

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

AROMA360, LLC,

Petitioner,

v.

AIR ESSSENTIALS, INC.,

Patent Owner.

Case IPR 2025-00706

Patent 10,583,449

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. 10,583,449 (’449 Patent). I have been asked to study and provide my opinions as an independent expert witness regarding technology described in the ’449 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 '449 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:

Prior Art	Basis	Claims
Sevy	Obviousness	1, 4 and 7-10
Sevy in view of Gao	Obviousness	1, 4 and 7-10
Goubet	Obviousness	1, 4 and 7-10
Goubet in view of Kaiser	Obviousness	1, 4 and 7-10
Gao	Anticipation	1, 4 and 7-10

16. After reviewing the '449 Patent and the prior art, it is my opinion that claims 1, 4, and 7-10 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 '449 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, 7
Compressed Air Source	Plain and Ordinary Meaning	Claims 1, 4, 7-10

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, 4, 7-10
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, 4, 7-10

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, 4, 7-10
Diffusion Unit	Plain and ordinary meaning	Claims 1, 4, 7-10

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 ’449 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 '449 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 '449 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 '449 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 '449 PATENT

A. Priority of '449 Patent

45. The '449 Patent was filed on October 8, 2018, as Application No. 16/154,373 (“the '373 Application”). EX1001, INID Codes (21), (22); *see also* EX1004. The '373 Application is a Continuation-In-Part (“CIP”) of Application No. 15/353,951 (“the '951 Application”), filed on November 17, 2016 (now Patent No. 10,092,918), which is a 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 (60), (63); *see also* EX1005, EX1006.

46. I note that the challenged claims of the '951 and '373 Applications appear to rely on new matter that was only added in the November 17, 2016 application. *Compare* Claims of '449 Patent and accompanying written description and figures, *with* support filed in earlier applications, e.g., EX1005, EX1006.

47. Nevertheless, I have been instructed by counsel to assume for purposes of this Declaration in support of the Petition for *inter partes* review, that the '449 Patent is entitled to a priority date as early as August 29, 2012 (the filing of the Provisional Application). Based on this priority date, all references relied upon in this Declaration are prior art to the '449 Patent.

B. Summary of the '449 Patent Prosecution History

48. The chain of filings of the '449 Patent are discussed above. In addition, I note that a single office action was issued during prosecution of the '449 Patent. EX1004 (non-final rejection mailed July 22, 2019). 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.* The Examiner also found that dependent claims 8-10, and 13 contained allowable

¹ The '918 and '094 Patents are subject to concurrently filed Petitions for *inter partes* review. The '215 Patent was not asserted in the parallel district court proceeding and is not being challenged at this time.

subject matter if rewritten in independent form including all of the limitations of the base claim and any intervening claims and if the double patenting rejections were overcome. *Id.*, pg. 37-39.

49. In response, Patent Owner filed a Terminal Disclaimer with respect to the priority patents and incorporated the allowable subject matter into the independent claim. *Id.*, pgs. 22-29 (Amendment filed October 22, 2019). A Notice of Allowance was then mailed and the '449 Patent ultimately issued on March 10, 2020. *Id.*, pgs. 1, 8-9 (Notice of Allowance mailed on November 15, 2019).

C. Summary of the '449 Patent

50. The '449 Patent is directed to a fluid dispersion assembly that is powered by compressed air and designed to deliver fluids, such as fragrant oils and essential oils, into the air in the form of fluid dispersion. EX1001, Abstract, 1:51-60. The '449 Patent further relates to fluid dispersion assemblies with a diffusion unit in fluid communication with a fluid container and powered by a compressed air source. EX1001, Abstract.

51. The '449 Patent states that the fluid dispersion assembly should generate a fluid dispersion having a “uniform particle size distribution” such that dosing of an airspace with a particular liquid can be predicted within acceptable limits. EX1001, 1:38-43.

52. The diffusion unit of the fluid dispersion assembly at least partially defines a diffusion chamber and includes a diffusion assembly containing an atomizer assembly which, in combination with the diffusion chamber, generates a fluid dispersion from a mixture of compressed air and an operative fluid, such as fragrant oils, essential oils, odor neutralizers, air sanitizers, and the like. EX1001, Abstract.

53. Figure 1 illustrates the fluid dispersion assembly 10, which “includes a diffusion unit 100 having oppositely disposed ends,” and which “at least partially defines a diffusion chamber 112.” *Id.*, 3:31-35.

54. “The diffusion chamber is structured so as to facilitate formation of a fluid dispersion comprising a plurality of substantially uniform droplets prior to discharge from the diffusion chamber.” EX1001, 1:56-60.

55. “The diffusion assembly comprises an atomizer assembly, which in one embodiment comprises an inlet channel, a mixing chamber, and an atomizer exhaust channel, wherein the inlet channel is interconnected to the compressed air source and the mixing chamber comprises a fluid inlet disposed in fluid communication with the fluid in the fluid container.” EX1001, 2:31-39.

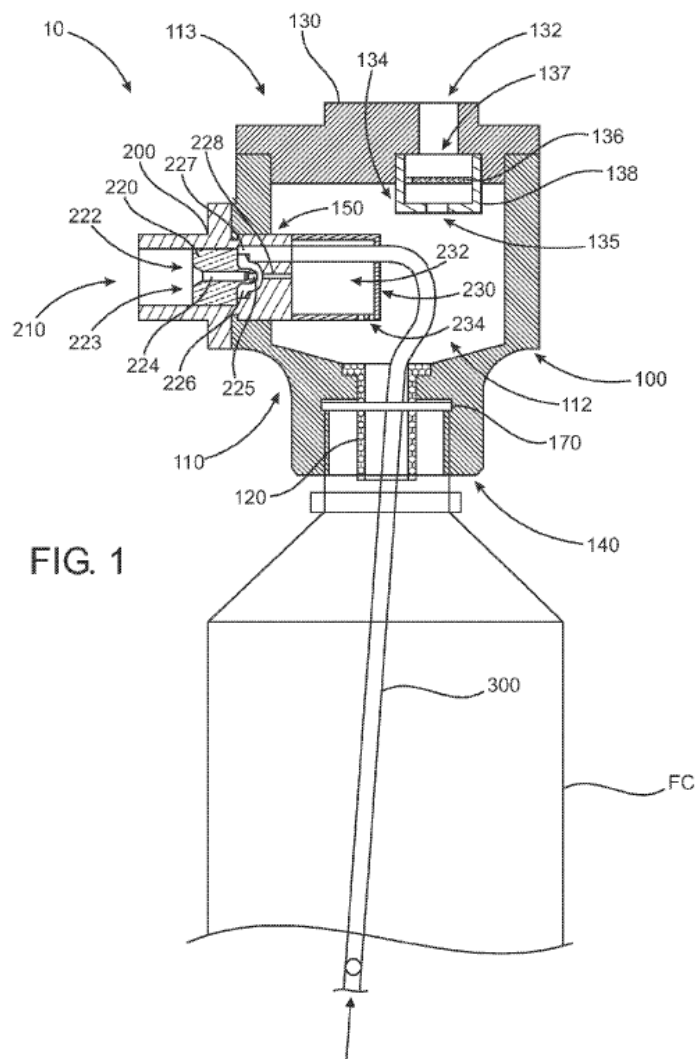


FIG. 1

EX1001, FIG. 1

56. I note that the '449 Patent emphasizes a need for a fluid dispersion assembly that reduces the amount of noise generated during operation. *See, e.g.*, EX1001, 1:35-43. The '449 Patent discloses various noise dampening features, such as a silencer assembly or a suppression assembly, as illustrated in figure 1 above and figures 2 and 3 below. *See, e.g., id.*, 6:5-30 (suppression assembly), 6:31-51 (silencer assembly).

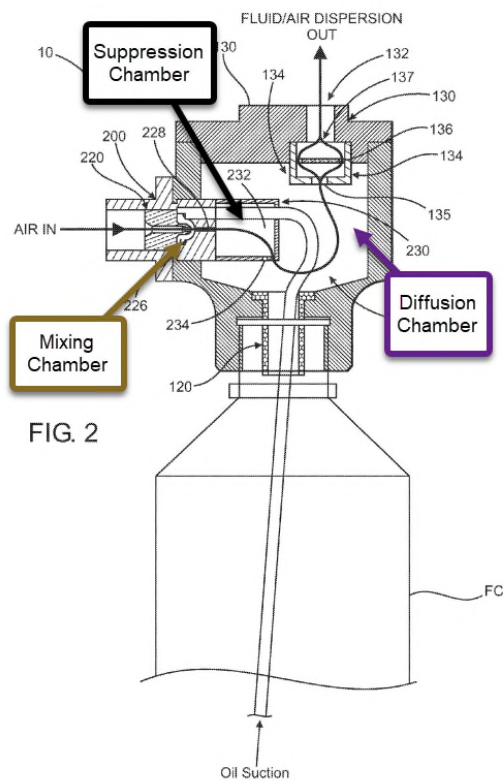


FIG. 2

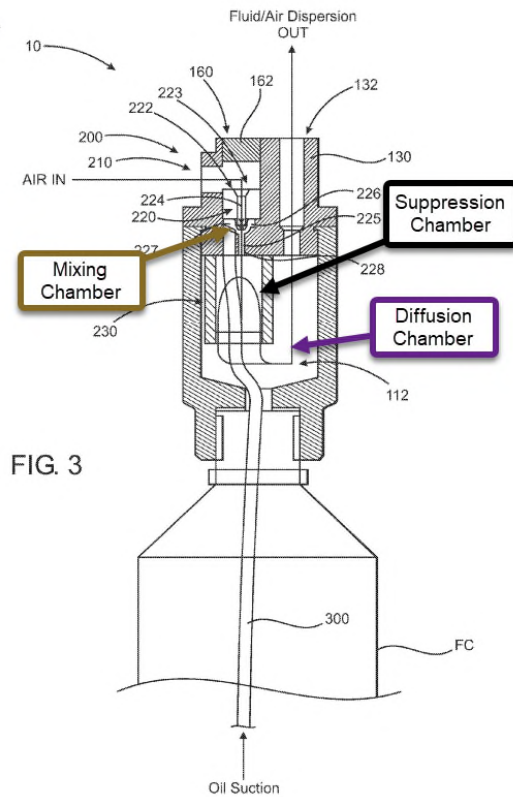


FIG. 3

EX1001, FIGS. 2 and 3 (Colorized and Annotated)²

57. Figure 6 illustrates another claimed embodiment where “the diffusion assembly 200 comprises an air inlet 210 and an atomizer assembly 220. The atomizer 220 comprises an atomizer air inlet channel 22, a mixing chamber 226, and an atomizer exhaust aperture 228.” EX1001, 10:19-23. “The atomizer air inlet channel 222 is interconnected to the compressed air source via the air inlet 210,” and “the atomizer air inlet channel 222 includes an inlet aperture 223 and an outlet aperture 223”, as may be seen in FIG. 6.” *Id.* 10:23-27.

² All annotations in this Declaration reflect my opinions and were prepared with the assistance of Petitioner’s counsel to help visualize my opinions.

58. In this embodiment the atomizer exhaust aperture 228'' replaces the atomizer exhaust channel disclosed in previous embodiments.

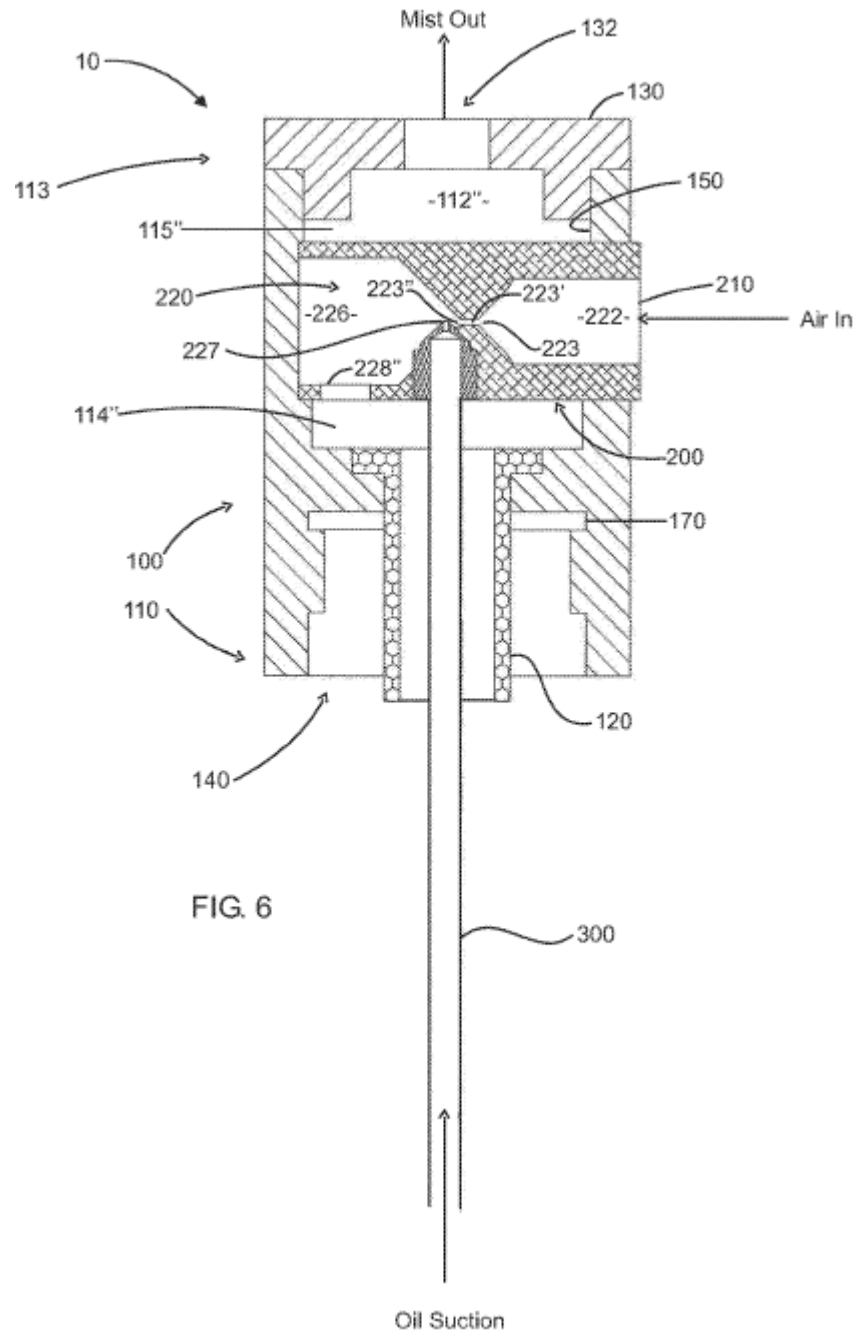


FIG. 6

EX1001, FIG. 6

59. It is noteworthy that although specification of the '449 Patent emphasizes the noise dampening features of the fluid dispersion assembly, none of the challenged claims recite any such feature. EX1001, 15:24-16:29. Instead, the challenged claims are directed to a fluid dispersion assembly that forms a fluid dispersion. *See* Appendix to Petition.

60. In this regard and as further explained below, I note that the Parties have stipulated that the term “fluid dispersion” should be construed to mean a “mixture of operative fluid in air comprising a plurality of substantially uniform droplets (having substantially the same diameter) of the operative fluid dispersed throughout the air.” EX1018, Exhibit A.

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 '449 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 '449 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, pg. 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.*, pg. 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.*, pg. 7 (“aerosol”).

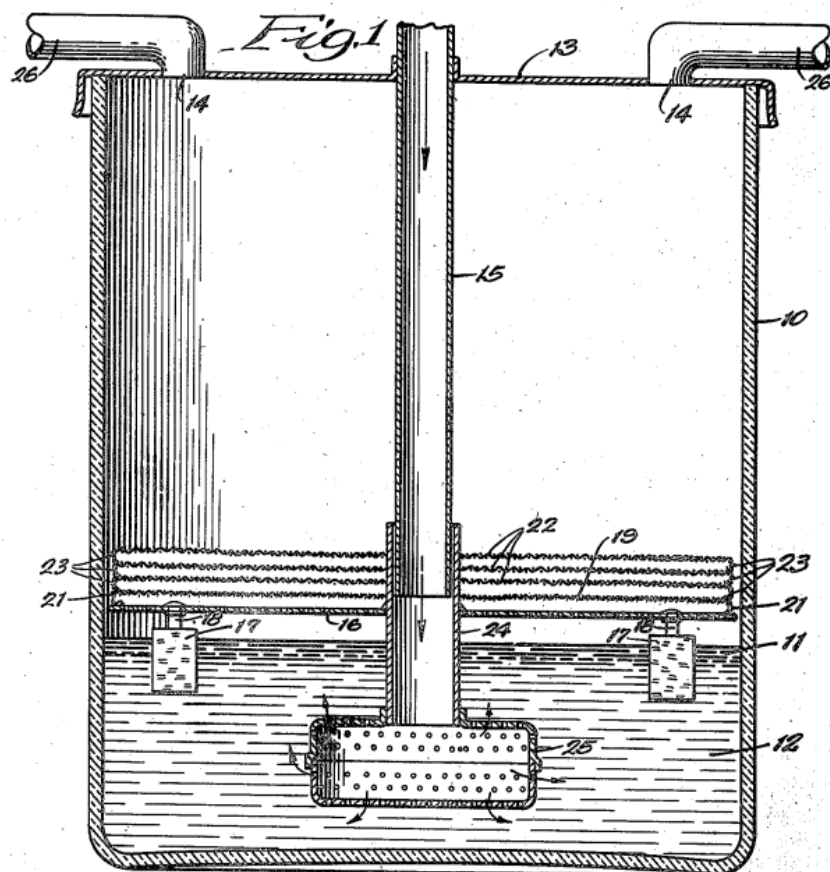
64. A homogenous suspension exists when solid particles or liquid droplets are distributed uniformly within the continuous phase. *See, e.g., id.*, pg. 240 (“mixture”). What this means is that any sample taken from this system is fully representative of the suspension. *See generally, e.g.*, EX1038. 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.

2,405,494

Filed March 29, 1944



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.” *Id.*

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 '449 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 improved 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.*, 1:33-35.

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 ’449 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 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 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 '449 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 '449 Patent and asserted prior art references constitute perforated-element mufflers as described in the Noise Handbook. EX1027, 301.

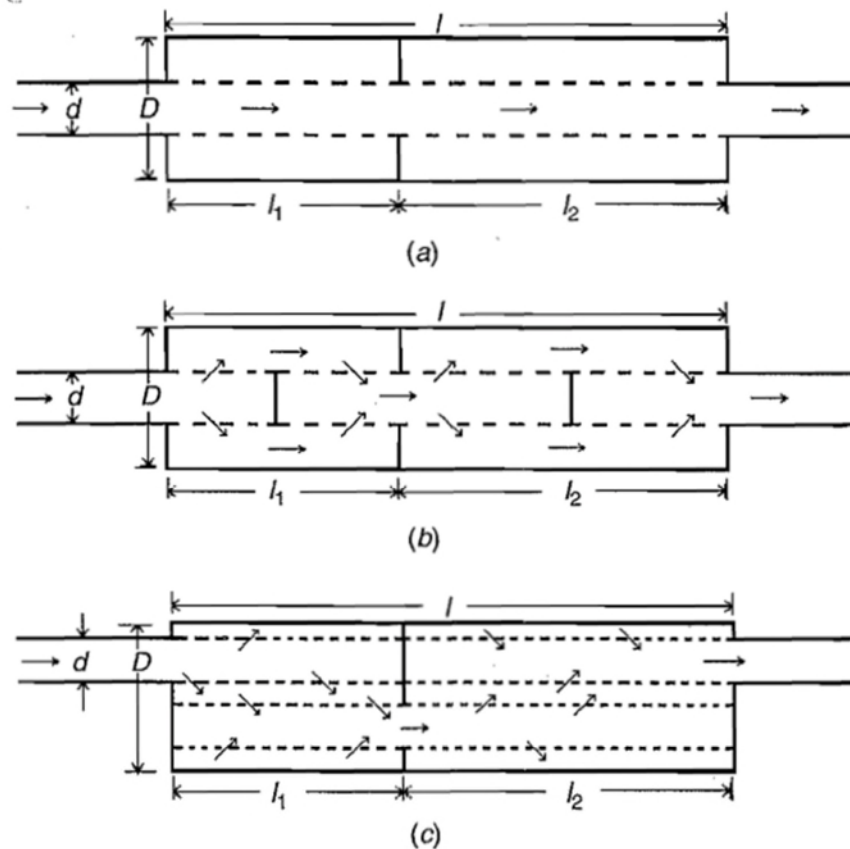


FIGURE 9.11 Schematic of the two-chamber configurations of three types of perforated-tube mufflers: (a) Concentric-tube resonator; (b) plug muffler; (c) three-duct cross-flow muffler.

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 sections 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 ’449 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 '449 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 '449 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.

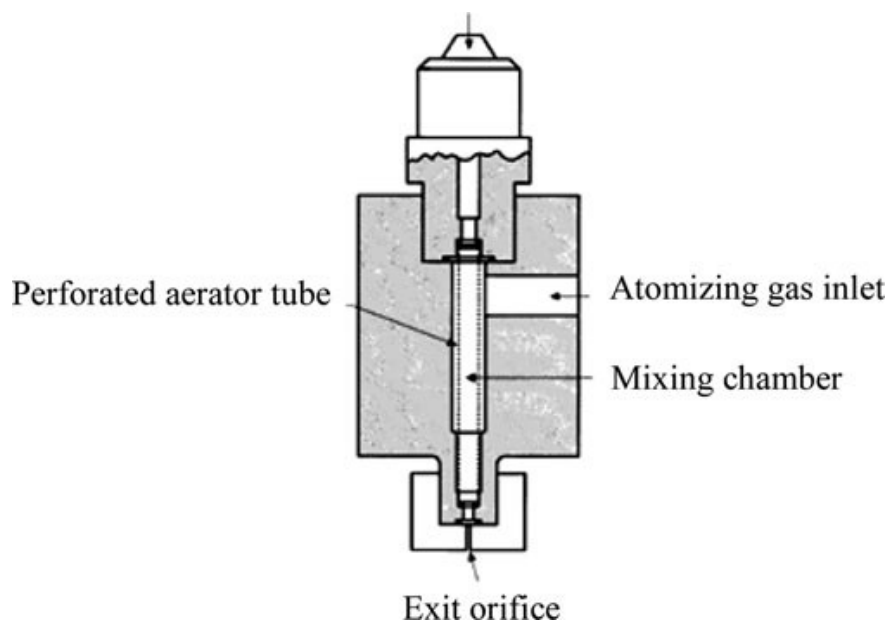
83. "[T]he instability and breakup of liquid jets into drops," as is generally discussed and claimed in the '449 Patent, "has been a subject of interest since the early nineteen century and has continued to this date." EX1028, pgs. 3-4.

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 '449 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, pg. 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.*, pg. 500.

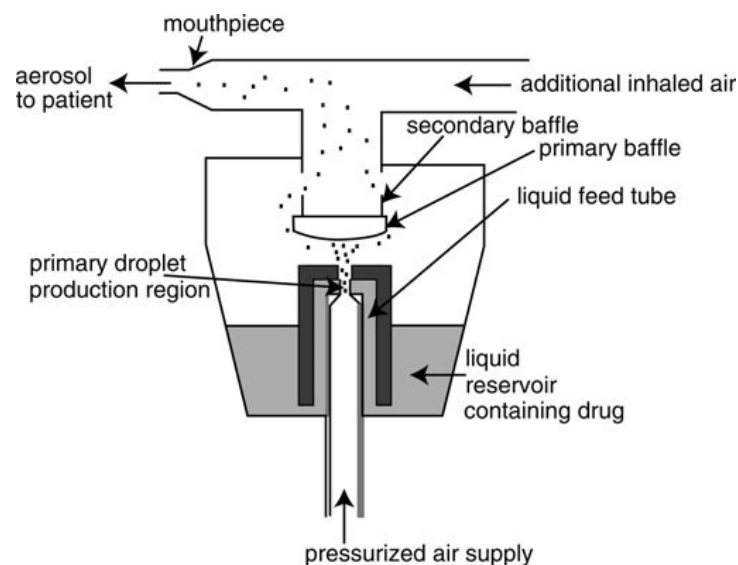
85. The Handbook describes that “gas and liquid can be brought in contact either within the nozzle (internal mix) or outside of the nozzle (external mix). In addition, nozzles can be categorized based on the flow rate of the atomizing gas and the way the gas is brought in contact with the liquid.” *Id.*, pg. 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.*, pg. 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, pg. 903.



EX1028, Fig. 41.3 (Schematic of jet nebulizer)

88. A POSITA would know that droplet separation methods, like that disclosed in the '449 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 '449 Patent and asserted prior art references, including gravity settling and inertial impaction. *See* EX1029, pg. 27 (14-84). The latter “employs direct impact and inertial forces between particles, the gas streamlines, and target bodies to provide capture.” *Id.*

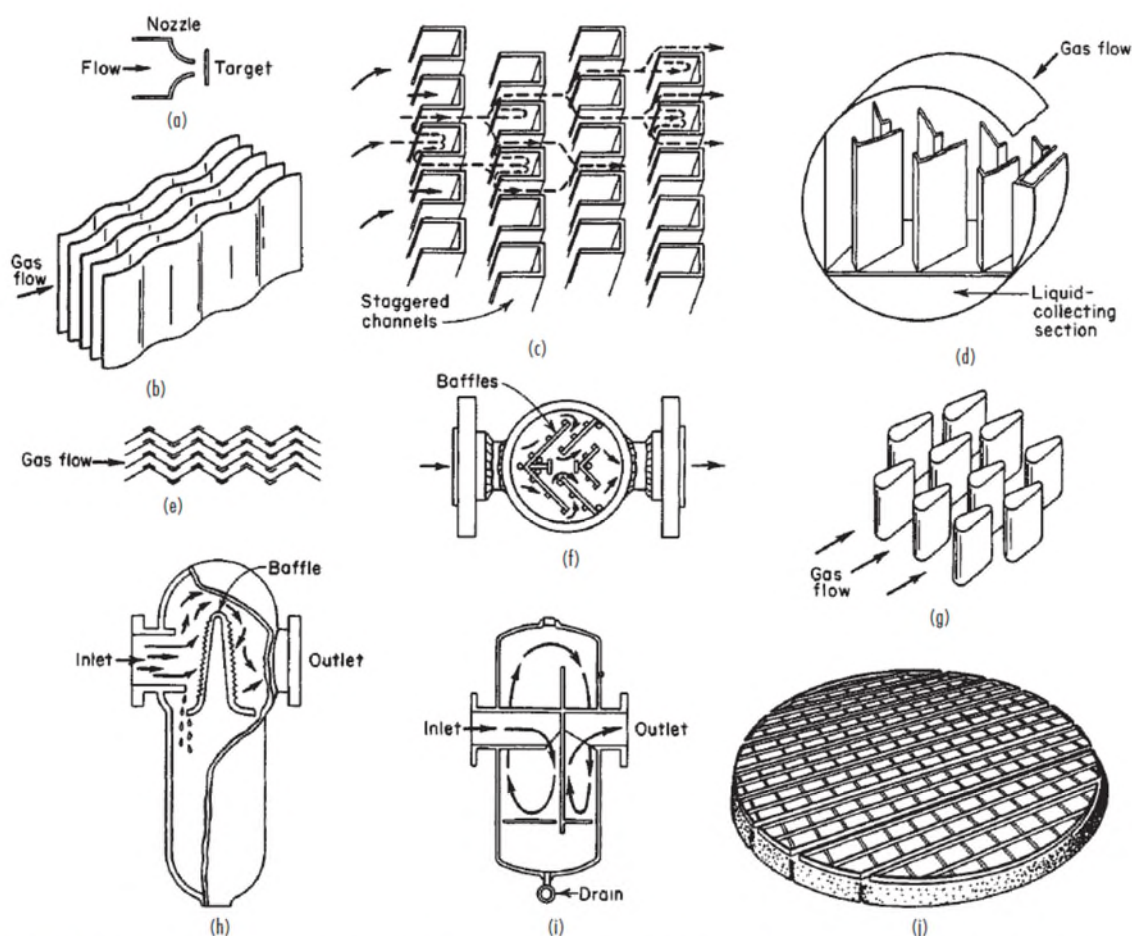


FIG. 14-110 Typical impingement separators. (a) Jet impactor. (b) Wave plate. (c) Staggered channels. (*Blaw-Knox Food & Chemical Equipment, Inc.*) (d) Vane-type mist extractor. (*Maloney-Crawford Tank and Mfg. Co.*) (e) Peerless line separator. (*Peerless Mfg. Co.*) (f) Strong separator. (*Strong Carlisle and Hammond.*) (g) Korbate 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, pg.

27 (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.*

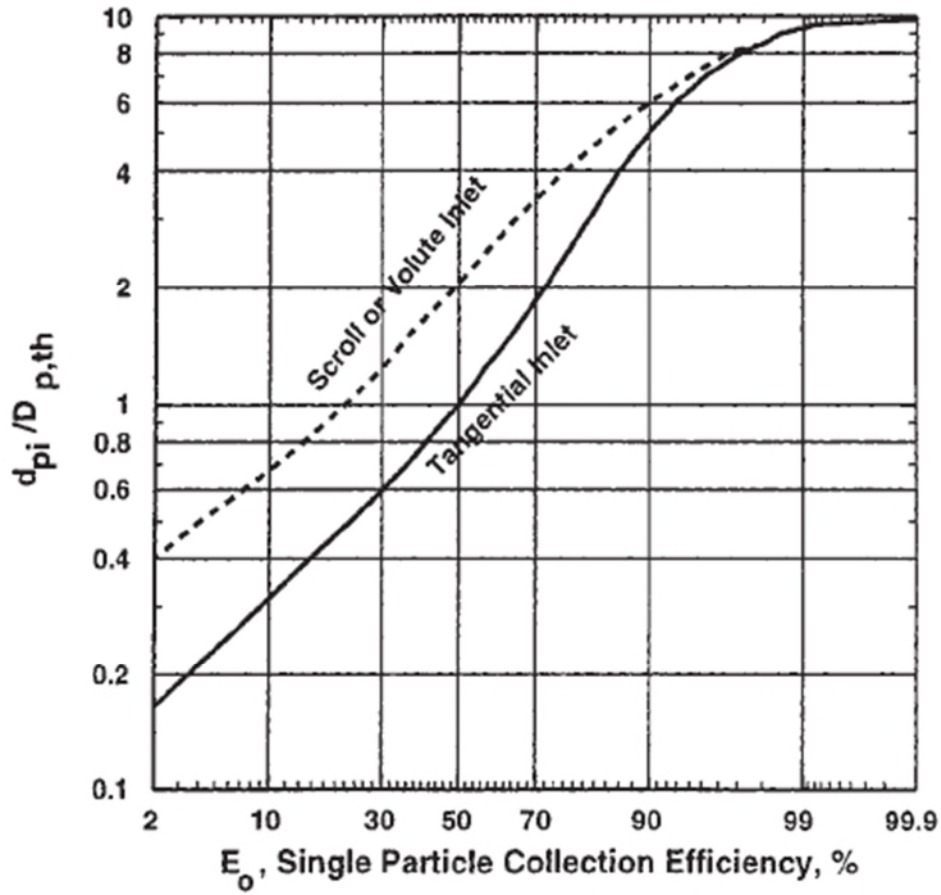


FIG. 17-39 Single particle collection efficiency curve. (Courtesy of PSRI, Chicago.)

EX1029, FIG. 17-39

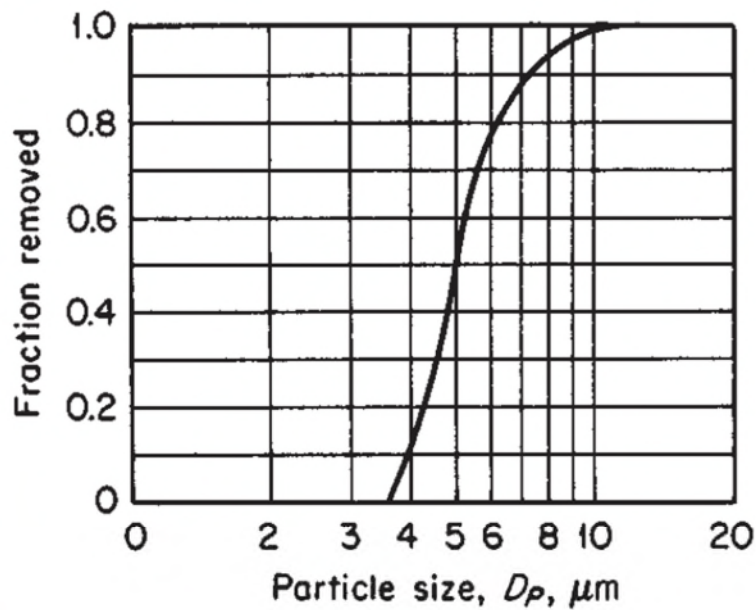


FIG. 14-114 Collection efficiency of Karbate line separator, based on particles with a specific gravity of 1.0 suspended in atmospheric air with a pressure drop of 2.5 cm water gauge. (*Union Carbide Corporation Cat. Sec. S-6900, 1960.*)

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

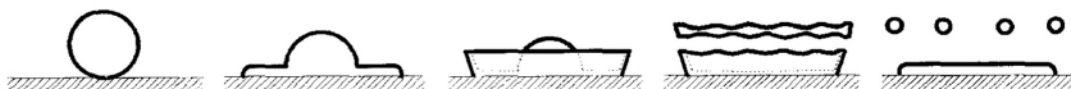
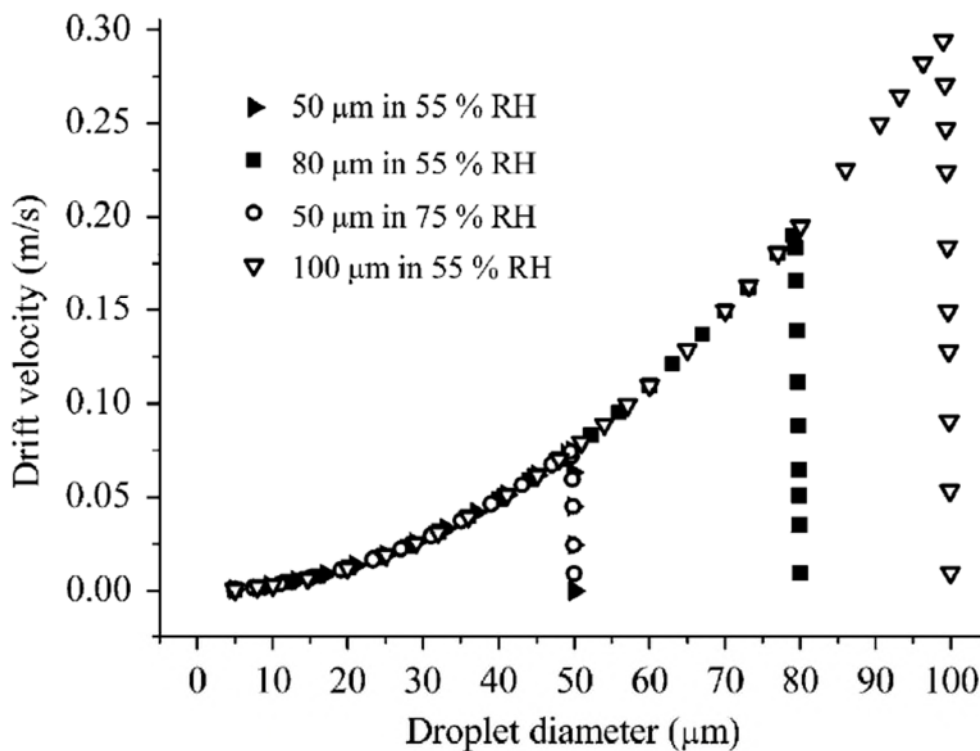


Figure 8. Schematic view of the splashing process.

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.



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.

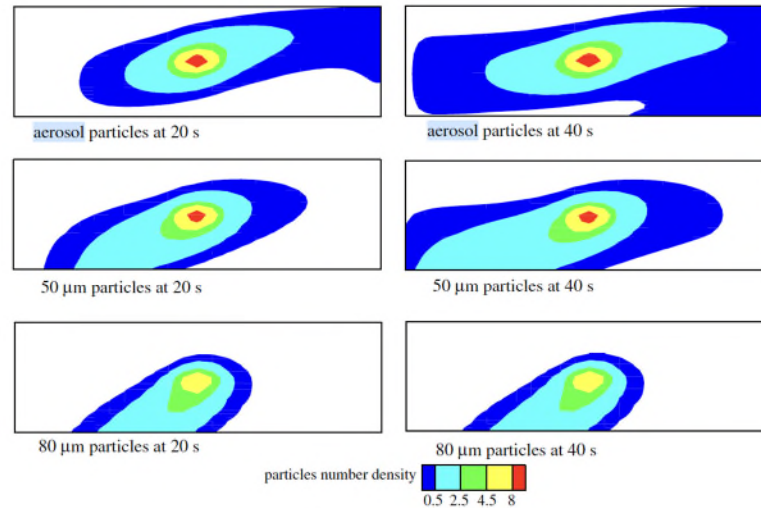


Fig. 4. Distribution of solid particles in the central X plane of the test room at 20 and 40 s after the particles are released at the room center. For top figures, "aerosol particles" refer to those neutral particles without gravitational settling.

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 ’449 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. For example, Chinese Patent No. CN 201832737 U to Xiaoyang Gao (“Gao”), titled Atomizer for Atomizing Essence or Essential Oil and published on May 18, 2011, discloses a fluid dispersion device that can effectively maintain the natural aroma of essence and essential oil; in addition, the atomized particles are finer and more uniform, the aroma is more uniform, and the aroma diffusion area is large. *See* EX1012 and EX1013, INID Codes (10), (45), (54), (57), (73).³

99. Gao teaches that the particles in fluid dispersion devices produced by the heating method are large and not uniform, and thus easily adhere to pipes and

³ All citations to Gao herein are to the certified translation, EX1013, unless otherwise noted.

other objects. EX1013, ¶ [0004]. (“The particles produced by the heating method are large and not uniform, and they are very easy to adhere to the air conditioning pipes and other objects. As a result, the air conditioning filter may be blocked after a long time period of use.”).

100. Thus, an object of Gao is to provide an atomizer for atomizing essence or essential oil, “the atomizer adopts a cold atomization mode, does not require heating, can effectively maintain the natural aroma of essence and essential oil; in addition, the atomized particles are finer and more uniform, the aroma is more uniform, and the aroma diffusion area is large.” EX1013, ¶ [0007].

101. Gao teaches that the “finer the atomized particles, the more uniform the smell. When the atomized particles are ultra-fine mist, they will not adhere to the pipes and filters.” EX1013, ¶ [0015].

102. Figure 1 of Gao illustrates that the fluid dispersion is created in a diffusion chamber prior to discharge into the surrounding airspace.

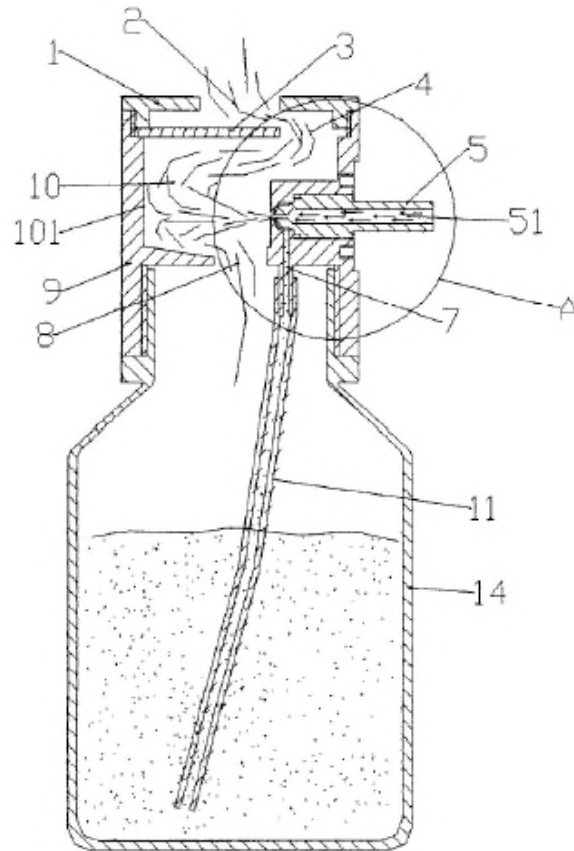


FIG. 1

EX1013, FIG. 1.

103. 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].

104. 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.

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

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

106. 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 '449 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, ¶ [0025] and FIG. 6 (reproduced below).

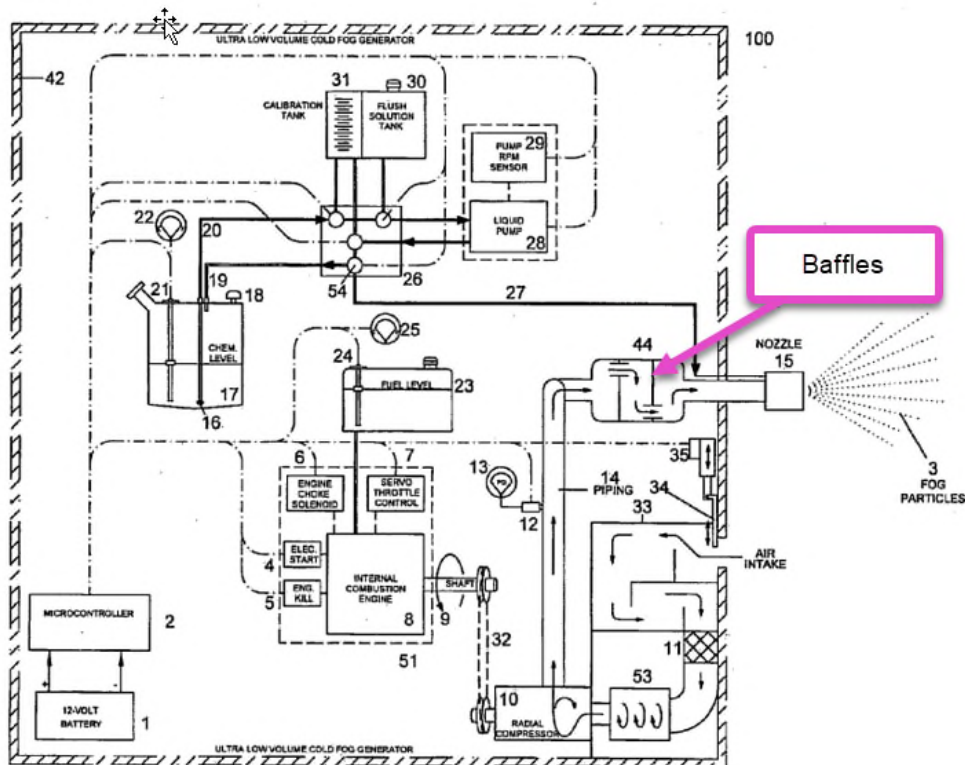


FIG. 6

107. 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 '449 Patent.

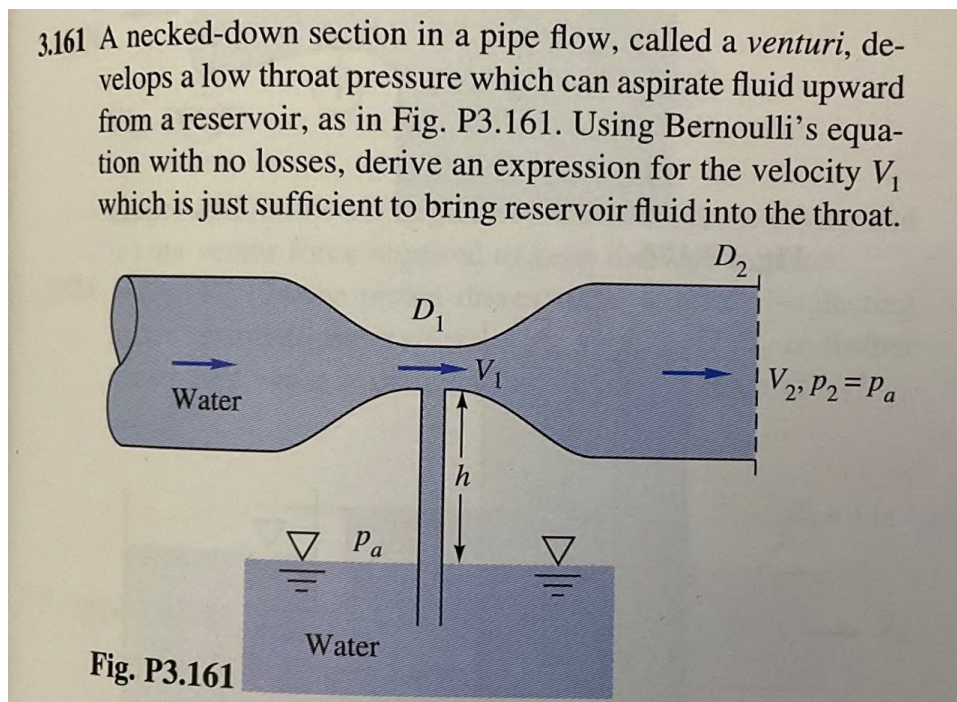
4. Venturi Effect

108. 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.

109. The fundamental physics describing the so-called "venturi-effect" referenced in the '449 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.

110. The venturi effect to aspirate fluid upward from a reservoir as described in the '449 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

111. 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.

112. 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 226.” EX1001, 5:46-54.

5. Final Remarks

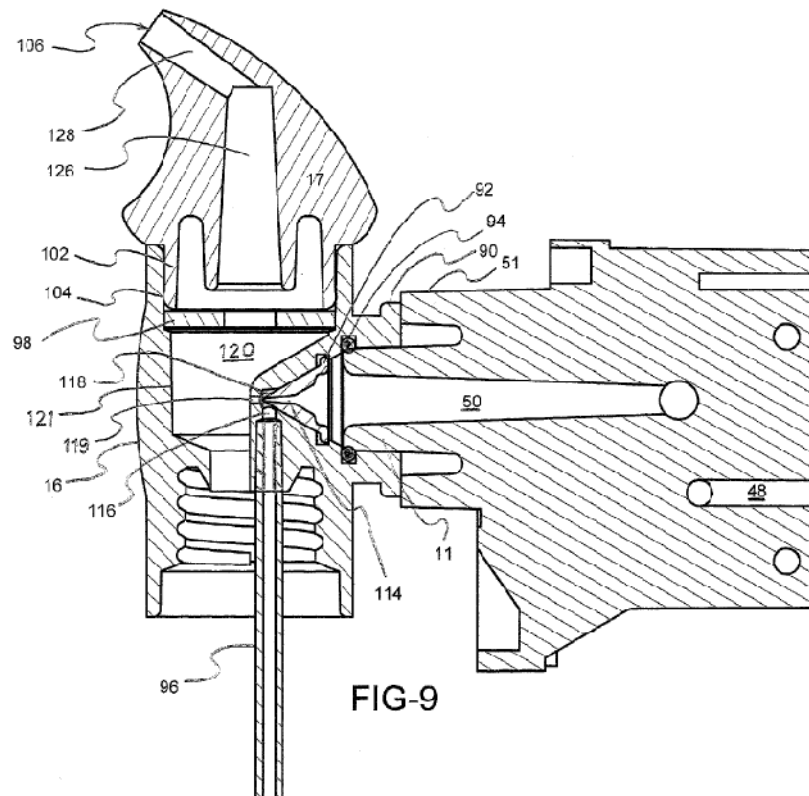
113. A POSITA would have been well aware of these concepts as of August 29, 2012, and they would have formed part of a POSITA’s background knowledge. I have applied this background knowledge in providing my opinions below on what is obvious to a POSITA in view of the teachings of the prior art.

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.

114. Sevy (US 2010/0084484) was published on April 8, 2010, and, thus, I understand is prior art to the '449 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 id.*, 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

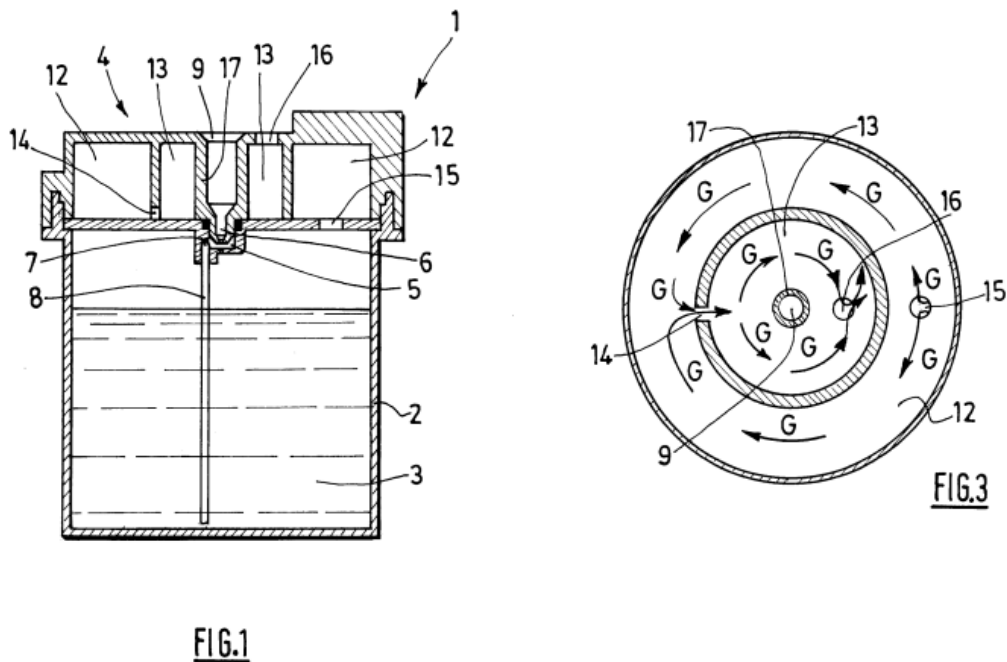
115. French Patent FR2886160A1 to Didier Goubet (“Goubet”) is titled Essential Oil Diffuser. EX1015, EX1016 (certified translation of Goubet), INID Codes (54), (71). Goubet was published on December 1, 2006, and, thus, I understand is prior art to the ’449 Patent. EX1016, INID Code (43).

116. 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). 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.*

117. 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).

118. 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.*



EX1016, FIGS. 1 and 3

119. 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.

120. 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.

121. 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.

122. 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

123. Chinese Patent No. CN 201832737 U to Xiaoyang Gao (“Gao”) is titled Atomizer for Atomizing Essence or Essential Oil. EX1012 and EX1013 (certified translation of Gao). Gao was filed on August 4, 2010, and published on May 18,

2011, and, thus, I understand is prior art to the '449 Patent. EX1013, INID Codes (22), (45), (54), (73).

124. Gao generally relates to the technical field of atomizers, in particular to an atomizer used for atomizing essence or essential oil. EX1013, ¶ [0001]. Gao relates to an atomizer for atomizing essential oil and includes a baffle plate 3, which as shown below in FIG. 1, disrupts the flow of fluid dispersion prior to being discharged through outlet 2.

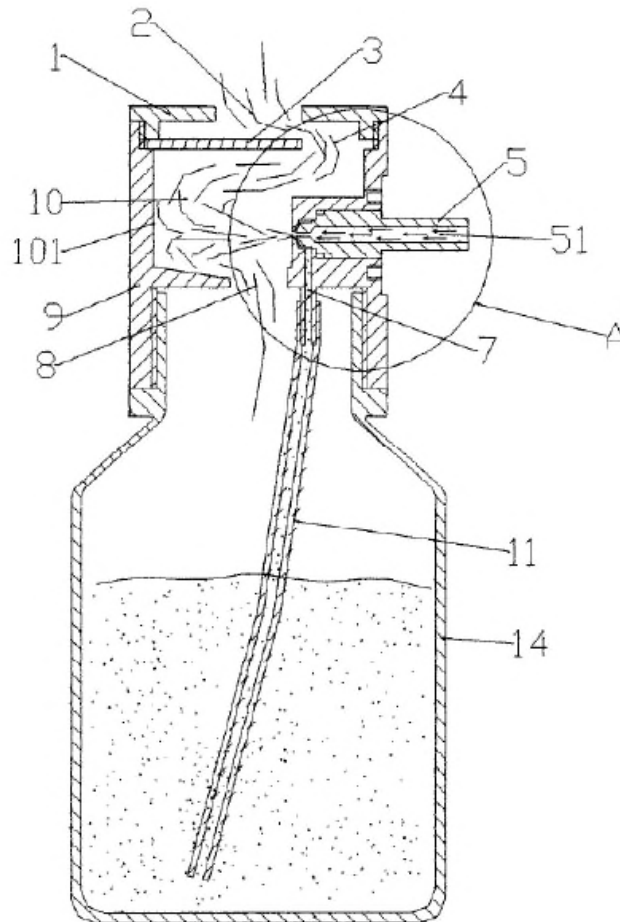


FIG. 1

EX1013, FIG. 1

125. More specifically, Gao teaches an atomizer for atomizing essence or essential oil, comprising (i) an atomizer body having a first cavity and a second cavity, (ii) an atomizing gas outlet on a top wall of the first cavity, (iii) a reflux hole on a bottom wall of the first cavity, (iv) a baffle on an upper part of the first cavity forming a top part cavity and a lower part cavity, (v) a through hole between the top part cavity and the lower part cavity, and (vi) a gas flow spray hole on a side wall of the lower part cavity. EX1013, Abstract. Gao further teaches that the lower part cavity is in communication with a bottom part of the second cavity through the gas flow spray hole, a gas flow nozzle is fixed in the second cavity, a gap is arranged between the gas flow nozzle and a bottom wall of the second cavity, an atomizing cavity is formed between the gas flow nozzle and the bottom wall of the second cavity, a liquid pipe is further provided on the atomizer body, and the liquid pipeline is in communication with the atomizing cavity. EX1013, Abstract.

126. Gao teaches the need for providing a fresh and natural scent to enclosed areas, and discusses several existing devices, including those that use a heating method to gasify essence and essential oil, those that air to atomize fluids, and those that use a small essential oil atomizer. EX1013, ¶ [0002].

127. Gao explains some of the disadvantages with these existing technologies. For example, Gao explains that, in the case of using electric heating, the essences or essential oils may differ in smell from their original scent because of

the heating process, and the heating of some oils may generate harmful gasses if overheated. EX1013, ¶ [0004]. Moreover, the particles produced by the heating method are large and non-uniform, causing them to easily adhere to air conditioning pipes and the like. EX1013, ¶ [0004].

128. In the case of the air to fluid atomization, the particles have a large range in size, generally between 1-50 microns, and are non-uniform, again causing them to easily adhere to objects like air conditioning pipes. EX1013, ¶ [0005].

129. Thus, Gao provides an atomizer a cold atomization type device that does not require heating and effectively maintains the natural aroma of essence and essential oil, while also providing atomized particles that are finer and more uniform than prior devices. EX1013, Abstract; [0007].

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

130. Kaiser was published in 2003 (several years before the earliest priority date of the '449). EX1014, Cover. Therefore, Kaiser is prior art to the '449 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 '449 PATENT ARE UNPATENTABLE

A. GROUND 1: Claims 1, 4, and 7-10 Are Unpatentable Under 35 U.S.C. § 103 as Obvious Over Sevy

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:

131. Patent Owner has contended that the preamble is not limiting. *See* EX1018, Exhibit B. However, to the extent the preamble is limiting, it is my opinion that it is taught by Sevy.

132. Sevy is titled and directed to an “Integrated, Essential-Oil Atomizer” for distributing essential oils into the atmosphere of a room. *See* EX1009, ¶ [0004]; *see also* EX1009, FIG. 1. The apparatus, as shown in annotated FIG. 1 below, includes an atomizer 16 that may be secured to a reservoir 18, and a director 17 for discharging atomized liquids into the air. EX1009, ¶ [0041].

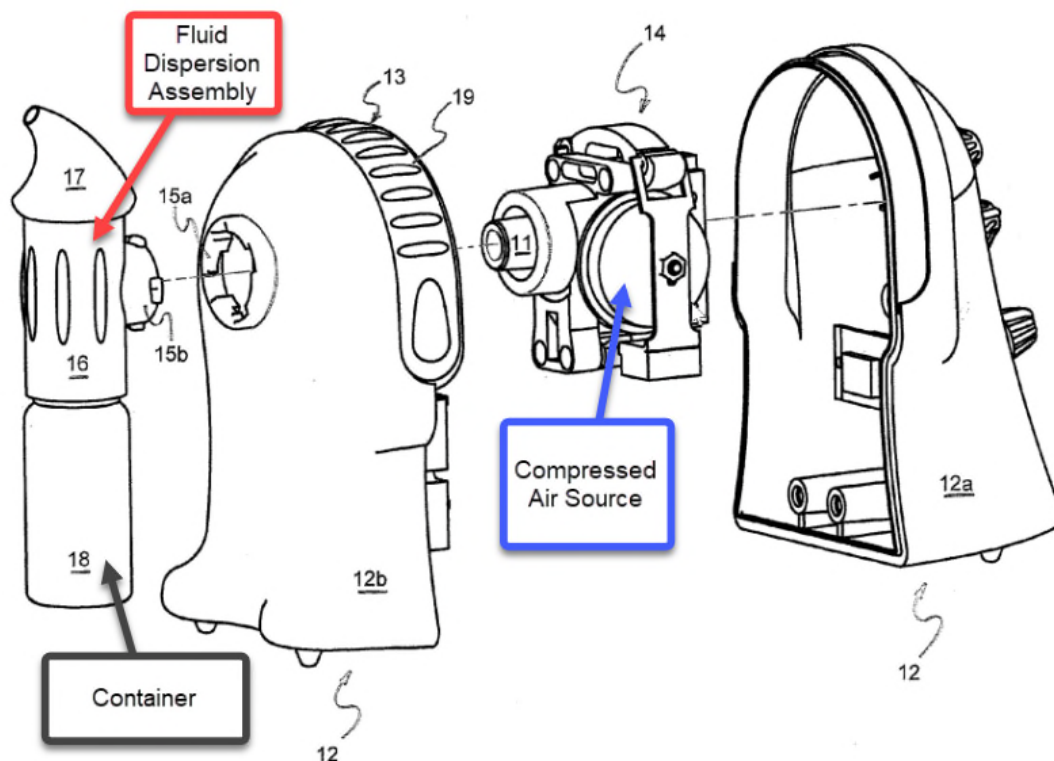


FIG-1

EX1009, FIG. 1

133. Sevy's essential oil apparatus is configured "to discharge atomized liquids out the director 17." EX1009, ¶ [0041]. "In the illustrated embodiment, the atomizer 16 may secure such as by threads or the like to a reservoir 18." EX1009, ¶ [0041]. Further, the apparatus is designed to "draw liquids from a reservoir and distribute them through an eductor into the atmosphere." EX1009, ¶ [0010].

134. Thus, it is my opinion that a POSITA would understand that Sevy's fluid dispersion assembly operatively engages a container (*e.g.*, reservoir 18) because the atomizer 16 is secured by threads to reservoir 18 and, when in operation,

the apparatus draws liquids from reservoir 18 and distributes them through eductor 17.

135. Sevy also recites that “[w]ithin the housing 12, may be located a pump 14.” EX1009, ¶ [0041]. “Air from the pump 14 drives atomization in the atomizer 16 to discharge atomized liquids out the director 17” and into the atmosphere. EX1009, ¶ [0041].

136. Thus, it is also my opinion that a POSITA would understand that Sevy’s fluid dispersion assembly operatively engages a compressed air source (*i.e.*, pump 14) because air from the pump 14 drives atomization, and these operative engagements are meant to generate and discharge a fluid dispersion into a surrounding airspace because the air from the pump drives atomization in the atomizer 16 to discharge atomized liquids.

137. Sevy’s pump 14 is a motorized diaphragm type pump that “compress[es] air to a pressure greater than ambient pressure.” EX1009, claim 16 and ¶¶ [0020], [0028], [0041], [0056] and [0057]. It is well understood that a diaphragm pump compresses air to a pressure greater than ambient pressure. Thus, it is my opinion that a POSITA would understand motorized pump 14 to be a compressed air source under Patent Owner’s proposed construction because pump 14 compresses air to a pressure greater than ambient pressure.

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

138. It is my opinion that Sevy discloses or renders obvious a fluid dispersion assembly comprising a diffusion unit at least partially defining an enclosed diffusion chamber.

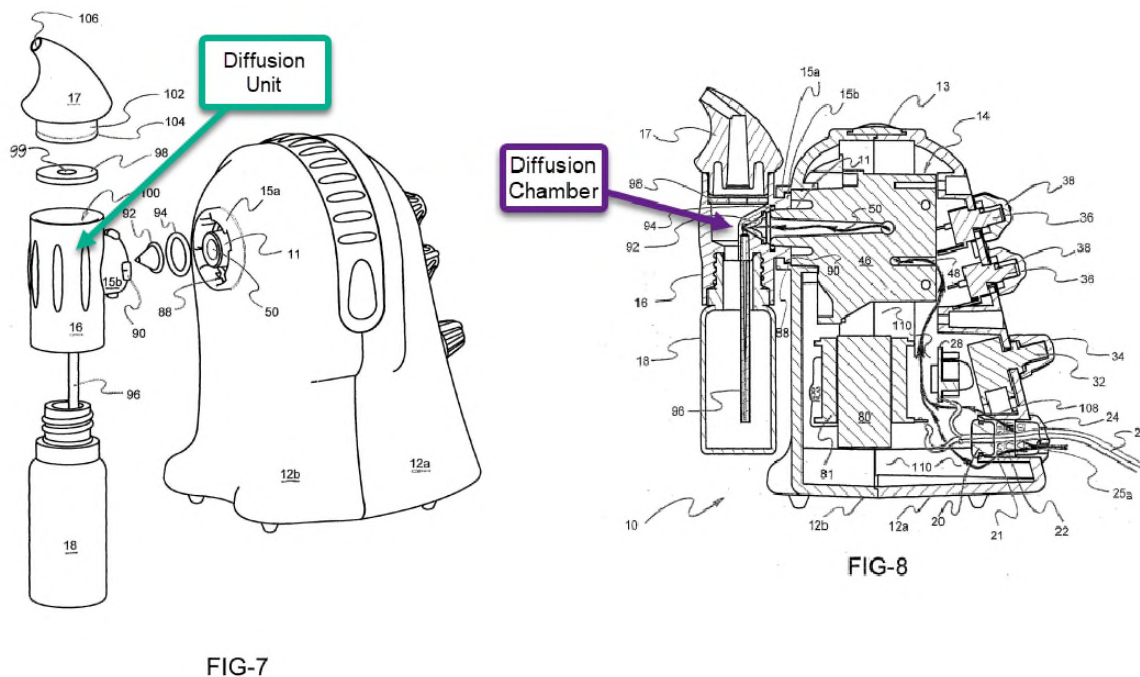
139. Sevy teaches that the wall of atomizer 16 at least partially defines a chamber. *See* EX1009, FIGS. 7 and 8 (reproduced below). Furthermore, Sevy teaches that droplets educted from nozzle 92 “dash against the wall 121” of atomizer 16 and cause additional atomization. *See* EX1009, ¶ [0082]. As a result, the relatively small, atomized droplets become entrained in the air within atomizer 16 before being discharged through director 17 and into the surrounding airspace. *See* EX1009, ¶ [0082].

140. A POSITA would understand, as I explained above in the background, that particles entrained within an airflow will spontaneously diffuse within the area in which they are constrained. Accordingly, Sevy’s atomizer 16 corresponds to the claimed diffusion unit.

141. In addition, FIGS. 7 and 8 of Sevy below depict the wall of atomizer 16 at least partially defining a chamber. The lower end of atomizer 16 is secured to reservoir 18, for example, via threads or a similar connector, and director 17

“encloses the atomizer 16 or the top thereof.”⁶ EX1009, ¶¶ [0041], [0050]. Thus, Sevy’s diffusion chamber is enclosed.

142. It is thus my opinion that Sevy’s atomizer 16 corresponds to the claimed diffusion unit, and that atomizer 16 at least partially defines a diffusion chamber (*e.g.*, the chamber of atomizer 16).



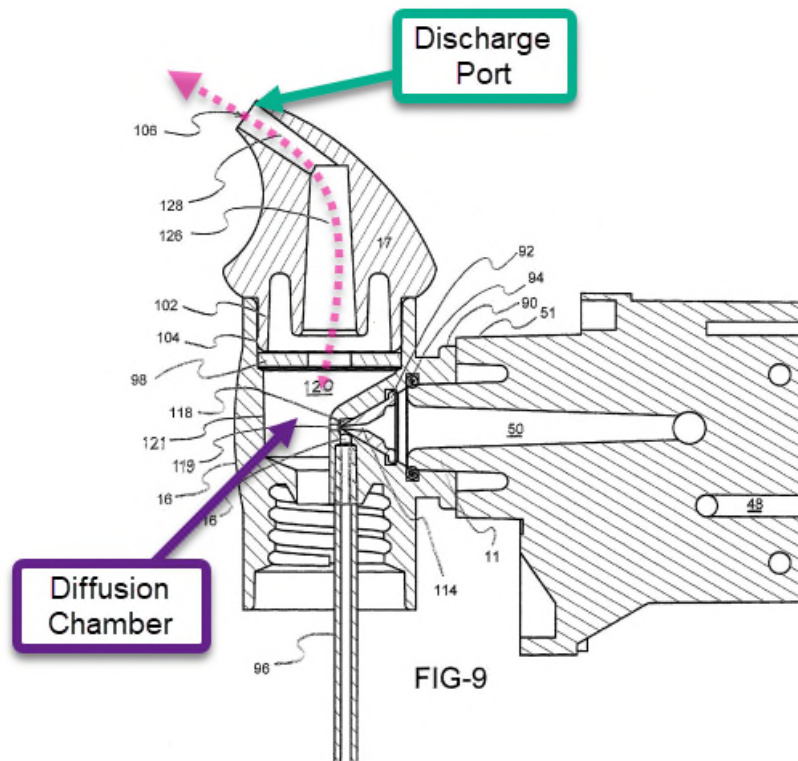
EX1009, FIGS. 7 and 8.

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

⁶ I note that Sevy interchangeably uses the terms “director” and “distributor” to refer to feature 17. I use the term “director” to avoid confusion and clarify the terms refer to the same feature.

143. It is my opinion that Sevy discloses or renders obvious a fluid dispersion assembly comprising a discharge port disposed in fluid communication between said diffusion chamber and the surrounding airspace.

144. Sevy teaches a port 106 formed in the director/eductor 17 through which atomized liquid droplets are passed. *See* EX1009, ¶ [0072]. More specifically, “[a]ir from the pump 14 drives atomization in the atomizer 16 to discharge atomized liquids out of the director 17.” EX1009, ¶ [0041]; *see also* ¶ [0010] (reciting the apparatus is designed to “draw liquids from a reservoir and distribute them through an eductor into the atmosphere”). FIG. 9 of Sevy illustrates the droplet flow. In the modified and annotated FIG. 9 below, the light pink arrow depicts droplets flowing from the diffusion chamber (*e.g.*, the of atomizer 16) through the discharge port 16 of eductor 17 and into the surrounding airspace.



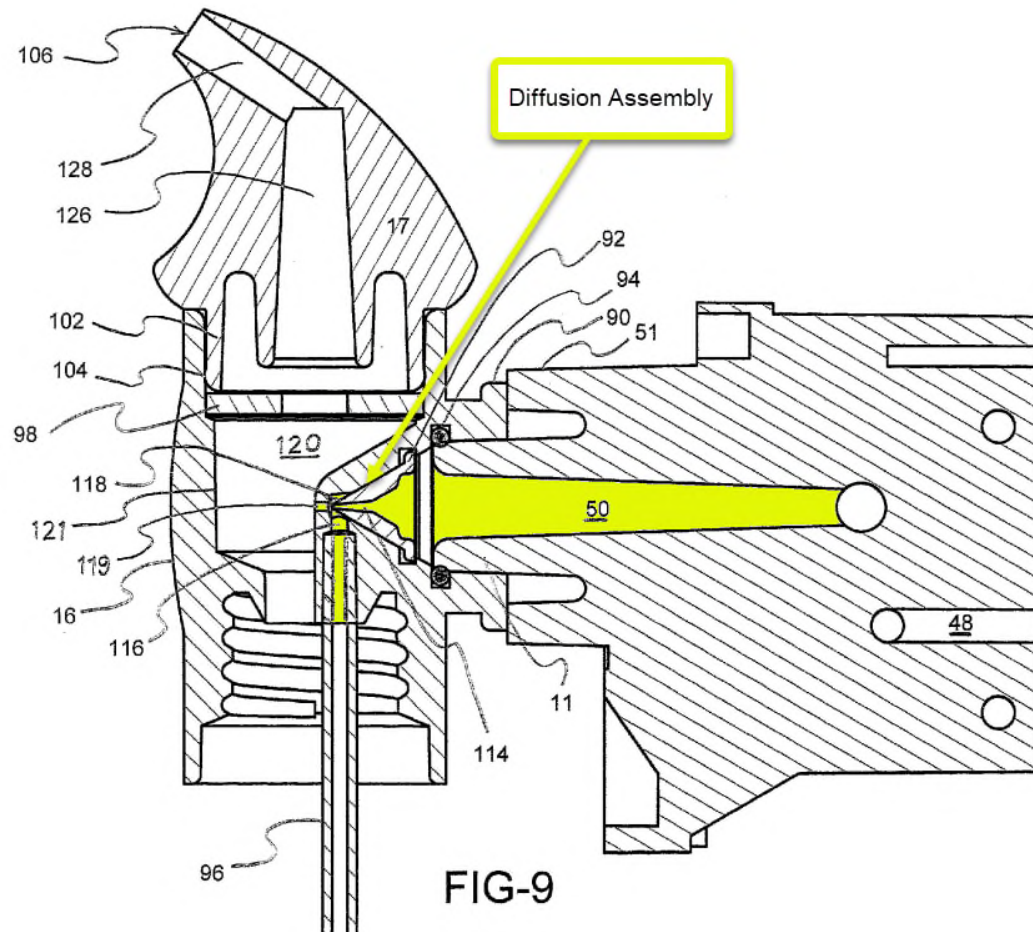
EX1009, FIG. 9

145. It is thus my opinion that a POSITA would understand that, based on FIG. 9 and the above teachings, Sevy's port 106 corresponds to a discharge port, and that such discharge port is disposed in fluid communication between the diffusion chamber (*e.g.*, the chamber of atomizer 16) and the surrounding airspace (*e.g.*, the ambient air).

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

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

147. The '449 Patent explains that “the diffusion assembly 200 comprises an air inlet 210 and an atomizer assembly 220.” EX1001, 5:5-6. It is my opinion that Sevy teaches a structure that corresponds to the diffusion assembly. Specifically, Sevy discloses an air inlet (*e.g.*, passage 50) that passes air from pump 14 to atomizer 16. See EX1009, ¶ [0079]. Sevy explains that “[t]he momentum of the jet of air ... creates a localized vacuum at the top of the siphon 96, drawing liquid up the siphon 96 from the reservoir 18, and transferring momentum into that liquid to atomize it and throw it into the atomizer 16.” EX1009, ¶ [0067]; *see also* FIG. 9. Sevy’s diffusion assembly (*e.g.*, the combination of the air inlet (*e.g.*, passage 50) and the atomizer assembly that atomizes the liquid) is shown in yellow in annotated FIG. 9 below.



EX1009, FIG. 9

148. Because Sevy's diffusion assembly expels atomized droplets into the chamber of atomizer 16 (*e.g.*, the diffusion unit), it is my opinion that a POSITA would understand Sevy to teach a diffusion assembly disposed in operative engagement with the diffusion unit. EX1009, ¶ [0067].

1[D] wherein said diffusion assembly comprises an atomizer assembly, said atomizer assembly comprising an atomizer air inlet channel, a fluid inlet, a mixing chamber, and an atomizer exhaust aperture, and

149. It is my opinion that Sevy discloses or renders obvious said diffusion assembly comprising an atomizer assembly, said atomizer assembly comprising an atomizer air inlet channel, a fluid inlet, a mixing chamber, and an atomizer exhaust aperture.

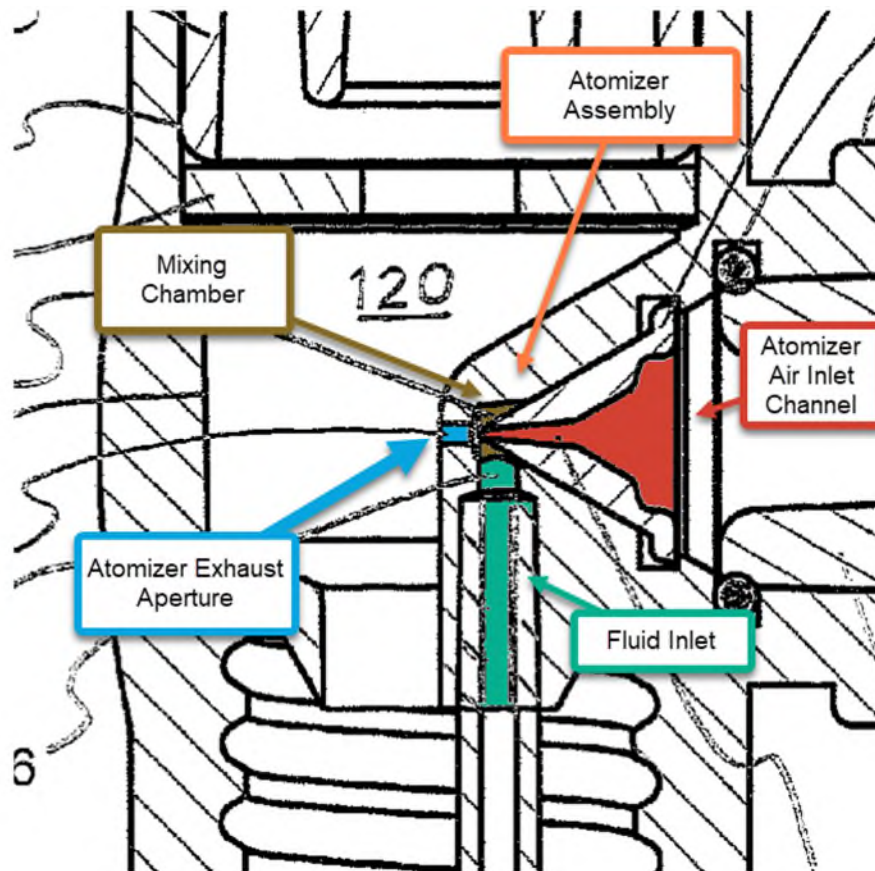
150. Sevy teaches an atomizer assembly that includes an air inlet channel, a fluid inlet, a mixing chamber, and an atomizer exhaust channel. Specifically, Sevy teaches a nozzle 92 that is formed separately from atomizer 16, and that is designed to sit within cavity⁷ of atomizer 16 to form a seal with the atomizer. EX1009, ¶ [0065]. As annotated in enlarged and partial FIG. 9 of Sevy depicted below, “orifice 118 is located within cavity 116 [and] sealed by the shape of the nozzle 92 itself. The cavity 116 has three openings.” *Id.*, ¶ [0080].

151. First, “[f]rom the pump side, the cavity is open to the orifice 118 of the nozzle 92.” *Id.*

152. Second, “[f]rom below, the cavity 116 is open to the siphon 96 leading to the reservoir 18.” *Id.*

153. Third, “[t]oward the atomizer 16, the cavity 116 is open to yet another orifice 119. The exit orifice 119 permits discharge of fluids including air from the orifice 118 and liquid from the siphon tube 96 out the exit orifice 119.” *Id.*

⁷ Sevy interchangeably uses the terms “cavity” and “distributor” to refer to feature 116. I use the term “cavity” to avoid confusion and submits these terms are equivalents.



EX1009, FIG. 9 (partial and enlarged)

154. Sevy describes the atomizer assembly operating as follows: “At a high-level, nozzle 92 receives air from passage 50, and atomizes the liquid from the reservoir.” *Id.*, ¶¶ [0066], [0079]. More specifically, “[t]he nozzle 92 encloses a cavity 114 or channel 114 leading from the passage 50 toward an orifice 118.” *Id.*, ¶ [0079]. When pressure is reduced in cavity 116, liquid is drawn up from the reservoir 18, through siphon tube 96 to orifice 118, where it is comminuted by a blast of high-speed air. *Id.*, ¶¶ [0080], [0081]. As a result, “[t]he liquid from the siphon 96 is atomized into droplets of various size [and] [t]he entire mixture of air and droplets passes through the exit orifice 119.” *Id.*, ¶ [0082].

155. It is my opinion that a POSITA would understand that Sevy's channel 114 that passes air received from passage 50 to cavity 116 corresponds to the claimed atomizer air inlet channel.

156. It is also my opinion that a POSITA would understand that the upper end of Sevy's siphon tube 96 that receives liquid from reservoir 18 corresponds to the claimed a fluid inlet.

157. It is also my opinion that a POSITA would understand that Sevy's cavity 116 where the liquid from siphon 96 and the blast of high-speed air are initially mixed together to atomize the liquid into liquid droplets corresponds to the claimed mixing chamber.

158. It is also my opinion that a POSITA would understand that Sevy's exit orifice 119 responsible for discharging the liquid droplets into the diffusion chamber (*e.g.*, the chamber of atomizer 16) corresponds to the claimed atomizer exhaust channel.

159. It is thus my opinion that Sevy satisfies limitation 1[D].

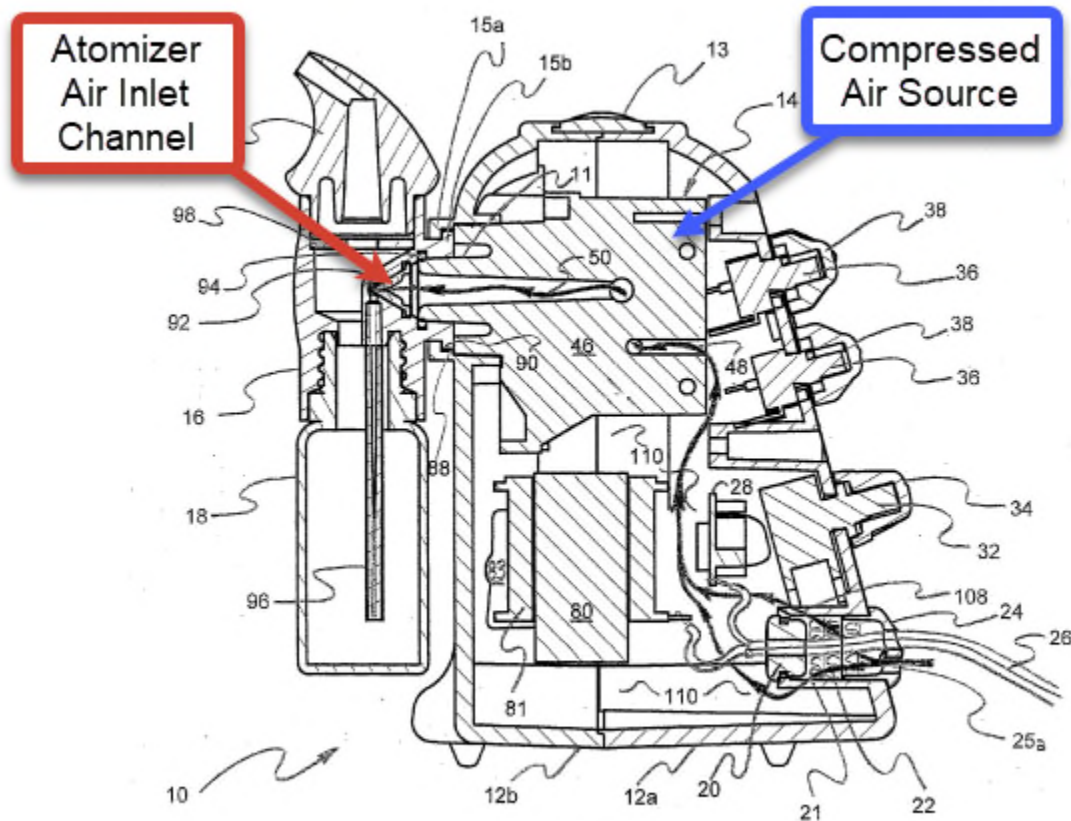
1[E] said atomizer air inlet channel interconnected to the compressed air source and

160. It is my opinion that Sevy discloses or renders obvious said atomizer air inlet channel interconnected to the compressed air source.

161. For the reasons I discussed in detail above regarding limitations 1[C] and 1[D], the atomizer air inlet channel (*e.g.*, channel 114) is interconnected to the

compressed air source (e.g., pump 14) via passage 50. EX1009, ¶¶ [0075]-[0079].

This interconnection is illustrated in annotated FIG. 8 below.



EX1009, FIG. 8

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

162. It is my opinion that Sevy discloses or renders obvious a fluid inlet disposed in fluid communication with the operative fluid in the container.

163. Sevy teaches that when pressure is reduced in cavity 116, liquid is drawn up from the reservoir 18, through the siphon tube 96, and to orifice 118 within

cavity 116, where it is comminuted by a blast of high-speed air. EX1009, ¶ [0081]. It is thus my opinion that the ability of Sevy's fluid inlet (*e.g.*, the upper end of siphon tube 96) to draw liquid from the reservoir corresponds to the claimed relationship of the fluid inlet being disposed in fluid communication with the operative fluid in the container (*e.g.*, reservoir 18).

1[G] the compressed air and the operative fluid mix together in said mixing chamber to form the fluid dispersion.

164. It is my opinion that Sevy discloses or renders obvious the compressed air and the operative fluid mix together in said mixing chamber to form the fluid dispersion.

165. As I discuss above with respect to limitation 1[F], Sevy teaches liquid is comminuted by the blast of high-speed air at orifice 118 within cavity 116 (*e.g.*, the mixing chamber). EX1009, ¶ [0081]. As a result, “[t]he liquid from the siphon 96 is atomized into droplets of various size [and] [t]he entire mixture of air and droplets passes through the exit orifice 119.” *Id.*, ¶ [0082].

166. 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[F], the atomized liquid need not include “a plurality of substantially uniform droplets.”

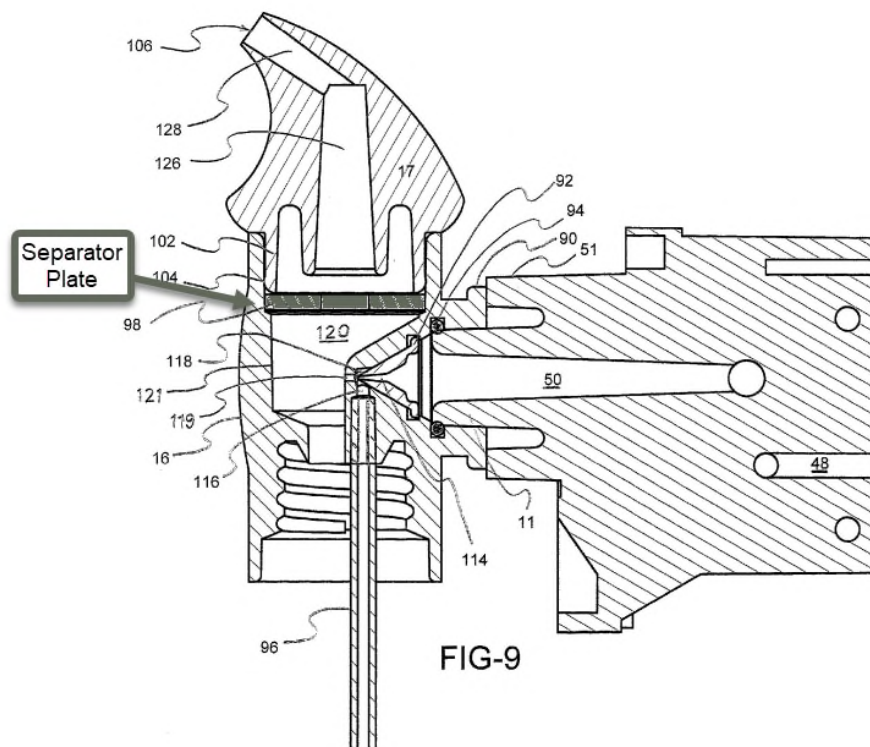
167. Sevy teaches that within the mixing chamber, the operative fluid is combined with compressed air because Sevy teaches that within the mixing chamber (*e.g.*, cavity 116), the operative fluid is atomized by compressed air, thereby satisfying Patent Owner’s apparent position regarding the meaning of “fluid dispersion” when used in connection with the mixing chamber.

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.

168. It is my opinion that Sevy 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.

169. Sevy teaches that after the liquid is atomized into droplets of various sizes by the blast of high-speed air as demonstrated in limitation 1[G], the droplets

break into smaller droplets “as they dash against the wall 121” of atomizer 16 (*i.e.*, the structure corresponding to the claimed diffusion unit). EX1009, ¶ [0082]. Some droplets agglomerate against the wall 121 and drip down toward the reservoir 18. *Id.* “Other droplets, having comparatively smaller effective diameters, are more easily entrained in the air, and pass with it through the separator chamber and out apertures in the separator plate 98.” *Id.* The separator plate 98 of Sevy is illustrated below in FIG. 9.



EX1009, FIG. 9

170. Sevy teaches that its “separator plate 98 may include one or more apertures 99 located centrally, peripherally, or otherwise.” *Id.*, ¶ [0068]. In this

regard, “[d]roplets that cannot move with the air flow, typically because they have too large a size and mass ... will strike the walls of the opening 100 or the separator plate 98.” *Id.*, ¶ [0069]. On the other hand, “more finely divided droplets form a cloud moving with the flow of air . . . through the apertures 99 of the separator plate 98.” *Id.* ¶ [0070]. “Ultimately, the jet of air expelled from the port 106 carries with it only those droplets that are sufficiently small, typically on the order of from about 1 to about 5 microns in diameter such that they will drift substantially indefinitely with ambient air movement as they evaporate.” *Id.*, ¶ [0084].

171. A POSITA would understand that these teachings mean that only the droplets that collided against the wall 121 of atomizer 16 and fragmented into sufficiently small sizes will be entrained in the air and pass through separator plate 98 and ultimately be discharged from port 106 into the surrounding airspace.

172. It is thus my opinion that the chamber of atomizer 16 facilitates formation of droplets on the order of about 1 to 5 microns.

Fluid Dispersion

173. Although Sevy does not explicitly use the term “substantially uniform” to describe the atomized droplets, in my opinion a POSITA would readily understand that Sevy teaches substantially uniform droplets.

174. First, Sevy discloses “it would be an advance in the art to provide an atomizer that provides a better atomization or a smaller mean or average size of

droplet in the distribution of atomized droplets.” EX1009, ¶ [0009]. 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 and evenly. Indeed, Sevy recognizes that principles. EX1009, ¶ [0024] (“[S]praying the droplets into a separator removes droplets insufficiently small *to be carried indefinitely by ambient air movement*. The separator and flow are sized to release with the air flow those droplets having *an effective diameter of from about 1 micron to about 5 microns*.”). As I explained above, droplets within this range will be carried substantially indefinitely by ambient air until they evaporate.

175. Second, 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. Sevy recognizes this principle. EX1009, ¶ [0074] (“[e]vaporation is a function of vapor pressure of a material, local concentration, and surface area available to evaporate molecules therefrom”). Thus, a POSITA would understand a “better atomization” means a smaller and more uniform droplet, which results in the droplets spreading more quickly throughout the room, and evaporating at a uniform rate, thereby quickly releasing a consistent scent.

176. Third, in defining the term “fluid dispersion” and the need for having “substantially uniform droplets,” the specification of the ’449 Patent recites “[i]n at least one embodiment, the plurality of ‘substantially uniform droplets’ each have a

diameter in the range of 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, 3:22-30. Although these examples are provided as three different embodiments (*e.g.*, 1, 3, or 5), the narrow range taught by Sevy similarly teaches droplets that have a size from 1 μm to 5 μm . In other words, Sevy’s teaching spans from the smallest to the largest examples of substantially uniform droplets taught by the ’449 Patent. It is thus my opinion that a POSITA would appreciate that the relatively small, atomized droplets taught by Sevy meet the “fluid dispersion” limitation.

177. Nevertheless, in the event Patent Owner argues that atomized droplets ranging from 1 to 5 microns do not meet the “fluid dispersion” limitation, it is my opinion that it would have been obvious to modify the location, size, and/or quantity of apertures 99 in the separator plate 98 to achieve an even narrower range of droplet sizes, to ensure that a plurality (at least two) of the droplets have a substantially uniform diameter. A POSITA would have been motivated to make such a modification because it was well known that greater uniformity would improve dispersion and evaporation. *See, e.g.*, EX1009, ¶ [0068] (“the separator plate may include one or more apertures 99 located centrally, peripherally, or otherwise”); *Id.*, ¶ [0074] (“[e]vaporation is function of ... surface area”).

178. It is thus my opinion that Sevy teaches a diffusion chamber that 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. It is therefore my opinion that Sevy discloses or renders obvious claim 4 of the '449 Patent.

Claim 7. [PRE] A fluid dispersion assembly is operatively interconnected to a container of an operative fluid and a compressed air source to generate and discharge a fluid dispersion into a surrounding airspace, said fluid dispersion assembly comprising:

179. In my opinion, there are no material differences between claim limitations 1[PRE]-1[D] and claim 7 of the '449 Patent. Appendix (*compare* claim limitations 1[PRE]-1[D], *with* claim 7). Thus, for the same reasons discussed above with respect to claim limitations 1[PRE]-1[D], Sevy discloses or renders obvious all the limitations of claim 7. *See supra* Claim 1, limitations 1[PRE]-1[D].

180. I note, however, that 1[PRE] recites that the fluid dispersion assembly “*operatively engages*” a container and compressed air source, whereas 7[PRE] recites that the fluid dispersion “*is operatively interconnected to*” a container and compressed air source. Patent Owner has not suggested there is any material difference between these terms (*i.e.*, between “operatively engages” and “is operatively interconnected to”), and the '449 Patent does not indicate any material

difference. In the event Patent Owner or the Board finds there is a difference, I reserve the right to supplement my opinion to address any such difference.

7[A] a diffusion unit at least partially defining a diffusion chamber,

181. As noted above, it is my opinion that there are no material differences between claim limitations 1[A] and 7[A] of the '449 Patent. Appendix (*compare* limitation 1[A], *with* limitation 7[A]). I note, however, that 1[A] recites a diffusion unit “at least partially defining an *enclosed* diffusion chamber,” whereas 7[A] recites a diffusion unit “at least partially defining a diffusion chamber” (*i.e.*, it does not include the word “enclosed”).

182. Patent Owner has not suggested there is any material difference between these terms (*i.e.*, between a diffusion unit at least partially defining an *enclosed* diffusion chamber versus a diffusion unit at least partially defining a diffusion chamber), and the '449 Patent does not indicate any material difference. In the event Patent Owner or the Board finds there is a difference, I reserve the right to supplement my opinion to address any such difference.

183. I note that the remaining limitations of claim 7 are identical to claim limitations 1[B]-1[D].

Claim 8. The fluid dispersion assembly as recited in claim 7 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, the compressed air and the operative fluid mix together in said mixing chamber to form the fluid dispersion.

184. In my opinion, there are no material differences between claim 8 and limitations 1[E]-1[G] of the '449 Patent. Appendix (*compare* claim 8, with limitations 1[E]-1[G]). Thus, for the same reasons discussed above with respect to claim limitations 1[E]-1[G], Sevy discloses or renders obvious all the limitations of claim 8. *See supra* Claim 1, limitations 1[E]-1[G].

Claim 9. The fluid dispersion assembly as recited in claim 8 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.

185. In my opinion, there are no material differences between claim 9 and claim 4 of the '449 Patent. Appendix (*compare* claim 4, with claim 9). Thus, for the same reasons discussed above with respect to claim 4, Sevy discloses or renders obvious all the limitations of claim 9. *See supra* Claim 4.

Claim 10. The fluid dispersion assembly as recited in claim 7 further comprising a container interconnect operatively interconnecting said diffusion unit to the container.

186. It is my opinion that Sevy discloses or renders obvious the fluid dispersion assembly as recited in claim 7 further comprising a container interconnect operatively interconnecting said diffusion unit to the container.

187. Sevy explains that, “[i]n the illustrated embodiment, the atomizer 16 may secure such as by threads or the like to a reservoir 18.” EX1009, ¶ [0041]. The threads, as shown in annotated FIG. 7 below, are used to

connect the diffusion unit (*e.g.*, atomizer 16) to the container (*e.g.*, reservoir 18), and thus, correspond to a container interconnect.

188. Thus, Sevy teaches a container interconnect (*e.g.*, threads) that operatively interconnects the diffusion unit (*e.g.*, atomizer 16) to the container (*e.g.*, reservoir 18).

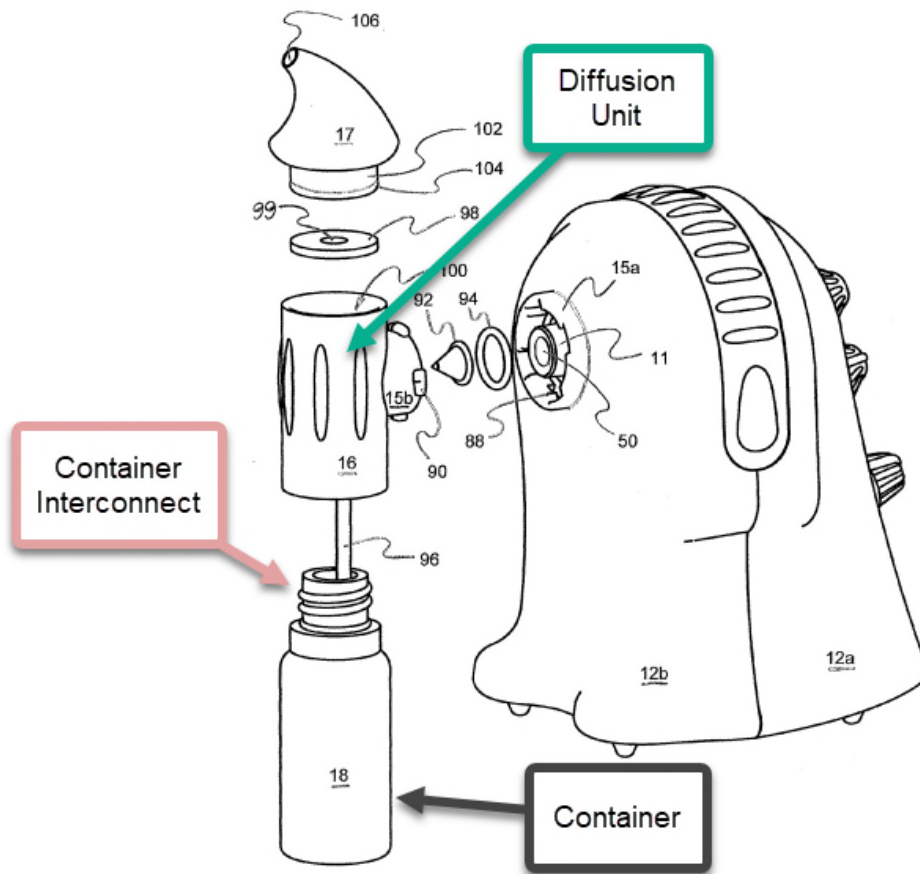


FIG-7

EX1009, FIG. 7

B. GROUND 2: Claims 1, 4, and 7-10 are rendered obvious under 35 U.S.C. § 103 by Sevy in view of Gao

189. As discussed in Ground 1, Sevy alone renders obvious claims 1, 4, and 7-10. As part of that analysis, I noted that Sevy discloses a diffusion unit (*e.g.*, atomizer 16) that generates and discharges atomized droplets ranging in size from 1 to 5 microns, and that Sevy teaches or suggests that droplets within this range exhibit high-quality dispersion and evaporation properties. EX1009, ¶¶ [0024], [0074]. However, Sevy does not explicitly disclose that its atomizer generates and discharges “substantially uniform droplets.” Thus, in Ground 2, I explain, to the extent Sevy is found not to teach “fluid dispersion,” why a POSITA would have found it obvious to modify Sevy in view of Gao’s explicit teaching of an atomizer in which “the mist can be controlled below 3 microns.” EX1013, ¶ [0025]; *id.*, ¶ [0007] (“[such that the droplets] are finer and more uniform, the aroma is more uniform, and the aroma diffusion is large”). Ground 2 is addressed to limitations 1[PRE], Claim 4, Claim 7, limitation 7[PRE], and Claim 9, as those are the limitations and claims that recite “fluid dispersion.” I still rely on the teachings of Sevy for the other limitations of claims 1, 4, and 7-10 as previously discussed in Ground 1.

190. Gao is titled and directed to an “Atomizer for Atomizing Essence or Essential Oil.” EX1013, Cover. Gao teaches that its atomizer controls droplet

discharge below 3 microns. *Id.*, ¶ [0025]. In this regard, “the atomized particles are finer and more *uniform*.” *Id.*, ¶ [0007] (emphasis added).

191. Gao’s atomizer, as shown below in annotated FIG. 1, includes a main body 9 secured to an essential oil bottle 14. *Id.*, ¶ [0019]. The main body defines a cavity in which an atomizer assembly is disposed. *Id.* The atomizer assembly is in fluid communication with the essential oil via hose 11, and in fluid communication with an air pump (not shown) via gas flow pipe 51. *Id.*, ¶¶ [0022], [0025]. A baffle 3 is fixed to an upper part of the main body 9 by cover body 1. *Id.*, ¶ [0021]. The cover body 1 is provided with an atomizing gas outlet 2 through which the atomized mist is discharged. *Id.*, ¶ [0019].

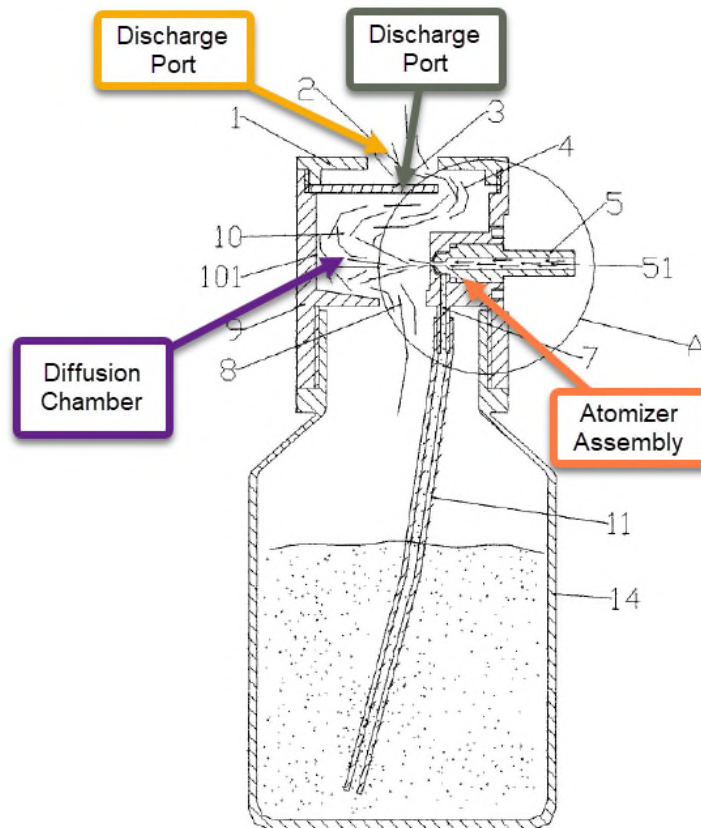


FIG. 1

EX1013, FIG. 1

192. When the air pump is in operation, air is blown through gas flow pipe 51 and liquid is sucked into atomizing cavity 6, where the liquid and air are fully mixed. *Id.*, ¶ [0025]. The high-speed gas-liquid mixture is then ejected against an inner wall 101 of main body 9 to atomize the liquid mixture into micron-sized fine particles. *Id.* Only the smallest particles (below 3 microns) will drift around the baffle 3 and out gas outlet 2. *Id.* In this manner, “mist can be controlled below 3 microns.” *Id.*, ¶ [0025]; *Id.*, ¶ [0007], (“the atomized particles are finer and more uniform . . . and the aroma diffusion area is large”). Gao teaches that the finer and

more uniform particles “are easier to vaporize after contact with the air, and the aroma is more uniform.” *Id.*, ¶ [0013]. Thus, Gao provides motivation to minimize droplet size to improve dispersion and to increase droplet uniformity, thereby improving the droplet’s aroma properties.

193. In view of Gao’s teachings, a POSITA would be motivated to further reduce the size of the droplets discharged by Sevy’s atomizer to improve their uniformity and corresponding aromatic properties. First, a POSITA would appreciate that the atomizer of Sevy generates particles ranging from 1 to 5 microns. Sevy’s separator plate allows droplets with a diameter of 5 microns or less to pass therethrough. EX1009, ¶ [0024]. Second, both Sevy and Gao recognize that evaporation rate is a function of droplet size. EX1009, ¶¶ [0025], [0074] (“[e]vaporation is a function of . . . surface area available to evaporate molecules therefrom”); EX1013, ¶ [0013] (“finer and more uniform [droplets] are easier to vaporize after contact with the air, and the aroma is more uniform”). That is, Sevy and Gao teach the principle that the more uniform the droplets the more uniform the aroma. Third, Sevy teaches its “separator plate may include one or more apertures 99 located centrally, peripherally, or otherwise” and a POSITA would recognize that the apertures 99 can be modified without negatively impacting the atomizer’s operation because Sevy itself contemplates there being more than one aperture, their locations of which are not critical. Fourth, a POSITA would have been motivated to

modify the locations and/or sizes of the apertures to prevent droplets on the order of 3-5 microns from passing through the separator plate and being discharged into the surrounding atmosphere.

194. A POSITA could have modified Sevy's separator plate to make the apertures smaller, thereby lowering the range of droplets that could pass through it without undue experimentation.

195. Furthermore, a POSITA would have had a reasonable expectation that such a modification would result in smaller and more uniform droplets being discharged from the diffuser, thereby improving the dispersion and aroma properties of the droplets.

Other Limitations of Claims 1 and 7

196. Limitations 1[A]–1[G] and 7[A]-7[E] are taught by Sevy for the reasons previously discussed in Ground 1 as such limitations are wholly unrelated to the discharge of “fluid dispersion.”⁸

Claims 8 and 10

197. Claims 8 and 10 are taught by Sevy for the reasons previously discussed in Ground 1 as such limitations are wholly unrelated to the discharge of fluid dispersion.

⁸ I understand that Patent Owner construes the term “fluid dispersion” when used in connection with the mixing chamber, as is the case in limitation 1[G], to mean “operative fluid combined with compressed air.”

C. GROUND 3: Claims 1, 4, and 7-10 are rendered obvious under 35 U.S.C. § 103 by 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:

198. Patent Owner has contended that the preamble is not limiting. *See* EX1018, Exhibit B. However, to the extent the preamble is limiting, it is my opinion that it is taught by Goubet.

199. Goubet is titled “essential oil diffuser,” the assembly of which is shown in Figure 1 below. EX1016, Cover. Goubet teaches an essential oil diffuser 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.

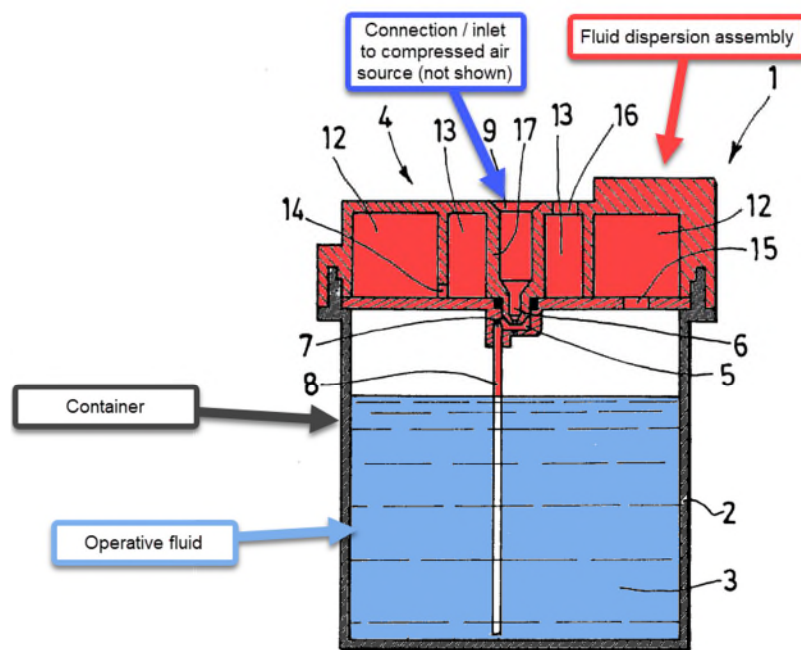


FIG.1

EX1016, FIG. 1

200. Goubet’s diffuser 1 includes a reservoir 2 designed to store oil 3 and a diffuser head 4. EX1016, 3:24-25. “The diffuser head 4 comprises a diffusion chamber 5 within which oil droplets are produced.” *Id.*, 3:30-31. Diffuser head also includes an outlet 16 through which microdroplets are discharged into the ambient air (*i.e.*, the surrounding airspace). *Id.*, 4:10-11. Thus, the diffusion head 4 of Goubet corresponds to the claimed fluid dispersion assembly.

201. “The diffuser head may be attached to the reservoir by ultrasonic welding or by any other means, such as gluing or screwing.” *Id.*, 3:26-27. Goubet teaches, “[t]he diffusion chamber 5 comprises ... an oil inlet in the form of the upper

end 10 of a dip tube 8 connected to the essential oil 3 contained in the reservoir 2.” EX1016, 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).

202. 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).

203. 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.” *Id.*, 4:19-22. The microdroplets are eventually discharged from diffuser head 4 into ambient air through outlet 16. *Id.*, 4:10-11.

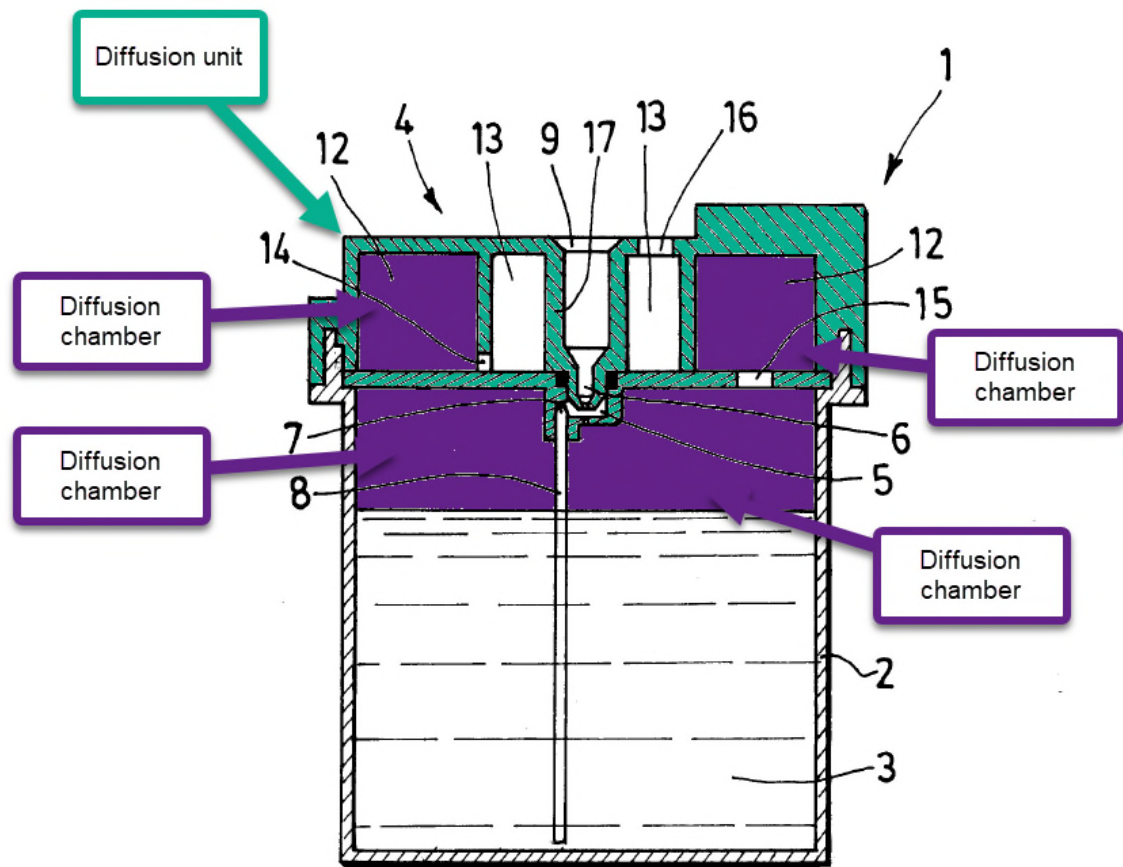
204. It is thus my opinion that Goubet teaches a fluid dispersion assembly (*e.g.*, diffuser head 4) that operatively engages a container (*e.g.*, reservoir 2) of an operative fluid (*e.g.*, oil 3) and a compressed air source (*e.g.*, air compressor described but not illustrated in Goubet) to generate 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,

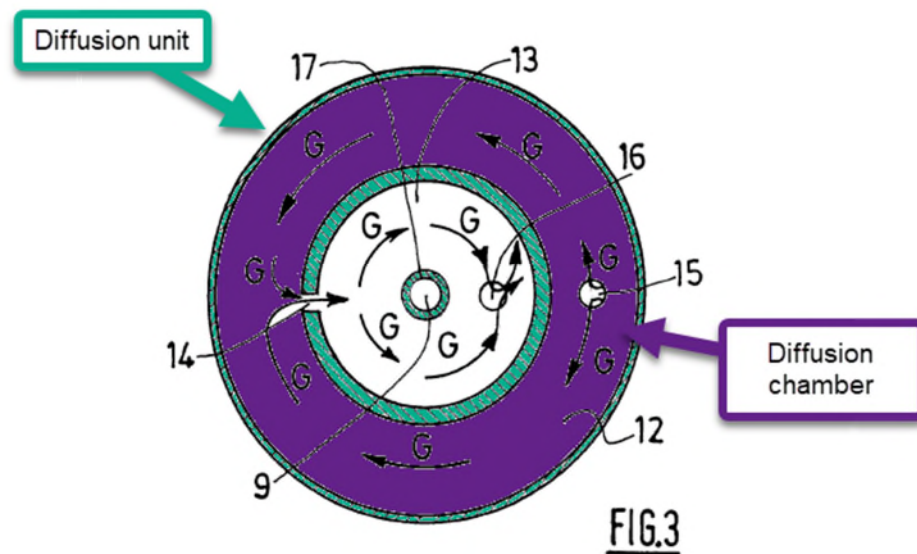
205. It is my opinion that Goubet discloses or renders obvious a diffusion unit at least partially defining an enclosed diffusion chamber.

206. Goubet's diffuser head 4 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.

207. Goubet further explains that "[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." *Id.*, 4:28-5:4. Thereafter, "[t]he microdroplets are diffused into the ambient air in the form of essential oil vapour." *Id.*, 5:6-7.



EX1016, FIG. 1



EX1016, FIG. 3

208. Thus, the walls of diffuser head 4 (*e.g.*, the walls separating the outer enclosure 12 from the inner enclosure 13) correspond to the claimed 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. It is thus my opinion that Goubet teaches a diffusion unit at least partially defining a diffusion chamber.

209. Goubet’s “diffuser head 4 may be attached to the reservoir by ultrasonic welding or by any other means, such as gluing or screwing.” *Id.*, 3:24-25. Furthermore, diffuser head 4 includes an upper wall, as shown in FIGS. 1 and 3, which corresponds to the diffusion chamber (*e.g.*, shaded purple) being enclosed.

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

210. 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.

211. Goubet describes diffuser head 4 as having an “inner chamber 13” that “comprises an outlet 16 for the microdroplets to [exit into] the ambient air.” EX1016, 4:10-11. Goubet’s outlet 16 is illustrated in FIG. 1 below.

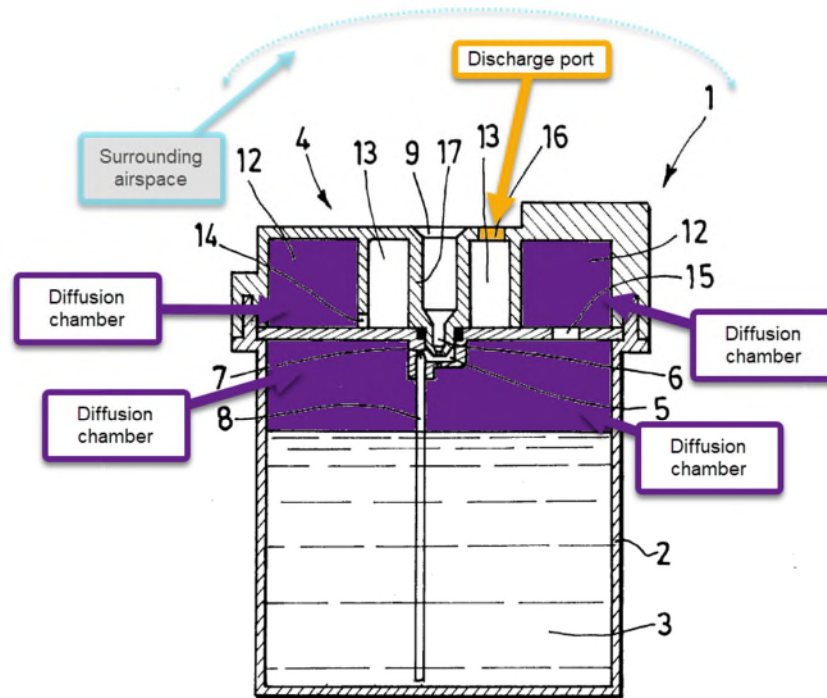
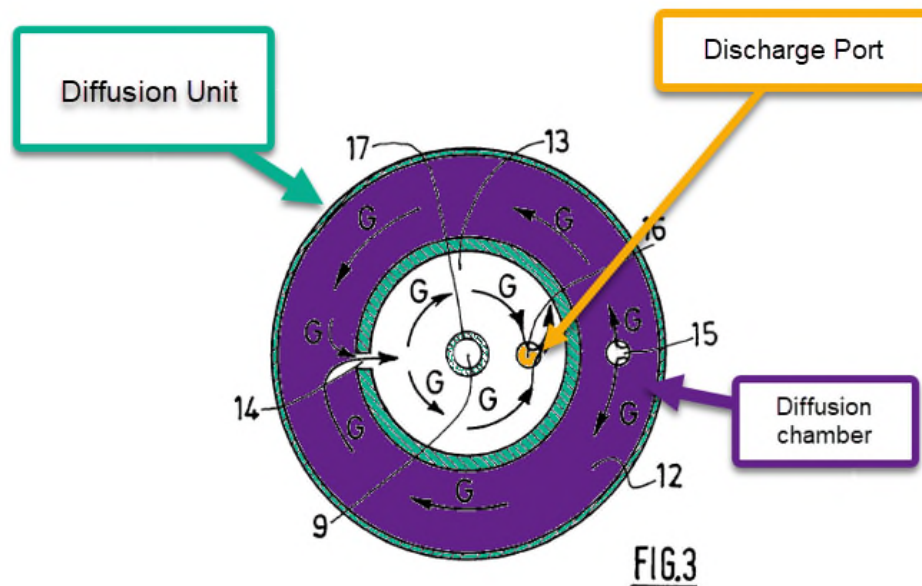


FIG.1

EX1016, FIG. 1

212. Goubet's 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 the ambient air.

213. It is thus my opinion that 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[C] a diffusion assembly disposed in an operative engagement with said diffusion unit,

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

215. The '449 Patent describes the diffusion assembly 200 as “compris[ing] an air inlet 210 and an atomizer assembly 220.” EX1001, 5:15-16. A POSITA would readily recognize that Goubet teaches a corresponding structure. Specifically, Goubet teaches that “[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.” EX1016, 4:15-16. Thus, Goubet teaches an air inlet in the form of air inlet channel 9.

216. Goubet further teaches that “essential oil 3 is drawn into the diffusion chamber ... through the upper end 10 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. *See, e.g.*, EX1016, 5:16 (referring to the droplets as “highly atomized oil mist”). It is thus my opinion that Goubet teaches an atomizer assembly (*e.g.*, the assembly of components that atomize oil 3).

217. It is my further opinion that Goubet 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.

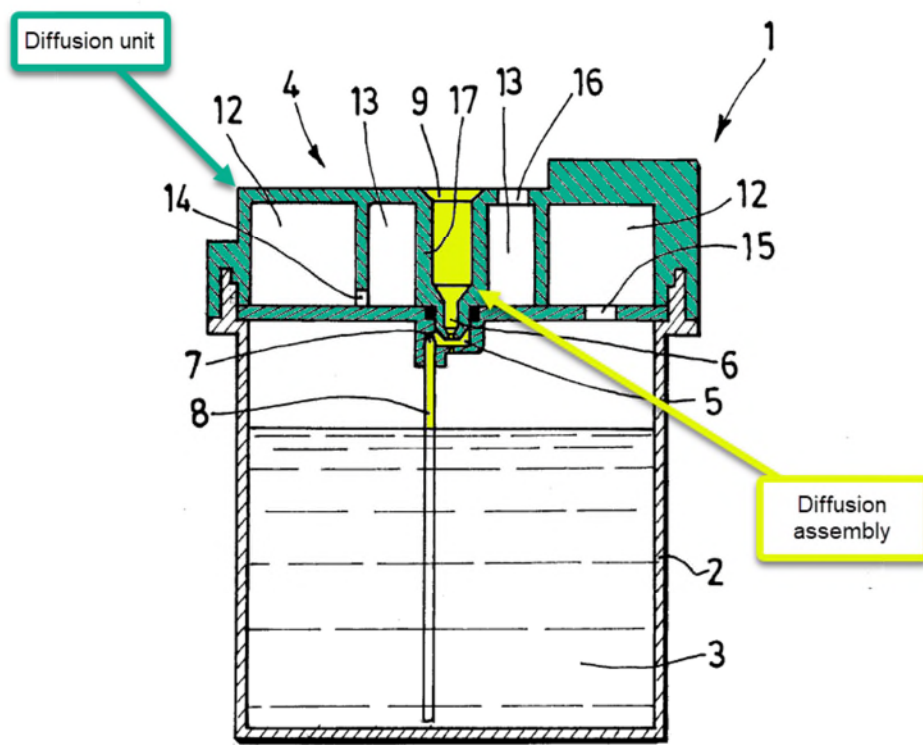
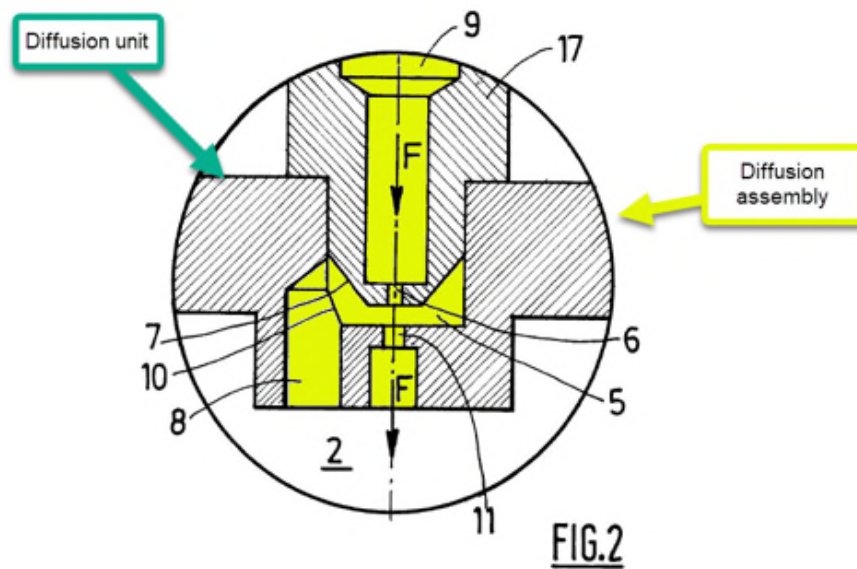


FIG.1

EX1016, FIG. 1



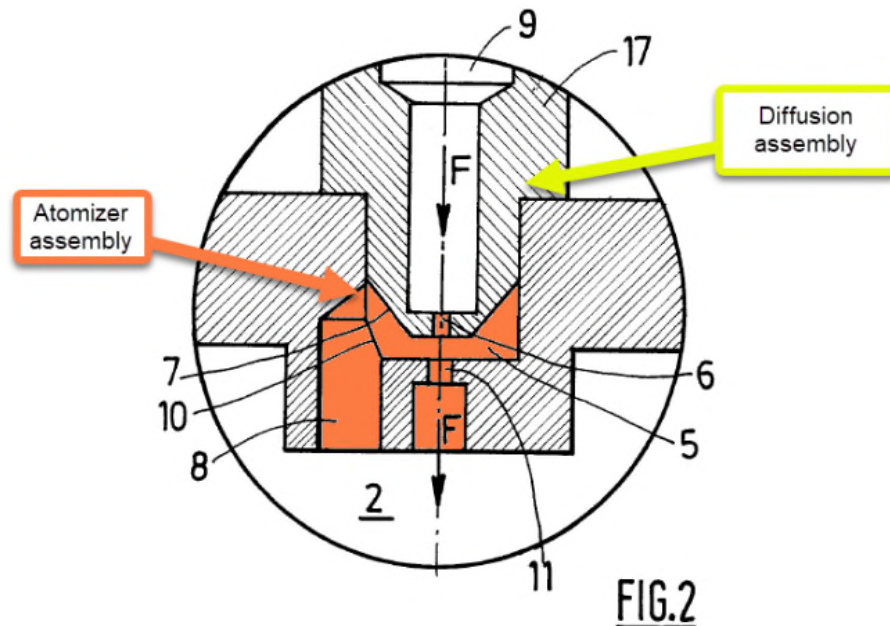
EX1016, FIG. 2

218. As illustrated in FIG. 1, Goubet's diffusion assembly is disposed within the wall 17 of diffuser head 4, and, thus disposed in operative engagement with the diffusion unit. Goubet additionally teaches that "[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.

1[D] wherein said diffusion assembly comprises an atomizer assembly, said atomizer assembly comprising an atomizer air inlet channel, a fluid inlet, a mixing chamber, and an atomizer exhaust aperture, and

219. It is my opinion that Goubet discloses or renders obvious wherein said diffusion assembly comprises an atomizer assembly, said atomizer assembly comprising an atomizer air inlet channel, a fluid inlet, a mixing chamber, and an atomizer exhaust aperture.

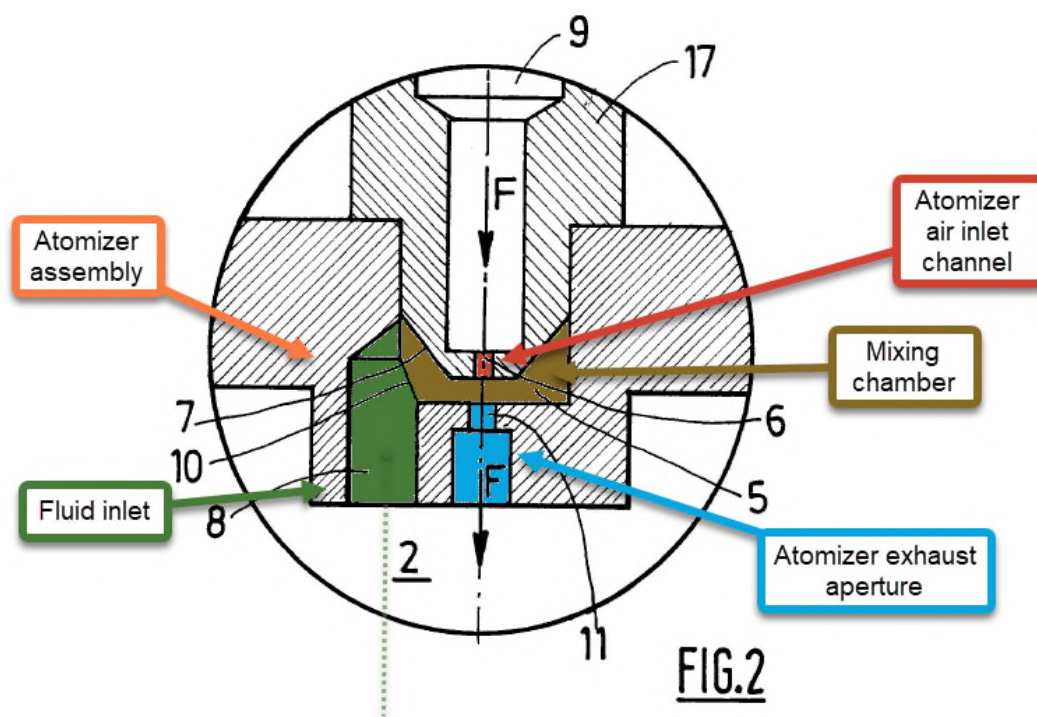
220. Goubet teaches a diffusion assembly including an atomizer assembly as previously demonstrated in limitation 1[C]. Goubet's atomizer assembly is shown in annotated FIG. 2 below.



EX1016, FIG. 2

221. The components of Goubet's atomizer assembly are further detailed 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 10 of a dip tube 8. EX1016, 3:31-4:2. When in operation, compressed air flows in the direction illustrated by arrow F in FIG. 2, from the compressed air source (not shown), through air inlet channel 9 to compressed air inlet 6, and then into diffusion chamber 5. EX1016, 4:15-18. Accordingly, Goubet's atomizer assembly includes an atomizer air inlet channel (*e.g.*, compressed air inlet 6).



EX1016, FIG. 2

222. Goubet further teaches that “[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 upper end of Goubet's dip tube 8 thus corresponds to the claimed fluid inlet.

223. Goubet also teaches that “[a]ir and essential oil are mixed within the diffusion chamber 5 and a flow of oil droplets is created.” *Id.*, 4:21-22, 5:15-16 (creating atomized oil mist). Goubet’s diffusion chamber 5 thus corresponds to the claimed mixing chamber.

224. 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. Goubet’s outlet 11 thus corresponds to the claimed atomizer exhaust aperture.

225. It is thus my opinion that Goubet teaches that the diffusion assembly comprises an atomizer assembly, which comprises an atomizer air inlet channel, a fluid inlet, a mixing chamber, and an atomizer exhaust aperture.

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

226. As I demonstrated in this Ground 3 with respect to limitation 1[D], it is my opinion that the atomizer air inlet channel (*e.g.*, compressed air inlet 6) is interconnected to the compressed air source (*e.g.*, not shown but referred to as a compressor, compressed air supply, pneumatic compressed air distribution system, and/or compressed air distribution network is a compressed air source) via inlet channel 9. *Id.*, 4:15-16; *see also Id.*, FIG. 2.

1[F] said atomizer air inlet channel interconnected to the compressed air source and said fluid inlet disposed in fluid communication with the operative fluid in the container,

227. As I demonstrated in this Ground 3 with respect to limitation 1[D], it is my opinion that the fluid inlet (*e.g.*, the upper end of the dip tube 8) is disposed in fluid communication with the operative fluid (*e.g.*, essential oil 3) in the container (*e.g.*, reservoir) via the lower portion of dip tube 8. *Id.*, 4:1-2; *see also Id.*, FIG. 2.

1[G] the compressed air and the operative fluid mix together in said mixing chamber to form the fluid dispersion.

228. As demonstrated in this Ground 3 with respect to limitation 1[D], the compressed air and the operative fluid (*e.g.*, essential oil 3) mix together in said mixing chamber (*e.g.*, diffusion chamber 5). *Id.*, 4:21-22; *Id.*, 5:15-16 (creating atomized oil mist); *see also Id.*, 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.

229. As I demonstrated above, Goubet's diffuser head 4 includes an outer enclosure 12 and an inner enclosure 13 forming a diffusion chamber that breaks oil droplets into microdroplets prior to discharging them through outlet 16 and into the surrounding airspace. EX1016, 4:3-11.

230. In my opinion, a POSITA would recognize Goubet to teach that the microdroplets are "substantially uniform" in diameter even though Goubet does not explicitly recite the words "substantially uniform." When discussing known essential oil diffusers, Goubet explains that "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 ... [and] such diffusion is also noisy.” EX1016, 1:10-13. To remedy this problem and as noted above, Goubet’s atomizer 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. See EX1016, 5:12-16 (emphasis added).

231. It is my opinion that microdroplets that have been reduced in size as much as possible within the constraints of Goubet’s structure meet the limitation of a “fluid dispersion”. A POSITA would appreciate that the circular shape of the baffled path necessitates that the droplets twist and turn several times, which will divide 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 crashing into one of the walls. That is, 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, Goubet dual path will divide droplets into substantially uniform microdroplets by the time the flow passes through outlet 16, thereby meeting the limitation “fluid dispersion.”

232. In the event Patent Owner argues that the resulting atomized droplets do not meet the “fluid dispersion” limitation, it is my opinion that it would have been obvious to modify Goubet to include additional enclosures to achieve an even narrower range of droplet sizes, such that a plurality (at least two of the droplets) of droplets were substantially uniform in size.

233. A POSITA would have been motivated to add additional enclosures to the dual enclosure design because it was an objective of Goubet to reduce droplet size as much as possible. EX1016, 5:13-16; *see also* EX1016, 2:16-18 (explaining that “said vaporization means comprise at least two concentric circular enclosures,” and thus suggesting additional circular enclosures were already contemplated). Furthermore, a POSITA would appreciate that additional enclosures would result in further atomization and smaller, and more uniform droplets.

234. It is also my opinion that 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.

235. It is thus my opinion that Goubet discloses or renders obvious claim 4 of the ’449 Patent.

Claim 7. [PRE] A fluid dispersion assembly is operatively interconnected to a container of an operative fluid and a

compressed air source to generate and discharge a fluid dispersion into a surrounding airspace, said fluid dispersion assembly comprising:

236. In my opinion, there are no material differences between claim limitations 1[PRE]-1[D] and claim 7 of the '449 Patent. Appendix (*compare* claim limitations 1[PRE]-1[D], *with* claim 7). Thus, for the same reasons discussed above with respect to claim limitations 1[PRE]-1[D], Goubet discloses or renders obvious all the limitations of claim 7. *See supra* Claim 1, limitations 1[PRE]-1[D].

237. I note, however, that 1[PRE] recites that the fluid dispersion assembly “*operatively engages*” a container and compressed air source, whereas 7[PRE] recites that the fluid dispersion “*is operatively interconnected to*” a container and compressed air source. Patent Owner has not suggested there is any material difference between these terms (*i.e.*, between “operatively engages” and “is operatively interconnected to”), and the '449 Patent does not indicate any material difference. In the event Patent Owner or the Board finds there is a difference, I reserve the right to supplement my opinion to address any such difference.

7[A] a diffusion unit at least partially defining a diffusion chamber,

238. As noted above, it is my opinion that there are no material differences between claim limitations 1[A] and 7[A] of the '449 Patent. Appendix (*compare* limitation 1[A], *with* limitation 7[A]). I note, however, that 1[A] recites a diffusion unit “at least partially defining an *enclosed* diffusion chamber,” whereas 7[A] recites

a diffusion unit “at least partially defining a diffusion chamber” (*i.e.*, it does not include the word “enclosed”).

239. Patent Owner has not suggested there is any material difference between these terms (*i.e.*, between a diffusion unit at least partially defining an *enclosed* diffusion chamber versus a diffusion unit at least partially defining a diffusion chamber), and the ’449 Patent does not indicate any material difference. In the event Patent Owner or the Board finds there is a difference, I reserve the right to supplement my opinion to address any such difference.

240. I note that the remaining limitations of claim 7 are identical to claim limitations 1[B]-1[D].

Claim 8. The fluid dispersion assembly as recited in claim 7 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, the compressed air and the operative fluid mix together in said mixing chamber to form the fluid dispersion.

241. In my opinion, there are no material differences between claim 8 and limitations 1[E]-1[G] of the ’449 Patent. Appendix (*compare* claim 8, with limitations 1[E]-1[G]). Thus, for the same reasons discussed above with respect to claim limitations 1[E]-1[G], Goubet discloses or renders obvious all the limitations of claim 8. *See supra* Claim 1, limitations 1[E]-1[G].

Claim 9. The fluid dispersion assembly as recited in claim 8 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.

242. In my opinion, there are no material differences between claim 9 and claim 4 of the '449 Patent. Appendix (*compare* claim 4, *with* claim 9). Thus, for the same reasons discussed above with respect to claim 4, Goubet discloses or renders obvious all the limitations of claim 9. *See supra* Claim 4.

Claim 10. The fluid dispersion assembly as recited in claim 7 further comprising a container interconnect operatively interconnecting said diffusion unit to the container.

243. It is my opinion that Goubet discloses or renders obvious the fluid dispersion assembly as recited in claim 7 further comprising a container interconnect operatively interconnecting said diffusion unit to the container.

244. Goubet teaches that “[t]he diffuser head may be attached to the reservoir by ultrasonic welding *or by any other means*, such as gluing or screwing.” EX1016, 3:26-27.

245. It is thus my opinion that Goubet discloses or renders obvious the fluid dispersion assembly as recited in claim 7 for the reasons discussed above, wherein the fluid dispersion assembly further comprises a container interconnect operatively interconnecting said diffusion unit to the container.

D. GROUND 4: Claims 1, 4, and 7-10 are rendered obvious under 35 U.S.C. § 103 by Goubet in view of Kaiser

246. As I explained in Ground 3, Goubet alone renders obvious claims 1, 4, and 7-10. As part of that analysis, I explained 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. As I further noted, the certified translation of Goubet does not explicitly state that its microdroplets are “substantially uniform” in diameter. Thus, Ground 4 relies on Kaiser in combination with Goubet for limitation 1[PRE], Claim 4, limitation 7[PRE], and Claim 9, which recite the “fluid dispersion” term.

247. I explain here in Ground 4 why a POSITA would have found it obvious in view of Kaiser and the general state of the art at the time to alter Goubet to include one or more additional circular enclosures within its structure, which would result in smaller droplets and greater uniformity. Notably, Ground 4 still relies on the teachings of Goubet for the other limitations of claims 1, 4, and 7-10 as previously discussed in Ground 3.

248. Kaiser 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”).

249. Accordingly, if Goubet is found not to teach a “fluid dispersion,” a POSITA would have been motivated to modify Goubet to include additional enclosures that result in “fluid dispersion.”

250. In this regard, I note that Goubet states that its “vaporization means comprise ***at least*** two concentric circular enclosures,” which form “***at least***” one baffle. EX1016, 2:16-19; *see also id.*, pg. 6 (claim 2). It is my opinion that the disclosure of “at least two” concentric circular enclosures (and the corresponding “at least one” baffle) would indicate to a POSITA that additional circular enclosures and additional baffles could be added to Goubet’s design, which would further improve atomization (more uniform droplets); they would also further decrease noise.

251. A POSITA would be motivated to add additional circular enclosures because the components were clearly well known in light of Goubet’s disclosure itself. A POSITA would have been motivated to add the additional enclosures in view of Kaiser’s teaching that uniform droplets result in uniform evaporation, which, in turn, would improve the smoothness (*i.e.*, less harsh) of the aroma generated as the oil droplets evaporate in the surrounding airspace. A POSITA would also have been motivated to add the additional enclosures because Goubet itself teaches that such enclosures will decrease the size of the microdroplets.

252. Further, a POSITA would have been motivated to add additional enclosures because numerous references in the field of art disclosed fluid dispersion assemblies seeking to minimize the noise of the device, and such references are in a common field of endeavor seeking to solve the same or substantially similar problems as Goubet. *See, e.g.*, EX1008, ¶ [0043] (“The radial compressor fluid

delivery system may also comprise a means for noise and heat suppression. This can include noise abatement enclosures, outlet noise suppression, and any other means for reducing the noise and heat produced by the radial compressor fluid delivery system. Means for noise and heat suppression include, but are not limited to, design of the enclosure structure itself, incorporation of materials known in the art that insulate sound and heat, wrapping pipes and tubing with sound and heat insulating materials, muffling and controlling the direction of air flow as well as the intake and output of air. Other mechanical devices such as cooling fans or noise and heat abatement engineering may be incorporated within the overall equipment design to maximize result. The mechanical devices may or may not be controlled by the microcontroller based on the required results. For example, as depicted in FIG. 6, the fluid delivery system 100 is enclosed by noise and heat abatement material 42. The inherent use of a radial compressor reduces the noise produced compared to prior technologies.”).

253. A POSITA would have recognized that fluid dispersion assemblies that use a compressed air source can be noisy and would have found it obvious to apply a silencer assembly therein to improve user enjoyment and satisfaction.

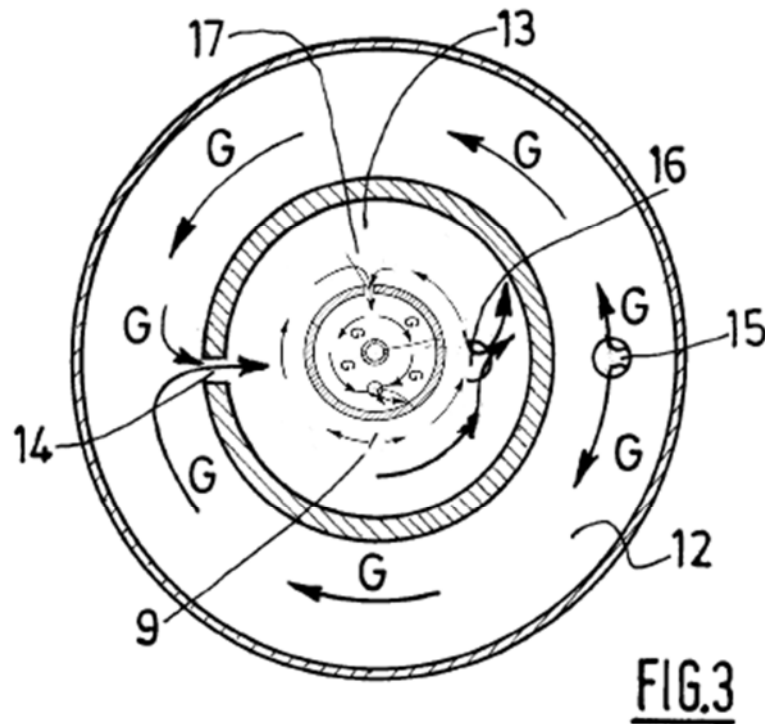
254. It is my opinion that a POSITA would have been motivated to combine the teachings of Goubet with the teachings of the general state of the art to improve atomization (*e.g.*, form uniform aerosolized particles) and to dampen sound waves,

thereby enhancing user experience. More specifically, both Goubet and the general state of the art identified drawbacks with conventional, essential oil atomizers, namely such atomizers are troublingly noisy and do not optimally atomize essential oil droplets. To further enhance user satisfaction, a POSITA would have been motivated to add an additional circular structure to Goubet's existing circular structures to more uniformly atomize the droplets and further dampen the noise. Specifically, a POSITA would have been motivated to include additional acoustic impedance discontinuities as known in the state of the art to reduce radiated acoustical power generated by air handling equipment.

255. A POSITA would implement the alteration of Goubet without undue experimentation for the same reasons discussed above in Ground 3. A POSITA would have had a reasonable expectation of success that adding an additional enclosure would increase the baffled path for the fluid flow to travel, which would further restrict fluid flow, and break the droplets into increasingly small microdroplets. Such an addition would result in only those microdroplets that are sufficiently atomized to pass through the assembly.

256. A POSITA would also have a reasonable expectation of success in further reducing the noise generated during operation of the assembly for the reasons discussed above. Thus, to provide droplet uniformity and noise reduction, a POSITA

would have been motivated to alter Goubet by adding an additional circular structure as roughly depicted in the figure below.



257. Goubet could either accommodate an additional circular enclosure within the existing structure, as shown above, or could increase the size of the outermost circular enclosure to accommodate an additional circular enclosure. It is my opinion that such a modification would be a simple addition, that could be repeated as many times as necessary to achieve the desired uniformity in fluid dispersion droplets and the desired dampening of sound waves.

Other Limitations of Claims 1 and 7

258. Limitations 1[A]–1[G] and 7[A]–7[E] are taught by Goubet for the reasons previously discussed in Ground 3 as such limitations are wholly unrelated to the discharge of “fluid dispersion.”

Claims 8 and 10

259. Claims 8 and 10 are taught by Goubet for the reasons previously provided in Ground 1 as such limitations are also wholly unrelated to the discharge of fluid dispersion.

260. Thus, for the foregoing reasons, it is my opinion that claims 1, 4, and 7-10 are rendered obvious over Goubet in view of Kaiser.

E. GROUND 5: Claims 1, 4, and 7-10 are anticipated under 35 U.S.C. § 102 by Gao

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:

261. Patent Owner has contended that the preamble is not limiting. *See* EX1018, Exhibit B. However, to the extent the preamble is limiting, it is my opinion that it is taught by Gao.

262. Gao is titled “Atomizer for Atomizing Essence or Essential Oil.” EX1013, Cover.

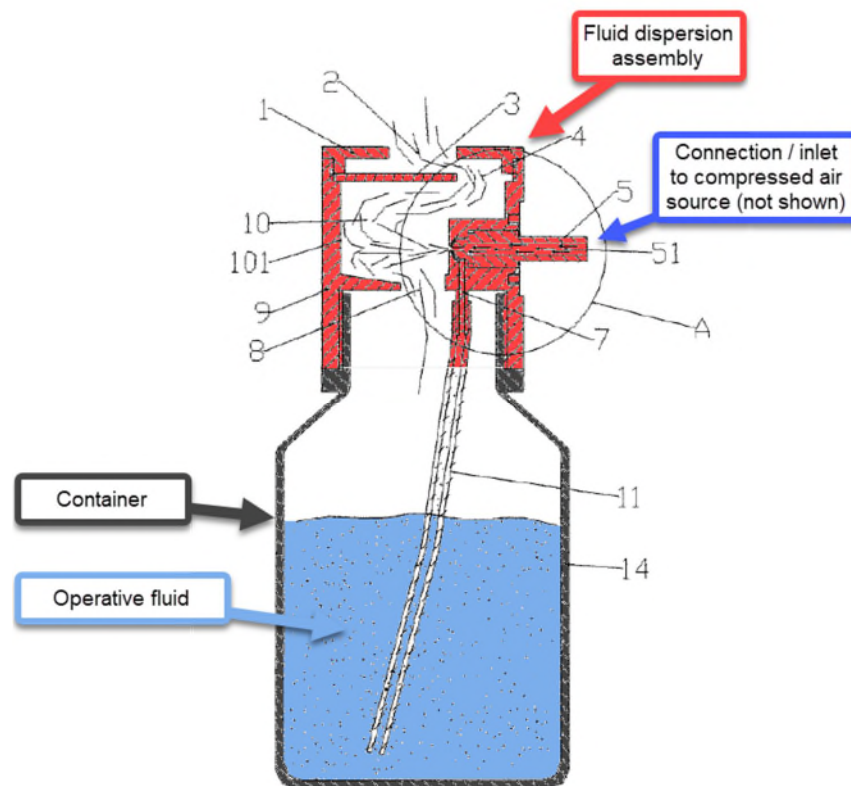


FIG. 1

EX1013, FIG. 1

263. As shown above in FIG. 1, Gao teaches a fluid dispersion assembly (*e.g.*, the atomizer). Gao's atomizer includes a "a main body 9 and a cover body 1." EX1013, ¶ [0020]. The main body 9 has "an upper cavity and a lower cavity," and the inner wall of the lower cavity "is provided with an internal thread for fixing the entire atomizer on an essence or essential oil bottle 14." *Id.* Accordingly, the fluid dispersion assembly (*e.g.*, the atomizer) is interconnected to a container of an operative fluid (*e.g.*, essential oil bottle 14) via the threading for atomizing essential oil.

264. Gao further teaches that the “atomizer body is provided with a first cavity and a second cavity 13.” EX1013, ¶ [0019]. A “gas flow nozzle 5 is fixed in the second cavity 13.” *Id.* “A coaxial gas flow pipe 51 is provided inside the gas flow nozzle 5.” *Id.*, ¶ [0023]. The “gas inlet on a side of the atomizer, *i.e.*, the inlet of the gas flow pipe 51 is connected to the air pump [not shown].” *Id.*, ¶ [0025]. Accordingly, Gao teaches that the fluid dispersion assembly (*e.g.*, the atomizer) is operatively interconnected to an air pump via the gas flow pipe 51.

265. “When the air pump is in operation, a gas flow is blown out through the pipe. The liquid is sucked into the atomizing cavity 6 based on the siphon principle.” *Id.*, ¶ [0025]. The Siphon principle is the fundamental idea that fluids flow from an area of higher pressure to areas of lower pressure. *Supra*, ¶ 82. Given Patent Owner’s proposed construction of a “compressed air source,” it is my opinion that Gao’s, which blows air above ambient pressure into the atomizer to produce the siphon principle, meets the “compressed air source” limitation.

266. It is thus my opinion that Gao teaches a fluid dispersion assembly (*e.g.*, the atomizer) that operatively engages a container (*e.g.*, essence or essential oil bottle 14) of an operative fluid (*e.g.*, essence or essential oil) and a compressed air source (*e.g.*, the pump) to generate and discharge a fluid dispersion (*e.g.*, atomized essential oil) into a surrounding airspace.

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

267. It is my opinion that Gao teaches a diffusion unit at least partially defining an enclosed diffusion chamber.

268. Gao discloses “liquid and gas are fully mixed” as a result of the siphon principle. EX1013, ¶[0025]. “The high-speed gas-liquid mixture is then ejected through a gas flow ... port and hits an inner wall 101 of the lower part cavity 10, thus the liquid is atomized into micron-sized fine particles.” *Id.* Accordingly, Gao teaches a diffusion unit (*e.g.*, main body 9) that at least partially defines a diffusion chamber (*e.g.*, lower part cavity 10 where atomization occurs to generate micron-sized fine particles). *Id.*, FIG. 1.

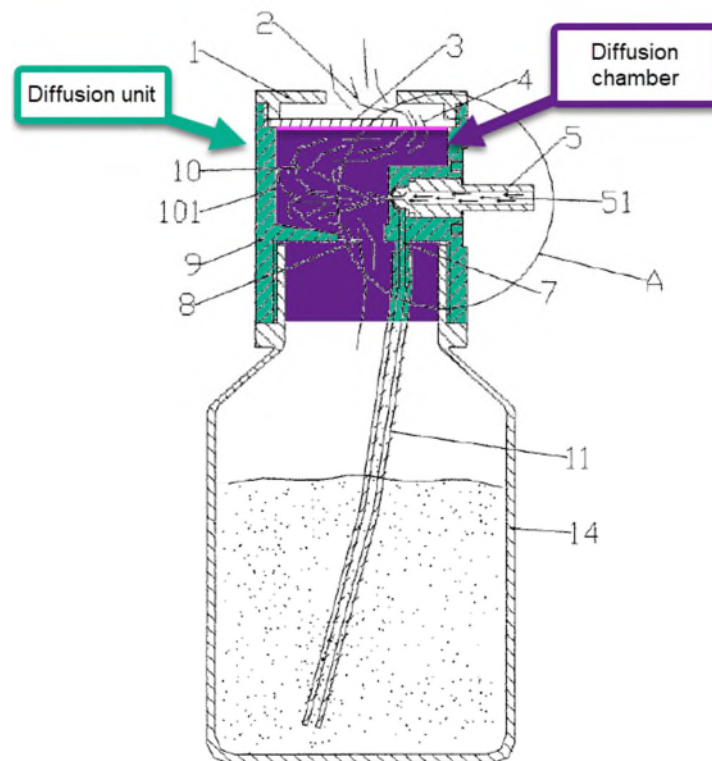


FIG. 1

EX1013, FIG. 1

269. As I mentioned, Gao's lower cavity of main body 9 (*e.g.*, the diffusion unit) "is provided with an internal thread for fixing the entire atomizer on an essence or essential oil bottle 14." EX1013, ¶ [0020]. The cover body 1 is fixed to an upper portion of main body. *Id.* The diffusion chamber (shaded purple), is enclosed by the inner wall 101 of main body 9, essence or essential oil bottle 14, and cover body 1.

270. It is thus my opinion that Gao teaches a diffusion unit that at least partially defines an enclosed chamber.

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

271. It is my opinion that Gao teaches a discharge port disposed in fluid communication between said diffusion chamber and the surrounding airspace.

272. As described above, when in operation, a source of compressed air is supplied to Gao's atomizer in the gas flow pipe 51, thereby sucking liquid into atomizing cavity 6 based on the siphon principle, and fully mixing the liquid with the gas (*e.g.*, air). EX1013, ¶ [0025]. Gao's "high-speed gas-liquid mixture is then ejected through a gas flow port and hits an inner wall 101 of the lower part cavity 10," causing the liquid to be "atomized into micron-sized fine particles." EX1013, ¶ [0025]. Gao teaches that "*[t]he smallest particles will float in the air, and drift out through the through hole 4 and the atomizing gas outlet 2 with the rising gas flow to be converted into gas through heat exchange with the air.*" EX1013, ¶ [0025] (emphasis added).

273. Gao teaches a discharge port (*e.g.*, gas outlet 2) that is disposed in fluid communication between the diffusion chamber (*e.g.*, lower part cavity 10 within main body 9) and the surrounding airspace. That the discharge port is disposed in fluid communication between the diffusion chamber and the surrounding airspace is illustrated in annotated Figure 1. The discharge of droplets is shown in black lines exiting gas outlet 2.

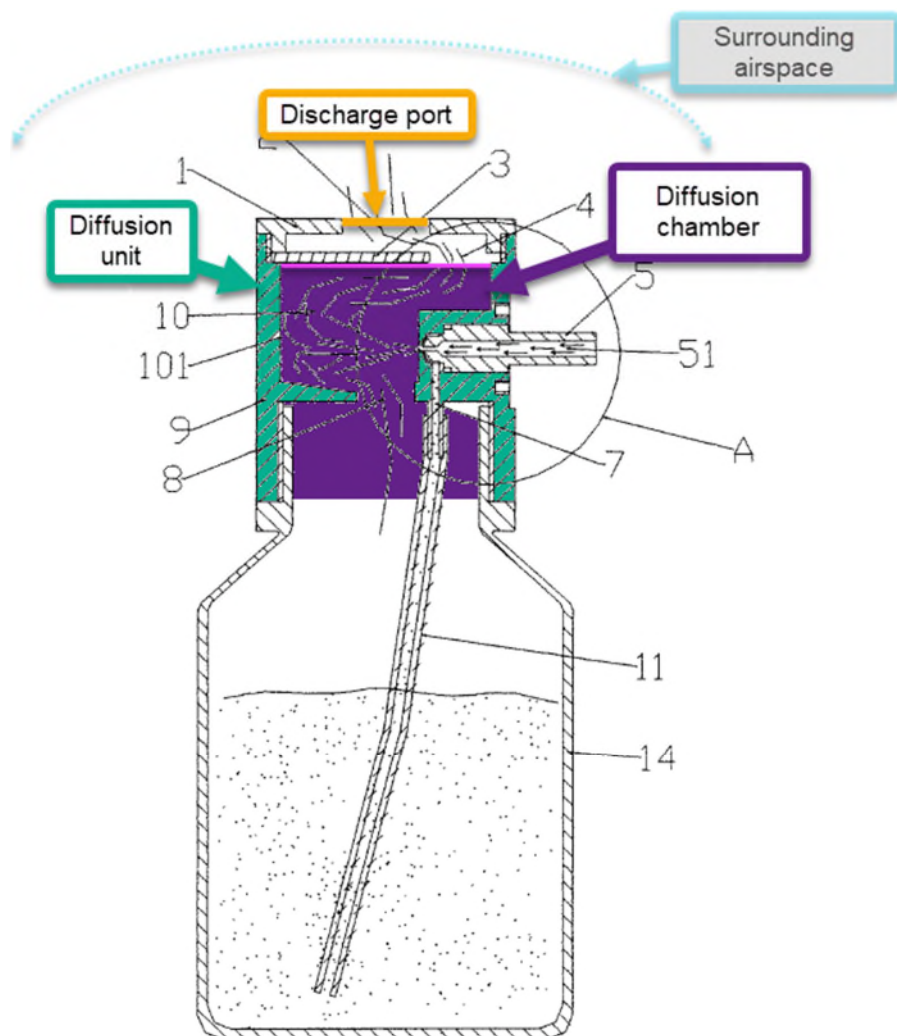


图 1

EX1013, FIG. 1

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

274. It is my opinion that Gao teaches a diffusion assembly disposed in an operative engagement with said diffusion unit.

275. Gao teaches a “gas flow nozzle 5 is fixed in the second cavity 13. . . . An atomizing cavity 6 is formed between the gas flow nozzle 5 and the bottom wall of the second cavity. A liquid pipeline 7 is further provided on the atomizer body, and the liquid pipeline 7 is in communication with the atomizing cavity 6.” EX1013, ¶ [0019]. Gao further teaches “[t]he liquid is sucked into the atomizing cavity 6 based on the siphon principle, and the liquid and the gas are fully mixed ... then ejected through a gas flow flow port.” *Id.*, EX1013, ¶ [0025].

276. It is my opinion that the features within section ‘A’ in Gao’s Figure 1, shown in greater detail in Figure 2, correspond to a diffusion assembly. Further, Gao’s diffusion assembly is in operative engagement with the diffusion unit (*e.g.*, second cavity 13 of main body 9). *See* EX1013, ¶ [0025]. That is, Gao’s “lower part cavity 10 is in communication with a bottom part of the second cavity 13 through the gas flow spray hole,” and, in this way, Gao’s diffusion assembly is disposed in an operative engagement with Gao’s diffusion unit.

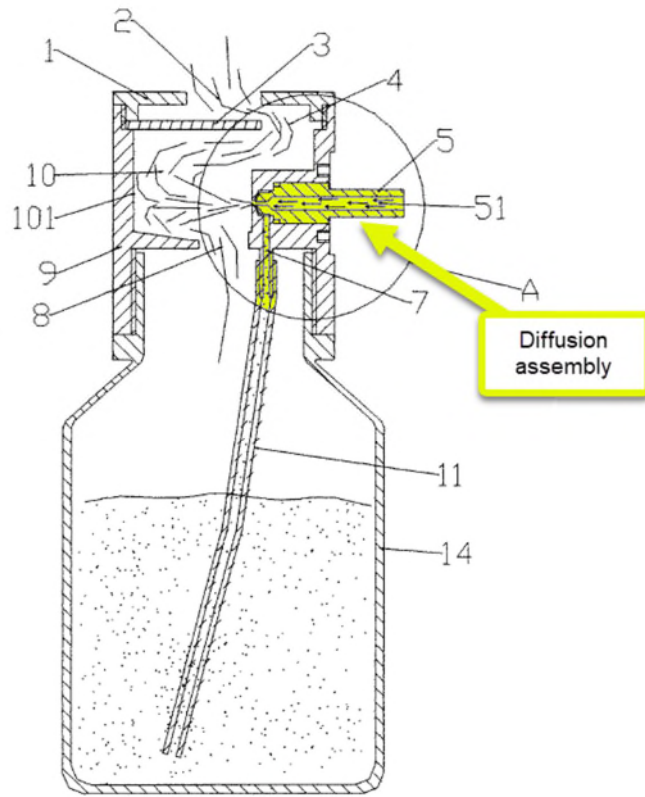


图 1

EX1013, FIG. 1

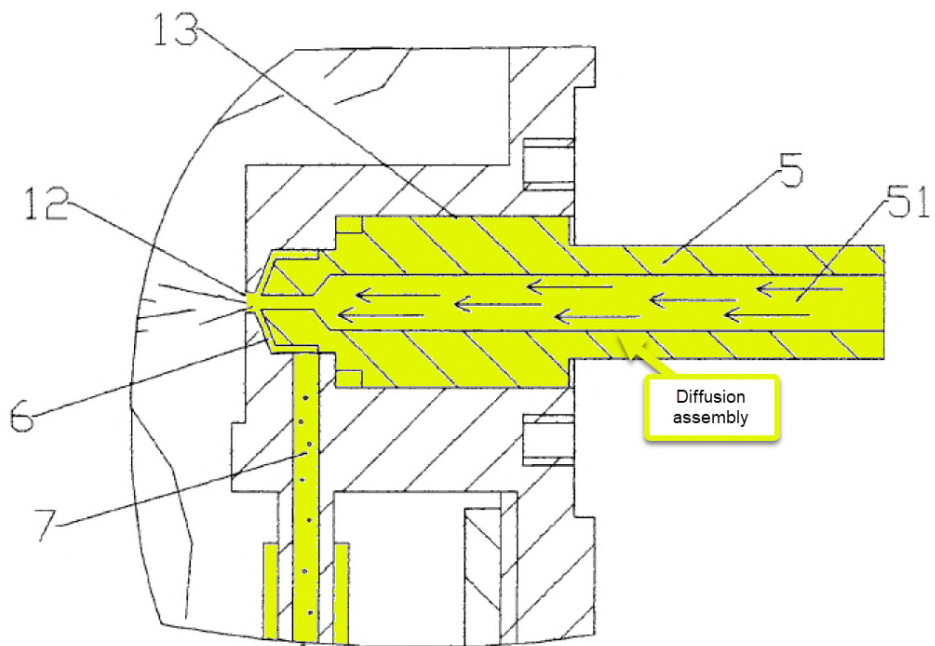


FIG. 2

EX1013, FIG. 2

1[D] wherein said diffusion assembly comprises an atomizer assembly, said atomizer assembly comprising an atomizer air inlet channel, a fluid inlet, a mixing chamber, and an atomizer exhaust aperture.

277. It is my opinion that Gao teaches a diffusion assembly comprising an atomizer assembly, said atomizer assembly comprising an atomizer air inlet channel, a fluid inlet, a mixing chamber, and an atomizer exhaust aperture.

278. As described above with respect to claim limitation 1[C], Gao teaches a diffusion assembly. Gao teaches that, when in operation, “[t]he liquid is sucked into the atomizing cavity 6 based on the siphon principle, and the liquid and the gas are fully mixed.” EX1013, ¶ [0025]. Gao’s atomizing cavity 6 thus corresponds to an atomizer assembly.

279. As shown in Figure 2, Gao’s diffusion atomizes liquid into micron-sized fine particles and disperses the same through the gas flow spray hole 12. Thus, Gao teaches a diffusion assembly that comprises an atomizer assembly (*e.g.*, atomizing cavity 6 formed between the gas flow nozzle 5 and the bottom wall of the second cavity 13).

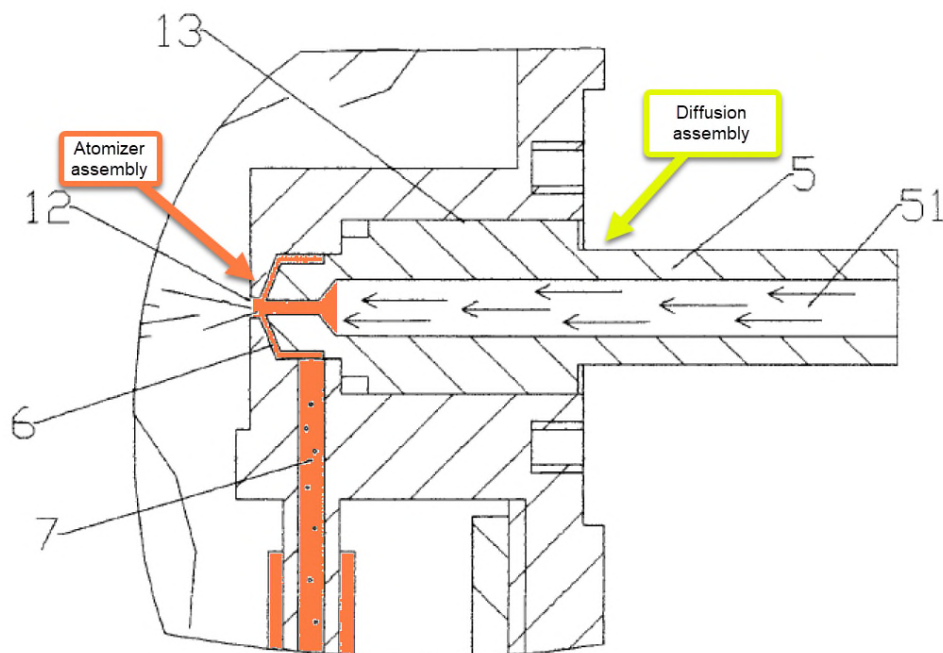


FIG. 2
EX1013, FIG. 2

280. Further, Gao’s “gas inlet on [the] side of the atomizer, *i.e.*, inlet of the gas flow pipe 51, is connected to the air pump.” EX1013, ¶ [0025]. Thus, Gao teaches an atomizer air inlet channel. “A gap is provided between the gas flow nozzle 5 and the bottom wall of the second cavity 13. An atomizing cavity 6 is formed between the gas flow nozzle 5 and the bottom wall of the second cavity. A liquid pipeline 7 is further provided on the atomizer body, and the liquid pipeline 7 is in communication with the atomizing cavity 6.” EX1013, ¶ [0019].

281. Further, “[w]hen the air pump is in operation, a gas flow is blown out through the pipe. The liquid is sucked into the atomizing cavity 6 based on the siphon principle, and the liquid and the gas are fully mixed.” EX1013, ¶ [0025]. Thus, Gao

teaches a fluid inlet (*e.g.*, liquid pipeline 7) and a mixing chamber (*e.g.*, atomizing cavity 6). *Id.* “The high-speed gas-liquid mixture is then ejected through a gas flow [] port [12].” *Id.* Thus, Gao also teaches an atomizer exhaust aperture.

282. It is thus my opinion that, as shown in FIG. 2, Gao teaches an atomizer assembly comprises an atomizer air inlet channel (*e.g.*, the inlet of gas flow pipe 51), a fluid inlet (*e.g.* the upper end of liquid pipeline 7), a mixing chamber (*e.g.*, atomizing cavity 6), and an atomizer exhaust channel (*e.g.*, gas flow spray hole 12).

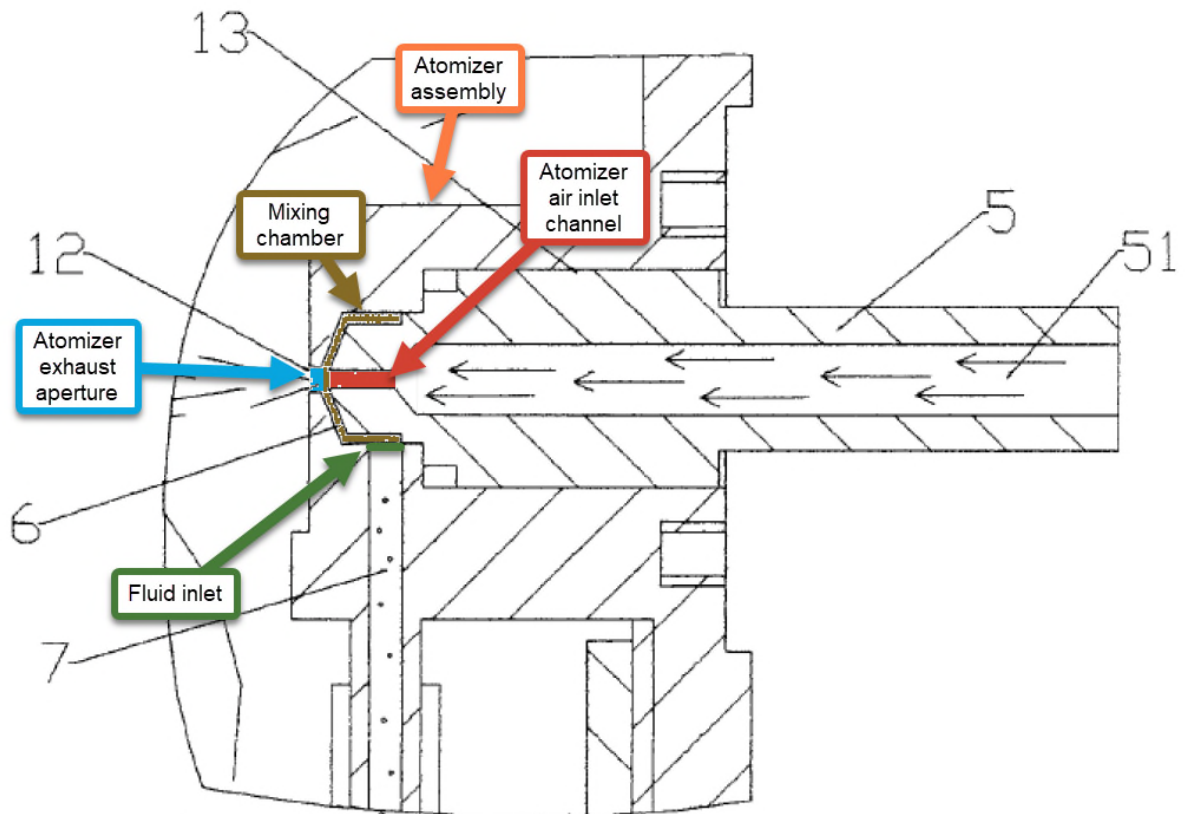


FIG. 2
EX1013, FIG. 2

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

283. It is my opinion that Gao teaches said atomizer air inlet channel interconnected to the compressed air source.

284. As I demonstrated in this Ground 5 with respect to limitation 1[D], the atomizer air inlet channel (*e.g.*, inlet of gas flow pipe 51 facing the atomizer) is interconnected to the compressed air source via the end of the of the gas flow pipe 51 facing Gao's air pump (described but not shown). EX1013, ¶ [0025].

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

285. It is my opinion that Gao teaches said fluid inlet disposed in fluid communication with the operative fluid in the container.

286. As I demonstrated in this Ground 5 with respect to limitation 1[D], the fluid inlet (*e.g.*, upper end of liquid pipeline 7) is disposed in fluid communication with the operative fluid in the container (*e.g.*, essential oil bottle 14) via the lower portion liquid pipeline. EX1013, ¶¶ [0025], [0019]; (“the liquid pipeline is in communication with the atomizing cavity”); *see also Id.*, FIGS. 1 and 2.

1[G] the compressed air and the operative fluid mix together in said mixing chamber to form the fluid dispersion.

287. It is my opinion that Gao teaches the compressed air and the operative fluid mix together in said mixing chamber to form the fluid dispersion.

288. As I demonstrated in this Ground 5 with respect to limitation 1[D], the compressed air and the operative fluid mix together in said mixing chamber (*e.g.*, atomizing cavity 6). EX1013, ¶ [0025] (“liquid is sucked into the atomizing cavity 6 . . . and the liquid and the gas are fully mixed”); *see also id.*, 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.

289. It is my opinion that Gao teaches 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.

290. Gao teaches that when the air pump is in operation, air is blown through gas flow pipe 51 and liquid is sucked into atomizing cavity 6, where the liquid and air are fully mixed. EX1013, ¶ [0025]. The high-speed gas-liquid mixture is then ejected against an inner wall 101 of main body 9 to atomize the liquid mixture into micron-sized fine particles. *Id.* Only the smallest particles (below 3 microns) will drift around the baffle 3 and out gas outlet 2. *Id.* In this manner, “mist can be controlled below 3 microns.” *Id.*, ¶¶ [0025], [0007] (“the atomized particles are finer *and more uniform* . . . and the aroma diffusion area is large”).

291. Gao further teaches that the finer and *more uniform particles* “are easier to vaporize after contact with the air, and the aroma is more uniform.” *Id.*, ¶ [0013]. It is thus my opinion that Gao teaches that the diffusion chamber (*e.g.*, chamber within main body 9) facilitates formation of the fluid dispersion (*e.g.*, substantially uniform droplets) prior to the discharge of the fluid dispersion from said diffusion chamber through said discharge port (*e.g.*, atomizing gas outlet 2) and into the surrounding airspace.

292. Gao teaches the fluid dispersion assembly as recited in claim for the reasons I explained above.

Claim 7. [PRE] A fluid dispersion assembly is operatively interconnected to a container of an operative fluid and a compressed air source to generate and discharge a fluid dispersion into a surrounding airspace, said fluid dispersion assembly comprising:

293. In my opinion, there are no material differences between claim limitations 1[PRE]-1[D] and claim 7 of the '449 Patent. Appendix (*compare* claim limitations 1[PRE]-1[D], *with* claim 7). Thus, for the same reasons discussed above with respect to claim limitations 1[PRE]-1[D], Gao teaches all the limitations of claim 7. *See supra* Claim 1, limitations 1[PRE]-1[D].

294. I note, however, that 1[PRE] recites that the fluid dispersion assembly “*operatively engages*” a container and compressed air source, whereas 7[PRE] recites that the fluid dispersion “*is operatively interconnected to*” a container and

compressed air source. Patent Owner has not suggested there is any material difference between these terms (*i.e.*, between “operatively engages” and “is operatively interconnected to”), and the ’449 Patent does not indicate any material difference. In the event Patent Owner or the Board finds there is a difference, I reserve the right to supplement my opinion to address any such difference.

7[A] a diffusion unit at least partially defining a diffusion chamber,

295. As noted above, it is my opinion that there are no material differences between claim limitations 1[A] and 7[A] of the ’449 Patent. Appendix (*compare* limitation 1[A], *with* limitation 7[A]). I note, however, that 1[A] recites a diffusion unit “at least partially defining an *enclosed* diffusion chamber,” whereas 7[A] recites a diffusion unit “at least partially defining a diffusion chamber” (*i.e.*, it does not include the word “enclosed”).

296. Patent Owner has not suggested there is any material difference between these terms (*i.e.*, between a diffusion unit at least partially defining an *enclosed* diffusion chamber versus a diffusion unit at least partially defining a diffusion chamber), and the ’449 Patent does not indicate any material difference. In the event Patent Owner or the Board finds there is a difference, I reserve the right to supplement my opinion to address any such difference.

297. I note that the remaining limitations of claim 7 are identical to claim limitations 1[B]-1[D].

Claim 8. The fluid dispersion assembly as recited in claim 7 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, the compressed air and the operative fluid mix together in said mixing chamber to form the fluid dispersion.

298. In my opinion, there are no material differences between claim 8 and limitations 1[E]-1[G] of the '449 Patent. Appendix (*compare* claim 8, with limitations 1[E]-1[G]). Thus, for the same reasons discussed above with respect to claim limitations 1[E]-1[G], Gao teaches all the limitations of claim 8. *See supra* Claim 1, limitations 1[E]-1[G].

Claim 9. The fluid dispersion assembly as recited in claim 8 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.

299. In my opinion, there are no material differences between claim 9 and claim 4 of the '449 Patent. Appendix (*compare* claim 4, with claim 9). Thus, for the same reasons discussed above with respect to claim 4, Gao teaches all the limitations of claim 9. *See supra* Claim 4.

Claim 10. The fluid dispersion assembly as recited in claim 7 further comprising a container interconnect operatively interconnecting said diffusion unit to the container.

300. It is my opinion that Gao teaches the fluid dispersion assembly as recited in claim 7 further comprising a container interconnect operatively interconnecting said diffusion unit to the container.

301. Gao teaches the main body 9 (*e.g.*, diffusion unit) has “an upper cavity and a lower cavity.” EX1013, ¶ [0020]. The inner wall of the lower cavity “is provided with an internal thread for fixing the entire atomizer on an essence or essential oil bottle 14.” *Id.* Thus, Gao teaches a container interconnect (*e.g.*, an internal thread) operatively interconnecting said diffusion unit to the container (essence or essential oil bottle 14).

302. For the foregoing reasons, it is my opinion that Gao anticipates claims 1, 4, and 7-10 of the '449 Patent.

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