

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.

DECLARATION OF ROBERT GIACHETTI

REGARDING

U.S. Patent No. 11,389,038

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I. INTRODUCTION

1. My name is Robert Giachetti. I have been retained by Dyson Technology Limited and Dyson, Inc. (collectively “Dyson” or “Petitioners”) as an independent expert in this proceeding.
2. I understand Dyson is challenging the validity of claims 1-15 of U.S. Patent No. 11,389,038 (the “’038 Patent”) in this petition for *inter partes* review (“IPR”). I refer to these as the “Challenged Claims.”
3. I have been asked to consider whether certain references invalidate the Challenged Claims.
4. I am a salaried employee of Fusion Engineering, LLC. Fusion Engineering is being compensated for my time in connection with this matter at the consulting rate of \$410 per hour. My compensation is not affected by the content of my opinions, testimony, or the outcome of this matter.
5. The prior art references on which my opinions are based are:
 - PCT Publication No. 2007/084543 to Butler et al. (“Butler,” attached as Ex1005)
 - C.N. Patent No. CN 201958793 to Peng (“Peng,” English translation attached as Ex1008)
 - U.K. Patent No. GB194,963 to Lehmann (“Lehmann,” attached as Ex1006)
 - U.S. Patent No. 4,473,923 to Neroni et al. (“Neroni,” attached as Ex1007)

6. In my opinion, the Challenged Claims are invalid based on the following:
- Butler renders claims 1-15 obvious.
 - The combination of Butler and Peng renders claims 1-15 obvious.
 - The combination of Lehmann and Peng renders claims 1-11 and 13-15 obvious.
 - The combination of Lehmann, Peng and Neroni renders claim 12 obvious.

II. BACKGROUND AND QUALIFICATIONS

7. I am a Licensed Professional Engineer in Illinois and Oklahoma, with over 20 years of experience in mechanical engineering. My experience in machinery and mechanisms spans numerous industries; I have worked directly designing mechanical systems and machinery, and I have consulted on the operation of machinery in various fields, including consumer products, commercial products, and industrial products.
8. I am employed by Fusion Engineering, LLC, where I have worked since November of 2020. Fusion is an engineering firm that provides multidisciplinary engineering consulting services.
9. I am currently the Director of Mechanical Engineering at Fusion. In this role, I am responsible for providing engineering consulting services in mechanical engineering, coordinating client outreach, coordinating marketing materials, and recruiting.
10. I am currently a Member of ASTM (American Society for Testing and

Materials) and ASME (American Society of Mechanical Engineers) where I sit on several committees, including the Power Transmission Gearing Committee (ASME), which looks at transferring movement with belts and gears. I am also on ASTM's F15 Consumer Product Committee, which handles matters such as consumer product safety guidelines. I am also a member of the ICPHSO (International Consumer Products Health & Safety Organization) group, and attend ICPHSO conferences, which cover health and safety issues relevant to consumer products.

11. I hold a Bachelor's, Master's, and Ph.D. degree in Mechanical Engineering. I have Minors in Physics (as an undergraduate) and Mechanics and Aeronautics (as a graduate student). I have taught courses in Physics, Mechanical Engineering, and Biomechanics across three universities.
12. I have been recognized as an expert in mechanical power transmission equipment, and I serve on the American Society of Mechanical Engineers (ASME) Power Transmission and Gearing Committee. I have also participated, by invitation, in the National Council of Examiners for Engineering and Surveying (NCEES) Mechanical Professional Activities and Knowledge Studies (PAKS) committee. This committee reviews and evaluates the problems and problem types that appear on the Mechanical

Engineering Professional Engineering exam for licensure as a Professional Engineer.

13. For the past 30 years, I have been involved in the area of machine design and applications of machine design. These machines and products have ranged from children's mattresses to garden hoses, pressure cookers, electronic tire/raft inflators, and industrial equipment including conveyors.
14. In approximately 1993-1994, I was a part of a team that developed and built a functioning autonomous, battery-powered vacuum cleaner. This design and development project involved analyzing the layout and inclusion of various vacuum-cleaner components, such as surface agitators, air filtration units, motors, fluid flow paths, batteries, and other electronic and mechanical components.
15. From 2003-2008, I was employed by the University of Wisconsin-Madison's Biomechanics laboratory in the Department of Kinesiology, where I was also a teaching assistant in biomechanics. While there, my research responsibilities included designing equipment with ergonomic handles for efficient use. While teaching biomechanics at the University of Wisconsin-Madison, I regularly instructed on the proper use of canes, crutches, and arm crutches in relationship to biomechanical principles, taking into consideration user ergonomics.

16. From 2008-2020, I was employed by Exponent, Inc., where I worked as a Senior Managing Engineer. At Exponent, I worked on various mechanical engineering projects that frequently related to consumer product design, machinery design, product and machinery performance, and human interaction with consumer products and industrial equipment.
17. In approximately 2010-2013, I conducted an engineering analysis of vacuum cleaner products. In particular, I single-handedly developed tests to assess the dust-collection efficacy of various physical-media filters used in bagless, cyclonic vacuum cleaners. My work on this project included product tear-downs to analyze the efficacy and safety of these vacuum cleaners and their filters. I also developed a protocol for nationwide in-home testing of vacuum cleaner filtration system efficacy across climates, as well as a protocol for analyzing the materials collected by the vacuum cleaners and their filters. This analysis considered, among other things, the size of particulates that were collected by vacuum cleaner cyclones and filters.
18. In approximately 2010-2014, I conducted an analysis of collets—a pipe and tube connection device—under dynamic fluid pressurization conditions. After initial and traditional methods of testing the collets, which included X-Rays and geometric measurements, failed to identify the

source of collet failure, I developed novel tests intended to mimic real-world conditions. These novel tests involved a hydro-static test and a dynamic test. The hydro-static test involved exposing the collets to extended periods of pressurized conditions. The dynamic test involved development of a computer-controlled manifold system that could selectively pressurize, de-pressurize, and drain collets in various sequences to determine the difference in performance. The novel tests I developed successfully determined the root cause of the collet failures.

19. In approximately 2012-2017, I performed a wholistic safety and efficacy analysis of various consumer vacuum-sealer products. In particular, I conducted tear-down analyses, reviewed the vacuum-sealers' performance for safety and functionality considerations, analyzed the function and operation of vacuum pumps, analyzed fluid flow paths, and analyzed the operation of small valves. I further worked with an electrical engineer to review the safety of the products' internal electronics.
20. Since approximately 2013 to the present, I have used principles of biomechanics, as well as principles of physics, to analyze the effect on a user or nearby operator of pressure cookers that failed, ejecting hot liquid. This work involved analyses of, among other things, forces that are applied to pressure cookers, the physics involved in the operation of pressure

cookers, and biomechanical principles.

21. In approximately 2013-2016, I used industry testing methods and developed and designed novel experiments and testing related to fluid flow analysis for a consumer garden hose. The analysis involved testing the hose's strength, durability, environmental performance (temperature and UV exposure), and material selection in connection with user operation. I further designed computer-controlled pressurization and de-pressurization systems for these garden hoses. The system was initially powered pneumatically with compressed air driven through a manifold in conjunction with a tank of water. When scaled, the system involved two parallel pumps that pressurized two groups of manifolds using computer-controlled valves in series to pressurize and de-pressurize expandable garden hoses. Developing this system involved, among other things, selecting the appropriate fluid power components and optimizing fluid flow paths.
22. In approximately 2015, I applied my biomechanical background to the use of cane handles, which involved assessing the amount of force to be applied to the handle and developing a handle that could both support that amount of force reliably and house a battery for novel electronics that were embedded in the cane.

23. In approximately 2015-2017, I investigated various properties of a garden hose ball valve. I worked as a part of a team to investigate valve properties, including materials, geometry, and seal selection. We further investigated fluid flow through the valve to ensure that the flow was optimized by analyzing valve shape with the Bernoulli equation.
24. In approximately 2016, I conducted an analysis of a cordless, handheld consumer leaf blower. In particular, I analyzed the functioning, operation, and failure of blower motors and fans in relation to the direction of fluid flow within a consumer leaf blower. This analysis concerned, among other things, consideration of fluid flow and mechanical design of leaf blowers, specifically regarding fan blade failure and its potential impact on the consumer-operator.
25. In approximately 2017-2018, I conducted an efficacy analysis of hand grips for ergonomic handheld hose nozzles. This analysis included a review of handheld nozzles in the marketplace that were advertised as ergonomic, as well as biomechanically modelling postures expected to be associated with the ergonomic handheld nozzles. To biomechanically model these handheld nozzles, I used a program called 3DSSPP, which models, among other things, human balance and effort levels. This program can be used calculate human joint torque based on operator input,

- which I used (and continue to use) to analyze the ergonomics of holding various handles, including handles for household consumer products.
26. I further used 3DSSPP to model biomechanics for use in household consumer products and industrial products. For example, in my paper, *Analytical Model for Estimating Knee Loads During Ladder Climbing*, published in the 2013 edition of the ASME International Mechanical Engineering Congress Exposition, I discussed how force output at the hands based on arm posture influences the forces within the knee joint. At a high level, this involved analyzing the ergonomics of how posture influences likely force output of limbs, particularly in connection with household consumer products, specifically ladders.
27. In approximately 2018-2020, I analyzed the operation of computer-controlled blowers, manifolds, valves, and sensors in consumer air mattresses. In particular, the analysis concerned the ability to control and maintain constant air pressure within air mattresses at particular pressure set points. This analysis concerned, among other things, fluid dynamics, fluid flow, fluid path selection, and changes in pressure.
28. In 2021, I published a paper, *Characterization of the Release of Heated and Pressurized Water from a Pressure Cooker*, in the Journal of Burns. In this paper, I analyzed and described how fluid is ejected from a pressure

cooker as a result of a flash boil event. In this analysis, I considered the operation of an exemplary household pressure cooker, analyzing fluid dynamics resulting from the trade-off between volume of liquid and pressure on fluid dynamics and its effect on consumer-users.

29. I have provided my full background in the curriculum vitae that is attached as Ex1003.

III. DOCUMENTS AND MATERIALS CONSIDERED

30. In forming the opinions expressed in this Declaration, I relied upon my education, training, knowledge, and experience in the relevant field of the art, as well as information pertaining to the documents described below.
31. In preparing this Declaration, I have reviewed the '038 patent and its file history, as well as the Butler, Peng, Neroni, and Lehmann prior art references on which my opinions are based. Other references and documents that I have reviewed are mentioned below. These references and documents reflect the state of the relevant art at the time of the alleged invention and the background knowledge of a POSA.
32. I have also reviewed the Patent Owner ("PO")'s infringement contentions served in the related litigation, *SharkNinja Operating LLC v. Dyson, Inc.*, No. 1:23-cv-12372 (D. Mass.) (the "Litigation").

IV. LEGAL PRINCIPLES

33. Dyson's counsel has informed me of certain legal standards. I have applied these understandings in my analysis as detailed below. I am not an attorney and offer no legal opinions.
34. I have been informed and understand that a patent claim is invalid if it is obvious, and that obviousness requires that the claim be obvious from the perspective of a person of ordinary skill in the relevant art at the time of the alleged invention. I have been informed and understand that a claim may be obvious in view of a single prior art reference, or may be obvious in view of a combination of two or more prior art references.
35. I have been informed and understand that the level of ordinary skill in the art may be determined by considering such factors as the education level of those working in the field, the sophistication of the technology, the types of problems encountered in the art, the prior art solutions to those problems, and the speed at which innovations are made. I have been informed and understand that not all of these factors need be considered and that one or more of these factors may control.
36. I have been informed and understand that an obviousness analysis is based on several factors, including the scope and content of the prior art, what differences, if any, existed between the alleged invention and the prior art,

and the level of ordinary skill in the pertinent art at the time of the alleged invention.

37. I have been informed and understand that to determine whether a claim is obvious, it is appropriate to consider, among other factors:
38. (1) whether the teachings of the prior art references disclose known concepts combined in familiar ways, and when combined, would yield predictable results; (2) whether a person of ordinary skill in the art could implement a predictable variation, and would see the benefit of doing so; (3) whether the claimed elements represent one of a limited number of known design choices, and would have a reasonable expectation of success by those skilled in the art; (4) whether a person of ordinary skill would have recognized a reason to combine known elements in the manner described in the claim; (5) whether there is some teaching or suggestion in the prior art to make the modification or combination of elements claimed in the patent; and (6) whether the innovation applies a known technique that had been used to improve a similar device or method in a similar way.
39. I further have been informed and understand that while it may be helpful to identify a reason for this combination, common sense should guide and no rigid requirement of finding a teaching, suggestion, or motivation to combine is required.

40. I further have been informed and understand that certain factors called secondary considerations may be considered in evaluating the obviousness of a claim. I understand that such secondary considerations include, among other things, commercial success of the alleged invention, skepticism of those having ordinary skill in the art at the time of the alleged invention, unexpected results of the alleged invention, any long-felt but unsolved need in the art that was satisfied by the alleged invention, the failure of others to make the alleged invention, praise of the alleged invention by those having ordinary skill in the art, and copying of the alleged invention by others in the field. I have been informed and understand that there must be a nexus—a connection—between any such secondary considerations and the alleged invention. I also have been informed and understand that contemporaneous and independent invention by others is a secondary consideration tending to show obviousness.
41. I have been informed and understand that a prior art reference may expressly or inherently describe a limitation of a claim. I have been informed and understand that if the prior art necessarily includes or functions in accordance with a claim's limitation, then the prior art inherently discloses that limitation. I have been informed and understand that to establish inherency, the evidence must make clear that the missing

descriptive matter is necessarily present in the item of prior art and that it would be so recognized by persons of ordinary skill in the art.

V. PERSON OF ORDINARY SKILL IN THE ART

42. In my opinion, a Person of Ordinary Skill in the Art (“POSA”) in the subject matter of the ’038 patent would have had a bachelor’s degree in mechanical engineering or a similar field and 2-3 years of experience in machine design, including machines that include fluid dynamics or fluid paths, such as vacuum cleaners. Additional education could offset less experience and vice versa, and a POSA could have also obtained similar knowledge and experience through other means.
43. I have been a POSA since at least 2003. The opinions I am offering are from the perspective of a POSA at the time of the alleged invention. For the purposes of my opinions below, I have been asked to assume that the relevant time frame is the relevant priority date for the Challenged Claims.

VI. TECHNOLOGY BACKGROUND

44. The Challenged Claims are directed to vacuum cleaner configurations and features, including alignment of certain vacuum components, “a rigid air flow conduit,” “a surface cleaning head,” “electrical connector[s],” “a suction motor and fan assembly,” and “an air treatment member provided at the front end.” *See* Ex1001, Claims.

45. I have reviewed the '038 patent's specification, and this claimed configuration does not purport to solve a technical problem.
46. I have also reviewed the file history of the '038 Patent. None of the references I rely upon in forming my invalidity opinions appear to have been before the United States Patent and Trademark Office.
47. In my opinion, as set forth in more detail below, these undisclosed references invalidate every claim of the '038 Patent.

VII. BACKGROUND OF THE '038 PATENT

48. The '038 Patent is titled "Surface Cleaning Apparatus." Ex1001, Title. The '038 Patent states that it issued on July 19, 2022, from U.S. Patent Application No. 16/590,972, filed on October 2, 2019. Ex1001, Cover. The '038 patent states that it is a division of application No. 16/156,006, which was filed on October 10, 2018, which in turn was a continuation of application No. 15/088,876, which was filed on April 1, 2016, which in turn was a continuation of application No. 14/822,211, filed on August 10, 2015. *Id.* It also claims priority to provisional application No. 62/093,189 filed on December 17, 2014. *Id.*

A. Summary of the '038 Patent's Specification

49. The '038 Patent states that it "relates to a type of stick vacuum cleaner wherein a hand vacuum cleaner is removably mounted to a drive handle

and provides motive power to draw dirty air into the surface cleaning head.” *Id.* at 1:18-20.

50. The '038 patent's large specification identifies “limited dirt collection capacity” as a problem with existing hand vacuums and attempts to solve this problem with a “supplemental bin” to “provide enhanced dirt collection capacity”:

In accordance with one aspect of this disclosure, a stick vacuum cleaner is provided which has a removable hand vacuum cleaner and also a supplemental bin which may function as a main dirt collection bin when the hand vacuum cleaner forms part of the stick vacuum cleaners. An advantage of this design is that the supplemental bin may provide enhanced dirt collection capacity for the stick vacuum cleaner. The supplemental bin may be removable so as to reduce the size of the stick vacuum cleaner when a smaller sized stick vacuum cleaner is desired, e.g., for cleaning in small or confined spaces.

Ex1001, 1:32-33, 1:43-53.

51. However, the '038 patent's claims do not claim a supplemental bin. Rather, it claims certain vacuum configurations and features. Ex1001, Claims.
52. The '038 patent's claimed combination of features do not solve any identified problem.

B. Prosecution History of the '038 Patent

53. I have reviewed the prosecution history of the '038 Patent. The following is my understanding:

54. The pending claims were allowed without any rejections from the Examiner. Ex1004, 248-255 (notice of allowability).

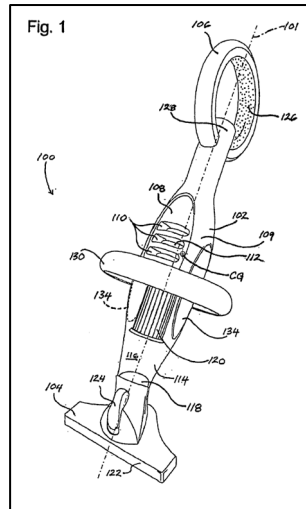
C. Priority Date of the Challenged Claims

55. For the purposes of my analysis, I have been instructed to apply and have applied a priority date of December 17, 2014, for the Challenged Claims.

VIII. BACKGROUND OF THE PRIOR ART

A. Butler

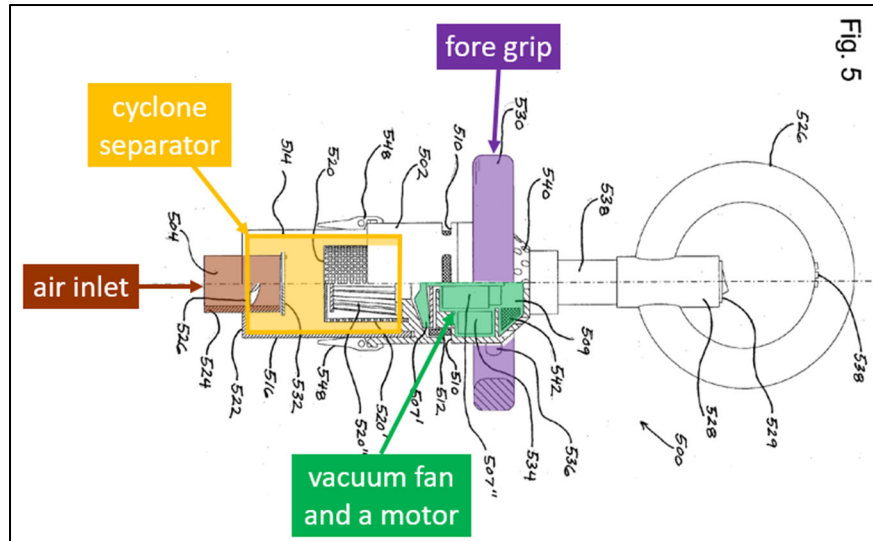
56. Butler is titled, "Stair Cleaning Vacuum Cleaner." Ex1005, Title. It generally describes an "improved vacuum cleaner for cleaning raised and vertical surfaces," as shown in Butler Figure 1 below. Ex1005, 3:10-12. Butler is a published PCT application that was filed January 17, 2007, and published July 26, 2007.



Ex1005, Fig. 1.

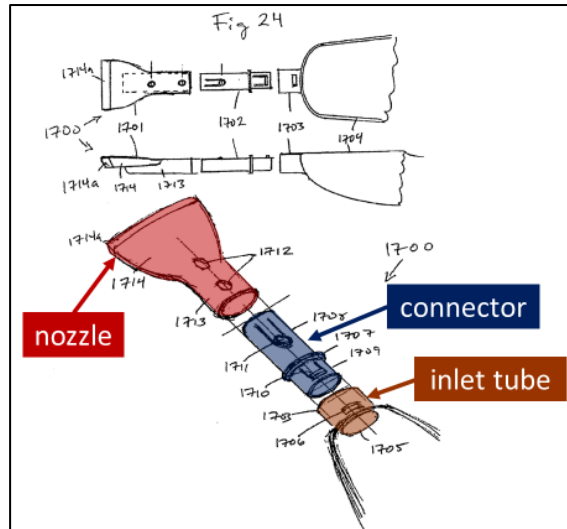
57. In my opinion, Butler is a single vacuum cleaner system that is configurable and optimizable for various use cases. Butler explains that its various components, including handles, grips, dirt receptacles, air filters, and cleaning tools, “may be interchangeable with one another to provide the user with various cleaning options,” and the arrangement of these components may be “used individually or in various other inventive combinations.” *Id.*, 16:25-29, 43:29-44:3; *see also id.*, 4:17-28, 18:22-28, 19:9-15, 34:12-13.

58. Butler’s improved vacuum cleaner comprises a “housing” with a “longitudinal axis,” “[a] fore grip” with a hand grip portion having a hand grip portion axis that intersects “[a] vacuum fan and a motor,” and “an air inlet” centrally positioned with respect to a “cyclone separator” front wall, as shown in the annotated image below:



Ex1005, Abstract, 3:10-12, 3:23-4:1, Claim 11, Fig. 5.

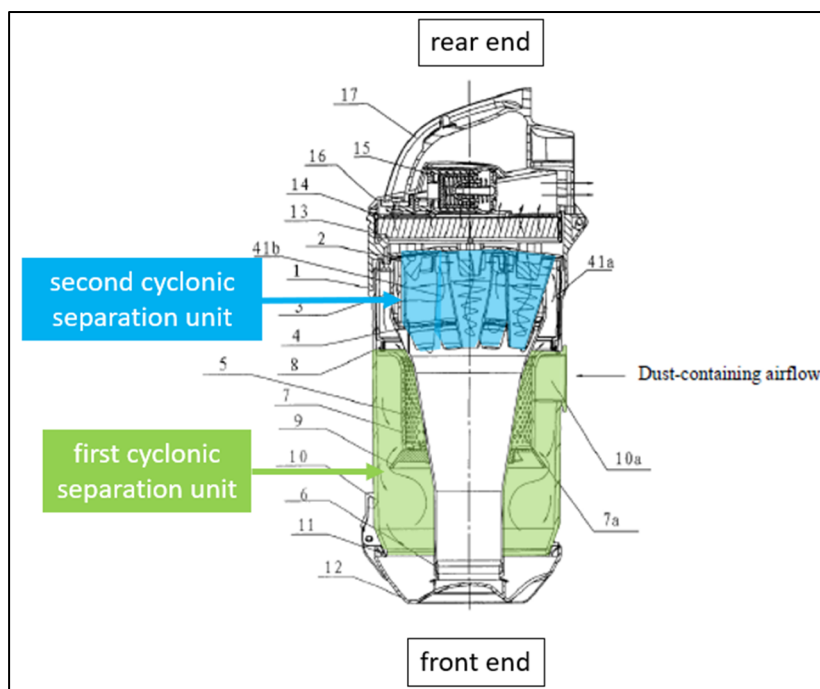
59. Butler further teaches various attachments that connect to the air inlet. *Id.* at 22:7-9.
60. Butler further describes a “**connector 1702**,” with an upstream “inlet portion 1708,” which is “telescopically received within the **nozzle 1701**,” and a downstream “outlet portion 1709,” which is “telescopically received within or around the **inlet tube 1703**,” as shown in the annotated image below:



Ex1005, 41:19-29, Fig. 24.

B. Peng

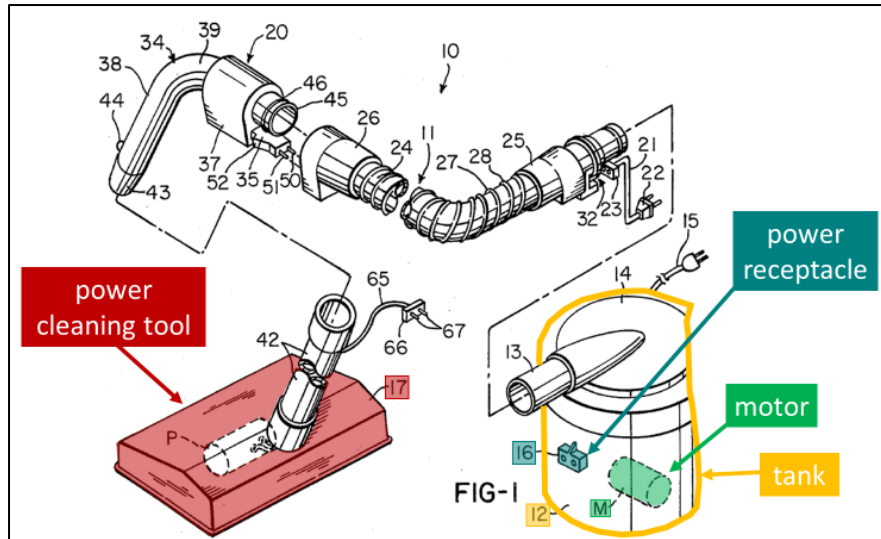
61. Peng is titled, Cyclone Separation Device and Cyclone Vacuum Cleaner Equipped with Same.” Ex1009, Title. It describes a “cyclone separation device” that includes a **first cyclonic separation unit** and a **second cyclonic separation unit**. Ex1009, 13. Peng is a Chinese patent that was filed on December 29, 2010, and published on September 7, 2011.
62. Peng describes two cyclonic stages that are arranged with a first cyclonic stage at the vacuum cleaner’s front end and a second cyclonic stage rearward of the first cyclonic stage, as shown in the annotated image below:



Id., Fig. 3.

C. Neroni

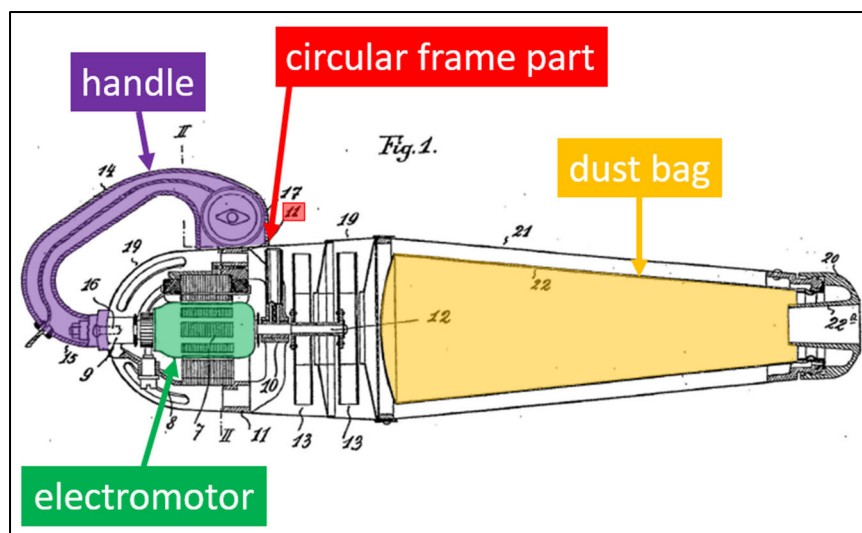
63. Neroni is titled “Vacuum Cleaning Tool Adapter with Electrical Control Means.” Ex1007, Title. It describes a vacuum cleaner with electrical connectors and cables that provide power to a powered surface cleaning head. Neroni is a U.S. patent that was filed on May 10, 1982, and issued October 2, 1984. Ex1007, Cover.
64. Neroni teaches a vacuum cleaner with a powered cleaning tool. Neroni’s vacuum powers the “**power cleaning tool 17**” by running electricity from the power cleaning tool to power “**receptacle 16A**, and to **motor M**,” located in separation “**tank 12**” as shown in the annotated image below:



Ex1007, 3:34-42, 6:42-45, Fig. 1.

D. Lehmann

65. Lehmann is titled “Improvements in Vacuum Cleaning and Dusting Apparatus”. Ex1006, Title. It describes a portable vacuum cleaner that is easy to manipulate. Lehmann is a U.K. patent that was filed on April 21, 1922, and issued March 22, 1923. Ex1006, Cover.
66. Lehmann’s vacuum has an “**electromotor 7**,” a “**dust bag 22**,” and an “**arched handle 14**” having an “end [17]” that “abut[s] radially against the **circular frame part 11**” of the vacuum cleaner main body, as shown in the annotated image below:



Ex1006, 1:63-67, 1:71-82, Fig. 1.

IX. CLAIM CONSTRUCTION

67. I am unaware of any claim construction determinations related to the '038 patent.
68. For purposes of this proceeding, I have been asked to consider and have considered whether the Challenged Claims are invalid as anticipated or obvious under their plain and ordinary meaning.

X. INVALIDITY OPINIONS: '038 PATENT

69. In my opinion, the Challenged Claims of the '038 patent are invalid based on the following references and combinations: claims 1-15 are rendered obvious by Butler; claims 1-15 are rendered obvious by the combination of Butler and Peng; claims 1-11 and 13-15 are rendered obvious by the combination of Lehmann and Peng; and claim 12 is rendered obvious by the combination of Lehmann, Peng, and Neroni.

70. As part of my obviousness analysis, I have considered the scope and content of the prior art, and whether any differences between the alleged invention and the prior art are such that the subject matter, as a whole, would have been obvious to a person having ordinary skill in the art at the time of the alleged invention, which I have been asked to assume was December 17, 2014, for the Challenged Claims of the '038 patent, as discussed above. I have also considered the level of ordinary skill in the pertinent art.
71. I describe in detail below the scope and content of the prior art, as well as any differences between the alleged invention and the prior art, on an element-by-element basis for each Challenged Claim of the '038 patent.

A. Ground 1: Butler Renders Claims 1-15 Obvious

1. A POSA Would Have Combined Butler's Teachings

72. To the extent PO argues that any of Butler's disclosures are not arranged as in the claims, in my opinion, a POSA would have had the expertise, the information from Butler's disclosure, and the motivation to have combined them. Butler explains that its various components are combinable and "may be interchangeable with one another to provide the user with various cleaning options," Ex1005, 16:25-29; and that "the present invention includes embodiments in which the features described herein are used

individually or in various other inventive combinations.” *id.*, 43:29-44:3.

73. For example, Butler identifies several interchangeable and combinable arrangements when describing its figures:

Figure 3 is a perspective view of a first alternative handle arrangement of the present invention.

Figure 4 is a perspective view of a second alternative handle arrangement of the present invention.

Figure 5 is a partially cut away side view of still another embodiment of a vacuum cleaner of the present invention.

Figure 6 is a partially cut away side view of another alternative handle arrangement of the present invention.

Figure 7 is a partially cut away side view of another alternative handle arrangement of the present invention.

Figure 8 is a schematic view of another alternative handle arrangement of the present invention.

Ex1005, 4:17-28

74. Butler also explains that its dirt receptacles are interchangeable and reconfigurable: “[t]he dirt receptacle 214 may also be omitted and replaced by a non-removable chamber within the housing.” Ex1005, 18:27-28.
75. Butler further explains that its grips are interchangeable to optimize vacuum ergonomics and efficiency:

In still other embodiments, the loop-shaped grips may be replaced by any combination of rear grip and foregrip that provide the user with hand positions to ergonomically maneuver the device and rotate it into different positions for cleaning horizontal and inclined surfaces. The looped foregrip may also be replaced by a grip having a single hand position that is suited to conveniently apply, in conjunction with the rear grip, a bending moment on the vacuum cleaner housing.

Ex1005, 19:9-15.

76. Butler explains that “[v]arious alternatives to the embodiments of Figures 14A and 14B are envisioned.” Ex1005, 34:12-13.
77. Butler further teaches that its components are readily optimizable and reconfigurable: “any other suitable variations to the foregoing embodiments may be practiced with the present invention.” Ex1005, 18:22-24.
78. In my opinion, combining Butler’s components would have been obvious because it would have involved combining prior art elements (e.g., hand vacuum handles, grips, filters, cleaning tools, and dust chambers) according to known methods to yield predictable results (ergonomic and efficient cleaning for different use cases), it would have involved a simple substitution of these known parts, which Butler expressly teaches are interchangeable, Ex1005, 16:25-29, and it would have involved applying

- known techniques (e.g., air filtration, attaching grips to a hand vacuum housing, and attaching cleaning tools to a hand vacuum air inlet).
79. Further, in my opinion optimizing Butler’s cleaner for different use cases by reconfiguring Butler’s interchangeable components would have at least been obvious to try as there are a finite number of identified, predictable solutions for arranging Butler’s well-known and interchangeable hand vacuum components.
 80. Also, in my opinion a POSA would have reasonably expected success, because these simple components (e.g., hand vacuum handles, grips, filters, cleaning tools, and dust chambers) were well-known in the art, and because Butler expressly teaches that they are interchangeable and that Butler’s hand vacuum can be optimally reconfigured based on use case.

2. Butler Renders Claim 1 Obvious

a. [1pre]

Reference Number	Claim Limitation
[1pre]	“A surface cleaning apparatus comprising:”

81. To the extent the preambles are limiting, in my opinion, Butler teaches a surface cleaning apparatus. (Limitation [1pre]).
82. Butler teaches a “vacuum cleaner” for cleaning various common “surfaces”:

The present invention provides a vacuum cleaner that can be used to clean floors and carpets, but is particularly adapted to clean stair treads or other elevated horizontal surfaces, stair risers and other inclined or vertical surfaces, and surfaces located in confines [*sic*] spaces.

Ex1005, Title, 7:2-5.

83. In my opinion a POSA would understand that Butler’s vacuum is a surface cleaning apparatus.

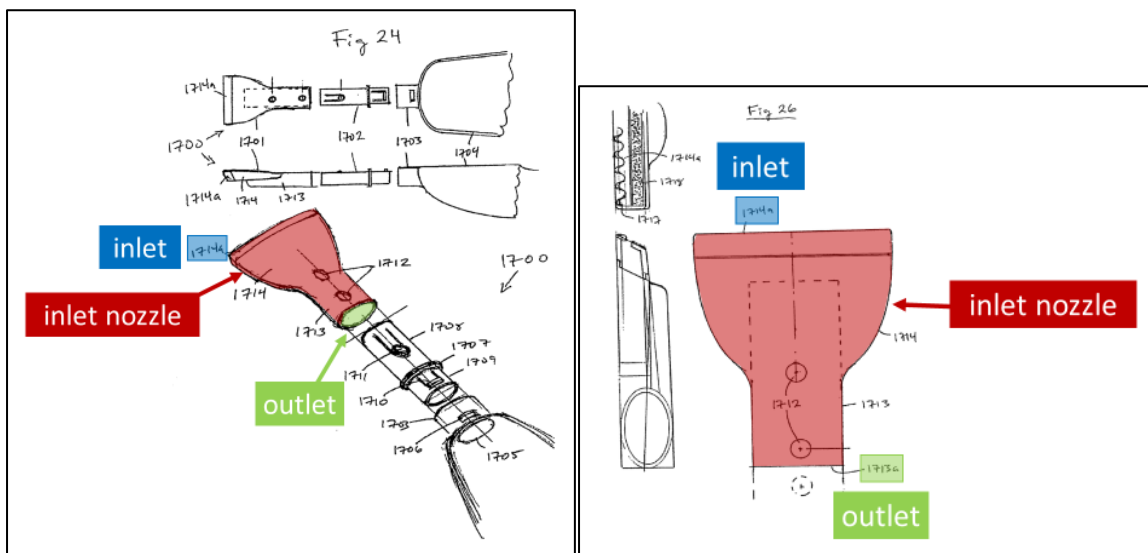
b. [1a]

Reference Number	Claim Limitation
[1a]	“(a) a surface cleaning head having a front end, a rear end, a dirt air inlet and a cleaning head air outlet;”

84. Butler teaches a surface cleaning head having a front end, a rear end, a dirt air inlet and a cleaning head air outlet. (Limitation [1a]).

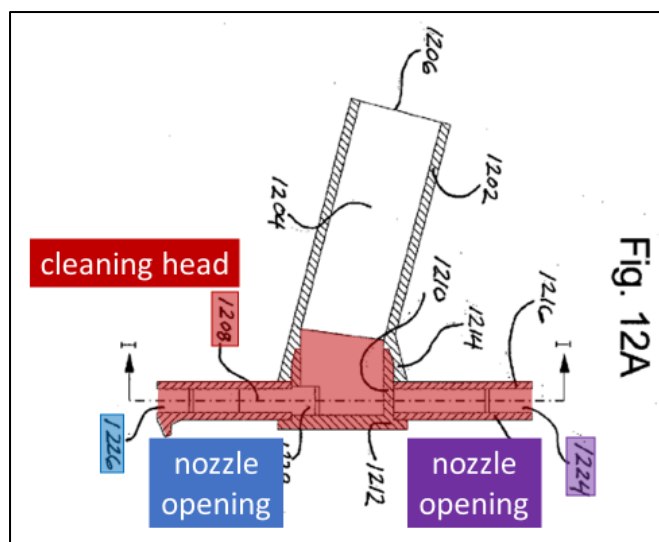
85. Butler teaches a variety of surface cleaning heads: “any type of cleaning device may be attached to the entry tube 524, such as an elongated cleaning head ... a crevice tool, a dusting attachment, a so-called powerhead having a rotating agitator” Ex1005, 22:7-9. In my opinion, a POSA would understand that each of these “cleaning device[s],” including an elongated cleaning head, crevice tool, dusting attachment, and powerhead are surface cleaning heads because they are at the end of the vacuum and clean surfaces.

86. In my opinion, each of these surface cleaning heads has a front and rear end. In my opinion, a POSA would understand that because each of these surface cleaning heads are three-dimensional objects, each has a front and rear end. For example, Butler teaches a surface cleaning head, “**inlet nozzle 1701**,” which, in my opinion, has a front end, “**inlet 1714a**,” and a rear end, “**outlet 1713a**,” as shown in the annotated images below:



Ex1005, 42:6-9, Figs. 24, 26.

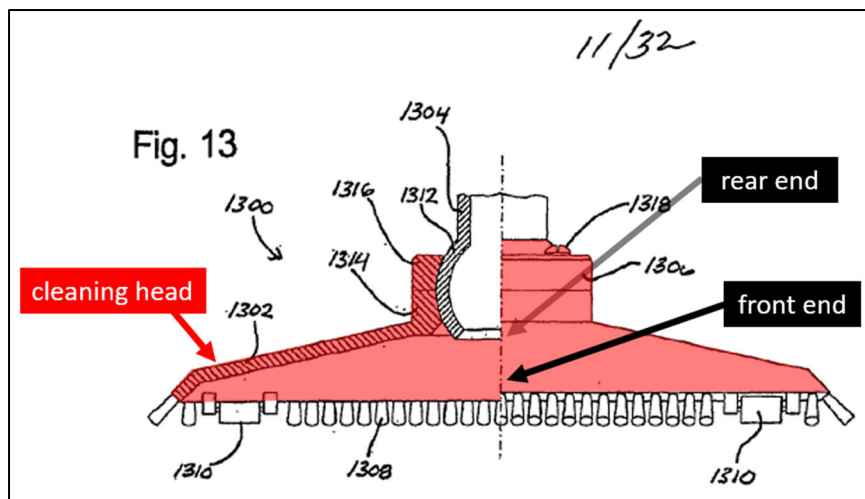
87. Further, Butler teaches another surface cleaning head, “**cleaning head 1208**,” with, in my opinion, a front end, “**nozzle opening 1226**,” and a rear end, “**nozzle opening 1224**,” as shown in the annotated image below:



Ex1005, 31:24-27, Fig. 12A.

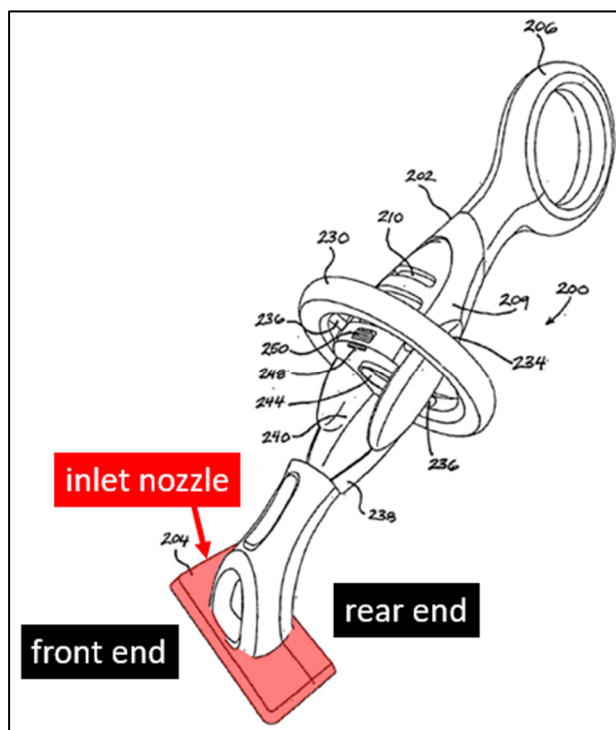
88. Butler teaches another “**cleaning head 1302**” that has “a generally rectangular body” with bristles extending downwards from the “outer perimeter of the **head 1302**.” Ex1005, 32:10-12. In my opinion, Butler’s “**cleaning head 1302**” has a front end and a rear end, with the front end extending out of the page and the rear end extending into the page, as shown in the annotated image below:¹

¹ Annotated text in black-filled boxes is the '038 patent's claim language, and text in colored boxes is disclosure from the cited reference.



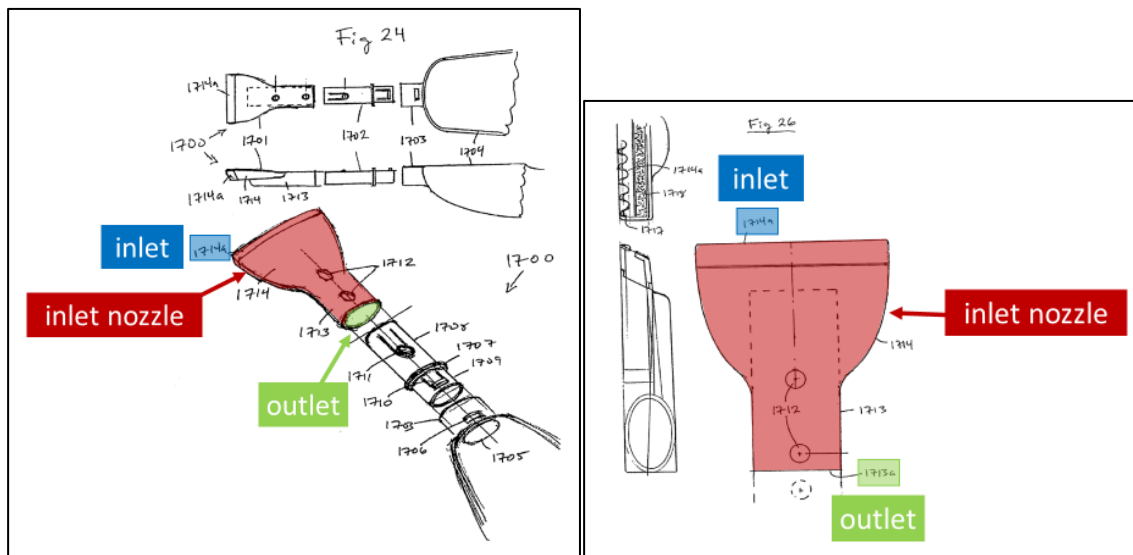
Id., Fig. 13, 32:8-12.

89. Butler teaches another cleaning head, “**inlet nozzle 204**.” Ex1005, 15:19-22. In my opinion, Butler’s “**inlet nozzle 204**” has a front end and a rear end, as shown in the annotated image below:



Ex1005, Fig. 2A, 15:19-22, 16:4-13.

90. In my opinion, each of Butler's surface cleaning heads have a dirt air inlet and a cleaning head air outlet. In my opinion, a POSA would understand that each surface cleaning head has a dirt air inlet where dirty air enters the surface cleaning head, and a cleaning head air outlet to deliver that dirty air to the vacuum, which separates the dirt from the air. For example, Butler teaches that air flows into "**inlet nozzle 1701**" at "**inlet 1714a**" and exits "**outlet duct 1713**" at "**outlet 1713a** for the **inlet nozzle 1701**," as shown in the annotated images below:



Ex1005, 42:6-9, Figs. 24, 26.

91. In my opinion, a POSA would understand that Butler's "**inlet 1714a**" is a dirt air inlet and that Butler's "**outlet 1713a**" is a cleaning head air outlet.
92. Similarly, for the surface cleaning head shown in Butler Figure 12A, air flows into "**nozzle opening 1226**," through the "**cleaning head 1208**," to

an “**end** to a cleaning head 1208” that is “attach[ed]” to “**grip 1202**,” as shown in the annotated image below:

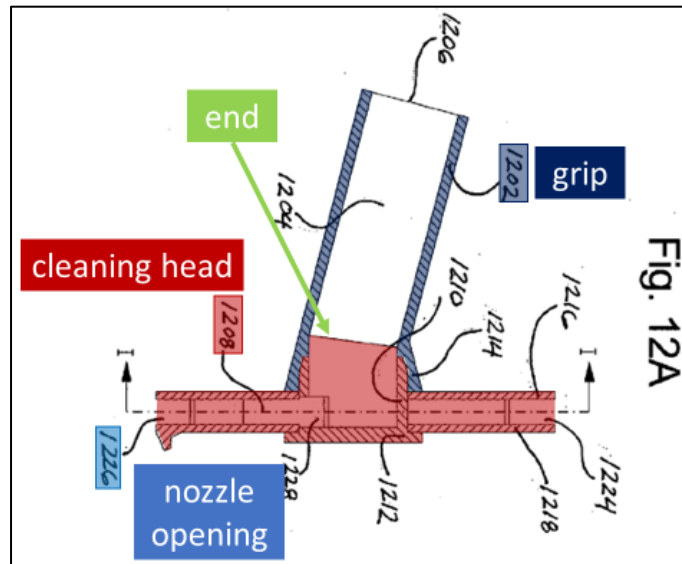
Another embodiment of an inlet nozzle of the present invention is shown in Figures 12A and 12B. Figure 12A is a cut away side view of an inlet nozzle 1200 shown along reference line H-II of Figure 12B, and Figure 12B is a cut away front view of the inlet nozzle 1200 shown along reference line I-I. According to this embodiment, the inlet nozzle 1200 comprises a tubular grip 1202 having a vacuum passage 1204 extending therethrough. The grip 1202 terminates at one end at an opening 1206 for attaching to a vacuum cleaner, and at the other end to a cleaning head 1208.

The cleaning head 1208 is mounted to a boss 1210 located at the end of the grip 1202. The boss 1210 has a cylindrical exterior profile, with a portion of the profile being removed to form a boss opening 1228 that opens into the vacuum passage 1204. The cleaning head 1208 is retained in the axial direction between two flanges 1212 and 1214. As such, the cleaning head 1208 can be rotated about the boss 1214, but the flanges 1212 and 1214 prevent axial movement or inadvertent removal of the cleaning head 1208.

The cleaning head 1208 comprises two generally parallel trapezoidal plates 1216 and 1218 that are held together by sidewalls 1220 and/or interior walls 1222. The sidewalls 1220 and interior walls 1222 are positioned and shaped to form a first nozzle opening 1224 at one end of the cleaning head 1208, and a second nozzle opening 1226 at the opposite end of the cleaning

head 1208. Each nozzle opening 1224, 1226 comprises an air passage, formed between the plates 1216, 1218 and interior walls 1222, that leads to the rotational center of the cleaning head 1208. As such, the first and second nozzle openings 1224, 1226 can be selectively placed in communication with the vacuum passage 1204 by rotating the cleaning head 1208 to align the desired nozzle opening air passage with the boss opening 1228.

Ex1005, 31:3-27.



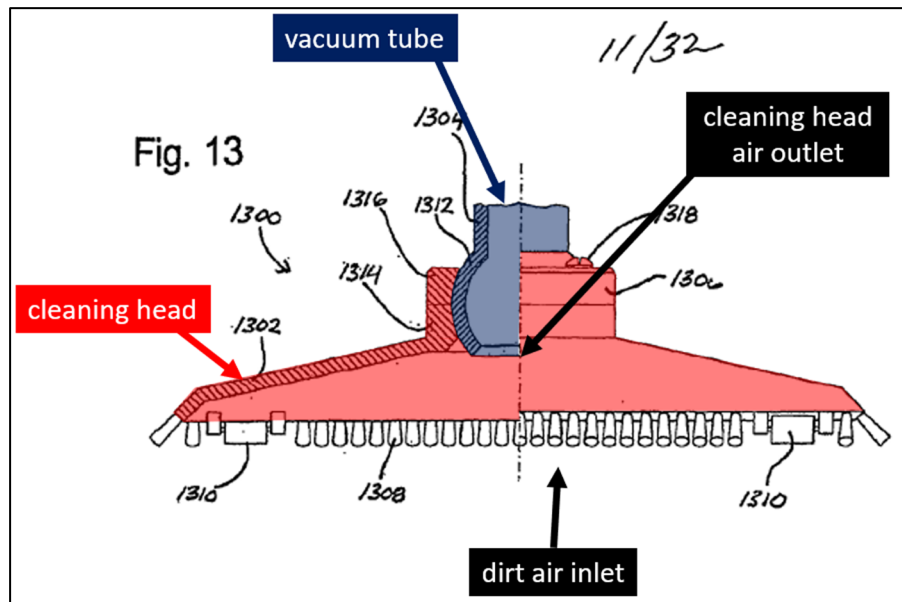
Id., Fig. 12A.

93. In my opinion, a POSA would understand that Butler’s “**nozzle opening 1226**” is also a dirt air inlet and Butler’s “cleaning head 1208” “**end**” is also a cleaning head air outlet.
94. Further, Butler’s “**cleaning head 1302**” has a dirt air inlet (which, in my opinion, is where the bristles are located), and a cleaning head air outlet (which, in my opinion, is where the “**cleaning head 1302**” attaches “to a

vacuum tube 1304”), as shown in the annotated image below:

Referring now to Figure 13, still another inlet nozzle 1300 of the present invention comprises a cleaning head 1302 that is pivotally attached to a vacuum tube 1304 by a ball-and-socket joint 1306. In this embodiment, the cleaning head 1302 comprises a generally rectangular body having a number of cleaning bristles 1308 extending downwardly from the outer perimeter of the head 1302.

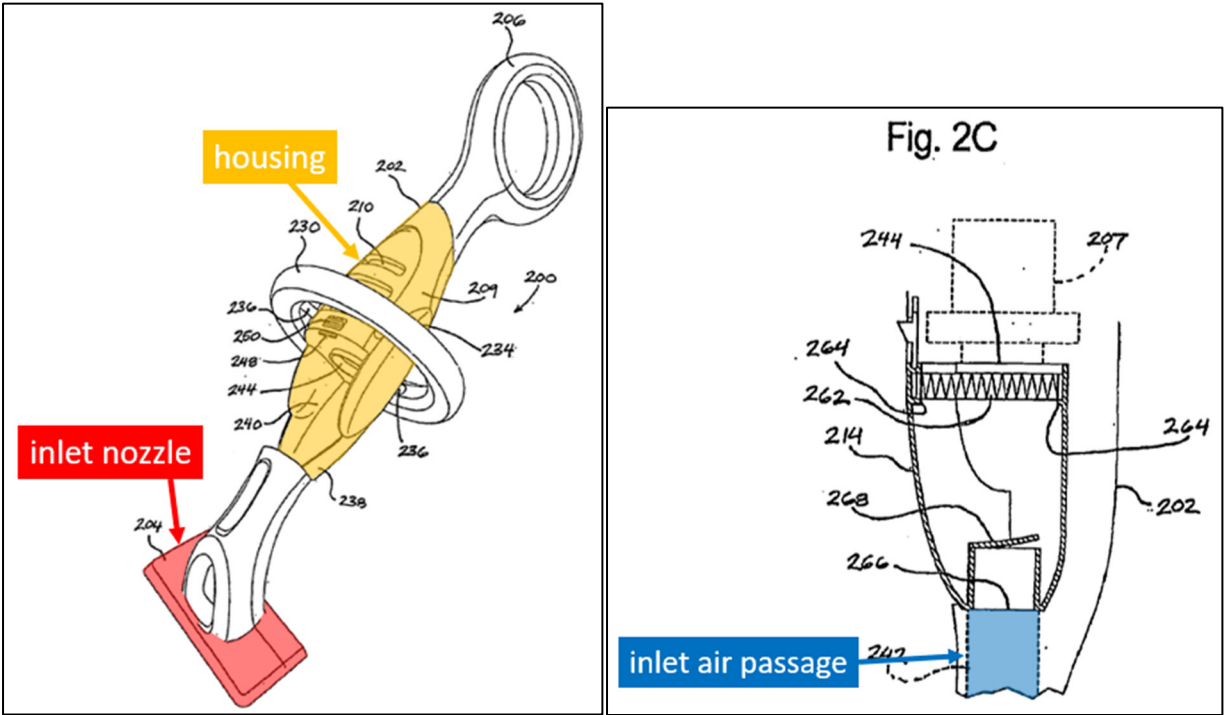
Ex1005, 32:8-12.



Id., Fig. 13.

95. For the surface cleaning head shown in Figure 2A, in my opinion, a POSA would understand that air flows into the “**inlet nozzle 204**” and exits into “**inlet air passage 242**” that attaches to “**housing 202**.” In my opinion, a POSA would further understand that the opening of the “**inlet nozzle 204**”

facing the ground is a dirt air inlet and the area where air flows out of “**inlet nozzle 204**” and into the “**inlet air passage 242**” is a cleaning head air outlet, as shown in the annotated images below:



Ex1005, Figs. 2A, 2C, 15:19-22, 16:4-13.

c. [1b.1]

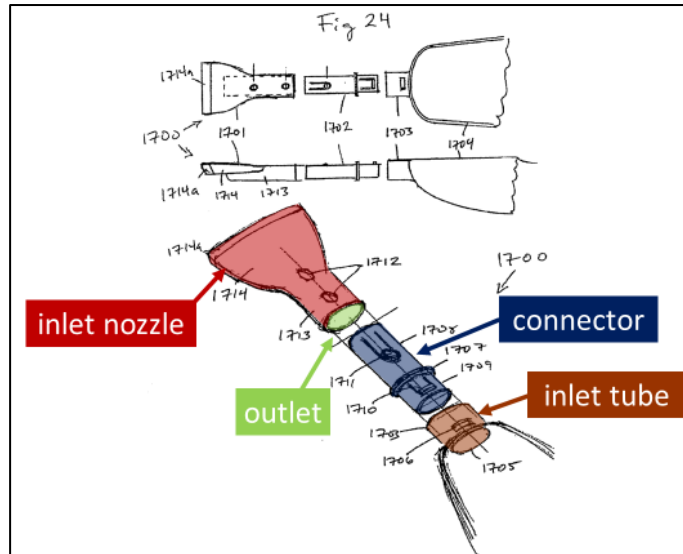
Reference Number	Claim Limitation
[1b.1]	“(b) a rigid air flow conduit having a rigid wand inlet end having an air inlet in communicable with the cleaning head air outlet, a rigid wand outlet end and a longitudinally extending conduit axis”

96. Butler teaches a rigid air flow conduit having a rigid wand inlet end having an air inlet in communicable with the cleaning head air outlet, a rigid wand outlet end and a longitudinally extending conduit axis. (Limitation [1b.1]).

97. In my opinion, Butler teaches rigid tubes that connect Butler's surface cleaning heads and Butler's vacuum cleaner air inlet, which, in my opinion, a POSA would understand are rigid airflow conduits. For example, Butler teaches that “**nozzle connector 1702**” connects Butler's “**inlet nozzle 1701**” and “**inlet tube 1703**,” as shown in the annotated image below:

Referring now to Figures 24-27, an example of a preferred inlet assembly 1700 is illustrated. This inlet assembly 1700 can be used with any combination of the embodiments described herein. The preferred inlet assembly 1700 comprises an inlet nozzle 1701, a nozzle connector 1702, and an inlet tube 1703 located on the housing 1704. The nozzle connector 1702 is secured to the inlet tube 1703 and the inlet nozzle 1701 is selectively secured to the connector 1702. The inlet nozzle 1701 is secured to the connector 1702 in at least one position, but preferably in two or more different axial and/or radial positions.

Ex1005, 41:7-14.



Id., Fig. 24.

98. In my opinion, a POSA would understand that Butler’s “**connector**” is a rigid air flow conduit at least because air passes through it (specifically, from “**outlet 1713a** for the **inlet nozzle 1701**” to the “**inlet tube 1703**”), and that Butler’s “**connector**” is made of rigid material, such as a rigid plastic. For example, Butler teaches that “[t]he rear grip 106, and any other part of the vacuum cleaner 100, may be made from any suitable material, such as ABS plastic ... other plastics, metal, and so on” and that “[p]lastics are generally preferred as a relatively inexpensive, moldable and structurally rigid material.” Ex1005, 11:3-6.
99. In my opinion, Butler’s “**connector**” has a rigid wand inlet end having an air inlet that communicates with the cleaning head air outlet. In my opinion, the upstream end of Butler’s “**connector**” is a rigid wand inlet

end with an air inlet at least because that is where air enters the “connector” from “outlet 1713a for the inlet nozzle 1701” (which, in my opinion, is the cleaning head air outlet), as shown in the annotated images below:

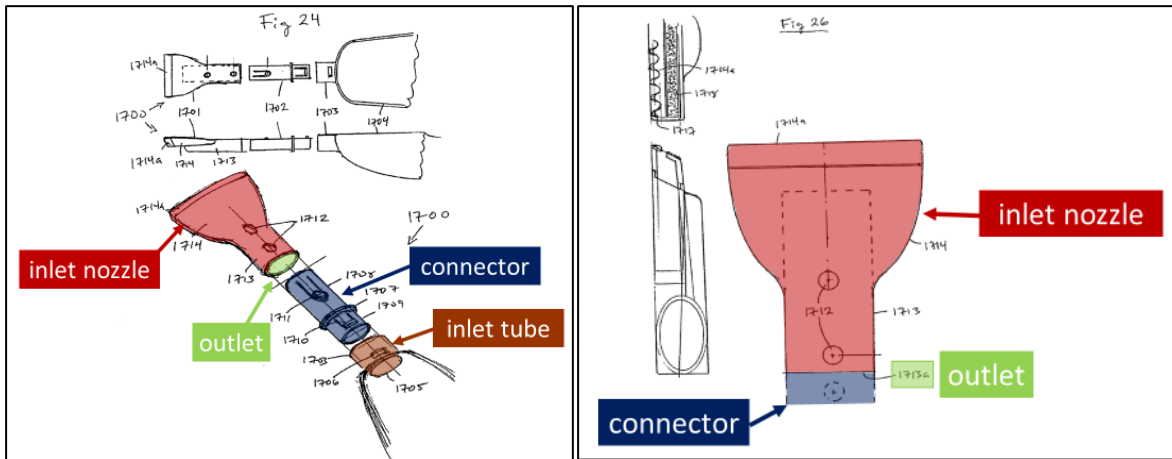
Referring now to Figures 24-27, an example of a preferred inlet assembly 1700 is illustrated. This inlet assembly 1700 can be used with any combination of the embodiments described herein. The preferred inlet assembly 1700 comprises an inlet nozzle 1701, a nozzle connector 1702, and an inlet tube 1703 located on the housing 1704. The nozzle connector 1702 is secured to the inlet tube 1703 and the inlet nozzle 1701 is selectively secured to the connector 1702. The inlet nozzle 1701 is secured to the connector 1702 in at least one position, but preferably in two or more different axial and/or radial positions.

The inlet tube 1703 comprises a hollow tube 1705 with an aperture 1706 on the side. It is preferably integrally formed with the housing 1704 and provides fluid communication between the vacuum dust receptacle (not shown) and the rest of the nozzle assembly 1700.

Referring to Figure 25, the connector 1702 is a hollow tube that preferably comprises an oval shaped cross-section to prevent rotation, but may comprise other anti-rotation features, or be allowed to rotate, if desired. The connector 1702 is divided into two portions by a collar 1707: an inlet portion 1708 and an outlet portion 1709. The outlet portion 1709 is telescopically received

within or around the inlet tube 1703 and includes a cantilever tab 1710 that fits into the inlet tube aperture 1706. The tab 1710 and aperture 1706 prevent the connector 1702 from backing out of the inlet tube 1703. The inlet portion 1708 of the connector 1702 is telescopically received within the nozzle 1701 and comprises a flexible nozzle-attaching tab 1711 that corresponds to one or more apertures 1712 in the nozzle 1701 to secure the nozzle 1701 to the connector 1702.

Ex1005, 41:8-29.



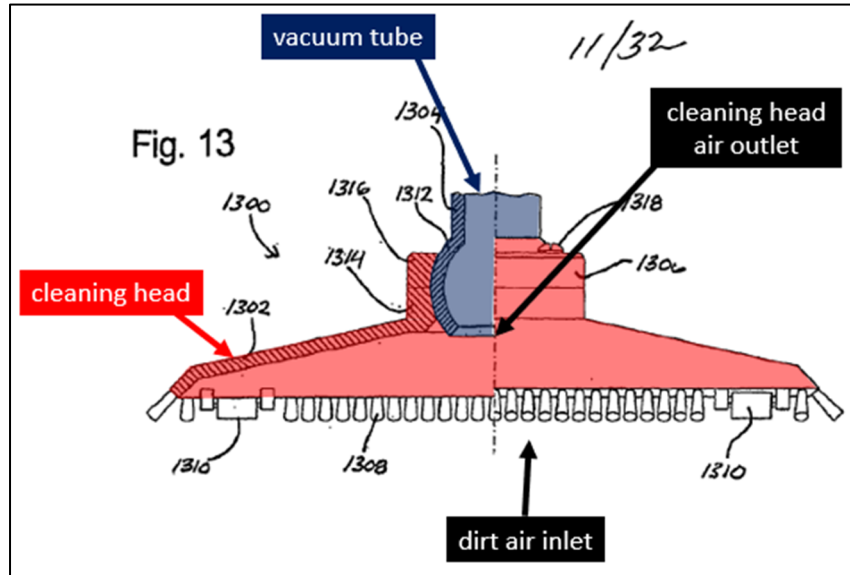
Id., Figs. 24, 26.

100. In my opinion, Butler’s “**connector**” has a rigid wand outlet end at the downstream end of the “**connector**,” where it connects to the “**inlet tube**,” as shown above, at least because this is where air exits the “**connector**.”

Ex1005, Fig. 24.

101. Butler also teaches “**vacuum tube 1304**,” which is attached to “**cleaning head 1302**.” Ex1005, 32:8-10. In my opinion, Butler’s “**vacuum tube**

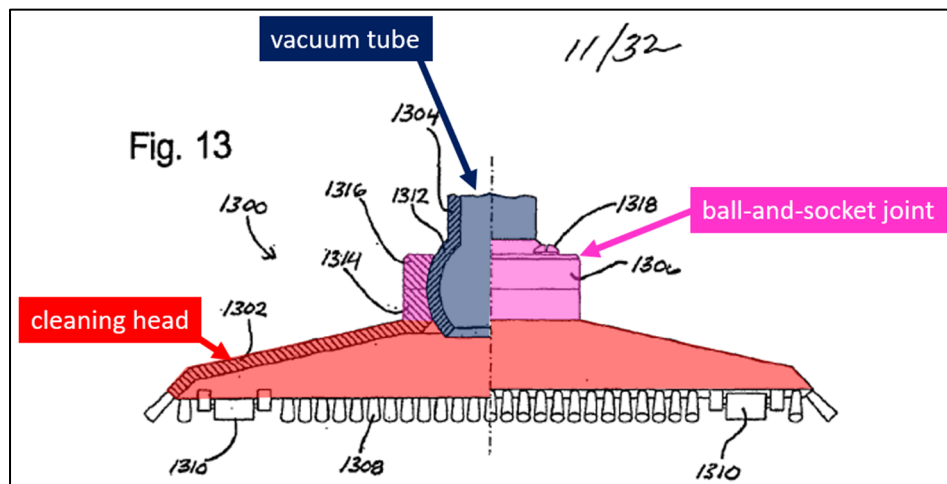
1304” is also a rigid air flow conduit having a rigid wand inlet that communicates with the cleaning head air outlet and has a rigid wand outlet end, for the same reasons as for Butler’s “**connector**,” as shown in the annotated image below:



Ex1005, 32:8-14, Fig. 13.

102. In my opinion, Butler’s **connector/vacuum tube** has a longitudinally extending conduit axis, as shown in the annotated images below:

103. Butler teaches the rigid air flow conduit is moveably mountable to the surface cleaning head between an upper position and an in-use floor cleaning position in which the rigid air flow conduit extends at an angle to the vertical. (Limitation [1b.2]).
104. In my opinion, Butler teaches that its **connector/vacuum tube** (which, in my opinion, is the rigid air flow conduit) is moveably mounted to the surface cleaning head using a pivotable joint. For example, Butler’s “**cleaning head 1302** ... is pivotally attached to a **vacuum tube 1304**,” which includes “a **generally spherical end portion 1312**,” by a **ball-and-socket joint 1306**,” as shown in the annotated image below:



Ex1005, Fig. 13, 32:8-10.

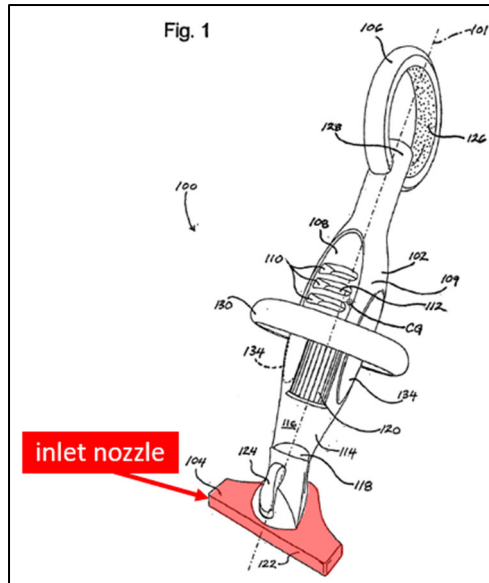
105. Butler explains that, “[u]sing this construction, the **vacuum tube 1304** can be rotated relative to the cleaning head 1302 in any direction” Ex1005, 32:21-22. In my opinion, a POSA would understand that this “ball-and-

socket joint” is a moveable mount between Butler’s “vacuum tube” (which, in my opinion, is the rigid air flow conduit) and the “cleaning head” (which, in my opinion, is the surface cleaning head) because it allows the vacuum tube and cleaning head to pivot relative to each other while maintaining a physical and an air-flow connection.

106. In my opinion, Butler teaches other moveable mounts between its surface cleaning head and rigid air flow conduit. For example, Butler teaches a “rotatable inlet nozzle,” including “**inlet nozzle 104**” (which, in my opinion, is the surface cleaning head) which is “rotatably mounted to the housing” (in my opinion, via the rigid airflow conduit) to allow for movement between them that is “typically found in conventional upright vacuums,” as shown in the annotated image below:

The inlet nozzle 104 may also be rotatably mounted to the housing 102 so that the angle between its working surface and the housing 102 can be changed. For example, the inlet nozzle 104 may be pivotable about an axis perpendicular to the longitudinal axis 101 of the housing 102. Such pivoting would allow the leading edge of the inlet nozzle 104 to move vertically with respect to the rear edge of the inlet nozzle 104 (or vice-versa), such as typically found in conventional upright vacuums.

Ex1005, 10:3-9.



Id., Fig. 1.

107. Butler further teaches that “various combinations of pivots” may be used for “more complex rotation capabilities,” which, in my opinion, are known in the art. Ex1005, 10:3-15.
108. For example, Butler teaches a “flexible nozzle-attaching tab” to moveably mount the rigid air flow conduit to the surface cleaning head. Ex1005, 41:26-42:1. Butler’s “inlet nozzle 1701” (which, in my opinion, is the surface cleaning head)—and “nozzle connector 1702” (which, in my opinion, is the rigid air flow conduit) may be connected using a “flexible nozzle-attaching tab 1711” that secures the “nozzle 1701 to the connector 1702” and Butler teaches that an “operator can depress this tab 1711 to ... move the nozzle 1701 between multiple axial or radial positions on the connector 1702”:

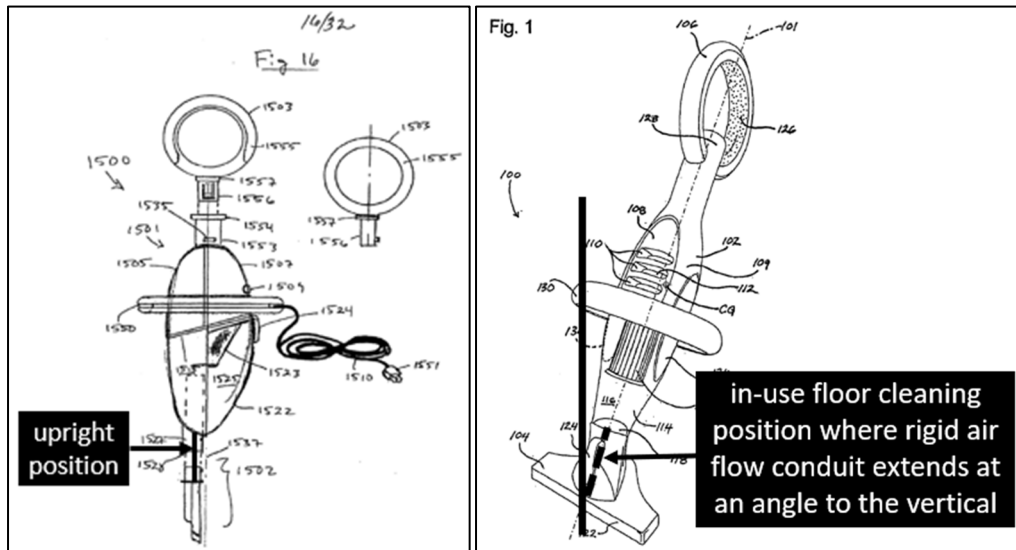
The inlet portion 1708 of the connector 1702 is telescopically received within the nozzle 1701 and comprises a flexible nozzle-attaching tab 1711 that corresponds to one or more apertures 1712 in the nozzle 1701 to secure the nozzle 1701 to the connector 1702. Preferably, the operator can depress this tab 1711 to remove the nozzle 1701 from the connector 1702, or move the nozzle 1701 between multiple axial or radial positions on the connector 1702.

Id., 41:8-11, 41:26-42:1.

109. In my opinion, Butler teaches that the rigid air flow conduit is moveably mountable to the surface cleaning head between an upright position and an in-use floor cleaning position in which the rigid air flow conduit extends at an angle to the vertical. In my opinion, a POSA would understand that each of Butler's moveable mounts, including the "ball-and-socket joint 1306," the "tab," and the moveable mount used in Butler's "rotatable inlet nozzle," allows Butler's rigid air flow conduit to move between an upright position and an in-use floor cleaning position in which the rigid air flow conduit extends at an angle to the vertical.
110. For example, Butler teaches that the connector/vacuum tube can be "rotated relative to the cleaning head 1302 in any direction," which, in my opinion, a POSA would understand includes an upright position and an in-use position in which the rigid air flow conduit extends at an angle to the

- vertical. Ex1005, 10:3-9, 32:15-24, 41:8-11, 41:26-42:1.
111. Butler also teaches a “rotatable inlet nozzle” that is “rotatably mounted to the housing,” and further teaches that the surface cleaning head can take “multiple axial or radial positions on the connector 1702,” which, in my opinion, a POSA would understand includes upright positions, like those “typically found in conventional upright vacuums,” and in-use positions in which the rigid air flow conduit extends at an angle to the vertical. Ex1005, 10:3-9, 32:15-24, 41:8-11, 41:26-42:1.
112. Butler further teaches that a user can “point the inlet nozzle 104 horizontally to clean surfaces such as stair treads, vertically to clean surfaces such as stair risers, or at any angle in between” when discussing the dexterity of the vacuum. Ex1005, 12:3-10. Because Butler’s surface cleaning head can also be attached to Butler’s rigid air flow conduit using a ball-and-socket joint, it can be “rotated,” and can be used in “multiple axial or radial positions” and at “any angle,” including horizontally and vertically, in my opinion, a POSA would understand that Butler teaches a rigid air flow conduit that is moveably mountable to the surface cleaning head between an upright position and an in-use floor cleaning position in which the rigid air flow conduit extends at an angle to the vertical.
113. Further, in my opinion, Butler teaches that its moveable mounting allows

the cleaner to pivot between an upright position, as depicted, for example, in Butler Figure 16, and the claimed in-use floor cleaning position in which the rigid air flow conduit extends at an angle to the vertical, as Butler depicts in Figure 1, and as shown in the annotated images below:



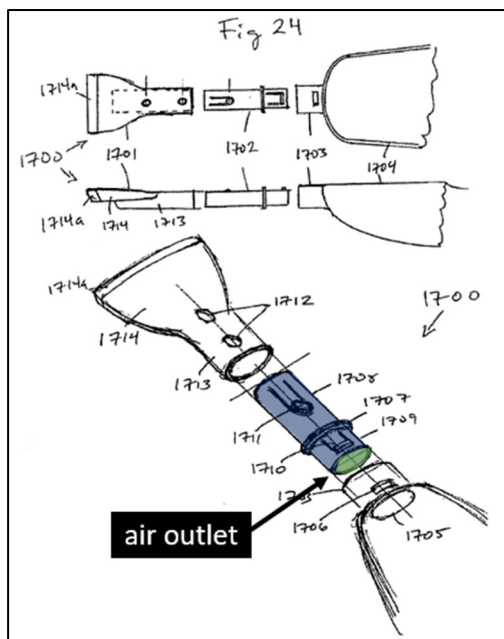
Ex1005, Figs. 1, 16.

e. [1b.3]

Reference Number	Claim Limitation
[1b.3]	“the rigid wand outlet end having an air outlet; and,”

114. Butler teaches the rigid wand outlet end having an air outlet. (Limitation [1b.3]).

115. In my opinion, a POSA would understand that Butler’s rigid wand outlet end has an air outlet where it connects to the hand vacuum, as shown in the annotated image below:



Ex1005, Fig. 24, 41:19-29.

116. In my opinion, a POSA would further understand that Butler’s “vacuum tube” likewise includes a rigid wand outlet end having an air outlet, for the same reasons.

f. [1c]

Reference Number	Claim Limitation
[1c]	“(c) a hand vacuum cleaner removably mountable to the rigid wand outlet end, the hand vacuum cleaner having a front end, a rear end, and upper end, a lower end and a hand vacuum cleaner air inlet, the hand vacuum cleaner comprising:”

117. Butler teaches a hand vacuum cleaner removably mountable to the rigid wand outlet end, the hand vacuum cleaner having a front end, a rear end, and upper end, a lower end and a hand vacuum cleaner air inlet. (Limitation [1c]).

118. Butler teaches “a vacuum cleaner” that is designed to be used by hand and is a hand vacuum cleaner. Ex1005, Title, Fig. 1. Butler’s vacuum cleaner includes a “**rear grip**” and “one or more **foregrips**,” and Butler teaches a range of “compact” sizes, including a distance between the foregrip and the rear grip of six inches, and an overall vacuum length of eighteen inches, as shown in the annotated image below:

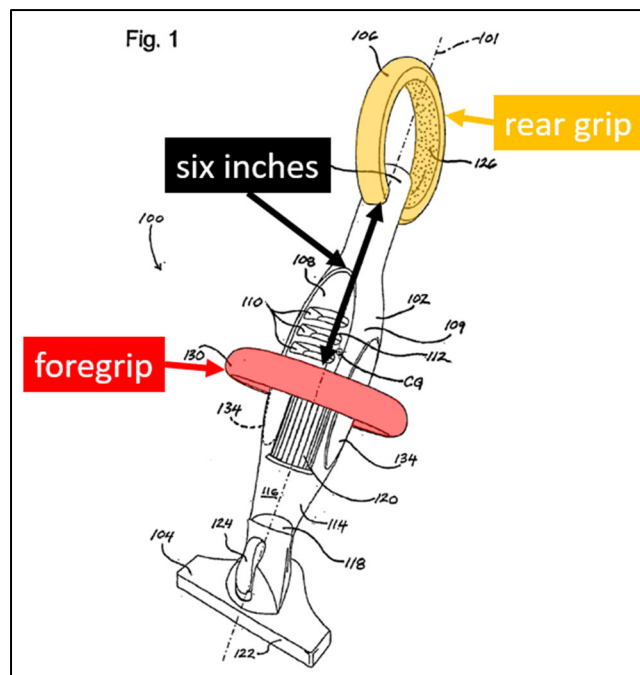
Considering the general build of many users, in one embodiment, the distance between the grips is about six to thirty inches. In a more preferred embodiment, the foregrip 130 is spaced from the most distant graspable portion of the rear grip 106 by about eight to twenty-four inches. These distances are expected to allow the user to comfortably grasp both grips and operate the vacuum cleaner 100 at about a 30 to 60 degree angle on the surface being cleaned, while remaining in a generally upright, comfortable standing position.

Ex1005, 15:5-11.

Embodiments of the present invention address these shortcomings by providing a relatively compact vacuum cleaner that is long enough to allow typical users to clean elevated stairs without excessive stooping, yet short enough to still provide ergonomic grip and control of the device, and the ability to maneuver in tight spaces, such as enclosed stairwells. As an ancillary benefit, this length may also prove to be better adapted for cleaning in confined spaces, such as closets. In a preferred

embodiment, the vacuum cleaner of the present invention has an overall length of about 18 to 46 inches, and more preferably about 20 to 24 inches.

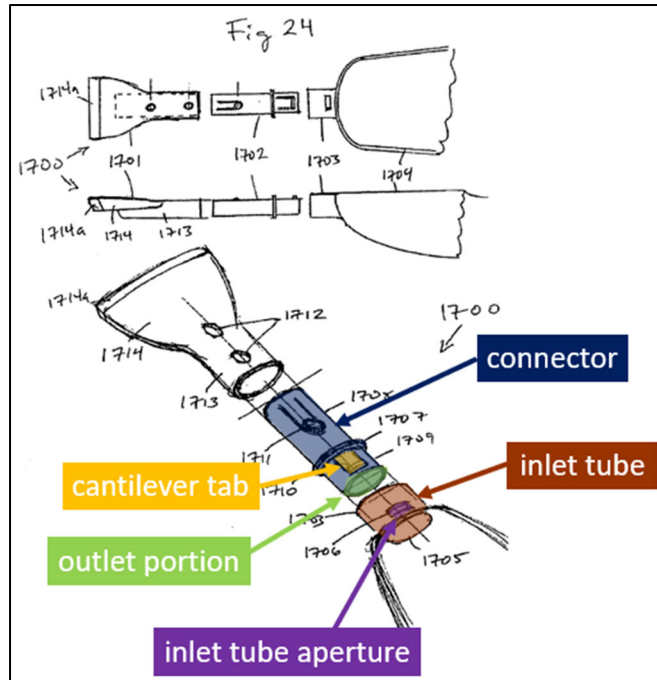
Id., 26:1-10.



Id., Fig. 1.

119. Further, Butler teaches that its vacuum cleaner is “compact” and “maneuver[able],” “adapted for cleaning ... stairwells and other confined spaces,” and teaches telescoping handgrip members and extension tubes to reach the floor. Ex1005, Abstract, 1:2-3, 26:1-5, 27:12-29. These extension members would commonly be used in hand vacuum cleaners. Moreover, Butler’s vacuum cleaner is designed to have an optimal “center of gravity” and to “remov[e] excess weight,” Ex1005, 13:1-19, 15:12-18.

120. A POSA would understand that center of gravity position, and weight are considerations that are crucial to hand vacuum cleaners, particularly since a hand vacuum is expected to be picked up and moved from place to place during use, not just during storage, so removal of excess weight and optimization of balance are important to minimizing exertion and effort while maximizing comfort. Furthermore, optimization of weight and balance provides the most maneuverability for users of the device. For example, a hand vacuum cleaner that had a sub-optimal center of gravity could disadvantageously create strain on a user's hand and wrist during use. A hand vacuum cleaner that was excessively heavy would be fatiguing for a user. Similarly, a hand vacuum cleaner that has a sub-optimal center of gravity, i.e., one that is unfavorably far from the hand, can also have the same effect on a user as an excessively heavy vacuum.
121. In my opinion, Butler teaches that its hand vacuum cleaner is removably mountable to the rigid wand outlet end via the hand vacuum cleaner's **"inlet tube,"** as shown in the annotated image below:



Ex1005, 41:19-29, Fig. 24.

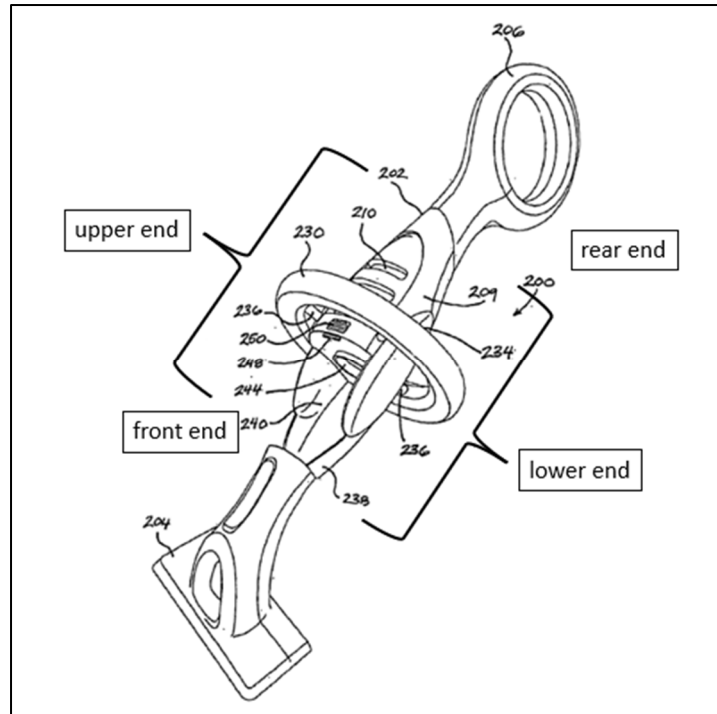
122. Specifically, Butler teaches that “**connector 1702**”—Butler’s rigid air flow conduit—has “an inlet portion 1708 and an **outlet portion 1709**” (which, in my opinion, is the rigid wand outlet end, *see* Ground 1, Limitation [1b.1]), which is “telescopically received within or around the “**inlet tube 1703**” of Butler’s hand vacuum cleaner:

Referring to Figure 25, the connector 1702 is a hollow tube that preferably comprises an oval shaped cross-section to prevent rotation, but may comprise other anti-rotation features, or be allowed to rotate, if desired. The connector 1702 is divided into two portions by a collar 1707: an inlet portion 1708 and an outlet portion 1709. The outlet portion 1709 is telescopically received within or around the inlet tube 1703 and includes a cantilever tab

1710 that fits into the inlet tube aperture 1706. The tab 1710 and aperture 1706 prevent the connector 1702 from backing out of the inlet tube 1703. The inlet portion 1708 of the connector 1702 is telescopically received within the nozzle 1701 and comprises a flexible nozzle-attaching tab 1711 that corresponds to one or more apertures 1712 in the nozzle 1701 to secure the nozzle 1701 to the connector 1702.

Ex1005, 41:19-29.

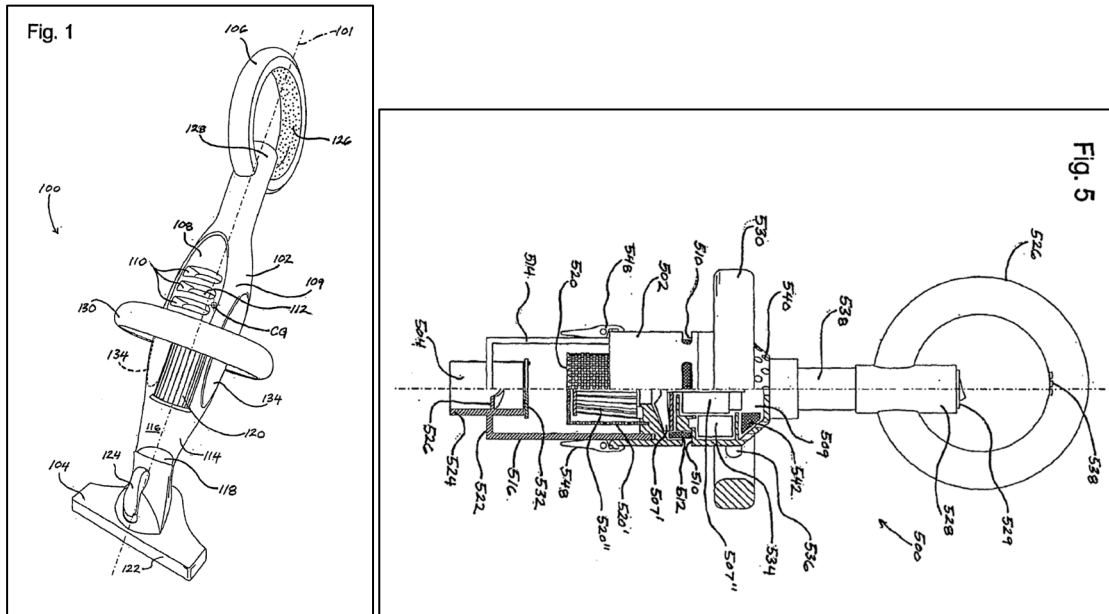
123. In my opinion, Butler further teaches that this mounting its removeable: in my opinion, a POSA would understand that the mounting includes a “cantilever tab 1710” that fits into the “inlet tube aperture 1706” of the hand vacuum cleaner and a user can depress the “cantilever tab 1710” clicking it out of the “inlet tube aperture 1706” to remove the “connector 1702” from the hand vacuum cleaner. Ex1005, 41:19-26. In my opinion, a POSA would further understand that Butler’s “vacuum tube” has the same functionality and therefore satisfies these limitations for the same reasons. Ex1005, Fig. 13.
124. In my opinion, Butler’s hand vacuum cleaner has a front end, a rear end, an upper end and a lower end as shown in the annotated image below:



Ex1005, Fig. 2A.

125. Butler teaches its hand vacuum cleaner includes a “housing 102 having an inlet nozzle 104 at a first end of the housing 102,” which is at the front end, and “a rear grip 106 at a second end of the housing 102,” which is at the rear end of the hand vacuum cleaner. In my opinion, a POSA would understand that because Butler’s hand vacuum cleaner is a three-dimensional object having front and rear ends, it would also have an upper end and a lower end as shown.
126. Butler teaches that the hand vacuum cleaner has a hand vacuum cleaner air inlet. Butler teaches that the hand vacuum cleaner’s “inlet tube 1703 comprises a hollow tube 1705,” which is “preferably integrally formed

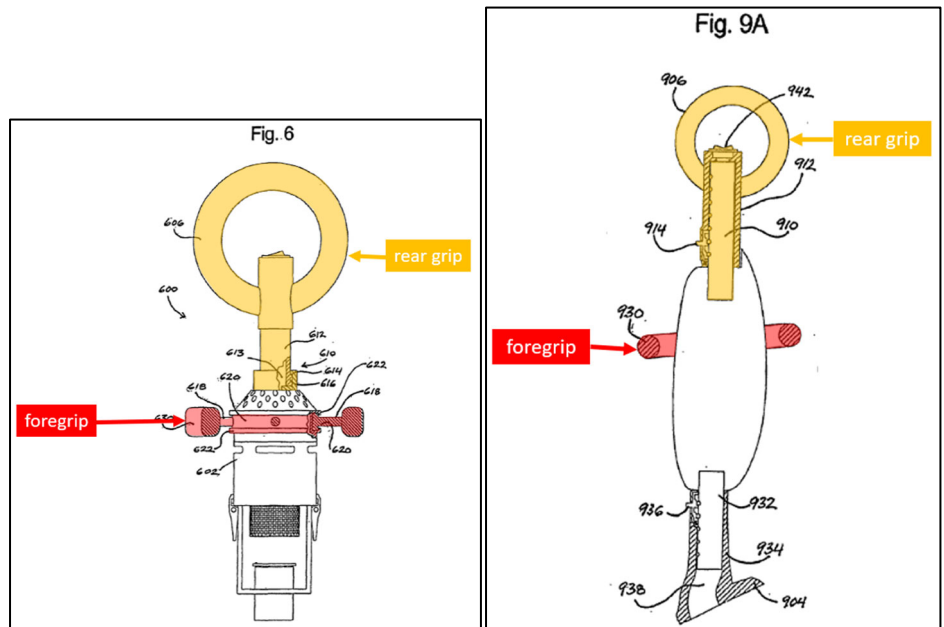
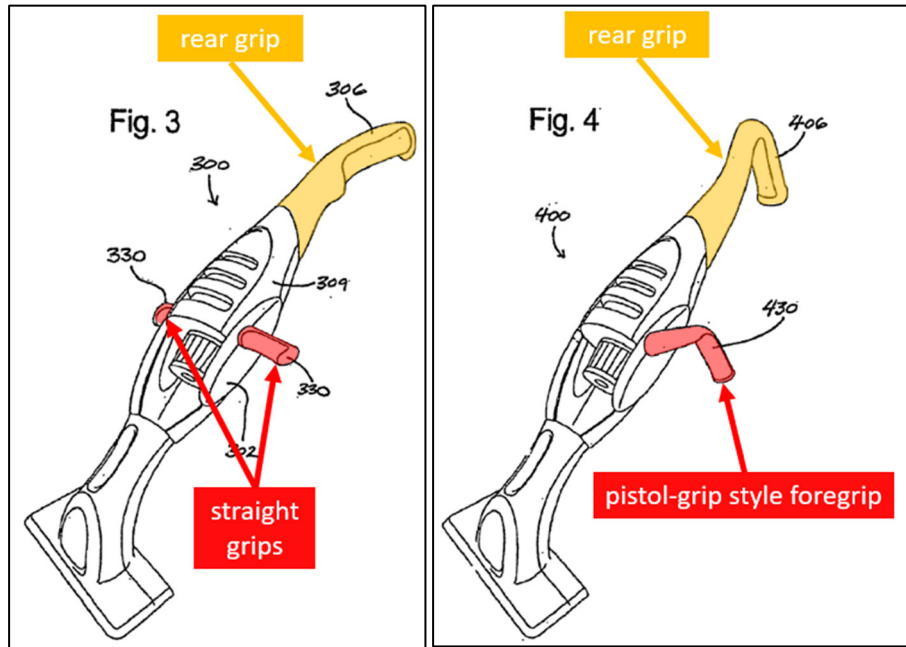
which includes a housing. For example, Butler teaches that its “vacuum cleaner ha[s] a generally elongated housing,” as shown in Butler Figures 1 and 5 below:



Ex1005, Abstract, Figs. 1, 5.

129. In my opinion, a POSA would understand that Butler’s vacuum cleaner main body includes Butler’s “generally elongated housing.”
130. In my opinion, Butler’s vacuum cleaner main body comprises a handle.
131. Butler teaches that the hand vacuum cleaner main body has a variety of handles. For example, Butler teaches and “one or more foregrips located on the housing,” which a POSA would understand is a handle because a user would hold the foregrip(s) to “handl[e] the device” when cleaning surfaces. Ex1005, Abstract, 3:28-4:1, 11:21-22, 12:3-13. Butler teaches

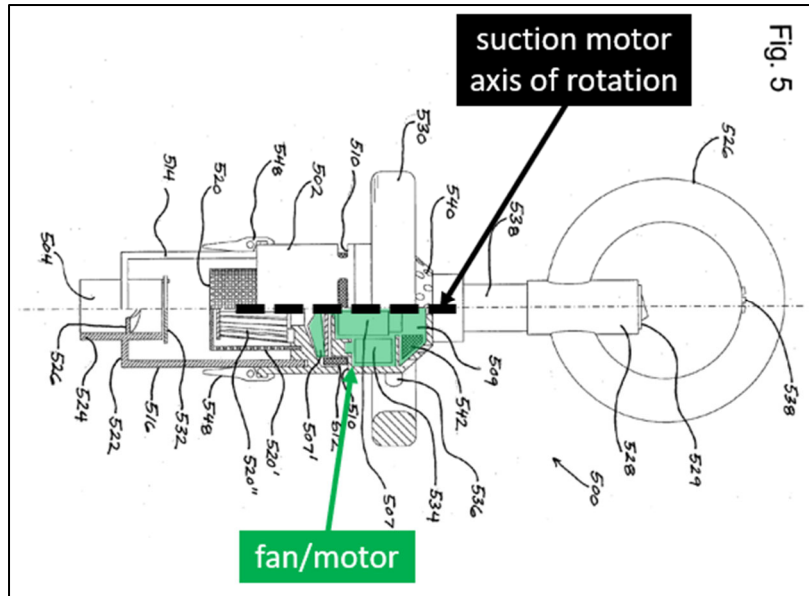
that its main body comprises other handles, including foregrips, including “straight grips 330,” “pistol-grip style foregrips 430,” and a “rotatable foregrip 630,” and rear grips as shown below:



Ex1005, Figs. 3-4, 6, 9A.

132. In my opinion, a POSA would understand that the suction motor axis of rotation is coincident with the center longitudinal axis of the vacuum, including because Butler teaches that the “fan/motor 1539” is “centered generally about the vacuum centerline 1537.” Ex1005, 37:3.
133. In my opinion, Butler’s main body further comprises a suction motor and fan assembly. Butler teaches that its vacuum cleaner main body includes “**fan/motor 507**,” which, in my opinion is a suction motor and fan assembly, and which, in my opinion, a POSA would understand has a suction motor axis of rotation as shown in the annotated image below:

The foregrip 530 surrounds a fan/motor chamber 509 in which the fan/motor 507 is located. The impeller fan 507' is adjacent the bottom end of the housing 502, and the motor 507" located between the fan 507' and the rear grip 506. If motor cooling is required, the motor 507" may be cooled by the working airflow after it is cleaned by the filtration system, by a separate flow of air, or by simple ventilation. In the embodiment of Figure 5, the housing includes a number of vents 540 for allowing air to pass through the housing 502 to cool the motor 507". A foam ring 542 may also be provided to prevent particles from the motor from exiting the vents 540 and obstruct the user's view into the fan/motor chamber 509.



Ex1005, 20:12-20, Fig. 5.

134. In my opinion, a POSA would understand that the suction motor axis of rotation is the axis through the center of Butler’s “fan/motor 507,” around which Butler’s “fan” rotates, including because Butler teaches that the “fan/motor 1539” is “centered generally about the vacuum centerline 1537.” Ex1005, 37:3.

h. [1c.i.1]

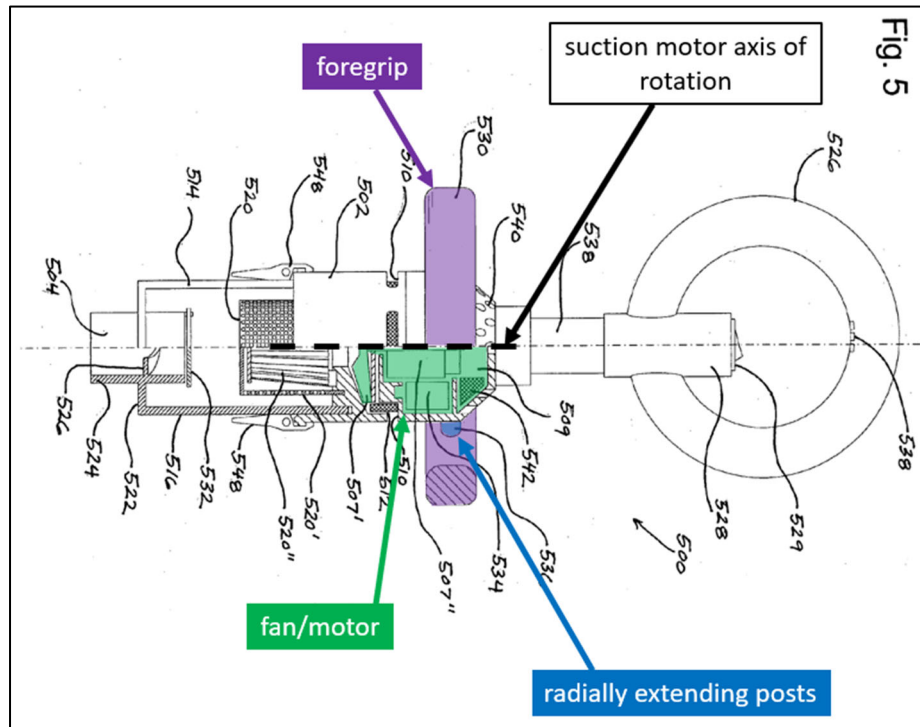
Reference Number	Claim Limitation
[1c.i.1]	“the handle having a hand grip portion, a first handle portion and a second handle portion, the first handle portion is mounted to the main body at the location of the suction motor and fan assembly;”

135. Butler teaches the handle having a hand grip portion, a first handle portion and a second handle portion, the first handle portion is mounted to the main body at the location of the suction motor and fan assembly. (Limitation

[1c.i.1]).

136. Butler teaches that the handle has a handgrip portion. Butler teaches that its handles may “include gripping surfaces or surface treatments to enhance the user’s grip and feel.” Ex1005, 12:3-7; 11:21-24, Figs. 1, 3-4, 10, 16.
137. In my opinion, Butler’s handle “gripping surfaces” and “surface treatments” are hand grip portions. Each of Butler’s handles has a first handle portion and a second handle portion, where first handle portion is mounted to the main body at the location of the suction motor and fan assembly.
138. In my opinion, a POSA would understand that Butler’s “gripping surfaces” are hand grip portions because they enhance the users grip while grasping the handle.
139. Butler teaches a handle that is a “continuous loop-like shape that surrounds the vacuum cleaner housing 102, which allows the user to hold the foregrip 130 in virtually any annular location around the housing 102.” *Id.*, 12:5-7. Butler explains that “it is likely that users will grasp the foregrip 130 in numerous different places at various times” indicating first, second, and “numerous” other handle portions. *Id.*, 13:20-14:3. As shown in Figure 5, this circular foregrip can be divided into any number of portions, each of

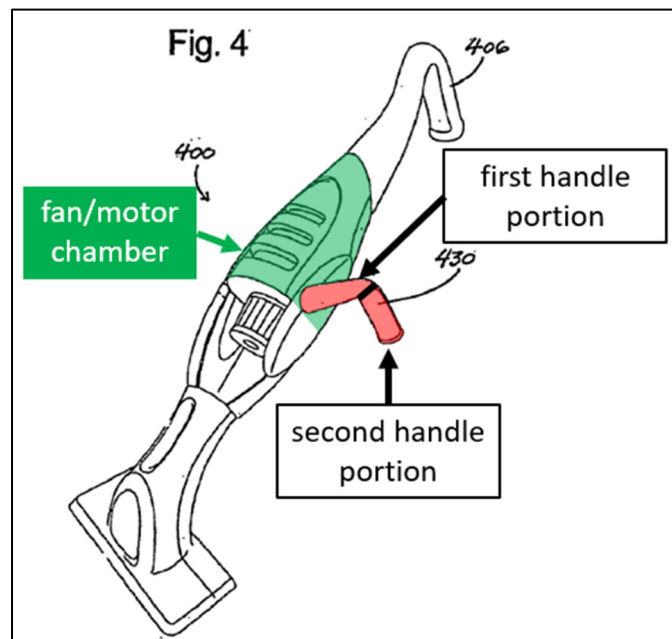
which are located at a location of the suction motor and fan assembly, including a first handle portion and a second handle portion, where the first handle portion is mounted to the main body at the location of the suction motor and fan assembly via “radially extending posts”:



Ex1005, 19:18-20:2, Fig. 5.

140. In my opinion, Butler’s “looped foregrip may also be formed as a partial loop to provide multiple hand positions around a portion of the vacuum cleaner housing.” *Id.*, 19:6-17. In such a “partial loop,” a POSA would understand that each end of the “partial loop” is one of the two portions of the handle, and each portion is mounted at the location of the suction motor and fan assembly.

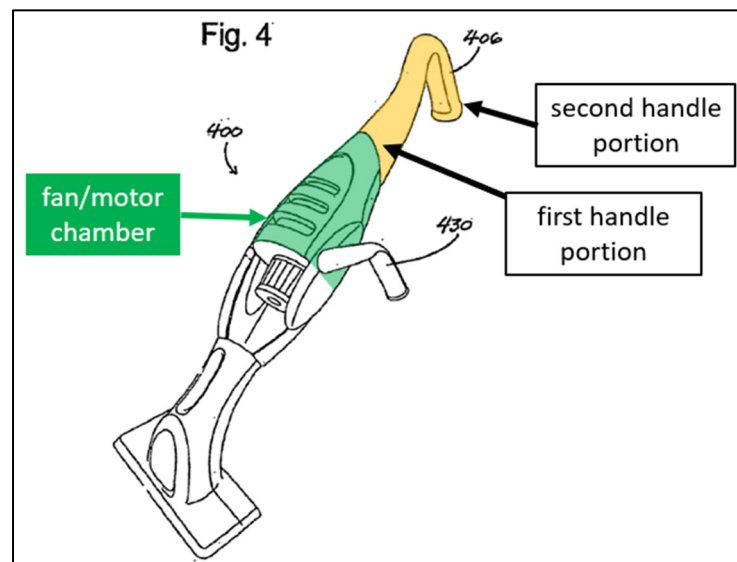
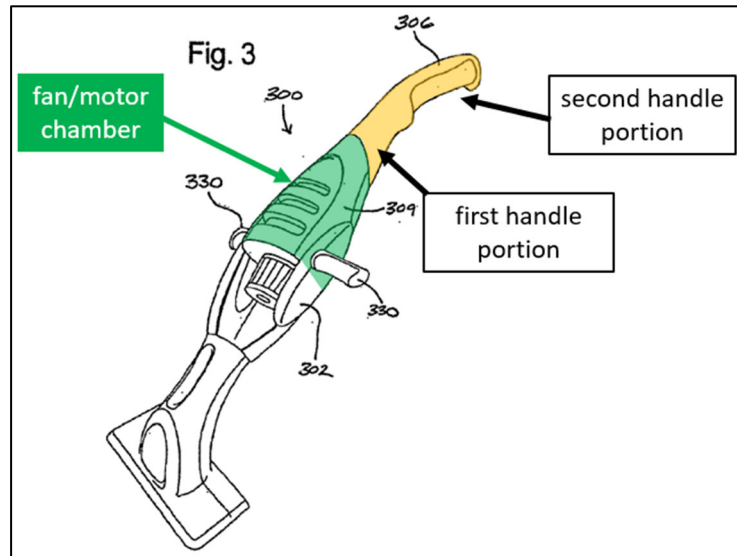
141. Butler also teaches that its foregrip may be “separate straight grips 330 that extend generally radially from the vacuum cleaner housing 302 at a location adjacent or just forward of the fan/motor chamber 309.” *Id.*, 19:18-20:2. As shown in Figure 3, Butler’s “grip[] 330” is a first handle portion that is mounted to the main body at the location of the suction motor and fan assembly and another “grip[] 330” is a second handle portion.
142. As shown in Figure 4, Butler’s handle has a first handle portion that is mounted to the main body at the location of the suction motor and fan assembly and a second handle portion that extends distally:

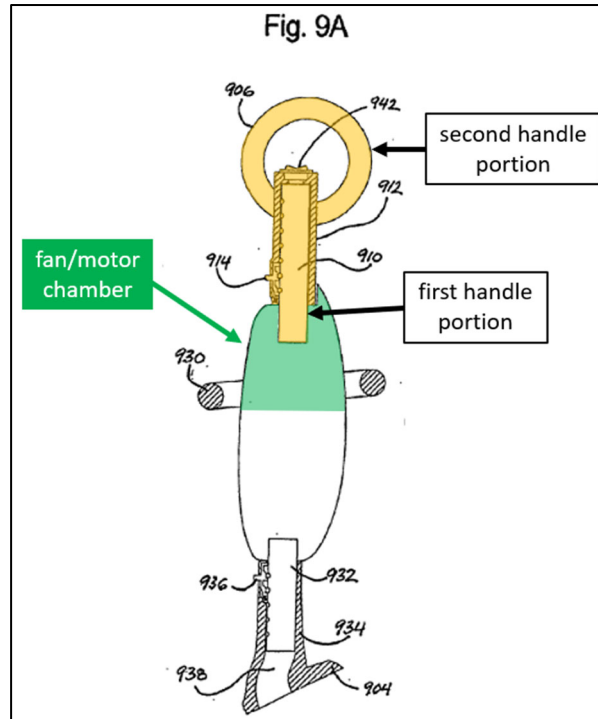


Ex1005, Fig. 4; *see also* Fig. 3

143. In my opinion, Butler’s **rear handle**, highlighted in the images below,

likewise have a first and second handle portions, where the first handle portion is mounted to the main body at the location of the suction motor and fan assembly. Each of these handles have a first portion that is mounted to the main body at the rear end of the suction motor and fan assembly:





Ex1005, Figs. 3-4, 9A.

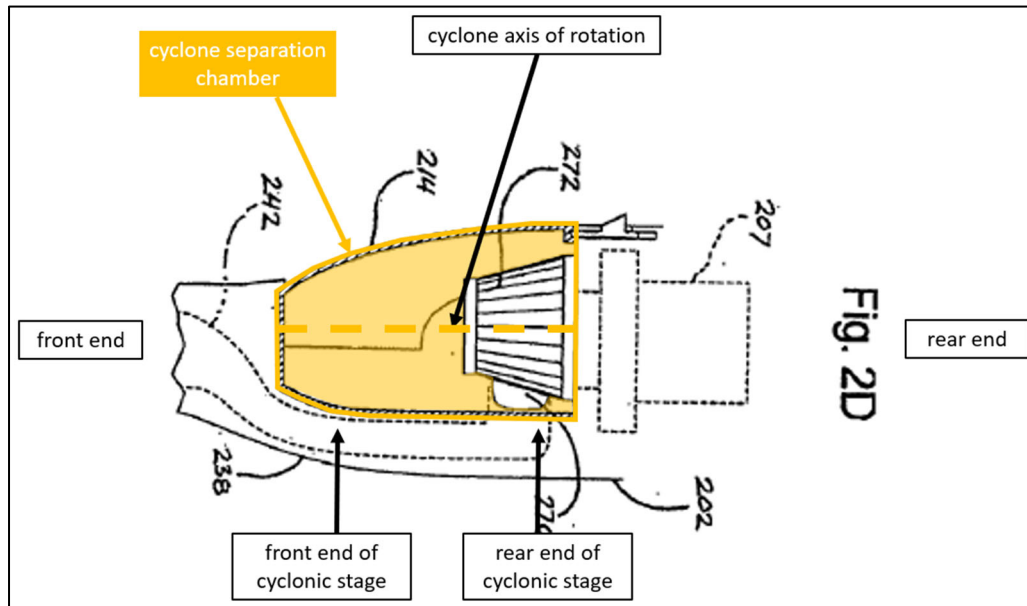
i. [1c.ii]

Reference Number	Claim Limitation
[1c.ii]	“(ii) a first cyclonic stage provided at the front end of the hand vacuum cleaner, the first cyclonic stage having a front end, a rear end and a cyclone axis of rotation extends between the front and rear ends of the first cyclonic stage; and”

144. Butler teaches a first cyclonic stage provided at the front end of the hand vacuum cleaner, the first cyclonic stage having a front end, a rear end and a cyclone axis of rotation extends between the front and rear ends of the first cyclonic stage. (Limitation [1c.ii]).

145. Butler teaches a first cyclonic cleaning stage, a “cyclone separation chamber in which the working airflow is swirled to remove dirt and dust

by centrifugal or cyclonic action.” Ex1005, 18:3-14, Fig. 2B-2D. Butler’s cyclone separation chamber is at the front of the hand vacuum cleaner, and has a front end, a rear end, and a cyclone axis of rotation that extends between its front and rear ends.



Ex1005, Fig. 2D.

146. In my opinion, a POSA would understand that Butler’s cyclone axis of rotation is as shown because “the inlet air passage 242 enters or terminates at an inlet port 270 through the dirt receptacle sidewall in a tangential or nearly tangential manner, which initiates a cyclonic flow therein.” Ex1005, 18:7-10.

147. Further, in my opinion, a POSA would understand that air would flow cyclonically around the sidewalls, rotating about the central axis shown above.

148. Butler explains how cyclonic airflow is initiated within Butler's cyclone separator:

Located inside the entry tube 524 is a helical ramp 526. The helical ramp 526 extends radially inward from the entry tube's inner wall, and may terminate short of the entry tube's centerline, as shown, to allow an unobstructed central path through the entry tube 524, or may extend to the centerline (or beyond) to block any direct flow of air through the entry tube 524. A one-way flap valve 532 made of a flexible material, such as are known in the art, is provided at the end of the entry tube 524 to prevent reverse flow of dirt out of the dirt receptacle 514. It has been found that the use of the foregoing helical ramp 524 is sufficient to establish a cyclonic airflow pattern within the dirt receptacle 514, despite the presence of the flap valve 532.

Ex1005, 22:14-22.

149. In my opinion, a POSA would understand that Butler's "cyclone separator" is a cyclone unit because it uses a "cyclonic airflow pattern" to separate dirt from air. In my opinion, a POSA would also understand that Butler's "cyclone separator" has a cyclone axis of rotation because, as Butler explains, air flows cyclonically around the sidewalls of Butler's "cyclone separator," rotating about the central axis shown above.
150. Thus, in my opinion, a POSA would understand that such air flow would flow cyclonically around the entirety of such sidewalls, and accordingly, a

POSA would understand that the cyclone axis of rotation extends between the front and rear ends of the first cyclonic stage.

j. [1c.iii]

Reference Number	Claim Limitation
[1c.iii]	“(iii) a second cyclonic stage having a front end, a rear end and at least one second stage cyclone having a cyclone axis of rotation that extends between the front and rear ends of the second cyclonic stage and the rear end of the second cyclonic stage is rearward of the rear end of the first cyclonic stage,”

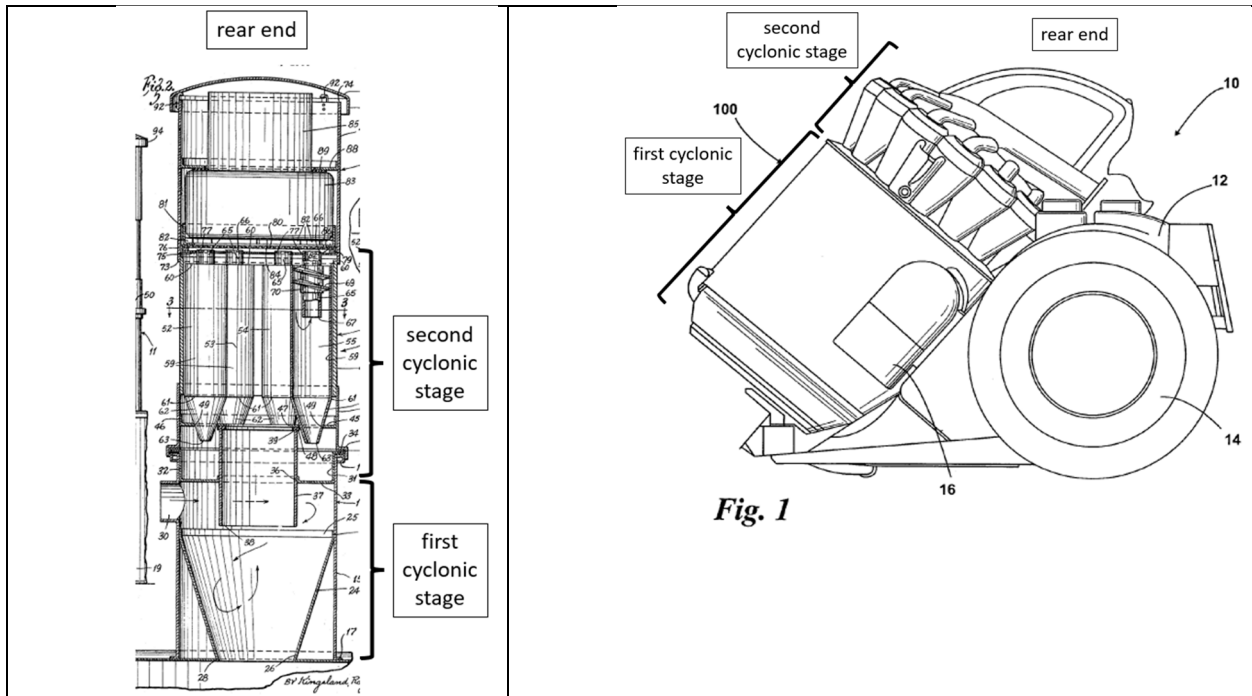
151. Butler teaches a second cyclonic stage having a front end, a rear end and at least one second stage cyclone having a cyclone axis of rotation that extends between the front and rear ends of the second cyclonic stage and the rear end of the second cyclonic stage is rearward of the rear end of the first cyclonic stage. (Limitation [1c.iii]).
152. Butler expressly teaches and suggests that its dirt separation unit may be modified. Butler teaches that “the dirt receptacle 214 comprises a cyclone separation chamber in which the working airflow is swirled to remove dirt and dust by centrifugal or cyclonic action,” and that “various different types of dirt receptacle 214 may be used, and may be interchangeable with one another to provide the user with various cleaning options.” Ex1005, 16:26-29, 18:3-14.
153. Butler further teaches that “other types of dirt separation system may

alternatively be used, as will be appreciated by those of ordinary skill in the art” and that Butler may use “any type of dirt separation system using any theory of operation.” *Id.* at 22:23-25; *see also id.* at 15:25-26, 16:25-26.

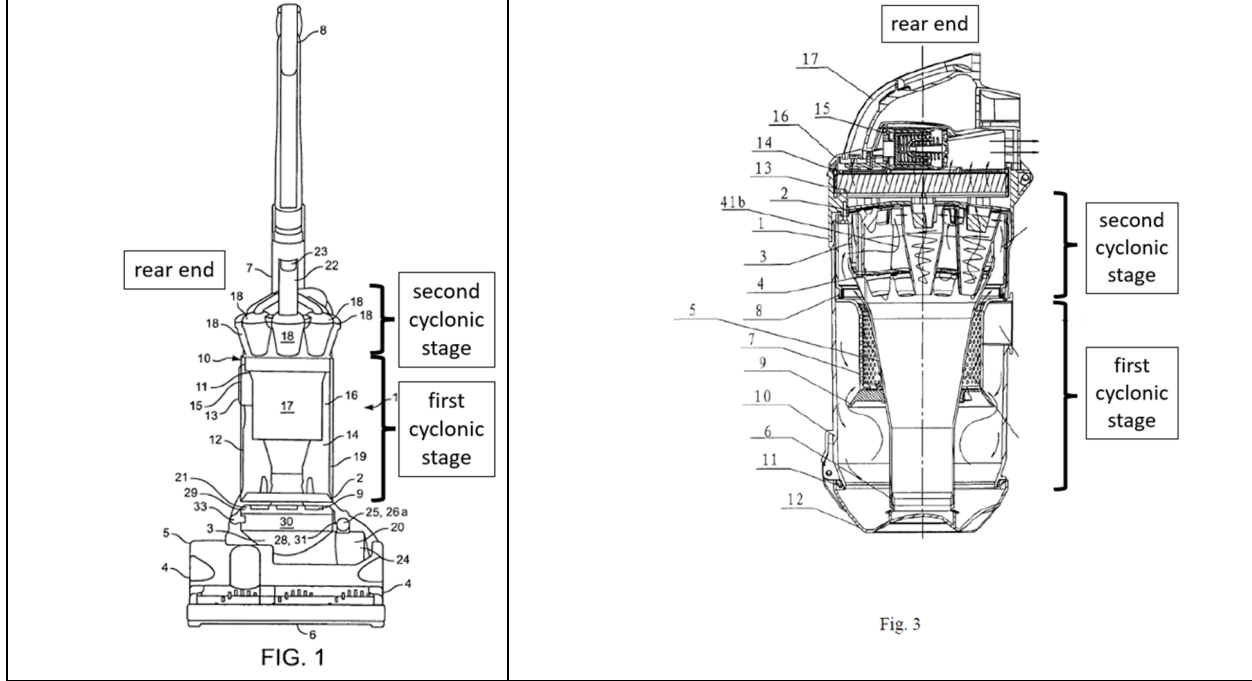
154. In my opinion, these express teachings and suggestions would have motivated a POSA to modify Butler to use or investigate other dirt separation systems to increase efficiency.

155. Furthermore, in my opinion, a POSA would have understood that second cyclonic stages were well-known in the art at the time of the '038 patent, including with the claimed features and orientation of Limitation [1cii]. For example, such second cyclone separators for vacuum cleaners have been known since the 1960s and appear in many contemporary hand vacuum cleaners:

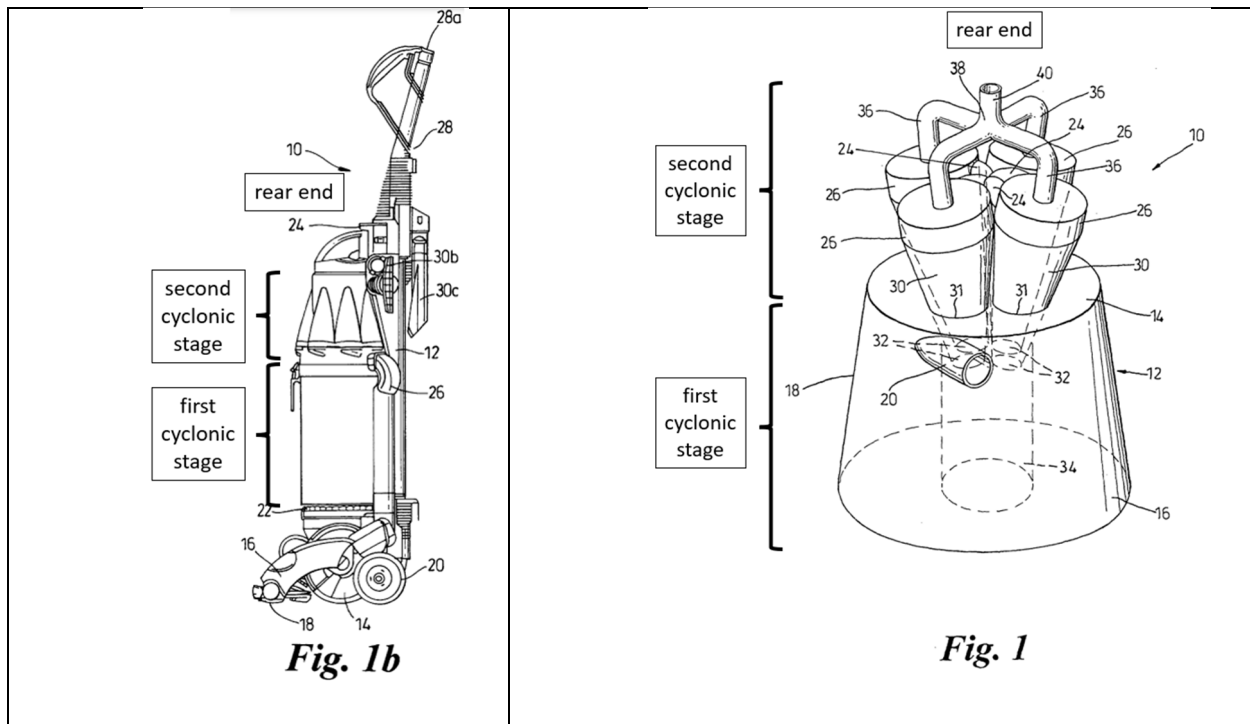
US 3,425,192 (1969)	US 7,867,307 (2011)
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US 8,051,531 (2011) **CN 201958793 (2010)**



US 6,607,572 (2003) **EP 1268076 (2004)**



Ex1027, Fig 2; Ex1028, Fig. 1; Ex1029, Fig. 1; Ex1009, Fig. 3; Ex1021, Fig. 1b; Ex1030, Fig. 1.

156. In my opinion, the art repeatedly describes this arrangement of the first and second cyclonic stages as “well-known.” For example, Courtney, which issued in 2010 explains that vacuum cleaners with “second cyclonic separating units” are “well-known”:

Vacuum cleaners which utilize cyclonic separating apparatus are well known. Examples of such vacuum cleaners are shown in EP 0042723, U.S. Pat. Nos. 4,373,228, 3,425,192, 6,607,572 and EP 1268076. In each of these arrangement, first and second cyclonic separating units are provided with the incoming air passing sequentially through each separating unit. In some cases,

the second cyclonic separating unit includes a plurality of cyclones arranged in parallel with one another.

Ex1015 at 1:21-29.

157. Additionally, another reference, Peng, which issued in 2011, states that “[a] **common** cyclone vacuum cleaner on the market is composed of two cyclone units connected in series” Ex1009 at [0005] (emphasis added).
158. Further, it was well known in the art that two cyclonic stages provided increased efficiency and additional filtration of the dirty air, which is an advantage over using a single cyclone. For example, Peng states that the two stage cyclonic vacuums allow for “larger dirt in the air [to be] separated from a first-stage cyclone unit, and smaller particles are separated from the second-stage cyclone unit.” Ex1009 at [0005]. By separating the larger dirt particles in the first cyclonic and the finer dust particles in the second cyclonic stage, a user would achieve greater “dust absorption function.” *Id.* at [0004].
159. Further, it was common to orient the first and second cyclonic stages such that where the front end of the second cyclonic stage is rearward of the rear end of the first cyclonic stage, including as shown above in US 7,867,307, US 8,051,531, and CN 201958793.
160. In my opinion, a POSA would have been motivated modify Butler to add

- a second cyclone, and orient it as claimed, and with the front end of the second cyclonic stage is rearward of the rear end of the first cyclonic stage, as was well-known in the art, and would have been motivated to do so based on Butler's express teachings and to achieve the well-known benefit of increased efficiency with additional dust separation.
161. For example, a POSA would have been motivated to take Butler's first cyclonic stage, and to use it as a platform to add a second, smaller cyclonic stage immediately downstream of it. Such an arrangement could have been accomplished by adding a more traditional, smaller, secondary cyclonic stage in a straightforward way to filter finer dust particles that was well understood in the art. A POSA would understand that shortening the chamber of the first cyclonic stage to accommodate the additional of a second cyclonic stage within the main housing body would not affect the functionality, efficacy, or efficiency of the filtration system negatively due to the addition of the second stage. A POSA would also understand that lengthening the main body housing with what is essentially a hollow space, by a few inches to accommodate a second cyclonic stage would also not substantially disrupt the ergonomic handling of the vacuum cleaner, nor would it affect the functionality, efficacy, or efficiency of the filtration system negatively. Additionally, a POSA would also have been motivated

- to implement a vacuum cleaner with two cyclonic stages by replacing Butler's filtration system with a two-cyclone stage filtration system similar to the one found in Peng.
162. A POSA would understand that each secondary cyclone would be smaller than the primary cyclone, but the secondary cyclonic stage taken as a whole would not necessarily need to be smaller than the primary cyclonic stage. Nevertheless, a POSA would understand that a smaller secondary cyclonic stage may be preferred to keep the device as compact as possible to fit in a hand vacuum cleaner. Adding a secondary cyclonic stage would have only involved combining prior art elements from Butler alone according to the known technique of using a second cyclonic cleaning stage, as was well-known in the art since the 1960s, to achieve the predictable and well-known benefit of efficiency and improved filtration of fine dust particles.
163. Further, in my opinion, such an arrangement meets Limitation [1c.iii]. Limitations [1c.ii] and [1c.iii] are identical, but for the elements that call for a second cyclonic stage where the second cyclonic stage is rearward of the rear end of the first cyclonic stage. As such, modifying Butler to add a second cyclonic stage with a structure that duplicates its first cyclonic cleaning stages teaches the identical elements in Limitation [1c.ii] for the

same reasons. Regarding the remaining elements, in my opinion, it would have been obvious to a POSA to position Butler's second cyclone stage rearward of the first cyclonic cleaning stage, including because (1) Butler teaches that its airflow is from front-to-rear, (2) a POSA would have understood that a second cleaning stage for filtration of fine particles is most effective when positioned downstream of the first cyclonic cleaning stage, and (3) such a technique was well-known in the art since the 1960s as described above. It would have been obvious to a POSA that the secondary cyclonic stage is positioned after the first cyclonic stage because it would be illogical anywhere else. A POSA would understand inefficiencies would be introduced if the second cyclonic stage were positioned anywhere else other than behind the first cyclonic stage to immediately capture the air that exits the first cyclonic stage.

164. Furthermore, Butler expressly teaches that its various components are combinable and “may be interchangeable with one another to provide the user with various cleaning options,” Ex1005, 16:25-29; and that “the present invention includes embodiments in which the features described herein are used individually or in various other inventive combinations.” *id.*, 43:29-44:3; *see also id.*, 4:17-28, 18:22-28, 19:9-15, 34:12-13 (components are combinable).

165. In my opinion, combining Butler’s components would have been obvious, with at least a reasonable expectation of success, including based on these teachings.
166. In my opinion, POSA would have understood that a straightforward substitution of one cyclonic stage for two cyclonic stages, where there would be an additional dust filtration, would have yielded the predictable result of additional dust filtration.
167. Additionally, in my opinion, a hand vacuum cleaner with two cyclonic stages was known in the art, and applying a second cyclonic stage to Butler’s hand vacuum cleaner would improve Butler’s hand vacuum cleaner in same way that similar other hand vacuum cleaners were improved—*i.e.*, better air filtration, including for fine particles.
168. Accordingly, in my opinion, a POSA would have found it obvious to try to add a second cyclonic stage rearward of the first cyclonic stage for additional filtration of the air and would have had a reasonable expectation of success.

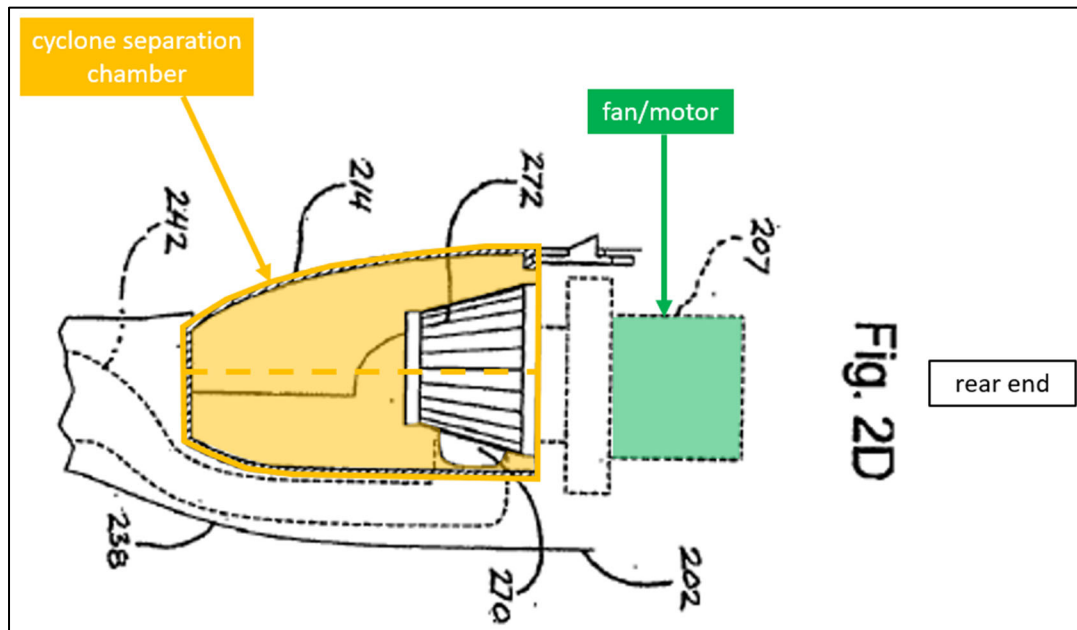
k. [1c.iii.1]

Reference Number	Claim Limitation
[1c.iii.1]	“wherein the suction motor is positioned rearward of the first cyclonic stage,”

169. Butler teaches wherein the suction motor is positioned rearward of the first

cyclonic stage. (Limitation [1c.iii.1]).

170. Butler's **fan/motor 207** is positioned rearward of the **cyclone separation chamber**, *i.e.*, the first cyclonic stage. Ex1005, 16:3-21.



Ex1005, Fig. 2D.

I. [1c.iii.2]

Reference Number	Claim Limitation
[1c.iii.2]	“and wherein, when the hand vacuum cleaner is mounted to the rigid wand outlet end, handle is drivingly connected to the surface cleaning head.”

171. Butler teaches and wherein, when the hand vacuum cleaner is mounted to the rigid wand outlet end, handle is drivingly connected to the surface cleaning head. (Limitation [1c.iii.2]).
172. Butler teaches that the hand vacuum cleaner can be mounted to the rigid

wand outlet end of the rigid air flow conduit, for the same reasons as in Limitation [1c].

173. Butler also teaches that when the hand vacuum cleaner so mounted, a/the² handle is drivingly connected to the surface cleaning head.
174. In my opinion, Butler teaches this limitation regardless of whether the claims require “the handle” or “a handle” because each of its handles is drivingly connected to the surface cleaning head.
175. Butler teaches that, when the hand vacuum is mounted to the wand as claimed, each of Butler’s handles are drivingly connected to the surface cleaning head, because driving each of these handles drives the cleaner head. Ex1005, Figs. 2A, 3, 4, and 6; *see also id.*, 12:4-12, 14:4-10, 19:18-20:2.
176. In my opinion, a POSA’s understanding that such handles are “drivingly connected” to the surface cleaning head is consistent with the ’038 Patent specification, which states that “[a]s used herein and in the claims, two or more parts are said to be ... “connected” ... where the parts are joined or operate together either directly or indirectly (i.e., through one or more intermediate parts), so long as a link occurs” and distinguishes the term

² The ’038 Patent claims do not include a particle before the term “handle.” *See* Ex1001, Cl. 1.

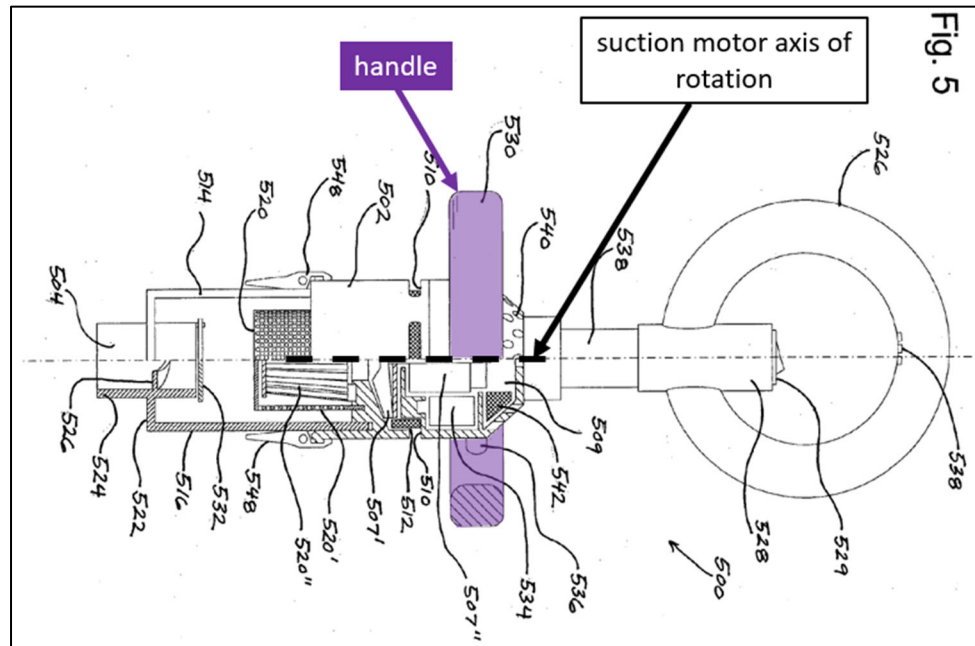
“directly connected,” stating that “[a]s used herein and in the claims, two or more parts are said to be ... “directly connected” ... where the parts are connected directly in physical contact with each other,” and that “[n]one of the terms ... “connected” ... distinguish the manner in which two or more parts are joined together.” Ex1001, 9:38-52.

m. [2]/[5]

Reference Number	Claim Limitation
[2]	“The surface cleaning apparatus of claim 1 wherein the suction motor and fan assembly axis of rotation intersects the handle.”
[5]	“The surface cleaning apparatus of claim 3 wherein the suction motor and fan assembly axis of rotation intersects the handle.”

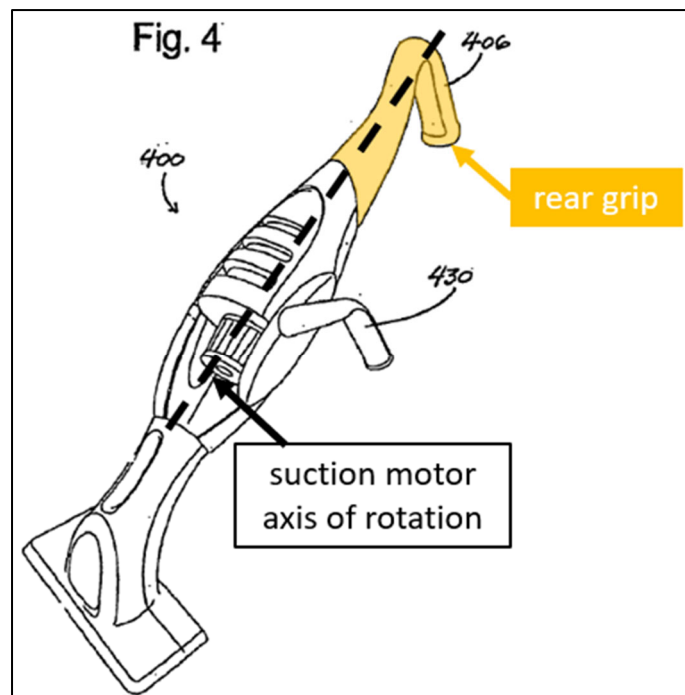
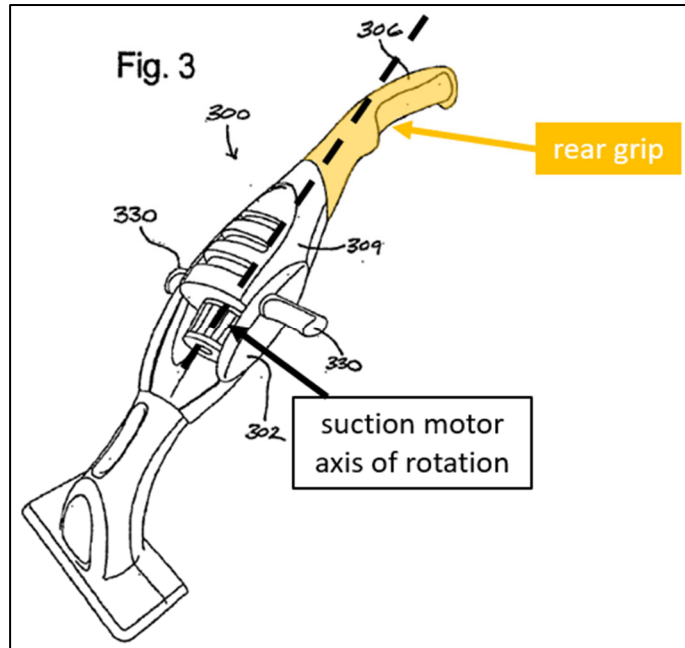
177. As I explained in Section X.A.2, Butler renders obvious Claims 1 and 3 of the '038 patent.
178. Butler teaches the surface cleaning apparatus of claim 1 and teaches wherein the suction motor and fan assembly axis of rotation intersects the handle. (Claim 2).
179. Butler teaches the surface cleaning apparatus of claim 3 and teaches wherein the suction motor and fan assembly axis of rotation intersects the handle. (Claim 5).
180. As explained in Limitation [1c.i] and [1c.i.1], Butler teaches a suction motor with a suction motor axis of rotation and various handles.

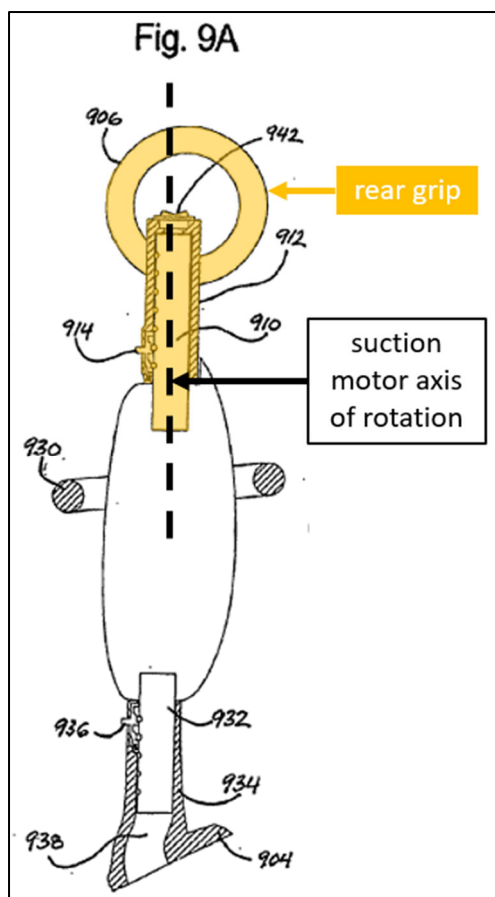
181. In my opinion, a POSA would understand that the suction motor and fan assembly axis of rotation intersects the foregrip shown in Figure 5, because it goes through Butler's foregrip as shown below:



Ex1005, Fig. 5.

182. Further, in my opinion, Butler's suction motor and fan assembly intersects its rear handles, as shown:





Ex1005, Figs. 3-4, 9A.

n. [3]

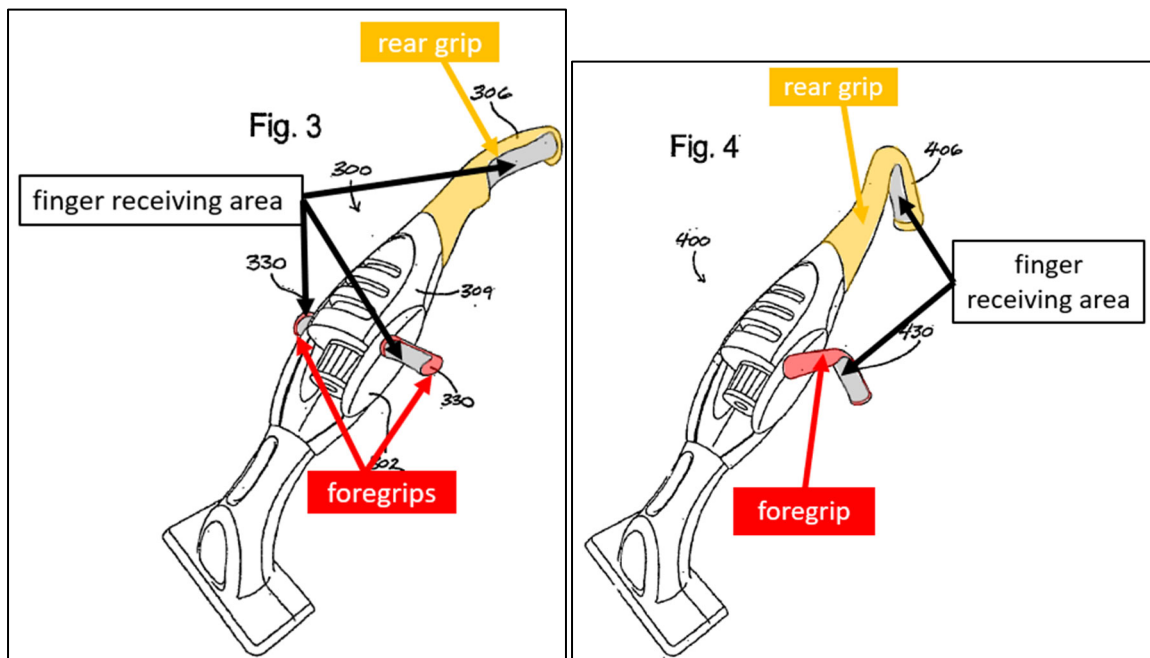
Reference Number	Claim Limitation
[3]	"The surface cleaning apparatus of claim 1 further comprising a finger receiving area positioned between the handle and the main body and a first portion of the finger receiving area is positioned rearward of the suction motor."

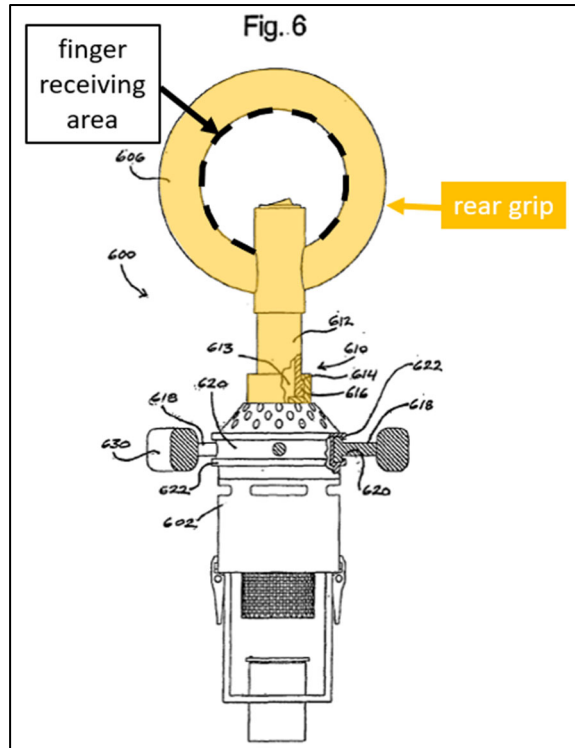
183. As I explained in Section X.A.2, Butler renders obvious Claim 1 of the '038 patent.

184. Butler teaches the surface cleaning apparatus of claim 1 and teaches further comprising a finger receiving area positioned between the handle and the

main body and a first portion of the finger receiving area is positioned rearward of the suction motor. (Claim 3).

185. As explained in Limitations [1c.1] and [1c.i.1], Butler teaches a main body and various handles, respectively.
186. In my opinion, a POSA would understand that any area of Butler's handles has a finger receiving area where the user's fingers would fall when gripping the handle.
187. Further, in my opinion, a POSA would understand that the finger receiving area for various handles is positioned between the handle and the main body, as shown in Figures. 3, 4, and 6:



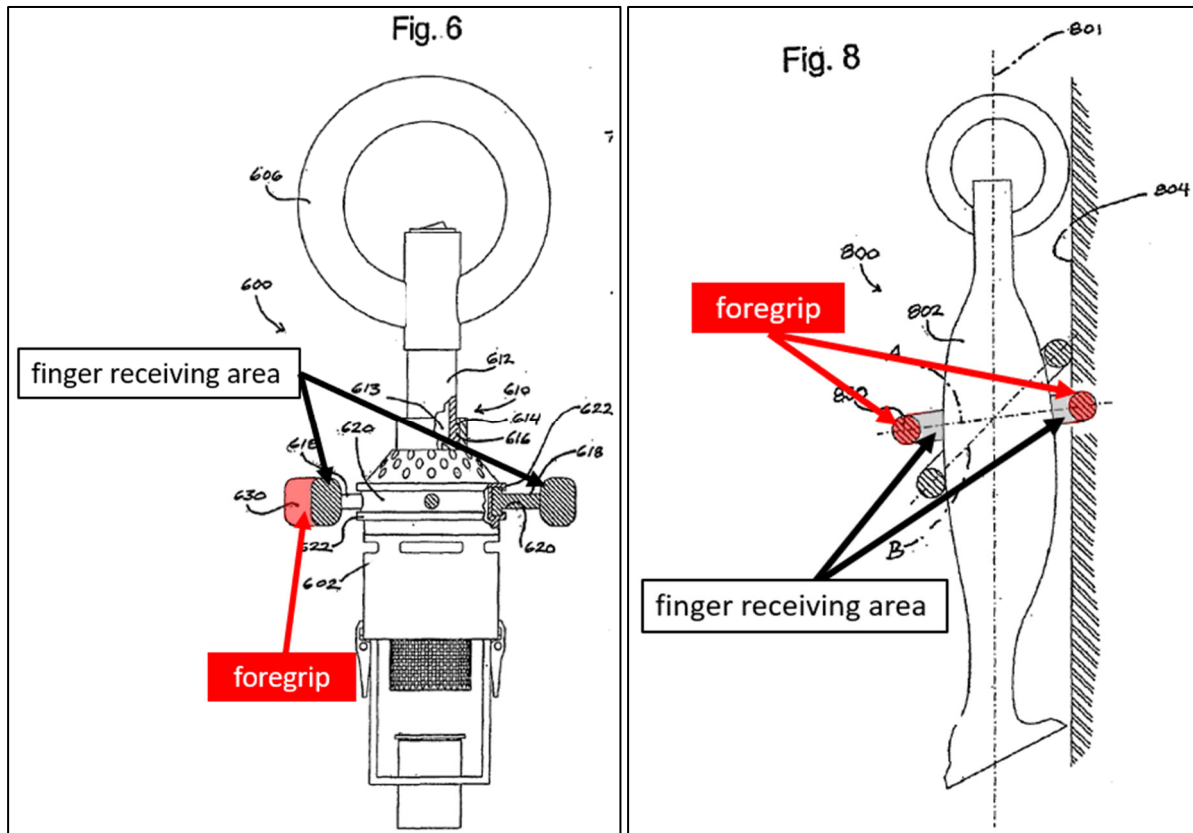


Ex1005, Figs. 3, 4, and 6.

188. Butler further teaches that a first portion of the finger receiving area is positioned rearward of the suction motor. For example, Butler teaches that the foregrip can pivot, such that a portion of the finger receiving area would be rearward of the suction motor: “**foregrip 830** comprises a loop-like device that is attached to the housing 802 of a vacuum cleaner 800” and is “pivotal about an axis generally perpendicular to the longitudinal axis 801 of the vacuum 800.” *Id.*, 24:26-25:8.

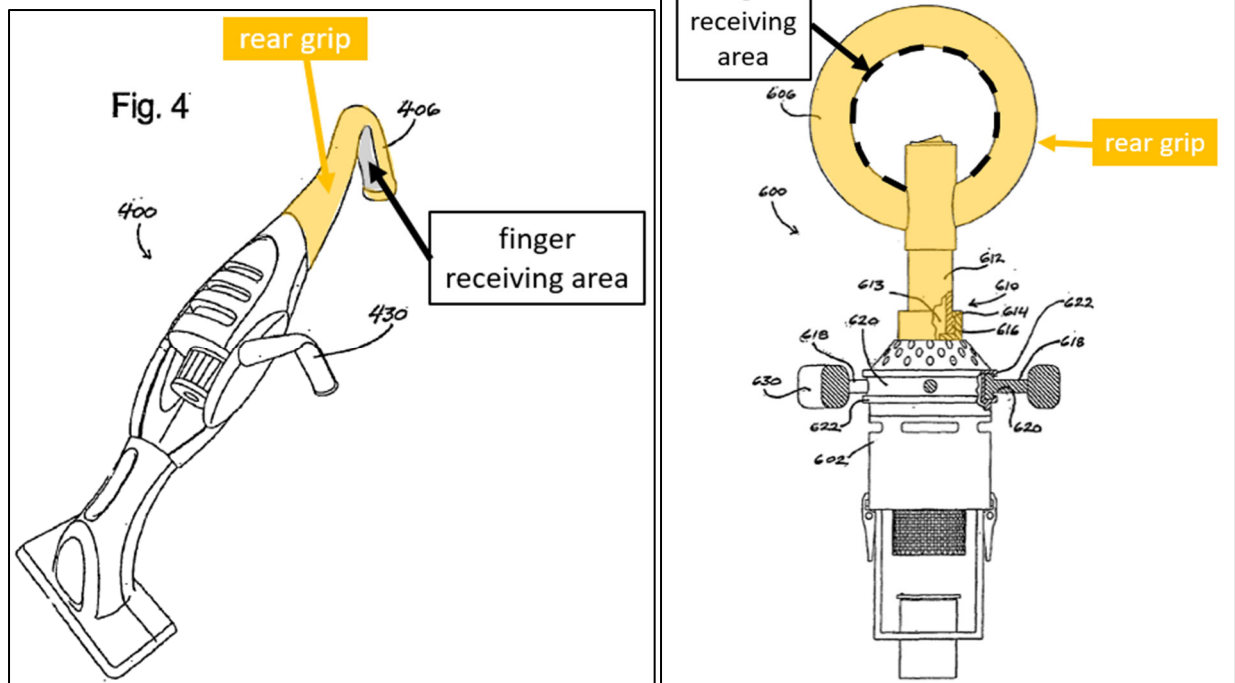
189. In my opinion, a POSA would understand that, when the “foregrip” as shown in Figure 6 is pivoted according to the teachings in Figure 8, a first portion of the finger receiving area is positioned rearward of the suction

motor, as shown:



Ex1005, Figs. 6 and 8.

190. Further, in my opinion, Butler's rear circular grip and rear pistol-style grip likewise have a first portion of the finger receiving area positioned rearward of the suction motor, as shown:



Ex1005, Figs. 4 and 6.

o. [4]

Reference Number	Claim Limitation
[4]	“The surface cleaning apparatus of claim 3 wherein a second portion of the finger receiving area is positioned above an upper end of the main body.”

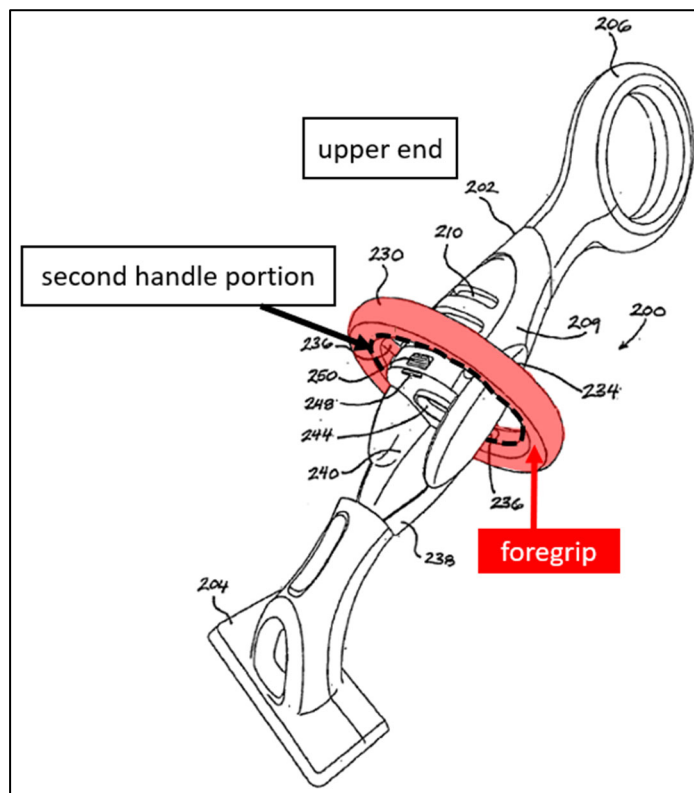
191. As I explained in Section X.A.2, Butler renders obvious Claim 1 of the '038 patent.

192. Butler teaches the surface cleaning apparatus of claim 3 and teaches wherein a second portion of the finger receiving area is positioned above an upper end of the main body.

193. As explained in Limitation [1c], Butler teaches a hand vacuum cleaner that

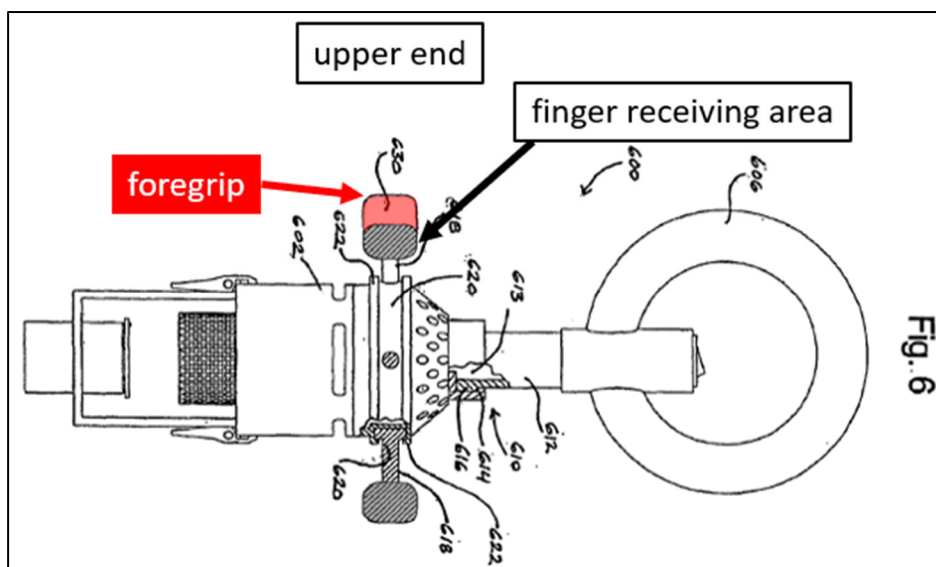
has an upper end. Furthermore, as explained in Claim 3, in my opinion, Butler teaches finger receiving areas, which are any graspable portions of the handle where the user's fingers fall when gripping the handle.

194. As seen Figure 1, when a user grips the **foregrip 230**, a second portion of the finger receiving area is positioned above the upper end of the main body.



Ex1005, Fig. 2A.

195. Further, in my opinion, Butler teaches a second portion of the finger receiving area positioned above an upper end of the main body, as shown in Figure 6:



Ex1005, Fig. 6.

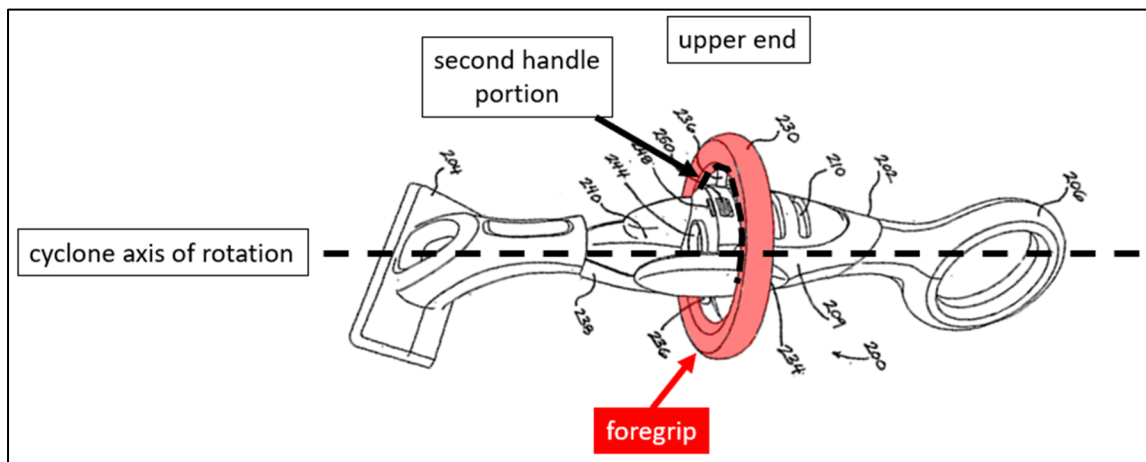
p. [6]/[7]

Reference Number	Claim Limitation
[6]	"The surface cleaning apparatus of claim 5 wherein when the hand vacuum cleaner is oriented such that the cyclone axis of rotation extends horizontally and the upper end of the hand vacuum cleaner above the lower end of the hand vacuum cleaner, the second handle portion is positioned above the suction motor."
[7]	"The surface cleaning apparatus of claim 1 wherein when the hand vacuum cleaner is oriented such that the cyclone axis of rotation extends horizontally and the upper end of the hand vacuum cleaner above the lower end of the hand vacuum cleaner, the second handle portion is positioned above the suction motor."

196. As I explained in Section X.A.2, Butler renders obvious Claims 1 and 5 of the '038 patent.

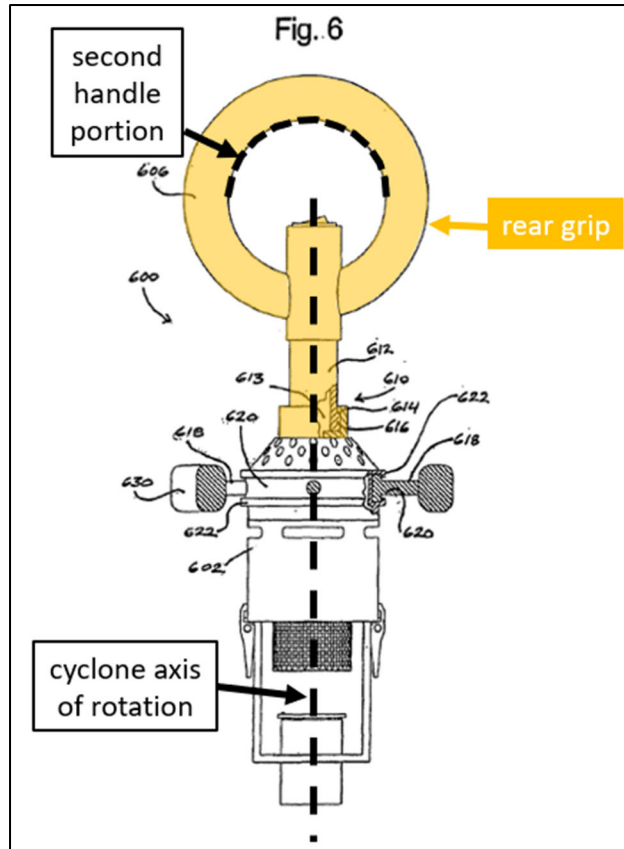
197. Butler teaches the surface cleaning apparatus of claim 5 and teaches wherein when the hand vacuum cleaner is oriented such that the cyclone axis of rotation extends horizontally and the upper end of the hand vacuum

- cleaner above the lower end of the hand vacuum cleaner, the second handle portion is positioned above the suction motor. (Claim 6).
198. Butler teaches the surface cleaning apparatus of claim 1 wherein when the hand vacuum cleaner is oriented such that the cyclone axis of rotation extends horizontally and the upper end of the hand vacuum cleaner above the lower end of the hand vacuum cleaner, the second handle portion is positioned above the suction motor. (Claim 7).
199. In my opinion, as seen in Figure 2A, when Butler's hand vacuum cleaner is oriented as claimed, a second handle portion is positioned above the suction motor.



Ex1005, Fig. 2A.

200. Similarly, in my opinion, as seen in Figure 6, when oriented as claimed, a second handle portion of the rear grip is positioned above the suction motor:



Ex1005, Fig. 6.

201. Further, Butler teaches that “[t]he foregrips 330, 430 also may be provided with joints or pivots to allow them to be articulated into more desirable positions.” Ex1005 19:18-20:2. Additionally, Butler teaches that “it may be desirable to construct the foregrips 330, 430 such that they can be removed and inserted in various different locations on the housing.” *Id.*
202. In my opinion, following Butler’s teaching, a POSA would find it obvious to pivot, rotate, or remove and insert the Butler’s handle, foregrip 330, 430, into different positions, so that when the hand vacuum cleaner is oriented such that the cyclone axis of rotation extends horizontally and the upper

end of the hand vacuum cleaner above the lower end of the hand vacuum cleaner, the handle is positioned above the suction motor the handle portion is positioned above the suction motor for easy maneuvering.

q. [8]/[9]

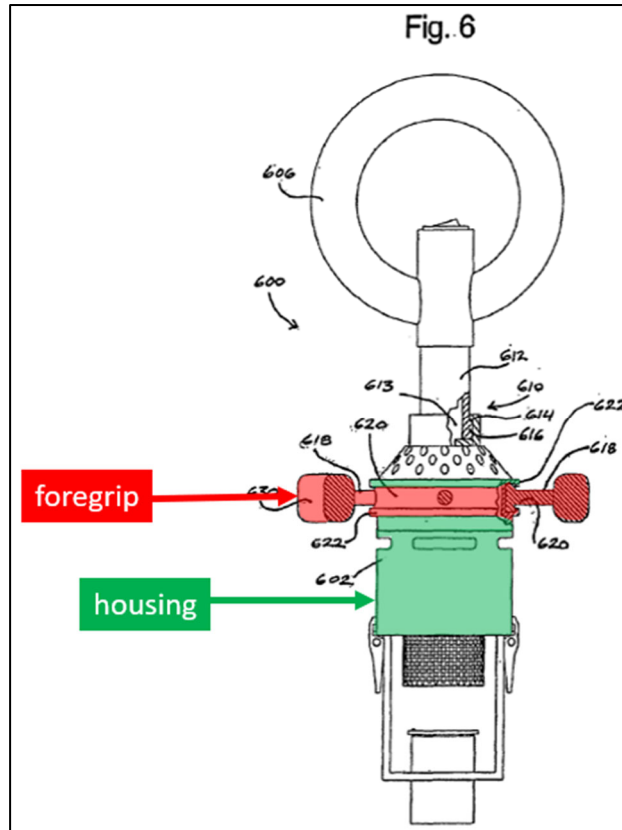
Reference Number	Claim Limitation
[8]	“The surface cleaning apparatus of claim 6 wherein the first portion of the handle is mounted to a rear end of the main body.”
[9]	“The surface cleaning apparatus of claim 1 wherein the first portion of the handle is mounted to a rear end of the main body.”

203. As I explained in Section X.A.2, Butler renders obvious Claims 1 and 6 of the '038 patent.

204. Butler teaches the surface cleaning apparatus of claim 6 and teaches wherein the first portion of the handle is mounted to a rear end of the main body. (Claim 8).

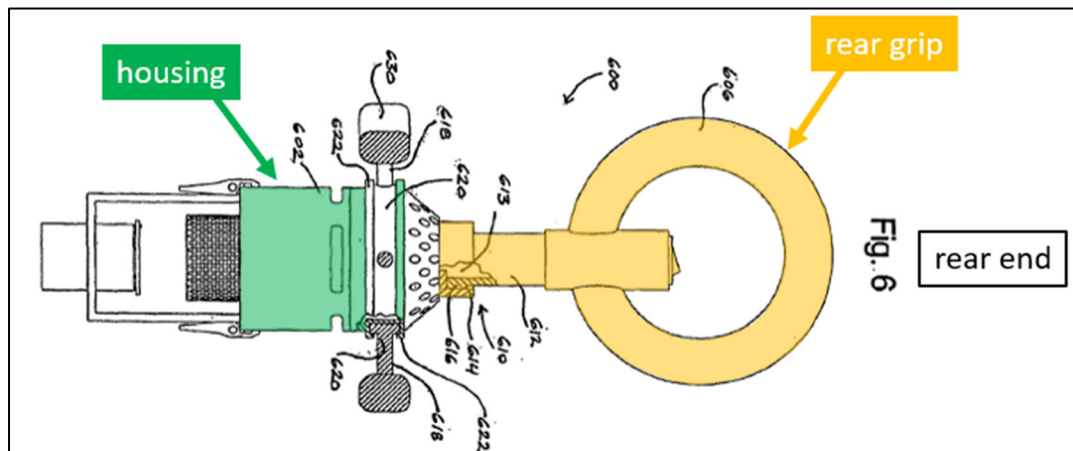
205. Butler teaches the surface cleaning apparatus of claim 1 and teaches wherein the first portion of the handle is mounted to a rear end of the main body. (Claim 9).

206. As seen in Figure 6, Butler's “**foregrip 630**” is mounted to the rear end of the main body.



Ex1005, Fig. 6.

207. Similarly, as seen in Figure 6, when oriented as claimed, the first portion of the handle is mounted to a rear end of the main body:



Ex1005, Fig. 6.

208. Additionally, Butler teaches that “[t]he foregrips 330, 430 also may be provided with joints or pivots to allow them to be articulated into more desirable positions.” Ex1005 19:18-20:2.
209. Further, Butler teaches that “it may be desirable to construct the foregrips 330, 430 such that they can be removed and inserted in various different locations on the housing.” *Id.*
210. In my opinion, following Butler’s teaching, a POSA would find it obvious to pivot, rotate, or remove and insert Butler’s handle, foregrip 330, 430, into different positions, so that when the hand vacuum cleaner is oriented such that the first portion of the handle is mounted to a rear end of the main body.

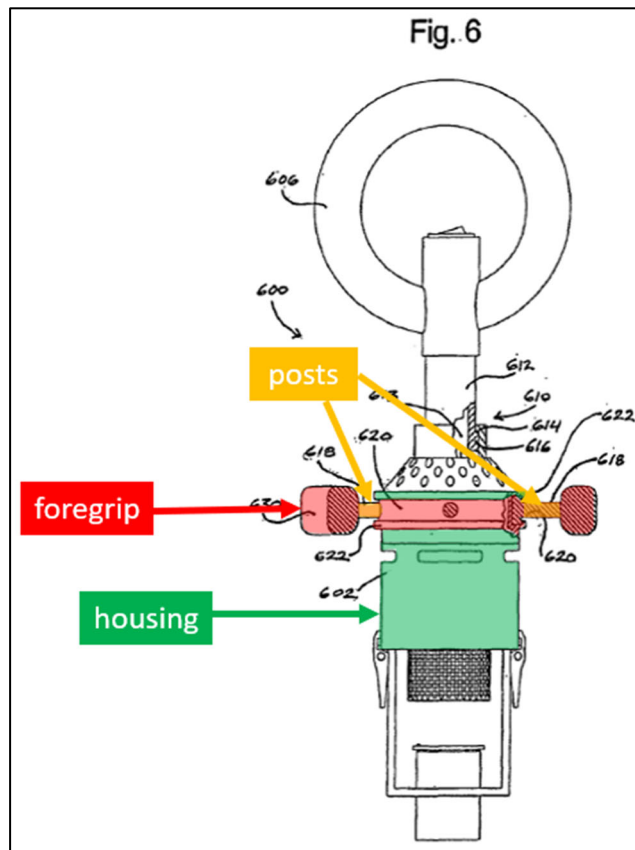
r. [10]

Reference Number	Claim Limitation
[10]	“The surface cleaning apparatus of claim 1 wherein the handle is also attached to a sidewall of the main body.”

211. As I explained in Section X.A.2, Butler renders obvious Claim 1 of the ’038 patent.
212. Butler teaches the surface cleaning apparatus of claim 1 and teaches wherein the handle is also attached to a sidewall of the main body. (Claim 10).
213. Butler teaches several handles attached to the sidewall of its main body.

For example, Figures 3 and 4 depict handles attached to the sidewall of its main body.

214. Butler further teaches that its “foregrip 630” is attached to a sidewall of the main body by “a number of radially-extending posts 618” as shown in Figure 6 below:



Ex1005, Fig. 6, 23:12-15.

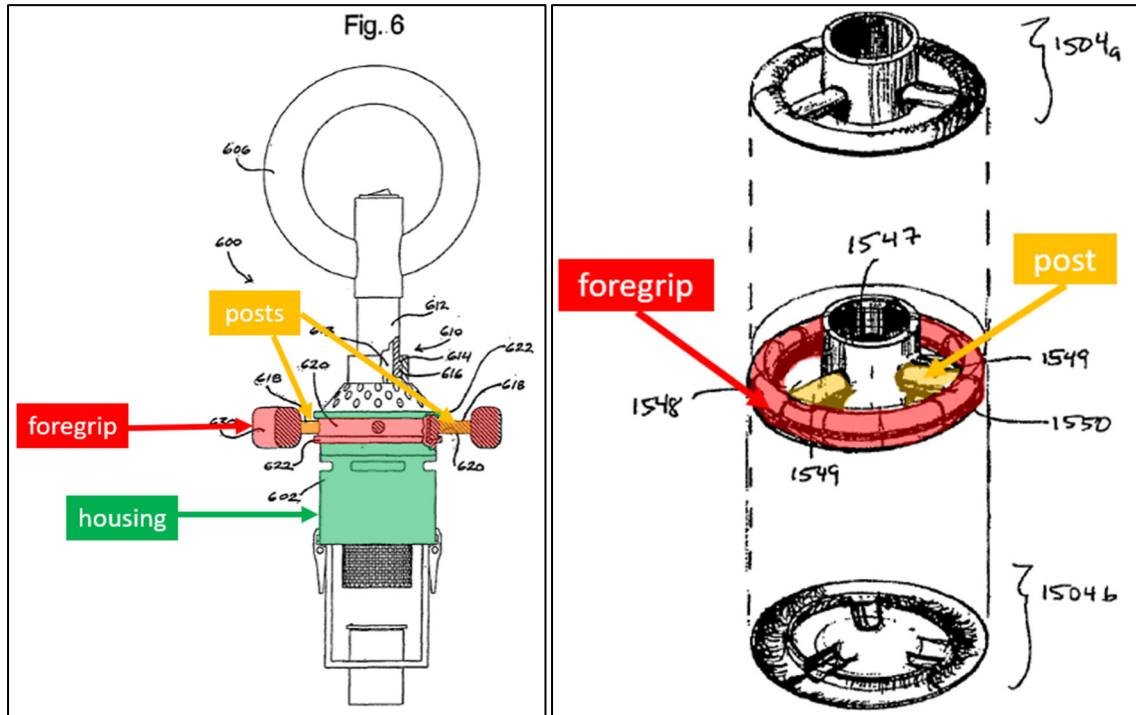
s. [11]

Reference Number	Claim Limitation
[11]	“The surface cleaning apparatus of claim 1 wherein handle is attached to the main body at two locations.”

215. As I explained in Section X.A.2, Butler renders obvious Claim 1 of the '038 patent.

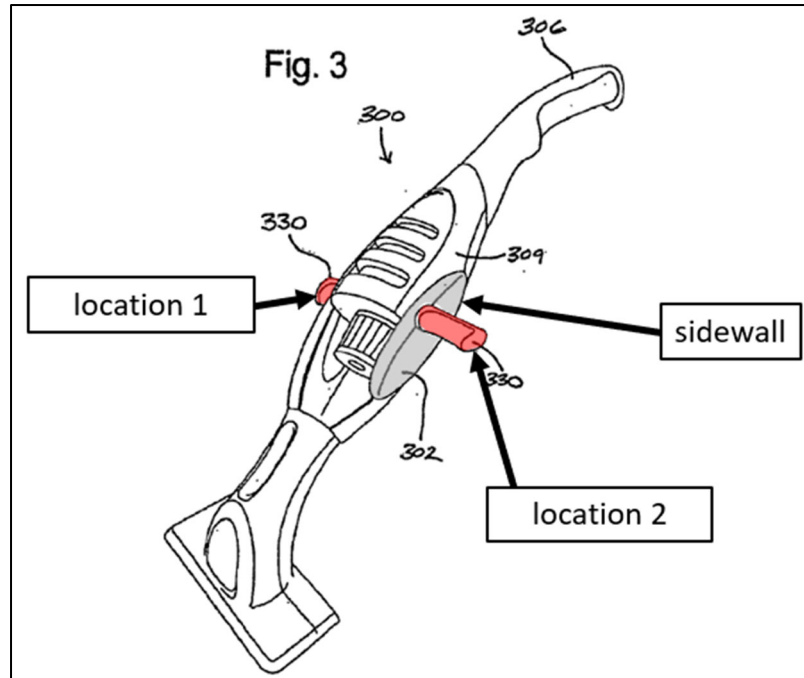
216. Butler teaches the surface cleaning apparatus of claim 1 and teaches wherein handle is attached to the main body at two locations. (Claim 11).

217. Butler teaches that its “foregrip” is attached to the main body at two locations: two of the three “posts” by which the foregrip is attached to the main body, as shown in Figures 6 and 18:



Ex1005, Figs. 6 and 18.

218. Further, as shown in Figure 3, Butler teaches the handle attached to the main body and two locations:



Ex1005, Fig. 3.

t. [12]

Reference Number	Claim Limitation
[12]	“The surface cleaning apparatus of claim 1 wherein the rigid wand outlet end has an outlet end electrical connector, the hand vacuum cleaner further comprises a hand vacuum cleaner electrical connector provided adjacent the hand vacuum cleaner air inlet, and the hand vacuum cleaner electrical connector is releaseably engageable with the outlet end electrical connector.”

219. As I explained in Section X.A.2, Butler renders obvious Claim 1 of the ’038 patent.

220. Butler teaches the surface cleaning apparatus of claim 1 and teaches wherein the rigid wand outlet end has an outlet end electrical connector, the hand vacuum cleaner further comprises a hand vacuum cleaner

electrical connector provided adjacent the hand vacuum cleaner air inlet, and the hand vacuum cleaner electrical connector is releaseably engageable with the outlet end electrical connector. (Claim 12).

221. In my opinion, Butler teaches that the rigid wand outlet end has an outlet end electrical connector to deliver power to its motorized powerhead. **First**, Butler teaches a motorized powerhead with electrical leads: Butler teaches a “powerhead having a rotating agitator” and teaches that “[o]f course, if a powered attachment is provided, suitable power leads can be provided to connect the powered attachment to the electric circuit.” Ex1005 22:6-11.

222. **Second**, Butler teaches electrical leads at the hand vacuum cleaner inlet: “leads may pass around or through the dirt receptacle, or may be integrated into the dirt receptacle body.” Ex1005, 22:11-13.

223. In my opinion, a POSA would understand that for the power leads to provide power to Butler’s powered attachments, the rigid wand outlet would have an outlet end electrical connector “to connect the powered attachment to the electrical circuit.” *Id.*, 22:5-11. Butler’s “entry tube 524” includes an electrical connector adjacent to the hand vacuum cleaner air inlet to connect to “power leads” and provide power to Butler’s powered attachment. Ex1005, 22:6-11.

224. **Third**, as described in Limitation [1c], Butler's connector/vacuum tube connects this powered attachment to the hand vacuum cleaner. In my opinion, a POSA would therefore understand that to do so, the connector/vacuum tube would have electrical connectors at both its inlet end (to connect to the electrical connectors of the motorized powerhead) and at its outlet end (to connect to the hand vacuum cleaner's electrical connector, located adjacent its air inlet).
225. Additionally, in my opinion, Butler teaches a hand vacuum cleaner electrical connector provided adjacent to the vacuum cleaner air inlet. Butler's "nozzle inlet 504 ... comprises an entry tube 524 that passes through the dirt receptacle bottom wall 522." Ex1005, 22:5-11. "[A]ny type of cleaning device may be attached to the entry tube 524," and if a "powered attachment is provided, suitable power leads can be provided to connect the powered attachment to the electric circuit." *Id.*, 22:5-11. Butler's "entry tube 524" includes an electrical connector adjacent to the hand vacuum cleaner air inlet to connect to "power leads" and provide power to Butler's powered attachment. Ex1005, 22:6-11.
226. Further, in my opinion, a POSA would understand that the hand vacuum cleaner electrical connector is releasably engageable with the rigid wand outlet end electrical connector to provide electrical circuitry to Butler's

powered attachments, because Butler teaches a releasably engageable connector/vacuum tube, as described for Limitation [1c].

u. [13]

Reference Number	Claim Limitation
[13]	“The surface cleaning apparatus of claim 1 wherein when the hand vacuum cleaner is mounted to the rigid wand outlet end, the longitudinally extending conduit axis extends in a same direction as the suction motor axis of rotation.”

227. As I explained in Section X.A.2, Butler renders obvious Claim 1 of the '038 patent.

228. In my opinion, Butler teaches the surface cleaning apparatus of claim 1 and teaches wherein when the hand vacuum cleaner is mounted to the rigid wand outlet end, the longitudinally extending conduit axis extends in a same direction as the suction motor axis of rotation. (Claim 13).

229. As explained in Limitation [1b.1], in my opinion, Butler teaches a hand vacuum cleaner mounted to the rigid wand outlet end that has a longitudinally extending conduit axis. Further, as explained in Limitation [1c.i], in my opinion, Butler teaches a suction motor axis of rotation that extends in the same direction as the longitudinally extending axis of the rigid wand. *Id.*, see Ex1005, Fig. 15.

teaches and renders obvious first and second cyclonic stages, respectively, including oriented as claimed, where the front end of the second cyclonic stage is rearward of the rear end of the first cyclonic stage. In my opinion, a POSA would understand that the front end of the second cyclonic stage is rearward of the rear end of the first cyclonic stage.

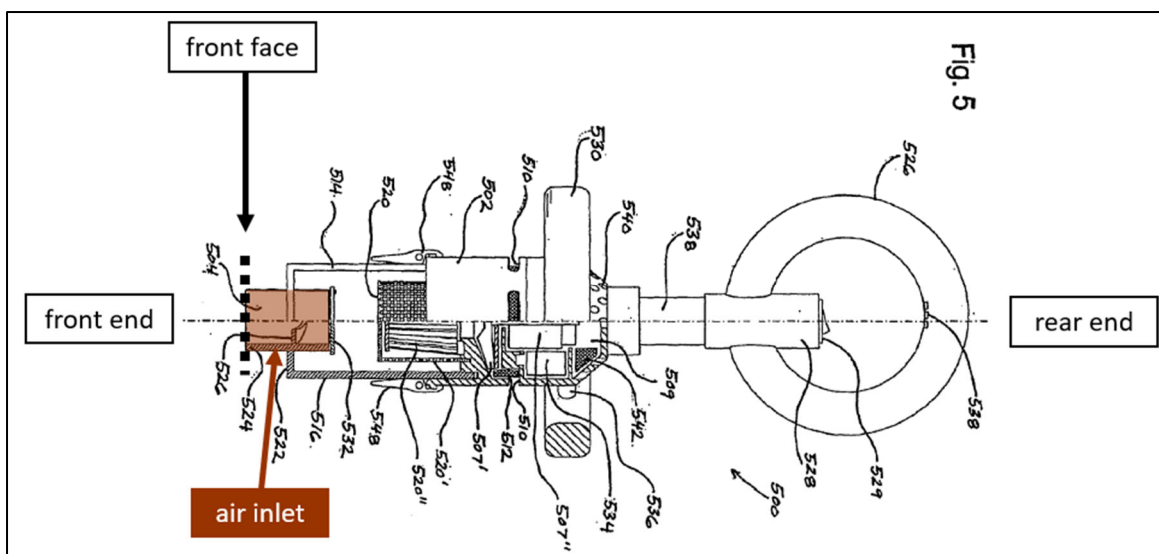
w. [15]

Reference Number	Claim Limitation
[15]	“The surface cleaning apparatus of claim 1 wherein the front face has the hand vacuum cleaner air inlet.”

233. As I explained in Section X.A.2, Butler renders obvious Claim 1 of the '038 patent.

234. Butler teaches the surface cleaning apparatus of claim 1 and teaches wherein the front face has the hand vacuum cleaner air inlet. (Claim 15).

235. In my opinion, while the claims do not previously refer to “a front face,” or state the structure containing the claimed front face, Butler teaches that its hand vacuum cleaner has a front face that has the hand vacuum cleaner air inlet, as shown:



Ex1005, Fig. 5.

B. Ground 2: Butler in Combination with Peng Renders Claims 1-15 Obvious

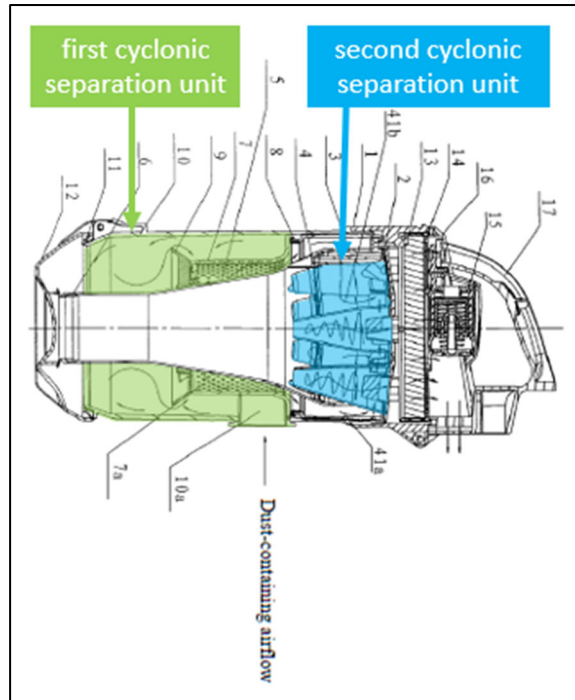
Reference Number	Claim Limitation
[1c.iii]	“a second cyclonic stage having a front end, a rear end and at least one second stage cyclone having a cyclone axis of rotation that extends between the front and rear ends of the second cyclonic stage and the rear end of the second cyclonic stage is rearward of the rear end of the first cyclonic stage,”

236. Butler in combination with Peng teaches a second cyclonic stage having a front end, a rear end and at least one second stage cyclone having a cyclone axis of rotation that extends between the front and rear ends of the second cyclonic stage and the rear end of the second cyclonic stage is rearward of the rear end of the first cyclonic stage. (Limitation [1c.iii]).

237. As explained in Ground 1, Limitation [1c.iii], Butler expressly teaches and suggests that its dirt separation unit may be modified with “other types of

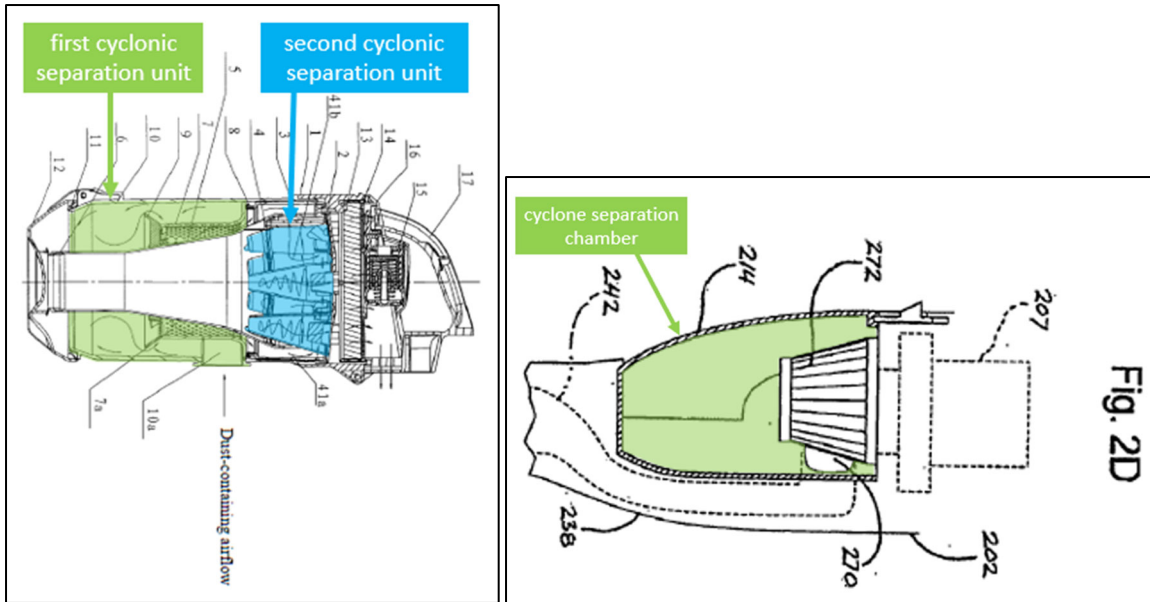
dirt separation system[s] ... appreciated by those of ordinary skill in the art.” Ex1005, 15:26-29, 16:25-26, 18:3-14, 22:23-25. Butler teaches that “various different types of dirt receptacle 214 may be used, and may be interchangeable with one another to provide the user with various cleaning options.” Ex1005, 16:26-28.

238. In my opinion, it would have been obvious to modify Butler’s hand vacuum cleaner to incorporate a two-stage cyclone separation system, including as taught by Peng, for the same reasons as explained in Ground 1, Limitation [1c.iii]. *See* Ground 1, Limitation [1c.iii].
239. Peng teaches a two-stage cyclone separation unit where its “second cyclone separation unit” is downstream and rearward of the “first cyclone separation unit”:



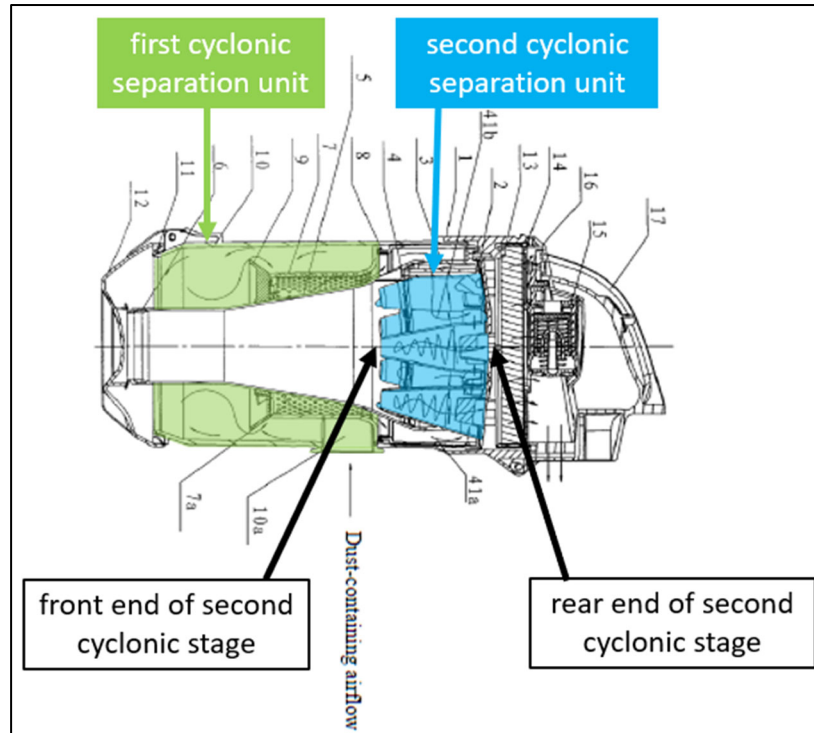
Ex1009, Fig. 3.

240. In my opinion, a POSA would have been motivated to incorporate Peng's second cyclonic separation unit immediately downstream of Butler's first cyclonic stage, for the reasons given in Limitation [1ciii], and to match the orientation of their respective first cyclone stages, with the upstream side at the front, and the downstream side at the rear:



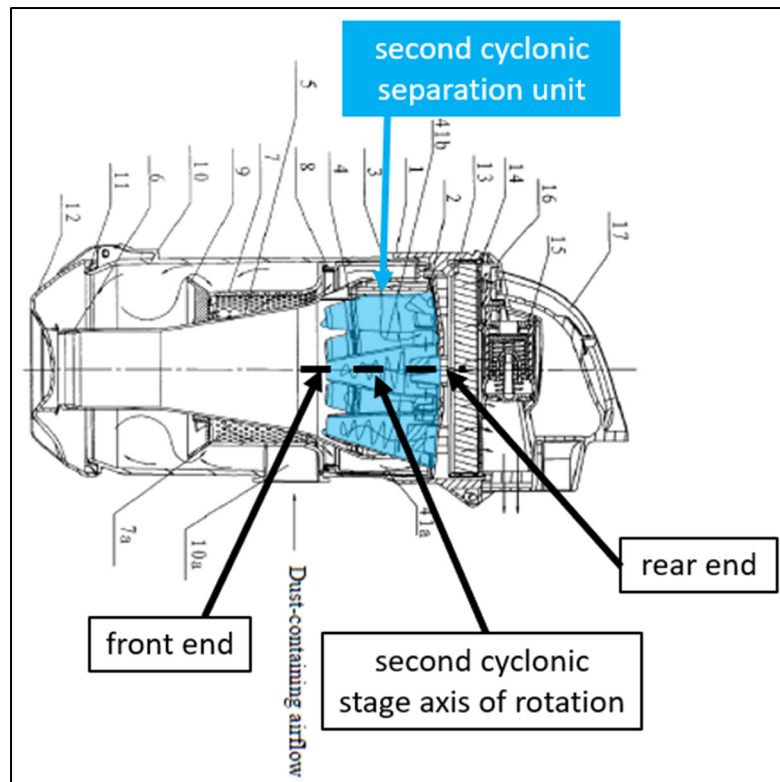
Ex1009, Fig. 3 (Peng); Ex1005, Fig. 2D (Butler); *see also* Ex1009 at [0005], [0008], [0010], [0012], [0059], [0060].

241. In my opinion, Butler in combination with Peng teaches a second cyclonic stage with a front end and a rear end, as shown:



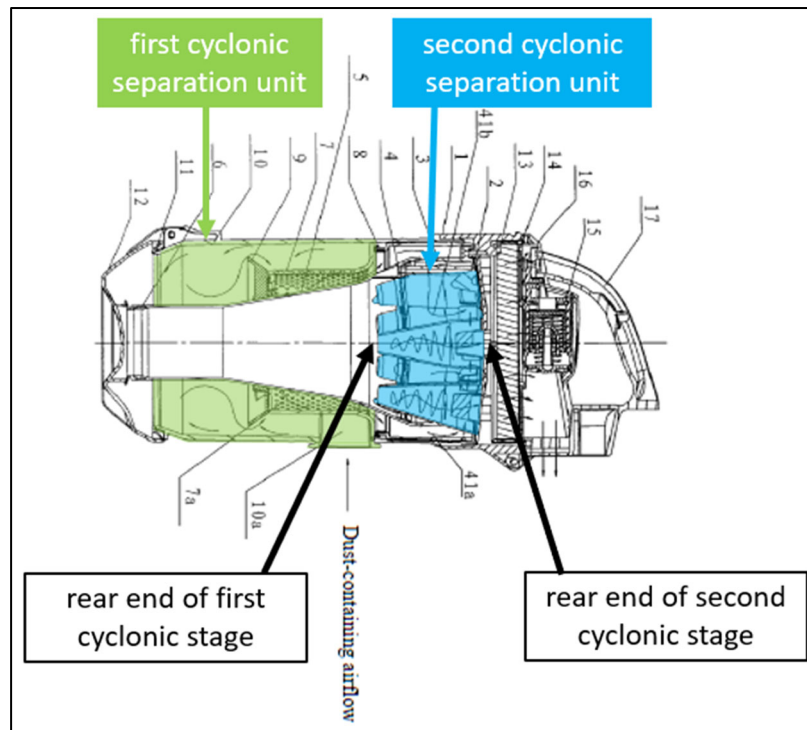
Ex1009, Fig. 3.

242. In my opinion, Butler in combination with Peng teaches a second cyclonic stage with a cyclone axis of rotation that extends between the front and rear ends of the second cyclonic stage, as shown:



Ex1009, Fig. 3.

243. In my opinion, Butler in combination with Peng teaches that the rear end of the second cyclonic cleaning stage is rearward of the rear end of the first cyclonic stage, as shown:



Ex1009, Fig. 3.

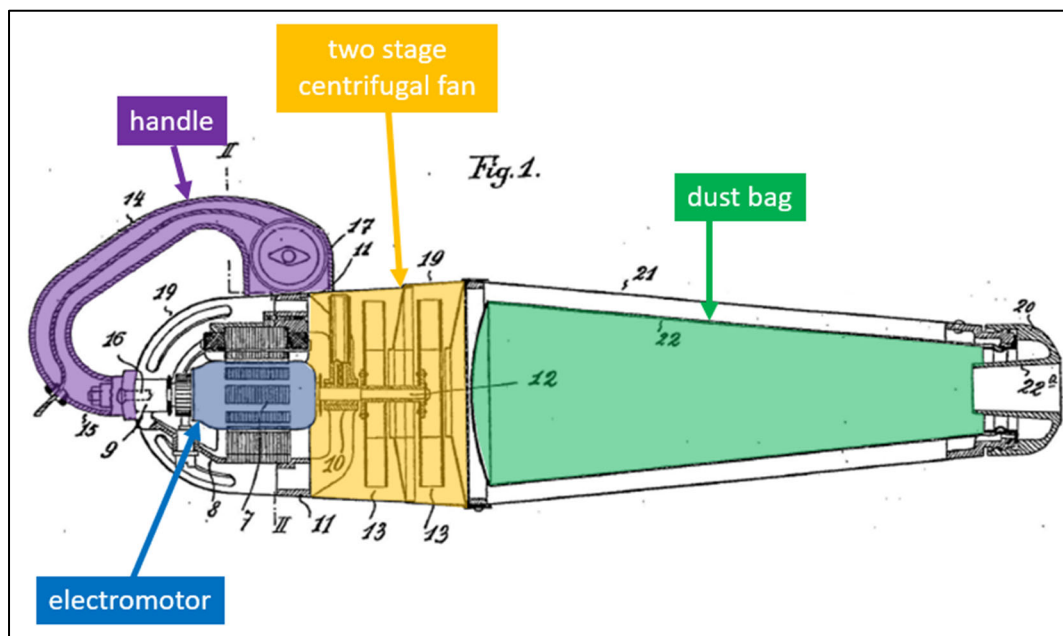
244. In my opinion, a POSA reading Butler would have been motivated to incorporate Peng's teachings. Further, in my opinion, a POSA would have been motivated to use a two-stage cyclonic separation unit with Butler by modifying the dirt receptacle comprising a single cyclone stage and to incorporate Peng's teachings of a second cyclone stage. Further, in my opinion, a POSA would have understood that hand vacuum cleaners with two cyclone stages were common, as Peng explains. Ex1009 at [0005]; *see also* Ground 1, Limitation [1c.iii]. Further, in my opinion, a POSA would have understood that a two-stage cyclonic stage provides additional filtration of dirty air, which is an advantage over a single cyclone

separation device. Further, in my opinion, a POSA would have been motivated to combine Butler with the teachings in Peng by adding a second cyclonic stage immediately downstream to the first to achieve the well-known and predictable benefits of additional dust separation.

C. Ground 3: Lehmann in Combination with Peng Renders Claims 1-11 and 13-15 Obvious

1. Motivation to Combine Lehmann and Peng

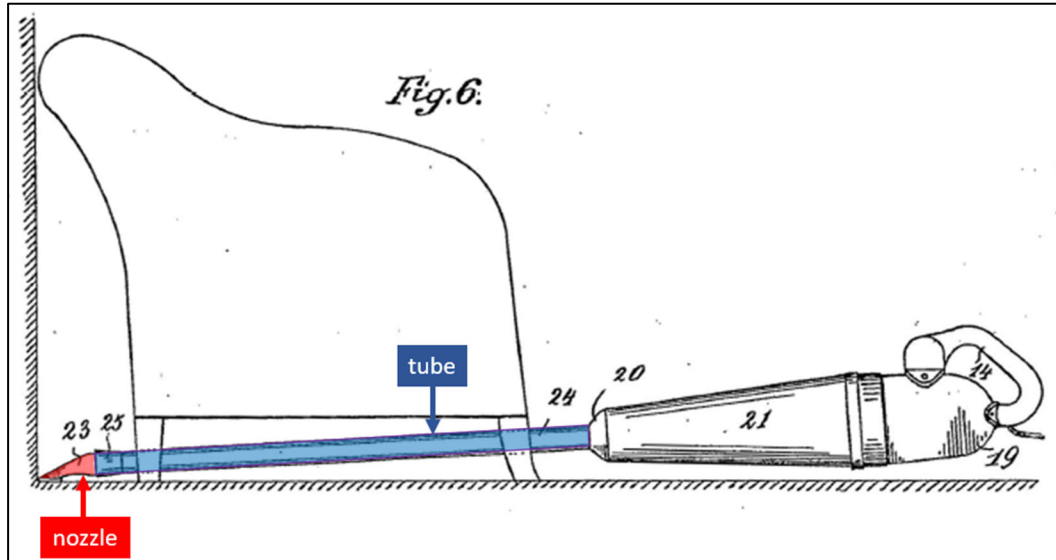
245. Lehmann teaches a portable vacuum cleaner from 1922 with an “**electromotor 7**,” a “**two stage centrifugal fan 13**,” and a “**dust bag 22**” arranged along the longitudinal axis, and an “**arched handle 14**.” Ex1006, Fig.1, 1:38-44, 1:63-73.



Ex1006, Fig.1, 1:38-44, 1:63-73, Claim 1.

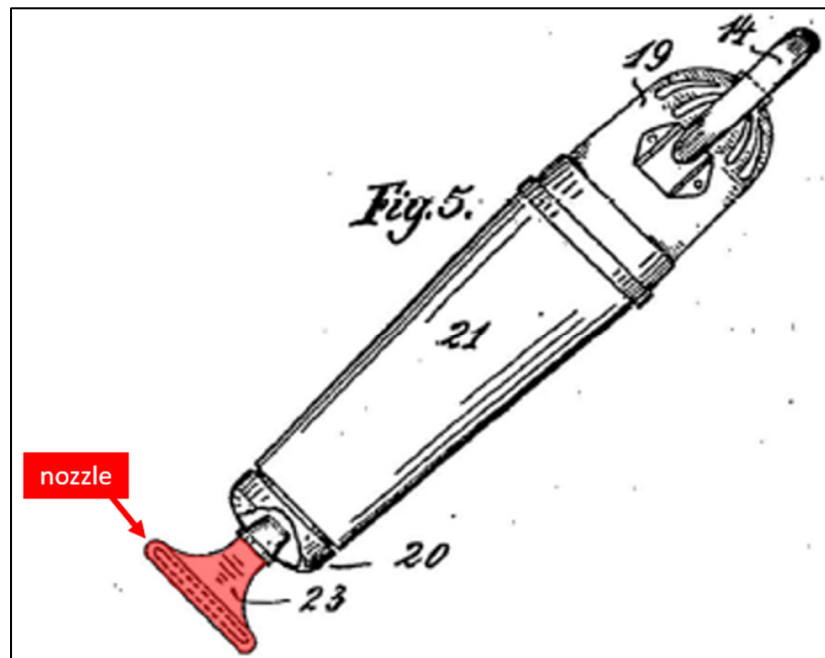
246. As shown in Figure 6, Lehmann teaches a “**tube 24**” that is “fitted to the

appliance for cleaning carpets and articles beyond ordinary reach” such as
“cleaning the floor under articles of furniture”:



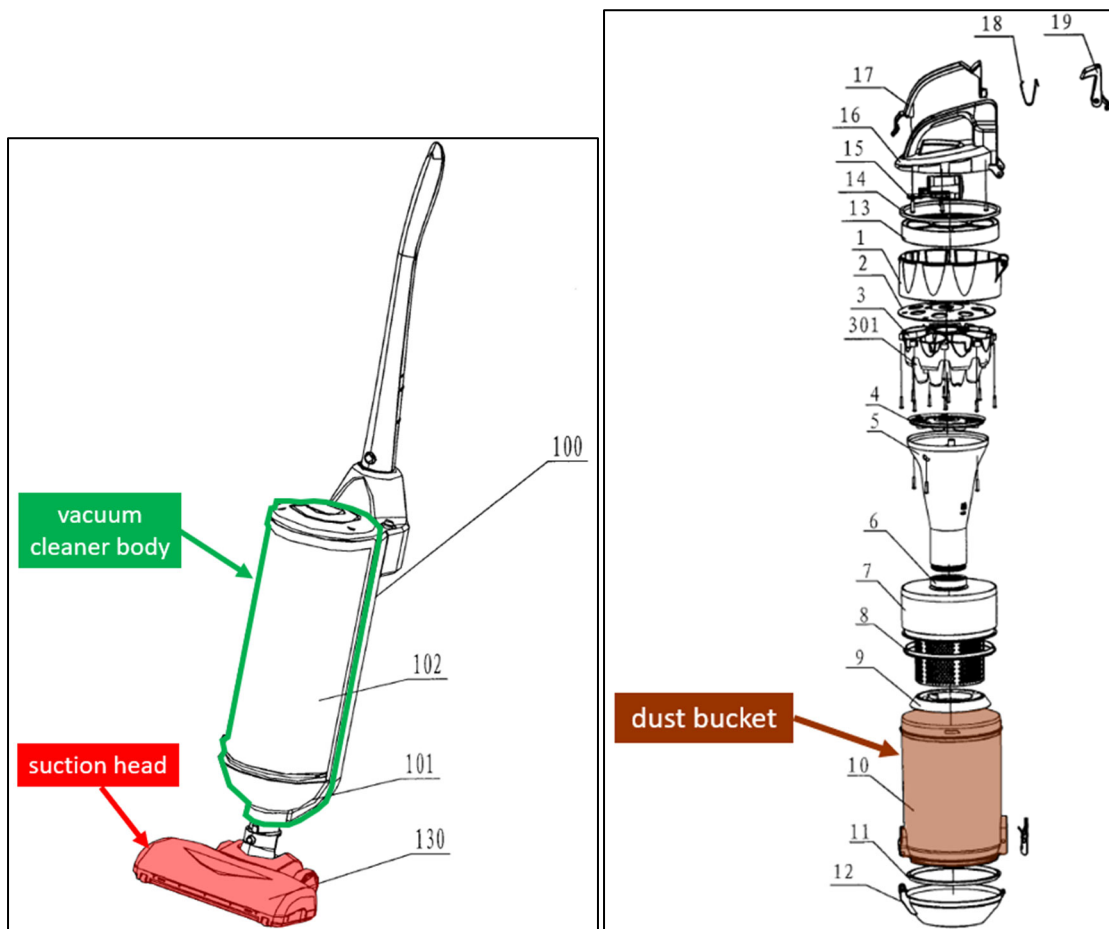
Ex1006, Fig 6, 2:7-24, 2:39-41.

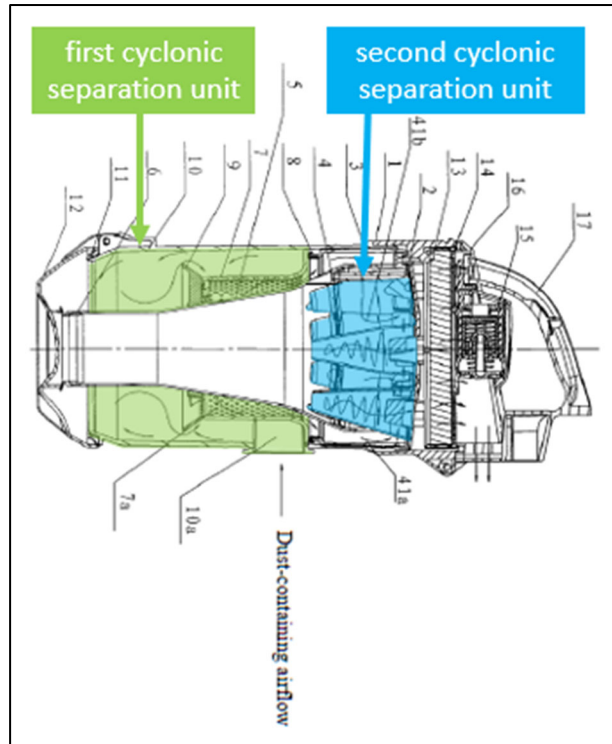
247. Alternatively, as shown in Figure 5, a “**nozzle 23**” may be directly attached for “cleaning upholstery cushions and the like”:



Ex1006, Fig. 5, 2:14-17.

248. Peng teaches a vacuum cleaner from 2010 with “a vacuum cleaner body,” “a suction head,” “a cyclone cylinder,” “a dust bucket” in a “vertical cyclone vacuum cleaner.” Ex1009 at [0029], [0041]-[0053]. Peng’s vacuum cleaner has “a first cyclone separation unit and a second cyclone separation unit.” Ex1009, Cl. 1, [0005], [0008]; *see* Ground 2.





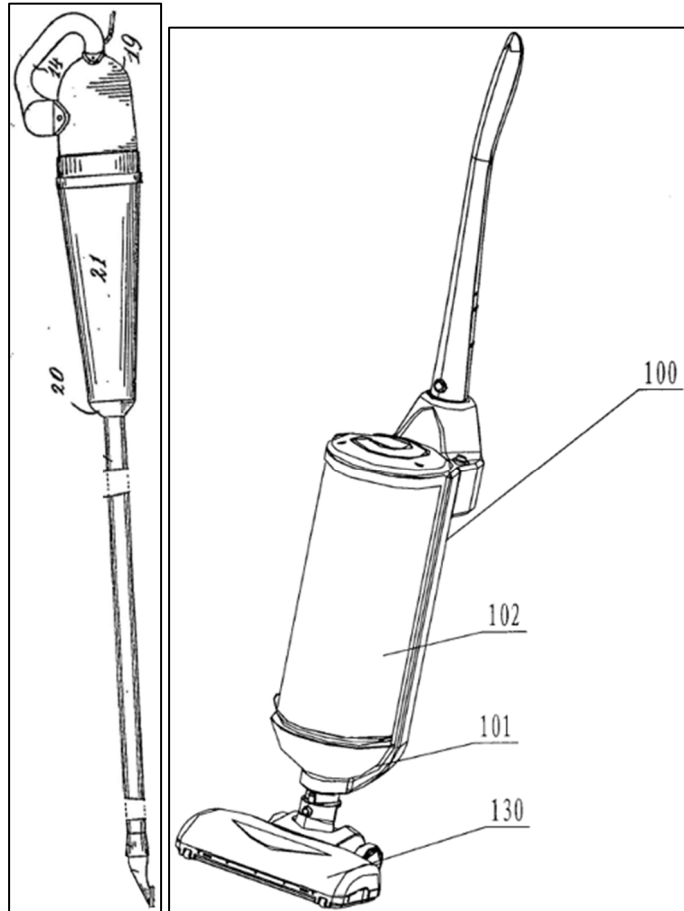
Ex1009, Figs. 2-3, 7.

249. In my opinion, a POSA would have understood that hand vacuum cleaners with two cyclone stages were common, as Peng and other prior art teaches. Ex1009 at [0005]; *see also* Ground 1, Limitation 1c.iii; Ground 2.
250. Further, in my opinion, a POSA would have further understood that a two-stage cyclonic stage provides an efficient and high level of filtration of dirty air, without the loss of suction that occurs when dust accumulates in a dust bag, and without the need to purchase, change, or dispose of a dust bag as it becomes full. The benefits of cyclonic separation over dust bags were well-known to a POSA, including as early as the 1950s. Martelliere taught these advantages in 1955: “By application of the ‘Whirlwind’

principle,” i.e., cyclonic filtration, “the materials are deposited in the bottom of the container, after having separated from the air, before it passes through the filter screen,” which “prevent[s] clogging” and creates “stable suction,” and by using a transparent cyclonic chamber, “the user is able, when stopped, to see where the filling of the container is” and “can therefore better judge when it must be emptied.” Ex1012, 1. These advantages were well-understood at the time of the ’038 Patent; as another example, in 2002, WO02/067753 to Vuijk explained that “so-called bagless vacuum cleaners,” or “cyclonic” cleaners, “are becoming increasingly popular” because they “avoid[ed] the use of a filter bag as the primary form of separation” and thus “maintain a consistently high level of suction, even as the collecting chamber fills with dirt.” Ex1013, 1:5-10. As Conrad teaches, “[c]yclonic vacuum cleaners are known in the art,” and one “advantage” of Conrad’s design is that its chamber is transparent so, “when the dirt collection bin is full, a user ... will have a visual signal to empty the cyclonic stage.” Ex1010 ¶¶2,112.

251. In my opinion, a POSA would have been motivated to substitute Lehmann’s dust separation unit (a dust bag) with Peng’s separation unit (a two-stage cyclonic separation unit) to achieve the well-known benefits of modern cyclonic separation, including as described above.

252. **First**, in my opinion, Lehmann and Peng are analogous art. Both are vacuum cleaners, and have similar layouts implementing a handle, a body, and a cleaning head from one end to the other when in the same orientation:



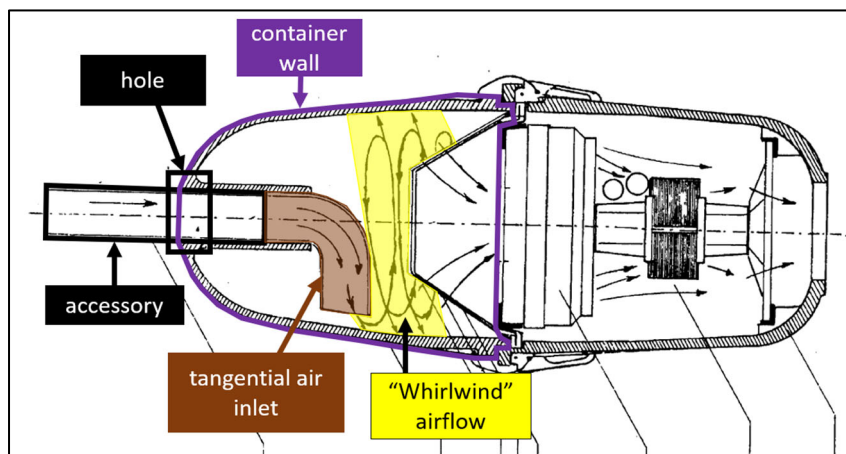
Ex1006, Fig. 6; Ex1009, Fig. 7.

253. **Second**, in my opinion, this combination would have involved a simple substitution of known elements for others to obtain predictable results. Lehmann teaches a cleaner having a dust-separation unit (a dust bag), and Peng teaches a two-stage cyclonic separation unit. Ex1006 1:38-44, 1:63-74, Fig. 1; Ex1009 at [0005], [0008], [0029], [0041]-[0053]; *see* Ground

2. In my opinion, a POSA would understand that the simple substitution of Peng's two-stage cyclonic separation unit in place of Lehmann's dust bag separation unit would achieve the predictable results of filtering air (with a high level efficiency, without loss of suction as the bag filled, without the need to purchase, change, or dispose of dust bags, and would allow a user to see how full the dust separation unit is). Further, as depicted above, in my opinion, Lehmann and Peng are directed to vacuums having a similar orientation of separation unit along the longitudinal axis of the vacuum. Ex1006, Fig. 1; Ex1009, Figs. 3, 7.
254. **Third**, in my opinion, it would have been at least obvious to try this combination. In my opinion, a POSA would understand there are a finite number of identified dust-separation solutions, including dust bags (as Lehmann teaches) and cyclonic separators (as Peng teaches), and it would have been obvious to try to achieve the known benefits describe above.
255. In my opinion, a POSA would have had a reasonable expectation of success substituting Lehmann's dust bag with Peng's cyclonic separator teachings. In my opinion, a POSA would have understood that these two separation units could be used interchangeably, and would have further expected success for the reasons stated above, including because such modification involves a simple substitution of known elements that

perform similar functions in similar ways.

256. Further, in my opinion, a POSA would have had a reasonable expectation of success incorporating Peng's cyclonic-separation teachings into Lehmann because it was well-known that front-located air inlets (such as Lehmann's) create cyclonic separation by using a tangential opening. As Peng explains, a "tangential air inlet" can create a cyclone. Ex1009 at [0010], [0055], Claim 1. Further, front-located tangential air inlets have been used for cyclonic cleaners since well before the '038 Patent. In 1955, Martelliere taught a "**tangential[]**" **air inlet** and removable **accessory** attached thereto through a **hole** in the "detachable" front "**wall of the ... container**" that created "the 'Whirlwind' principle," which a POSA understands is cyclonic airflow:



Ex1012, 1, Fig. 1.

257. In my opinion, a POSA would have understood that the same configuration

would create cyclonic airflow in the combined teachings of Lehmann and Peng.

2. The Combined Teachings of Lehmann and Peng Render Obvious Claims 1-11 and 13-15

a. [1pre]

Reference Number	Claim Limitation
[1pre]	“A surface cleaning apparatus comprising:”

258. To the extent the preambles are limiting, in my opinion, Lehmann teaches a surface cleaning apparatus. Lehmann teaches a “portable vacuum dusting and cleaning apparatus” for surfaces such as “carpets” and “the floor.” Ex1006, 2:15-24, Cls. 1,2. Lehmann further teaches that its vacuum can be used on other surfaces, such as for “cleaning upholstery, cushions and the like” *Id.*

b. [1a]

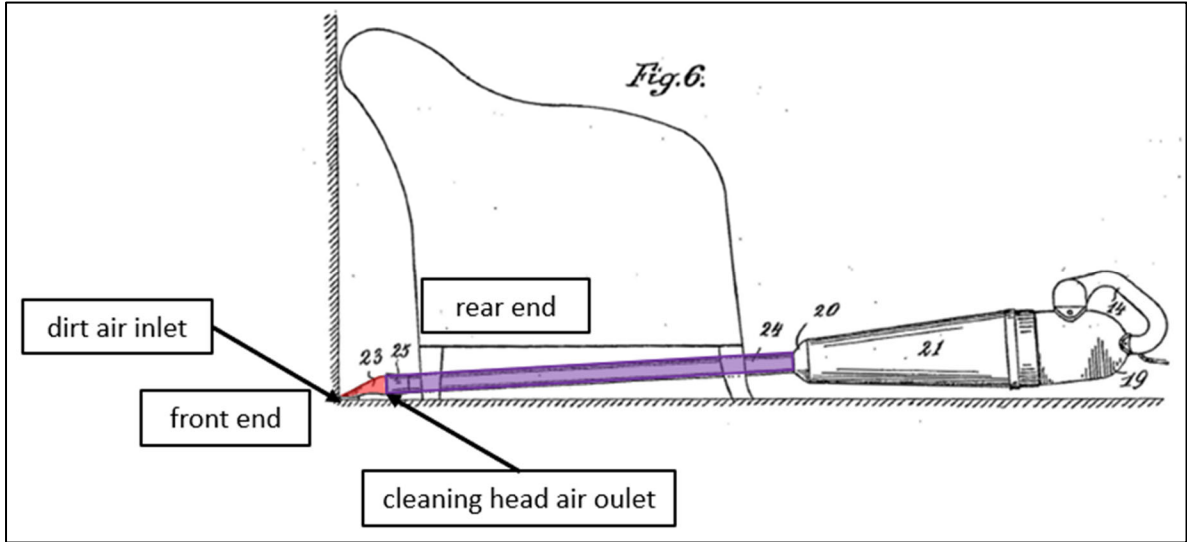
Reference Number	Claim Limitation
[1a]	“(a) a surface cleaning head having a front end, a rear end, a dirt air inlet and a cleaning head air outlet;”

259. Lehmann teaches a surface cleaning head having a front end, a rear end, a dirt air inlet and a cleaning head air outlet. (Limitation [1a]).

260. Lehmann’s vacuum cleaner includes a “**nozzle 23**,” which is a surface cleaning head with a front end, a rear end, a dirt air inlet and a cleaning air

outlet. Ex1006 at 1.

261. In my opinion, a POSA would understand that “**nozzle 23**” has a dirt air inlet where air enters the nozzle, and a cleaning head air outlet where the nozzle connects to “**tube 24**,” and a front end and rear end as shown:



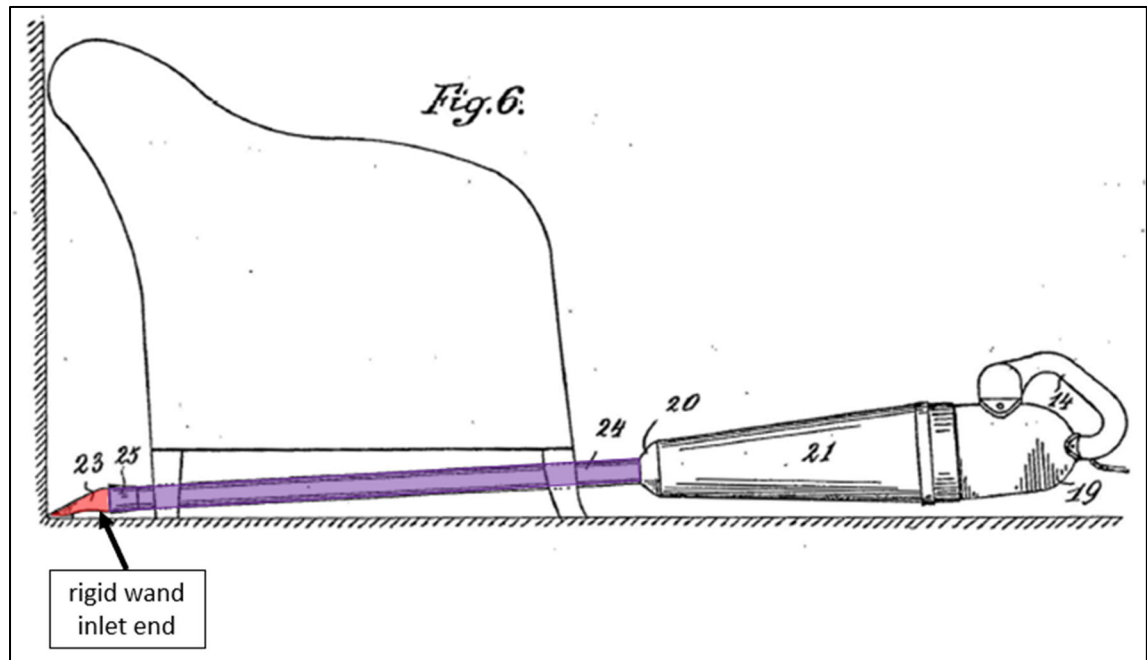
Ex1006 at 2, Fig. 6.

c. [1b.1]

Reference Number	Claim Limitation
[1b.1]	“(b) a rigid air flow conduit having a rigid wand inlet end having an air inlet in communicable with the cleaning head air outlet, a rigid wand outlet end and a longitudinally extending conduit axis”

262. Lehmann teaches a rigid air flow conduit having a rigid wand inlet end having an air inlet in communicable with the cleaning head air outlet, a rigid wand outlet end and a longitudinally extending conduit axis. (Limitation [1b.1]).

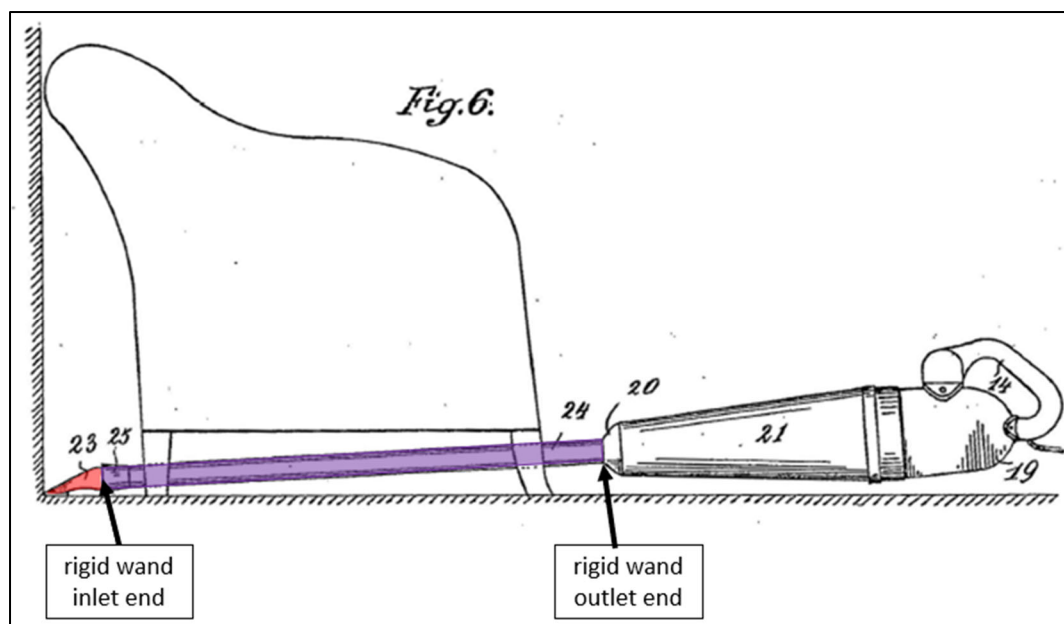
263. Lehmann teaches a “**tube 24**,” which is a rigid air flow conduit:



Ex1006 at 2, Fig. 6.

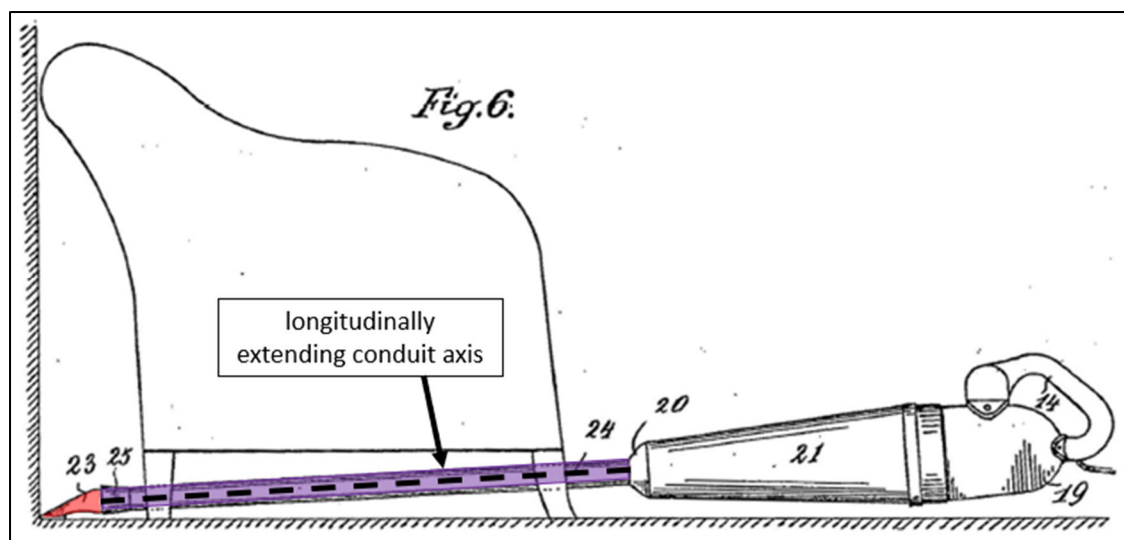
264. In my opinion, a POSA would understand that Lehmann’s tube is rigid, as shown in Figure 6.

265. Lehman’s “tube 24” has a rigid wand inlet end having an air inlet, located where air enters the tube from “nozzle 23,” as shown:



Ex1006 at Fig. 6, 2 (“**tube 24** [has] at its forward end a socket 25 for the **nozzle 23**”).

266. In my opinion, because Lehmann’s “tube 24” connects to its “nozzle 23” to extend its range, a POSA would understand that the tube’s air inlet communicates with the cleaning head air outlet of “nozzle 23.”
267. Lehmann further teaches that the tube has a rigid wand outlet end, as shown above: “**tube 24**,” has a rigid wand outlet end where it connects to the “cap 20,” which “makes a tight joint around the mouth of the dust bag” and has a “inwardly directed coned socket 22a, adapted to receive ... a **tube 24**” Ex1006 at 2:7-14. Lehman further teaches that its tube has a longitudinally extending conduit axis; “**tube 24**” has a longitudinally extending conduit axis as shown:



Ex1006 at Fig. 6.

d. [1b.2]

Reference Number	Claim Limitation
[1b.2]	“the rigid air flow conduit is moveably mountable to the surface cleaning head between an upper position and an in-use floor cleaning position in which the rigid air flow conduit extends at an angle to the vertical,”

268. Lehmann teaches the rigid air flow conduit is moveably mountable to the surface cleaning head between an upper position and an in-use floor cleaning position in which the rigid air flow conduit extends at an angle to the vertical. (Limitation [1b.2]).

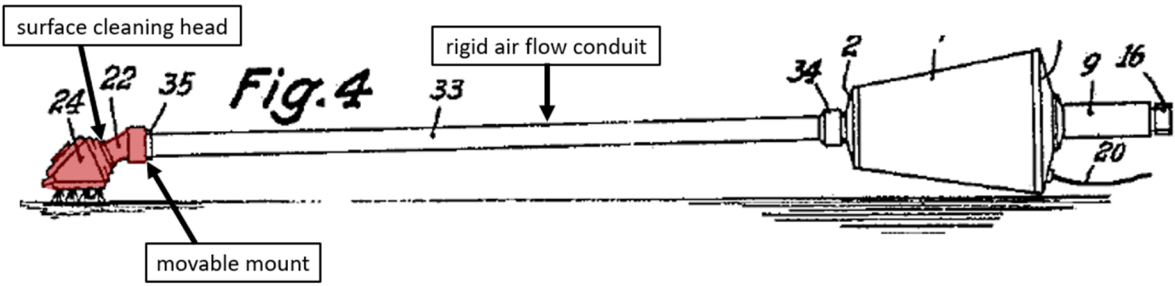
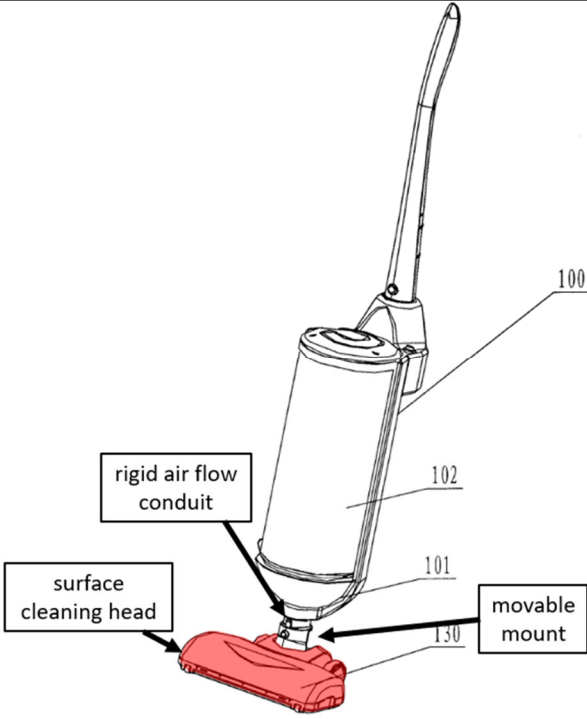
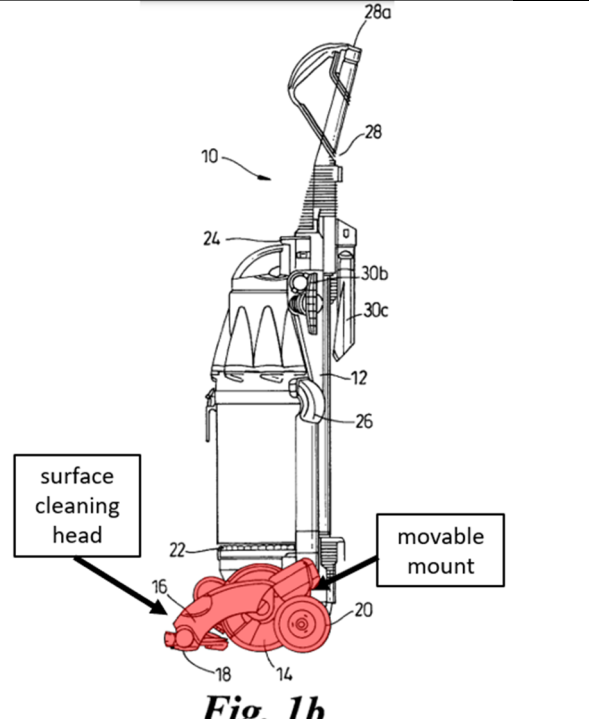
269. Lehmann’s “tube 24” (the rigid air flow conduit) is moveably mountable to the “nozzle 23” (the surface cleaning head) via “socket 25.”

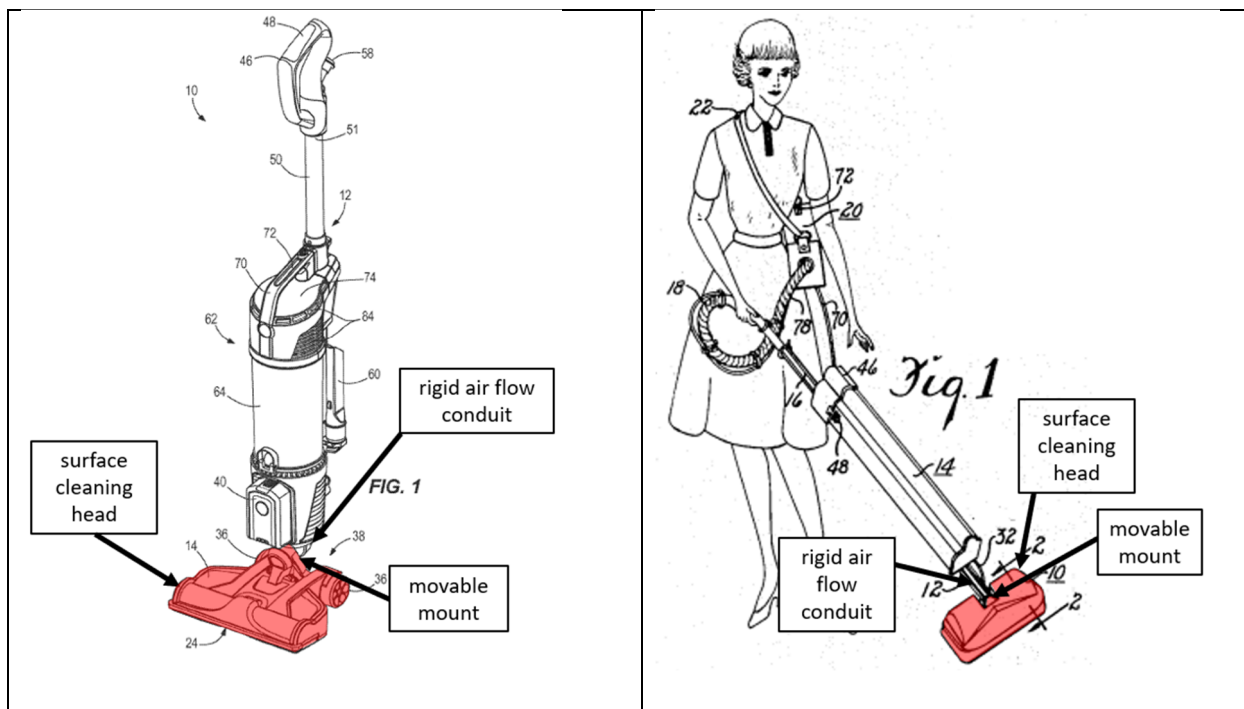
270. In my opinion, POSA would understand that, because Lehmann allow for cleaning at a variety of angles, including below low furniture as shown in

Figure 6, that such a socket would permit the nozzle to pivot relative to the tube so that the nozzle remains flush with the floor at a variety of angles. Ex1006 at 2.

271. Lehmann teaches that its vacuum cleaner may be used “for cleaning carpets and articles beyond ordinary reach” such as “for cleaning the floor under articles of furniture.” Ex1006, 2:8-24.
272. In my opinion, a POSA would understand that to be able to clean surfaces at all such angles, Lehmann’s “nozzle 23” would be moveably mounted to the “tube 24.” Otherwise, a user would have to manipulate Lehmann’s vacuum in uncomfortable postures, which goes against Lehmann’s teaching that its vacuum is easy to maneuver such that it “can be handled by a child if desired.” Ex1006, 1:30-31.
273. To the extent PO argues that Lehmann does not teach a moveably mounted rigid air flow conduit to the surface cleaning head, in my opinion, it would have been obvious to a POSA to modify Lehmann’s “socket 25” to allow for pivoting to allow for better contact between the surface cleaning head and surfaces at a variety of angles, including when standing and when cleaning under furniture. A moveably mounted rigid air flow conduit to a surface cleaning head was well known in the art at the time of the ’038 patent. For example, moveable mounts are disclosed in the art as early as

1939:

Swiss Pat. No. CH203,675 (1939) 	
CN 201958793 (2010) 	US 6,607,572 (2003)  Fig. 1b
US 9,402,516 (2014)	US 3,226,758 (1963)

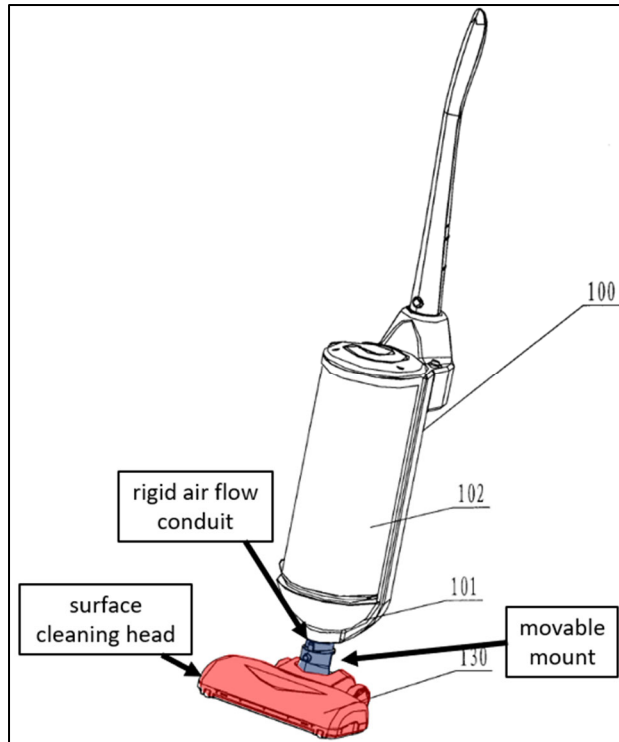


274. Ex1020, Fig. 4; Ex1009, Fig. 7; Ex1021, Fig1b; Ex1022, Fig. 1; Ex1023,

Fig. 1. In my opinion, a POSA would have been motivated to modify Lehmann's "socket 25" such that it was a moveable mount between the surface cleaning head and the rigid air flow conduit. In my opinion, such an arrangement would have involved minimal modifications, and a POSA would have expected predictable results—*i.e.*, easier manipulation of the vacuum cleaner when cleaning at different angles—from the simple substitution. In my opinion, by modifying the "socket 25" to be a moveable mount, a user would additionally achieve a more efficient suction of the dirt air because it would be allow for the surface cleaner head to lay flat against the surface it was cleaning from a much broader set of postures. Accordingly, in my opinion, it would have been obvious for

a POSA to try such modification to Lehmann's vacuum cleaner so that a user could maximally achieve the stated goals of Lehmann's apparatus: "[f]acility of manipulation," "opera[ble] under and behind chairs and like furniture" and "[e]fficient suction, equal to that of stationary appliances." Ex1006, 1:30-37. And in light of the numerous examples of pivotable mounts in the art between tubes and cleaner heads, in my opinion, a POSA would have had at least a reasonable expectation of success in making such a combination.

275. A POSA would have been motivated to combine Lehmann with Peng for this limitation: in my opinion, Lehmann and Peng are analogous art with similar configurations, which would have motivated a POSA to incorporate Peng's teachings. In my opinion, a POSA would have understood that Peng has a pivoting joint between its suction head and tube so that it could be effectively used as an upright vacuum:



Ex1009, Fig. 7.

276. In my opinion, a POSA would have motivated to substitute Peng's pivotable joint into Lehmann to achieve the well-known benefits described above, including keeping the surface cleaning head flat against the surface to be cleaned at multiple angles, including when cleaning deep under furniture.
277. In my opinion, Lehmann teaches that its cleaning apparatus can be used in an upper position. Lehmann teaches that the "tube 24" may be fitted for cleaning carpets and other surfaces presumably while a user is standing, which is an upper position. Ex1006, 2:14-20. Lehmann also teaches that the "tube 24" can be fitted to clean "articles beyond ordinary reach"

including for “cleaning floors under articles of furniture,” which is an in-use floor position. *Id.*

278. When cleaning such surfaces with the “tube 24” affixed to the body of Lehmann’s vacuum cleaner, in my opinion, a POSA would understand that the rigid air flow conduit would extend at an angle to the vertical. Further, in my opinion, a POSA would understand that Lehmann, when modified to include a pivoting joint (including as taught by Peng), would likewise allow its tube to move between an upper position (including as shown in Peng’s Figure 7) and an in-use floor cleaning position in which the rigid air flow conduit extends at an angle to the vertical (such as that shown in Lehmann’s Figure 6).

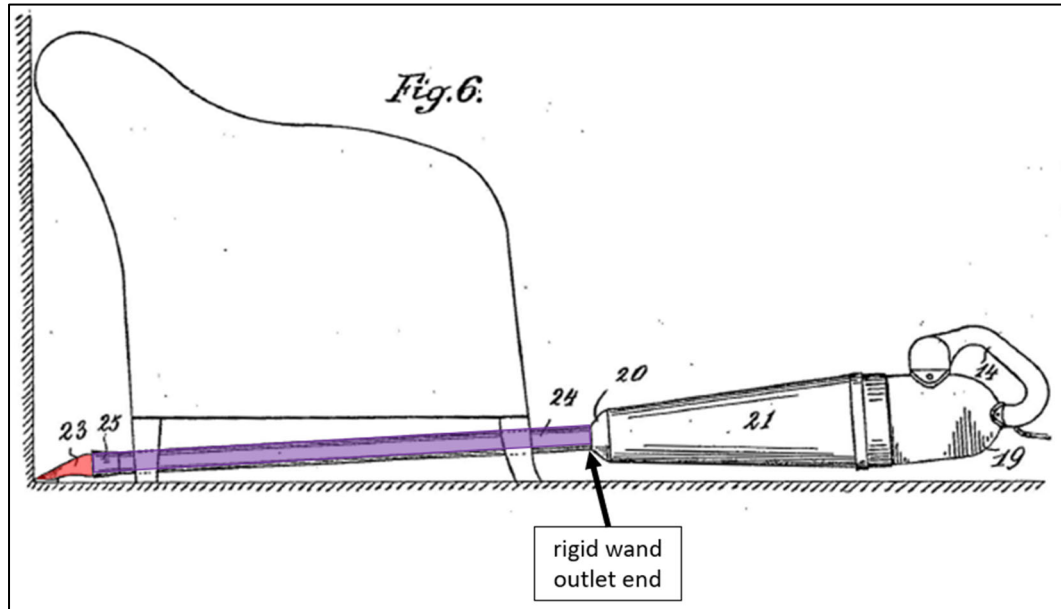
e. [1b.3]

Reference Number	Claim Limitation
[1b.3]	“the rigid wand outlet end having an air outlet; and,”

279. Lehmann teaches the rigid wand outlet end having an air outlet. (Limitation [1b.3]).
280. As explained in Limitation [1b.2], Lehmann teaches a rigid air flow conduit, which has a rigid air flow outlet end. Lehmann further teaches that the “**tube 24**” is connected to the “cap 20,” which “makes a tight joint around the mouth of the dust bag” and has a “inwardly directed coned

socket 22a, adapted to receive ... a **tube 24**" Ex1006, 2:7-14.

281. In my opinion, a POSA would understand that air exits the tube at this location, and Lehmann therefore teaches that the rigid wand outlet end has an air outlet.



Ex1006, Fig. 6.

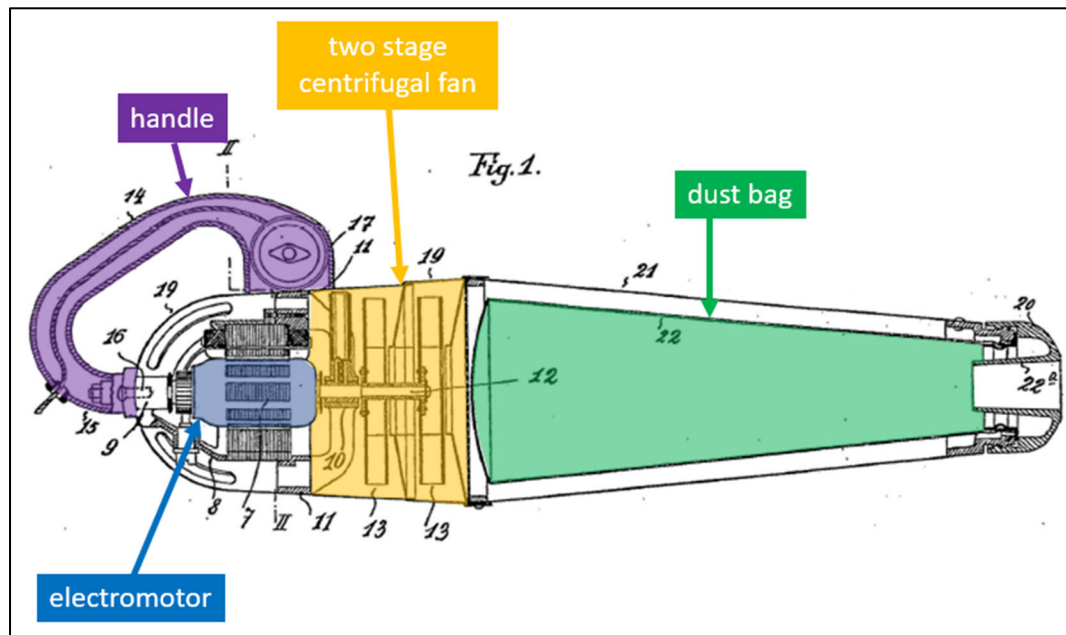
f. [1c]

Reference Number	Claim Limitation
[1c]	“(c) a hand vacuum cleaner removably mountable to the rigid wand outlet end, the hand vacuum cleaner having a front end, a rear end, and upper end, a lower end and a hand vacuum cleaner air inlet, the hand vacuum cleaner comprising:”

282. Lehmann teaches a hand vacuum cleaner removably mountable to the rigid wand outlet end, the hand vacuum cleaner having a front end, a rear end, and upper end, a lower end and a hand vacuum cleaner air inlet.

(Limitation [1c]).

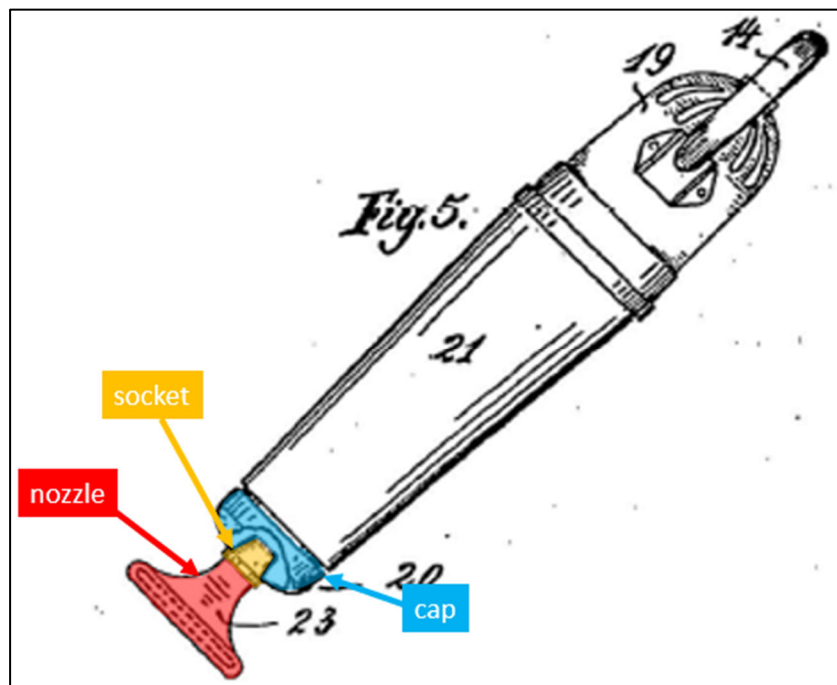
283. Lehmann teaches a hand vacuum cleaner: its “portable vacuum dusting and cleaning apparatus comprising an electromotor, a centrifugal fan, a dust bag, a casing and an arched handle for manipulating the appliance.”
Ex1006, Cl. 1; *see also id.* at 1:63-92.



Ex1006, Fig. 1.

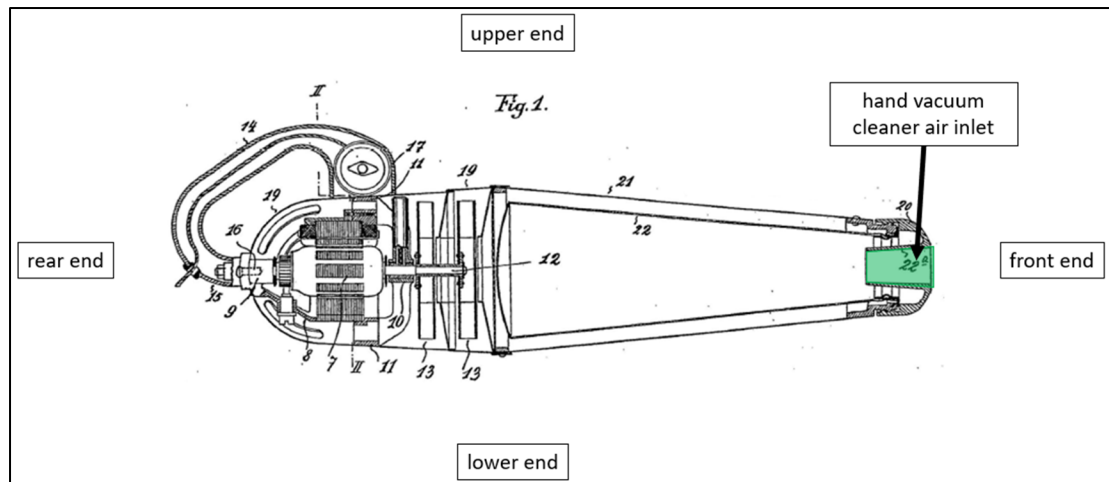
284. Lehmann’s hand vacuum cleaner is removably mountable to the rigid wand outlet end. Lehman’s hand vacuum includes a “cap 20” with a “socket 22a” for receiving the outlet end of “tube 24”: “inwardly directed coned socket 22a” is “adapted to receive ... a tube 24” and “cap 20” “makes a tight joint around the mouth of the dust bag.” Ex1006 at 2:7-14.
Further, Lehmann teaches that this mounting is removeable, because

Lehmann teaches dispensing the “tube 24” when cleaning upholstery cushions and affixing the “nozzle” to the “socket 22a” directly as shown in Figure 5:



Ex1006, Fig. 5.

285. Lehmann’s hand vacuum cleaner has a front end, rear end, upper end, and lower end, as shown, and a hand vacuum cleaner air inlet: “**socket 22a,**” where air enters the hand vacuum, as shown:



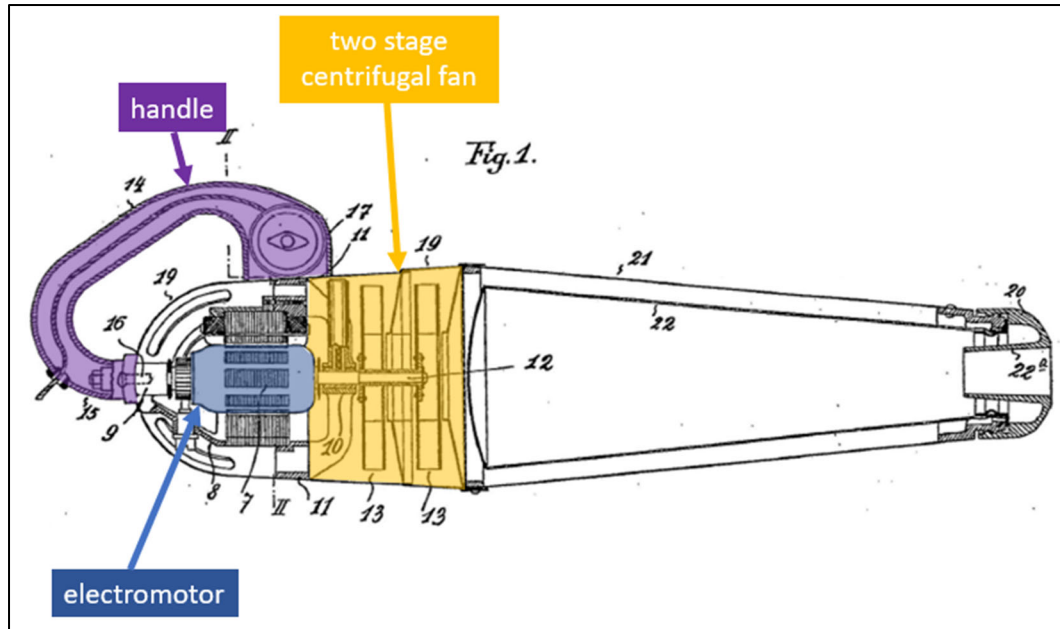
Ex1006 at Fig. 1.

g. [1c.i]

Reference Number	Claim Limitation
[1c.i]	“(i) a main body comprising a handle and a suction motor and fan assembly, the suction motor and fan assembly having a suction motor axis of rotation”

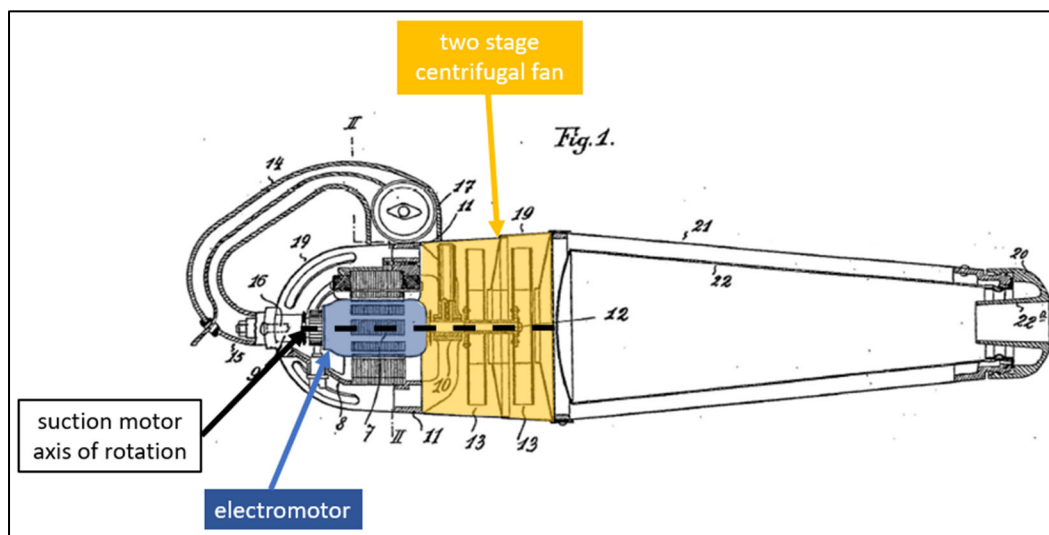
286. Lehmann teaches the hand vacuum cleaner comprising a main body comprising a handle and a suction motor and fan assembly, the suction motor and fan assembly having a suction motor axis of rotation. (Limitation [1c.i]).

287. Lehman’s hand vacuum cleaner has a main body comprising a handle, and a suction motor and fan assembly. Lehmann teaches a “portable vacuum dusting and cleaning apparatus comprising an electromotor, a **centrifugal fan** ... and an **arched handle** for manipulating the appliance.” Ex1006, Cl. 1; *see also id.* at 1:38-44, 1:63-82.



Ex1006, Fig. 1.

288. In my opinion, Lehmann's "arched handle" is a handle, its "electromotor" is a suction motor, and its "centrifugal fan" is a fan assembly.
289. In my opinion, Lehmann's suction motor and fan assembly has a suction motor axis of rotation that runs through "motor shaft 12" as shown:



Ex1006, Fig. 1.

290. In my opinion, a POSA would understand that motor shaft 12 and fan rotate about this motor axis of rotation.

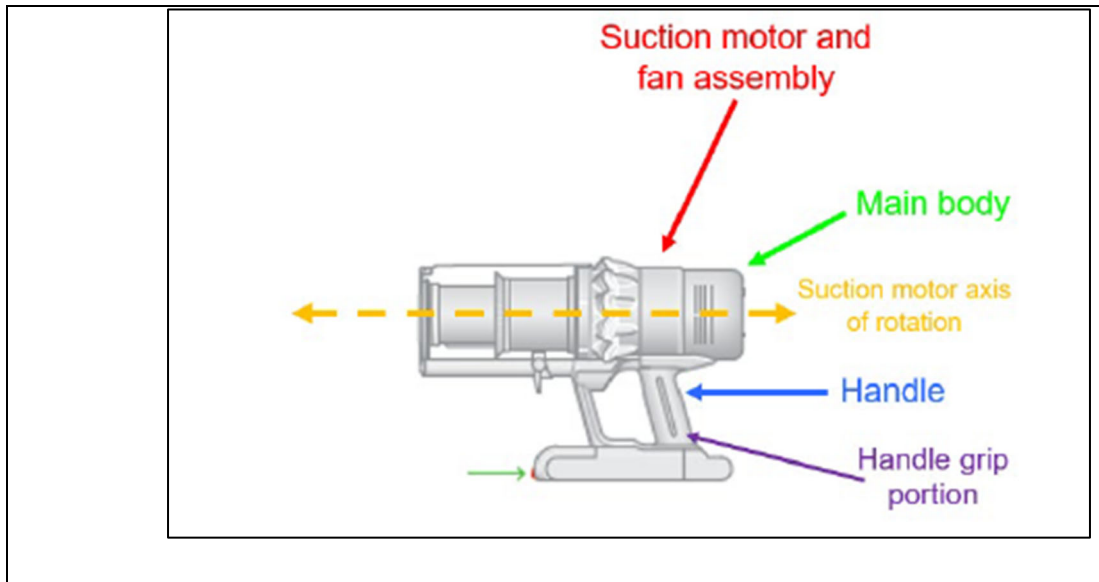
h. [1c.i.1]

Reference Number	Claim Limitation
[1c.i.1]	“the handle having a hand grip portion, a first handle portion and a second handle portion, the first handle portion is mounted to the main body at the location of the suction motor and fan assembly;”

291. Lehmann teaches the handle having a hand grip portion, a first handle portion and a second handle portion, the first handle portion is mounted to the main body at the location of the suction motor and fan assembly to the same extent as alleged by PO. (Limitation [1c.i.1]).

292. In my opinion, Lehmann teaches a handle with a hand grip portion to the same extent PO has argued in its infringement contentions in the related district court matter that Petitioners’ products have a hand grip portion. *See e.g.*, Ex1018 (’038 Infringement Contentions Ex. A-5). Like the accused products, Lehmann’s handle has a smooth surface, which PO alleges is a “hand grip portion”:

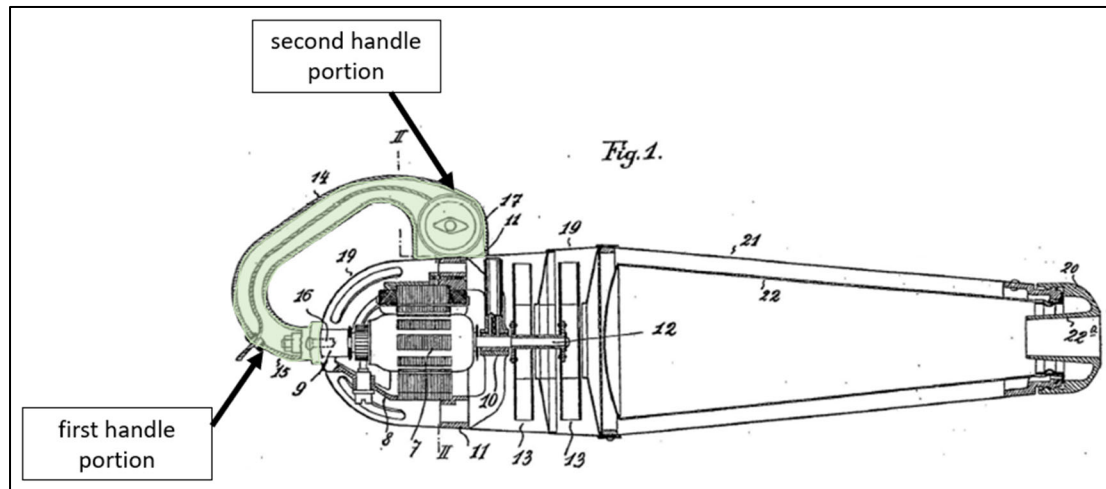
PO’s Infringement Contentions



Compare Ex1006, Fig. 1 with Ex1018, 21.

293. In my opinion, Lehmann therefore teaches a “hand grip portion” to the same extent as alleged by PO.
294. Additionally, in my opinion, it would have been obvious to a POSA to modify Lehmann’s handle with a textured surface to provide added gripping, which was well known in the art prior to the ’038 Patent. For example, Butler teaches such a gripping surface. *See* Ground 2, Limitation [1c.i.1]. Accordingly, in my opinion, it would have been obvious to a POSA that by adding a textured gripping surface to the handle where a user’s hand would normally grip the handle, to achieve the well-known benefit of prevent slippage and to allow for more secure handling of the vacuum cleaner.
295. In my opinion, Lehmann further teaches a first handle portion and a second

handle portion, as shown:



Ex1006, Fig. 1; *see also* Ex1006, 1:38-44, 1:71-78.

296. As shown above, Lehmann teaches that its first handle portion is mounted to the main body at the location of the suction motor and fan assembly.

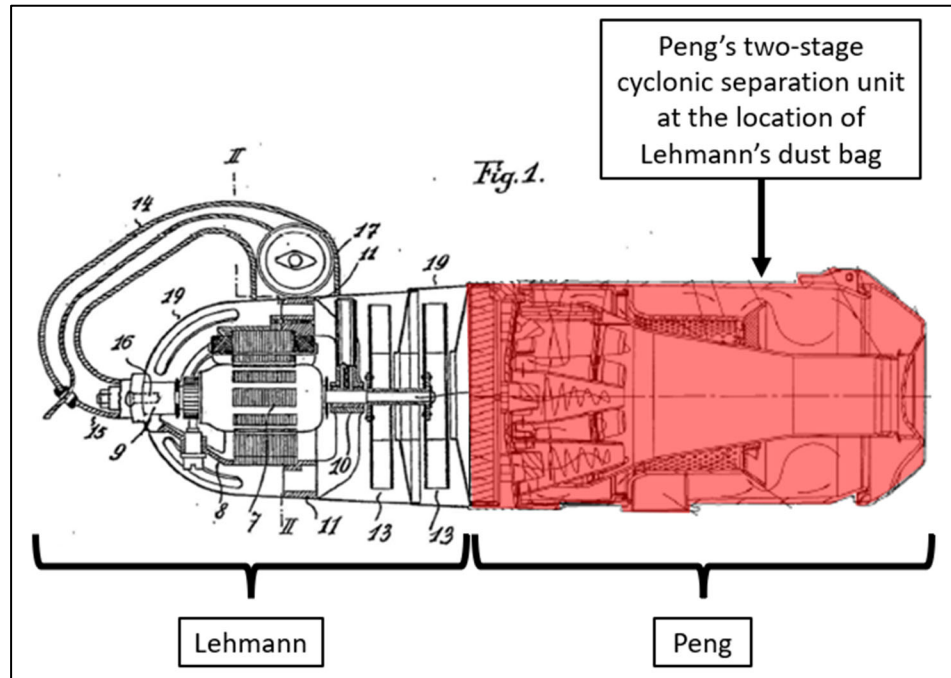
i. [1c.ii]

Reference Number	Claim Limitation
[1c.ii]	“(ii) a first cyclonic stage provided at the front end of the hand vacuum cleaner, the first cyclonic stage having a front end, a rear end and a cyclone axis of rotation extends between the front and rear ends of the first cyclonic stage; and”

297. Lehmann in combination with Peng teaches a first cyclonic stage provided at the front end of the hand vacuum cleaner, the first cyclonic stage having a front end, a rear end and a cyclone axis of rotation extends between the front and rear ends of the first cyclonic stage. (Limitation [1c.ii]).

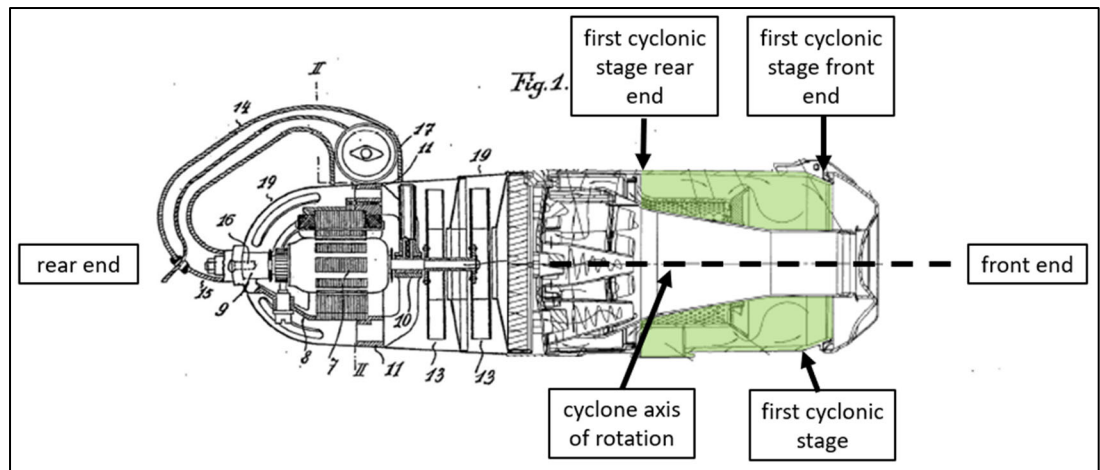
298. As described above, in my opinion, a POSA would have been motivated

to substitute Lehmann's dust bag with Peng's cyclonic separation unit, as shown:



Ex1006, Fig. 1 (as modified); Ex1009, Fig. 3.

299. In my opinion, the combination of Lehmann and Peng teaches a first cyclonic stage provided at the front end of the hand vacuum cleaner, the first cyclonic stage having a front end, a rear end and a cyclone axis of rotation extends between the front and rear ends of the first cyclonic stage, as shown:



Ex1006, Fig. 1; Ex1009, Fig. 3.

j. [1c.iii]

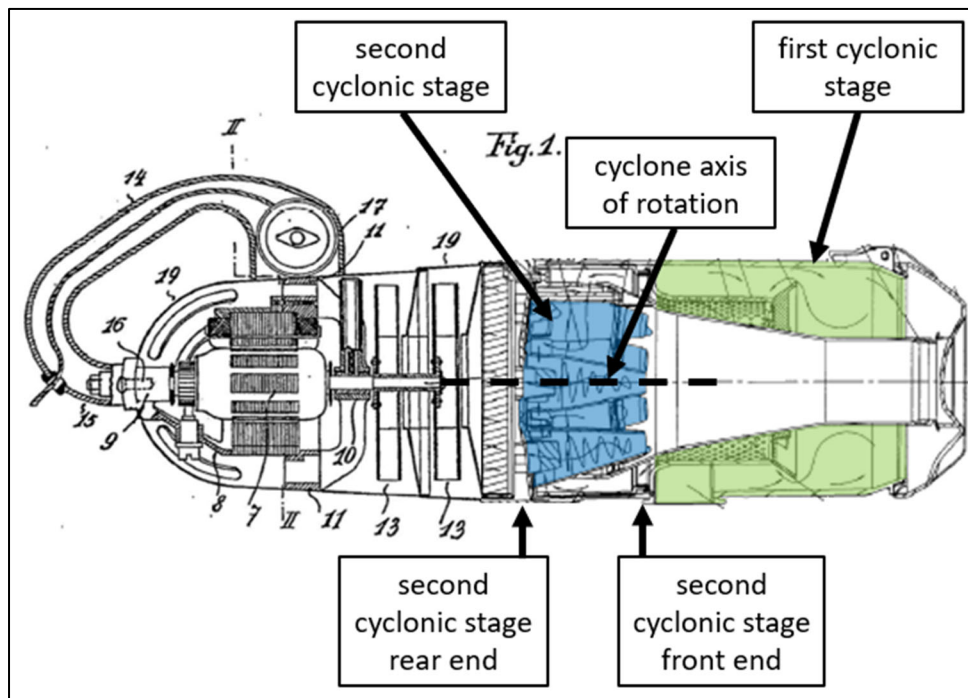
Reference Number	Claim Limitation
[1c.iii]	“(iii) a second cyclonic stage having a front end, a rear end and at least one second stage cyclone having a cyclone axis of rotation that extends between the front and rear ends of the second cyclonic stage and the rear end of the second cyclonic stage is rearward of the rear end of the first cyclonic stage,”

300. Lehmann in combination with Peng teaches a second cyclonic stage having a front end, a rear end and at least one second stage cyclone having a cyclone axis of rotation that extends between the front and rear ends of the second cyclonic stage and the rear end of the second cyclonic stage is rearward of the rear end of the first cyclonic stage. (Limitation [1c.iii]).

301. As explained in Limitation [1c.ii], in my opinion, a POSA would have been motivated to combine Lehmann with Peng to modernize Lehmann’s cleaning apparatus with other known filtration systems in the art such as

one with two cyclonic stages.

302. Further, Lehmann in combination with Peng meets this limitation for the same reasons described in Ground 1, Limitation [1c.iii]. In my opinion, the combination of Lehmann and Peng teaches a second cyclonic stage having a front end, a rear end and a cyclone axis of rotation that extends between the front and rear ends of the second cyclonic stage and the rear end of the second cyclonic stage is rearward of the rear end of the first cyclonic stage:



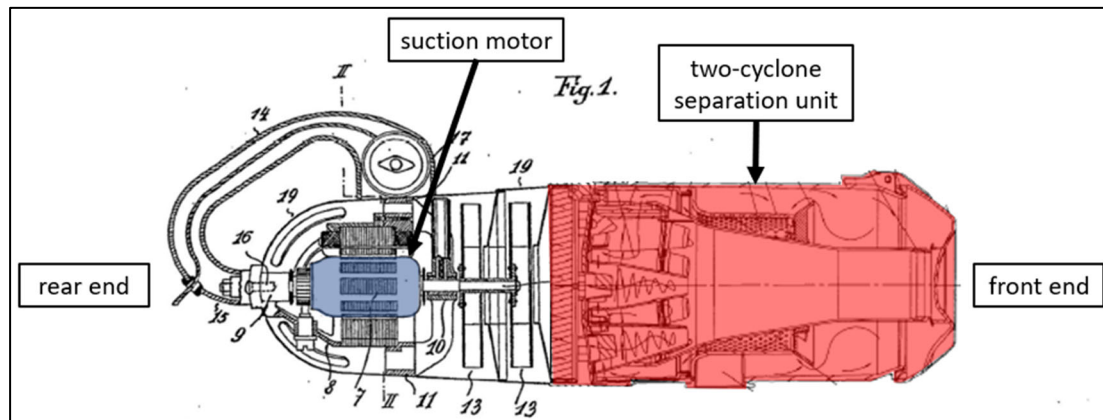
Ex1006, Fig. 1; Ex1009, Fig. 3.

k. [1c.iii.1]

Reference Number	Claim Limitation
[1c.iii.1]	“wherein the suction motor is positioned rearward of the first cyclonic stage,”

303. Lehmann in combination with Peng teaches wherein the suction motor is positioned rearward of the first cyclonic stage. (Limitation [1c.iii.1]).

304. Lehman’s section motor is positioned rearward of its dust bag, and in the combined teachings of Lehman and Peng, where Peng’s two-cyclone separation unit is substituted in place of Lehman’s dust bag, the suction motor is positioned rearward of the two-cyclone separation unit, as shown:

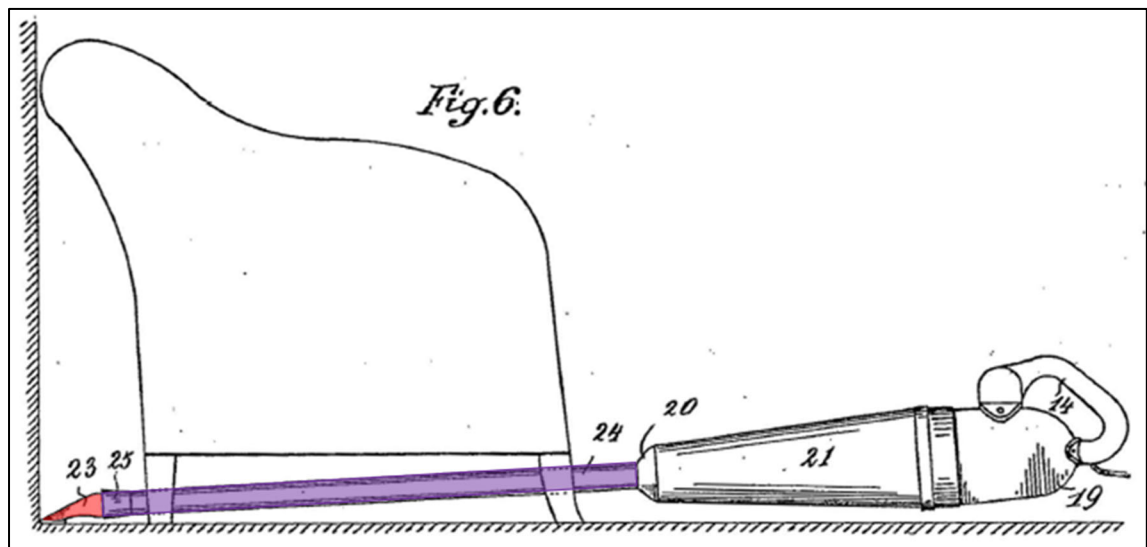


Ex1006, Fig. 1 (as modified).

l. [1c.iii.2]

Reference Number	Claim Limitation
[1c.iii.2]	“and wherein, when the hand vacuum cleaner is mounted to the rigid wand outlet end, handle is drivingly connected to the surface cleaning head.”

305. Lehmann teaches and wherein, when the hand vacuum cleaner is mounted to the rigid wand outlet end, handle is drivingly connected to the surface cleaning head. (Limitation [1c.iii.2]).
306. As explained in Limitation 1c, Lehmann teaches a hand vacuum cleaner that is mounted to the rigid wand outlet end of the “**tube 24.**”
307. In my opinion, in this configuration, the handle is drivingly connected to the surface cleaning head because driving the handle drives the surface cleaning head, including as shown:

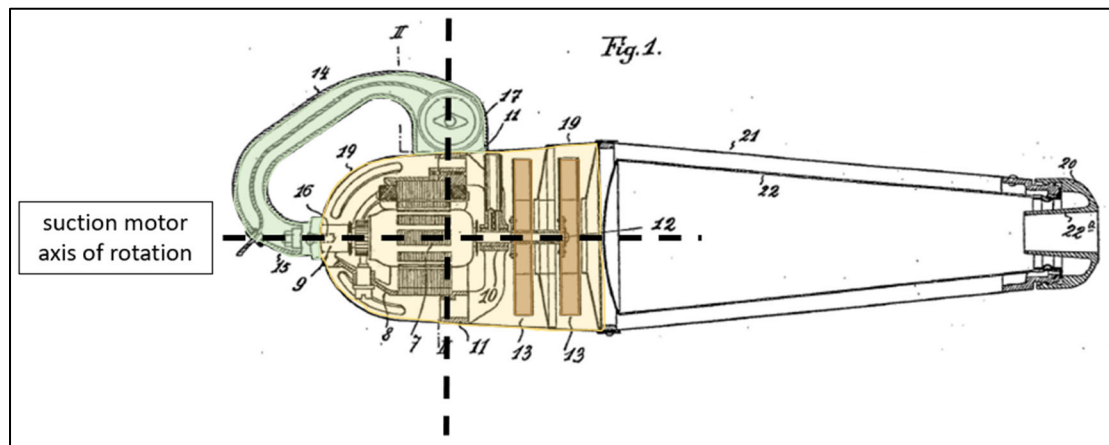


Ex1006, Fig. 6; 2:14-20.

m. [2]/[5]

Reference Number	Claim Limitation
[2]	“The surface cleaning apparatus of claim 1 wherein the suction motor and fan assembly axis of rotation intersects the handle.”
[5]	“The surface cleaning apparatus of claim 3 wherein the suction motor and fan assembly axis of rotation intersects the handle.”

308. As explained in Section X.C, Lehmann in combination with Peng renders obvious claim 1.
309. Lehmann in combination with Peng teaches wherein the suction motor and fan assembly axis of rotation intersects the handle. (Claims 2 and 5).
310. In my opinion, Lehmann in combination with Peng teaches the surface cleaning apparatus of claim 3 and teaches wherein the suction motor and fan assembly axis of rotation intersects the handle.
311. In my opinion, Lehman's suction motor fan assembly axis of rotation intersects the handle, as shown below:



Ex1006, Fig. 1, 1:38-44, 1:71-78.

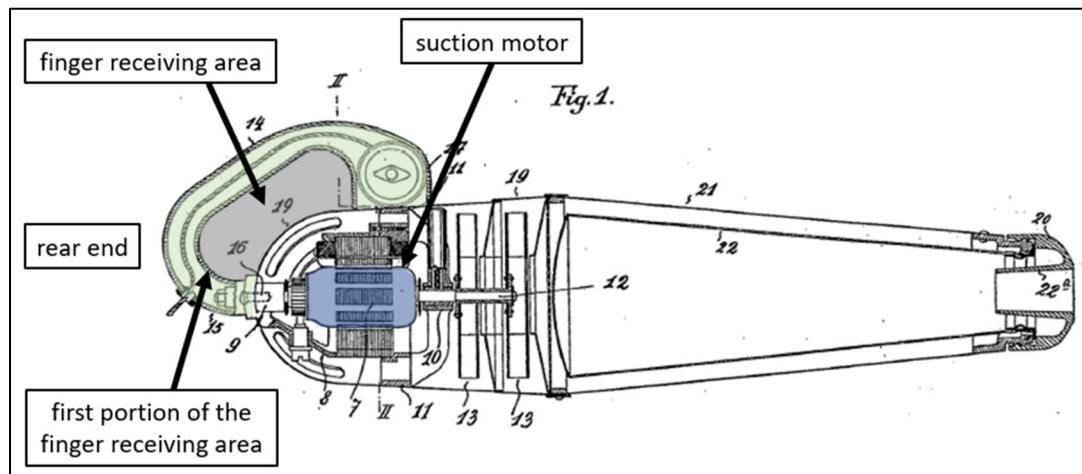
n. [3]

Reference Number	Claim Limitation
[3]	"The surface cleaning apparatus of claim 1 further comprising a finger receiving area positioned between the handle and the main body and a first portion of the finger receiving area is positioned rearward of the suction motor."

312. As explained in Section X.C, Lehmann in combination with Peng renders obvious claim 1.

313. Lehmann in combination with Peng teaches further comprising a finger receiving area positioned between the handle and the main body and a first portion of the finger receiving area is positioned rearward of the suction motor. (Claim 3).

314. In my opinion, Lehmann teaches a finger receiving area positioned between the handle and the main body, where a first portion of the finger receiving area is positioned rearward of the suction motor, as shown:

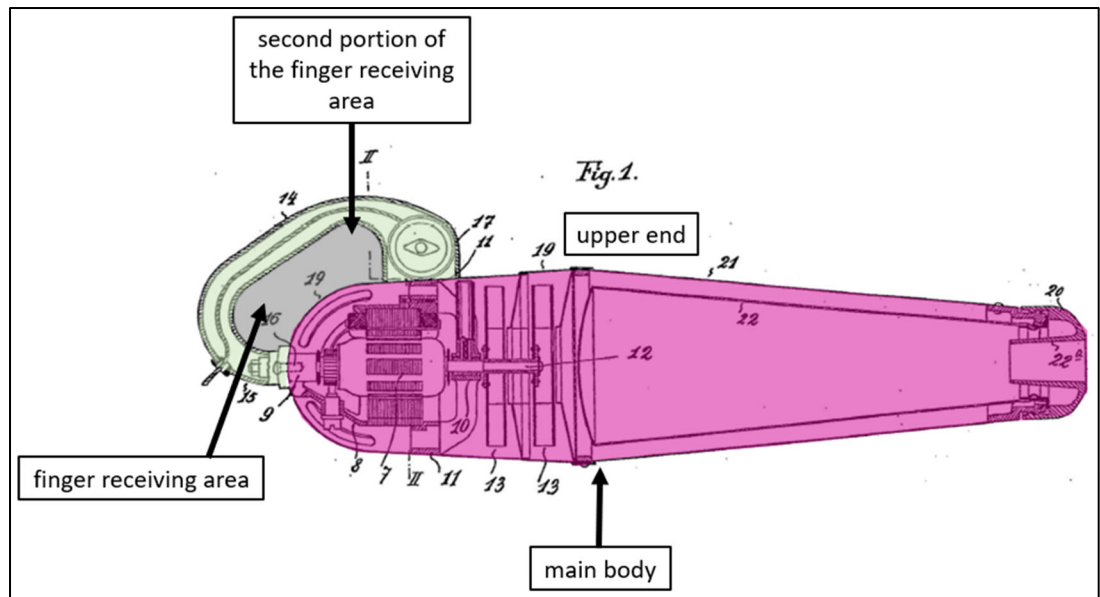


Ex1006, Fig. 1, 1:38-44.

o. [4]

Reference Number	Claim Limitation
[4]	“The surface cleaning apparatus of claim 3 wherein a second portion of the finger receiving area is positioned above an upper end of the main body.”

315. As explained in Section X.C, Lehmann in combination with Peng renders obvious claim 1.
316. Lehmann in combination with Peng teaches wherein a second portion of the finger receiving area is positioned above an upper end of the main body. (Claim 4).
317. In my opinion, Lehmann teaches a second portion of the finger receiving area is positioned above an upper end of the main body.



Ex1006, Fig. 1.

p. [6]/[7]

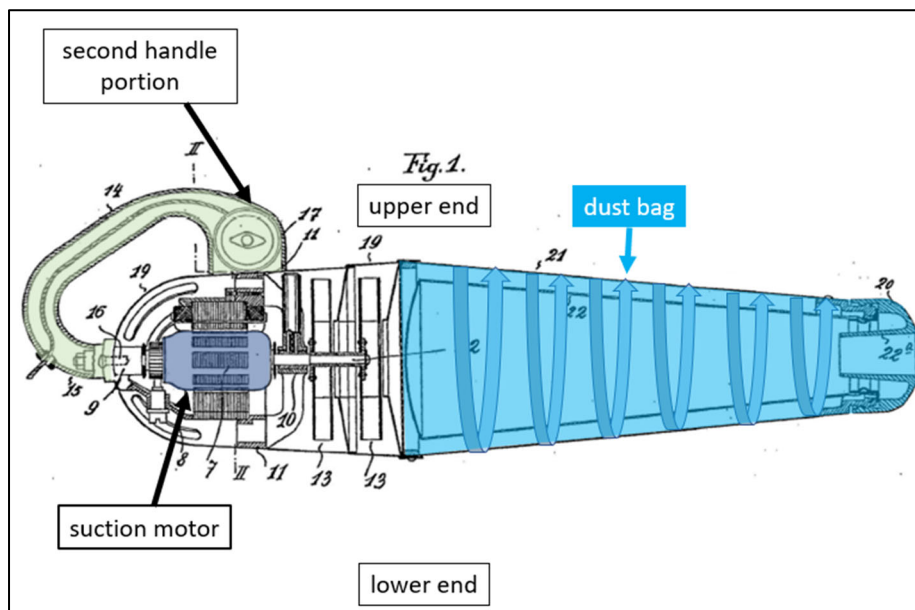
Reference Number	Claim Limitation
[6]	“The surface cleaning apparatus of claim 5 wherein when the hand vacuum cleaner is oriented such that the cyclone axis of rotation extends horizontally and the upper end of the hand vacuum cleaner above the lower end of the hand vacuum cleaner, the second handle portion is positioned above the suction motor.”
[7]	“The surface cleaning apparatus of claim 1 wherein when the hand vacuum cleaner is oriented such that the cyclone axis of rotation extends horizontally and the upper end of the hand vacuum cleaner above the lower end of the hand vacuum cleaner, the second handle portion is positioned above the suction motor.”

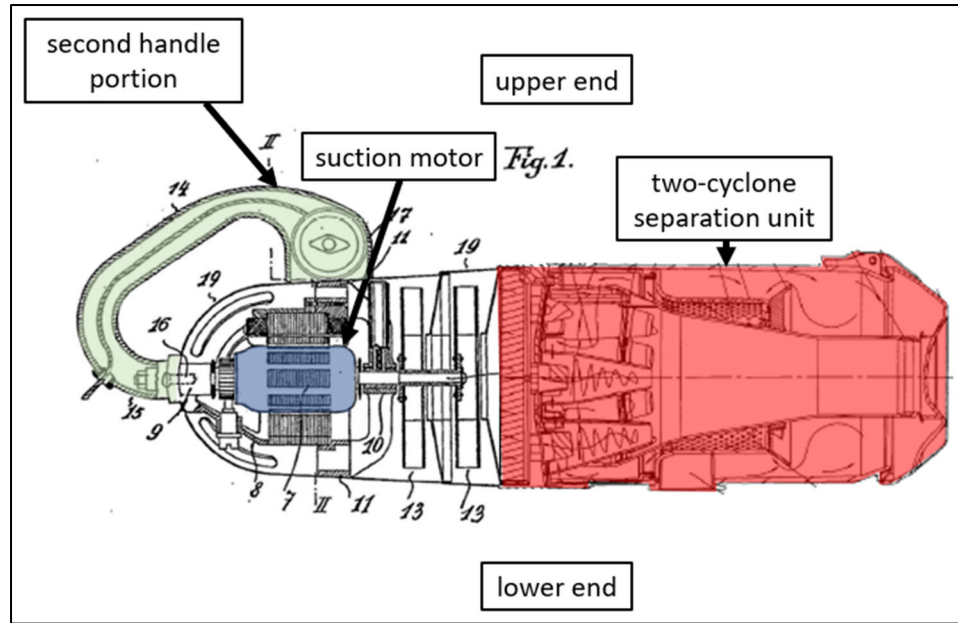
318. As explained in Section X.C, Lehmann in combination with Peng renders obvious claims 1 and 5.

319. Lehmann in combination with Peng teaches wherein when the hand vacuum cleaner is oriented such that the cyclone axis of rotation extends horizontally and the upper end of the hand vacuum cleaner above the lower end of the hand vacuum cleaner, the second handle portion is positioned above the suction motor. (Claims 6 and 7).

320. In my opinion, Lehmann in combination with Peng teaches the surface cleaning apparatus of claim 1 and teaches wherein when the hand vacuum cleaner is oriented such that the cyclone axis of rotation extends horizontally and the upper end of the hand vacuum cleaner above the lower end of the hand vacuum cleaner, the second handle portion is positioned above the suction motor.

321. As explained in Limitations [1c.ii] and [1c.iii], in my opinion, Lehmann alone or in combination with Peng teaches a hand vacuum cleaner with a cyclone axis of rotation.
322. Additionally, as explained in Limitation [1c.i.1], in my opinion, Lehmann teaches a second handle portion, which is at the location above the suction motor. *See also*, Ex1006, 1:71-78.





Ex1006, Fig. 1 (as modified); Ex1009, Fig. 3.

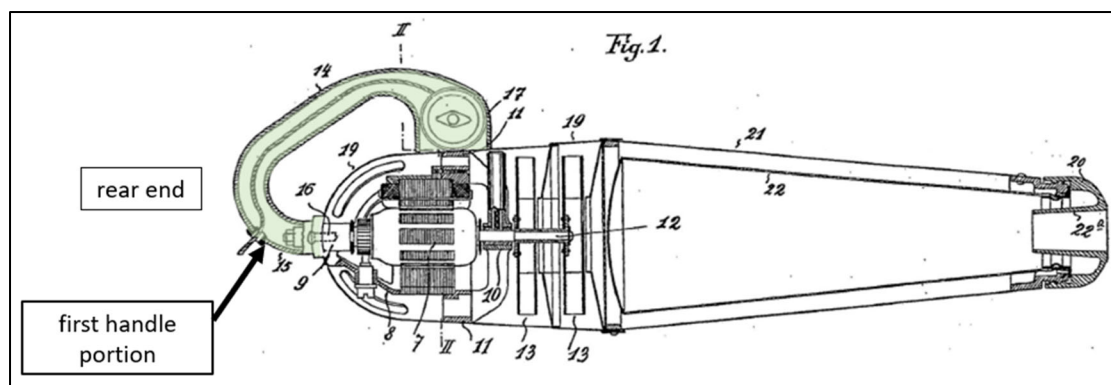
q. [8]/[9]

Reference Number	Claim Limitation
[8]	"The surface cleaning apparatus of claim 6 wherein the first portion of the handle is mounted to a rear end of the main body."
[9]	"The surface cleaning apparatus of claim 1 wherein the first portion of the handle is mounted to a rear end of the main body."

323. As explained in Section X.C, Lehmann in combination with Peng renders obvious claims 1 and 6.

324. Lehmann in combination with Peng teaches wherein the first portion of the handle is mounted to a rear end of the main body. (Claims 8 and 9).

325. In my opinion, Lehmann teaches that the first portion of the handle is mounted to the rear end of the main body, as shown:



Ex1006, Fig. 1.

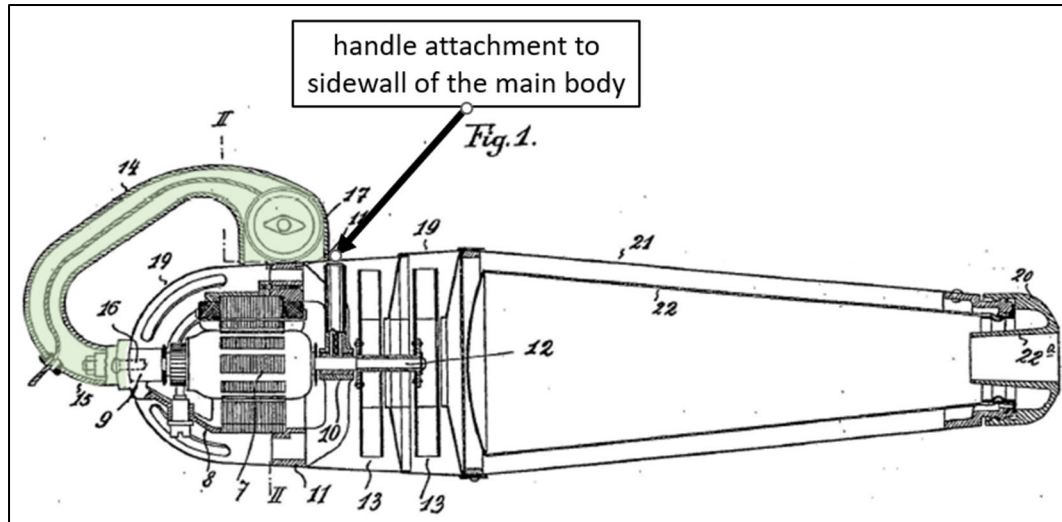
r. [10]

Reference Number	Claim Limitation
[10]	"The surface cleaning apparatus of claim 1 wherein the handle is also attached to a sidewall of the main body."

326. As explained in Section X.C, Lehmann in combination with Peng renders obvious claim 1.

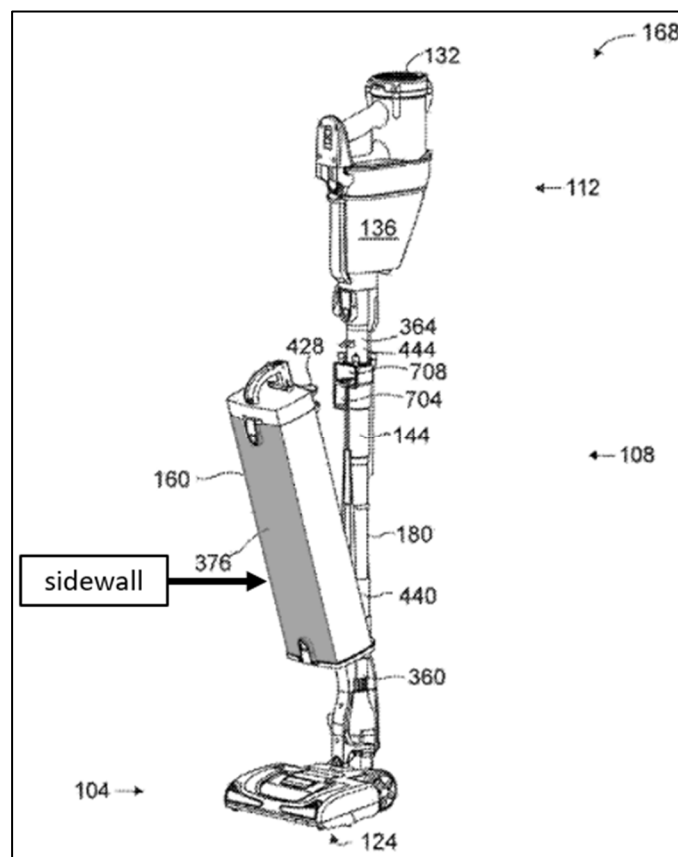
327. Lehmann in combination with Peng teaches wherein the handle is also attached to a sidewall of the main body. (Claim 10).

328. Lehman teaches that the handle is also attached to a sidewall of the main body, as shown:



Ex1006 at Fig. 1.

329. The '038 patent describes a “sidewall” as including the face of the vacuum body that faces away from the user and toward the ceiling when in use:



Ex1001, Fig. 20.

330. The '038 further teaches that its “sidewall” may be “substantially cylindrical.” *Id.*, 17:21-23.

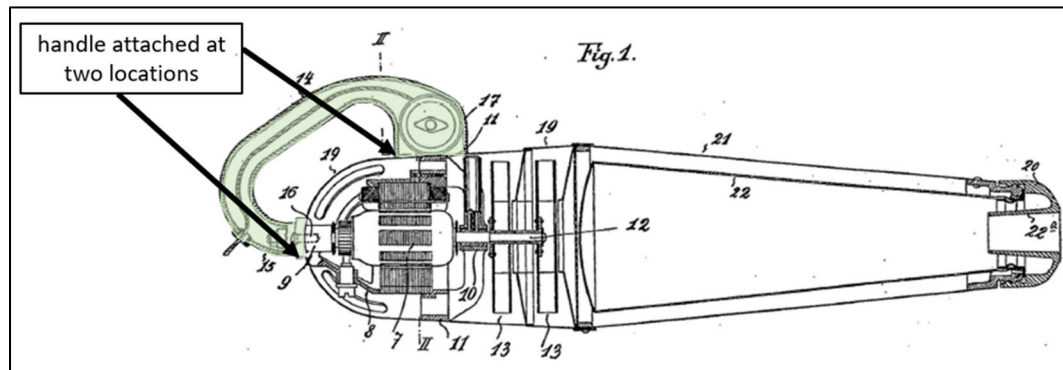
s. [11]

Reference Number	Claim Limitation
[11]	“The surface cleaning apparatus of claim 1 wherein handle is attached to the main body at two locations.”

331. As explained in Section X.C, Lehmann in combination with Peng renders obvious claim 1.

332. Lehmann in combination with Peng teaches wherein handle is attached to the main body at two locations. (Claim 11).

333. Lehmann teaches that its handle is attached to its main body at two locations, as shown:



Ex1006, Fig. 1.

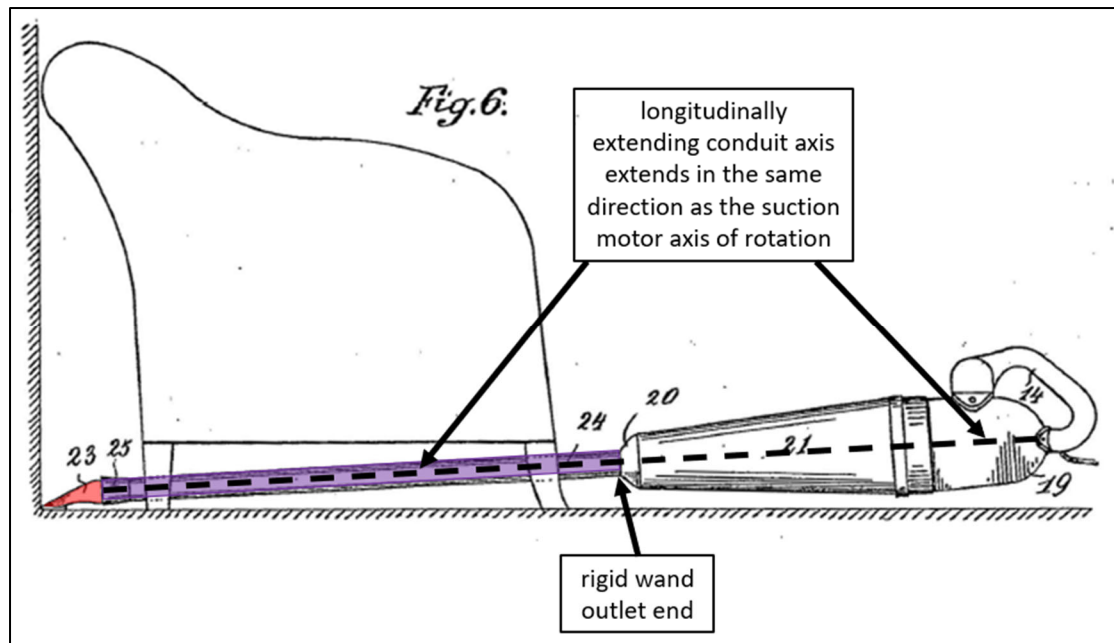
t. [13]

Reference Number	Claim Limitation
[13]	“The surface cleaning apparatus of claim 1 wherein when the hand vacuum cleaner is mounted to the rigid wand outlet end, the longitudinally extending conduit axis extends in a same direction as the suction motor axis of rotation.”

334. As explained in Section X.C, Lehmann in combination with Peng renders obvious claim 1.

335. Lehmann in combination with Peng teaches wherein when the hand vacuum cleaner is mounted to the rigid wand outlet end, the longitudinally extending conduit axis extends in a same direction as the suction motor axis of rotation. (Claim 13).

336. In my opinion, when Lehmann’s hand vacuum is mounted to the outlet end of its “tube 24,” the longitudinally extending conduit axis extends in a same direction as the suction motor axis of rotation, as shown:



Ex1006, Fig. 6; *see also* Ground 2, Limitations [1b.1], [1b.3], [1c.i].

u. [14]

Reference Number	Claim Limitation
[14]	"The surface cleaning apparatus of claim 1 wherein the front end of the second cyclonic stage is rearward of the rear end of the first cyclonic stage."

337. As explained in Section X.C, Lehmann in combination with Peng renders obvious claim 1.

338. Lehmann in combination with Peng teaches wherein the front end of the second cyclonic stage is rearward of the rear end of the first cyclonic stage. (Claim 14).

339. As explained in Limitations [1c.ii] and [1c.iii], in my opinion, Lehmann in combination with Peng teaches two cyclonic stages where the front end of

the second cyclonic stage is rearward of the rear end of the first cyclonic stage.

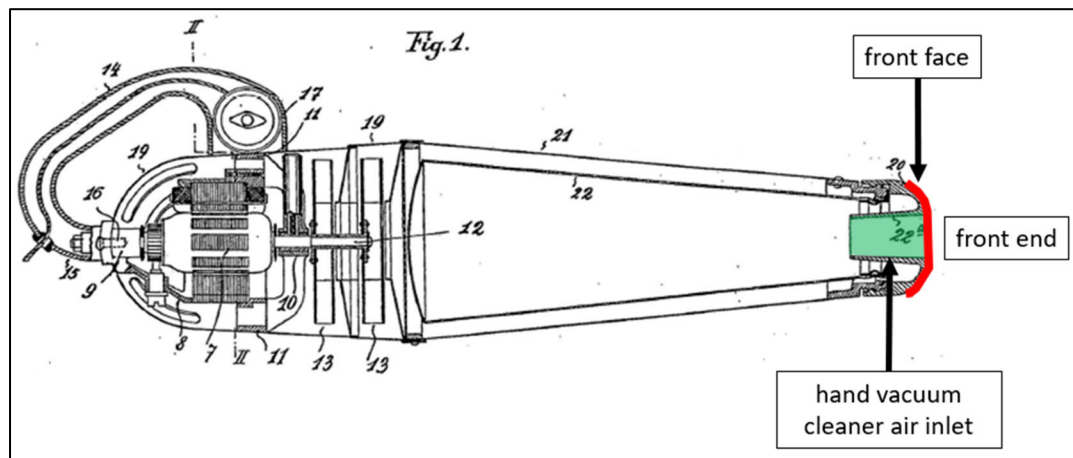
v. [15]

Reference Number	Claim Limitation
[15]	“The surface cleaning apparatus of claim 1 wherein the front face has the hand vacuum cleaner air inlet.”

340. As explained in Section X.C, Lehmann in combination with Peng renders obvious claim 1.

341. Lehmann teaches wherein the front face has the hand vacuum cleaner air inlet. (Claim 15).

342. In my opinion, while the claims do not previously refer to “a front face,” or state the structure containing the claimed front face, Lehmann teaches that its hand vacuum cleaner has a front face that has the hand vacuum cleaner air inlet, as shown:



Ex1006, Fig. 1.

343. Further, regardless of how the claims are interpreted, in my opinion, Lehmann teaches this limitation at least to the same extent as interpreted by PO in its infringement contentions. Ex1018.

3. Ground 4: Lehmann in Combination with Neroni Renders Claim 12 Obvious

a. Neroni Teaches A Surface Cleaning Apparatus With A Releasably Engageable Electrical Connector That A POSA Would Have Been Motivated To Incorporate Into Lehmann

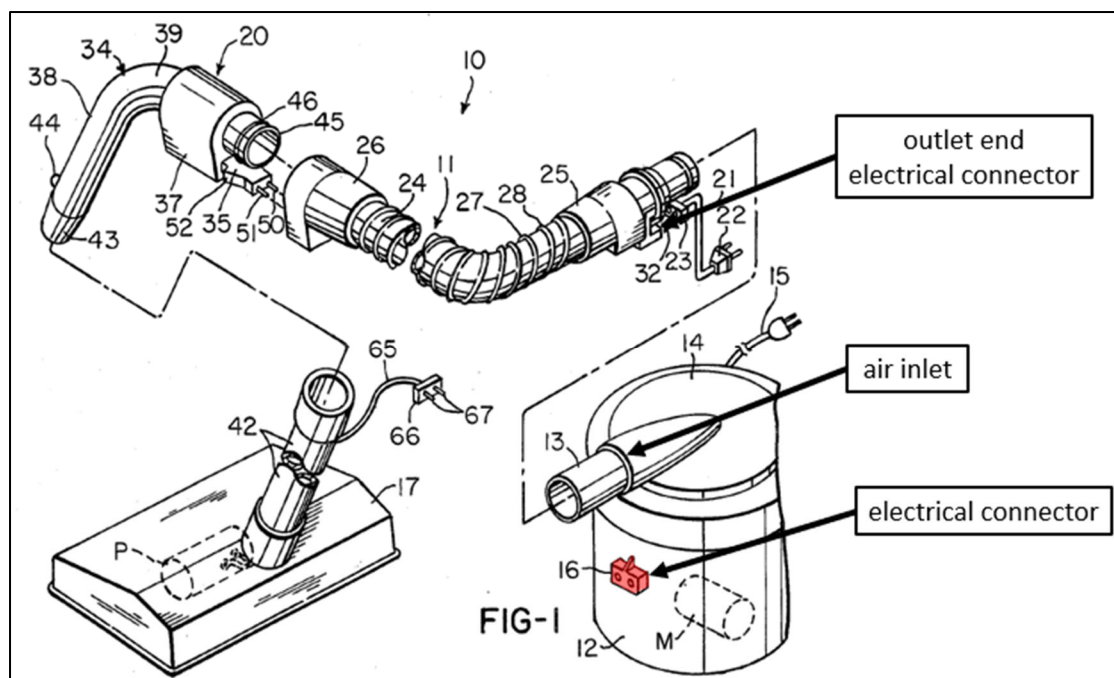
344. Lehmann in combination with Peng renders claim 1 obvious. *See* Ground 2, Claim 1. In my opinion, Lehmann and Neroni further teaches the remaining limitations of this claim.

345. In my opinion, a POSA would have been motivated to combine Lehmann, Peng, and Neroni. As described for Claim 1, the combination of Lehmann and Peng teaches a hand vacuum cleaner with an extension “tube” and “nozzle” for cleaning surfaces, including “carpets.” Ex1006, 2:14-20. In my opinion, a POSA would have been motivated to further combine Lehmann and Peng with Neroni, which teaches electrical connectors on a vacuum and its wand for powering a motorized floor tool.

346. Neroni teaches a “means on the adapter for interlocking the adapter [sic] with an adjacent hose assembly to provide electrical continuity from the adapter, through the hose, and into the vacuum cleaner.” Ex1007, 1:66-

2:2. Neroni further teaches that “[t]he vacuum cleaner has a **female power receptacle 16** disposed on the outside surface of its tank 12 for ready access thereto. The **receptacle 16** 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 which is also operatively connected to the vacuum system itself through the adapter and the hose assembly, through tube 13 and into the vacuum cleaner 12.” *Id.* at 3:34-42.

347. Neroni teaches several benefits of this configuration, including that the invention “provides the means to mechanically interlock with the hose and provide electrical continuity to be located in the cleaning tool adapter rather than being a separate cord and plug device as in the prior art.” *Id.* at 2:18-24. Also, as seen in Figure 1, Neroni teaches that the hand vacuum cleaner electrical connector provided adjacent to the hand vacuum cleaner air inlet:



Ex1007, Fig. 1.

348. In my opinion, a POSA would have been motivated to use a powered cleaning tool with Lehmann (which would have been possible by either modifying Lehmann's "tube" and "nozzle," or by using a separate powered cleaning tool attachment) and to incorporate Neroni's teachings of a power cleaning tool adaptor.

349. In my opinion, a POSA would have understood that powered cleaning tools were common, as Neroni explains. Ex1007, 1:17-49.

350. In my opinion, a POSA would have understood that powered cleaning tools can improve cleaning including by agitating the surface being cleaned, which frees dust that was otherwise trapped on that surface, including surfaces such as upholstery and carpet where dust can

accumulate in the upholstery/carpet fibers, which would further Lehmann's stated purpose of cleaning "carpets," "upholstery, cushions, and the like," and would have reasonably expected success. Ex1006, 2:14-24.

351. For example, in 2006, US2006/0026788 to Fischer explained that "simple brushes or crevice tools without electrically powered features or accessories" are "limit[ed]" in "both their cleaning power and usefulness," but "a powered cleaning tool attachment including a motor driven rotary agitator, a headlight and/or a booster fan" can provide benefits such as "additional cleaning power" and "greater cleaning efficiency," including by "scrub[bing] and beat[ing] dirt and debris from the nap of an underlying carpet being cleaned." Ex1017 ¶¶5, 6, 20, 22.

352. In my opinion, a POSA would have understood the well-known benefits of a powered floor tool and would have been motivated to incorporate Neroni's electrical system into Lehmann to achieve these benefits.

353. In my opinion, a POSA would have reasonably expected success incorporating Neroni's teachings into Lehmann's. In my opinion, a POSA would understand that Neroni's power cleaning tool adaptor teachings, including power leads and power connectors, were well-known, as Neroni explains (Ex1007, 1:17-49), that their incorporation would have simply

required the addition of well-known parts—namely, Neroni’s “female power receptacle 16,” which “is used to supply electrical power” and “electrical cord assembly,” which is used to transfer electrical power and “which is provided with a male fitting 22”—and that they would predictably result in delivering power to the surface cleaning tool. Ex1007, 3:34-49.

354. In my opinion, a POSA would have had a reasonable expectation of success modifying Lehmann’s “cap” and “tube” with Neroni’s teaching because similar modifications were well-known in the art, including as disclosed in WO201474248A1, a 2013 Dyson patent that teaches an “electrical connecting arrangement [] provided to link electrical power from the vacuum cleaner to the wand 32 and, thus, also to the floor tool 34. The electrical connecting arrangement comprises a first pair of electrical terminals 56 provided on the air inlet nozzle 40 and a second pair of electrical terminals provided 58 on the wand connector 54.” Ex1016, 7:14-19. Further, in my opinion, they would have been obvious to try as there were a finite number of predictable solutions for transferring power to a powered surface cleaning accessory, which includes running power lines through or along the body of the vacuum cleaner.

XI. SECONDARY CONSIDERATIONS OF NON-OBVIOUSNESS

355. I am unaware of any secondary considerations of non-obviousness that provide evidence that the claims of the '038 patent are not obvious. To the extent PO argues that there are secondary considerations of non-obviousness, I reserve the right to respond.

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

Signed: RA Giachetti
Dr. Robert Giachetti

Dated: 5/16/24