

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SHARKNINJA, INC.,
SHARKNINJA OPERATING LLC,
SHARKNINJA MANAGEMENT LLC, AND
SHARKNINJA SALES COMPANY,
Petitioners,

v.

DYSON TECHNOLOGY LIMITED,
Patent Owner.

Case No. IPR2023-01324

U.S. Patent No. 9,414,662

**Declaration of Dr. Daniel M. Nosenchuck in Support of
Petition for *Inter Partes* Review of U.S. Patent No. 9,414,662**

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PETITIONERS' EXHIBIT LIST

Exhibit	Description
1001	U.S. Patent No. 9,414,662
1002	File History for U.S. Patent No. 9,414,662
1003	Declaration of Dr. Daniel M. Nosenchuck
1004	U.S. Patent Application Publication No. US 2013/0111777
1005	Japanese Patent Application Publication No. JP S 60-249907 and Certified Translation Thereof
1006	U.S. Patent No. 5,407,135
1007	U.S. Patent No. 1,564,896
1008	U.S. Patent No. 5,546,674
1009	PCT Pub. No. WO 83/02753
1010	U.S. Patent Application Pub. No. 2010/0065545
1011	Great Britain Patent No. 1,417,052

TABLE OF ABBREVIATIONS

Abbreviation	Term
'662 patent	U.S. Patent No. 9,414,662
AIA	America Invents Act
CFM	cubic feet per minute
Challenged Claims	Claims 26–27, 35, and 37 of U.S. Patent No. 9,414,662
Chung	U.S. Patent Application Pub. No. 2010/0065545 (Ex. 1010)
Ex.	Exhibit
Fig.	Figure
IPR	<i>inter partes</i> review
Jeong	U.S. Patent Application Publication No. US 2013/0111777 (Ex. 1004)
Jeffs	U.S. Patent No. 5,407,135 (Ex. 1006)
Lange	U.S. Patent No. 5,546,674 (Ex. 1008)
Nosenchuck Declaration	Declaration of Dr. Daniel M. Nosenchuck (Ex. 1003)
Patent Owner	Dyson Technology Limited
Petitioners	SharkNinja, Inc., SharkNinja Operating LLC, SharkNinja Management LLC, and SharkNinja Sales Company
POSITA	Person[s] of ordinary skill in the art
Rinker	U.S. Patent No. 1,564,896 (Ex. 1007)
Sarocchi	Great Britain Patent No. 1,417,052 (Ex. 1011)
Skarsten	PCT Pub. No. WO 83/02753 (Ex. 1009)
Yoshida	Japanese Patent Application Publication No. JP S 60-249907 (Ex. 1005)

I, Dr. Daniel M. Nosenchuck, declare as follows:

1. I have been retained by counsel for SharkNinja, Inc., SharkNinja Operating LLC, SharkNinja Management LLC, and SharkNinja Sales Company to submit a Declaration in support of the Petition for *Inter Partes* Review of U.S. Patent No. 9,414,662 (“the Petition”), which I understand has been assigned to Dyson Technology Limited. (“Dyson” or “Patent Owner”).

2. I have been asked to opine on whether the ’662 patent is anticipated or rendered obvious by the prior art. My opinions are based on my experience, knowledge, and skill in fluid mechanics and heat transfer, as well as in product development including the design and manufacture of personal care appliances, including hair dryers. In preparation for this declaration, I have reviewed the ’662 patent, its prosecution history, and all exhibits cited in this Declaration and in the Petition.

3. I may rely upon these materials, my experience and knowledge, and/or additional materials to rebut arguments raised by the Patent Owner. Further, I may also consider additional documents and information in forming any necessary opinions, including documents that may not yet have been provided to me.

4. My analysis of the materials produced in this investigation is ongoing and I will continue to review any new material as it is provided. This Declaration represents only those opinions I have formed to date. I reserve the right to revise,

supplement, and/or amend my opinions stated herein based on new information and on my continuing analysis of the materials already provided.

5. I am being paid at my normal hourly rate for my work on this matter. I have no personal or financial stake or interest in the outcome of the Petition.

I. QUALIFICATIONS

6. I received a B.S. degree in Aerospace Engineering and Mechanical Engineering from Syracuse University, and M.S. and Ph.D. degrees in Aeronautics from the California Institute of Technology.

7. In August, 1983, I joined the faculty of Princeton University as an Assistant Professor, where I became Associate Professor of Mechanical and Aerospace Engineering in 1988. I have taught classes in Heat Transfer, Thermodynamics, Fluid Dynamics, Viscous Flows, Energy Conversion and the Environment, Applications to Transportation, Mechanical Design, and Entrepreneurial Engineering (Product Design and Marketing). My curriculum vitae is submitted herewith as Appendix A.

8. I have conducted extensive research in fluid mechanics and heat transfer, including the design, prototyping and use of turbo-machines. My research has further included flow control, drag reduction and development of a special-purpose architecture computer for complex flow simulations (Navier-Stokes Computer). I have worked in Hollywood as a consultant on special-effects related to

hydrodynamics and ballistics, and in 1984 I received an Academy of Television Arts and Sciences Primetime Emmy Award for Outstanding Individual Achievement in Special Visual Effects, for the ABC television movie, “The Day After.”

9. I have 10-15 years of experience in product development including the design and manufacture of personal care appliances, including curling irons, curlers, make-up mirrors and hair dryers. I am the named inventor on 12 issued patents, including D398,074 “Hair Dryer,” U.S. Patent No. 5,841,943 “Ducted flow hair dryer with multiple impellers,” and U.S. Patent No. 6,011,903 “Reduced-noise ducted flow hair dryer with multiple impellers and ambient air inlets.” This work was commercialized and extensively marketed by Revlon as the “Get Quiet” hair dryer.

10. In past courses I taught in Engineering and Mechanical design, students have designed personal care products such as hairdryers and curling irons. For several years in the late 1990s, I held a competition among the student teams for the best product design, as judged by industry representatives and a patent attorney. The ‘prize’ was an expense-paid trip to factories and overseas offices of US companies in China, Hong Kong and Thailand to present their design for consideration of further development by these entities.

11. In addition, in 2015 I was retained as an expert for TF3 Limited in the matter of the *inter partes* review of U.S. Patent No. 8,651,118, IPR2015-00649.

12. If asked, I will testify regarding my qualifications, background, and experience in the fields of fluid mechanics and heat transfer, general mechanical design and prototyping, and in product development including the design and manufacture of personal care appliances.

II. SCOPE OF OPINIONS

13. I have been asked to provide my opinions regarding whether the Challenged Claims of the '662 patent would have been anticipated by Jeong (Ex. 1004) (Ground 1), Yoshida (Ex. 1005) (Ground 2), and/or Jeffs (Ex. 1006) (Ground 3), and/or obvious to one of ordinary skill in the art at the time of the alleged invention in view of the combination of Jeffs and Jeong (Ground 4), and the combination of Jeffs and Yoshida (Ground 5).

14. This Declaration, including the exhibits cited herein, sets forth my opinions on these topics. It is my opinion that the Challenged Claims of the '662 patent would have been anticipated or obvious based on the five Grounds listed above.

III. MATERIALS REVIEWED AND CONSIDERED

15. The materials I considered and relied upon in preparing my Declaration and forming my opinions include all exhibits cited in this Declaration and the Petition, including the '662 patent, the file history of the '662 patent, and all of the relevant prior art.

16. I also have relied on my professional experience, knowledge, and skill in fluid mechanics and heat transfer, general mechanical design and prototyping, as well as in product development including the design and manufacture of personal care appliances, including hair dryers in reaching the opinions expressed in this Declaration.

IV. LEVEL OF ORDINARY SKILL IN THE ART

17. In rendering the opinions set forth in this Declaration, I was asked to consider the patent claims and the prior art through the eyes of one of ordinary skill in the art at the effective filing date of the claimed invention.

18. I understand that various factors, such as the education level of those working in the field, sophistication of the technology, types of problems encountered in the art, prior art solutions to those problems, and speed at which innovations are made, may help establish the level of skill in the art. In determining the level of ordinary skill in the art, I have taken into account these factors as well as my years of experience in the personal care appliance industry related to the subject matter of the '662 patent.

19. It is my opinion that one of ordinary skill in the art would have had the equivalent of a Bachelor's degree or comparable technical degree in Mechanical and/or Aerospace Engineering or an equivalent engineering or design-related field that involved exposure to introductory fluid mechanics and heat transfer at a level

roughly equivalent to that of a second-year engineering student. In addition, it is my opinion that one of ordinary skill in the art would have had the equivalent of at least one year's worth of experience in research, design and/or development related to appliances for blowing air such as hair dryers for (or other comparable industrial design) at the time of the earliest claimed effective filing date of the claimed invention, July 5, 2013. Additional education could substitute for experience, and vice versa.

V. STATEMENT OF LEGAL PRINCIPLES

A. Claim Construction

20. I understand that terms appearing in the patent claims are to be interpreted according to their “ordinary and customary meaning” in an IPR proceeding. In determining the ordinary and customary meaning, the words of a claim are first given their plain meaning as they would have been understood by one of skill in the art at the time of the effective filing date of the claimed invention, in light of the specification and file history. I understand that, under limited circumstances, evidence external to the patent and its prosecution may be used to determine the meaning attributed by a person of ordinary skill in the art at the time of the effective filing date of the claimed invention. I have followed this approach in my analysis, and have applied the ordinary and customary meaning of the terms of the Challenged Claims throughout my analysis in this Declaration.

21. I understand that the words of the claims should be interpreted as they would have been understood by a person of ordinary skill in the art at the time of the effective filing date of the claimed invention. For purposes of my analysis, and for the reasons explained below, I have applied a date of July 5, 2013, as the effective filing date of the claimed invention in my analysis.

B. Anticipation

22. I have been informed that if each and every element of a claim is disclosed in a single prior art reference, then the claimed invention is anticipated and not patentable under AIA 35 U.S.C. § 102. In order for the invention to be anticipated, each element of the claimed invention must be described or embodied, either expressly or inherently, in a single prior art reference. I understand that a reference inherently discloses a claim limitation when that claim limitation is necessarily present in the reference. I also understand that a prior art reference must be enabling in order to anticipate a patent claim.

C. Obviousness

23. I have been informed that a patent claim is invalid as “obvious” under AIA 35 U.S.C. § 103 if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in

the art to which the claimed invention pertains. I have reviewed AIA 35 U.S.C. § 103.

24. I have also been informed that the framework for determining obviousness involves considering the following factors: (i) the scope and content of the prior art; (ii) the differences between the prior art and the claimed subject matter; (iii) the level of ordinary skill in the art; and (iv) any objective evidence of obviousness as set forth in the case of *Graham v. John Deere Company*. I have been informed that in the case of *KSR International Company v. Teleflex*, the Supreme Court reaffirmed the framework for determining obviousness that was previously set forth in the case of *Graham v. John Deere Company*.

25. I have further been informed that the “objective” (or “secondary”) evidence of non-obviousness includes things such as: (1) a long-felt but unmet need in the prior art that was satisfied by the claimed invention; (2) commercial success or the lack of commercial success of the claimed invention; (3) unexpected results achieved by the claimed invention; (4) praise of the claimed invention by others skilled in the art; (5) taking of licenses under the patent by others; (6) deliberate copying of the claimed invention; and (7) contemporaneous and independent invention by others.

26. I have been informed that a claim can be obvious in light of a single prior art reference or multiple prior art references. To be obvious in light of a single

prior art reference or multiple prior art references, there must be a reason to modify the single prior art reference, or combine two or more references, in order to achieve the claimed invention. This reason may come from a teaching, suggestion, or motivation to combine, or may come from the reference or references themselves, the knowledge of one skilled in the art, or from the nature of the problem to be solved, and may be explicit or implicit from the prior art as a whole. I have been informed that the combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results. I also understand it is improper to rely on hindsight in determining obviousness.

VI. SUMMARY OF THE '662 PATENT

27. The '662 patent is entitled "Hand Held Appliance." Ex. 1001. I understand that the '662 patent was filed on July 3, 2014 as application number 14/323,937, and claims foreign priority to Great Britain Patent Application No. 1312068.8, which was filed on July 5, 2013. Ex. 1001. For purposes of my analysis, I have assumed that the effective filing date of the '662 patent is the filing date of the Great Britain foreign priority application, July 5, 2013.

28. The '662 patent relates generally to a "hair care appliance comprising a handle, the handle comprising a wall and an outer wall wherein the wall defines a primary fluid flow path that extends from a primary fluid inlet into the appliance and the outer wall is an external surface of the appliance." Ex. 1001, Abstract. In one

example, the appliance described is “a hair care appliance such as a hairdryer or hot styling brush.” Ex. 1001 at 1:11-13.

29. Figure 1 of the '662 Patent depicts “a hairdryer 10 with a handle 20 and a body 30”:

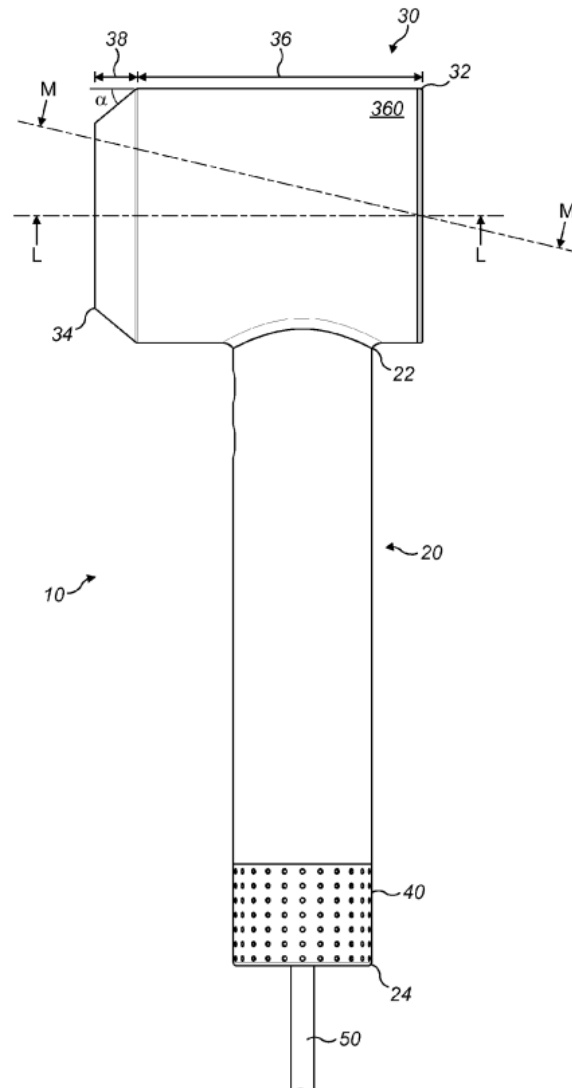


FIG. 1

30. The hairdryer shown in Figure 1 has “a handle 20 and a body 30,” the handle having “a first end 22 which is connected to the body 30 and which includes a primary inlet 40.” Ex. 1001, 9:52-56. The device also includes “a fan unit 70” located “[u]pstream of the primary inlet 40” that “includes a fan and a motor.” The fan unit “draws fluid through the primary inlet 30 towards the body 30 through a fluid flow path 400 that extends from the primary inlet 40 and into the body 30 where the handle 20 and the body 30 are joined 90.” Ex. 1001 at 10:22-27. The annotated Figure 3 of ’662 Patent below depicts the “fluid flow path”:

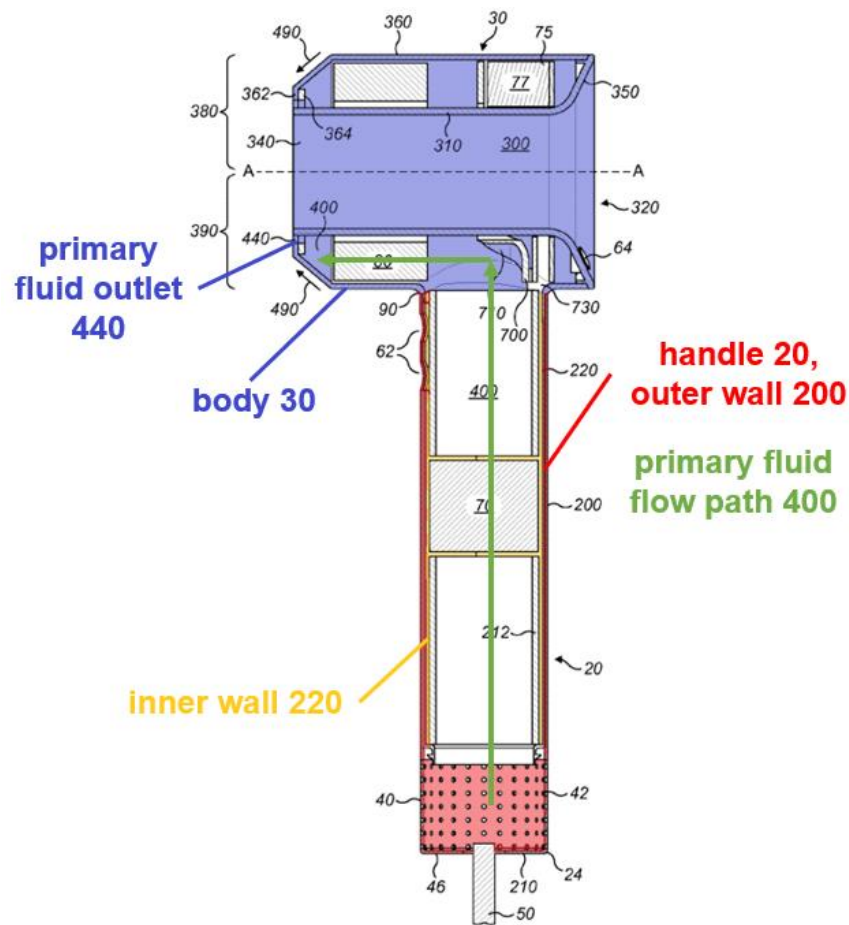


FIG. 3

31. The '662 patent explains that the “fluid flow path 400 continues through the body 30 towards the second end 32 of the body, around a heater 80 and to a primary fluid outlet 330 where fluid that is drawn in by the fan unit exits the primary fluid flow path 400,” and the “primary fluid flow path 400 is non linear and flows through the handle 20 in a first direction and through the body 30 in a second direction which is orthogonal to the first direction.” Ex. 1001 at 10:27-34.

32. Particularly relevant to the Challenged Claims are the limitations that “the inner wall is disposed radially inwardly from the outer wall” and that “the outer wall is an external surface of the handle.” As I explain below regarding the Prosecution History of the '662 patent (Section VI.B), those limitations were added to Challenged Claim 26 in order to avoid the prior art Sarocchi patent. Thus, I understand that these were the key limitations that made the Challenged Claims allowable.

33. Regarding those two limitations, the '662 patent indicates that “[t]he handle 20 has an outer wall 200 and an inner wall 220,” both of which are annotated in Figure 3 above. Ex. 1001 at 12:29-31. The '662 patent describes the “inner wall 220” as “a duct which surrounds and defines a primary fluid flow path 400 through the hairdryer.” Likewise, the “outer wall 200” is described as including “a grippable portion and in this example, includes the primary inlet 40 into the primary fluid flow path 400.” Ex. 1001 at 12:31-35. The '662 patent further indicates that “an insulating

layer of material 212” may be provided either within the inner wall or “between the outer wall 210 and inner wall 220,” but this “insulating layer” is not recited in any of the Challenged Claims. Ex. 1001 at 12:35-44, cl. 26.

A. Challenged Claims

34. The ’662 patent has three independent claims, (1, 13, and 26), however, only independent claim 26 and its dependent claims 27 and 28 are Challenged Claims. The Challenged Claims 26-28 are provided below:

[26pre] A hair care appliance comprising

[26a] a body and a handle

[26b] the handle comprising an inner wall and an outer wall,

[26c] wherein the inner wall is disposed radially inwardly from the outer wall and defines a primary fluid flow path that extends from a primary fluid inlet into the appliance,

[26d] wherein the outer wall is an external surface of the handle, and

[26e] wherein the primary fluid flow path from the primary fluid inlet to a primary fluid outlet from the body is nonlinear.

[27] The appliance of claim 26, wherein the primary fluid flows within the handle in a first direction and within the body in a second direction.

[28] The appliance of claim 26, wherein the primary fluid flow in the body is substantially orthogonal to the primary fluid flow in the handle.

B. Prosecution History of the '662 Patent

35. The '662 patent issued from U.S. Patent Application No. 14/323,937, which was filed on July 3, 2014. The '662 patent claims foreign priority to Great Britain patent application no. 1312068.8, which was filed on July 5, 2013. *See* Ex. 1001, Cover.

36. The application for the '662 patent was filed with 39 original claims. The numbering of the claims did not change between the claims originally filed with the application and the claims of the issued '662 patent. *See* Ex. 1002 at 45-48. The Challenged Claims (26-28) originally read as follows:

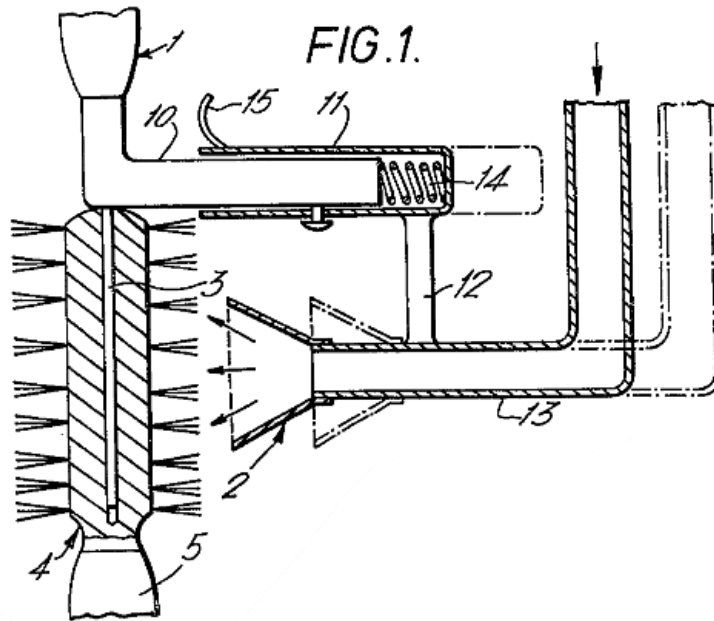
26. A hair care appliance comprising a handle, the handle comprising a wall and an outer wall wherein the wall defines a primary fluid flow path that extends from a primary fluid inlet into the appliance and the outer wall is an external surface of the appliance wherein the primary fluid flow path from the primary fluid inlet to a primary fluid outlet is nonlinear.

27. The appliance of claim 26, wherein the primary fluid flows within the handle in a first direction and within the body in a second direction.

28. The appliance of claim 26, wherein the primary fluid flow in the body is substantially orthogonal to the primary fluid flow in the handle.

Ex. 1002 at 47-48. Claims 27 and 28 were not amended during prosecution.

37. On February 2, 2016, the PTO examiner rejected independent claim 26 (and its dependent claims 27 and 28) as invalid in view of GB 1,417,052 (“Sarocchi”), which discloses a “device for brushing, shaping, or fashioning hair or filaments, comprising a first handle which supports the nozzle of an air heater, a guide projecting from the first handle, and a brush provided with a second handle and removably mounted on the said guide, the brush having a cavity adapted to receive the guide, the brush being slidable along and rotatable about the guide when mounted on the latter,” which is depicted in Sarocchi’s Figure 1:



Ex. 1011 at 1:48-57, Fig. 1. The examiner determined that Sarocchi disclosed all of the elements of original claims 26-28. See Ex. 1002 at 2091-92.

38. The applicant filed amendments to the claims on May 2, 2016. See Ex. 1002 at 2249-2253. The applicant explained that “Claim 26 has been amended to

recite that “the inner wall is disposed radially inwardly from the outer wall” and that “the outer wall is an external surface of the handle,” and that “Sarocchi fails to disclose or suggest these features.” Ex. 1002 at 2255. The amended claim 26 (which has the same text as the issued claim 26 in the ’662 patent) read as follows:

26. (Currently Amended) A hair care appliance comprising a body and a handle, the handle comprising [[a]] an inner wall and an outer wall, wherein the inner wall is disposed radially inwardly from the outer wall and defines a primary fluid flow path that extends from a primary fluid inlet into the appliance, wherein [[and]] the outer wall is an external surface of the ~~appliance~~ handle, and wherein the primary fluid flow path from the primary fluid inlet to a primary fluid outlet from the body is non linear.

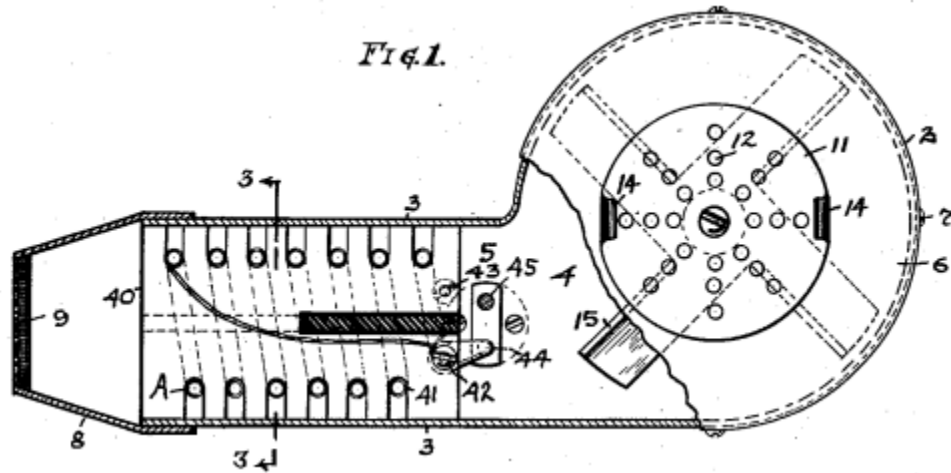
Ex. 1002 at 2252. The examiner noted that the amendments shown above distinguished the “wall and outer wall such that it more clearly defines over the rejecting prior art of record,” *i.e.*, Sarocchi, “both structurally and functionally” and “will place the application in condition for allowance.” Ex. 1002 at 2261. The examiner issued a Notice of Allowance on May 26, 2016, and the ’662 patent issued on August 16, 2016. Ex. 1002 at 2268, 2286.

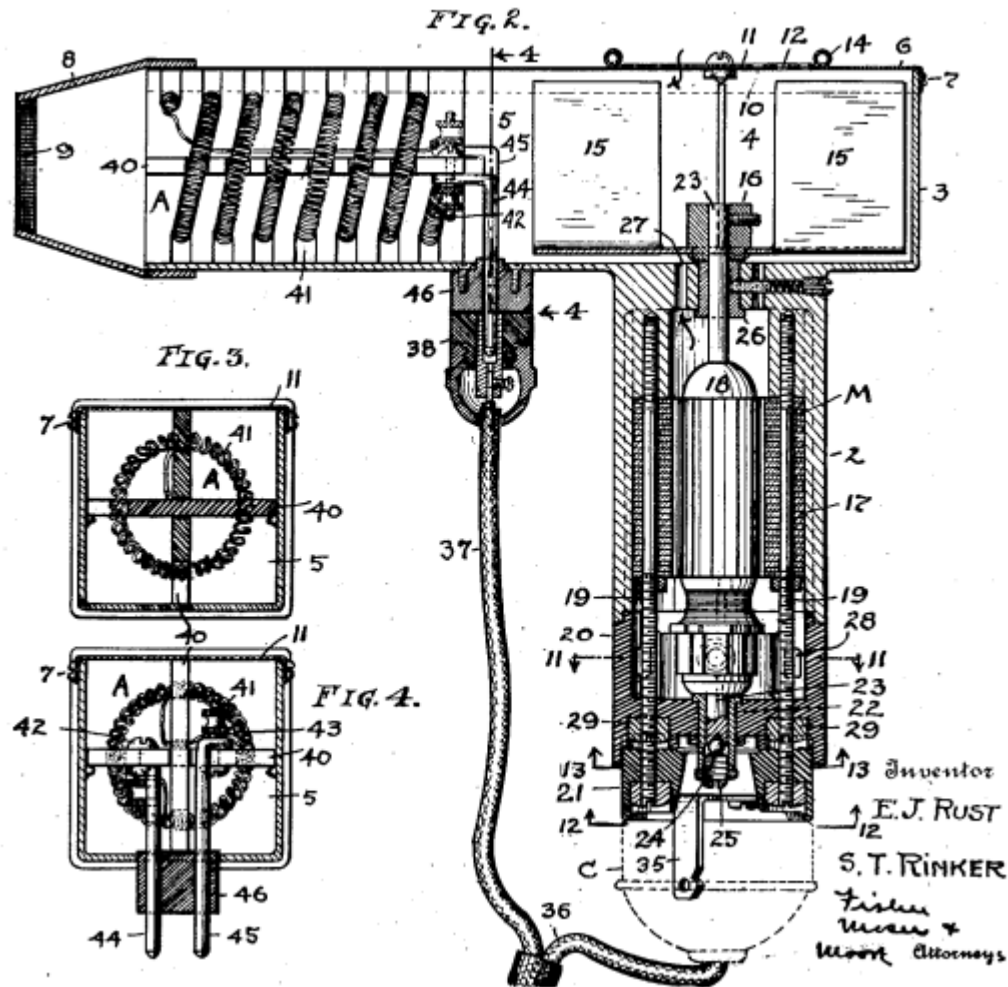
VII. STATE OF THE ART

A. Conventional Blower Technology

39. Early hairdryers predominantly used centrifugal compressors as the “blower.” These designs used an impeller which is a series of blades circumferentially disposed on a disk. In use, the disk rotates at a high rate, essentially

guiding air from the center of the disk outwards though the rotating blades, thus adding kinetic energy to the airflow, increasing momentum and a corresponding pressure rise to the air. The flow enters the impeller near the center of, and normal to, the rotating disk where the pressure is below atmospheric. The flow exits radially outwards from the disk where it is collected in a volute that has a discharge port which directs the high-pressure air flow outwards and generally through heating elements towards the target subject's hair. Thus, the flow path of air in such a blower is nonlinear in that the air flow turns approximately 90 degrees from the impeller inlet to the volute outlet. For example, U.S. Patent No. 1,564,896 (published in 1925) demonstrates this type of design.



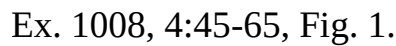


Ex. 1007, 1:10-61, Figs. 1, 2.

40. Though effective as a hair dryer, this blower approach tended to be rather bulky and somewhat noisy due to the early and rather inefficient design of electric motors. Such hairdryers were common from roughly the 1920s through the 1960s. Subsequent hairdryer designs were based on axial flow compressors in which a multi-bladed fan internal to the hairdryer housing propelled air in essentially a straight, linear path from an inlet in the rear of the housing, through the axial fan which supplied a pressure rise to the flow, and then onward towards the exit nozzle.

Heating elements were generally located downstream of the fan. These designs tended to be more compact and somewhat quieter than the previous centrifugal blower designs, in large part due to the evolving design of the increased efficiency and shrinking sizes of electric motors.

41. In the past several decades, blowers have been made more efficient based on advances in fan blade and body housing designs. Hairdryer and curler designs have also been developed in which the “handle” of the unit housed the motor/blower unit. In general, those designed involved an outlet closest to the distal end of handle in which the air outlet is an open portion on the side of the handle, creating a nonlinear flow path from inlet to outlet. One example where the “handle” of the unit housed the motor/blower unit and a nonlinear flow path was created from inlet to outlet is shown in U.S. Patent No. 5,546,674 (published in 1996), which details “an air-moving appliance for drying or styling hair” that included “air directing means 24 which aid in deflecting the air stream at approximately right angles to the longitudinal axis of the housing”:



A. Effective Filing Date

B. Overview of the Prior Art

43. The Jeong reference is a U.S. patent application publication that was filed on December 24, 2012 and was published on May 9, 2013. Jeong is entitled “Hair Dryer,” and the applicant is listed as BA Solutions Co., Ltd. Ex. 1004, Cover

Page. I understand that Jeong is available as prior art because it has earlier effective filing and publication dates than the effective filing date of the '662 patent (July 5, 2013).

44. Jeong discloses a “hair dryer in which an amount of air current generated by a fan rotated by an operation of a motor is increased by a coanda effect to transfer a relatively large amount of air current into user’s hair”:

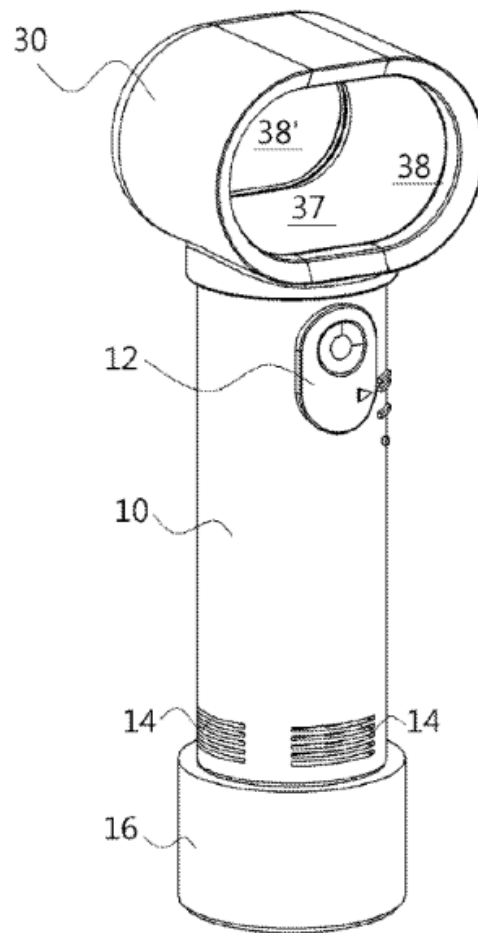


FIG. 1

Ex. 1004 at ¶ 9, Fig. 1. As shown in Jeong's Figure 1, the hair dryer consists of "a housing 10" that "defines a portion of an outer appearance of a hair dryer" and has a cylindrical shape. Ex. 1004 at ¶ 30. Jeong's "housing 10" provides "an inner space 11 in which parts . . . are installed," such as a "motor housing 18," a "motor 20," and a "fan 22," which are all depicted in Jeong's Figure 2:

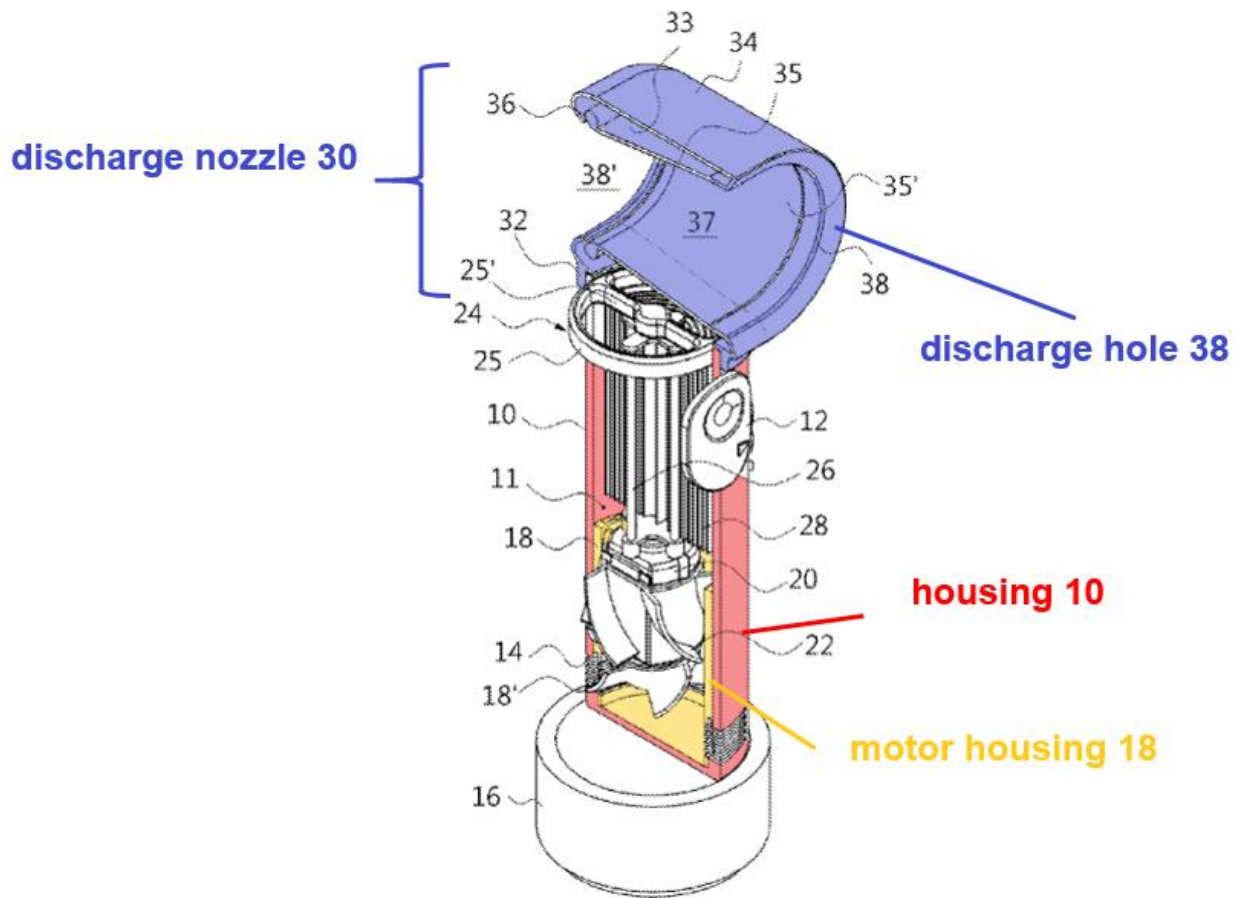


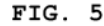
FIG. 2

Ex. 1004 at ¶¶ 30–35, Fig. 2. Note that the "motor housing 18" is radially inward of the "housing 10," which is shown in the annotated version of Jeong's Figure 2 above.

45. Jeong's hair dryer includes a "discharge nozzle 30" that "is disposed on an upper end of the housing 10." The "discharge nozzle 30 is configured to mix the air passing through the housing 10 with the external air, thereby discharging the mixed air." Ex. 1004 at ¶ 39.

46. Jeong states that the "front end of the central passage part 37, i.e., a portion through which air is finally discharged from the discharge nozzle 30 may be referred to as a discharge hole 38, and the rear end of the central passage part 37, i.e., a portion through which air is introduced into the central passage part 37 may be referred to as a secondary inflow hole 38'." "The air introduced through the secondary inflow hole 38' is mixed with the air discharged through the discharge slit 36 while passing through a region corresponding to the diffusion surface 35", and then the mixed air is discharged through the discharge hole 38." Ex. 1004 at ¶ 46.

47. Figure 5 "is an operation state view illustrating an air current generation process according to an embodiment" of the Jeong hair dryer:



¹ All annotations and shading have been added unless noted otherwise.

whole region of the inner passage 33 having the ring shape and then is discharged from the inner passage 33 through the discharge slit 36.” Ex. 1004 at ¶ 54. The air that is discharged through the discharge slit 36 flows along a “coanda surface 35’,” as shown by arrow A in Figure 5. Jeong explains that “when the air is increased in velocity while flowing along the coanda surface 35’, the surrounding of the coanda surface 35’ may be relatively decreased in pressure,” and thus, as shown by an arrow B of FIG. 5, air outside the discharge nozzle 30 is introduced into the central passage part 32 through the secondary inflow hole 38[’].” Ex. 1004 at ¶ 55. Finally, the “external air introduced into the central passage part 32 through the secondary inflow hole 38[’] and the air discharged through the discharge slit 36 are mixed with each other while passing through the section of the central passage part 32 corresponding to the diffusion surface 35’,” and “the air is discharged through the discharge hole 3[8] and is transferred into the user’s hair.” Ex. 1004 at ¶ 56.

48. As shown in the element-by-element analysis of the Challenged Claims below, Jeong discloses every claimed feature, and therefore anticipates each of the Challenged Claims.

49. Based on my review, it is my opinion that a POSITA reading Jeong would have been able to implement Jeong’s hair dryer with little or no experimentation required. Jeong provides ample detail regarding its hair dryer such

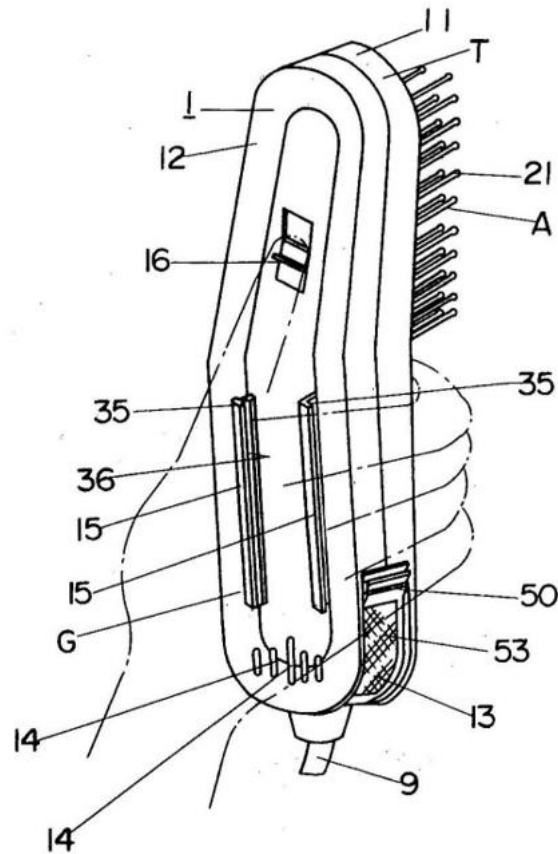
that a POSITA would have been able to build the hair dryer without undue experimentation.

2. Yoshida (Ex. 1005)

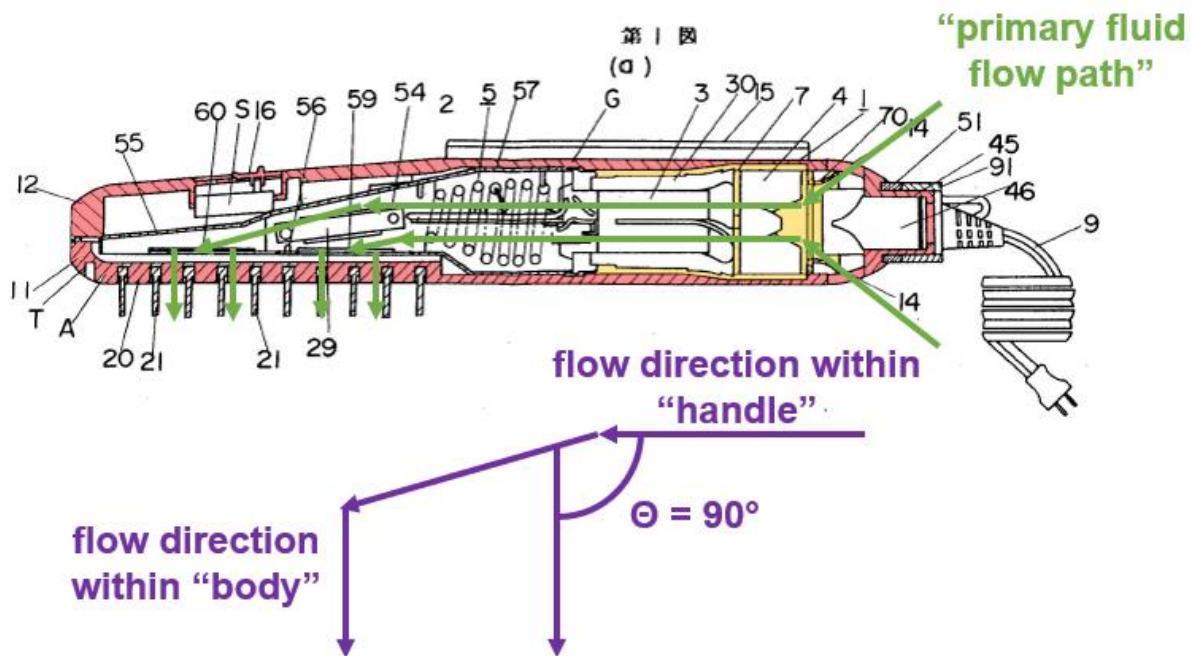
50. The Yoshida reference is a Japanese Unexamined Patent Application Publication that was filed on May 25, 1984 and was published on December 10, 1985. Yoshida is entitled “Hair Dryer,” and the applicant is listed as Matsushita Electric Works Co., Ltd. Ex. 1005, Cover Page.² I understand that Yoshida is available as prior art because it was published prior to the effective filing date of the ’662 patent (July 5, 2013).

51. Yoshida discloses “a hair dryer, and more particularly to a hair dryer having a hair brush-like or cylindrical shape, so that the hair can be easily curled”:

² All citations to Yoshida refer to the certified English translation that begins on page 9 of Ex. 1005.



Ex. 1005 at 47, Fig. 5. Yoshida's Figure 1(a) is a vertical cross-sectional view of an embodiment of the hair dryer:



Ex. 1005 at 50, Fig. 1. As shown in Figure 1(a), Yoshida's hair dryer includes "a motor, a fan and a heater inside," as well as a "heater enclosing frame 5" that includes "a partition plate 55 inclined toward the front side toward the tip in order to change the direction of the air that has passed through the heater 2 portion from the axial direction to the front" of the hair dryer. Ex. 1005 at 49.

52. Regarding airflow through the hair dryer (which is shown in green in the annotated version of Fig. 1 above), Yoshida explains that "the air flowing into the housing 1 from the suction ports 13 and 14" is "guided by the partition plate 55 of the heater enclosing frame 5," and then, the air "is blown forward through an air outlet composed of the outlet 59 of the front plate 56 arranged on the front surface of the housing 1 and the slit 22 of the attachment A." Ex. 1005 at 49.

53. As shown in the element-by-element analysis of the Challenged Claims below, Yoshida discloses every claimed feature, and therefore anticipates each of the Challenged Claims.

54. Based on my review, it is my opinion that a POSITA reading Yoshida would have been able to implement Yoshida's hair dryer with little or no experimentation required. Yoshida's extensive disclosure provides ample detail regarding its hair dryer such that a POSITA would have been able to build the hair dryer without undue experimentation.

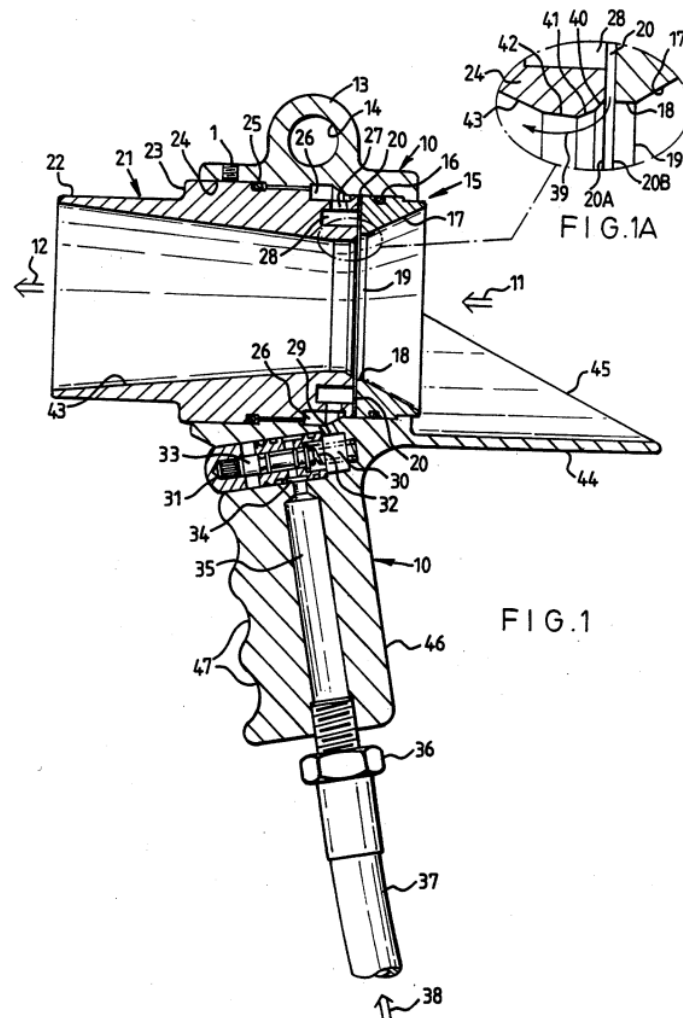
3. Jeffs (Ex. 1006)

55. Jeffs is a United States patent that was filed on November 16, 1993 and issued on April 18, 1995. Ex. 1006, Cover Page. Jeffs is entitled "Hand-Held Blower Device," and the applicant is listed as Imperial Chemical Industries PLC. Ex. 1006. I understand that Jeffs is available as prior art because it was patented prior to the effective filing date of the '662 patent (July 5, 2013).

56. Jeffs discloses "a hand-held air blower device for directing a jet of air in a desired direction," and which is "capable of being readily re-directed and re-positioned by the operator." Ex. 1006 at 2:19-20. Jeffs notes that its "hand-held air blower device" is "particular useful in accelerating the drying of intermediate and final coats of water-borne coatings for example during the re-painting of road

vehicles,” but as I explain in more detail below, would also readily function as a hand-held hair dryer.

57. Figures 1 (and 1A) of Jeffs depict a hand-held air blower device as described by Jeffs:



Ex. 1006, Fig. 1. Unlike a conventional hand-held air dryer, which would typically include an electrically-powered fan to generate air flow, the Jeffs air blower is connected to “a source of high pressure air.” Ex. 1006 at 2:29-30.

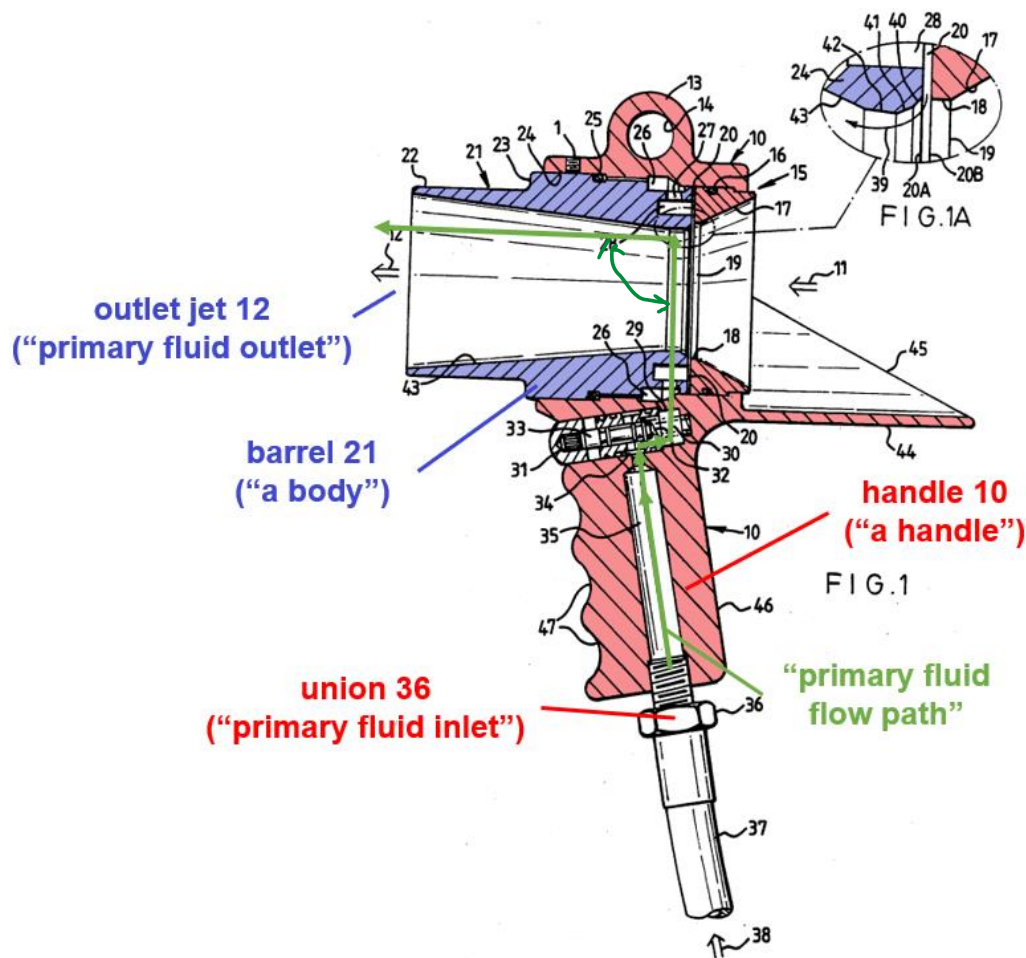
58. The hand-held air blower device described in Jeffs “consists of two interconnected body components: a handle 10 and a barrel 21.” Ex. 1006 at 3:13-15. The barrel 21 “has a generally cylindrical outer wall which is accommodated with a sliding fit by a cylindrical opening in the handle 10.” Ex. 1006 at 3:15-17. The handle includes a “pistol grip portion” which “receives the fingers of the operator,” and a “push button 31” that operates a high-pressure air inlet valve. Ex. 1006 at 3:19-22. Jeffs explains that the “pistol grip portion depends generally at 90° from a longitudinal axis of the barrel 21, so that the entire device resembles a pistol.” Ex. 1006 at 3:24-26.

59. The Jeffs hand-held air blower device is operated essentially the same way as a conventional hand-held hair dryer. Jeffs explains that, in use, “the operator holds the device as he or she would a pistol, directs the outlet air flow in the desired direction over a surface to be dried, and at an appropriate distance from that surface, and depresses the button 31 to supply a jet of air for one or more periods, until he or she judges that the drying is complete.” Ex. 1006 at 5:10-15.

60. Airflow within the Jeffs air blower device beings at the “outer chamber 26,” which is in register with a “high pressure air supply port 29.” Ex. 1006 at 4:17-20. When the “push button 21” is depressed, high pressure air is “conveyed along flexible hose 37 and union 36 to the channel 35 within the handle 10,” and “reaches the inner chamber 30.” Ex. 1006 at 4:28-30. From the inner chamber 30, “the high

pressure air emerges through channel 29 to the barrel chambers 26 and 28, where it then emerges through the inlet slot 20” of the barrel.” Ex. 1006 at 4:31-34. When the operator releases the push button, the supply of high pressure air to the inlet slot 20 is switched off via the valve. See Ex. 1006 at 4:34-41.

61. Once “the high pressure air emerges from the inlet 20 at right angles to the longitudinal axis of the barrel 21, it is drawn by the Coanda effect progressively in the down stream direction, as shown by arrow 39 in FIG. 1A,” reproduced above. Ex. 1006 at 4:42-45. Jeffs explains that the air “is attracted to the progressively stepped surfaces 40, 41, 42 and 43 of the inlet wall of the barrel,” but “not drawn to the upstream surface 18, because that is parallel to the longitudinal axis.” Ex. 1006 at 4:45-49. Accordingly, the “high speed flow of this high pressure air 39 creates a region of low pressure which attracts bulk air flow 11 in the longitudinal direction,” and the bulk air flow combines with the high pressure air flow, within the barrel 21, and the combined air flow is at an intermediate velocity when it emerges at 12.” Ex. 1006 at 4:49-54. The overall air flow path is shown in **green** in the following annotated version of Figure 1 is nonlinear, and roughly orthogonal between the inlet flow and the primary fluid outlet:



Ex. 1006, Fig. 1.

62. As shown in the element-by-element analysis of the Challenged Claims below, Jeffs discloses every claimed feature, and therefore anticipates each of the Challenged Claims. Further, in the event that the preamble is considered to be limiting, the combination of Jeffs and Jeong, as well as the combination of Jeffs and Yoshida render the Challenged Claims obvious, as Jeong and Yoshida each disclose a “hair care appliance.”

63. Based on my review, it is my opinion that a POSITA reading Jeffs would have been able to implement Jeffs’ hand-held air blower device with little or

no experimentation required. Jeffs' disclosure provides ample detail regarding its hand-held air blower such that a POSITA would have been able to build the blower without undue experimentation.

C. Ground 1: Claims 26-28 Are Anticipated By Jeong

64. I have analyzed claims 26-28 of the '662 patent, and it is my opinion that each claim is anticipated by Jeong.

1. Claim 26

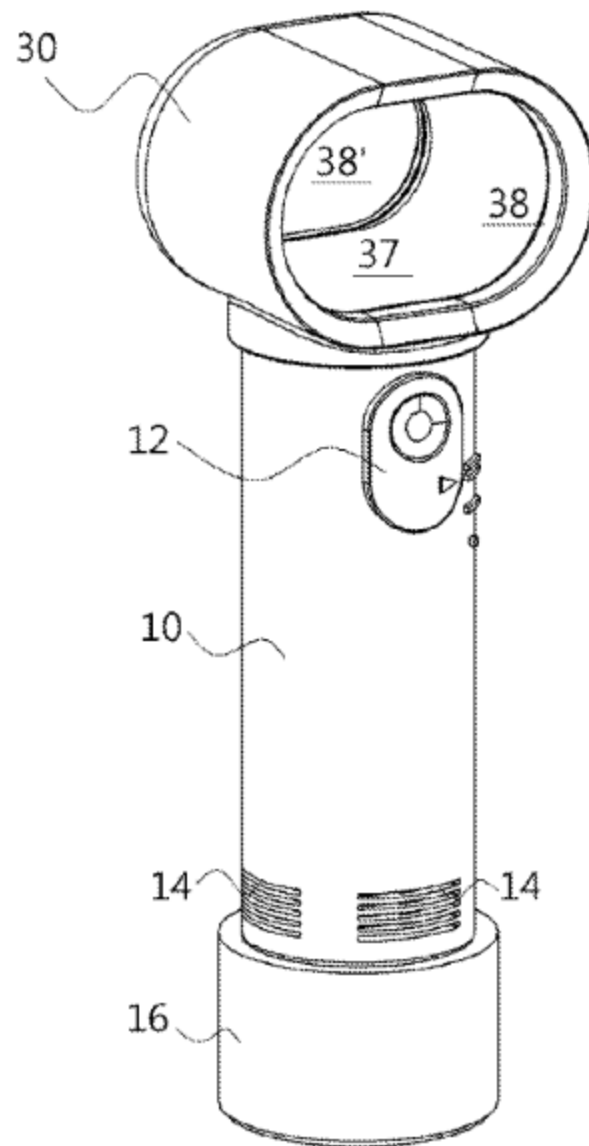
65. It is my opinion that Jeong anticipates claim 26, for the reasons discussed below.

a) [26pre]: "A hair care appliance comprising"

66. I understand that a preamble typically does not limit a claim. Regardless of whether the preamble of claim 26 is limiting, it is my opinion that it is disclosed by Jeong.

67. As I explained above in the Overview of the Prior Art, Jeong is directed to a hair dryer. Ex. 1004 at Abstract. Jeong discloses "a hair dryer in which an amount of air current generated by a fan rotated by an operation of a motor is increased by a coanda effect to transfer a relatively large amount of air current into user's hair." Ex. 1004 at ¶ 9.

68. Figure 1 of Jeong (reproduced below) is a perspective view of a hair dryer according to an embodiment of Jeong. Ex. 1004 at ¶ 24; *see also* Ex. 1004 at ¶¶ 2, 10-11.

**FIG. 1****b) [26a]: “a body and a handle”**

69. It is my opinion that Jeong discloses this limitation.

70. As shown in the annotated Figure 1 of Jeong below, Jeong discloses “a housing 10” that “defines a portion of an outer appearance of a hair dryer” and

“provides an inner space 11” in which parts are installed. Ex. 1004 ¶¶ 30, 33. Jeong also discloses a “discharge nozzle 30” that “is disposed on an upper end of the housing 10,” and “is configured to mix the air passing through the housing 10 with the external air, thereby discharging the mixed air.” Ex. 1004 ¶ 39.

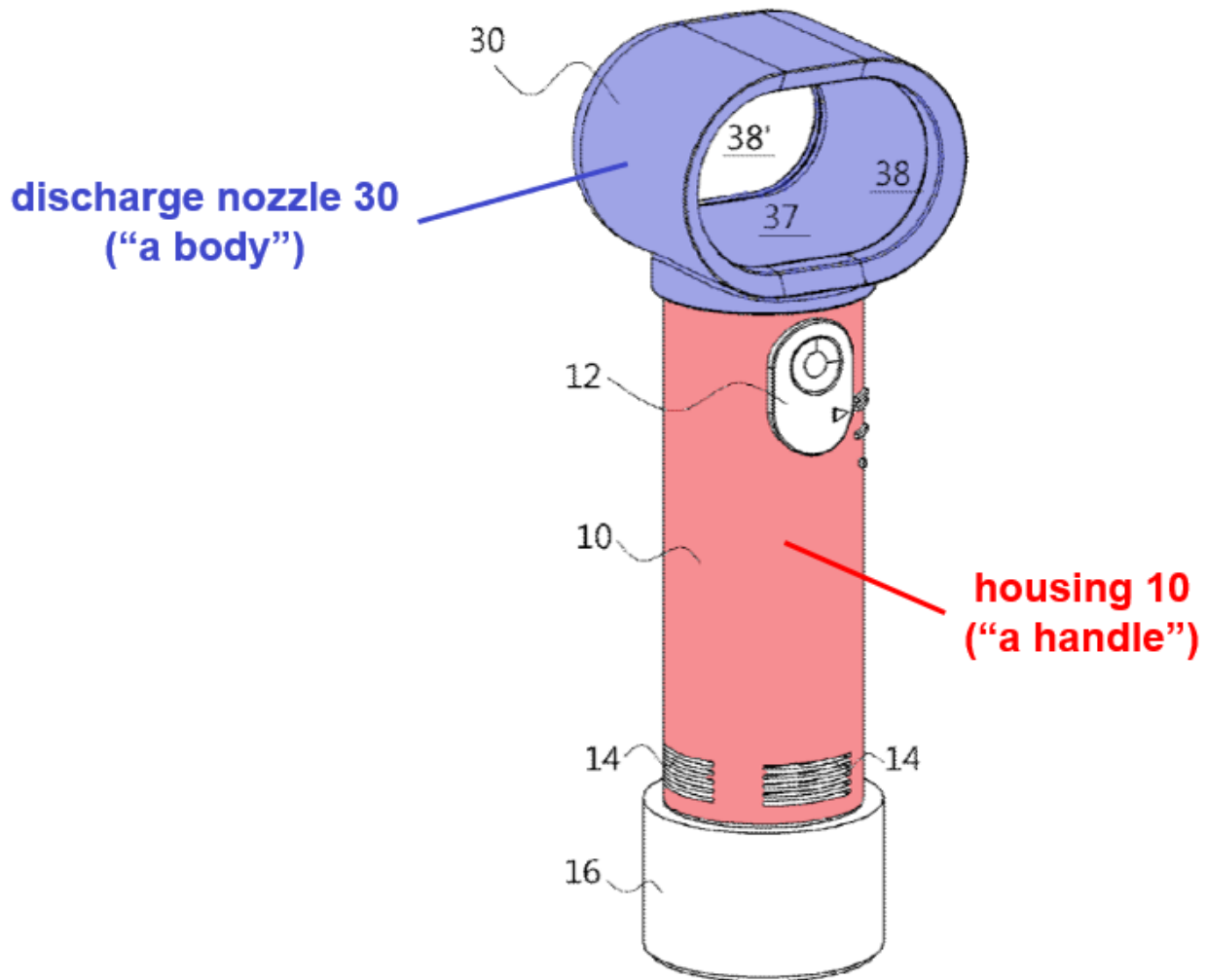


FIG. 1

71. Jeong’s “discharge nozzle 30” includes “a portion through which air is finally discharged from the discharge nozzle 30” that “may be referred to as a discharge hole 38.” Jeong’s discharge nozzle also includes “a portion through which air is introduced into the central passage part 37” that “may be referred to as a secondary inflow hole 38’.” Ex. 1004 ¶ 46. The discharge nozzle “is configured to mix the air passing through the housing 10 with the external air, thereby discharging the mixed air.” Ex. 1004 ¶ 39.

72. I note that the “body” of the hair dryer described in the ’662 patent similarly includes “a fluid inlet 320” and a “a fluid outlet 340” that are “at least partially defined by the duct 310 which is an inner wall of the body 30 and extends within and along the body.” Ex. 1001 at 10:46-50. Moreover, the “body 30” is connected to the first end of the “handle 20,” and the second end of the handle is “distal from the body” and includes a primary inlet. Ex. 1001 at 1:52-55. Given the similarity in structure and how the term body would be understood by a person of ordinary skill in the art, it is my opinion that a person of ordinary skill in the art would understand that Jeong discloses “a body” through its description of the “discharge nozzle 30.”

73. Jeong’s “housing 10 defines a portion of an outer appearance of a hair dryer,” and “has a cylindrical shape.” Ex. 1004 at ¶ 30. The “housing 10” also “provides an inner space 11” in which parts are installed.” Ex. 1004 at ¶ 30. For

example, a “motor housing 18 is disposed within the housing 10,” and a “motor 20 is disposed within the motor housing 18.” Ex. 1004 at ¶ 33. The “housing 10” also includes a “fan 22” that “is rotated inside the motor housing 18 so that the air flows.” Ex. 1004 at ¶ 34.

74. Jeong’s “housing 10” includes “[a] manipulation button 12” that “is disposed on a side of an outer surface of the housing 10,” which “manipulates an operation of the hair dryer.” Ex. 1004 at ¶ 31.

75. Jeong indicates that “[t]o operate the hair dryer assembled as described above according to the current embodiment, the manipulation button 12 should be manipulated by the user,” and for example, “the manipulation button 12 may be manipulated to select one of a hot wind mode and a room-temperature wind mode.” Ex. 1004 at ¶ 51. In my opinion, given the overall structure of the “housing 10,” which includes a button that is to be manipulated by a user when operating the hair dryer, Jeong’s “housing 10” and the components that are housed within it meet the “a handle” portion of claim limitation [26a].

c) [26b]: “the handle comprising an inner wall and an outer wall,”

76. It is my opinion that Jeong discloses this limitation.

77. As I explained above with respect to claim element [26a], Jeong’s housing (and the components it houses) are a handle that “defines a portion of an outer appearance of a hair dryer” and “provides an inner space 11” in which parts

are installed. Ex. 1004 ¶¶ 30, 33. Moreover, Jeong’s housing comprises an “outer wall” of the hair dryer as required by this claim, as shown in the annotated version of Jeong’s Figure 2 below:

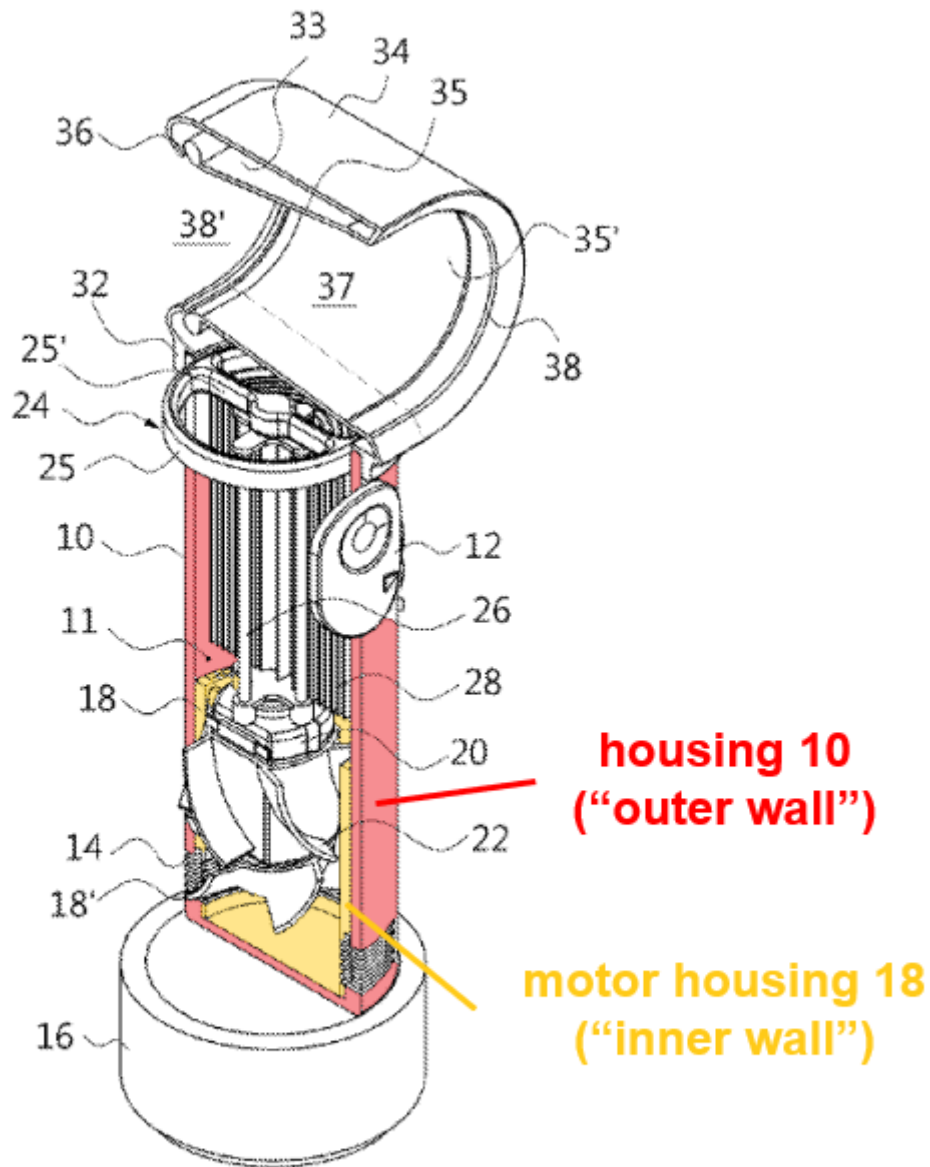
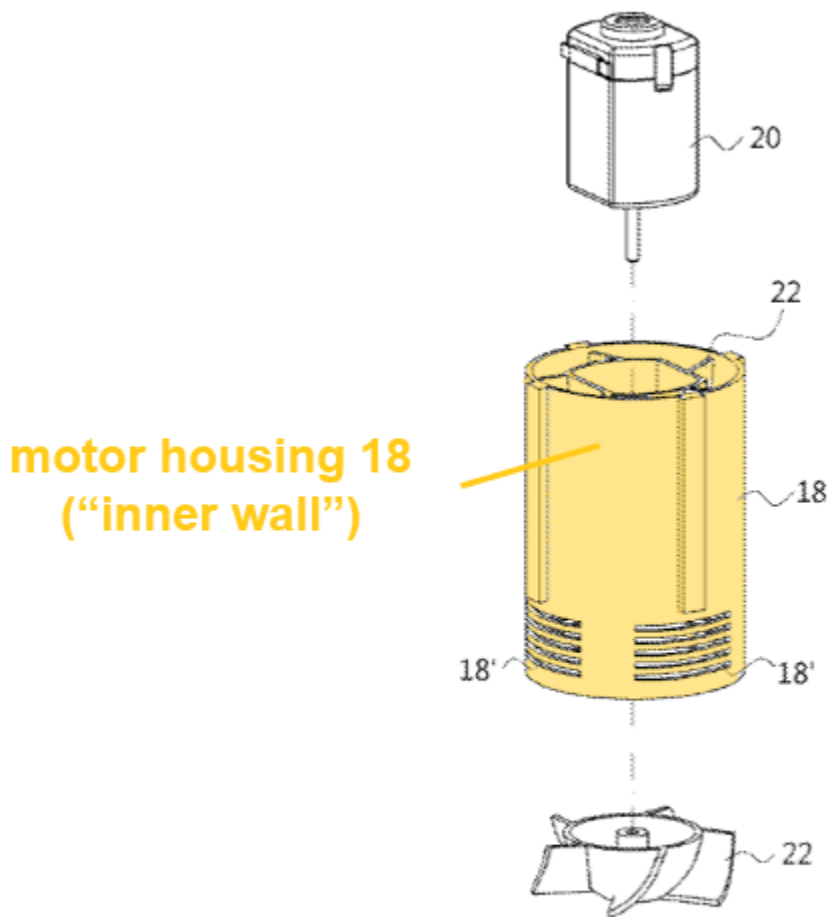


FIG. 2

Ex. 1004, Fig. 2. Further, the motor housing 18, which is within the inner space 11 of the handle, is “an inner wall” as required by this claim element. Jeong explains that “[a]n outer surface of the motor housing 18 may be closely attached to an inner surface of the housing 10,” and that the motor housing 18 may be “firmly fixed to the inside of the housing 10.” Ex. 1004 at ¶¶ 33, 37. The position of the motor housing 18 is shown in the annotated version of Jeong’s Figure 3, below:

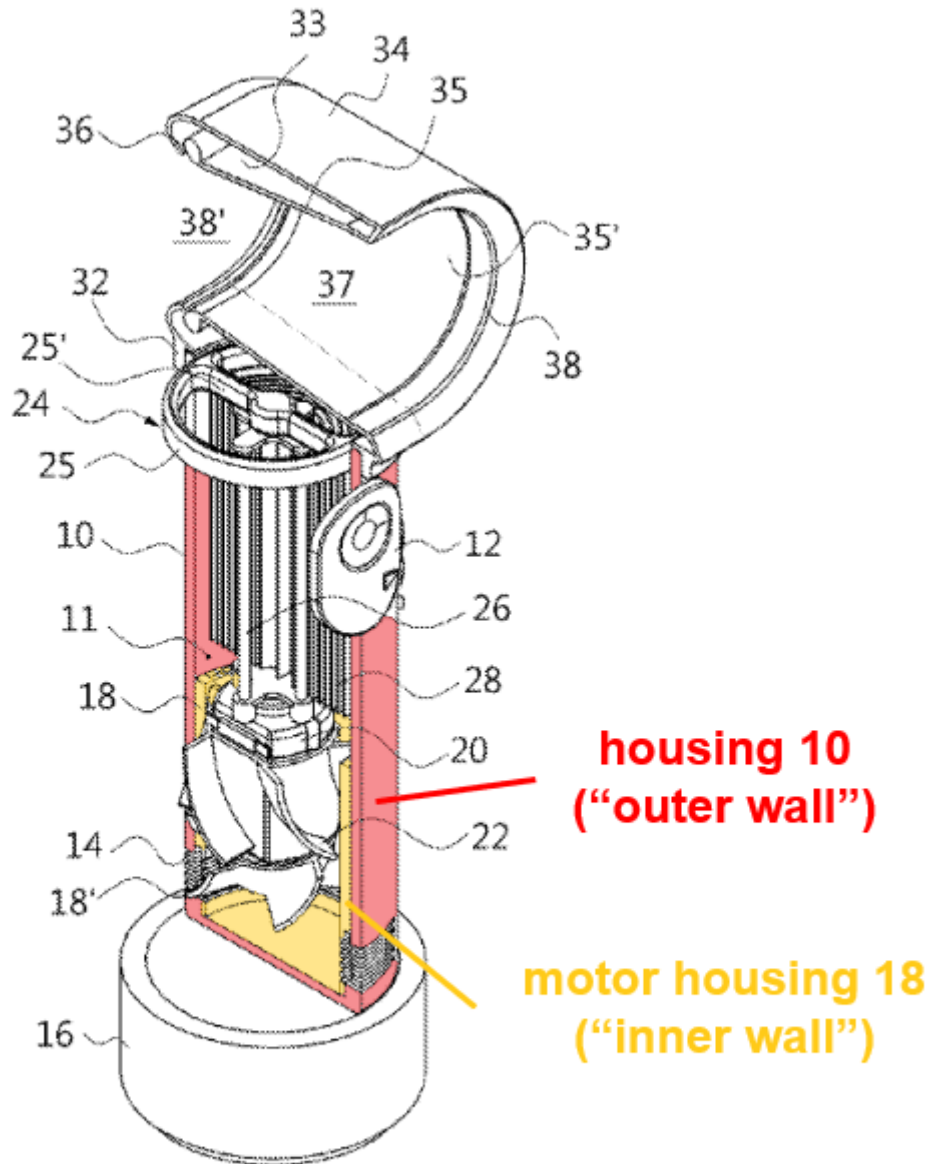


Ex. 1004, Fig. 3.

- d) [26c]: “wherein the inner wall is disposed radially inwardly from the outer wall and defines a primary fluid flow path that extends from a primary fluid inlet into the appliance,”

78. It is my opinion that Jeong discloses this limitation.

79. As I explained above with respect to claim element [26b], Jeong’s motor housing 18 is an “inner wall,” is disposed within the housing 10 (which is an “outer wall”), and may be “firmly fixed to the inside of the housing.” Ex. 1004 at ¶¶ 33, 37. Figure 2 illustrates that the motor housing 18 “is disposed radially inwardly from the outer wall” as required by this claim element:

**FIG. 2**

Ex. 1004, Fig. 2.

80. The motor housing 18, which is an “inner wall,” also “defines a primary fluid flow path that extends from a primary fluid inlet into the appliance,” as required by claim element [26c]. For example, Jeong explains that a plurality of inflow slots

14” (i.e., “a primary fluid inlet into the appliance”) are “defined in a lower portion of the housing 10,” and the “inflow slots 14 may serve as passage through which air is introduced inward from the outside of the housing 10.” Ex. 1004 at ¶ 31. And, in the motor housing 18, “inner inflow slots 18’ are defined in positions corresponding to those of the inflow slots 14 to introduce external air into the motor housing 18.” Ex. 1004 at ¶ 33.

81. As I explained in the Overview of the Prior Art, Jeong’s Figure 5 “is an operation state view illustrating an air current generation process according to an embodiment” of the Jeong hair dryer:

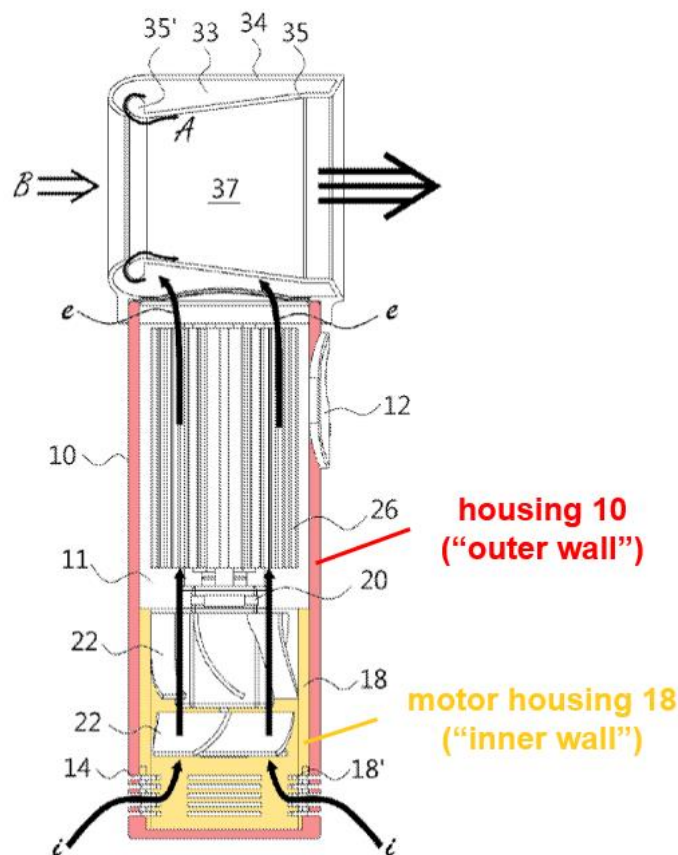


FIG. 5

Ex. 1004, Fig. 5 (black arrows showing flow path in original). As shown in the figure, air is introduced as shown by an arrow *i* “through the inflow slot 14 and the inner inflow slot 18’ from the outside of the housing 10.” Ex. 1004 at ¶ 52. Thus, the motor housing 18 “defines a primary fluid flow path that extends from a primary fluid inlet into the appliance” as required by claim element [26c].

e) [26d]: “wherein the outer wall is an external surface of the handle, and”

82. It is my opinion that Jeong discloses this limitation.

83. As I explained above with respect to element [26a], Jeong discloses “a housing 10” that “defines a portion of an outer appearance of a hair dryer” and “provides an inner space 11” in which parts are installed. Ex. 1004 ¶¶ 30, 33. Jeong’s “housing 10” also includes “[a] manipulation button 12” that “is disposed on a side of an outer surface of the housing 10,” which “manipulates an operation of the hair dryer.” Ex. 1004 at ¶ 31. Accordingly, Jeong’s housing 10 and the components housed within are a handle that comprises an “outer wall” that “is an external surface of the handle,” as shown highlighted in **red** in each of Jeong’s Figures 1, 2, and 5:

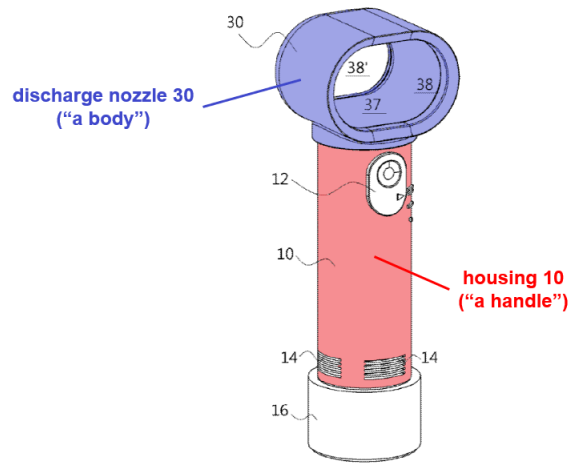


FIG. 1

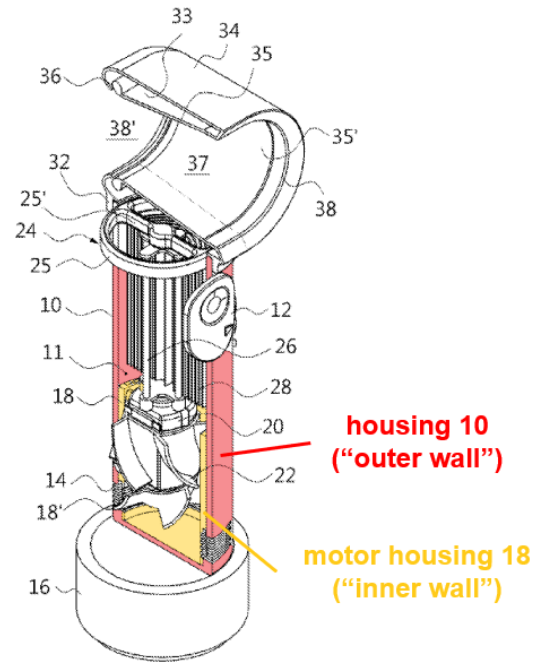


FIG. 2

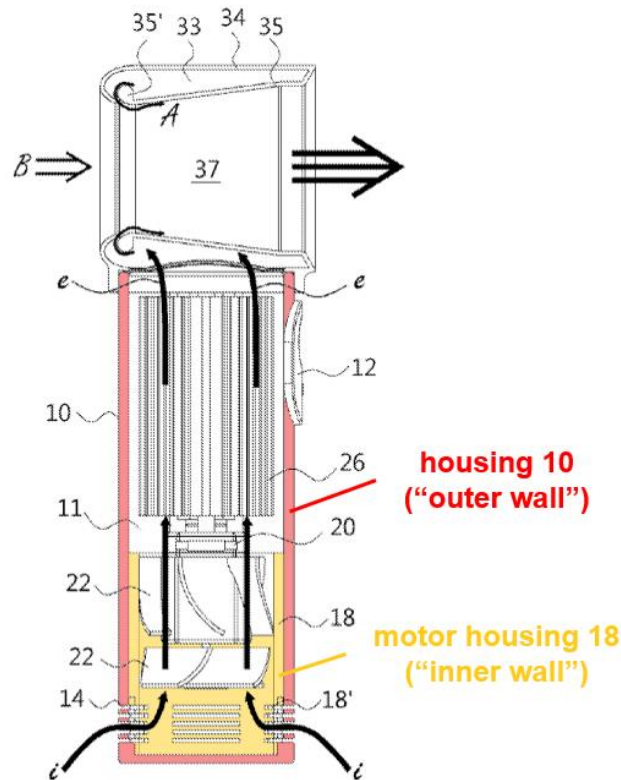


FIG. 5

Ex. 1004, Figs. 1, 2, and 5.

f) [26e]: “wherein the primary fluid flow path from the primary fluid inlet to a primary fluid outlet from the body is non linear.”

84. It is my opinion that Jeong discloses this limitation.

85. As I explained above with respect to claim element [26c], Jeong explains that a plurality of inflow slots 14” (i.e., “a primary fluid inlet into the appliance”) are “defined in a lower portion of the housing 10,” and the “inflow slots 14 may serve as passage through which air is introduced inward from the outside of the housing 10.” Ex. 1004 at ¶ 31. And, in the motor housing 18, “inner inflow slots

18' are defined in positions corresponding to those of the inflow slots 14 to introduce external air into the motor housing 18.” Ex. 1004 at ¶ 33.

86. Figure 5 “is an operation state view illustrating an air current generation process according to an embodiment” of the Jeong hair dryer:

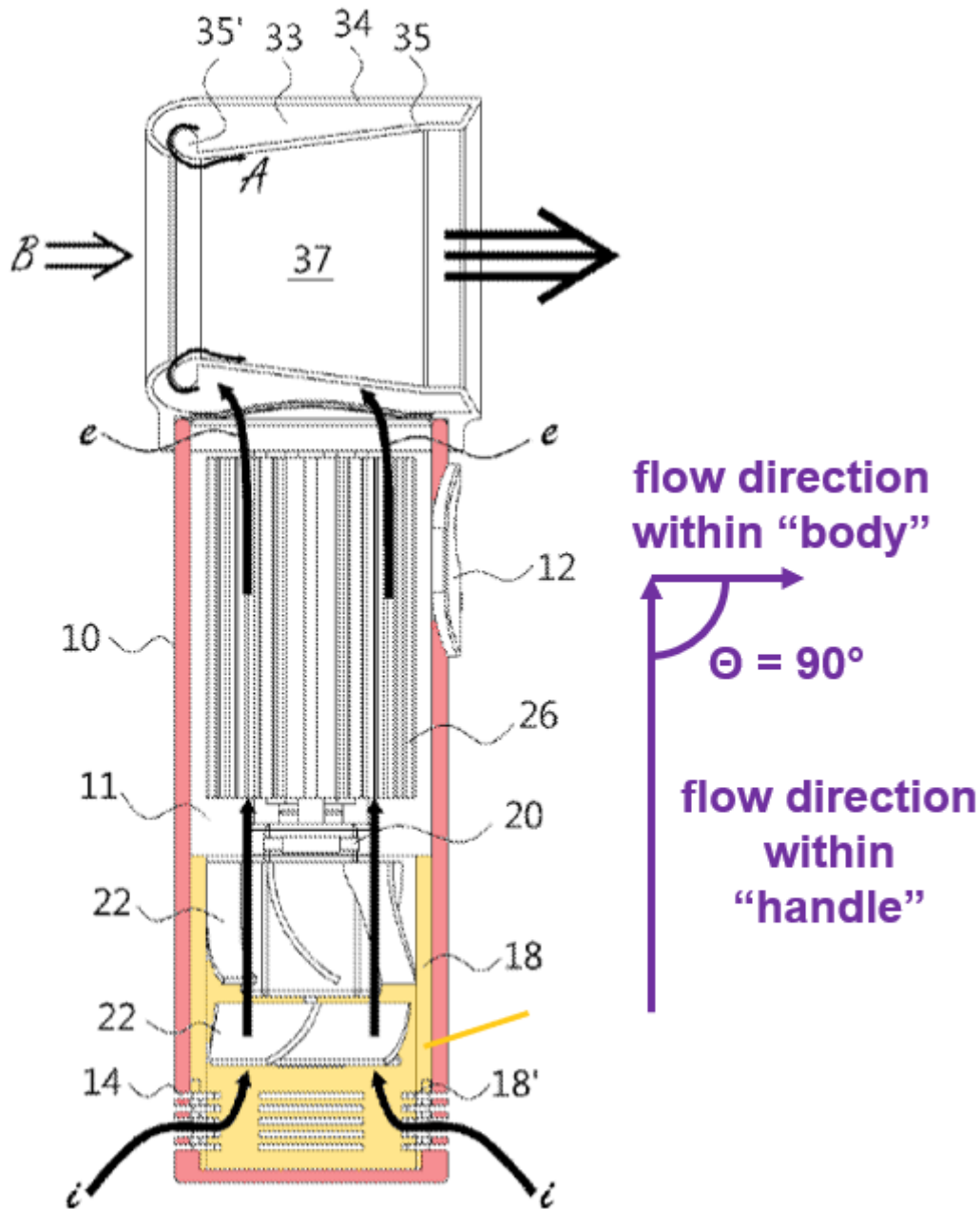


FIG. 5

Jeong, Fig. 5. As shown in the figure, air is introduced as shown by an arrow *i* “through the inflow slot 14 and the inner inflow slot 18’ from the outside of the housing 10.” Ex. 1004 at ¶ 52. The air introduced into the housing 10 “passes

through the outside of the fan 22 and the motor 20 to pass between the heating plates of the heater 28.” Ex. 1004 at ¶ 53. Next, the air passing through the heater 28 “passes through the coupling ring part 32 to flow into the inner passage 33 as shown by an arrow *e*.” The air introduced into the inner passage 33 “is transferred into the whole region of the inner passage 33 having the ring shape and then is discharged from the inner passage 33 through the discharge slit 36.” Ex. 1004 at ¶ 54. The air that is discharged through the discharge slit 36 flows along a “coanda surface 35’,” as shown by arrow *A* in Figure 5. Jeong explains that “when the air is increased in velocity while flowing along the coanda surface 35’, the surrounding of the coanda surface 35’ may be relatively decreased in pressure,” and thus, as shown by an arrow *B* of FIG. 5, air outside the discharge nozzle 30 is introduced into the central passage part 32 through the secondary inflow hole 38[’].” Ex. 1004 at ¶ 55. Finally, the “external air introduced into the central passage part 32 through the secondary inflow hole 38 and the air discharged through the discharge slit 36 are mixed with each other while passing through the section of the central passage part 32 corresponding to the diffusion surface 35’,” and “the air is discharged through the discharge hole 3[8] and is transferred into the user’s hair.” Ex. 1004 at ¶ 56.

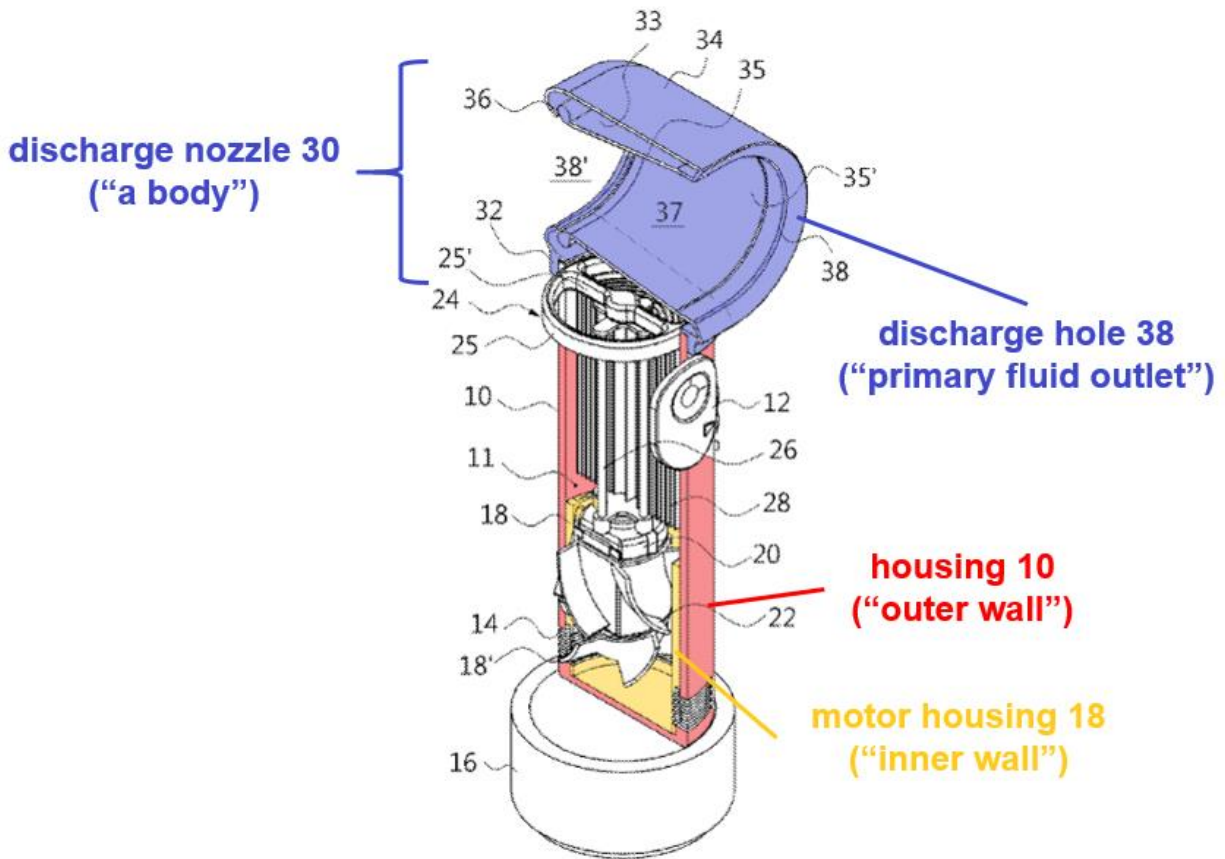


FIG. 2

87. Thus, as shown in the annotated version of Figure 5 above, Jeong's air flow path changes by approximately 90 degrees between the housing 10 / motor housing 18 (*i.e.*, "the handle") and the discharge nozzle 30 (*i.e.*, "the body"). Thus, in my opinion, Jeong discloses that "the primary fluid flow path from the primary fluid inlet to a primary fluid outlet from the body is non linear" as required by claim element [26e].

2. Claim 27: “The appliance of claim 26, wherein the primary fluid flows within the handle in a first direction and within the body in a second direction.”

88. It is my opinion that Jeong discloses this additional limitation of dependent claim 27, for the same reasons I expressed above with respect to the “non linear” requirement of claim element [26e].

89. Specifically, the “primary fluid flow path” in Jeong, which travels through the housing 10 and motor housing 18, the discharge slit 36, and ultimately the discharge hole 38 in the discharge nozzle 30, changes by approximately 90 degrees:

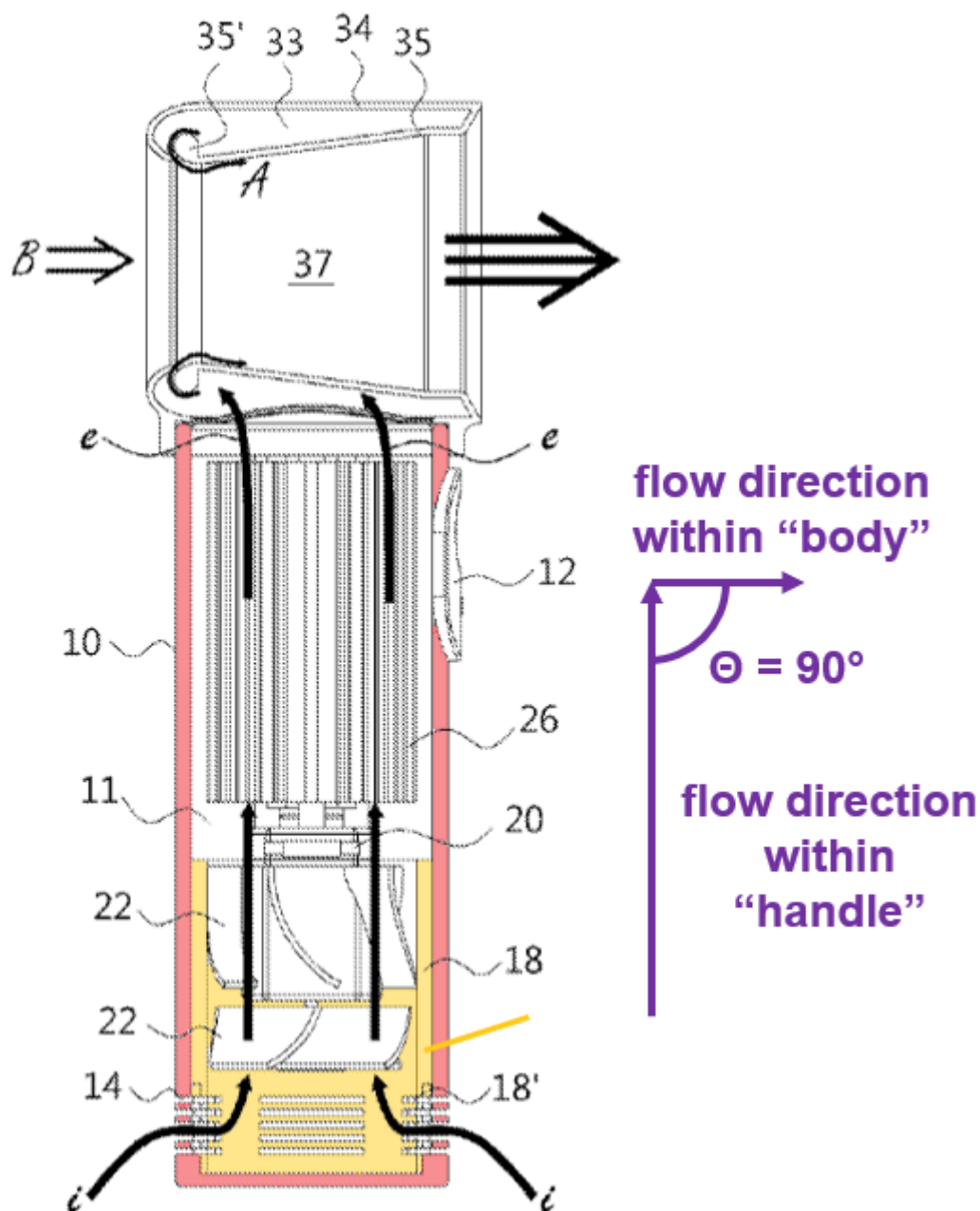


FIG. 5

3. Claim 28: “The appliance of claim 26, wherein the primary fluid flow in the body is substantially orthogonal to the primary fluid flow in the handle.”

90. It is my opinion that Jeong discloses the additional limitation of dependent claim 28, for the same reasons I expressed above with respect to the “non linear” requirement of claim element [26e].

91. Specifically, the “primary fluid flow path” in Jeong, which travels through the housing 10 and motor housing 18, the discharge slit 36, and ultimately the discharge hole 38 in the discharge nozzle 30, changes by approximately 90 degrees:

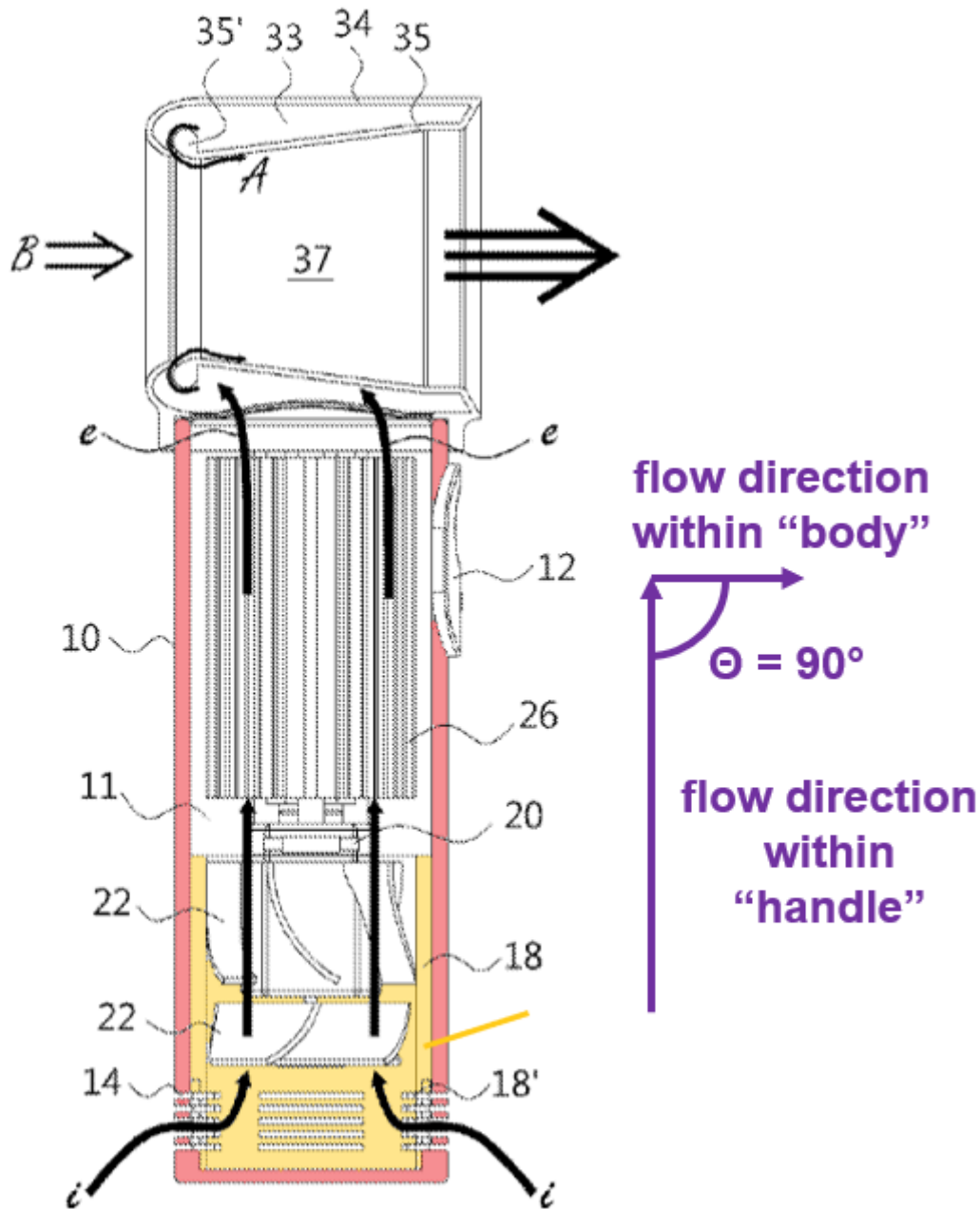


FIG. 5

92. Given that the angle between the direction of flow in the housing 10 and the direction of flow within the discharge nozzle 30 is approximately 90 degrees,

the flow is “substantially orthogonal” between the two, as required by dependent claim 28.

D. Ground 2: Claims 26-28 Are Anticipated By Yoshida

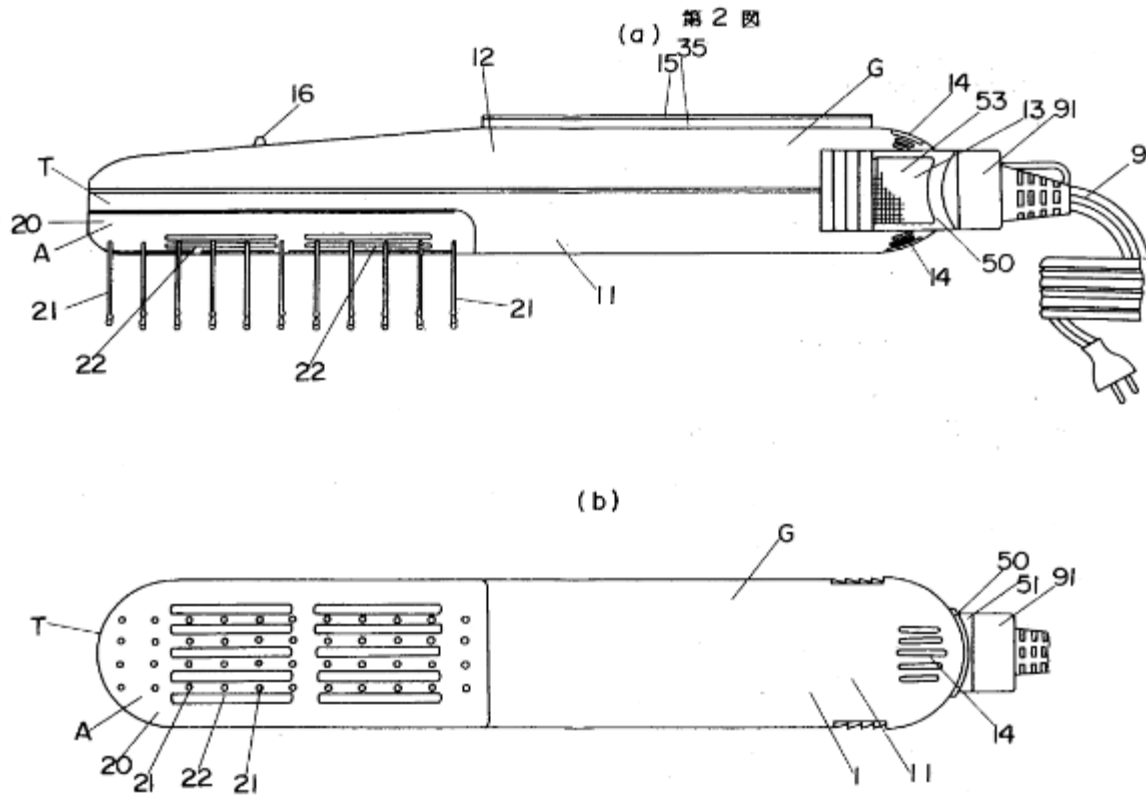
93. I have analyzed claims 26-28 of the '662 patent, and it is my opinion that each claim is anticipated by Yoshida.

1. Claim 26

94. It is my opinion that Yoshida anticipates claim 26, for the reasons discussed below.

a) [26pre]: “A hair care appliance comprising”

95. I understand that a preamble typically does not limit a claim. However, to the extent that the preamble of claim 26 is limiting, it is my opinion that it is disclosed by Yoshida. Yoshida discloses “[a] hair dryer in which a motor, a fan, and a heater are housed in an air passage,” as shown in Figures 2(a) and 2(b) of Yoshida, below:

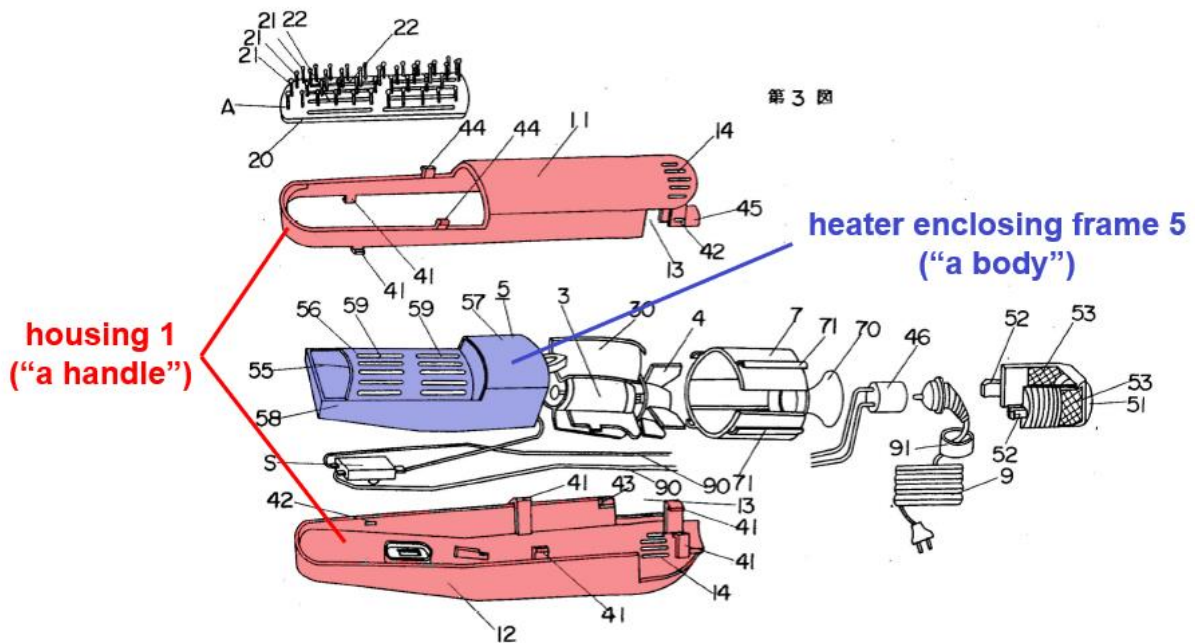


Ex. 1005 at 48, Figs. 2(a) and 2(b).

b) [26a]: “a body and a handle”

96. It is my opinion that Yoshida discloses this limitation.

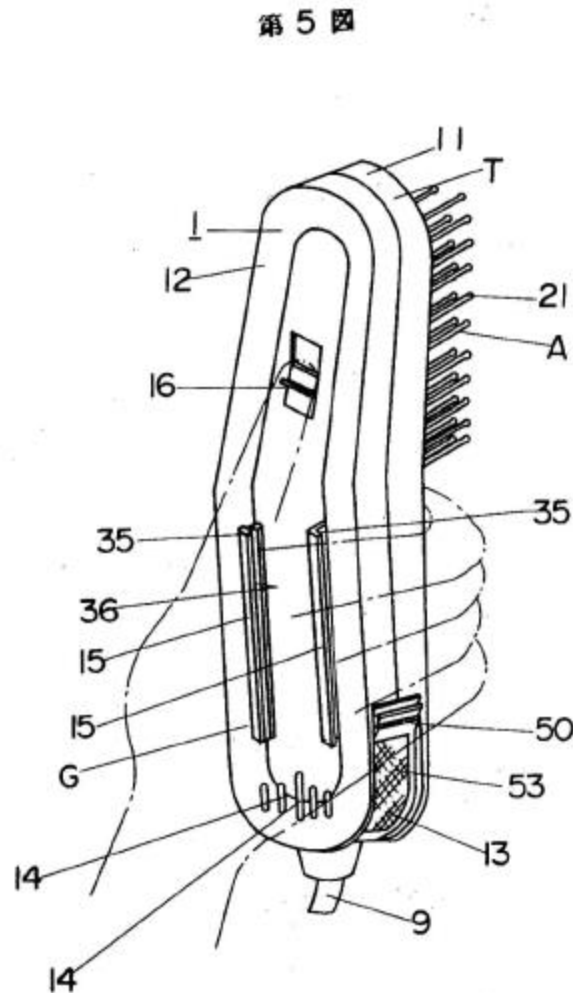
97. Yoshida discloses a “heater enclosing frame 5” that is incorporated within a “housing 1” that is constituted of a “pair of halves 11 and 12.” Ex. 1005, 48-49. The “heater enclosing frame 5” and the “housing 1” (including the cylindrical wind tunnel 7 housed within) are a “body and a handle,” respectively, as shown in the annotated version of Yoshida’s Figure 3, below:



Ex. 1005, Fig. 3.

98. In particular, Yoshida explains that “heater enclosing frame 5” includes a “partition plate 55” that serves as “an air blow guide” and a “front plate 56” that includes “a large number of slit-shaped discharge ports 59” that are “positioned at the opening on the front side of the front end of the housing 1.” Ex. 1005 at 49. The air that flows “into the housing . . . is guided by the partition plate 55 of the heater surrounding without being heated,” and the air is then “blown forward through an air outlet composed of the outlet 59 of the front plate 56 arranged on the front surface of the housing 1 and the slit 22 of the attachment A.” Ex. 1005 at 49. Thus, it is my opinion that Yoshida discloses “a body” through its description of the “heater enclosing frame 5.”

99. As noted above, Yoshida's housing 1 is "composed of a combination of a front side half 11 and a rear side half 12," and the "housing 1 has a rectangular cross-section." Ex. 1005 at 48. A "grip section G is formed on the rear end side half portion." And as shown in Figure 5, an "operation plate 16 is positioned on the rear side of the housing 1," that can be "used by gripping the grip section G, which is one half portion on the rear end side of the housing 1, . . . [and] since it is located at the tip of the grip part G, operating the switch with a thumb is easy." Ex. 1005 at 49. Yoshida additionally states that "[t]his hair dryer is used by gripping grip section G and operating the operation plate 16 located in front of the grip section G and behind the hair styling section T, while switching the switch S." Ex. 1005 at 49. Yoshida's Figure 5 depicts an operator's hand gripping the grip section G and operating the operation plate 16:



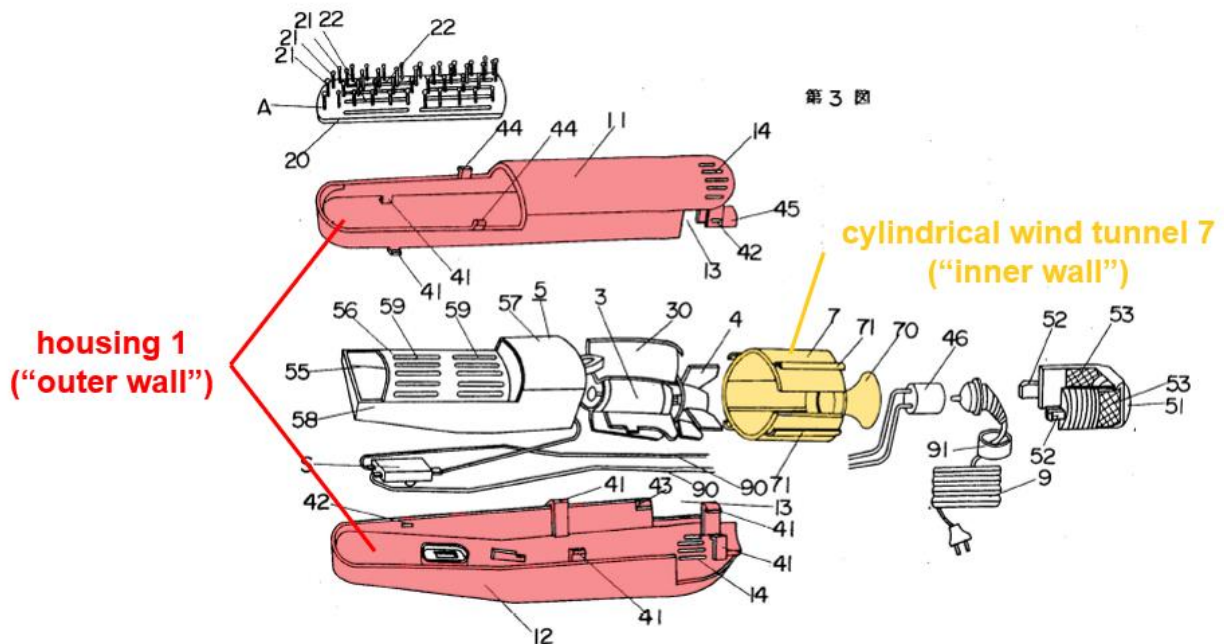
Ex. 1005, Fig. 5.

100. In my opinion, given the overall structure of the “housing 1,” which includes an “operation plate 16” that is to be operated by a user when using the hair dryer, Yoshida’s “housing 1” and the components housed within, including the cylindrical wind tunnel 7 meet the “a handle” portion of claim limitation [26a].

c) **[26b]: “the handle comprising an inner wall and an outer wall,”**

101. It is my opinion that Yoshida discloses this limitation.

102. As I explained above with respect to claim limitation [26a], Yoshida’s “housing 1” is composed of front side half 11 and rear side half 12 and includes a cylindrical wind tunnel 7 within the housing, (*i.e.*, “a handle”). Ex. 1005 at 48. As shown in the annotated version of Figure 3 below, the “pair of halves 11 and 12 constituting the housing 1 are provided with hooks 41 [engaging] locking grooves 42, respectively, provided at the front end, middle, and rear end of the housing 1”:



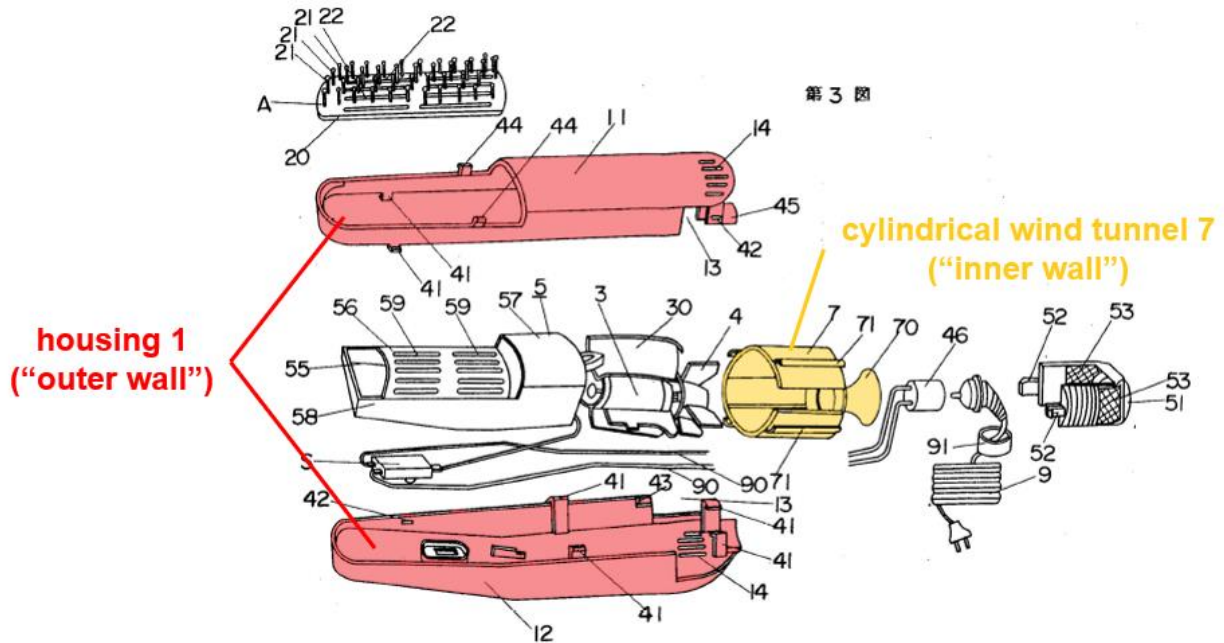
Ex. 1005 at 48, Fig. 3. Thus, as shown in Yoshida’s Figure 3, Yoshida’s “housing 1” is an “outer wall” of the hair dryer.

103. Yoshida also discloses a “cylindrical wind tunnel 7” that is disposed within housing 1, and highlighted in **gold** in Figure 3 above, is an “inner wall” as required by this claim element. Yoshida explains that the “cylindrical wind tunnel 7 surrounding the fan 4 is provided because the cross-section shape of the housing 1 is rectangular and the air blowing efficiency is low if left as it is.” Ex. 1005 at 48. The cylindrical wind tunnel 7 includes an integrally formed “suction ring 70 . . . for directing the air flowing in from the suction ports 13 and 14 in the axial direction,” as well as “supporting ribs 71” which contact the inner surface of the housing 1. Ex. 1004 at 48–49.

d) [26c]: “wherein the inner wall is disposed radially inwardly from the outer wall and defines a primary fluid flow path that extends from a primary fluid inlet into the appliance,”

104. It is my opinion that Yoshida discloses this limitation.

105. As explained above with respect to element [26b], Yoshida’s “cylindrical wind tunnel 7” is an “inner” wall that is provided within the housing 1, and includes “supporting ribs 71” that contact the inner surface of the housing 1. Ex. 1005 at 48-49. As shown in the annotated version of Figure 3 below, Yoshida’s cylindrical wind tunnel 7 “is disposed radially inwardly from the outer wall,” *i.e.*, the two halves of the housing 1:

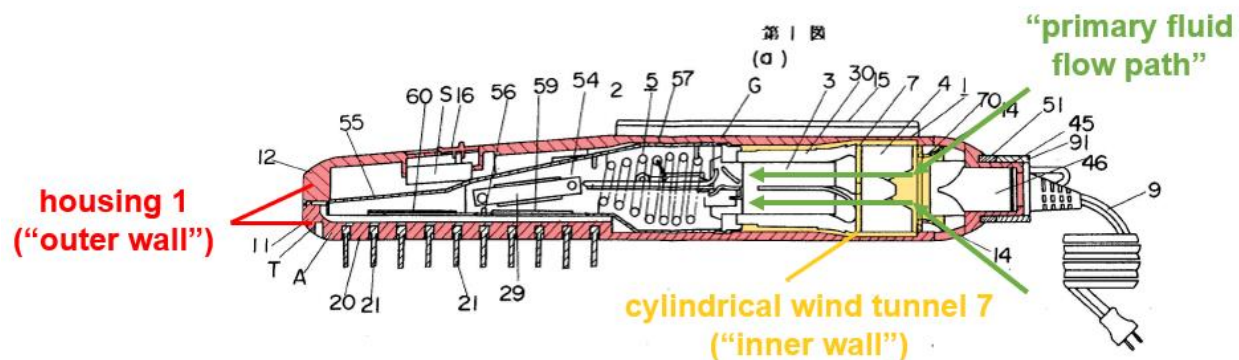


Ex. 1005, Fig. 3.

106. The cylindrical wind tunnel 7, which includes an integrally formed suction ring 70, is an “inner wall,” and “defines a primary fluid flow path that extends from a primary fluid inlet into the appliance,” as required by claim element [26c]. For example, Yoshida explains that air flows “into the housing 1 from the suction ports 13 and 14 located at the rear end of the housing 1.” Ex. 1005 at 49. As I explained above, the “cylindrical wind tunnel 7 surrounding the fan 4 is provided because the cross-sectional shape of the housing 1 is rectangular and the air blowing efficiency is low if left as it is,” and that the “suction ring 70 is integrally formed at one end in the axial direction for directing the air flowing in from the suction ports 13 and 14 in the axial direction.” Further, Yoshida explains that because “the suction port 14 is likely to be covered by the palm of the hand gripping the grip section G,”

the suction ports 14 “are slit-shaped and formed as a supplementary one with a small opening area,” whereas the “[t]he opening areas of the suction ports 13, which are located on both sides of the housing 1 and are difficult to cover with a hand, are much larger than that of the suction ports 14.” Ex. 1005 at 49. Thus, the suction ports 13 and 14 are “a primary fluid inlet into the appliance” as required by this claim element.

107. Regarding airflow through the hair dryer (“a primary fluid flow path”), Yoshida explains that “the air flowing into the housing 1 from the suction ports 13 and 14” is “guided by the partition plate 55 of the heater enclosing frame 5,” and then, the air “is blown forward through an air outlet composed of the outlet 59 of the front plate 56 arranged on the front surface of the housing 1 and the slit 22 of the attachment A.” Ex. 1005 at 49. This portion of the primary fluid flow path of Yoshida is shown in the annotated version of Yoshida’s Figure 1(a), below:



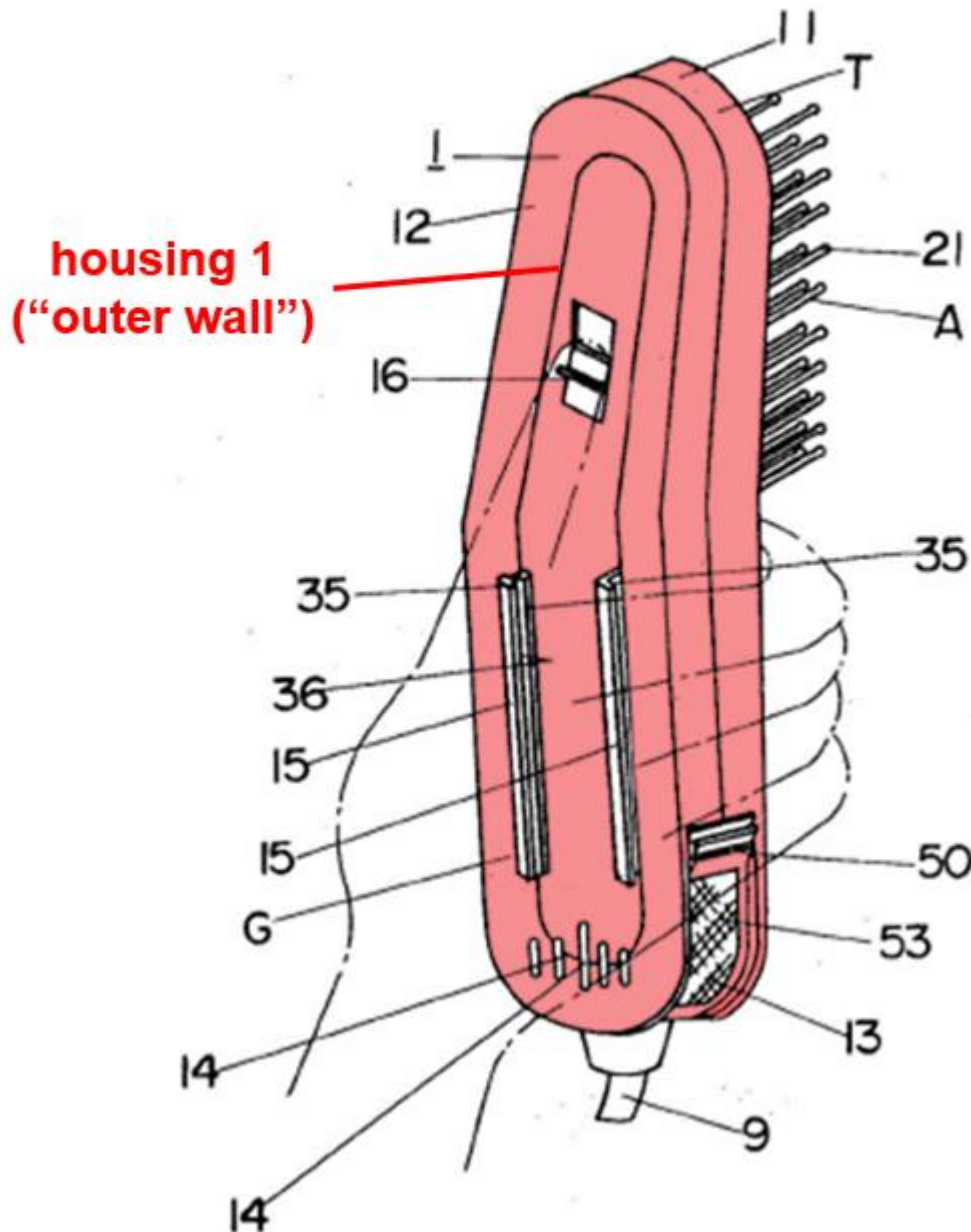
Ex. 1005, Fig. 1(a).

e) [26d]: “wherein the outer wall is an external surface of the handle, and”

108. It is my opinion that Yoshida discloses this limitation.

109. As I explained above with respect to claim element [26a], Yoshida’s “housing 1” is a handle, and is “composed of a combination of a front side half 11 and a rear side half 12,” and “[a] grip section G is formed on the rear end side half portion.” Ex. 1005 at 48. During operation, the housing 1 (*i.e.*, the “handle”) is gripped by the user. Accordingly, Yoshida’s “housing 1” is a handle that comprises an “outer wall” that “is an external surface of the handle,” as shown highlighted in **red** as shown in the annotated version of Figure 5 below:

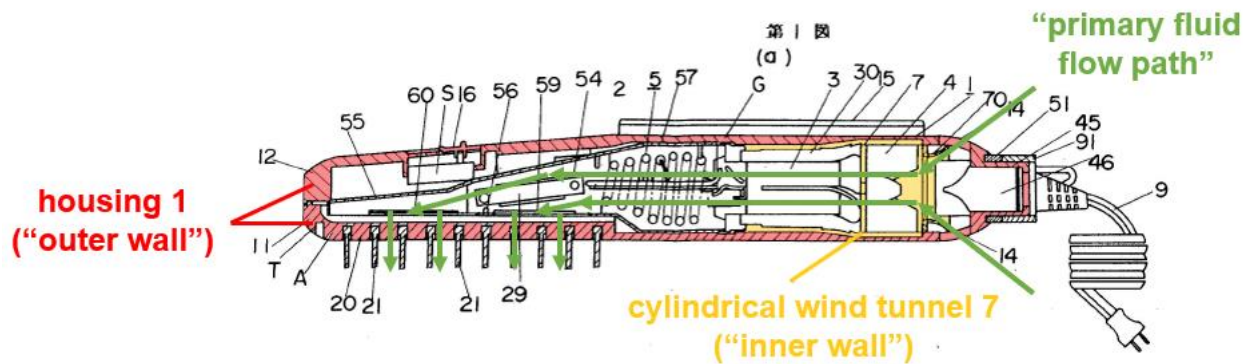
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- f) [26e]: “wherein the primary fluid flow path from the primary fluid inlet to a primary fluid outlet from the body is non linear.”

110. It is my opinion that Yoshida discloses this limitation.

111. As I explained above with respect to claim element [26c], Yoshida explains that air flows “into the housing 1 from the suction ports 13 and 14 located at the rear end of the housing 1.” Ex. 1005 at 49. Therefore, the suction ports 13 and 14 are a “primary fluid inlet.” Further, Yoshida explains that “the air flowing into the housing 1 from the suction ports 13 and 14” is “guided by the partition plate 55 of the heater enclosing frame 5,” and then, the air “is blown forward through an air outlet composed of the outlet 59 of the front plate 56 arranged on the front surface of the housing 1 and the slit 22 of the attachment A.” Ex. 1005 at 49. Thus, Yoshida discloses a “primary fluid flow path” as shown in **green** in the annotated version of Yoshida’s Figure 1(a), below:



Ex. 1005, Fig. 1(a).

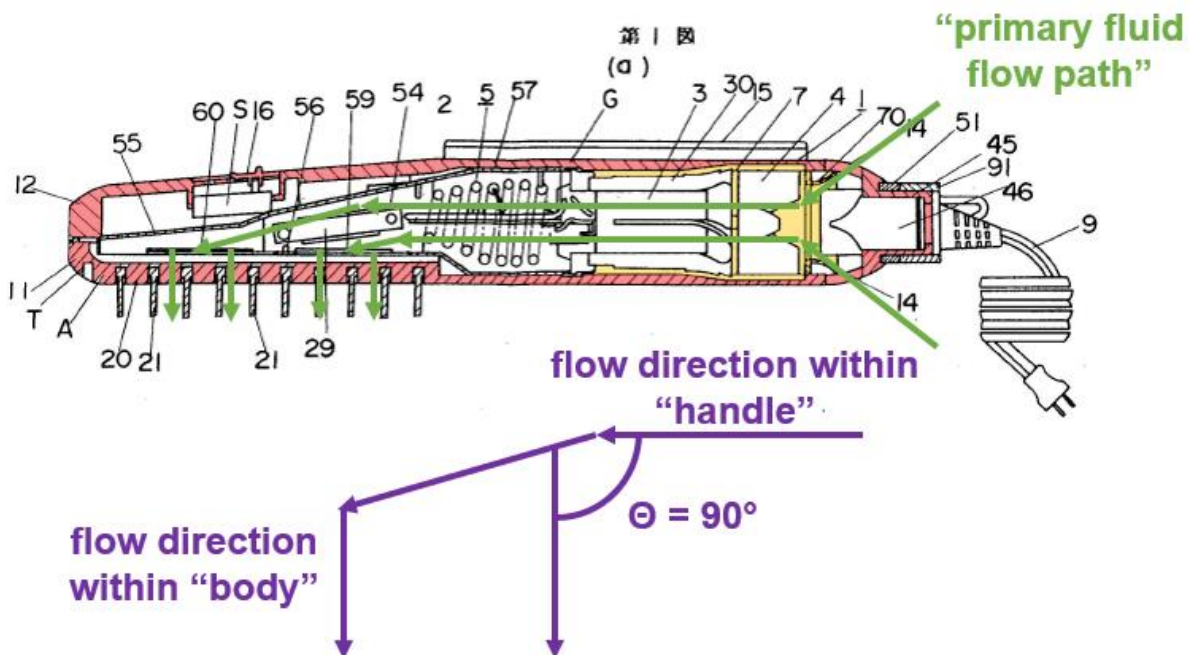
112. As shown in the annotated version of Yoshida’s Figure 1(a), Yoshida’s air flow path changes by approximately 90 degrees between the housing 1 / cylindrical wind tunnel 7 (i.e., “the handle”) and the heater enclosing frame 5 (i.e., “the body”). Thus, in my opinion, Yoshida discloses that “the primary fluid flow

path from the primary fluid inlet to a primary fluid outlet from the body is non linear” as required by claim element [26e].

2. Claim 27: “The appliance of claim 26, wherein the primary fluid flows within the handle in a first direction and within the body in a second direction.”

113. It is my opinion that Yoshida discloses this additional limitation of dependent claim 27, for the same reasons I expressed above with respect to the “non linear” requirement of claim element [26e].

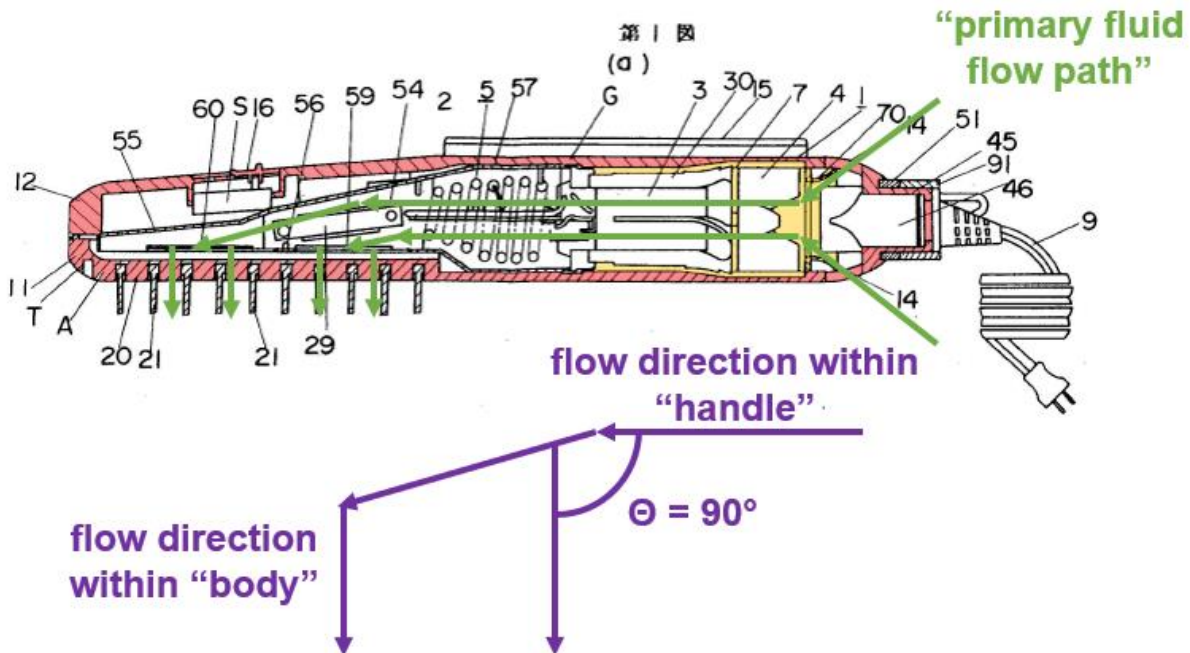
114. Specifically, the “primary fluid flow path” in Yoshida, which travels through the housing 1 and cylindrical wind tunnel 7, into the heater enclosing frame 5, and ultimately the outlets 59, changes by approximately 90 degrees:



3. Claim 28: “The appliance of claim 26, wherein the primary fluid flow in the body is substantially orthogonal to the primary fluid flow in the handle.”

115. It is my opinion that Yoshida discloses the additional limitation of dependent claim 28, for the same reasons I expressed above with respect to the “non linear” requirement of claim element [26e].

116. Specifically, the “primary fluid flow path” in Yoshida, which travels through the housing 1 and cylindrical wind tunnel 7, into the heater enclosing frame 5, and ultimately the outlets 59, changes by approximately 90 degrees:



117. Given that the angle between the direction of flow in the housing 1 / cylindrical wind tunnel 7 and the direction of flow within the heater enclosing frame

5 is approximately 90 degrees, the flow is “substantially orthogonal” between the two, as required by dependent claim 28.

E. Grounds 3, 4, and 5: Claims 26-28 Are Anticipated by Jeffs, or are Obvious Over Jeffs in View of Jeong or Obvious Over Jeffs in view of Yoshida

118. I have analyzed claims 26-28 of the '662 patent, and it is my opinion that each claim is anticipated by Jeffs (**Ground 3**). Alternatively, to the extent that the preamble of claim 26 is considered to be limiting, the combinations of Jeffs and Jeong (**Ground 4**) and Jeffs and Yoshida (**Ground 5**) render the Challenged Claims obvious.

1. Claim 26

119. It is my opinion that Jeffs anticipates claim 26. Alternatively, to the extent that the preamble of claim 26 is considered to be limiting, it is also my opinion that the combinations of Jeffs and Jeong, and Jeffs and Yoshida render the Challenged Claims obvious, for the reasons discussed below.

a) [26pre]: “A hair care appliance comprising”

(i) Ground 3

120. I understand that a preamble typically does not limit a claim. Specifically, I am informed that a preamble to a claim is not limiting where it merely states the purpose or intended use of the invention. Here, preamble [26pre] merely states that the purpose or intended use of the “appliance” is for “hair care.” Thus, it is my opinion that the preamble is not limiting.

121. Further, I am informed that where the body of the claim describes a structurally complete invention such that deletion of the preamble phrase does not affect the structure, that the preamble is not limiting. Here, deletion of the preamble phrase “hair care” does not affect the structure of the claimed “appliance.” Without the “hair care” purpose or intended use, the preamble merely recites an “appliance,” which is a generic term. For this additional reason, it is my opinion that the preamble is not limiting.

122. I also note that dependent claims 27 and 28 *do not* repeat the preamble phrase “hair care.” In my opinion, a person of ordinary skill in the art would have recognized that the preamble phrase “hair care” was not intended to be limiting given the fact that it is not repeated in the dependent claims.

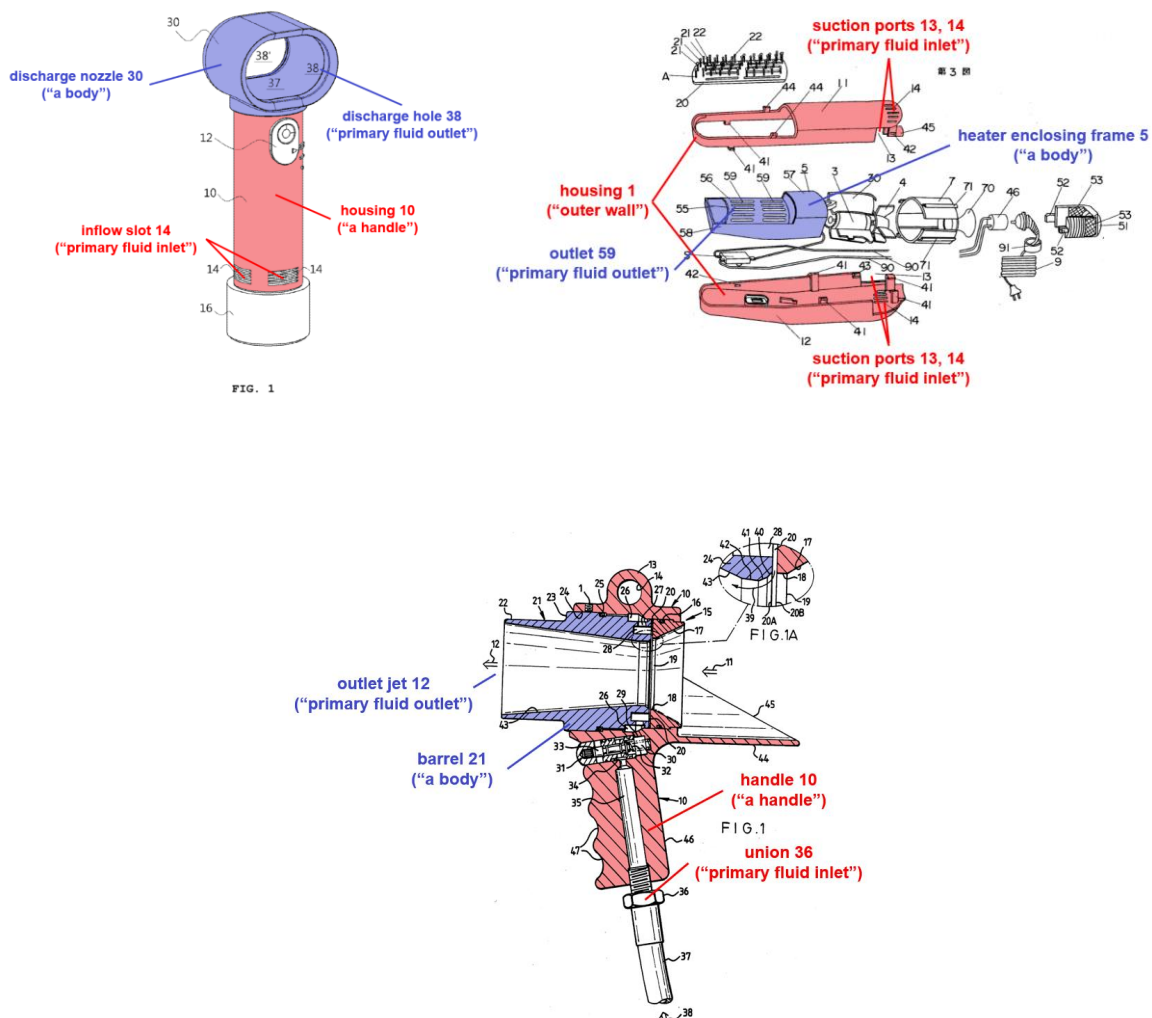
123. Because the “hair care” portion of the preamble is not limiting, Jeffs discloses [26pre]. Specifically, Jeffs discloses “a hand-held air blower device for directing a jet of air in a desired direction,” which is “capable of being readily re-directed and re-positioned by the operator”—*i.e.*, an “appliance.” Ex. 1006 at 2:19-20.

(ii) Grounds 4 and 5

124. Even if the preamble of claim 26 is considered to be limiting, it is my opinion that it would have been obvious to a person of skill in the art in light of the disclosures of Jeong or Yoshida (and the knowledge of hair dryers and their

operation generally) that the “hand-held air blower device” disclosed in Jeffs would have been used for “hair care,” *i.e.*, as a hair dryer.

125. The Jeong and Yoshida hair dryers are structurally similar to the air blower device disclosed in Jeffs. For example, all three include air inlets at the proximal ends of their respective handles, and air outlets from bodies attached to the distal ends of their respective handles:



Ex. 1004, Fig. 1; Ex. 1005, Fig. 3; Ex. 1006, Fig. 1.

126. The difference between the appliances described in Jeong, Yoshida, and Jeffs is that Jeong and Yoshida utilize electrically-powered fans to generate air flow, whereas the Jeffs blower uses externally-generated high pressure air (*e.g.*, from an air compressor). However, I note that none of the Challenged Claims require any specific method or mode of generating airflow, therefore. Thus, and as explained below, Jeffs alone discloses all of the structural elements of the Challenged Claims. Moreover, in my opinion, a person of ordinary skill in the art would have recognized that the Jeffs device would have been used as a hair dryer.

127. In my opinion, a person of ordinary skill in the art would have had a reasonable expectation of success in using the Jeffs air blower device as a hair dryer given the performance specifications indicated. Jeffs provides a table of “flow rate performance” of the device that indicates that the output volume from the device would be appropriate for drying hair, and similar to the output volume produced by comparable conventional hair dryers:

TABLE 1			
psig	input volume cu.ft./min.	output volume cu.ft./min.	ratio input/output
25	3.66	62.5	17.0
30	4.25	70.9	16.7
35	4.67	74.1	15.9
40	5.26	86.8	16.4
45	5.94	93.2	15.7

Ex. 1006 at 4:60-5:9. In my experience designing hairdryers, typical flow rates vary from less than 20 CFM (cubic feet per minute) to over 70 CFM. For example, the Parlux 3800 Ionic & Ceramic Eco Friendly Dryer

(<https://parluxus.com/products/parlux-3800-eco-friendly-ionic-ceramic-hair-dryer>)

is capable of producing an airflow output of 47 CFM. It is clear that the Jeffs unit would have been used as an effective hair dryer with the stated flow rates. If lower flow rates would have been desired, it would have been obvious to a person of skill in the art, and a trivial matter, to simply decrease the psig (the gauge pressure of the high pressure air supplied at 38) to a level appropriate for drying hair using a regulator.

128. The operation instructions that Jeffs provides is the same as how a conventional hand-held hair dryer is used. Specifically, Jeffs explains that “the operator holds the device as he or she would a pistol, directs the outlet air flow in the desired direction over a surface to be dried, and at an appropriate distance from that surface, and depresses the button 31 to supply a jet of air for one or more periods, until he or she judges that the drying is complete.” Ex. 1006 at 5:10-15.

129. Further, I note that the ’662 patent itself states that blowers “are used for a variety of applications such as drying substances such as paint or hair and cleaning or stripping surface layers.” Ex. 1001, 1:17-19. Accordingly, a person of skill in the art would have recognized that blowers (such as the Jeffs device or the ’662 patent device) would have been used for a “variety of applications.” For example, a person of ordinary skill in the art would have recognized the application of the Jeffs device to hair care, or conversely, the ’662 patent device to paint drying.

130. The evaporation rate (i.e. drying) of wetted hair is generally increased with a convective flow of ambient, unheated air due to the enhanced mass diffusion rate of water into the continuously moving ambient air flow. A common feature of hairdryers is the cool- or cold-shot button which generally turns off the heating elements while maintaining the convective flow established by region of higher pressure within the hair dryer. Such a “cool” or “cold” flow is used for a variety of purposes, including the removal of moisture from hair.

131. Because the Jeffs device does not include a heating element, a person of ordinary skill in the art would have been motivated to use it as a “cold-shot” hair dryer, which would have provided a decreased but finite evaporation rate compared to a hairdryer that provides the same airflow but with additional heating. In other words, the lack of a heating element decreases the drying rate, but not to zero.

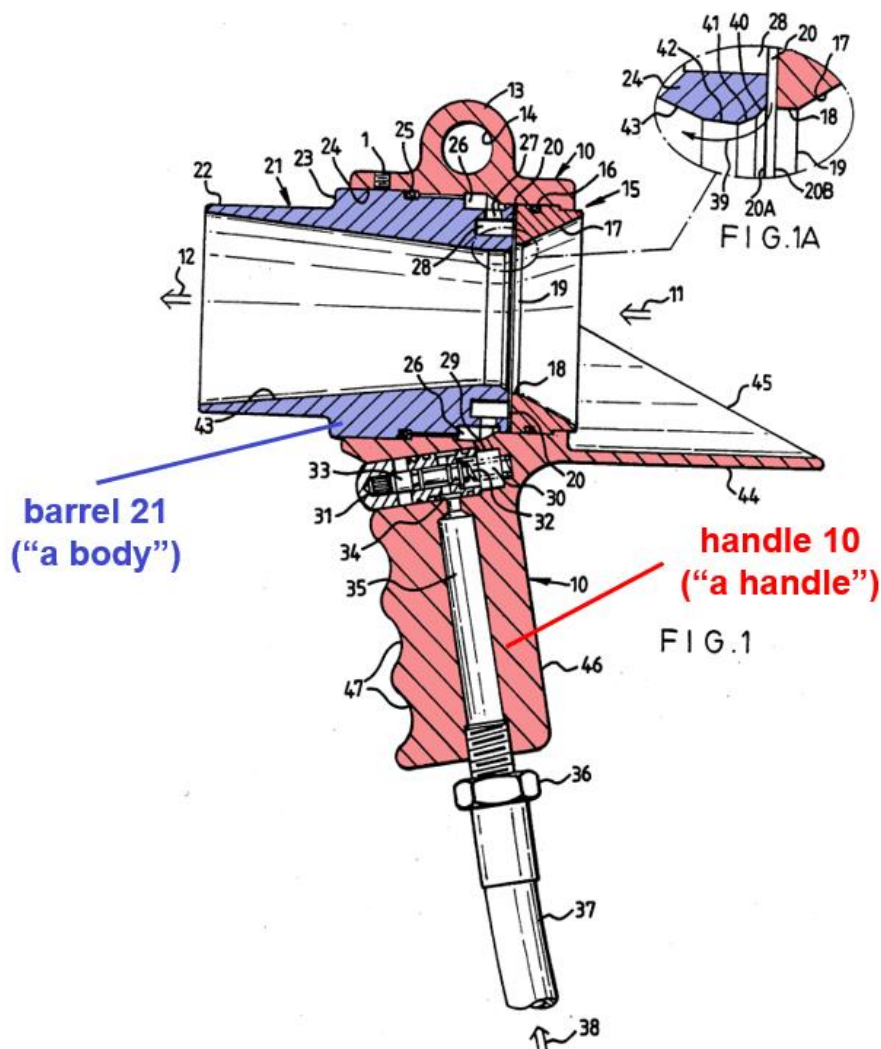
132. The '662 patent also recognizes that heating of the air is optional, and it is not required by any of the Challenged Claims. For example, the '662 patent states that “The fluid may be heated prior to exiting the body,” that the fluid “is optionally heated by the heater 80,” and that “The appliance can be used with or without a heater; the action of the outflow of fluid at high velocity has a drying effect.” Ex. 1001 at 1:22-23, 11:31-33, and 18:23-25.

133. Thus, even though Jeffs is not described as a “hair care appliance” as recited in the preamble of claim 26, it is my opinion that it would have been obvious to use the Jeffs air blower device as a “hair care appliance,” *i.e.*, as a hair dryer.

b) [26a]: “a body and a handle”

134. It is my opinion that Jeffs discloses this limitation.

135. Jeffs discloses that “[t]he hand-held air blower device . . . consists of two interconnected body components: a handle 10 and a barrel 21,” which are shown in the annotated Figure 1 of Jeffs, below:



Ex. 1006 at 3:13-15.

136. Jeffs discloses that the barrel 21 “has a generally cylindrical outer wall which is accommodated with a sliding fit by a cylindrical opening in the handle 10.” Ex. 1006 at 3:15-17. The handle includes a “pistol grip portion” which “receives the fingers of the operator,” and a “push button 31” that operates a high-pressure air inlet valve. Ex. 1006 at 3:19-22. Jeffs further explains that the “pistol grip portion depends generally at 90° from a longitudinal axis of the barrel 21, so that the entire device resembles a pistol.” Ex. 1006 at 3:24-26.

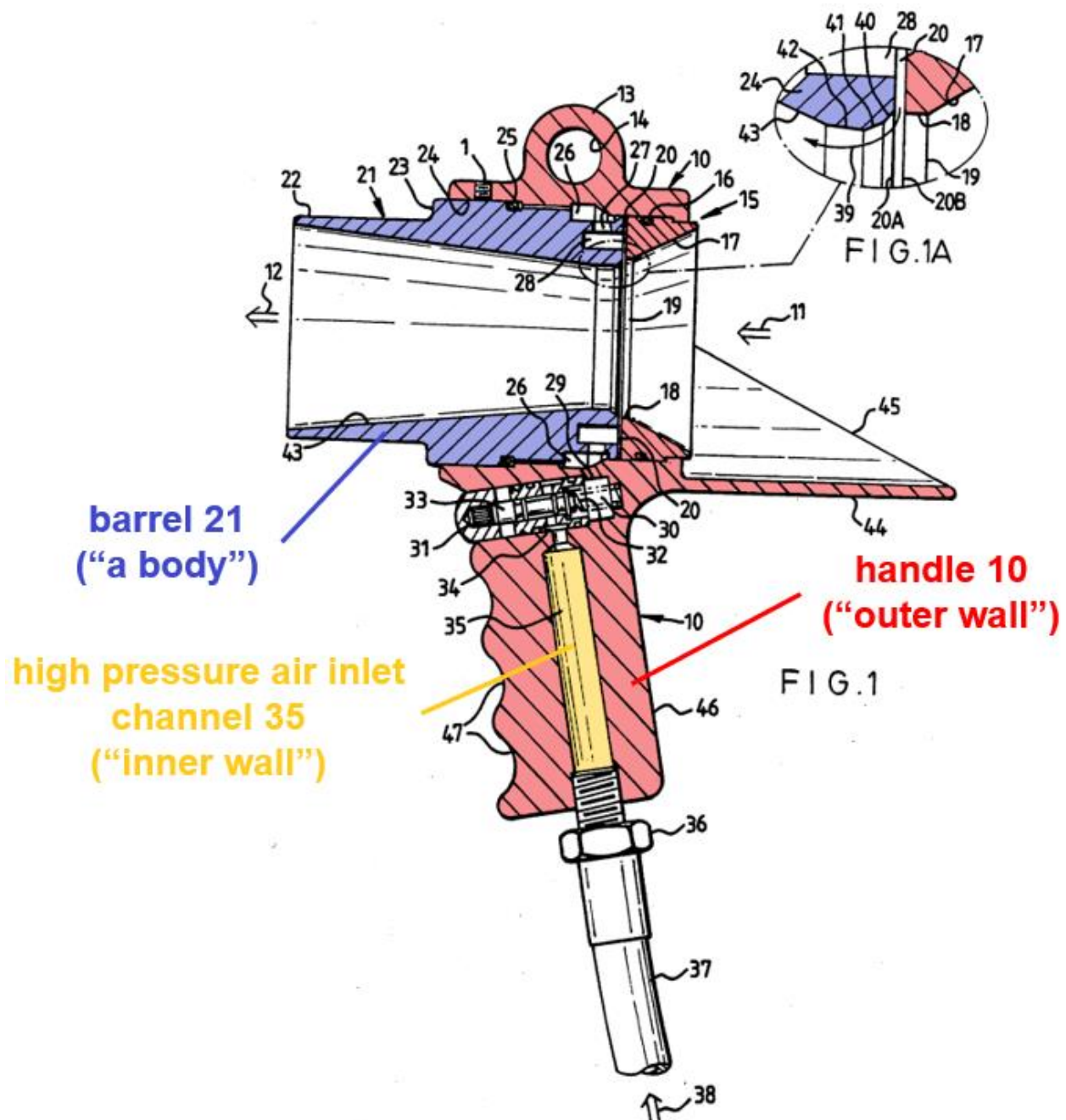
137. The barrel 21 of the Jeffs device “is intended to receive external air 11 at atmospheric pressure, to pass this through a throat portion of the barrel, to accelerate this air flow, and to provide an outlet jet 12 along the longitudinal axis of the barrel.” Ex. 1006 at 3:38-42. Thus, in my opinion, the “barrel 21” and “handle 10” described in Jeffs are “a body and a handle,” respectively.

c) [26b]: “the handle comprising an inner wall and an outer wall,”

138. It is my opinion that Jeffs discloses this limitation.

139. As I explained above with respect to element [26a], the “hand-held air blower device” that is described in Jeffs includes a “handle 10. Ex. 1006 at 3:13-15. The “handle 10 has a pistol grip portion 46 with indentations 47 for receiving the fingers of the operator, and a push button 31 for operating a high-pressure air inlet valve.” Ex. 1006 at 3:19-22. Jeffs explains that the “pistol grip portion depends

generally at 90° from a longitudinal axis of the barrel 21, so that the entire device resembles a pistol.” Ex. 1006 at 3:24-26. These components are shown in the annotated version of Figures 1 and 1A of Jeffs, below:



Ex. 1006, Figs. 1, 1A.

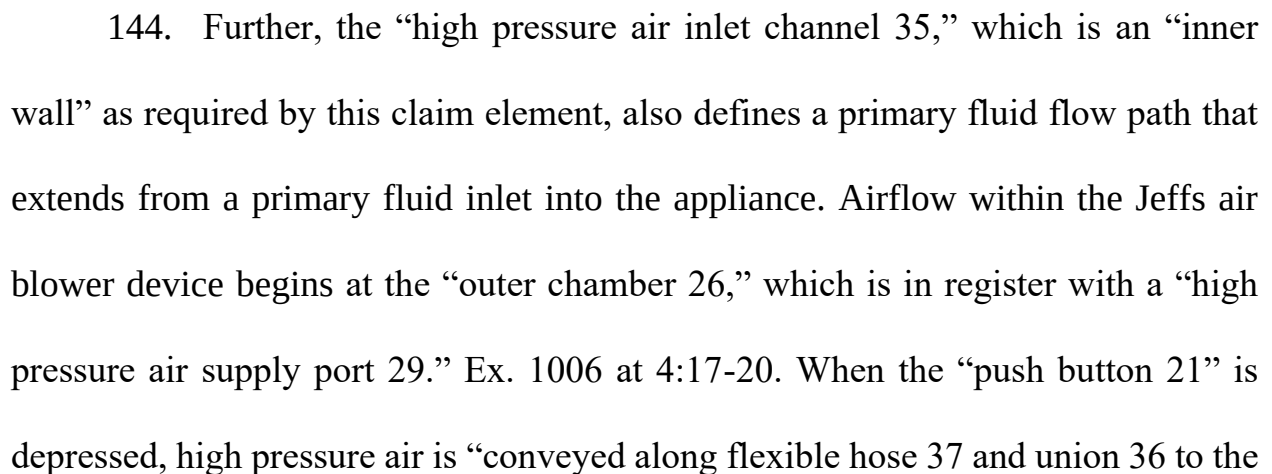
140. As shown in the annotated figures above, “handle 10” forms an outer wall, as required by this claim element because, as I explained above, “handle 10 has a pistol grip portion 46 with indentations 47 for receiving the fingers of the operator, and a push button 31 for operating a high pressure air inlet valve.” Ex. 1006 at 3:19-22.

141. Further, when the “push button 21” is depressed, “high pressure air 38 [is] conveyed along flexible hose 37 and union 36 to the channel 35 within the handle 10.” Ex. 1006 at 4:28-31. Because the channel 35 is disposed within the “handle 10,” it forms an “inner wall” as required by this claim element.

d) [26c]: “wherein the inner wall is disposed radially inwardly from the outer wall and defines a primary fluid flow path that extends from a primary fluid inlet into the appliance,”

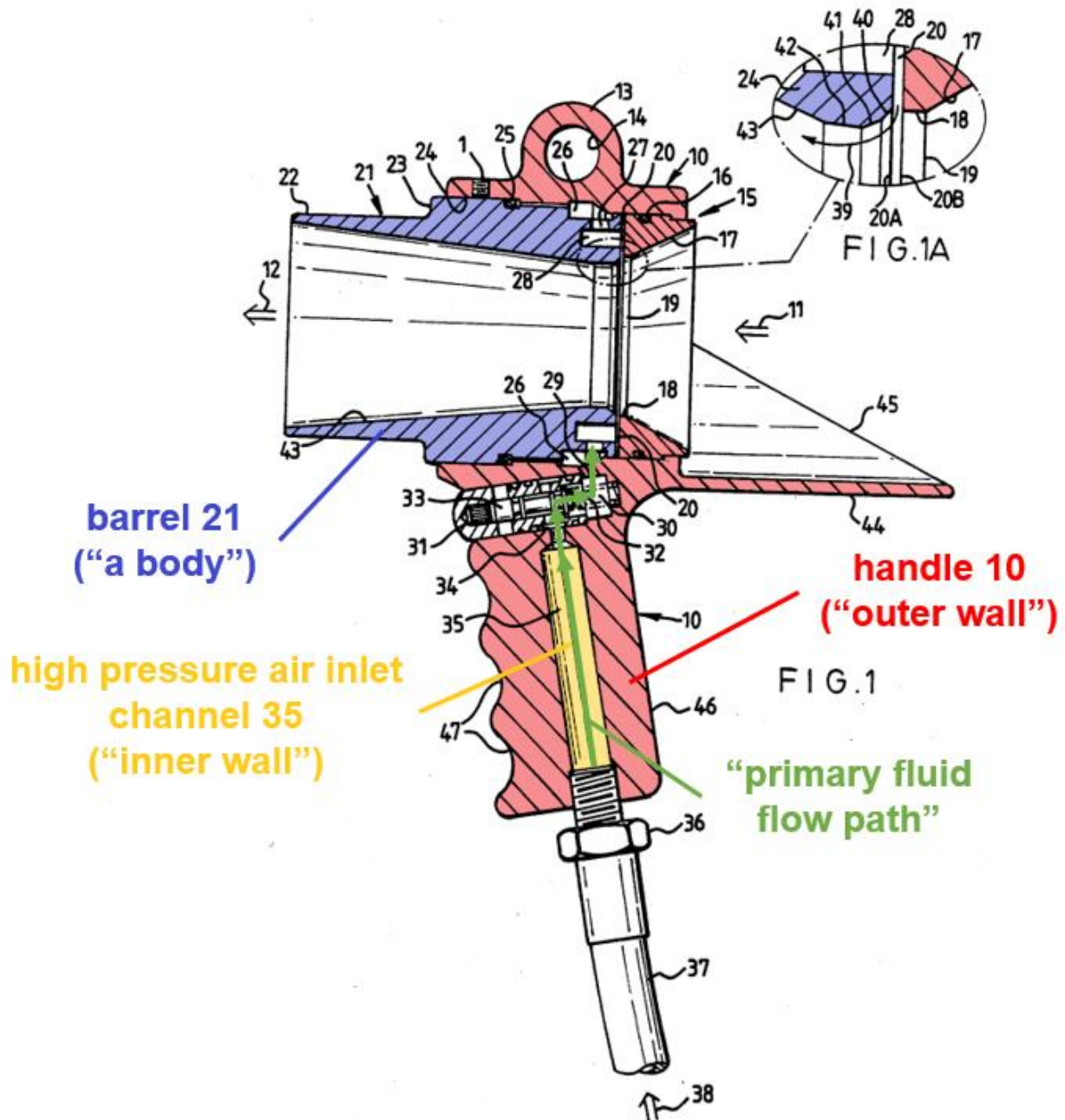
142. It is my opinion that Jeffs discloses this limitation.

143. As I explained with respect to the previous element [26b], the “high pressure air inlet channel 35,” which forms a “inner wall,” is disposed within the “handle 10.” See Ex. 1006 at 4:25-31. The figures included in Jeffs indicate that the air inlet channel 35 is essentially centered within the handle 10. Thus, it is “disposed radially inwardly from the outer wall” as required by this claim element. For example, Figure 1 depicts the high pressure air inlet 35 disposed radially within the handle 10:



channel 35 within the handle 10,” and “reaches the inner chamber 30.” Ex. 1006 at 4:28-30. Because the “union 36” is the entry point for air flow into the blower device, it is therefore “a primary fluid inlet into the appliance” as required by claim element [26c].

145. Jeffs explains that, “[f]rom the inner chamber 30, the high pressure air emerges through channel 29 to the barrel chambers 26 and 28, where it then emerges through the inlet slot 20. Ex. 1006 at 4:31-34. Thus, the channel 35 “defines a primary fluid flow path that extends from a primary fluid inlet into the appliance” as required by claim element [26c]. This “primary fluid flow path” through the high pressure air inlet channel 35 is shown in the annotated version of Figure 1, below (the “primary fluid flow path” is colored **green**):

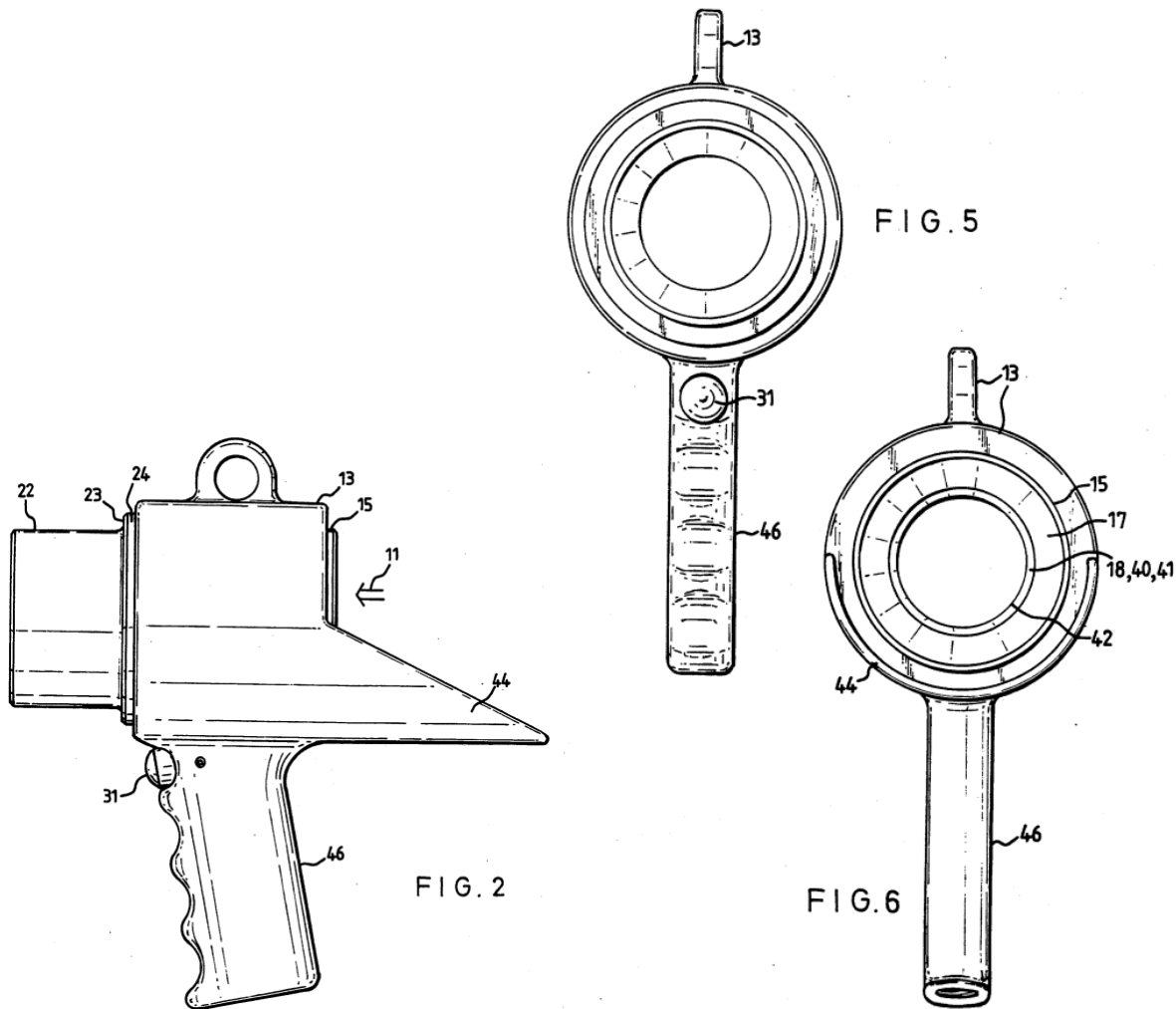


e) [26d]: “wherein the outer wall is an external surface of the handle, and”

146. It is my opinion that Jeffs discloses this limitation.

147. As I explained above with respect to claim element [26a], the handle 10 includes a “pistol grip portion” which “receives the fingers of the operator,” and

a “push button 31” that operates a high-pressure air inlet valve. Ex. 1006 at 3:19-22. Jeffs further explains that the “pistol grip portion depends generally at 90° from a longitudinal axis of the barrel 21, so that the entire device resembles a pistol.” Ex. 1006 at 3:24-26. Figures 2, 5, and 6 of Jeffs all depict the “pistol grip portion” of the handle 10 as an external surface of the handle:



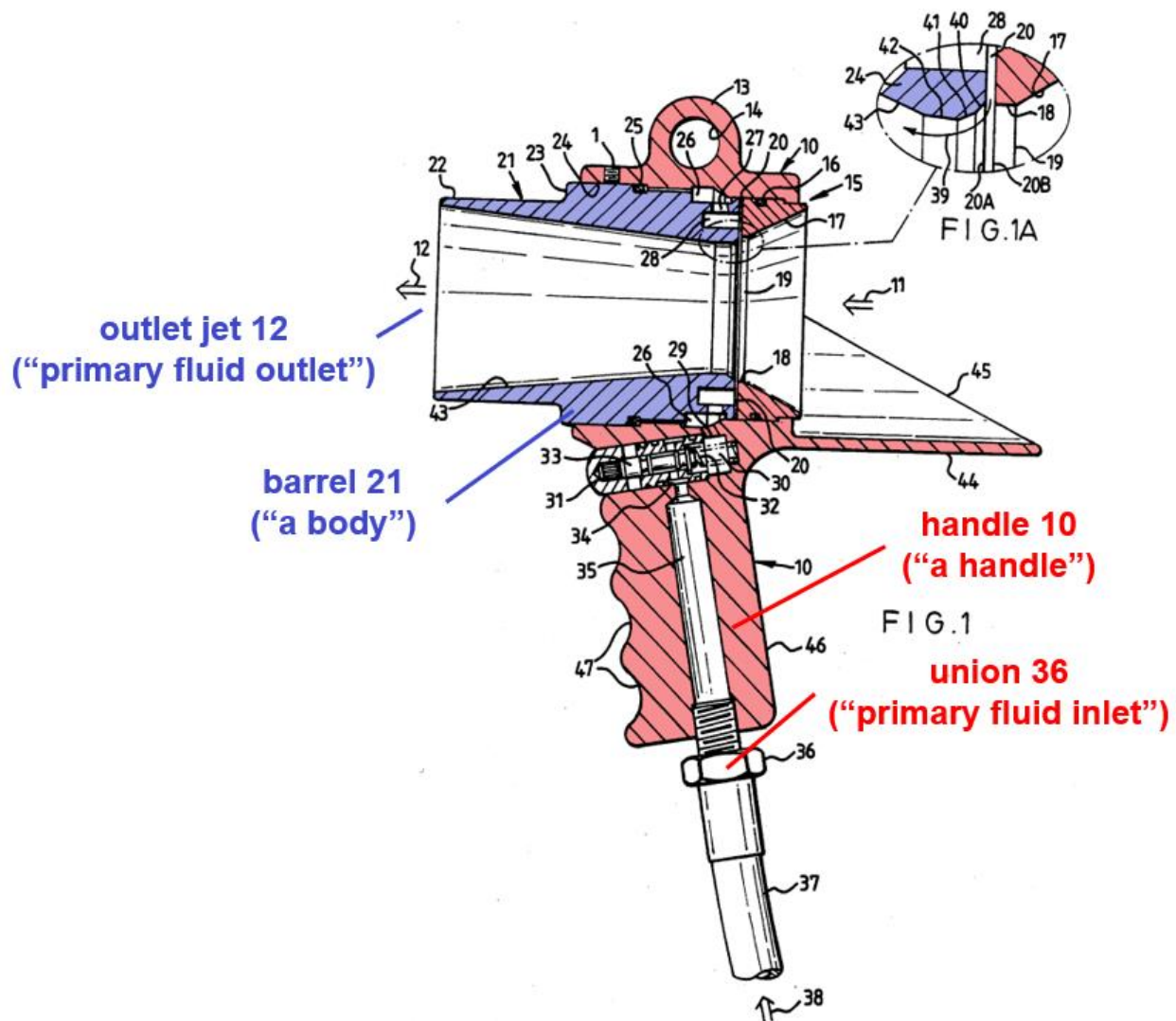
Ex. 1006, Figs. 2, 5, and 6. Thus, in my opinion, Jeffs discloses that the pistol grip portion is an “outer wall [that] is an external surface of the handle” as required by this claim element.

f) [26e]: “wherein the primary fluid flow path from the primary fluid inlet to a primary fluid outlet from the body is non linear.”

148. It is my opinion that Jeffs discloses this limitation.

149. As I explained above with respect to claim element [26c], airflow within the Jeffs air blower device begins at the “outer chamber 26,” which is in register with a “high pressure air supply port 29.” Ex. 1006 at 4:17-20. When the “push button 21” is depressed, high pressure air is “conveyed along flexible hose 37 and union 36 to the channel 35 within the handle 10,” and “reaches the inner chamber 30.” Ex. 1006 at 4:28-30. Because the “union 36” is the entry point for air flow into the blower device, it is therefore “a primary fluid inlet.”

150. Further, as I explained above with respect to claim element [26a], the barrel 21 of the Jeffs device “is intended to receive external air 11 at atmospheric pressure, to pass this through a throat portion of the barrel, to accelerate this air flow, and to provide an outlet jet 12 along the longitudinal axis of the barrel.” Ex. 1006 at 3:38-42. Accordingly, the “outlet jet 12” is a “primary fluid outlet from the body” as required by this claim element. The union 36 and outlet jet 12 are shown in the annotated version of Figure 1 of Jeffs, below:

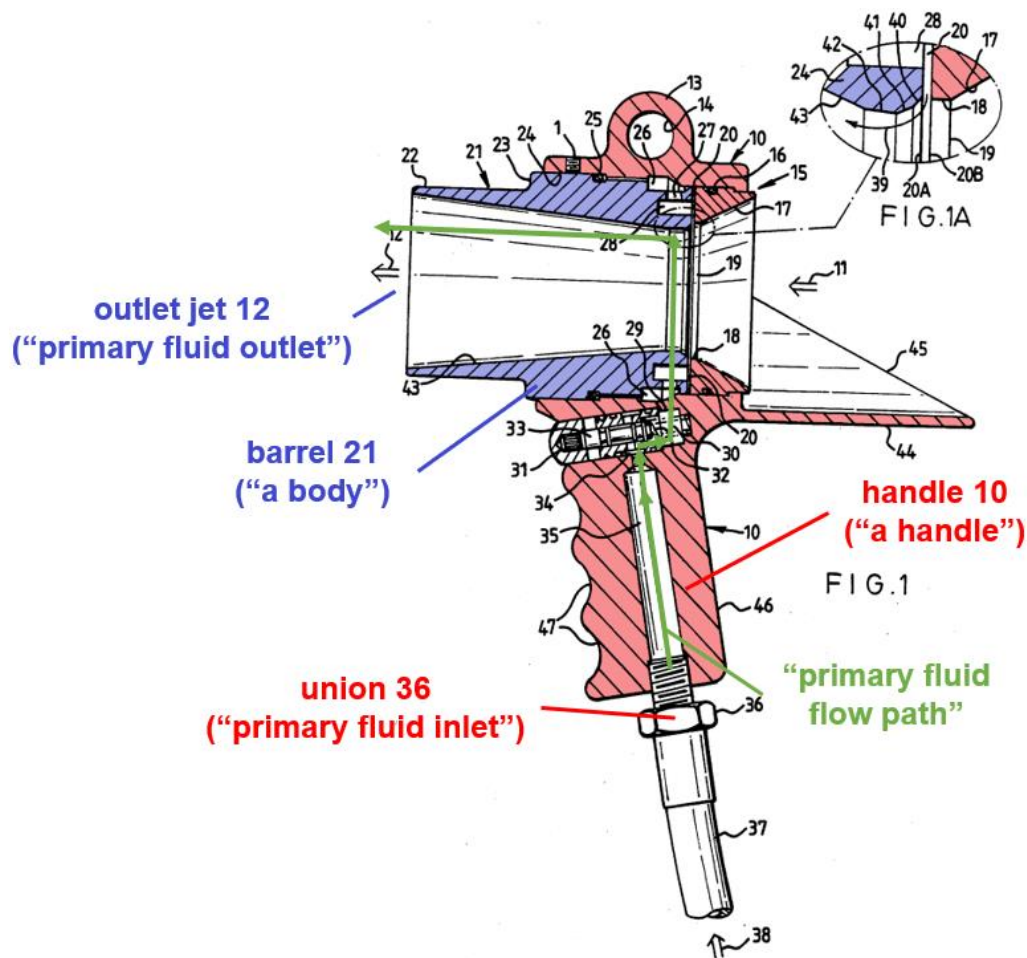


Ex. 1006, Fig. 1 (annotations added).

151. As I explained in the Overview of the Prior Art, airflow within the Jeffs air blower device beings at the “outer chamber 26,” which is in register with a “high pressure air supply port 29.” Ex. 1006 at 4:17-20. When the “push button 21” is depressed, high pressure air is “conveyed along flexible hose 37 and union 36 to the channel 35 within the handle 10,” and “reaches the inner chamber 30.” Ex. 1006 at 4:28-30. From the inner chamber 30, “the high pressure air emerges through channel

29 to the barrel chambers 26 and 28, where it then emerges through the inlet slot 20” of the barrel.” Ex. 1006 at 4:31-34. When the operator releases the push button, the supply of high pressure air to the inlet slot 20 is switched off via the valve. *See* Ex. 1006 at 4:34-41.

152. Once “the high pressure air emerges from the inlet 20 at right angles to the longitudinal axis of the barrel 21, it is drawn by the Coanda effect progressively in the down stream direction, as shown by arrow 39 in FIG. 1A,” reproduced above. Ex. 1006 at 4:42-45. Jeffs explains that the air “is attracted to the progressively stepped surfaces 40, 41, 42 and 43 of the inlet wall of the barrel,” but “not drawn to the upstream surface 18, because that is parallel to the longitudinal axis.” Ex. 1006 at 4:45-49. Accordingly, the “high speed flow of this high pressure air 39 creates a region of low pressure which attracts bulk air flow 11 in the longitudinal direction,” and the bulk air flow combines with the high pressure air flow, within the barrel 21, and the combined air flow is at an intermediate velocity when it emerges at 12.” Ex. 1006 at 4:49-54. The overall air flow path is shown in **green** in the following annotated version of Figure 1:



Ex. 1006, Fig. 1.

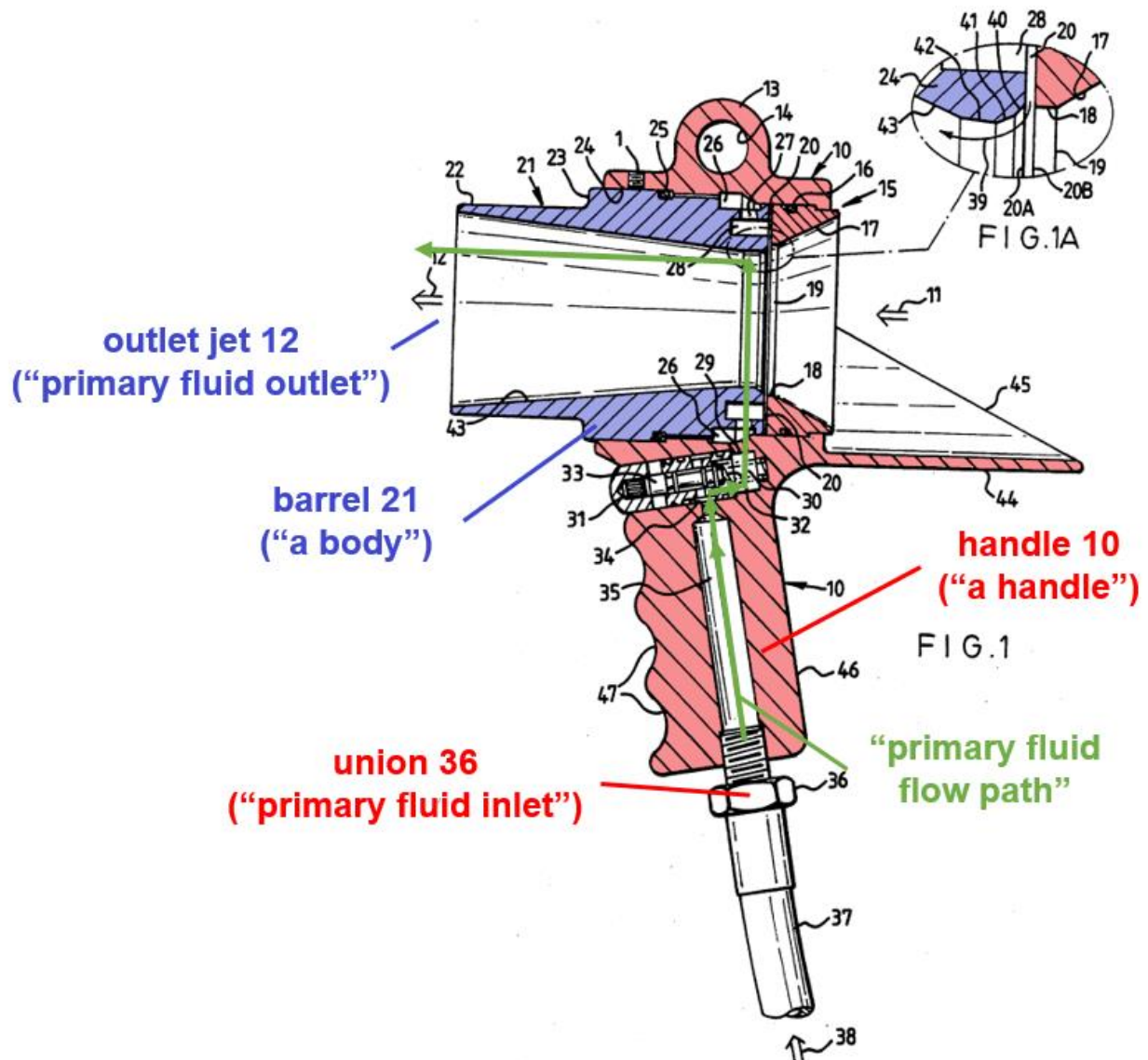
153. It is clear from the description of the Jeffs device that the primary fluid flow path through the air blower is “non linear” as required by this claim element. Jeffs itself notes that “high pressure air emerges from the inlet 20 *at right angles* to the longitudinal axis of the barrel 21,” and is drawn in the downstream direction where it emerges at outlet jet 12. Ex. 1006 at 4:42-54. A person of skill in the art would have recognized that the air emerging from the inlet 20 “at right angles” to the longitudinal axis of the barrel would have meant that the path of the airflow changed by approximately 90 degrees, as shown in the annotated airflow path above.

154. Thus, in my opinion, Jeffs discloses that “the primary fluid flow path from the primary fluid inlet to a primary fluid outlet from the body is non linear” as required by claim element [26e].

2. Claim 27: “The appliance of claim 26, wherein the primary fluid flows within the handle in a first direction and within the body in a second direction.”

155. It is my opinion that Jeffs discloses this additional limitation of dependent claim 27, for the same reasons I expressed above with respect to the “non linear” requirement of claim element [26e].

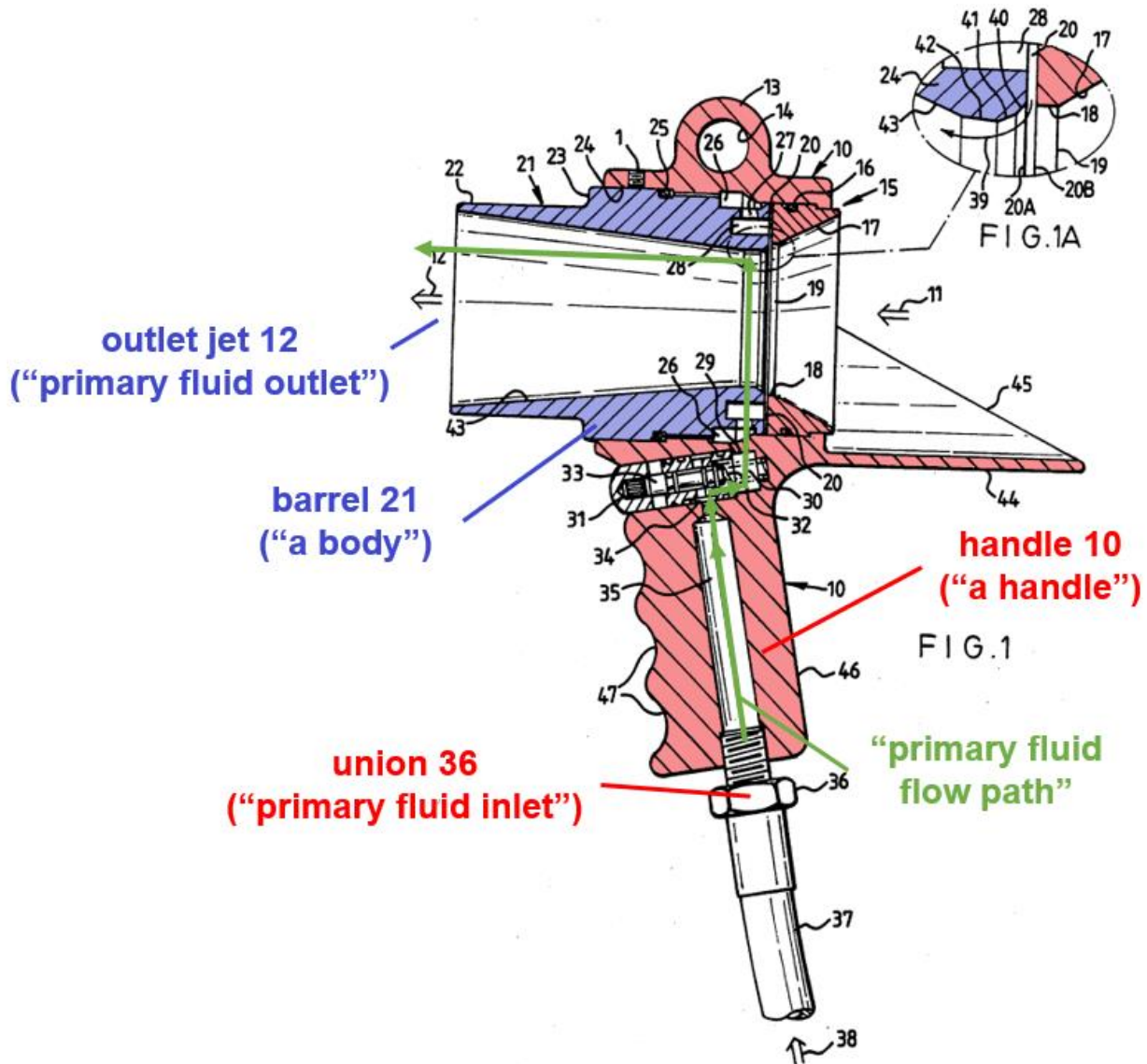
156. Specifically, the “primary fluid flow path” in Jeffs, which begins at the union 26 and ends at the outlet jet 12 changes by approximately 90 degrees between the direction it flows within the handle and the direction it flows within the barrel:



3. **Claim 28:** "The appliance of claim 26, wherein the primary fluid flow in the body is substantially orthogonal to the primary fluid flow in the handle."

157. It is my opinion that Jeffs discloses this additional limitation of dependent claim 28, for the same reasons I expressed above with respect to the "non linear" requirement of claim element [26e].

158. Specifically, the “primary fluid flow path” in Jeffs, which begins at the union 26 and ends at the outlet jet 12 changes by approximately 90 degrees between the direction it flows within the handle and the direction it flows within the barrel:



159. Given that the angle between the direction of flow in the handle and the direction of flow in the barrel is approximately 90 degrees, the flow is “substantially orthogonal” between the two, as required by dependent claim 28.

IX. SECONDARY CONSIDERATIONS OF NON-OBVIOUSNESS

160. As I explained above in Section VII.C, I understand that an obviousness analysis includes consideration of “secondary” or “objective” evidence of non-obviousness, including things such as: (1) a long-felt but unmet need in the prior art that was satisfied by the claimed invention; (2) commercial success or the lack of commercial success of the claimed invention; (3) unexpected results achieved by the claimed invention; (4) praise of the claimed invention by others skilled in the art; (5) taking of licenses under the patent by others; (6) deliberate copying of the claimed invention; and (7) contemporaneous and independent invention by others.

161. I am not aware of any secondary considerations of non-obviousness raised by Dyson with respect to the Challenged Claims of the '662 patent. As an example, I am not aware of any showing of a long-felt but unmet need satisfied by the '662 patent. As I explained in my obviousness analysis above, any alleged “need” that would have been satisfied by the '662 patent had already been satisfied in light of Jeong, Yoshida, and Jeffs. As another example, I am not aware of any commercial success of any hair dryers that is due to their practicing of the Challenged Claims of the '662 patent. I likewise am not aware of any evidence relating to the other “secondary” or “objective” considerations listed above.

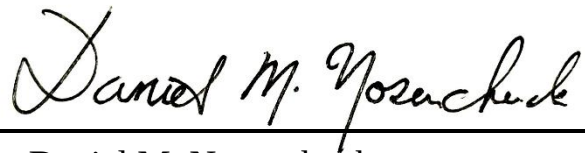
162. Accordingly, the consideration of “secondary” or “objective” evidence of nonobviousness does not change my opinion that claims 26-28 of the ’662 patent would have been obvious to one of skill in the art.

X. CONCLUSION

163. Based on my review and above analysis of the prior art, it is my opinion that claims 26-28 of the ’662 patent would have been anticipated or obvious to one of skill in the art.

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

Dated: August 18, 2023

A handwritten signature in black ink, reading "Daniel M. Nosenchuck", written over a horizontal line.

Dr. Daniel M. Nosenchuck

Appendix A

CV

Daniel M. Nosenchuck

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Education:

Ph.D.	California Institute of Technology, Pasadena, California	June 1982
	<i>Aeronautics</i> , Thesis Advisor: H.W. Liepmann	
M.S.	California Institute of Technology, Pasadena, California	June 1977
	<i>Aeronautics</i>	
B.S.	Syracuse University, Syracuse New York	May 1976
	<i>Aerospace Engineering</i>	
	<i>Mechanical Engineering</i>	

Experience:

July 1988 - Present	Princeton University, Princeton NJ: Associate Professor of Mechanical and Aerospace Engineering
August 1983 – June 1988	Princeton University, Princeton NJ: Assistant Professor

Recent Teaching (Graduate and Undergraduate): Thermodynamics, Heat Transfer, Fluid Dynamics, Viscous Flows, Energy Conversion and the Environment: Applications to Transportation, Mechanical Design, Entrepreneurial Engineering (Product Design and Marketing)

Research: Experimental fluid mechanics: Turbulence control; Drag reduction; Heat Transfer, Dynamic Three-Dimensional Flow Visualization
Computer Simulation: Special-purpose computer architecture design and fabrication

Honors and Awards:

- Boeing H.G. Welliver Fellow, 1995
- Excellence in Teaching Award, Princeton University Undergraduate Engineering Council, 1993
- Presidential Young Investigator Award (NSF), 1984-1989
- GTE Emerging Scholar, 1987
- Rheinstein Award, School of Engineering, Princeton University, 1986
- IBM Faculty Development Award 1984 - 1985
- EMMY Award from the Academy of Television Arts and Sciences *for Outstanding Individual Achievement - Special Visual Effects: The Day After*, 1984
- The William F. Ballhaus Prize for an *Outstanding Doctoral Dissertation in Aeronautics* California Institute of Technology, 1982
- Graduate Fellowships, California Institute of Technology, 1976

U.S.A. Department of Defense Activities (1994 - Present):

- Member of Navel Studies Board Panels on
 - Joint Strike Operations
 - Regional Conflict (Combat Power Panel)
 - Undersea Warfare
- Member of Defense Science Board Ballistic Missile Defense Task Force
- Member of Defense Science Study Group
- Reviewer of Various Research Programs for the Operational Forces

U.S. Patents - First or Sole Inventor (Provisional, Applications and Foreign Patents Not Listed):

1. Patent 6,393,208 (May 2002) *Compressor with integrated impeller and motor*
2. Patent 6,168,405 (January 2001) *Wankel type pump for transporting fluid with entrained particulate matter*
3. Patent 6,014,791 (January 2000) *Quiet vacuum cleaner using a vacuum pump with a lobed chamber*
4. Patent 6,011,903 (January 2000) *Reduced-noise ducted flow hair dryer with multiple impellers and ambient air inlets*
5. Patent 5,964,433 (October 1999) *Staggered actuation of electromagnetic tiles for boundary layer control*
6. Patent No. 5,841,943 (November 1998) *Ducted flow hair dryer with multiple impellers*
7. Design Patent No. D398,074 (September 1998) *Hair Dryer*
8. Patent No. 5,492,289 (February 1996) *Lifting Body with Reduced-Strength Trailing Vortices*
9. Patent No. 5,442,790 (August 1995) *A Parameterized Optimizing Compiler*
10. Patent No. 5,437,421 (August 1995) *Multiple Electromagnetic Devices for Boundary Layer Control*
11. Patent No. 5,320,309 (June 1994) *Electromagnetic Device and Method for Boundary Layer Control*
12. Patent No. 4,811,214 (March 1989): *Dynamic Reconfiguration System for Pipelined Computers*

Numerous foreign patents also awarded for many of the above patents; other patents pending.

Technology Development and Commercialization:

- Small- and Personal-Care Appliances
 - Extensive Involvement in IP Creation and Commercial Product Development and Manufacture of Small and Personal-Care Appliances
 - Typical Example of High-Volume and -Market-Share Product: Hairdryer
 - Numerous Utility and Design Patents
 - Models Introduced: Quiet Hairdryers (numerous brands)
 - Makeup Mirrors (numerous brands)
 - Follow-on Next-Generation Models Under Major Brand Names
 - Major U.S. National Chain Retail Outlets Include: Target, Wal-Mart and Kmart
 - Other Ongoing and New-Launch Products Include Hairdryers, Lighted Makeup-Mirrors, Hair Curlers, Portable Heater-Based Appliances, Humidifiers, Vacuum-Based Appliances
- Direct-Response TV Products
 - Involved in development, prototype and manufacture of DR TV products, including
 - Air-Press Massager, Roll-A-Hose, Doggy Steps, Ped Egg, Jupiter Jack, ...

Past Technology Development and Transfer:

- Navier-Stokes Computer Technology
 - Princeton University to Concurrent Computer Corporation, Tinton Falls, NJ - 1987
 - Supercomputer Solutions Inc., San Diego, CA - 1989
- Electromagnetic Flow-Control Technology
 - Princeton University to Nova Innovations, San Diego, CA - 1993

Consulting Experience:

- Avolio and Hanlon, P.C., Lawrenceville, NJ
- Boeing Company, Seattle, WA
- Defense Science Board, Washington DC
- DSV Partners, Princeton, NJ
- Greenberg Traurig, LLP, New York, NY
- General Atomics, San Diego, CA
- Helen of Troy, El Paso, TX
- Hultquist IP, Chapel Hill, NC
- Institute for Defense Analysis, Alexandria VA
- The Manica Group, Tokyo, Japan
- Matsushita Electric Works, Osaka, Japan
- Nova Innovations Corporation, San Diego, CA
- National Research Council (Naval Studies Board)
- Northwest Research Associates Inc., Bellevue WA
- Praxis Film Works, North Hollywood, CA
- Princeton Combustion Research Laboratories, Princeton, NJ
- Rubin/Anders Scientific Inc., Brookline, MA
- Security and Exchange Commission, Denver, CO
- Telebrands, Fairfield, NJ
- Union Camp Corporation, Lawrenceville, NJ
- Wiggin and Dana, Hartford, CT
- Wolf Popper Ross Wolf and Jones, New York City, NY

Reviewer for:

- AIAA Journal
- Journal of Fluid Mechanics
- Physics of Fluids
- Review of Scientific Instruments
- National Science Foundation (Proposals and NYI Selection Committee)

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Daniel Nosenchuck received his BS in both Mechanical and Aerospace Engineering (cum laude) from Syracuse University in 1976. He then received his Ph.D. in Aeronautics from the California Institute of Technology (Caltech) in 1982, for which he was the charter winner of the William Ballhaus Prize for an outstanding thesis. After a year as a post-doctoral fellow in Aeronautics at Caltech, he joined the faculty in Mechanical and Aerospace Engineering at Princeton University.

His interests include experimental and computational fluid mechanics, dynamic flow control and visualization, heat transfer, advanced parallel supercomputer and compiler architectures, and concurrent design, manufacture and test of complex aero-mechanical systems, and consumer product design, manufacture and marketing. His major scientific and engineering contributions include experimental active laminar-flow control, the first successful demonstration of active turbulence control, the development of electromagnetic turbulence control, and the creation of a parallel-processing supercomputer for complex flow simulations. He was a charter-year recipient of the five-year NSF Presidential Young Investigator Award (1984-89), a recipient of the IBM Faculty Development Award (1984-85) and the Princeton University School of Engineering Rhinestein Award (1986) for work related to the implementation of unique flow-control concepts, and the development of new flow visualization techniques. He was a Boeing Welliver Fellow (1995) and is active in industrial consulting and technology transfer. He also consults directly with the Department of Defense, has been a member of the DoD/IDA Defense Science Study Group and is frequently a member of various DoD Defense Science Board and Naval Studies Board Task Forces and Panels.

Daniel Nosenchuck has a dozen US Utility and Design Patents as primary inventor, along with foreign patents in areas ranging from supercomputers and aircraft drag reduction and safety, to commercial products. In the latter category, he developed and introduced a range of branded (e.g. Revlon, Helen-of-Troy) personal care appliances, including the Revlon Perfect Look Makeup Mirror and the first successfully mass-marketed quiet hairdryer: the Revlon 'Get Quiet.' In the direct-marketing category, he has been extensively involved in the development of well-received mass-market products, such as Roll-A-Hose, Doggy Steps, Ped Egg, Jupiter Jack and others. For the past several decades, he has spent considerable time in China, Thailand and Japan where he has been working with businesses and factories in direct support of the development of commercial prototypes and transition to large-scale manufacture. He has also consulted with a number of patent and intellectual property firms in a variety of matters, including IPR issues.

Among his other interests, he has worked in Hollywood as a consultant on special effects, and in 1984 he received the Academy of Television Arts and Sciences *Primetime Emmy Award* for 'Outstanding Individual Achievement in Special Visual Effects: The Day After.' Contemporaneous with the ABC's airing of *The Day After* (which was the most-watched TV-movie of all time), the mushroom clouds and missile launches he created for the film were prominently featured in numerous national and international print and media publications, including the cover of Newsweek.

Some of his further activities include flying (Commercial Pilot since 1973; former FAA Certified Flight Instructor in Airplanes and Gliders 1974-1982), and fine woodworking (furniture and cabinet making). He enjoys motorcycling, and is currently Vice President of the Star of David Bikers motorcycle club.