

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

DYSON TECHNOLOGY LIMITED AND DYSON, INC.,
Petitioners,
v.
OMACHRON INTELLECTUAL PROPERTY INC.,
Patent Owner.

Case No. IPR2024-00690
U.S. Patent No. 10,117,550

**Declaration of Richard Figliola, Ph.D. in Support of
Patent Owner's Response**

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I, Richard S. Figliola, declare as follows:

1. My name is Richard Figliola. I have been retained by the Patent Owner to offer technical opinions related to U.S. Patent No. 10,117,550 (“the ’550 Patent”) (Ex. 1001). I understand that the Patent Trial and Appeal Board (“PTAB” or “Board”) has instituted this *inter partes* review (“IPR”) of the ’550 Patent.

2. In this Declaration I give my opinions as to whether the claims of U.S. Patent No. 10,925,550 (“the ’550 Patent”) are valid. I provide technical bases for these opinions as appropriate.

3. This Declaration contains statements of my opinions formed to date and the bases and reasons for those opinions. I may offer additional opinions based on further review of materials in this case, including opinions and/or testimony of other expert witnesses. I make this Declaration based upon my own personal knowledge and, if called upon to testify, would testify competently to the matters contained herein.

I. BACKGROUND

A. Qualifications

4. I am over the age of 18 and am competent to write this Declaration. I have personal knowledge, or have developed knowledge of these technologies based upon education, training, or experience, of the matters set forth herein. This Section contains a summary of my educational background, career history, publications, and

other relevant qualifications. My full *curriculum vitae* is attached as Appendix A to this declaration.

5. As shown in my *curriculum vitae*, I have over 40 years of experience as a practicing engineer and a professor teaching in the fields of fluid mechanics, flow devices, and engineering measurements.

6. I hold a B.S. degree in aerospace engineering, an M.S. degree in mechanical engineering, and a Doctor of Philosophy degree from the University of Notre Dame, Indiana.

7. I am a professional engineer licensed in the State of South Carolina, USA.

8. I am currently employed by Clemson University as the Alumni Distinguished Professor Emeritus of Mechanical Engineering and Research Professor. I recently retired from full-time duties but continue there in a part-time role. In this capacity, I teach at the undergraduate and graduate levels and solicit and conduct scientific research. My contract with Clemson University permits me to interact with local industry as a consultant, which has allowed me to be involved in the development of several commercial products.

9. Early in my career, I held the position of Research Engineer and NATO Fellow at the von Karman Institute for Fluid Dynamics (Brussels, Belgium), a NATO-affiliated institution, where I conducted research from which I developed an

expertise in pneumatic conveying. I also worked as a test engineer at Pratt-Whitney Aircraft Engines (Connecticut, USA). While at Clemson, I have held short-term visiting appointments as a research engineer at the US Department of Energy Ames Laboratory (Iowa State University, Iowa, USA) and the US Air Force Research Laboratory (Ohio, USA).

10. As part of my faculty status with Clemson University, I am permitted to practice independently as a consultant with industry. Relevant to this case, I have worked closely with Ryobi Motor Products (Pickens, SC) on the design and performance testing of household vacuum cleaners. This work began in December 1993 and continued for just under two years. I was hired to explain the fluid mechanics of vacuum cleaners, centrifugal blowers, and pneumatic conveying, and how the internal device design affects air flow, including the blower, connecting passages, nozzle and hose designs. I worked with Ryobi engineers on model performance enhancements and new designs. This work permitted me to work collaterally with engineers, industrial designers, and marketing persons. I oversaw testing pursuant to ASTM F558 and F608 in the course of this assignment and the testing of Ryobi (i.e., Singer, Kenmore, Ryobi lines) vacuum cleaners, as well as those of many other brands. These included uprights and canister models. I worked with an engineering design team on the project code named FutureVac, a totally new

design of a Ryobi upright cleaner that they were considering for entry into the upper-end market.

11. Also related, I provided services to Electrolux with my colleague Dr. Tah-Teh Yang in the 1980s on improving the air flow through blowers, the air pumps used in most vacuum cleaners and extractors.

12. Also related, I was retained in 2007 as an expert in the dispute *Dyson v. Maytag* presented before the United States District Court for the District of Delaware. I offered opinions on test methods and conclusions challenging Dyson's "never loses suction" claim.

13. Further, using my experience with vacuum cleaners, I have developed a series of undergraduate engineering lab exercises that use store bought vacuum cleaners as a focus pursuant to carrying out ASTM F558, a performance test standard, and as a platform to explore engineering design.

14. I am a Fellow of the American Society of Mechanical Engineers (ASME).

15. I serve on the ASME PTC 19.1 Test Uncertainty standards committee.

16. I have authored in excess of 90 peer-reviewed technical publications, including studies of flows in enclosed spaces, as well as various applications in thermal-fluids engineering, bio-fluid mechanics, measurement techniques, and manufacturing design.

17. I am senior author of a widely-used textbook in engineering test measurements published by Wiley; the seventh edition (2019) is in current production and is available in several languages.

18. I am a named inventor on four United States patents with another patent pending.

B. Compensation

19. For my efforts in connection with the preparation of this Declaration, I have been compensated at my standard rate for this type of consulting activity of \$425 per hour. My compensation is in no way contingent on the results of these or any other proceedings relating to the above-captioned patent.

C. Materials and Other Information Considered

20. I have considered information from various sources in forming my opinions. I have reviewed and considered all exhibits listed in the attached Appendix B (Materials Considered) in forming my opinions.

II. UNDERSTANDING OF THE LAW

21. I am not an attorney. In forming my opinions in this Declaration, I applied the relevant legal principles provided to me by counsel, which are summarized in Appendix D.

III. TECHNOLOGY OF THE '550 PATENT

A. Overview of the '550 Patent

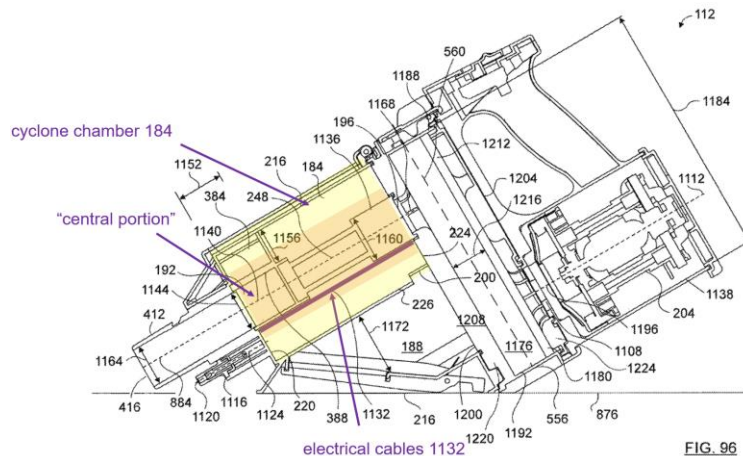
22. The '550 Patent discloses and claims novel designs for a hand vacuum cleaner which comprises at least one cyclone and at least a cyclone unit electrical connector. The electrical connector provided at the front end of the cyclone unit at a location adjacent a hand vacuum cleaner air inlet, wherein electrical cables extend rearwardly from the electrical connector through a central portion of the cyclone unit toward the suction motor and fan assembly.¹ The '550 Patent improves the prior art by providing an electrical connection between “an upstream attachment (e.g. a surface cleaning head)” and a “source of power.”²

23. As an example, Figure 96 and the accompanying texts demonstrate a possible configuration. As shown below in the annotated figure, “one or more electrical cables 1132 . . . extend from electrical connector 1116 along vortex finder 1136 of cyclone chamber 184 toward motor housing 1138”—*i.e.*, through a “central portion” of the cyclone unit.³

¹ Ex. 1001, Abstract.

² *Id.*, 34:39–58.

³ *Id.*



Ex. 1001 ('550 Patent), Fig. 96 (annotations added).

24. The '550 Patent has 4 independent claims (claims 1, 12, 20, 28). The limitations relating to the electrical connector and the cables extending rearward are as follows in claim 1:

(iii) an electrical connector provided on the front end of the cyclone unit wherein electrical cables extend rearwardly from the electrical connector through a central portion of the cyclone unit toward the suction motor and fan assembly.

Ex. 1001, cl. 1.

B. Priority Date

25. I have been asked to assume that the '550 Patent is entitled to claim priority to provisional application No. 62/093,189, filed on December 17, 2014.

C. Challenged Claims

26. I understand that Petitioners are challenging the validity of claims 1–28 of the ’550 Patent in the Petition for *Inter Partes* Review to which this Declaration will be attached. The claims being challenged are reproduced in Appendix C.

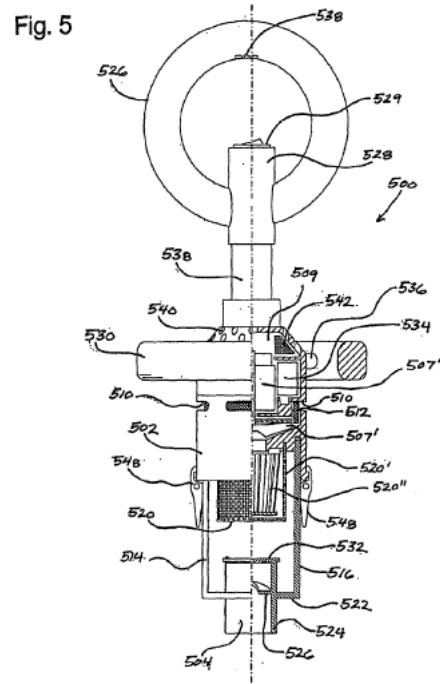
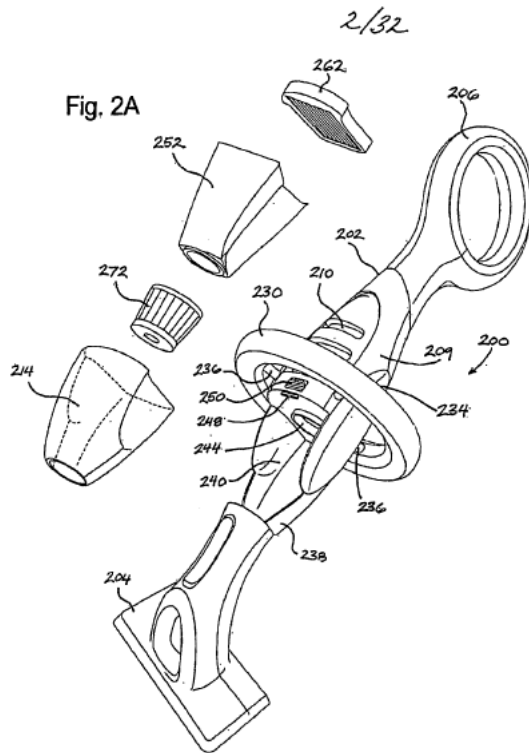
IV. SUMMARY OF THE REFERENCES

A. PCT Publication No. 2007/084543 (“Butler”) (Exhibit 1005)

27. Butler is a 2007 PCT publication that details several distinct embodiments of a specialized “Stair Cleaning Vacuum.”⁴ Butler discusses various existing solutions such as “upright and canister vacuum cleaners,” “stick vacuums,” and “compact hand-held vacuums,” and concludes that there “exists a need for an improved vacuum cleaner” specifically adapted for cleaning “raised” surfaces, and “particularly stair treads and risers.”⁵ Two distinct embodiments from Butler—one associated with Figure 2A and the other with Figure 5—are shown below.

⁴ Ex. 1005, Title.

⁵ *Id.*, 1:5–24, 3:10–16.

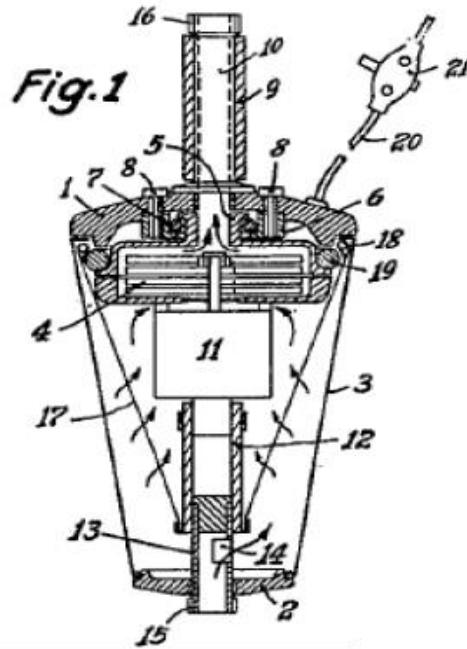


Id., Figs. 2A, 5.

B. Swiss Patent No. CH203,675 (“Peter”) (English translation: Exhibit 1007)

28. Peter is a 1939 Swiss patent for a vacuum cleaner having “suction nozzles and suction brushes that can be connected to the vacuum cleaner housing both directly and with the interposition of tubular and articulated parts so that they can be rotated, individually exchanged and combined with one another.”⁶

⁶ Ex. 1007, 1.



Id., Fig. 1.

C. U.S. Patent Publication No. 2008/0189901 (“Jansen”) (Exhibit 1008)

29. Jansen is a 2008 U.S. patent application publication for an upright “bare floor cleaner” for “wet and dry bare floor surfaces.”⁷

⁷ Ex. 1008, Abstract.

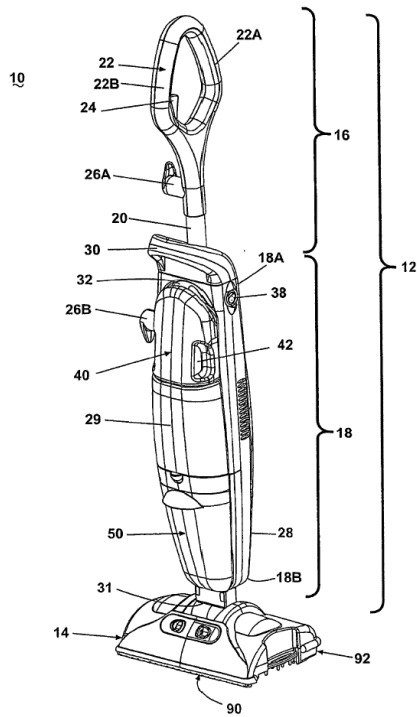


Fig. 1A

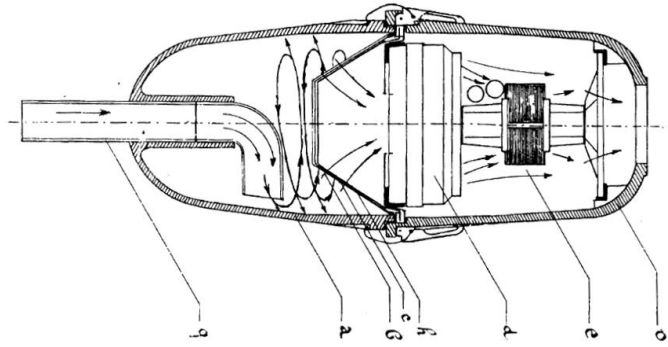
Id., Fig. 1A.

D. French Patent No. 1,094,603 (“Martelliere”) (English Translation: Exhibit 1010)

30. Martelliere is a 1955 French patent for an improvement to a “broom type vacuum cleaner model” that addresses the “recognized difficulty” of emptying dust bags by “replacing fabric [dust] bags” with a container made of “smooth and transparent material.”⁸ This transparency allows a user to see how full the dust container is to “better judge when it must be emptied” and to “even see a lost object sucked up by the device and recover it.”⁹

⁸ Ex. 1010, 1.

⁹ *Id.*



Id., 2.

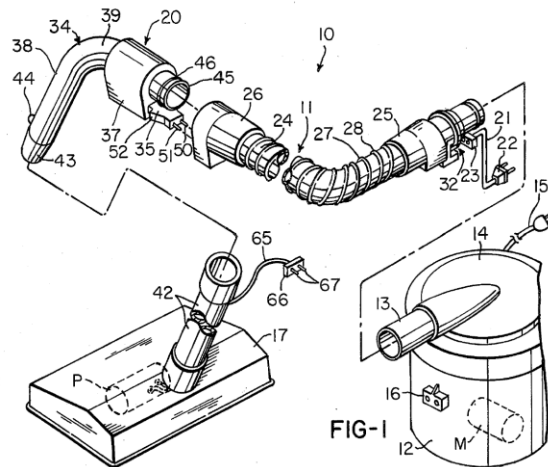
E. U.S. Patent No. 4,473,923 (“Neroni”) (Exhibit 1011)

31. Neroni is a 1984 U.S. patent for a “Vacuum Cleaning Tool Adapter with Electrical Control Means.”¹⁰ Neroni describes a “canister or tank type” of vacuum cleaner with a “hose assembly [that] is attached to the tank at one end” and attached to “a powered cleaning tool” at the other end.¹¹ Neroni describes a “female power receptacle 16 disposed on the outside surface of its tank 12” that is used to “supply electrical power through the hose assembly 11 into the adapter 20, and then to motor P of the power cleaning tool 17.”¹²

¹⁰ Ex. 1011, Title.

¹¹ *Id.*, 1:6–17.

¹² *Id.*, 3:34–49.



Id., Fig. 1.

V. LEVEL OF ORDINARY SKILL IN THE ART

32. I understand that Petitioner has proposed that a person of ordinary skill in the art would have had a Bachelor's degree in mechanical engineering, or in a similar field and 2-3 years of experience in fluid dynamics and/or machine design for devices related to fluid dynamics, such as vacuum cleaners.¹³ I understand that Dr. Giachetti has adopted this standard in his declaration.¹⁴ I also understand that the Board adopted Petitioner's definition in its institution decision.¹⁵

33. For the purposes of this declaration, I accept this proposed level of ordinary skill in the art. I meet these criteria under the Petitioner's proposed level of skill. I consider myself to be a person with at least ordinary skill in the art pertaining to the '550 Patent at the time of this declaration's drafting. In addition, I

¹³ Pet. at 11.

¹⁴ Ex. 1002, ¶ 40.

¹⁵ Instit. Dec., 8-9.

was a person of at least ordinary skill in the art at the time of invention of the '550 Patent.

VI. CLAIM CONSTRUCTION

34. For purposes of this *inter partes* review, I have considered the claim language, specification, and portions of the prosecution history, to determine the meaning of the claim language as it would have been understood by a POSITA at the time of the invention in the '550 Patent. I have applied the plain and ordinary meaning to a POSITA, in view of the specification, of each of the terms in the claims of the '550 Patent. I understand that in instituting this IPR, the Board decided that “no terms require explicit construction to resolve the issues presented by the arguments and evidence of record to reach a decision on institution.”¹⁶

VII. ANALYSIS OF THE GROUNDS

35. Based on my review and analysis of the materials cited herein, my opinions regarding the knowledge and understanding of a POSITA in the 2015 timeframe, and my training and experience, it is my opinion that a POSITA would have found the challenged claims invalid in view of the references and combinations of references discussed below. The reasons for my conclusions are explained more fully below.

¹⁶ Instit. Dec., 10.

A. Ground 1: Claims 1–28 Are Not Anticipated by Butler

36. It is my opinion that Butler fails to disclose to a POSITA each and every element of claims 1–28 of the '550 Patent.

- 1. “an electrical connector provided on the front end of the cyclone unit” [1a.3]/[20a.3], “an electrical connector provided on the front end of the air treatment chamber” [12a.3], or “an electrical connector provided on the front end of the cyclone unit at a location adjacent the hand vacuum cleaner air inlet” [28a.3]**

37. It is my opinion that Butler fails to anticipate claims 1, 12, 20, 28 and all dependent claims, at least because it does not disclose limitations [1a.3]/[20a.3]/[12a.3]/[28a.3].

38. Petitioners and Dr. Giachetti cite Butler’s disclosure that “if a powered attachment is provided, suitable power leads can be provided to connect the powered attachment to the electric circuit.”¹⁷ But this disclosure does not teach an electrical connector provided on the front end. Although power leads may include an electrical connector, power leads themselves are cables or wires.

39. But to a POSITA, a disclosure of “power leads,” without more, does not teach an electrical connector provided on the front end. Furthermore, even if one were to assume that the power leads of Butler necessarily included an electrical

¹⁷ Pet., 21; Ex. 1002, ¶ 116 (citing Ex. 1005, 22:10–11).

connector, Butler is silent as to where this “electrical connector” would be located with respect to the “dirt receptacle body” of Butler.

40. I understand that Petitioners assert that “Butler’s ‘entry tube’ includes an electrical connector provided on the front end of the cyclone separator to connect to ‘power leads’ and power Butler’s powered attachment.”¹⁸

41. I disagree. No text or figures in Butler support this naked assertion.

42. Butler discloses nothing about an electrical connector for the “powered attachments,” much less anything about this connector being included in the “entry tube” (or anywhere else on the front end of Butler’s dirt receptacle body)..

2. electrical cables extend rearwardly from the electrical connector through a central portion of the air treatment member toward the suction motor and fan assembly” [1a.3]/[12a.3]/[28a.3] or “electrical cables extend rearwardly from the electrical connector through the cyclone unit adjacent the hand vacuum cleaner inlet passage towards the suction motor and fan assembly” [20e]

43. It is my opinion that Butler fails to anticipate claims 1, 12, 20, 28 and all dependent claims, at least because it does not disclose limitations [1a.3]/[20e]/[12a.3]/[28a.3].

44. As explained above, a POSITA would find Butler’s disclosure with respect to providing electrical power to attachments is extremely thin and limited to two sentences: “[I]f a powered attachment is provided, suitable power leads can be

¹⁸ Pet., 22; Ex. 1002 ¶ 117.

provided to connect the powered attachment to the electric circuit. These leads may pass around or through the dirt receptacle, or may be integrated into the dirt receptacle body.” A POSITA would even find “integrating into the dirt receptacle body” to be challenging, because the “dirt receptacle body 522” surrounds air inlet/entry tube 524. No further explanation is found regarding the leads.

45. This scant disclosure relied on by Petitioners fails to teach the novel configuration of electrical cables required by the Challenged Claims. Notably, Butler does not disclose the claimed origin of the electrical cables (from the “electrical connector”); it does not disclose the claimed direction of the cables’ extension (“rearwardly . . . toward the suction motor and fan assembly”); and it does not disclose in any way how or where the cables pass through Butler’s dirt receptacle (such as “through a central portion of the air treatment member” for claims 1, 12, and 28 or “through the cyclone unit adjacent the hand vacuum cleaner inlet passage” for claim 20).

46. Petitioners and Dr. Giachetti claim that “Butler teaches the electrical cables extend rearwardly from the electrical connector through a central portion of the cyclone unit toward the suction motor and fan assembly,”¹⁹ but they cited no support from Butler. Petitioners annotated Figure 5 of Butler in an attempt to

¹⁹ Pet., 22–24.

demonstrate the claimed “electrical cables.”²⁰ I disagree. Again, nothing in Butler’s Figure 5 or accompanying text identifies the power leads or any electrical cable. The annotations are Dr. Giachetti and Petitioners’ own artistic additions and renderings, not a POSITA’s understanding of Butler’s disclosure.

47. Petitioners argue that because the power leads of Butler “may pass . . . through the dirt receptacle” of Butler, they must “extend rearwardly through a central portion of the cyclone separator toward the fan/motor assembly.” Pet., 23. I disagree. Butler discloses nothing about how or where the cables may pass through the dirt receptacle. For example, Butler’s disclosure that “leads may pass . . . through the dirt receptacle” could mean that the leads only pass through a corner, which is not “through a central portion” under any reasonable construction. Thus, whether the “central portion” refers to the center from left-to-right, radially central, or some other center, Butler fails to disclose electrical cables extending “through” such portion. A POSITA having read Butler, especially in view of the filters shown in Figures 2c and 2d would have understood that if leads were to pass through the “central portion” in any orientation, the leads would pass through filters as well, and this would pose obstacles not only to the air flow path but also pose obstacles to cleaning of the dirt filter themselves. A POSITA reading Butler would therefore be advised against passing the leads through the dirt receptacle or cyclone separator.

²⁰ See Pet., 22.

3. Butler does not anticipate Challenged Dependent Claims 2–11, 13–19, and 21–27

48. It is my opinion that Butler fails to anticipate independent claims 1, 12, 20, and 28 of the '550 Patent, Butler necessarily fails to anticipate dependent claims 2–11, 13–19, and 21–27, which depend on independent claims 1, 12, and 20, respectively.

B. Ground 2: Claims 1–28 Are Not Rendered Obvious by Butler

49. It is my opinion that Butler fails to teach to a POSITA each and every element of claims 1–28 of the '550 Patent.

- 1. “an electrical connector provided on the front end of the cyclone unit” [1a.3]/[20a.3], “an electrical connector provided on the front end of the air treatment chamber” [12a.3], or “an electrical connector provided on the front end of the cyclone unit at a location adjacent the hand vacuum cleaner air inlet” [28a.3]**

50. As discussed above, Butler not only fails to disclose any electrical connector for “powered attachments,” but it also provides no teachings regarding where the nondisclosed electrical connector may be located. It is my opinion that Butler fails to render obvious claims 1, 12, 20, 28 and all dependent claims, at least because it does not teach limitations [1a.3]/[20a.3]/[12a.3]/[28a.3].

51. Petitioners and Dr. Giachetti cite to no objective evidence (other than a parroting a conclusory declaration) in support of their assertion that not only using a connector to power the tools would be obvious to a POSITA, but so too would placing the connector exactly where the claims require the connector to be.

52. Petitioners assume that the claimed solution of the '550 Patent would be the only way to position an electrical connector in Butler. I disagree. This argument ignores feasible alternatives to a connector on the front wall, such as running an electrical cable to a top wall, bottom wall, or sidewall.

2. **electrical cables extend rearwardly from the electrical connector through a central portion of the air treatment member toward the suction motor and fan assembly” [1a.3]/[12a.3]/[28a.3] or “electrical cables extend rearwardly from the electrical connector through the cyclone unit adjacent the hand vacuum cleaner inlet passage towards the suction motor and fan assembly” [20e]**

53. It is my opinion that Butler fails to render obvious claims 1, 12, 20, 28 and all dependent claims, at least because it does not teach limitations [1a.3]/[20e]/[12a.3]/[28a.3].

54. I understand that Petitioners and Dr. Giachetti argue that there are exactly two solutions to implementing Butler’s teaching of power leads extending “through the dirt receptable” and each is obvious to try—one following the '550 Patent’s teaching (extending through a central portion of the cyclone unit) and one not following the '550 Patent’s teaching (not extending through a central portion of the cyclone unit).²¹ I disagree. By this logic all claimed limitations are obvious to try, because for any technical challenge, there are two solutions, namely, one

²¹ See Pet. 66; Ex. 1002, ¶ 271.

following a challenged claim's teaching and one not following the challenged claim's teaching. This leads to a ridiculous conclusion.

55. Butler does not identify any specific choices as to how to wire the “power leads” of Butler, other than stating at a high level that they “may pass around or through the dirt receptacle, or may be integrated into the dirt receptacle body.”²² Contrary to Petitioners’ arguments, there are numerous ways for wires to “pass . . . through” a receptacle, e.g., cutting through a corner near the front wall, transversely cutting through a diameter, cutting through a corner near the rear wall, hugging a wall along the perimeter, etc.

56. Petitioners argue that it would have been obvious to have “the electrical cables extend through the cyclone’s entire radial center”—i.e., for the cables to be exposed and in the airflow of the cyclone—because this is “where there is the least airflow” and it is “the shortest distance through the cyclone unit.”²³ But neither Petitioners nor Dr. Giachetti provide any examples of vacuum cleaners with unprotected and unsupported electrical cables running down the center of a cyclone, where sharp debris could damage and even cut the cables. Moreover, in that placement in Butler, hair, carpet fibers and other stringy debris would wrap around

²² Ex. 1005, 22:10–13.

²³ Pet., 67; Ex. 1002, ¶¶ 272-73.

the cable. To remove it, a user would have to cut or pull it away from the electrical cable, leading to a risk of damaging or removing the electrical cable entirely.

3. Butler does not render obvious Challenged Dependent Claims 2–11, 13–19, and 21–27

57. It is my opinion that Butler fails to render obvious independent claims 1, 12, 20, and 28 of the '550 Patent, Butler necessarily fails to render obvious dependent claims 2–11, 13–19, and 21–27, which depend on independent claims 1, 12, and 20, respectively.

C. Ground 3: Claims 1–28 Are Not Rendered Obvious by Peter In View Of Neroni

58. It is my opinion that Peter In View Of Neroni fails to teach to a POSITA each and every element of claims 1–28 of the '550 Patent.

1. “a cyclone unit” [1a.2],[20a.2],[28a.2]

59. It is my opinion that Peter in view of Neroni fails to render obvious claims 1, 20, 28 and all their dependent claims, at least because it does not teach limitations [1a.2]/[20a.23]/[28a.2]. Petitioners did not explain what shape, configuration or location the cyclone would take within the proposed Peter/Neroni combination. Petitioners did not indicate where that cyclone would be placed such that it would then be clear whether its later proposed modification to place the electrical cables through the cyclone would even be possible, nor did Petitioners provide any figures or drawings to show how the cyclone should be placed within the Peter system.

60. Neither Peter nor Neroni discloses or suggests a cyclone. Peter discloses a filter separation system with a “dustbag or filter” labeled 17.²⁴ Neroni is completely silent with respect to the type of the separation system employed. Petitioners and Dr. Giachetti claimed that “lateral outlet opening 14” makes Peter a cyclonic system.²⁵ This is not how a POSITA would have understood Peter. Nowhere in Peter is the idea that this outlet opening somehow creates the primary and secondary vortex swirl of cyclonic separation. Further, as a POSITA would have understood, a cyclonic separator would at least need a concentrated tangential airflow with reasonable radial speed so as to separate the dust which has a higher specific density than air against a sidewall. The lateral outlet opening 14 as disclosed in Peter lacks a device that sends airflow with any radial speed, because this is a lateral opening that blows air at a generally perpendicular direction at the sidewall. In contrast, the ’550 Patent with respect to Fig. 96, for example, explicitly teaches that “[i]nlet passage 384 may redirect the axial flow through inlet 192 to a tangential flow for developing a cyclonic motion inside cyclone chamber 184.” Further, the annotations of fluid motion in Fig. 1 clearly show to a POSITA that Peter never envisioned cyclonic separation, as the Figure reveals an air flow that is directly upwards through filter 17 and out path. Nothing in Peter suggests that the opening

²⁴ Ex1007, 2.

²⁵ Pet., 78; Ex. 1002, ¶¶ 306-307.

14 creates a cyclone. Furthermore, opening 14 is located in the bottom of casing 3 and would blow on any sequestered debris and keep it from settling but rather encourage mixing – a poor design for a cyclonic separator. Further, as discussed below in more detail in Section D, Peter does not leave much space between the casing and filter 17. Forcing a cyclone cannot lead to efficient separation.

61. Petitioners claimed that, regardless of the absence of cyclone in the cited references, it would have been obvious for a skilled artisan to simply add a cyclone unit.²⁶ I disagree. Even assuming that cyclonic separators were known, a POSITA would have known and weighed the pros and cons of replacing a non-cyclonic separator with a cyclonic one and would not simply replace all separators with cyclonic separators. For example, the overall weight of a cyclonic separator may be heavier than a filter-based separator, making it less desirable for handheld or stick vacuums. For another example, a POSITA would have known that filtration-based separators perform effectively and competitively compared with alternate separation methods, including cyclones.²⁷ Furthermore, a POSITA would have understood that a cyclone’s effectiveness decreases if the diameter of the cyclone

²⁶ Pet. 78-79; Ex. 1002 ¶308.

²⁷ See *e.g.*, Ex. 2002 at 575, 578, 579, 583 (“In vacuum technology testing, filter-base separators performed more favorably than cyclonic separators in the areas of pressure drop, efficiency, and particle reentrainment.”).

decreases, and therefore a slimmer and smaller-sized handheld system such as Peter's disclosed embodiment may not fit an effective cyclone separator.²⁸

2. The Peter and Neroni combination does not render obvious limitations [1a.3], [12a.3], [20a.3, 20e], or [28a.3] regarding the “electrical connector” and “electrical cables”

62. It is my opinion that Peter in View of Neroni fails to render obvious claims 1, 12, 20, 28 and all dependent claims, at least because it does not teach limitations [1a.3]/[20a.3, 20e]/[12a.3]/[28a.3].

63. All Challenged Claims require (1) an electrical connector provided at the front end of the cyclone unit or air treatment member, and (2) that electrical cables extend rearwardly from the connector through a central portion of the cyclone unit or air treatment member (for claims 1, 12, and 28) or through the cyclone unit adjacent the hand vacuum cleaner inlet passage (for claim 20)

64. Petitioners claimed that powered cleaning tools are known and useful.²⁹ Even assuming that this is true, a POSITA would have understood that powered and electrified tools have both pros and cons. A POSITA would also be aware of the drawbacks of using powered cleaning attachments, and would further be aware of the benefits of unpowered cleaning attachments, and therefore, would not be

²⁸ See *e.g.*, Ex. 2003 at 234–235 (“Enlarging the cyclone diameter D also increases the efficiency”); Ex. 2004 at 1007–1008 (“[T]he particle collection efficiency for a cyclone having a larger body diameter is higher than that for a smaller cyclone.”).

²⁹ Pet., 71-73.

motivated solely by the benefits of including powered cleaning attachments. As an example, unpowered cleaning attachments are simpler designs having fewer parts and without potential electrical device issues.

65. Moreover, powering powered attachments draw additional power, which is of particular concern for battery-powered vacuum cleaners. A POSITA would know adding an electrically powered attachment to a vacuum cleaner with a battery pack would decrease the amount of time a user could use a battery-powered vacuum without needing to recharge the battery. A POSITA would also be aware that runtime is an important factor to take into consideration when designing a cordless vacuum.

66. Lastly, a POSITA would also know that attachments, such as a “powerhead having a rotating agitator” of Butler, could be implemented without the use of electrically powering the attachment. For example, pneumatics and the use of the suction power of the vacuum itself can be used to enable brush rolls and “rotating agitators” to spin. Alternatively, a dedicated battery and brush motor could be implemented without the use of using power from the vacuum body. Moreover, an agitator can be spun simply through a user’s own movement of the attachment, such as in a carpet sweeper. The benefits of using the foregoing methods as opposed to electrically powering an attachment using the battery pack of the hand vacuum include increased runtime (for a cordless vacuum cleaner), as power is not drawn

from the battery pack of the hand vacuum to power the attachment. Moreover, a POSITA would understand that it would be easier to implement the foregoing methods, rather than developing a powered attachment, that requires the use of electrical connectors and cables to deliver power to the attachment from the battery pack of a hand vacuum, which would also need to be designed into the vacuum. Petitioners failed to cite to any evidence that a skilled artisan would find the pros of including a powered tool in the handheld system of Peter would outweigh the cons and costs of doing so; instead, Petitioners simply ignored the drawbacks and costs of including powered tools in a handheld system without justification or documentation.

67. Neroni discloses a “female power receptacle 16” on the outer surface of the canister, which supplies power to the cleaning tool through the flexible hose assembly.³⁰ The hose assembly has a power cord with a male fitting that plugs into female power receptacle 16.³¹ The canister also has a cord assembly 15 to plug into a suitable power source (*e.g.*, a wall).³² Figure 4 is a wiring diagram, which shows that power receptacle 16 is connected to the motor, but this does not disclose how the electrical cables themselves are configured with respect to the canister.³³

³⁰ Ex. 1011, 3:34–49.

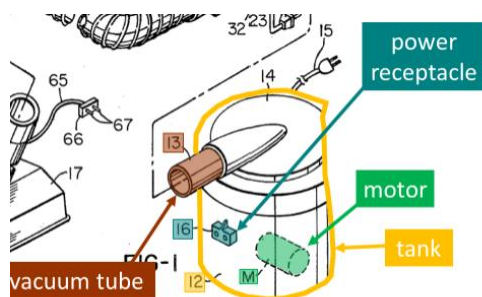
³¹ *Id.*

³² *Id.*, 3:25–29.

³³ *Id.*, Fig. 4.

Notably, Neroni does not say (or even suggest) that an electrical cable runs from power receptacle 16 “through a central portion of the cyclone unit” to the motor. If anything, Neroni would be designed so any power cable run around (not “through”) the air separation in Neroni to get to the motor. In fact, a POSITA having read Neroni would understand that Neroni is mostly about the connector and its safe design and the clever three-way power control switch circuit, not about placement or central location of wiring.

68. First of all, Neroni only discloses that “a female power receptable 16 [is] disposed on the outside surface of its tank 12” but does not further describe where the receptable 16 is preferably located. Nothing in Neroni describes that the receptable is to be located at the “front” end of anything. Further, when transposing the receptacle from Neroni to Peter, Petitioners and their expert only nakedly claim that a skilled artisan would put the receptacle at the front end, exactly as guided by the claims, without citing to any teachings from any references.³⁴

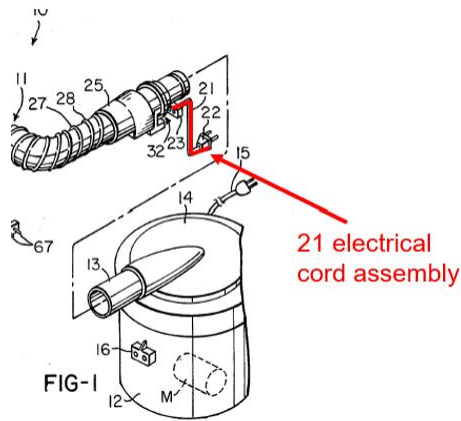


³⁴ Pet., 83-84; Ex. 1002 ¶321.

Ex. 1011, Fig. 1 (annotated by Petitioners, excerpted, to show the receptacle in teal). This is not how a POSITA having read Peter and Neroni would have considered. I disagree.

69. As Neroni discloses, the receptacle 16 is not immediately adjacent to the tube 13, but rather spaced at a distance of an “electrical cord assembly 21” of a certain length which connects between a female fitting 23, which is adapted to be connected to the hose assembly 11 and immediately adjacent to the tube, and a male fitting 22 which is to be connected with receptacle 16.³⁵ A POSITA would know that such an arrangement, as described by Neroni, of an electrical receptacle 16 with fitting 22 somewhere on the body of the vacuum cleaner and an electrical cord assembly 21 with its mating fitting 23 dangling from an accessory or flexible or rigid hose assembly 11 is not an uncommon design for vacuum cleaners of the day. As one example, I own an Electrolux Epic 3500SR upright vacuum cleaner, sold between 1991 and 2000, having this similar arrangement taught by Neroni, and the simplicity of the design works fine. The equivalent connector 16 is found on the back of the upright assembly well separated from its dirty air inlet. The Epic has a very capable upholstery brush accessory attached to a hose assembly and is powered by its own motor.

³⁵ Ex. 1011, 3:42-49.



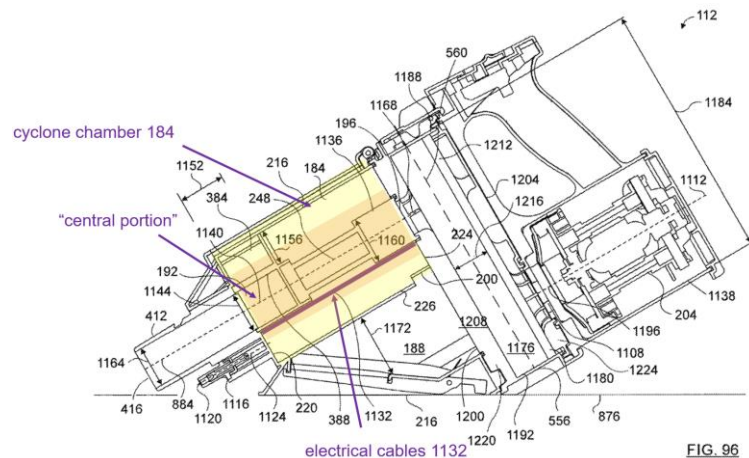
Ex. 1011, Fig. 1 (annotated and excerpted to show the electrical cord assembly length in red).

70. As such, a POSITA would have understood that if the receptacle were supposed to be transposed to Peter, an analogous location would be similarly a location on the sidewall at a certain distance (approximately the length of the electrical cord assembly's length) from the tube connection, as indicated above.

71. Contrary to Petitioners and their expert's assertion, a POSITA would not have put the receptacle 16 where Petitioners propose and would have understood that putting the receptacle right next to the intake nozzle of Peter would lead to the intake nozzle interfering with the manual plug and unplug of the male fitting 22 into the receptacle 16.

72. Claims 1, 20, and 28 all require that electrical cables extend rearwardly from the connector through a central portion of the cyclone unit or air treatment member. The Specification of the '550 discloses, for example, with respect to Fig.

96, “one or more electrical cables 1132 . . . extend from electrical connector 1116 along vortex finder 1136 of cyclone chamber 184 toward motor housing 1138”—*i.e.*, through a “central portion” of the cyclone unit.³⁶ This configuration is illustrated below in an annotated version of Figure 96 of the ’550 Patent.



Id., Fig. 96 (annotated).

73. Nothing in Neroni or Peter discloses or suggests that the cables extend rearwardly from the connector. Moreover, nothing in Neroni or Peter discloses or suggests that the cables extend rearwardly through a central portion of the cyclone unit (there is no cyclone to begin with) or air treatment member.

74. First of all, Neroni in either text or figures discloses nothing regarding how the relay wire “R” between the receptacle 16 and motor is wired. Petitioners and their expert improperly took the reference’s absolute silence as free canvas to draw their own fiction based on the claim’s language.

³⁶ Ex. 1001, 34:39–58.

75. To a POSITA, extending wires centrally through an air treatment member or specifically a cyclone unit raises the risk of the wires interfering with air treatment and also increasing the risk of air and sharp debris damaging the wires, reducing the longevity. Petitioners identified zero references suggesting or contemplating extending wires through an air treatment member prior to the '550 Patent's disclosure of extending wires through a central portion of the cyclone chamber. Yet, guided by the very claims they seek to invalidate, Petitioners and their expert nakedly assert that electrical cables according to Neroni "extend rearwardly" "through a central portion of the separation unit, including a radially central portion shown above, and a central portion from top to bottom."³⁷ Again, Petitioners cited to no evidence either in Neroni or elsewhere suggesting that the cables should go through a central portion of a cyclone unit or an air treatment member. This is incorrect. Instead, a POSITA having read Neroni would have understood that the cables are wired around the air treatment chamber, beneath the sidewall or partially along the top wall or bottom wall.

76. Alternatively, Petitioners and their expert claimed that it would have been obvious to have "cord assembly 15 extend rearwardly through a central portion (centered both front-to-back and top-to-bottom) of the 'tank.'"³⁸ This is again

³⁷ Pet., 85-86; Ex. 1002, ¶325.

³⁸ Pet. 86; Ex. 1002, ¶326.

incorrect. First of all, a POSITA having read Neroni would understand that the cord assembly 15 connects a power outlet to the canister tank and is not the cables extending from the receptacle; and the cables extending between receptacle 16 and the motor is “relay R.”³⁹ Nothing is disclosed or suggested about the location of relay R.

77. It is therefore abundantly clear that Petitioners’ analysis with respect to the electrical connector and electrical cables elements are guided by hindsight, reading teachings from Neroni where none exist.

78. Just because this is the most “direct” or shortest route between the power receptacle and the motor does not mean a POSITA would have tried it. Neither Petitioners’ nor their expert provide *any* evidence of vacuum cleaners with electrical cables running through the middle of an air separation unit in a canister vacuum, where sharp debris could damage and even cut the cables and where the presence of wires may make cleaning or debris removal complicated. To the contrary, as explained above, the only logical solution would be to run electrical cables around and not “through” a central portion of the air separation.

79. Furthermore, even if Neroni taught or suggested an electrical cable through the middle of the air treatment member in a canister vacuum (it does not), Petitioners are further deficient on explaining why a POSITA would have been

³⁹ Ex. 1011, 3:25-29, 6:42-45.

motivated to apply that teaching to Peter's stick vacuum. As discussed above, Petitioners claimed that a "POSA would've been motivated to implement Neroni's 'power receptacle 16' on the front end of Peter's cyclone unit."⁴⁰ Peter does not make mention at all of using powered tools, and yet Petitioners provide conclusory statements about how a POSITA would have been motivated to implement Neroni's power receptacle in Peter.

80. Petitioners and Dr. Giachetti claimed that "it would have been obvious to extend the electrical cables rearwardly through Peter's 'connecting piece 12.'"⁴¹ But Peter provides no suggestion or indication to a POSITA that wires may run through the connecting piece 12. A POSITA having read Peter would have understood that the connecting piece 12 is a mechanical part that helps holding the filter 17 in place. No text or figure from Peter suggests that it can act as a guiderail for wires. Petitioners and Dr. Giachetti did not discuss *why* A POSITA without the hindsight instruction from the '550 Patent, would have made the extension as proposed.

3. The Peter and Neroni combination does not render obvious Challenged Dependent Claims 2–11, 13–19, and 21–27

81. It is my opinion that Peter in view of Neroni fails to render obvious independent claims 1, 12, 20, and 28 of the '550 Patent, Butler necessarily fails to

⁴⁰ Pet., 83.

⁴¹ Pet. 87; Ex. 1002, ¶328.

render obvious dependent claims 2–11, 13–19, and 21–27, which depend on independent claims 1, 12, and 20, respectively.

82. More specifically, with respect to Claim 10, Petitioners point to the lateral outlet opening 14 of Peter for the claimed “tangential air inlet.”⁴² As discussed above, this lateral opening sends air perpendicular to the sidewall and does not set the tangential air flow path for an effective cyclonic separator.

D. Ground 4: Peter, Neroni, Martelliere, and/or Jansen Combination Does Not Render Obvious Challenged Claims 1–28

83. It is my opinion that Peter, Neroni, Martelliere, and/or Jansen fails to teach to a POSITA each and every element of claims 1–28 of the ’550 Patent.

84. I understand that Petitioners did not address any elements or claims other than elements [1a.1]/[28a.1], [1a.2]/[12a.2]/[20a.2]/ [28a.2], and [9]. I understand that this is deficient.

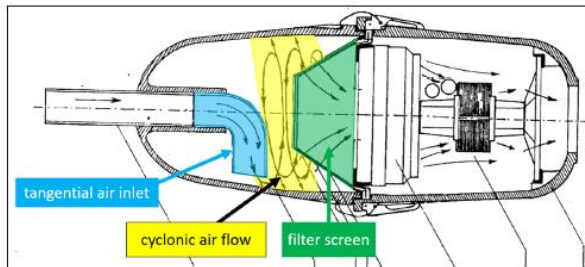
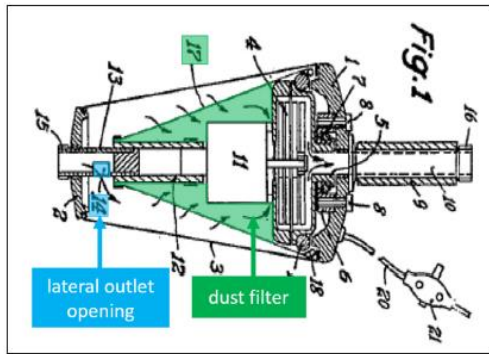
85. Assuming that that Petitioners meant to alternatively further include Martelliere in all analyses of Ground 3 above (which Petitioners failed to make the argument of), it is my opinion that this proposed further inclusion of Martelliere is driven by hindsight and produces an inoperable, self-conflicting device.

⁴² Pet., 105-106; Ex. 1002, ¶¶413-14.

86. I understand that Petitioners propose to add the tangential air inlet according to Martelliere into Peter.⁴³ However, as clearly shown by Petitioners' own annotations, the added tangential air inlet would spatially occupy the same space and conflict with the connecting piece 12 of Peter. A POSITA would understand that Peter's narrow casing is not designed for (and does not have enough space) the inclusion of a cyclonic separator.

87. As discussed above, Petitioners proposed that the cables should run along with connecting piece 12 in the combination system of Peter and Neroni. And here, for Ground 4, Petitioners proposed adding a spatially conflicting piece of component (tangential air inlet according to Martelliere) without explaining how the further combined system should look like or should operate.

⁴³ Pet. 114-115; Ex. 1002, ¶451.



Ex. 1007, Fig. 1 and Ex. 1010, Fig. 1 (both annotated by Petitioners)

88. If the connecting piece 12 were to be removed, then at least a portion of the cables would be dangling naked in the cyclone chamber, risking being cut by air and debris.

89. If the tangential air inlet were to be made narrower or smaller to make space for the connecting piece 12, and if the tangential air inlet were to be made at the front end of the separation chamber, such as taught in Peter, a POSITA would have seen the issue that adding a tangential air inlet blowing tangential air right in the region meant for dirt collection in the Peter system would blow dust and unsettle the already collected dust. Further, because Peter does not leave much space between the casing and filter 17, in this arrangement, the tangential air flow would be constricted, significantly reducing the efficiency of the vacuum.

90. Either way, Petitioners proposed an inoperable device and failed to show that the proposed modification is a simple alteration that does not require extraordinary creativity.

VIII. RESERVATION OF RIGHTS

91. My opinions are based upon the information that I have considered to date. I am unaware of any evidence of secondary considerations with respect to the '550 Patent that would render any of the challenged claims non-obvious. I reserve the right, however, to supplement my opinions in the future to respond to any arguments raised by the Petitioners and to take into account new information that becomes available to me.

I, Richard S. Figliola, declare 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 and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that willful false statements and the like so made could jeopardize the validity of the patent at issue in this proceeding.

Executed on December 11, 2024, in Central, (Pickens County), South Carolina USA.

By:



Richard S. Figliola, PhD, PE.

APPENDIX A: CURRICULUM VITAE

[INSERT]

Richard S. Figliola, PhD, PE

582 Browning Road, Central, SC 29630

Alumni Distinguished Professor Emeritus and Research Professor of Mechanical Engineering

Clemson University, Clemson, South Carolina 29634-0921

Technical Consultant and Founder, Upstate Aerodynamics, Inc, Central, SC

Phone: (864) 650-3247; fgliola@clemson.edu

Expertise

Expert in experimental and engineering test methods and engineering system modeling in fields of fluid mechanics, energy systems, gas – particle transport, and interpreting test codes, standards, and patents. I have broad experience in applications of product and device performance, process measurements, test design and interpreting test results. I have more than 40 years of experience in engineering education and administration.

Education

University of Notre Dame	Aerospace Engineering	B.S. 1974
University of Notre Dame	Mechanical Engineering	M.S. 1976
University of Notre Dame	(emphasis: Fluid Mechanics/Heat Transfer)	Ph.D. 1979

Professional Experience

Clemson University, Clemson, South Carolina (January 2022 – ff). Alumni Distinguished Professor Emeritus of Mechanical Engineering. Part-time duties include leading externally sponsored research projects.

UAI - Upstate Aerodynamics, Inc., Central, South Carolina. Founder/President/Consultant (1996 - ff). Technical consulting company focused on advanced and unique expert services to industry and private enterprises in the areas of energy, fluid flow and flow devices, and engineering test development and interpretation. Product realization assistance. Patent litigation and expert testimony. Experienced in providing technical reports.

Former positions:

Clemson University, Clemson, South Carolina (August 1980 – December 2021). Alumni Distinguished Professor of Mechanical Engineering. Also, Director, Graduate Educational Programs – Charleston, SC (CURI) campus (2018 -2021). Site Manager – CURI, Charleston, SC (2019 – 2021). Department Chair, Department of Mechanical Engineering (May 1995 – July 2002; May 2016 – August 2018). Broad management and academic duties in research, education and professional service.

von Karman Institute for Fluid Dynamics, Rhode-Saint Genese, Belgium. NATO Fellow (June 1979 - August 1980). Research activity in areas of gas-particle fluid transport (specifically, pneumatic conveying), natural convection, and test measurements.

Pratt and Whitney Aircraft Co., Wilgoose Experimental Gas Turbine Laboratory, East Hartford, CT. Assistant Test Engineer (1973, 1974). Engineer on jet engine testing programs and test data analysis.

Short-Term Professional Development Experience

Air Force Research Laboratory, Dayton, OH. Air Vehicles Directorate. Short-term Research Program participant. (Short-term stays 2003 – 2011, 2018). Consultant in aerodynamics, uncertainty, and energy transport. Consultant in exergy methods for aircraft design and conceptual design of hypersonic vehicles.

DoE Ames Laboratory, Ames, IA. Visiting Scientist. Faculty Laboratory Program, Institute for Physical Research (Short-term stays 1995 and 2000). Collaborator in areas of atomization and measurement techniques.

Professional Engineering Registration and Activity

State of South Carolina, PE 10536 (License Current). Active consultant to industry.

Significant Awards

National:

Elected Fellow, American Society of Mechanical Engineers (Fellow, 2006; Life Fellow, 2018)

Local:

Class of 1939 Award for Faculty Excellence – Clemson University's highest faculty award (2011)

University Centennial Professor (Clemson University, 2015-17) – Unique recognition for outstanding performance

Alumni Distinguished Professor (Clemson University, 2015) – Named professorship

David A. Brown Endowed Faculty Scholar (Clemson University, 2014- 2020)

Patents and Applications Pending

Anderson I., R. Figliola and H. Morton-Molnar, "An Improved Atomization Nozzle", U.S. 5,125,574 (1992),

Anderson, Iver E, Figliola, Richard S, Morton –Molnar, Holly, "A Melt Atomizing Nozzle And Process," EP 0504382 (A1) (1992); WO 1992/005903 (1992); CA 2068421 (1992)

Anderson I., R. Figliola and H. Morton-Molnar, "Improved Atomizing Nozzle and Process-Continuation," U.S. 5,228,620 (1993).

Anderson I., R. Figliola and R. Terpstra, "In-Situ Control Systems for Gas Atomization Nozzles", U.S. 5,423,520 (1995).

Bishop E., G. Failla, R. Figliola, J. Liburdy, "Method and Apparatus for Cooling a Heat Source ", U.S. 5,576,932 (1996).

McQuinn T., R. Figliola, D. Beasley, , "Artificial Heart Valve," Provisional U.S. application 20060271171 (patent pending).

University Courses Taught (Full list available on request)

I have taught twelve (12) different engineering courses at the undergraduate and graduate University levels covering areas of measurements and instrumentation (including statistics and standards), undergraduate and graduate fluid mechanics, heat transfer and thermal sciences, vehicle aerodynamics, systems modeling, and engineering design.

Books, Chapters and Media (16 articles in print or media; example given below)

Figliola, R.S., and D.E. Beasley, *Theory and Design for Mechanical Measurements – 7th edition*, Wiley, 2019. Prior editions: 1991, 1995, 2000, 2005, 2011., 2014. Translated into several non-english editions. This textbook has been the world market leader on this subject for the past twenty years. An 8th edition is in preparation.

Dieck, R. (Chair), W. Steele, **R. Figliola**, H. Coleman, et al. *Test Uncertainty – ANSI/ASME PTC 19.1.2019*, Revision of PTC 19.1.2005 and 2013, ASME, New York, 2019. Standards/codes committee writes and maintains the international test standard requirements for reporting the quality of engineering test results.

Sample of Archival Research Publications: (more than 90 refereed journal and refereed technical publications, full listing available on request, **examples over a career chosen below to show breadth**)

Publication history covers a wide range of fluid mechanics and heat transfer topics including fluid motion, bio-fluid mechanics, energy and flow transport, heat exchangers, manufacturing processes, atomization processes, measuring instruments, aerodynamics, and vehicle dynamics. Publications appear in outstanding and prestigious journals and relevant engineering society proceedings or published edited volumes.

Rodefeld M, Neary M, **Figliola RS**, Conover T, Giridharan G, Ivashenko A, Bennett, E. Autonomous Fontan pump: a computational feasibility study. *JTCVS Open*, 2024. <https://doi.org/10.1016/j.xjon.2024.07.003>

Yang W, Conover TA, **Figliola RS**, Giridharan GA, Marsden AL, Rodefeld MD, Passive performance evaluation and validation of a viscous impeller pump for subpulmonary fontan circulatory support. *Nature: Scientific Reports*, 2023;13:12668.

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Hsia TY, Conover T, **Figliola RS**. Computational Modeling to Support Surgical Decision Making in Single Ventricle Physiology. *Seminars in Thoracic and Cardiovascular Surgery*. 2020;23:2-10.

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Conover T, Hlavacek A, Migliavacca F, Kung E, Dorfman A, **Figliola RS** (senior technical author), Hsia TY (senior clinical author) for the MOCHA Investigators. An Interactive Simulation Tool for Patient-Specific Clinical Decision Support in Single Ventricle Physiology. *J Thorac Cardiovasc Surg.*, 2018;155 (2):712–721.

Hsia TY and **Figliola RS**. Multiscale Modeling of Single Ventricle Hearts for Clinical Decision Support. *Eur J Cardio Thor Surg*, 2016;49(2):365-368. Invited Editorial.

Grier B, Alyanak E, Camberos J, White M, **Figliola RS**, Numerical integration techniques for discontinuous manufactured solutions, *J Comp Physics*, 2014;278:193–203.

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Figliola, R.S., and M. Swaminathan, "The Effects of Non-perfect Boundary Conditions on the Steady Response of a Local Heat Flux Probe", *Measurement Science and Technology*, 7, 1996.

Figliola, R.S., and P. Thomas, "An Approximate Method for Estimating Laminar Heat Transfer in a Channel Having Discrete Heat Sources", *Trans. ASME Journal of Electronic Packaging*, 117, 1995.

Beasley, D. and **R.S. Figliola**, "Generalized Analysis of a Local, Isothermal Heat Flux Probe", *Journal of Physics, E: Scientific Instruments*, 21, 1988. (Paper received recognition for Best Paper, ASEE Southeastern Division)

Scott, D., R. Anderson and R.S. Figliola, "Blockage of Natural Convection Boundary Layer Flows in Multizone Enclosures", *International Journal of Heat and Fluid Flow*, 9, 2, 1988.

Figliola, R.S., "Convection Transitions Within a Vertical Cylinder Heated from Below", *The Physics of Fluids*, 29, 7, 1986.

Examples of Edited Volumes (with Focus on Heat Transfer and Buoyancy Induced Motion)

Natural Convection in Enclosures - 1992, ASME Symposium Volume, Edited by P.G. Simpkins and R.S. Figliola, HTD-198, New York, 1992.

Convection Heat Transfer and Transport Processes, ASME Symposium volume, edited by R.S. Figliola, M. Kaviany and M.A. Ebadian, HTD, New York, 1989.

Natural Convection in Enclosures - 1988, ASME Symposium Volume, edited by R.S. Figliola and P.G. Simpkins, HTD-99, New York, 1988.

Convective Transport, ASME Symposium Volume, edited by Y. Jaluria, R.S. Figliola, M. Kaviany, HTD-82, New York, 1987.

Natural Convection in Enclosures - 1986, ASME Symposium Volume, edited by R.S. Figliola and I. Catton, HTD-63, New York, 1986.

Professional Activity, Membership Level, and Significant Professional Service

American Society of Mechanical Engineers (ASME), Membership Grade: Life Fellow

ASME Codes and Standards Committee on Test Uncertainty PTC 19.1 (elected 2000 - present).

Heat Transfer Division National Technical Committee Activities:

Environmental Heat Transfer Committee, K-19, (1983 - present), Member

Heat Transfer Education Committee, K-21 (1995 - present). Founding member.

General Technical Papers Committee (1986 - 90), Chair (1988 - 90)

Committee on Honors and Recognition (1989 - 93) Founding member

Membership Development Committee (1990 - 93), Chair (1992 - 93)

Committee on Heat Flux Measurements/Standards (1995 - 2009) Founding member

ASME Fellows Review Committee (elected terms 2007 – 2012) Society-wide review of nominations.

ASHRAE, Member

ASHRAE Student Chapter advisor, Clemson University (2013 – present)

Professional development and continuing education: to date over 3900 practicing engineers have taken my various workshops as refresher courses, professional licensing preparation, or continuing education credit, particularly in the topics of *Applied Thermodynamics*, *Applied Fluid Mechanics*, *Engineering Measurements*, and *design themes*.

Organized at least 33 technical sessions, symposia, and panels at national/international engineering conferences.

Sponsored Research Activities

Principal or Co-principal Investigator on a long list of projects valued at over \$26M including over \$6M in personally attributed expenditures in areas of general fluid mechanics and thermal processes, flow devices, biofluid mechanics, and aerodynamics. I have directed more than 40 theses and dissertations over my career. Currently (2024), I fund and supervise a research (PhD-level) engineer and students.

Industrial Consulting Experience

Consultant to regional industry in area of fluid mechanics and flow devices, thermal transport processes, application of measurement techniques and test standards, product test development for performance and design assessment, analysis of engineering tests with uncertainty analyses. Client/project list available on request.

Successful and significant product realization and assessment services offered have included (selected examples): mass flowmeter (Neptune/RedSeal Measurements); optical fiber manufacture cooling process (Seibel Corning);

thermal barrier and cooling vent design (Thomas-Built Buses, NC); medical patient mattress support surface (Span America Medical Systems, SC); high efficiency vacuum cleaner design and testing and test analysis (Electrolux, Ryobi); modeling, testing, and defining best practices for handling of thermally active biosolid products (Synagro, Mulberry, FL).

Legal Matters Involvements

Expert Legal Services (Federal Format: Past 5 years)

No trial appearances as an expert over the past five years.

Legal and Patent Consulting (This section provided as requested)

Gibson, Dunn and Crutcher, Washington, DC (2024 – ff) (contact: Robert Vincent, partner)
Retained for petitioner on Patent infringement dispute (in progress).

Gibson, Dunn and Crutcher, Washington, DC (2024 – ff) (contact: Brian Buroker, partner)
Expert opinion for petitioner on Inter Partes Review (in progress).

Gibson, Dunn and Crutcher, Washington, DC (2022 – 2023) (contact: Brian Buroker, partner)
Expert opinion for petitioner on Inter Partes Review and patent infringement related to floor cleaning products (SharkNinja et al v Bissell). Three declarations presented based on claim arguments shown as anticipated or obvious. Court decision in favor of petitioner on cited claims with several patents invalidated (1/11/2024).

Marks and Clerk, Canada, Toronto, Ontario Canada (2018 – 2020) (contact: Nathan Fan)
Expert opinion. Canadian Federal Court (Canplas Industries v Lomanco). Patent infringement claims. Analyzed patent and prior art, worked with legal team to prepare claims construction and response to infringement claims, examine breadth, uniqueness and utility of patent. Developed plan for performance testing. Examined specimens. Case Settled (8/2020).

Ridout and Maybee LLP, Toronto, Ontario, Canada. (2014-2016) (contact: Matt Norwood)
Expert opinion. Canadian Federal Court (Canplas Industries v Merit Precision Moulding/Airturn Products). Patent infringement claims. Analyzed patent and prior art, examined expert reports, examined specimens. Issued expert report. Scheduled for trial appearance (3/2016). Case settled (3/2016).

Ogletree, Deakins, Nash, Smoak, Stewart, PC, Charleston, SC. (2009-2010) (contact: Luci Nelson)
Expert opinion. US (South Carolina) District Court (KEBO, LLC v. Jim Coleman Company v. Froggy's Car Wash, et al.). Product performance and design claims. Analyzed product design and function, reviewed on-site installations, reviewed test and performance standards. Issued expert report. Deposition offered in Charleston, SC (March, 2010). Case settled (5/2010).

Manatt, Phelps, Phillips, LLP, New York, NY. (2006- 2007) (contact: Monica Youn)
Expert opinion. US (Delaware) District court (Maytag v. Dyson). Patent dispute and False advertising claim. Analyzed test results and test protocols, inspected tested devices, interpreted test results with application of statistical analyses and uncertainty analyses, opinion regarding device design, analyzed opposing expert reports. Both written and verbal expert opinions rendered. Two depositions offered in Chicago, IL (4/2007 and 5/2007). Scheduled for trial appearance (6/2007). Case settled (6/2007).

Robinson and Lawing, LLP, Winston-Salem, NC (2004 - 2005) (contact: Bob Lawing)
Expert opinion. Product liability. Pipeline mechanical joint failure/pump operation/hydraulic shock. Review of agreements, interpretation of relevant codes and system tests. Opinion rendered. No further action.

Harper Law Firm, LLP, Greenville, SC (2004) (contact: Don Harper)
Expert opinion. Patent/Product liability. Gas diaphragm flowmeter accuracy dispute. Reviewed device and tests; Analyzed potential uncertainties. Opinion rendered - No further action.

Clement, Rivers, Tisdale, Charleston, SC (2002-2004) (contact: Duke Highfield)
Expert opinion. Product liability. Vehicle rollover with fatalities. Vehicle inspection, accident analysis, review of depositions. Opinion rendered - No further action.

Clement, Rivers, Tisdale, Charleston, SC (2000-01) (contact: Thomas Tisdale)

Expert opinion. US (South Carolina) District Court. Patent/confidentiality impropriety regarding automotive part; Hydraulics, pneumatics and mechanical design. Opinion offered. Deposition offered in Charleston, SC (11/2000). Case settled (12/2000).

Hill, Wyatt, Bannister & Brown, Greenville, SC (1996-97) (contact: Gary Hill)

Expert witness. Product liability. Installation and use of space heaters and related fabric ignition by heat flux and personal injury. Interpreting national and local building codes. Deposition offered in Greenville, SC (4/97). Trial appearance in Greenville County, SC (9/97).

Leonard Bloom and Associates, Towson, MD; Fibertech Medical, Inc.(now CSA Medical), Baltimore, MD (1998-99) (contact: Jennifer Cartledge).

Expert opinion. Patent preparation and dispute. Analysis of proposed method for cryogenic spray ablation of tissue. Report issued for patent preparation. Prepared report for subsequent patent dispute resolution and prepared response to Official Action from US Patent Office. No further action required.

Gibbs, Gallivan, White, and Boyd, Greenville, SC (1994-95) (contact: Edwin Martin)

Expert witness. Product liability in Plaintiff vs Lowes Corp. Analysis and testing of blowers. Accident reconstruction on behalf of defendant. Deposition offered in Clemson, SC (1995). Trial appearance in Pickens County, SC (1995).

Wood, Herron, and Evans, Cincinnati, OH (1988-1989) (contact: J. Robert Chambers)

Expert opinion. Patent dispute. Flow measurement apparatus and air sampler. Analysis with written and oral (Atlanta, GA) report issued to defendants. No further action.

Wender, Murase and White, Washington, DC (contact: Tony Shaw/Richard Linn) (1986) and Babcock and Wilcox (contact: Alan Ferguson) (1981 and 1986).

Expert testimony. US District Court. Analysis of rapid cure masonry product process for patent preparation and comments for response to Official Action from US Patent Office. Expert testimony related to a subsequent patent dispute. *Subpoena issued for deposition in Anderson County, SC*. Case settled. No further action.

Updated July 2024.

APPENDIX B: MATERIALS CONSIDERED

In addition to all documents and references cited or referred to in my Declaration, I considered the following materials in forming my opinions:

Exhibit No.	Description
1001	U.S. Patent No. 10,117,550 (“’550Patent”)
1002	Declaration of Robert Giachetti
1003	<i>Curriculum Vitae</i> of Robert Giachetti
1004	Excerpted File History of U.S. 10,117,550 (App. No. 16/021,152)
1005	PCT Publication No. 2007/084543 to Butler et al. (“Butler”)
1006	Swiss Patent No. CH203,675 to Peter (“PeterCH”)
1007	Certified English translation of Swiss Patent No. CH203,675 to Peter (“Peter”)
1008	U.S. Patent Publication No. 2008/0189901 to Jansen (“Jansen”)
1009	French Patent No. 1,094,603 to Martelliere (“MartelliereFR”)
1010	Certified English translation of French Patent No. 1,094,603 to Martelliere (“Martelliere”)
1011	U.S. Patent No. 4,473,923 to Neroni et al. (“Neroni”)
1012	U.S. Patent Publication No. 2006/0026788 to Fischer et al. (“Fischer”)
1013	Patent Owner’s Infringement Contentions regarding the ’550Patent
1014	U.K. Patent No. GB194,963 to Lehmann (“Lehmann”)
1015	U.K. Patent No. GB482,938 to British Thomson-Houston Company Limited (“BTHCL”)
1016	Plaintiffs’ Infringement Contentions in <i>SharkNinja Operating LLC v. Dyson, Inc.</i> , No. 1:23-cv-12372 (D. Mass.)
1017	The Parties’ Revised Proposed Schedule in <i>SharkNinja Operating LLC v. Dyson, Inc.</i> , No. 1:23-cv-12372 (D. Mass.)
1018	https://www.uscourts.gov/sites/default/files/data_tables/fcms_na_distp_rofile1231.2023.pdf

Exhibit No.	Description
1019	Petitioners' Stipulation
1020	U.S. Patent No. 6,829,804 to Sepke ("Sepke")

APPENDIX C: CHALLENGED CLAIMS

Reference Number	Claim Limitation
Claim 1	
[1pre]	A surface cleaning apparatus comprising:
[1a]	(a) a hand vacuum cleaner comprising:
[1a.1]	(i) a hand vacuum cleaner body comprising a bottom, a handle, the hand vacuum cleaner body housing a suction motor and fan assembly, the suction motor and fan assembly having a suction motor axis of rotation, the handle having a hand grip portion that extends upwardly and forwardly when the hand vacuum cleaner body is positioned with the bottom on a horizontal surface; and,
[1a.2]	(ii) a cyclone unit provided at a front end of the hand vacuum cleaner body, the cyclone unit comprising a cyclone chamber having a cyclone axis of rotation, a front end of the cyclone unit having a hand vacuum cleaner air inlet and a rear end wherein the hand vacuum cleaner air inlet is provided in a centre of the front end of the cyclone unit; and,
[1a.3]	(iii) an electrical connector provided on the front end of the cyclone unit wherein electrical cables extend rearwardly from the electrical connector through a central portion of the cyclone unit toward the suction motor and fan assembly,
[1b]	(b) a surface cleaning head having a front end, a rear end, a dirt air inlet and a cleaning head air outlet; and,
[1c]	(c) a rigid air flow conduit extendable between the cleaning head air outlet and the hand vacuum cleaner air inlet, the rigid air flow conduit having a longitudinally extending conduit axis which is parallel to the cyclone axis of rotation when the rigid air flow conduit extends between the cleaning head air outlet and the hand vacuum cleaner air inlet,
[1d]	wherein the hand vacuum cleaner is removably mountable to a downstream end of the rigid air flow conduit and when the hand vacuum cleaner is mounted to the downstream end of the rigid air flow conduit, and the rigid air flow conduit extends between the surface cleaning head and the hand vacuum cleaner, the handle is a driving handle for the surface cleaning apparatus.
Claim 2	
[2]	The surface cleaning apparatus of claim 1 wherein the cyclone axis of rotation is rearward of the longitudinally extending conduit axis

Reference Number	Claim Limitation
	when the hand vacuum cleaner is mounted to the rigid air flow conduit and the rigid air flow conduit extends generally vertically upwardly from the surface cleaning head.
Claim 3	
[3]	The surface cleaning apparatus of claim 2 wherein a projection of the longitudinally extending conduit axis intersects the hand grip portion when the hand vacuum cleaner is mounted to the rigid air flow conduit.
Claim 4	
[4]	The surface cleaning apparatus of claim 2 wherein the suction motor axis of rotation is generally parallel to the longitudinally extending conduit axis.
Claim 5	
[5]	The surface cleaning apparatus of claim 1 wherein a projection of the longitudinally extending conduit axis intersects the hand grip portion when the hand vacuum cleaner is mounted to the rigid air flow conduit.
Claim 6	
[6]	The surface cleaning apparatus of claim 1 wherein the suction motor axis of rotation is generally parallel to the longitudinally extending conduit axis.
Claim 7	
[7]	The surface cleaning apparatus of claim 1 wherein the cyclone unit has an outlet conduit and the outlet conduit extends in a direction that is generally parallel to the cyclone axis of rotation.
Claim 8	
[8]	The surface cleaning apparatus of claim 1 wherein the rigid air flow conduit is removably attachable to the hand vacuum cleaner air inlet.
Claim 9	
[9]	The surface cleaning apparatus of claim 8 wherein the hand vacuum cleaner air inlet comprises a hand vacuum cleaner inlet passage that is generally parallel to the longitudinally extending conduit axis and the cyclone axis of rotation, the hand vacuum cleaner inlet passage having an inlet end and an outlet end, the outlet end communicating with a cyclone chamber air inlet and the electrical cables extend rearwardly adjacent the hand vacuum cleaner inlet passage.

Reference Number	Claim Limitation
Claim 10	
[10]	The surface cleaning apparatus of claim 9 wherein the cyclone chamber air inlet comprises a tangential air inlet provided at the outlet end of the hand vacuum cleaner inlet passage.
Claim 11	
[11]	The surface cleaning apparatus of claim 9 wherein the hand vacuum cleaner inlet passage is coaxial with the longitudinally extending conduit axis.
Claim 12	
[12pre]	A surface cleaning apparatus comprising:
[12a]	(a) hand vacuum cleaner comprising:
[12a.1]	(i) a hand vacuum cleaner body comprising a bottom, a handle, the hand vacuum cleaner body housing a suction motor and fan assembly, the suction motor and fan assembly having a suction motor axis of rotation; and,
[12a.2]	(ii) an air treatment member provided at a front end of the hand vacuum cleaner body, the air treatment member having a front end of the air treatment member and a rear end, a hand vacuum cleaner air inlet and the rear end having an air treatment member air outlet whereby air exits the air treatment member in a rearward direction, wherein the hand vacuum cleaner air inlet is provided in a centre of the front end of the air treatment member; and,
[12a.3]	(iii) an electrical connector provided on the front end of the air treatment member wherein electrical cables extend rearwardly from the electrical connector through a central portion of the air treatment member toward the suction motor and fan assembly,
[12b]	(b) a surface cleaning head having a front end, a rear end, a dirt air inlet and a cleaning head air outlet; and,
[12c]	(c) a rigid air flow conduit extendable between the cleaning head air outlet and the hand vacuum cleaner air inlet, the rigid air flow conduit having a longitudinally extending conduit axis which is parallel to the rearward direction when the rigid air flow conduit extends between the cleaning head air outlet and the hand vacuum cleaner air inlet and when the hand vacuum cleaner is mounted to a downstream end of the rigid air flow conduit, the handle is a driving handle for the surface cleaning apparatus.

Claim 13	
[13]	The surface cleaning apparatus of claim 12 wherein the air treatment member air outlet comprises an outlet conduit having an outlet conduit axis that is generally parallel to longitudinally extending conduit axis.
Claim 14	
[14]	The surface cleaning apparatus of claim 12 wherein the outlet conduit axis is rearward of the longitudinally extending conduit axis when the hand vacuum cleaner is mounted to the rigid air flow conduit and the rigid air flow conduit extends generally vertically upwardly from the surface cleaning head.
Claim 15	
[15]	The surface cleaning apparatus of claim 14 wherein a projection of the longitudinally extending conduit axis intersects a hand grip portion of the handle when the hand vacuum cleaner is mounted to the rigid air flow conduit.
Claim 16	
[16]	The surface cleaning apparatus of claim 15 wherein the suction motor axis of rotation is generally parallel to the longitudinally extending conduit axis.
Claim 17	
[17]	The surface cleaning apparatus of claim 12 wherein the suction motor axis of rotation is generally parallel to the longitudinally extending conduit axis.
Claim 18	
[18]	The surface cleaning apparatus of claim 12 wherein the rigid air flow conduit is removably attachable to the hand vacuum cleaner air inlet and the hand vacuum cleaner air inlet comprises a hand vacuum cleaner inlet passage that is generally parallel to the longitudinally extending conduit axis when the rigid air flow conduit is attached to the hand vacuum cleaner air inlet, the hand vacuum cleaner inlet passage having an inlet end and an outlet end, the outlet end communicating with an air treatment member air inlet and the electrical cables extend rearwardly adjacent the hand vacuum cleaner inlet passage.
Claim 19	
[19]	The surface cleaning apparatus of claim 18 wherein the hand vacuum cleaner inlet passage is coaxial with the longitudinally extending conduit axis.

Claim 20	
[20pre]	A surface cleaning apparatus comprising:
[20a]	(a) a hand vacuum cleaner comprising:
[20a.1]	(i) a hand vacuum cleaner body comprising a handle, the hand vacuum cleaner body housing a suction motor and fan assembly, the suction motor and fan assembly having a suction motor axis of rotation; and,
[20a.2]	(ii) a cyclone unit provided at a front end of the hand vacuum cleaner body, the cyclone unit comprising a cyclone chamber having a cyclone axis of rotation, a front end of the cyclone unit having a hand vacuum cleaner air inlet and a rear end wherein the hand vacuum cleaner air inlet is provided in a centre of the front end of the cyclone unit; and,
[20a.3]	(iii) an electrical connector provided on the front end of the cyclone unit,
[20b]	(b) a surface cleaning head having a front end, a rear end, a dirt air inlet and a cleaning head air outlet; and,
[20c]	(c) a rigid air flow conduit extendable between the cleaning head air outlet and a hand vacuum cleaner air inlet, the rigid air flow conduit having a longitudinally extending conduit axis which is parallel to the cyclone axis of rotation when the rigid air flow conduit extends between the cleaning head air outlet and the hand vacuum cleaner air inlet,
[20d]	wherein the hand vacuum cleaner is removably mountable to a downstream end of the rigid air flow conduit and when the hand vacuum cleaner is mounted to the downstream end of the rigid air flow conduit, the handle is a driving handle for the surface cleaning apparatus, and
[20e]	wherein when the rigid air flow conduit extends between the cleaning head air outlet and the hand vacuum cleaner air inlet, the hand vacuum cleaner air inlet comprises a hand vacuum cleaner inlet passage that is generally coaxial with the longitudinally extending conduit axis and the cyclone axis of rotation, the hand vacuum cleaner air inlet passage is positioned inside the cyclone unit and the electrical cables extend rearwardly from the electrical connector through the cyclone unit adjacent the hand vacuum cleaner inlet passage towards the suction motor and fan assembly.

Claim 21	
[21]	The surface cleaning apparatus of claim 20 wherein the hand vacuum cleaner body comprises a suction motor and fan assembly housing and the handle extends from a sidewall of the suction motor and fan assembly housing.
Claim 22	
[22]	The surface cleaning apparatus of claim 1 wherein the hand vacuum cleaner inlet passage has an inlet axis and a projection of each of the inlet axis and the cyclone axis intersects the suction motor.
Claim 23	
[23]	The surface cleaning apparatus of claim 12 wherein the hand vacuum cleaner air inlet comprises a hand vacuum cleaner inlet passage that has an inlet axis, and when the rigid air flow conduit extends between the cleaning head air outlet and the hand vacuum cleaner air inlet, the inlet axis is generally parallel to the longitudinally extending conduit axis and a projection of each of the inlet axis and an outlet conduit axis of the air treatment member intersects the suction motor.
Claim 24	
[24]	The surface cleaning apparatus of claim 20 wherein the hand vacuum cleaner comprises a hand vacuum cleaner inlet passage that has an inlet axis, and when the rigid air flow conduit extends between the cleaning head air outlet and the hand vacuum cleaner air inlet, the inlet axis is generally parallel to the longitudinally extending conduit axis and a projection of each of the inlet axis and the cyclone axis intersects the suction motor.
Claim 25	
[25]	The surface cleaning apparatus of claim 1, wherein when the hand vacuum cleaner is mounted to the downstream end of the rigid air flow conduit and the rigid air flow conduit is in an upright storage position, the handle is at an upper end of the surface cleaning apparatus and a portion of the handle is rearward of the wand axis.
Claim 26	
[26]	The surface cleaning apparatus of claim 12, wherein when the hand vacuum cleaner is mounted to the downstream end of the rigid air flow conduit and the rigid air flow conduit is in an upright storage position, the handle is at an upper end of the surface cleaning apparatus and a portion of the handle is rearward of the wand axis.

Claim 27	
[27]	The surface cleaning apparatus of claim 20, wherein when the hand vacuum cleaner is mounted to the downstream end of the rigid air flow conduit and the rigid air flow conduit is in an upright storage position, the handle is at an upper end of the surface cleaning apparatus and a portion of the handle is rearward of the wand axis.
[28pre]	A surface cleaning apparatus comprising:
[28a]	(a) a hand vacuum cleaner comprising:
[28a.1]	(i) a hand vacuum cleaner body comprising a bottom, a handle, a suction motor and fan assembly, the suction motor and fan assembly having a suction motor axis of rotation, the handle having a hand grip portion that extends upwardly and forwardly when the hand vacuum cleaner is positioned with the bottom on a horizontal surface;
[28a.2]	(ii) a cyclone unit provided at a front end of the hand vacuum cleaner body, the cyclone unit comprising a cyclone chamber having a cyclone axis of rotation, a centre of the front end of the cyclone unit having a hand vacuum cleaner air inlet; and,
[28a.3]	(iii) a cyclone unit electrical connector provided at the front end of the cyclone unit at a location adjacent the hand vacuum cleaner air inlet, wherein electrical cables extend rearwardly from the electrical connector through a central portion of the cyclone unit toward the suction motor and fan assembly,
[28b]	(b) a surface cleaning head having a front end, a rear end, a dirt air inlet and a cleaning head air outlet; and,
[28c]	(c) a rigid air flow conduit extendable between the cleaning head air outlet and the hand vacuum cleaner air inlet, the rigid air flow conduit having a longitudinally extending conduit axis, and when the rigid air flow conduit is extending between the cleaning head air outlet and the hand vacuum cleaner air inlet conduit axis is parallel to the cyclone axis of rotation and a rigid air flow conduit electrical connector that is aligned with and connected to the cyclone unit electrical connector when the hand vacuum cleaner is mounted to the rigid air flow conduit,
[28d]	wherein the hand vacuum cleaner is removably mountable to a downstream end of the rigid air flow conduit and when the hand vacuum cleaner is mounted to the downstream end of the rigid air flow conduit, the handle is a driving handle for the surface cleaning apparatus.

APPENDIX D: UNDERSTANDING OF THE LAW

I have applied the following legal principles provided to me by counsel in arriving at the opinions set forth in this declaration.

Legal Standard for Prior Art

I am not an attorney. I have been informed by attorneys of the relevant legal principles and have applied them to arrive at the opinions set forth in this declaration.

I understand that the petitioner for *inter partes* review may request the cancelation of one or more claims of a patent based on grounds available under AIA 35 U.S.C. § 102 and 35 U.S.C. § 103 using prior art that consists of patents and printed publications.

Anticipation and Prior Art

I understand that § 102 specifies when a challenged claim is invalid for lacking novelty over the prior art, and that this concept is also known as “anticipation.” I understand that a prior art reference anticipates a challenged claim, and thus renders it invalid by anticipation, if all elements of the challenged claim are disclosed in the prior art reference. I understand the disclosure in the prior art reference can be either explicit or inherent, meaning it is necessarily present or implied. I understand that the prior art reference does not have to use the same words as the challenged claim, but all of the requirements of the claim must be disclosed so that a person of ordinary skill in the art could make and use the claimed subject matter.

In addition, I understand that § 102 also defines what is available for use as a prior art reference to a challenged claim.

Under § 102(a)(1), a challenged claim is anticipated if it was patented, described in a printed publication, or in public use, on sale, or otherwise available to the public before the effective filing date of the claimed invention.

Under § 102(b)(1), a challenged claim is anticipated if it was described in an issued patent or published patent application, in which the patent or application names another inventor and was effectively filed before the effective filing date of the claimed invention.

I understand that the effective filing date of a patent or patent application is the earlier of the actual filing date of the patent or the application for patent or, if the patent or application for patent is entitled to claim earlier priority or the benefit of an earlier filing, the filing date of the earliest application that describes the claimed subject matter.

I understand that when a challenged claim covers several structures, either generically or as alternatives, the claim is deemed anticipated if any of the structures within the scope of the claim is found in the prior art reference.

I understand that when a challenged claim requires selection of an element from a list of alternatives, the prior art teaches the element if one of the alternatives is taught by the prior art.

Legal Standard for Obviousness

I understand that even if a challenged claim is not anticipated, it is still invalid if the differences between the claimed subject matter and the prior art are such that the claimed subject matter would have been obvious to a person of ordinary skill in the pertinent art at the time the alleged invention.

I understand that, in order for a prior art reference to be proper for use in an obviousness analysis, the reference must be analogous art. I understand that a prior art reference is analogous art if: (1) the reference is from the same field of endeavor as the challenged patent (even if it addresses a different problem); or (2) the reference is reasonably pertinent to the problem faced by the inventor of the challenged patent (even if it is not in the same field of endeavor). I understand that the field of endeavor is determined by reference to explanations of the challenged claims' subject matter in the challenged patent, including the embodiments, functions, and structures of the challenged claims. A prior art reference is "reasonably pertinent" to a problem if it would have logically commended itself to an inventor's attention in considering the problem.

I understand that obviousness must be determined with respect to the challenged claim as a whole.

I understand that one cannot rely on hindsight in deciding whether a claim is obvious.

I also understand that an obviousness analysis includes the consideration of factors such as (1) the scope and content of the prior art, (2) the differences between the prior art and the challenged claim, (3) the level of ordinary skill in the pertinent art, and (4) “secondary” or “objective” evidence of non-obviousness.

Secondary or objective evidence of non-obviousness includes evidence of: (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. However, I understand that there must be a relationship between any secondary evidence of non-obviousness and the claimed invention.

I understand that a challenged claim can be invalid for obviousness over a combination of prior art references if a reason existed (at the time of the alleged invention) that would have prompted a person of ordinary skill in the art to combine elements of the prior art in the manner required by the challenged claim. I understand that this requirement is also referred to as a “motivation to combine,” “suggestion to combine,” or “reason to combine,” and that there are several rationales that meet this requirement.

I understand that the prior art references themselves may provide a motivation to combine, but other times simple common sense can link two or more prior art references. I further understand that obviousness analysis recognizes that market demand, rather than scientific literature, often drives innovation, and that a motivation to combine references may come from market forces.

I understand obviousness to include, for instance, scenarios where known techniques are simply applied to other devices, systems, or processes to improve them in an expected or known way. I also understand that practical and common-sense considerations should be applied in a proper obviousness analysis. For instance, familiar items may have obvious uses beyond their primary purposes.

I understand that the combination of familiar elements according to known methods is obvious when it yields predictable results. For instance, obviousness bars patentability of a predictable variation of a technique even if the technique originated in another field of endeavor. This is because design incentives and other market forces can prompt variations of it, and predictable variations are not the product of innovation, but rather ordinary skill and common sense.

I understand that a particular combination may be obvious if it was obvious to try the combination. For example, when there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions, a person of ordinary skill has good reason to pursue the known options within his or

her technical grasp. This would result in something obvious because the result is the product not of innovation but of ordinary skill and common sense. However, I understand that it may not be obvious to try a combination when it involves unpredictable technologies.

It is further my understanding that a proper obviousness analysis focuses on what was known or obvious to a person of ordinary skill in the art, not just the patentee. Accordingly, I understand that any need or problem known in the field of endeavor at the time of invention and addressed by the patent can provide a reason for combining the elements in the manner claimed.

It is my understanding that the Manual of Patent Examining Procedure §2143 sets forth the following as exemplary rationales that support a conclusion of obviousness:

- Combining prior art elements according to known methods to yield predictable results;
- Simple substitution of one known element for another to obtain predictable results;
- Use of known technique to improve similar devices (methods, or products) in the same way;
- Applying a known technique to a known device (method, or product) ready for improvement to yield predictable results;

- Choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success;
- Known work in one field of endeavor may prompt variations of it for use in either the same field or a different one based on design incentives or other market forces if the variations are predictable to one of ordinary skill in the art;
- Some teaching, suggestion, or motivation in the prior art that would have led one of ordinary skill to modify the prior art reference or to combine prior art reference teachings to arrive at the claimed invention.

A person of ordinary skill in the art looking to overcome a problem will often use the teachings of multiple publications together. I understand that obviousness analysis takes into account inferences, creative steps, common sense, and practical logic and applications that a person of ordinary skill in the art would employ under the circumstances.

I understand that a claim can be obvious in light of a single reference, if the elements of the challenged claim that are not explicitly or inherently disclosed in the reference can be supplied by the common sense of one of skill in the art.

I understand that obviousness also bars the patentability of applying known or obvious design choices to the prior art. One cannot patent merely substituting one prior art element for another if the substitution can be made with predictable results.

Likewise, combining prior art techniques that are interoperable with respect to one another is generally obvious and not patentable.

In order for a claim to be found invalid based upon a modification or combination of the prior art, there must be reasonable expectation that a person of ordinary skill would have successfully modified or combined the prior art to arrive at the claimed arrangement. This does not mean that it must be certain that a person of ordinary skill would have been successful—the law only requires that the person of ordinary skill in the art would have perceived a reasonable expectation of success in modifying or combining the prior art to arrive at the claimed invention.

In sum, my understanding is that obviousness invalidates claims that merely recite combinations of, or obvious variations of, prior art teachings using understanding and knowledge of one of skill in the art at the time and motivated by the general problem facing the inventor at the time. Under this analysis, the prior art references themselves, or any need or problem known in the field of endeavor at the time of the invention, can provide a reason for combining the elements of or attempting obvious variations on prior art references in the claimed manner.

Legal Standard for Claim Construction

I understand that before any invalidity analysis can be properly performed, the scope and meaning of the challenged claims must be determined by claim construction.

I understand that a patent may include two types of claims, independent claims and dependent claims. I understand that an independent claim stands alone and includes only the limitations it recites. I understand that a dependent claim depends from an independent claim or another dependent claim. I understand that a dependent claim includes all the limitations that it recites in addition to the limitations recited in the claim (or claims) from which it depends.

In comparing the challenged claims to the prior art, I have carefully considered the patent and its file history in light of the understanding of a person of skill at the time of the alleged invention.

I understand that to determine how a person of ordinary skill would have understood a claim term, one should look to sources available at the time of the alleged invention that show what a person of skill in the art would have understood disputed claim language to mean. It is my understanding that this may include what is called “intrinsic” evidence as well as “extrinsic” evidence.

I understand that, in construing a claim term, one should primarily rely on intrinsic patent evidence, which includes the words of the claims themselves, the remainder of the patent specification, and the prosecution history. I understand that extrinsic evidence, which is evidence external to the patent and the prosecution history, may also be useful in interpreting patent claims when the intrinsic evidence itself is insufficient. I understand that extrinsic evidence may include principles,

concepts, terms, and other resources available to those of skill in the art at the time of the invention.

I understand that words or terms should be given their ordinary and accepted meaning unless it appears that the inventors were using them to mean something else or something more specific. I understand that to determine whether a term has special meaning, the claims, the patent specification, and the prosecution history are particularly important, and may show that the inventor gave a term a particular definition or intentionally disclaimed, disavowed, or surrendered claim scope.

I understand that the claims of a patent define the scope of the rights conferred by the patent. I understand that because the claims point out and distinctly claim the subject matter which the inventors regard as their invention, claim construction analysis must begin with and is focused on the claim language itself. I understand that the context of the term within the claim as well as other claims of the patent can inform the meaning of a claim term. For example, because claim terms are normally used consistently throughout the patent, how a term is used in one claim can often inform the meaning of the same term in other claims. Differences among claims or claim terms can also be a useful guide in understanding the meaning of particular claim terms.

I understand that a claim term should be construed not only in the context of the particular claim in which the disputed term appears, but in the context of the

entire patent, including the entire specification. I understand that because the specification is a primary basis for construing the claims, a correct construction must align with the specification.

I understand that the prosecution history of the patent as well as art incorporated by reference or otherwise cited during the prosecution history are also highly relevant in construing claim terms. For instance, art cited by or incorporated by reference may indicate how the inventor and others of skill in the art at the time of the invention understood certain terms and concepts. Additionally, the prosecution history may show that the inventors disclaimed or disavowed claim scope, or further explained the meaning of a claim term.

With regard to extrinsic evidence, I understand that all evidence external to the patent and prosecution history, including expert and inventor testimony, dictionaries, and learned treatises, can also be considered. For example, technical dictionaries may indicate how one of skill in the art used or understood the claim terms. However, I understand that extrinsic evidence is considered to be less reliable than intrinsic evidence, and for that reason is generally given less weight than intrinsic evidence.

I understand that in general, a term or phrase found in the introductory words or preamble of the claim, should be construed as a limitation if it recites essential structure or steps, or is necessary to give meaning to the claim. For instance, I

understand preamble language may limit claim scope: (i) if dependence on a preamble phrase for antecedent basis indicates a reliance on both the preamble and claim body to define the claimed invention; (ii) if reference to the preamble is necessary to understand limitations or terms in the claim body; or (iii) if the preamble recites additional structure or steps that the specification identifies as important.

On the other hand, I understand that a preamble term or phrase is not limiting where a challenged claim defines a structurally complete invention in the claim body and uses the preamble only to state a purpose or intended use for the invention. I understand that to make this determination, one should review the entire patent to gain an understanding of what the inventors claim they invented and intended to encompass in the claims.