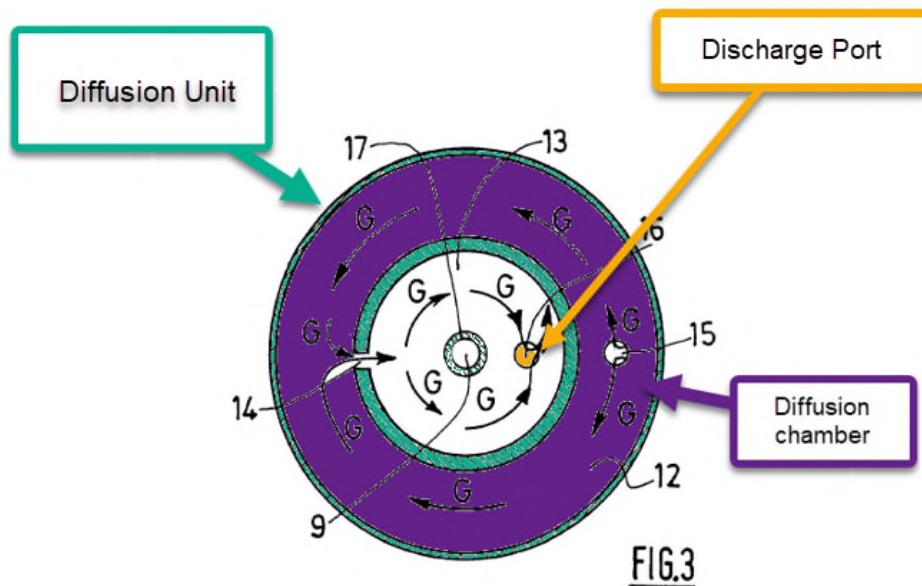
133. It is my opinion that Goubet discloses or renders obvious a discharge port disposed in fluid communication between said diffusion chamber and the surrounding airspace.

134. In describing diffuser head 4, Goubet recites “[t]he inner chamber 13 comprises an outlet 16 for the microdroplets to [exit to] the ambient air.” EX1016, 4:10-11. Outlet 16 is illustrated in FIG. 1 below.



EX1009, FIG. 9

135. The droplet flow path is illustrated by the arrows G in FIG. 3 below. EX1016, 4:25. As shown, the droplets travel from outer enclosure 12 (e.g., a portion of the diffusion chamber), to inner enclosure 13, through outlet 16 (e.g., discharge port) and into ambient air. Thus, Goubet teaches a discharge port (e.g., outlet 16) disposed in fluid communication between said diffusion chamber (e.g., annotated in purple) and the surrounding airspace.



EX1016, FIG. 3

1[D] a diffusion assembly disposed in an operative engagement with said diffusion unit

136. It is my opinion that Goubet discloses or renders obvious a diffusion assembly disposed in an operative engagement with said diffusion unit.

137. In the '918 Patent, the diffusion assembly 200 is described as “compris[ing] an air inlet 210 and an atomizer assembly.” EX1001, 5:15-16. Goubet teaches a corresponding structure. Specifically, Goubet recites “[c]ompressed air is supplied by a compressor, not shown, and penetrates the diffuser head 4 via an air inlet channel 9, connected to said diffusion chamber 5.” Thus, Goubet teaches an air inlet in the form of air inlet channel 9. EX1016, 4:15-16.

138. Goubet further recites essential oil 3 is drawn into the diffusion chamber through the upper end of the dip tube 8. Air and essential oil are mixed

within the diffusion chamber 5 and a flow of oil droplets is created. EX1016, 4:19-22. A POSITA would appreciate that mixing liquid with compressed air describes an atomization process. EX1016, 5:16 (referring to the droplets as “highly atomized oil mist”). Therefore, Goubet teaches an atomizer assembly (*e.g.*, the assembly of components that atomize oil 3). Goubet also teaches a diffusion assembly (*e.g.*, the combination of air inlet channel 9 and the atomizer assembly (*e.g.*, the assembly of components that atomize liquid)) as depicted in FIGS. 1 and 2 below.

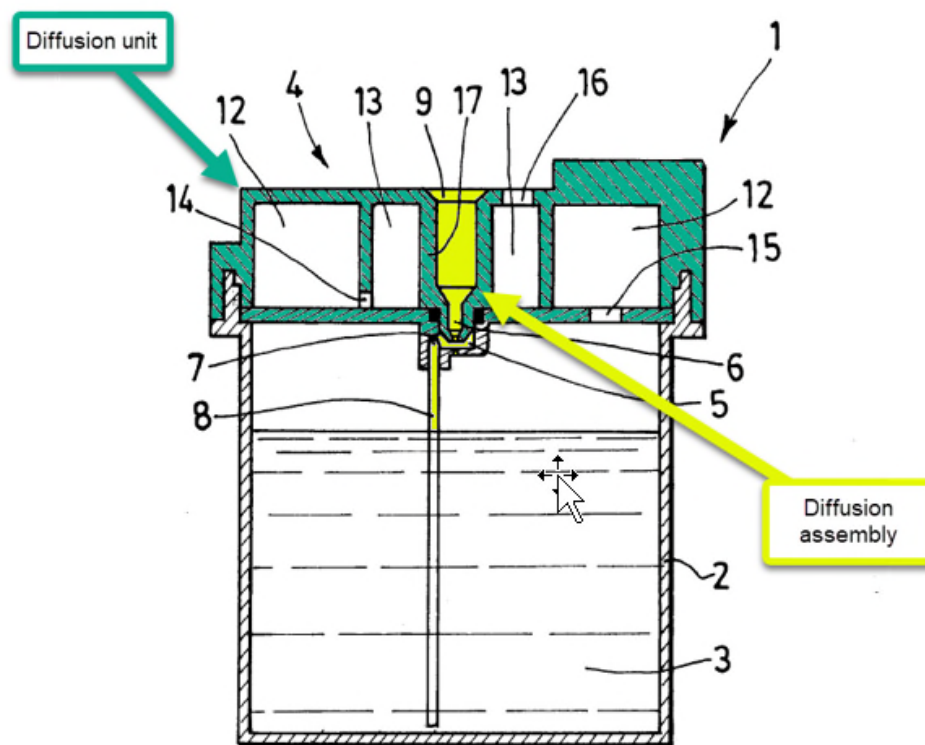
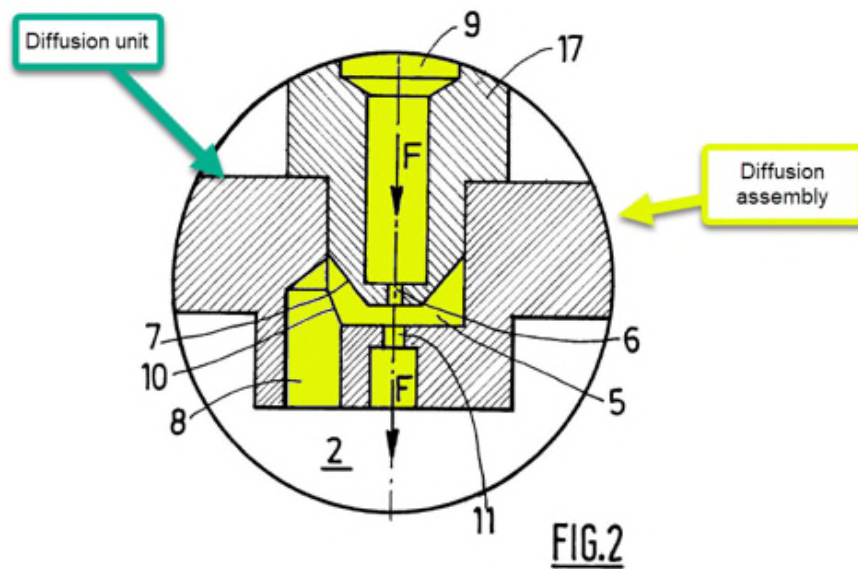


FIG.1

EX1016, FIG. 1



EX1016, FIG. 2

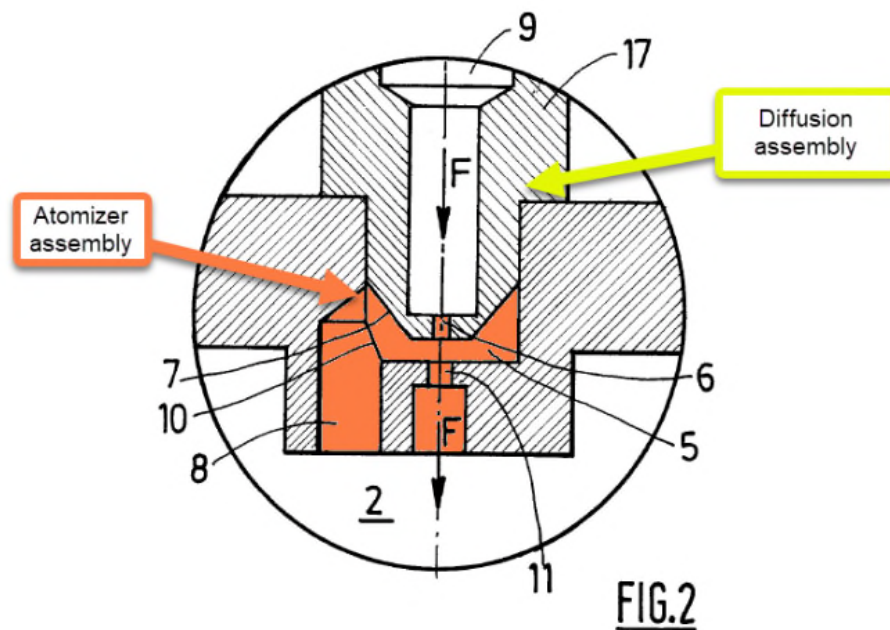
139. As illustrated in FIG. 1, the diffusion assembly of Goubet is disposed within the wall 17 of diffuser head 4, and therefore, disposed in operative engagement with the diffusion unit. Goubet additionally recites “[u]nder the effect of the compressed air pressure, the droplets leaving the diffusion chamber 5 are pushed towards the inside of the reservoir 2 and then towards the inlet 15 of the outer enclosure 12, into which they emerge.” EX1016, 4:26-28. As a result, Goubet teaches that the diffusion assembly (*e.g.*, the combination of air inlet channel 9 and the assembly of components that atomize oil 3) is in operative engagement with said diffusion unit, and specifically the diffusion chamber (*e.g.*, shaded purple) thereof.

140. It is thus my opinion that a POSITA would understand Goubet to teach a diffusion assembly disposed in an operative engagement with said diffusion unit.

1[E] wherein said diffusion assembly comprises an atomizer assembly,

141. It is my opinion that Goubet discloses or renders obvious wherein said diffusion assembly comprises an atomizer assembly.

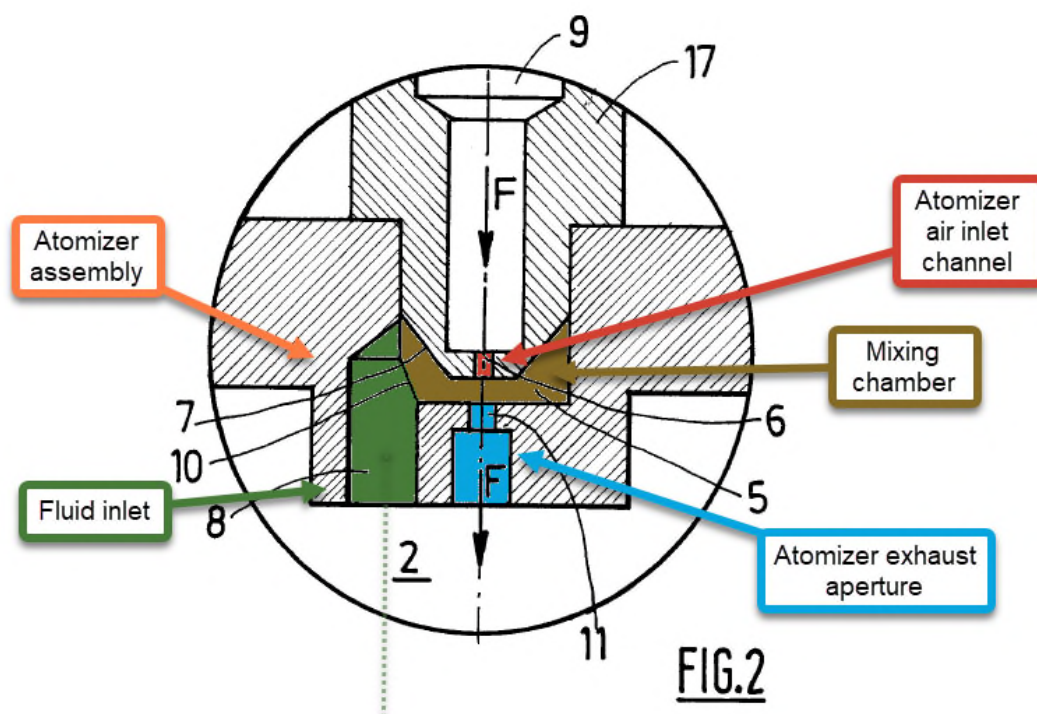
142. Goubet teaches a diffusion assembly including an atomizer assembly as previously demonstrated in limitation 1[D]. The atomizer assembly is annotated in FIG. 2 below.



EX1016, FIG. 2

143. The components of Goubet's atomizer assembly are detailed further and annotated in another FIG. 2 below. Specifically, Goubet's atomizer assembly includes a diffusion chamber 5, a compressed air inlet 6, a venturi cone 7, and an upper end of a dip tube 8. EX1016, 3:31-4:2. In use, compressed air flows in the

direction illustrated by arrow F in FIG. 2, and more specifically from the compressor (not shown), through air inlet channel 9 to compressed air inlet 6, and then into diffusion chamber 5. *Id.*, 4:15-18. Accordingly, the atomizer assembly of Goubet includes an atomizer air inlet channel (e.g., compressed air inlet 6).



EX1016, FIG. 2

144. Goubet further teaches, “[w]hen the compressed air flows into the diffusion chamber 5, the essential oil 3 is drawn into the diffusion chamber 5 by the vacuum [force] . . . through the upper end 10 of the dip tube 8.” *Id.*, 4:19-21. The atomizer assembly of Goubet thus includes a fluid inlet (e.g., the upper end of the dip tube 8).

145. Goubet goes on to recite, “[a]ir and essential oil are mixed within the diffusion chamber 5 and a flow of oil droplets is created.” *Id.*, 4:21-22; *Id.*, 5:15-16 (creating atomized oil mist). Goubet’s atomizer assembly therefore includes a mixing chamber (*e.g.*, diffusion chamber 5). Afterwards, the flow of “oil droplets is then carried along by the compressed air and exits the diffusion chamber 5 through an outlet 11 towards the inside of the reservoir 2.” *Id.*, 4:23:24. The atomizer assembly thus also includes an atomizer exhaust aperture (*e.g.*, outlet 11).

146. Therefore, Goubet teaches an atomizer assembly having each of the components described in the ’918 Patent, namely an atomizer air inlet channel, a fluid inlet, a mixing chamber, and an atomizer exhaust aperture.

1[F] said diffusion assembly is disposed between said upper chamber and said lower chamber,

147. It is my opinion that Goubet discloses or renders obvious said diffusion assembly is disposed between said upper chamber and said lower chamber. The atomizer assembly discussed above in limitation 1[E] of this Ground 1, is illustrated in orange, in FIG. 1 (below). As depicted, the atomizer assembly is disposed between said upper chamber and said lower. In this regard, after liquid is atomized in the diffusion chamber 5, the droplets “are pushed towards the inside of the reservoir 2 and then towards the inlet 15 of the outer enclosure 12, into which they emerge.” EX1016, 4:26-28. This flow path is annotated in FIG. 1 below.

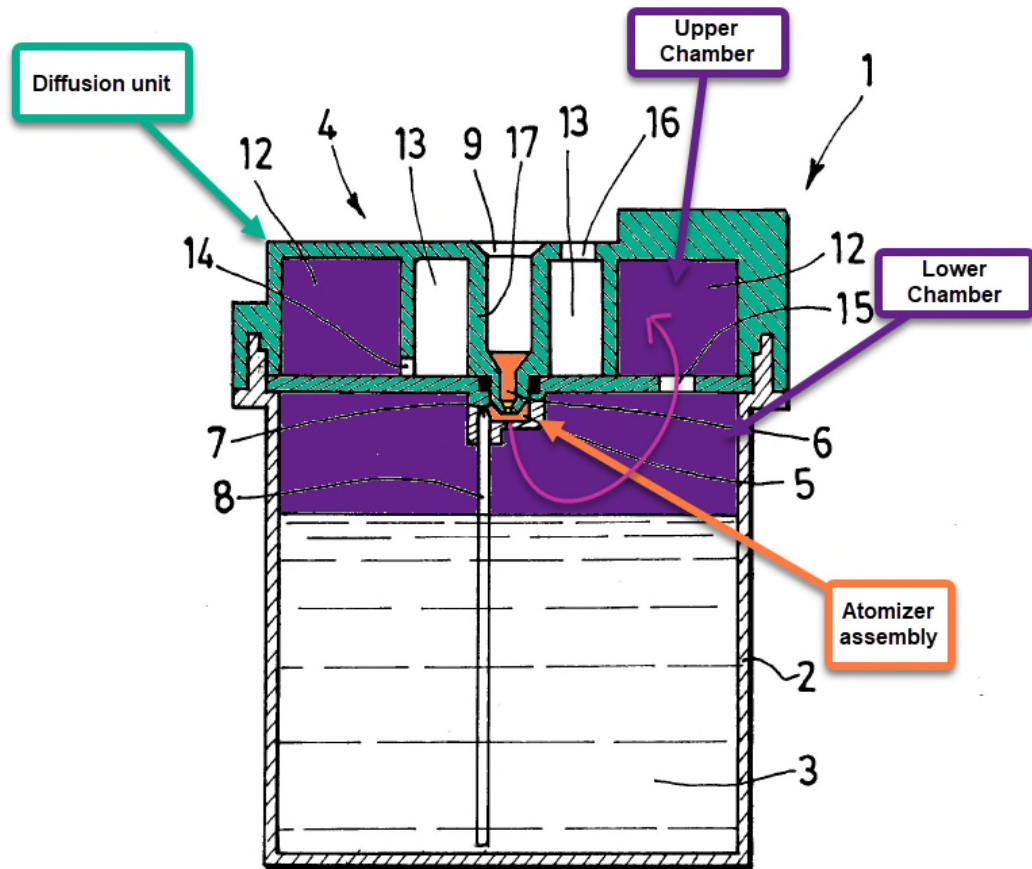


FIG.1

EX1016, FIG. 2

1[G] said atomizer assembly comprising an atomizer air inlet channel, a fluid inlet, a mixing chamber, and an atomizer exhaust aperture, and

148. It is my opinion for the reasons discussed above in limitation 1[E] of this Ground 1 that the atomizer assembly comprises air inlet channel (*e.g.*, compressed air inlet 6), a fluid inlet (*e.g.*, the upper end of dip tube 7), a mixing

chamber (*e.g.*, diffusion chamber 5), and an atomizer exhaust aperture (*e.g.*, outlet 11). EX1016, 4:15-24; *Id.*, FIG. 2.

1[H] said atomizer air inlet channel interconnected to the compressed air source and

149. It is my opinion for the reasons discussed above in limitation 1[E] of this Ground 1 that the atomizer air inlet channel (*e.g.*, compressed air inlet 6) is interconnected to the compressed air source (*e.g.*, compressor (not shown)) (via air inlet channel). *Id.*, 4:15-16; *Id.*, FIG. 2.

1[I] said fluid inlet disposed in fluid communication with the operative fluid in the container,

150. It is my opinion for the reasons discussed above in limitation 1[E] of this Ground 1 that said fluid inlet (*e.g.*, the upper end of dip tube 7) is disposed in fluid communication with the operative fluid in the container (*e.g.*, reservoir 2) (via the lower end of dip tube 7). *Id.*, 4:1-2; *Id.*, FIG. 2.

1[J] wherein the compressed air and the operative fluid are mixed together in said mixing chamber to form the fluid dispersion.

151. It is my opinion for the reasons discussed above in limitation 1[E] of this Ground 1 that the compressed air and the operative fluid are mixed together in said mixing chamber (*e.g.*, diffusion chamber 5). *Id.*, 4:21-22 (“and a flow of oil droplets is created”).

152. It is my understanding that although Patent Owner stipulated to the meaning of “fluid dispersion,” Patent Owner appears to construe the term differently

depending on whether the “fluid dispersion” is within the “mixing chamber” or whether the “fluid dispersion” is within the “diffusion chamber.” EX1018, Exhibit B. I understand that Patent Owner has construed the term “diffusion chamber” to mean a region that is structured to facilitate the formation of the fluid dispersion (*e.g.*, substantially uniform droplets) prior to discharge. *Id.* By contrast, Patent Owner has construed the term “mixing chamber” to mean a region where the operative fluid is combined with compressed air. *Id.* Put differently, Patent Owner’s position appears to be that when the fluid dispersion is within the “mixing chamber,” as is the case in limitation 1[J], the atomized liquid need not include “a plurality of substantially uniform droplets.”

153. As demonstrated above, Goubet teaches that within the mixing chamber (*e.g.*, diffusion chamber 5), the operative fluid is atomized by compressed air, which in my opinion means that the compressed air and operative fluid were at least combined within the mixing chamber.

Claim 3. The fluid dispersion assembly as recited in claim 1 wherein said atomizer exhaust aperture is disposed in a communicating relation between said mixing chamber and said lower chamber to facilitate transfer of the fluid dispersion therebetween.

154. It is my opinion that Goubet discloses or renders obvious the fluid dispersion assembly as recited in claim 1 wherein said atomizer exhaust aperture is

disposed in a communicating relation between said mixing chamber and said lower chamber to facilitate transfer of the fluid dispersion therebetween.

155. Goubet teaches “[u]nder the effect of compressed air pressure, the droplets leaving the diffusion chamber 5 are pushed towards the inside of the reservoir 2 and then towards the inlet of the outer enclosure, into which they emerge.” EX1016, 26-28. This flow path is annotated in FIG. 1 below. Therefore, Goubet teaches said atomizer exhaust aperture (*e.g.*, outlet 11 through which droplets exit the diffusion chamber 5) is disposed in a communicating relation between said mixing chamber and said lower chamber (*e.g.*, shaded purple underneath diffuser head 4) to facilitate transfer of the fluid dispersion therebetween.

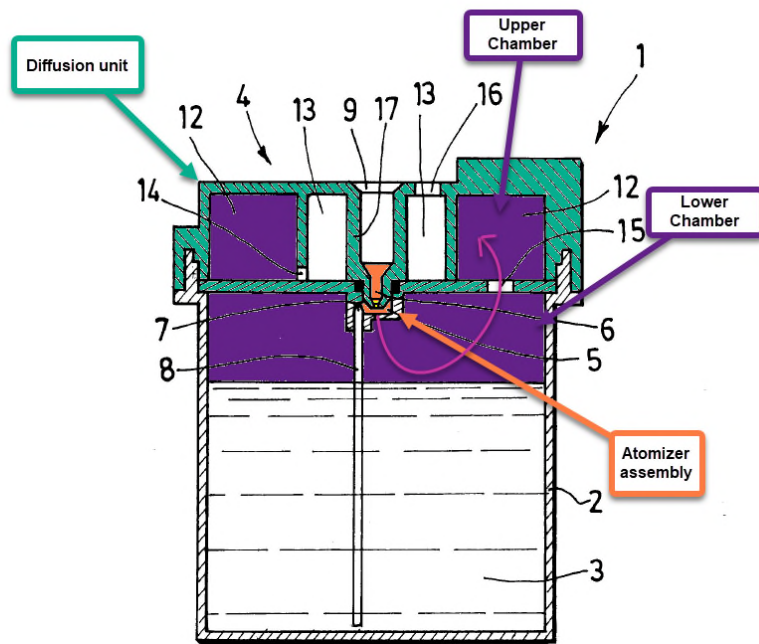


FIG.1

EX1016, FIG. 2

Claim 4. The fluid dispersion assembly as recited in claim 1 wherein said diffusion chamber facilitates formation of the fluid dispersion prior to discharge of the fluid dispersion from said diffusion chamber through said discharge port and into the surrounding airspace.

156. It is my opinion that Goubet discloses or renders obvious the fluid dispersion assembly as recited in claim 1 wherein said diffusion chamber facilitates formation of the fluid dispersion prior to discharge of the fluid dispersion from said diffusion chamber through said discharge port and into the surrounding airspace.

157. As demonstrated above, the diffuser head 4 of Goubet includes an outer enclosure 12 and an inner enclosure 13 forming a diffusion chamber that breaks oil

droplets into microdroplets prior to discharging the microdroplets through outlet 16 and into the surrounding airspace. EX1016, 4:3-11.

158. Although Goubet does not explicitly teach that the microdroplets are “substantially uniform” in diameter, a POSITA would appreciate that Goubet at least suggests this limitation. First, when discussing known essential oil diffusers, Goubet submits that “compressed air generally arrives in the diffuser head rather abruptly, with the result that a large quantity of oil droplets is rapidly diffused into the ambient atmosphere ... with no real control over this diffusion. Furthermore, such diffusion is also noisy.” EX1016, 1:10-13. Goubet goes on to teach, “such diffusion may be felt as harsh by those present and is detrimental to establishing a refreshing, relaxing atmosphere.” EX1016, 1:14-15. To remedy this problem, the diffuser of Goubet includes vaporization means defining a circular and very particular “path, allowing [the droplet] size *to be reduced as much as possible*” before the microdroplets are “silently diffused” into the ambient air (*emphasis added*). See EX1016, 5:12-16.

159. The microdroplets that have been “reduced [in size] as much as possible” within the confines of Goubet’s structure meet the “fluid dispersion” limitation. A POSITA would appreciate that the circular shape of the baffled path will continually separate the droplets into increasingly smaller and thus more uniform droplets. More particularly, only droplets of a particular size (and smaller) will be able to follow the air flow to navigate each additional turn without

accumulating on surface of one of the walls. Each turn will continually filter out droplets over a certain size, such that only smaller and more substantially uniform droplets of a particular size will continue to flow along the path. As a result, the dual enclosure and circular flow path of Goubet at least suggest that the droplets are divided into substantially uniform microdroplets by the time the microdroplets reach and pass through outlet 16, thereby meeting the limitation “fluid dispersion”.

160. If PO argues that the resulting atomized droplets do not meet the “fluid dispersion” limitation, it would have been obvious to modify Goubet to include additional enclosures to further decrease the diameter of the microdroplets, which would result in greater uniformity in the diameters of the microdroplets that eventually are discharged into the surrounding airspace. Goubet’s objective of reducing droplet size as much as possible would have motivated a POSITA to add additional enclosures to the dual enclosure design. EX1016, 5:13-16; 2:16-18 (reciting “said vaporization means comprise at least two concentric circular enclosures” and thus suggesting additional circular enclosures were already contemplated). A POSITA would appreciate that additional enclosures would result in further atomization and thus smaller, and more uniform droplets. A POSITA would have had a reasonable expectation of success in adding additional enclosures because the combination would not require undue experimentation or modification of the existing components and because a further enclosure would not introduce any

incompatibilities with Goubet's existing design. Goubet thus renders obvious claim 4 of the '918 Patent.

Claim 5.

161. There are no material differences between claim limitations 1[PRE]-1[F] and claim 5 of the '918 Patent. Appendix (*compare* claim limitations 1[PRE]-1[F], *with* claim 5). Thus, for the same reasons discussed in this Ground 1 with respect to claim limitations 1[PRE]-1[F], Goubet discloses or renders obvious all the limitations of claim 5. *See supra* Claim 1, limitations 1[PRE]-1[F].

Claim 6. The fluid dispersion assembly as recited in claim 5 wherein said atomizer assembly comprising an atomizer air inlet channel, a fluid inlet, a mixing chamber, and an atomizer exhaust aperture.

162. It is my opinion that Goubet discloses or renders obvious the fluid dispersion assembly as recited in claim 5 wherein said atomizer assembly comprising an atomizer air inlet channel, a fluid inlet, a mixing chamber, and an atomizer exhaust aperture.

163. There are no material differences between claim limitation 1[G] and claim 6 of the '918 Patent. Appendix (*compare* claim limitation 1[G], *with* claim 6). Thus, for the same reasons discussed in this Ground 1 with respect to claim limitation 1[G], Goubet discloses or renders obvious all the limitations of claim 6. *See supra* Claim 1, limitations 1[F].

Claim 7. The fluid dispersion assembly as recited in claim 6 wherein said atomizer air inlet channel is interconnected to the compressed air source and said fluid inlet disposed in fluid communication with the operative fluid in the container, wherein the compressed air and the operative fluid are mixed together in said mixing chamber to form the fluid dispersion.

164. There are no material differences between claim limitations 1[H]-1[J] and claim 7 of the '918 Patent. Appendix (*compare* claim limitations 1[H]-1[J], with claim 7). Thus, for the same reasons discussed in this Ground 1 with respect to claim limitations 1[H]-1[J], Goubet discloses or renders obvious all the limitations of claim 7. *See supra* Claim 1, limitations 1[H]-1[J].

Claim 8. The fluid dispersion assembly as recited in claim 7 wherein said diffusion chamber facilitates formation of the fluid dispersion prior to discharge of the fluid dispersion from said diffusion chamber through said discharge port and into the surrounding airspace.

165. There are no material differences between claim 4 and claim 8 of the '918 Patent. Appendix (*compare* claim 4, with claim 8). Thus, for the same reasons discussed in this Ground 1 with respect to claim 4, Goubet discloses or renders obvious all the limitations of claim 8. *See supra* Claim 4.

B. GROUND 2: Claims 1 and 3-8 are Unpatentable Under 35 U.S.C. §103 as Obvious Over Goubet in view of Kaiser

166. As discussed in Ground 1, Goubet alone renders obvious claims 1 and 3-8. As part of that analysis, I noted that Goubet discloses a diffusion unit (*e.g.*, diffuser head 4) that generates and discharges particularly fine microdroplets to improve control over the diffusion, to reduce the harshness of the aroma, and to

quietly disperse the essential oil into the air. EX1016, 2:6-8. However, Goubet does not explicitly disclose that its microdroplets are “substantially uniform” in diameter. For this reason, in Ground 2, and, in addressing the “fluid dispersion” limitations, where PO’s construction requires “substantially uniform droplets,” namely, limitations set in limitation 1[PRE], Claim 3, Claim 4, limitation 5[PRE], and Claim 8, I also rely on Kaiser, which demonstrates that it was well known in the field at the time of the invention that droplets of greater uniformity result in uniform droplet evaporation. EX1014, pg. 43 (“critical to uniform evaporation and burning is a good control of the size distribution of the resulting aerosol”).

167. If the PTAB concludes that Goubet’s diffuser head 4 does not teach a ‘fluid dispersion’ (*e.g.*, substantially uniform droplets) as presently configured, a POSITA would have been motivated to modify Goubet to include additional enclosures to further reduce the size (diameter) of the droplets—for the reasons discussed above in Ground 1—and to improve droplet uniformity, which will in turn create a more uniform, and less harsh, scent as the oil droplets evaporate in the surrounding airspace, as I discussed above in the background.

168. A POSITA would modify Goubet’s diffuser head to include additional enclosures to further reduce the size of the microdroplets without undue experimentation for the same reasons set forth in Ground 1 above. Furthermore, a POSITA would have reasonably expected such modification to result in the

discharge of smaller droplets with greater uniformity from diffuser, which would exhibit improved dispersion and evaporation (*e.g.*, aroma) properties.

Other Limitations of Claims 1 and 5

169. Limitations 1[PRE]–1[J] and 5[PRE]–5[F] are taught by Goubet for the reasons previously provided in Ground 1 as such limitations are unrelated to the discharge of “fluid dispersion” as it relates to “substantially uniform droplets.”

Claims 6 and 7

170. Claims 6 and 7 are taught by Goubet for the reasons I previously provided in Ground 1 as such limitations are also unrelated to the discharge of fluid dispersion as it relates to “substantially uniform droplets”.

171. Claims 1 and 3-8 are thus rendered obvious under 35 U.S.C. §103 over Goubet in view of Kaiser.

C. GROUND 3: Claims 1 and 3-8 are Unpatentable Under 35 U.S.C. §103 as Obvious Over Gao-2

Claim 1. [PRE] A fluid dispersion assembly operatively engages a container of an operative fluid and a compressed air source and generates and discharges a fluid dispersion into a surrounding airspace, said fluid dispersion assembly comprising:

172. To the extent the preamble is limiting, it is taught by Gao-2, which is titled “aroma diffuser” and designed to generate “a fragrant mist.” EX1042, ¶ [0027]. A cross-section of the diffuser is illustrated in FIG. 2 below. The diffuser includes a housing defining a first installation chamber 6 and a second installation chamber 7. *Id.* An “atomization device 3 is installed in the first installation chamber.” *Id.* The

atomization device 3 is connected to an air pump 4, via a pipeline, which is “installed in the second installation chamber.” *Id.* The atomization device 3 is also “connected to an essential oil bottle 2, used to atomize [] essential oil . . . and discharge the fragrant mist . . . in the air.” *Id.* Thus, Gao-2 teaches a fluid dispersion assembly (*e.g.*, atomization device 3) that operatively engages a container (*e.g.*, essential oil bottle 2) of operative fluid (*e.g.*, essential oil) and a compressed air source (*e.g.*, air pump 4) and generates and discharges a fluid dispersion (*e.g.*, fragrant mist mist) into a surrounding airspace).

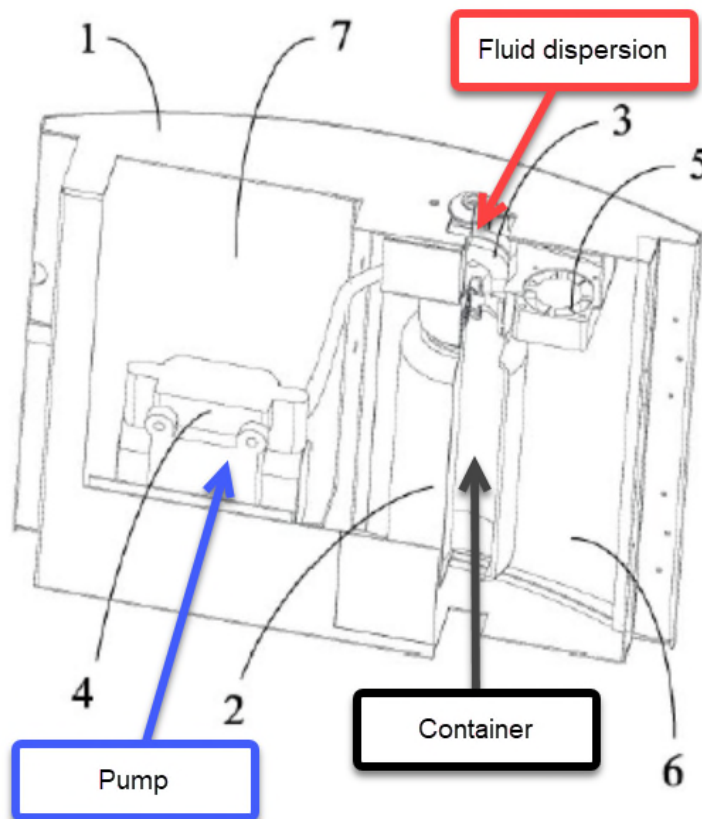


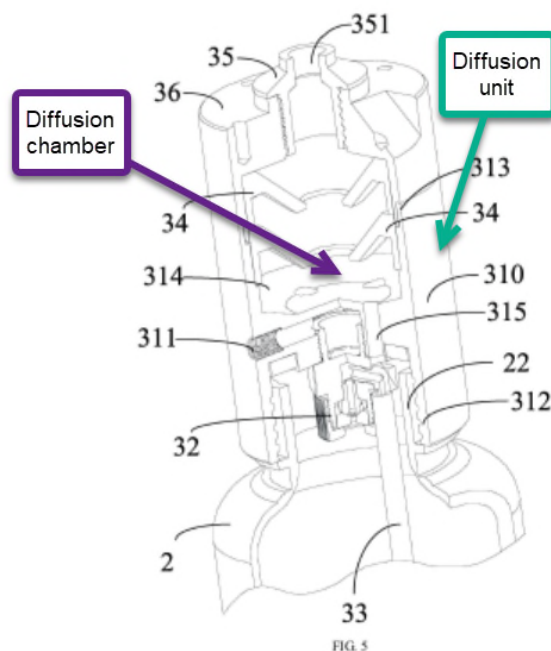
FIG. 2

EX1042, FIG. 2

1[A] a diffusion unit at least partially defining an enclosed diffusion chamber,

173. It is my opinion that Gao-2 discloses or renders obvious a diffusion unit at least partially defining an enclosed diffusion chamber.

174. Atomization device 3 includes a cylindrical body 310 surrounding an atomization core 32 for atomizing essential oil. EX1042, ¶ [0033]. A first connection portion 312, at a lower end of the cylindrical body 310, secures atomization device 3 to essential oil bottle 2. *Id.* As shown below in FIG. 5, an atomization head cover 36 is provided at an upper end of cylindrical body 310 and encloses the atomization core 32 within a chamber of the cylindrical body 310. *Id.* Therefore, it my opinion that Gao-2 teaches a diffusion unit (*e.g.*, cylindrical body 310) at least partially defining an enclosed diffusion chamber (*e.g.*, the chamber in which atomization core 32 is disposed).

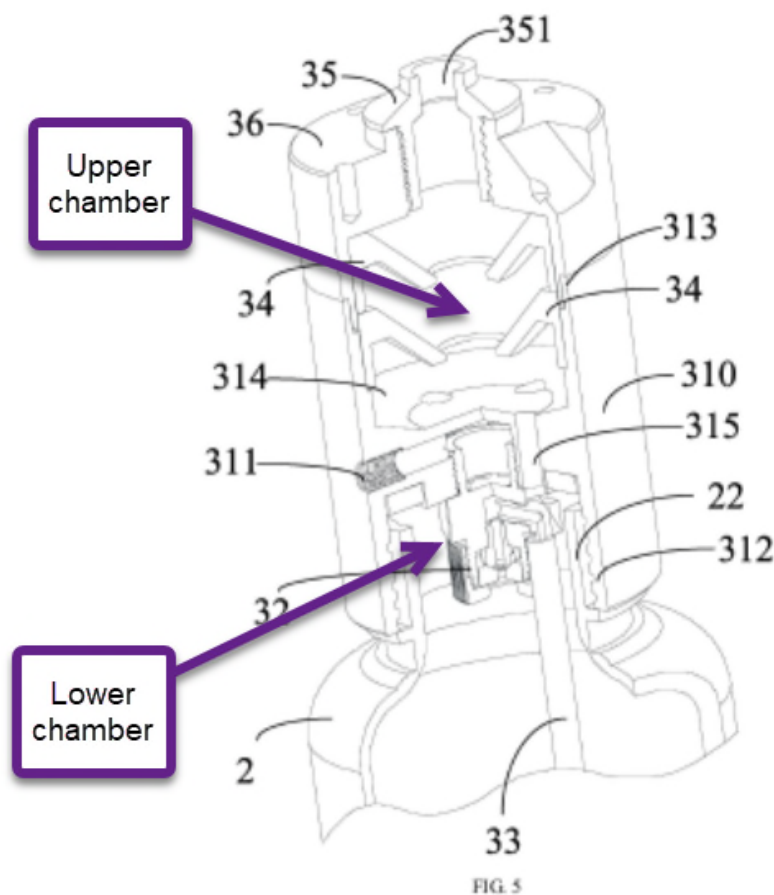


EX1042, FIG. 5

1[B] wherein said diffusion chamber comprises an upper chamber and a lower chamber,

175. It is my opinion that Gao-2 discloses or renders obvious wherein said diffusion chamber comprises an upper chamber and a lower chamber.

176. Gao-2's atomization core 32 is secured to a partition plate 314, which divides the diffusion chamber into "an upper chamber" formed above the partition plate 314 and "a lower chamber" formed "below the partition plate." EX1042, ¶¶ [0031], [0032]. Thus, Gao-2 teaches the limitation said diffusion chamber comprises an upper chamber and a lower chamber.



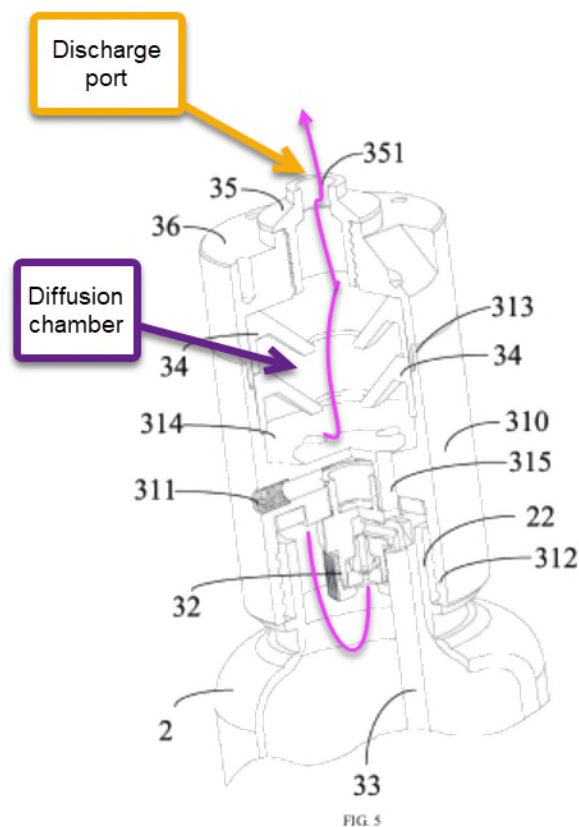
EX1042, FIG. 5

1[C] a discharge port disposed in fluid communication between said diffusion chamber and the surrounding airspace,

177. It is my opinion that Gao-2 discloses or renders obvious a discharge port disposed in fluid communication between said diffusion chamber and the surrounding airspace.

178. Gao-2's atomization device 3, and specifically atomization head cover 36, is provided with a mist outlet 351 through which mist is discharged into the air. EX1042, ¶ [0034]. After liquid is atomized in atomization core, mist flows into the

lower chamber, through mist passage holes 315 to the upper chamber, and then through noise reduction device 34, before exiting atomization device 3 through mist outlet 351. *Id.* This flow path is annotated by the pink arrow shown in FIG. 5 below. Thus, Gao-2 teaches a discharge port (e.g., mist outlet 351) disposed in fluid communication between said diffusion chamber and the surrounding airspace.



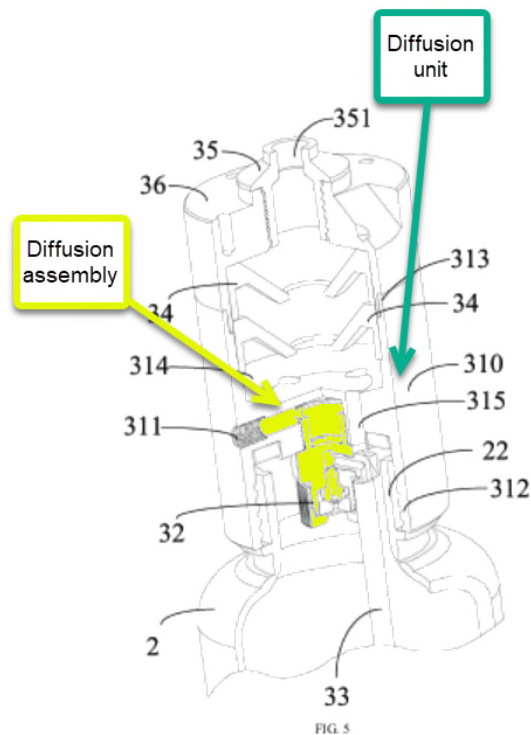
EX1042, FIG. 5

1[D] a diffusion assembly disposed in an operative engagement with said diffusion unit,

179. It is my opinion that Gao-2 discloses or renders obvious a diffusion assembly disposed in an operative engagement with said diffusion unit.

180. The '918 Patent explains the diffusion assembly 200 is described as “compris[ing] an air inlet 210 and an atomizer assembly.” EX1001, 5:15-16. Gao-2 teaches a corresponding structure. Specifically, Gao-2 recites “[t]he airflow generated by the air pump 4 enters the upper end of the atomization core [32] through the air inlet channel 311.” EX1042, ¶ [0038]. Therefore, Gao-2 teaches an air inlet (*e.g.*, air inlet channel 311). The atomization core, as evident from its nomenclature, is designed to “effectively atomize essential oils” and meets the limitation an “atomizer assembly.” *Id.*, ¶ [0038].

181. As I explained in detail in limitations 1[B] and 1[C], atomization core 32 is secured to cylindrical body 310 (*e.g.*, diffusion unit) via partition plate 314, and is designed to atomize mist into its chamber. It is therefore my opinion that Gao-2 teaches a diffusion assembly (*e.g.*, the combination of air channel 311 and atomization core 32) disposed in an operative engagement with the diffusion unit (*e.g.*, cylindrical body 310) as shown below in FIG. 5.



EX1042, FIG. 5

1[E] wherein said diffusion assembly comprises an atomizer assembly,

182. It is my opinion that Gao-2 discloses or renders obvious wherein said diffusion assembly comprises an atomizer assembly.

183. Gao-2 teaches a diffusion assembly including an atomizer assembly (*e.g.*, atomization core 32) as I explained in detail above in limitation 1[E]. The components of Goa-2's atomization core 32 are detailed further and annotated below in FIG. 10 (depicting an assembled cross-sectional view of the atomization core).
EX1042, ¶ [0025].

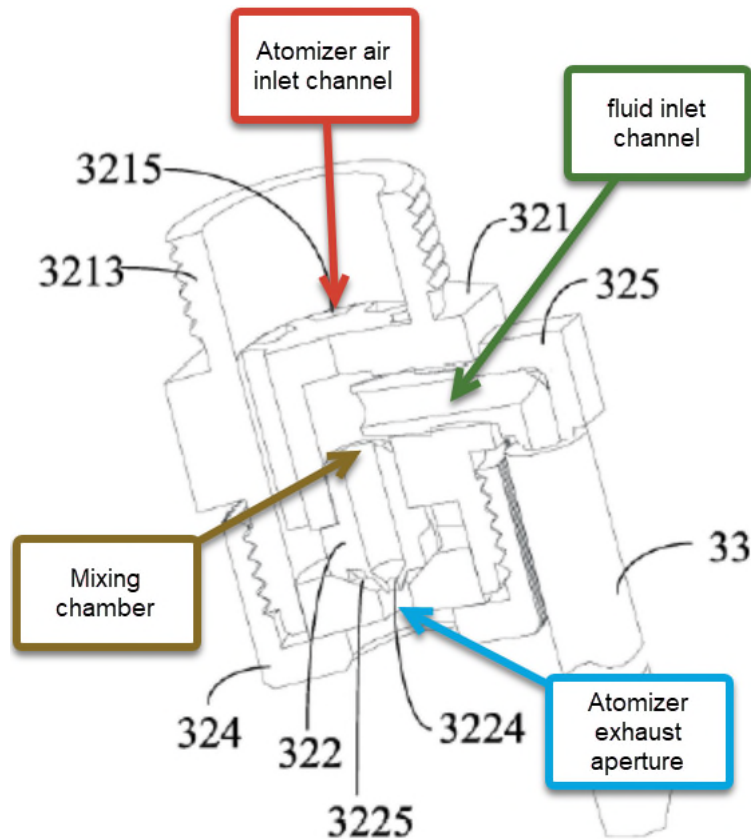


FIG. 10

EX1042, FIG. 10

184. Specifically, Gao-2's atomizer assembly (*e.g.*, atomization core 32) includes an atomization rotating core 322 attached to a core base 321. EX1042, ¶ [0038]; *Id.*, FIG. 10. Atomization rotating core 322 defines a chamber and is provided underneath a mounting plate 3214. EX1042, ¶ [0038]; *Id.*, FIG. 10. A hole 3224 is provided at an end of atomization rotating core 322 that is disposed within a spray outlet 3231 of atomization core cap 323. *Id.*, ¶ [0036].

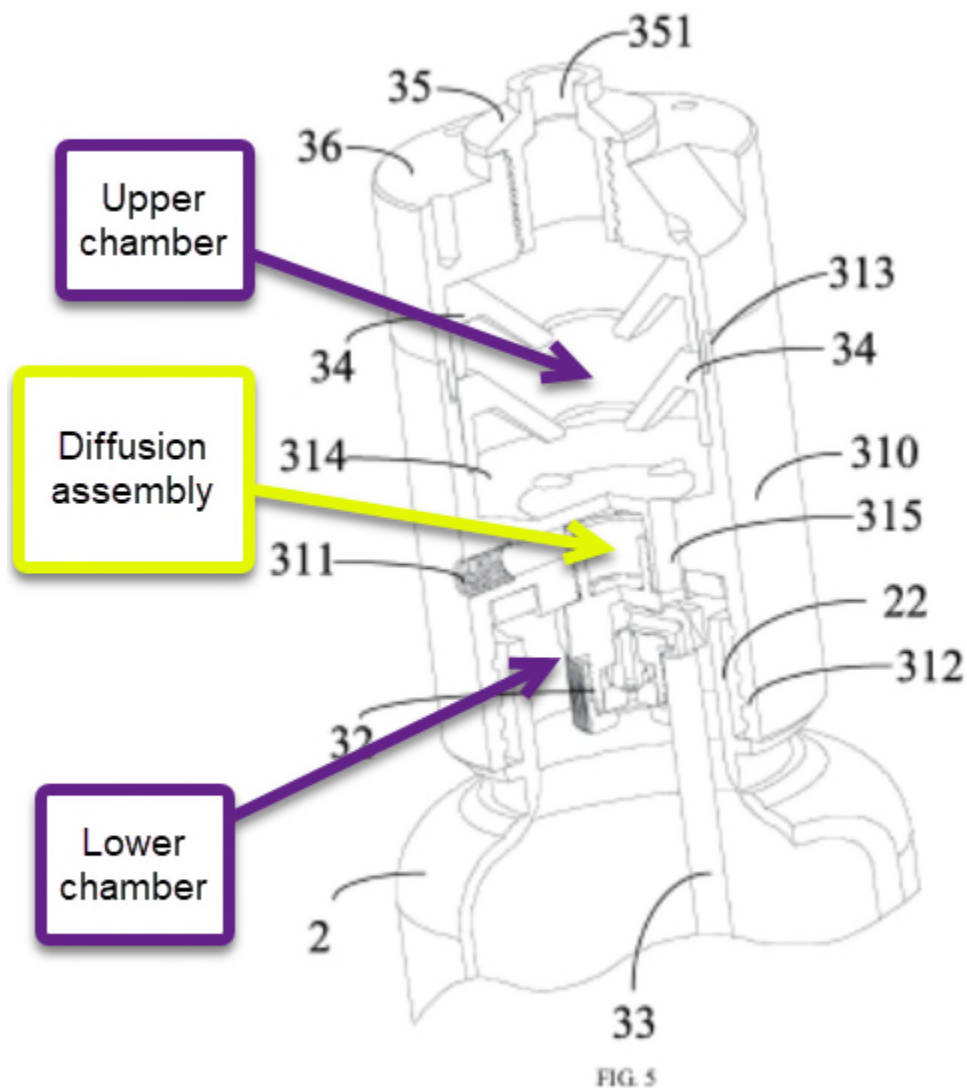
185. “[A]irflow generated by the air pump 4 enters the upper end of the atomization core base 321 through the air inlet channel 311, then passes through the vent hole(s) 3215” and into rotating core 322. EX1042, ¶ [0038]. Atomization core 32 also includes a “liquid suction tube 325 connect[ing] the atomization core base 321 and the liquid suction tube 33.” *Id.*, ¶ [0036].

186. When the aroma diffuser is in operation, and air pump 4 generates an airflow, the “airflow sequentially passes through the pipeline [connecting the pump to the atomization device 3], the air inlet channel 311, [and] the vent hole(s) 3215.” *Id.*, ¶ [0040]. Gao-2 recites, “this creates a negative pressure . . . draw[ing] the essential oil from the essential oil bottle 2 through the liquid suction tube 33” and into atomization rotating core 322 where “[t]he essential oil then mixes with the airflow and is atomized at the outlet of the [] hole 3224, before being sprayed out from the spray outlet 3231.” *Id.* Therefore, Gao-2 teaches an atomizer assembly having each of the components described in the ’918 Patent, namely an atomizer air inlet channel (*e.g.*, vent hole(s) 3215), a fluid inlet (*e.g.*, liquid suction tube 325), a mixing chamber (*e.g.*, chamber within rotating core 322), and an atomizer exhaust aperture (*e.g.*, spray outlet 3231).

1[F] said diffusion assembly is disposed between said upper chamber and said lower chamber,

187. It is my opinion that Gao-2 discloses or renders obvious said diffusion assembly is disposed between said upper chamber and said lower chamber.

188. As I demonstrated above in limitation 1[B] of this Ground 3, atomization core 32 (*e.g.*, a portion of the diffusion assembly) is secured to a partition plate 314, which divides the diffusion chamber into “an upper chamber” formed above the partition plate 314 and “a lower chamber” formed “below the partition plate.” EX1042, ¶¶[0031], [0032]. Thus, Gao-2 teaches the limitation said diffusion assembly disposed between said upper chamber and said lower chamber.



EX1042, FIG. 5

1[G] said atomizer assembly comprising an atomizer air inlet channel, a fluid inlet, a mixing chamber, and an atomizer exhaust aperture, and

189. It is my opinion that Gao-2 discloses or renders obvious said atomizer assembly comprising an atomizer air inlet channel, a fluid inlet, a mixing chamber, and an atomizer exhaust aperture.

190. As I demonstrated above in limitation 1[E] of this Ground 3, the atomizer assembly comprises an atomizer air inlet channel (*e.g.*, vent hole(s) 3215), a fluid inlet (*e.g.*, liquid suction tube 325), a mixing chamber (*e.g.*, chamber within core base 322), and an atomizer exhaust aperture (*e.g.*, spray outlet 3231).

1[H] said atomizer air inlet channel interconnected to the compressed air source and

191. As I demonstrated in limitation 1[E] of this Ground 3, said atomizer air inlet channel (*e.g.*, vent holes(s) 3215) is interconnected to the compressed air source (*e.g.*, pump 4).

1[I] said fluid inlet disposed in fluid communication with the operative fluid in the container,

192. As demonstrated in limitation 1[E] of this Ground 3, said fluid inlet (*e.g.*, liquid suction tube 325) is disposed in fluid communication with the operative fluid in the container (*e.g.*, essential oil bottle 2).

1[J] wherein the compressed air and the operative fluid are mixed together in said mixing chamber to form the fluid dispersion.

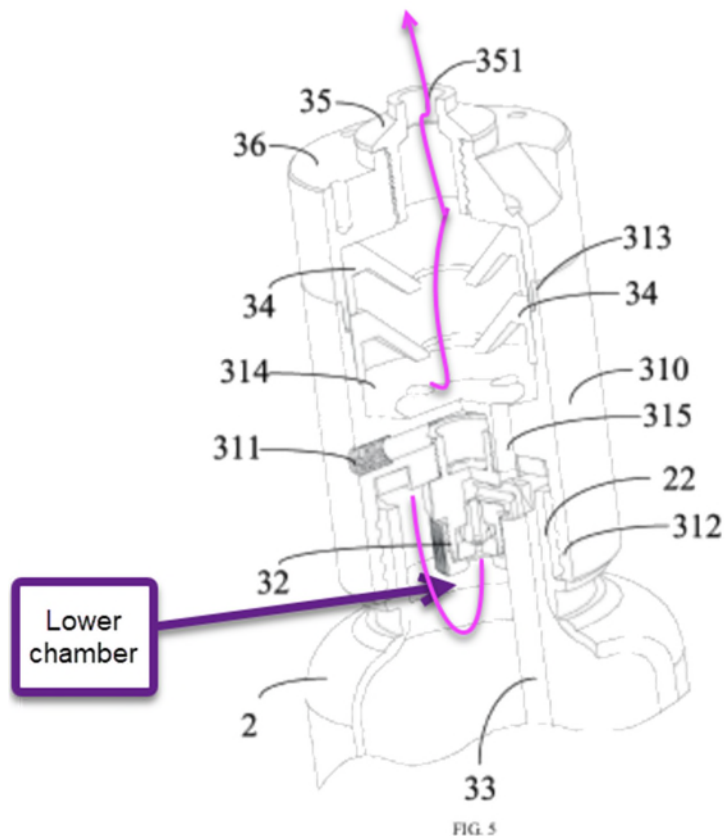
193. As demonstrated in limitation 1[E] of this Ground 3, the compressed air and the operative fluid are mixed together in said mixing chamber (*e.g.*, chamber within core base 322).

194. It is my understanding that although Patent Owner stipulated to the meaning of “fluid dispersion,” Patent Owner appears to construe the term differently depending on whether the “fluid dispersion” is within the “mixing chamber” or whether the “fluid dispersion” is within the “diffusion chamber.” EX1018, Exhibit B. I understand that Patent Owner has construed the term “diffusion chamber” to mean a region that is structured to facilitate the formation of the fluid dispersion (*e.g.*, substantially uniform droplets) prior to discharge. *Id.* By contrast, Patent Owner has construed the term “mixing chamber” to mean a region where the operative fluid is combined with compressed air. *Id.* Put differently, Patent Owner’s position appears to be that when the fluid dispersion is within the “mixing chamber,” as is the case in limitation 1[J], the atomized liquid need not include “a plurality of substantially uniform droplets.”

195. As demonstrated above, Goubet teaches that within the mixing chamber (*e.g.*, diffusion chamber 5), the operative fluid is atomized by compressed air, which in my opinion means that the compressed air and operative fluid were at least combined within the mixing chamber.

Claim 3. The fluid dispersion assembly as recited in claim 1 wherein said atomizer exhaust aperture is disposed in a communicating relation between said mixing chamber and said lower chamber to facilitate transfer of the fluid dispersion therebetween.

196. As demonstrated in limitation 1[C] of this Ground 3, after liquid is atomized in atomization core 32, the atomized mist initially flows into the lower chamber, along the flow path annotated by the pink arrow in FIG. 5 below.



EX1042, FIG. 5

Claim 4. The fluid dispersion assembly as recited in claim 1 wherein said diffusion chamber facilitates formation of the fluid dispersion prior to discharge of the fluid dispersion from said diffusion chamber through said discharge port and into the surrounding airspace.

197. It is my opinion that Gao-2 discloses or renders obvious the fluid dispersion assembly as recited in claim 1 wherein said diffusion chamber facilitates formation of the fluid dispersion prior to discharge of the fluid dispersion from said diffusion chamber through said discharge port and into the surrounding airspace.

198. Although Gao-2 does not explicitly teach that mist consists of “substantially uniform droplets” (in diameter), it is my opinion that a POSITA would recognize that Gao-2 at least suggests this limitation. In discussing known essential oil diffusers, Gao-2 identifies that it is a drawback that their perfume particles are relatively large. EX1042 ¶ [0002].

199. To remedy this problem, Gao-2 includes a spray outlet 3231 in its diffuser that faces downward, which results in a dispersion comprising a coarse fragrant mist (*e.g.*, droplets) from the spray outlet 3231 downwards, directly back into the essential oil bottle. EX1042, ¶[0030]. In this regard, “only the fine fragrant mist disperses outward.” Gao-2 also provides an upper chamber of cylindrical body 310 that includes one or more “noise reduction device(s)” that project into the flow path. *Id.*, ¶ [0032]; *Id.*, FIG. 5. A POSITA would appreciate that these devices are

“baffles” and as the mist travels along its path, the baffles will continually separate the droplets into increasingly smaller and thus more uniform droplets. More particularly, only droplets of a particular size (and smaller) will be able navigate around the noise reduction devices without accumulating on a surface of one of the devices. Each turn will continually filter out droplets over a certain size, such that only smaller and more substantially uniform droplets of a particular size will continue to flow along the path. As a result, Gao-2 at least suggest that the droplets are divided into substantially uniform microdroplets by the time the microdroplets reach and pass through mist outlet 351, thereby meeting the limitation “fluid dispersion”.

200. If PO argues that the resulting atomized droplets do not meet the “fluid dispersion” limitation, it would have been obvious to modify Gao-2 to include additional baffles to further decrease the diameter of the microdroplets, which would result in greater uniformity in the diameters of the microdroplets that eventually are discharged into the surrounding airspace.

201. Gao-2’s objective of reducing droplet size, and noise, would have motivated a POSITA to add additional noise reduction devices (*e.g.*, baffles). A POSITA would appreciate that additional baffles would result in further atomization and thus smaller, and more uniform droplets. A POSITA would have had a reasonable expectation of success in adding additional baffles because the

combination would not require undue experimentation or modification of the existing components and because further baffles would not introduce any incompatibilities with Gao-2's existing design. Gao-2 thus discloses or renders obvious claim 4 of the '918 Patent.

Claim 5

202. There are no material differences between claim limitations 1[PRE]-1[F] and claim 5 of the '918 Patent. Appendix (*compare* claim limitations 1[PRE]-1[F], *with* claim 5). Thus, for the same reasons I discussed above in this Ground 3 with respect to claim limitations 1[PRE]-1[F], Gao-2 discloses or renders obvious all the limitations of claim 5. *See supra* Claim 1, limitations 1[PRE]-1[F].

Claim 6. The fluid dispersion assembly as recited in claim 5 wherein said atomizer assembly comprising an atomizer air inlet channel, a fluid inlet, a mixing chamber, and an atomizer exhaust aperture.

203. There are no material differences between claim limitation 1[G] and claim 6 of the '918 Patent. Appendix (*compare* claim limitation 1[G], *with* claim 6). Thus, for the same reasons I discussed above in this Ground 3 with respect to claim limitation 1[G], Gao-2 discloses or renders obvious all the limitations of claim 6. *See supra* Claim 1, limitations 1[F].

Claim 7. The fluid dispersion assembly as recited in claim 6 wherein said atomizer air inlet channel is interconnected to the compressed air source and said fluid inlet disposed in fluid communication with the operative fluid in the container, wherein the compressed air and the operative fluid are mixed together in said mixing chamber to form the fluid dispersion.

204. There are no material differences between claim limitations 1[H]-1[J] and claim 7 of the '918 Patent. Appendix (*compare* claim limitations 1[H]-1[J], with claim 7). Thus, for the same reasons I discussed above in this Ground 3 with respect to claim limitations 1[H]-1[J], Goubet discloses or renders obvious all the limitations of claim 7. *See supra* Claim 1, limitations 1[H]-1[J].

Claim 8. The fluid dispersion assembly as recited in claim 7 wherein said diffusion chamber facilitates formation of the fluid dispersion prior to discharge of the fluid dispersion from said diffusion chamber through said discharge port and into the surrounding airspace.

205. There are no material differences between claim 4 and claim 8 of the '918 Patent. Appendix (*compare* claim 4, with claim 8). Thus, for the same reasons I discussed above in this Ground 3 with respect to claim 4, Goubet discloses or renders obvious all the limitations of claim 8. *See supra* Claim 4.

D. GROUND 4: Claims 1 and 3-8 are Unpatentable Under 35 U.S.C. § 103 as Obvious Over Gao-2

206. As discussed in Ground 3, Gao-2 alone renders obvious claims 1 and 3-8. As part of that analysis, I noted that Gao-2 discloses a diffusion unit (*e.g.*, cylindrical body 310) that generates fine mist and quietly disperses the mist into the air. EX1042, ¶¶ [0030], [0032]. However, Gao-2 does not explicitly disclose

that its mist droplets are “substantially uniform” in diameter. For this reason, in Ground 4, and, in addressing the “fluid dispersion” limitation, where PO’s construction requires “substantially uniform droplets,” namely, the limitations set forth in limitation 1[PRE], Claim 3, Claim 4, limitation 5[PRE], and Claim 8, I also rely on Goubet, which discloses a diffusion unit (*e.g.*, diffuser head 4) that generates and discharges particularly fine microdroplets to improve control over the diffusion, to reduce the harshness of the aroma, and to quietly disperse the essential oil into the air. EX1016, 2:6-8.

207. When discussing known essential oil diffusers, Goubet submits that “compressed air generally arrives in the diffuser head rather abruptly, with the result that a large quantity of oil droplets is rapidly diffused into the ambient atmosphere ... with no real control over this diffusion.” EX1016, 1:10-13. Goubet goes on to teach, “such diffusion may be felt as harsh by those present and is detrimental to establishing a refreshing, relaxing atmosphere.” EX1016, 1:14-15. To remedy this problem, the diffuser of Goubet includes vaporization means defining a circular and very particular “path, allowing [the droplet] size *to be reduced as much as possible*” before the microdroplets are “silently diffused” into the ambient air (*emphasis added*). See EX1016, 5:12-16.

208. A POSITA would appreciate that the circular shape of the baffled path of Goubet will continually separate the droplets into increasingly smaller and thus

more uniform droplets, in a similar manner to Gao-2's 'noise reduction' baffles. More particularly, only droplets of a particular size (and smaller) will be able to follow the air flow to navigate each additional turn without accumulating on surface of one of the walls. Each turn will continually filter out droplets over a certain size, such that only smaller and more substantially uniform droplets of a particular size will continue to flow along the path.

209. In view of Goubet's teachings, a POSITA would be motivated to further reduce the size of the droplets discharged by Gao-2's atomizer to improve their dispersion and aromatic properties. First, both Gao-2 and Goubet at least acknowledge that it is advantageous to reduce droplet size. EX1043, ¶ [0002]; EX1016, 5:12-16. Second, Gao-2 teaches "in other embodiments, the number of noise reduction devices 34 [baffles] can be one, two, or more." EX1043, ¶ [0033]. Thus, a POSITA would have been motivated to modify the series of noise reduction devices 34 (*e.g.*, baffles) into a series of spiraling encloses, as taught by Goubet, to further reduce the size of the mist droplets that are discharged into the atmosphere, which, in turn, would also increase their uniformity.

210. The combination would be a simple substitution of one known element for another to achieve the same desired effect of improved atomization and noise reduction.

Other Limitations of Claims 1 and 5

211. Limitations 1[PRE]–1[J] and 5[PRE]–5[F] are taught by Gao-2 for the same reasons I previously provided in Ground 3 as such limitations are unrelated to the discharge of “fluid dispersion” as it relates to “substantially uniform droplets.”

Claims 6 and 7

212. Claims 6 and 7 are taught by Gao-2 for the same reasons I previously provided in Ground 3 as such limitations are also unrelated to the discharge of fluid dispersion as it relates to “substantially uniform droplets”.

213. Claims 1 and 3-8 are thus rendered obvious under 35 U.S.C. §103 over Gao-2 in view of Goubet.

VIII. OATH

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

Dated: 3/18/2025

By: Christopher White