

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. 10,117,550

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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 1-28 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 Exhibit 1005)
 - Swiss Patent No. CH203,675 to Peter (“PeterCH,” attached as Exhibit 1006)
 - Certified English translation of Swiss Patent No. CH203,675 to Peter (“Peter,” attached as Exhibit 1007)
 - U.S Patent Publication No. 2008/0189901 to Jansen (“Jansen,” attached as Exhibit 1008)

- French Patent No. 1,094,603 to Martelliere (“MartelliereFR,” attached as Exhibit 1009)
 - Certified English translation of French Patent No. 1,094,603 to Martelliere (“Martelliere,” attached as Exhibit 1010)
 - U.S. Patent No. 4,473,923 to Neroni et al. (“Neroni,” attached as Exhibit 1011)
 - U.S. Patent Publication No. 2006/0026788 to Fischer et al. (“Fischer,” attached as Exhibit 1012)
 - U.K. Patent No. GB194,963 to Lehmann (“Lehmann,” attached as Exhibit 1014)
 - U.K. Patent No. GB482,938 to British Thomson-Houston Company Limited (“BTHCL,” attached as Exhibit 1015)
 - U.K. Patent Publication No. GB283,179 to Inventia Patent-Verwertungs-Gesellschaft (“IPVG,” attached as Exhibit 1016)
6. In my opinion, the Challenged Claims are invalid based on the following:
- Butler anticipates claims 1-28.
 - Butler renders claims 1-28 obvious.
 - The combination of Peter and Neroni renders claims 1-28 obvious.
 - The combination of Peter, Neroni, Martelliere, and/or Jansen renders claims 1-28 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 Exhibit 1003.

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 '550 patent and its file history, as well as the Butler, Peter, Neroni, Martelliere, and Jansen prior art references on which my opinions are based. Other references 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 am not an attorney. 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:
- (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. 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.

38. 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.

39. 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

40. In my opinion, a Person of Ordinary Skill in the Art ("POSA") in the subject matter of the '550 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.
41. 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

42. The Challenged Claims are directed vacuum cleaner configurations and features, including alignment of certain vacuum components, “a cyclone unit at a front end,” a rigid air flow conduit, a “surface cleaning head,” a handle, and an electrical connector. *See* Ex. 1001, Claims.
43. I have reviewed the ’550 patent’s specification, and this claimed configuration does not purport to solve a technical problem.
44. I have also reviewed the file history of the ’550 patent. None of the references I rely upon in forming my invalidity opinions appear to have been before the patent office.
45. In my opinion, as set forth in more detail below, these undisclosed references invalidate every claim of the ’550 patent.

VII. BACKGROUND OF THE ’550 PATENT

46. The ’550 patent is titled “Surface Cleaning Apparatus.” Ex. 1001, Title. The ’550 patent states that it issued on November 6, 2018, from U.S. Patent Application No. 16/021,152, filed on June 28, 2018. Ex. 1001, Cover. The ’550 patent states that it is 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. It also claims priority to provisional application No. 62/093,189 filed on December 17, 2014. *Id.*

A. Summary of The '550 Patent's Specification

47. The '550 patent states that it relates “to a type of stick vacuum cleaner wherein a hand vacuum cleaner is removably mounted to a drive handle.”

Ex. 1001, 1:18-22.

48. The '550 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.

Ex. 1001, 1:45-55.

49. However, the '550 patent's claims do not claim a supplemental bin. Rather, it claims certain vacuum configurations and features. Ex. 1001, Claims.
50. However, the '550 patent's claimed combination of features do not solve any identified problem.

B. Prosecution History of the '550 Patent

51. I have reviewed the prosecution history of the '550 patent. The following is my understanding.
52. The prosecution of the '550 patent lasted less than a year. *See generally* Ex. 1004. The Examiner found that the prior art did not teach an “electrical connector provided on the front end of the cyclone unit wherein electrical cables extend rearwardly from the electrical connector through a central portion of the cyclone unit toward the suction motor and fan assembly” in combination with the other claimed elements and issued all claims without rejection. *Id.*, 3282-3290.
53. Further, none of the references I rely upon in forming my invalidity opinions appear to have been before the patent office.

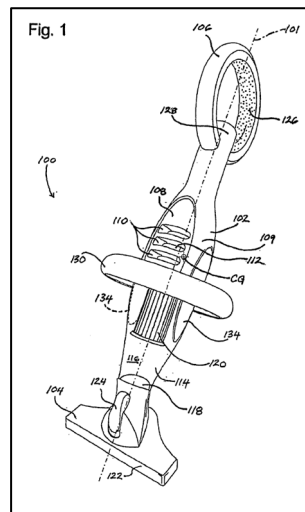
C. Priority Date of the Challenged Claims

54. 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

55. Butler is titled “Stair Cleaning Vacuum Cleaner.” Ex. 1005, Title. It generally describes an “improved vacuum cleaner for cleaning raised and vertical surfaces,” as shown in Butler Figure 1 below. Ex. 1005, 3:10-12. Butler is a published PCT application that was filed January 17, 2007, and published July 26, 2007.

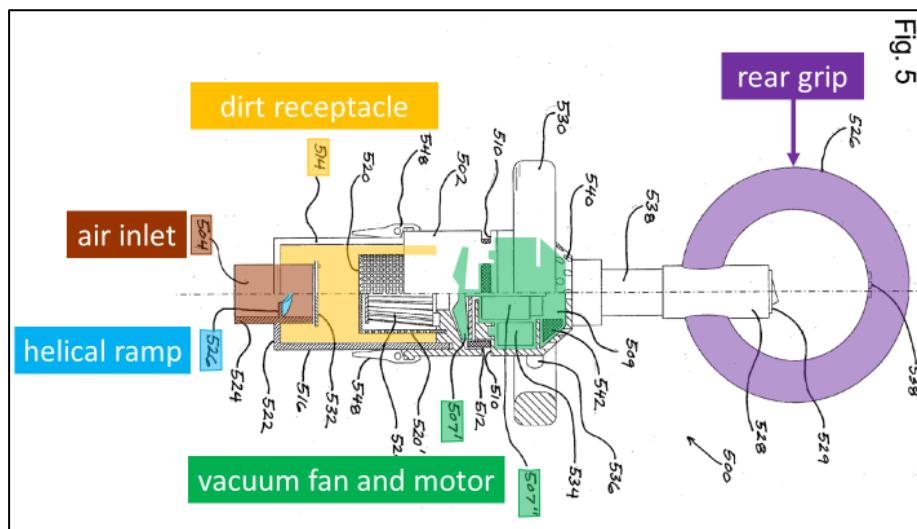


Ex. 1005, Fig. 1.

56. 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

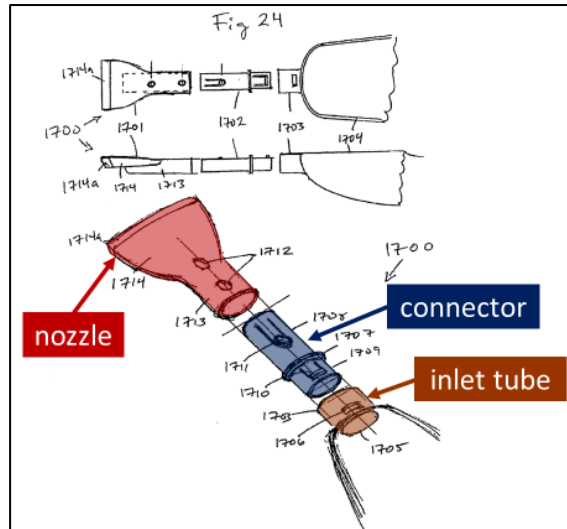
combinations.” *Id.*, 16:25-29, 43:29-44:3; *see also id.*, 4:17-28, 18:22-28, 19:9-15, 34:12-13.

57. Butler’s “improved vacuum cleaner” comprises a “housing with a longitudinal axis,” an “**air inlet**,” a “**helical ramp 526**” that “establish[es] a cyclonic airflow pattern within the **dirt receptacle**,” a “**vacuum fan and a motor**,” and a “**rear grip**,” as shown in the annotated image below:



Ex. 1005, 3:20-28, 22:14-22, Fig. 5, Claim 11.

58. 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:



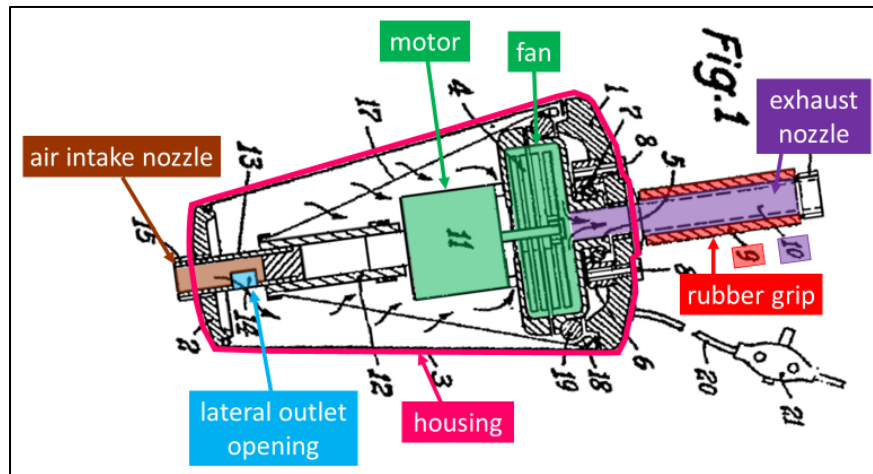
Ex. 1005, 41:19-29, Fig. 24.

B. Peter¹

59. Peter is titled “Vacuum Cleaner.” Ex. 1007, Title. It describes a vacuum cleaner with a detachable extension tube for cleaning “areas that are difficult to access.” Ex. 1007, 2. Peter is a Swiss patent that was filed May 27, 1938, and published June 16, 1939.
60. Peter’s vacuum has an “**air intake nozzle 13**” with a “**lateral outlet opening 14**” at the front end that creates cyclonic airflow within the conical “**housing,**” a “**fan**” and “**motor 11,**” and an “**exhaust nozzle 10**” with a “**rubber grip 9**” at the rear end, as shown in the annotated image

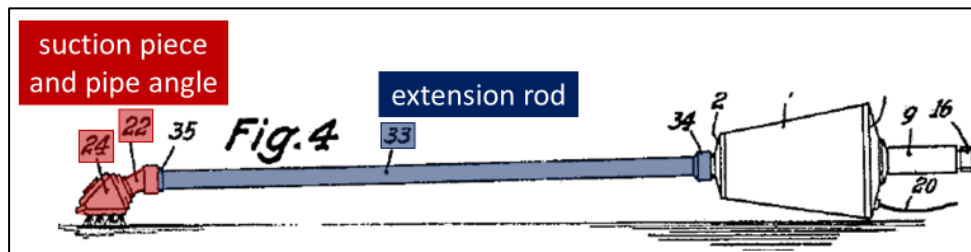
¹ Ex. 1007 is a certified English translation of Ex. 1006, originally published in German. Citations to Ex. 1007 are to the page, as the English translation does not include column or line numbers.

below:



Ex. 1007, 2, Fig. 1.

61. Peter also teaches a “**suction piece 24**” connected to a “**pipe angle 22**,” and an “**extension rod 33**” “between the vacuum cleaner housing and the pipe angle,” as shown in the annotated image below:

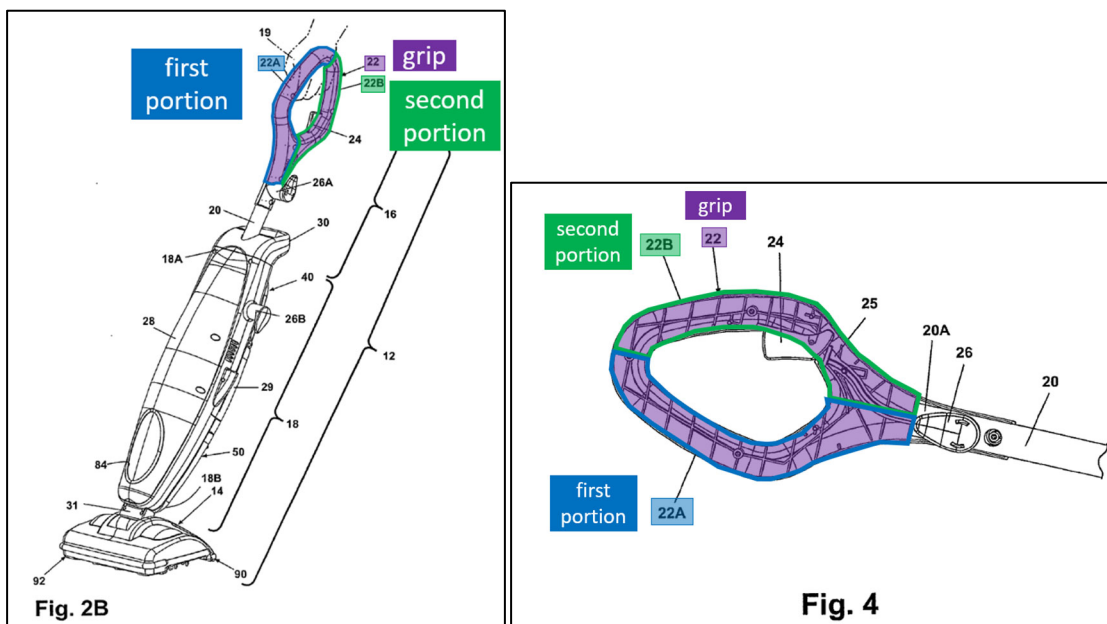


Id., 3, Fig. 4.

C. Jansen

62. Jansen is titled “Bare Floor Cleaner.” Ex. 1008, Title. Jansen is a published U.S. patent application that was filed on August 20, 2004, and published on August 14, 2008.
63. Jansen teaches a bi-directional “bare floor cleaner” with two handle

portions for bi-directional cleaning: “**first portion 22A**” and “**second portion 22B**,” as shown in the annotated images below:



Ex. 1008 ¶¶30, 65-66, Figs. 2B, 4.

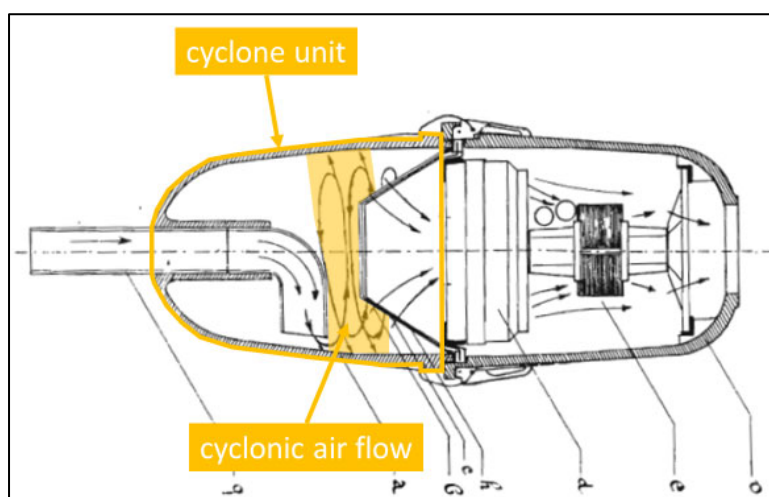
D. Martelliere²

64. Martelliere is titled “Improved dust vacuums.” Ex. 1010, Cover. It describes a “broom type vacuum cleaner model, where the device is held vertically or slightly inclined” and that “app[lies] the ‘Whirlwind’ principle” to separate dust from air. Ex. 1010, 1. Martelliere is a French

² Ex. 1010 is a certified English translation of Ex. 1009, originally published in French. Citations to Ex. 1010 are to the page, as the English translation does not include column or line numbers.

patent that was filed on December 16, 1953, was issued on December 8, 1954, and published on May 23, 1955. Ex. 1010, Cover.

65. Martelliere teaches vacuums that use cyclonic separation, which Martelliere describes as using “the ‘Whirlwind’ principle” to separate dust from air using “tangential[]” airflow, as shown in the annotated image below:

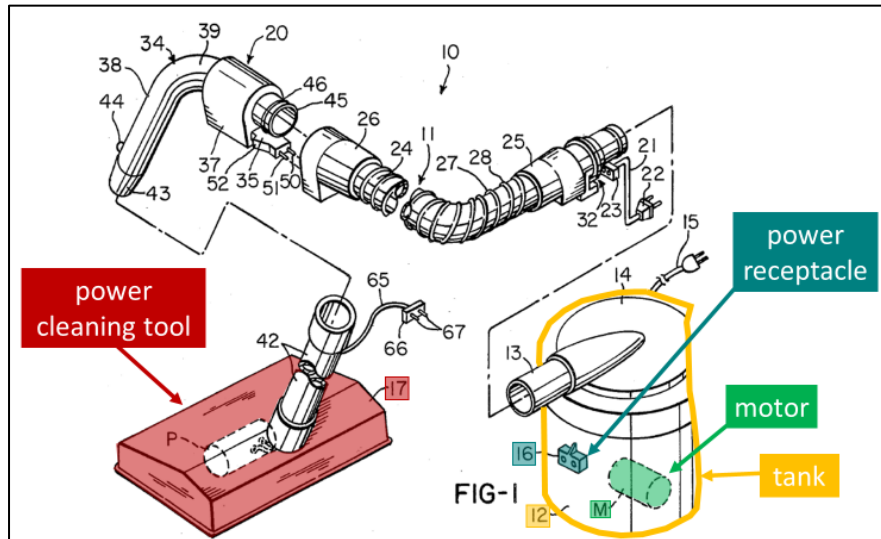


Ex. 1010, 1, Fig. 1.

E. Neroni

66. Neroni is titled “Vacuum Cleaning Tool Adapter with Electrical Control Means.” Ex. 1011, 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. Ex. 1011, Cover.
67. 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:



Ex. 1011, 3:34-42, 6:42-45, Fig. 1.

IX. CLAIM CONSTRUCTION

68. I am unaware of any claim construction determinations related to the '550 patent.

69. 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: '550 PATENT

70. In my opinion, the Challenged Claims of the '550 patent are invalid based on the following references and combinations: claims 1-28 are anticipated or rendered obvious by Butler; claims 1-28 are rendered obvious by the

combination of Peter and Neroni; and claims 1-28 are rendered obvious by the combination of Peter, Neroni, Martelliere, and/or Jansen.

71. 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 '550 patent, as discussed above. I have also considered the level of ordinary skill in the pertinent art.

72. 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 '550 patent.

A. Ground 1: Butler Anticipates Claims 1-28

1. Butler Anticipates Claims 1, 12, 20, and 28

a. [1pre]/[12pre]/[20pre]/[28pre]

Reference Number	Claim Limitation
[1pre]	“A surface cleaning apparatus comprising:”
[12pre]	“A surface cleaning apparatus comprising:”
[20pre]	“A surface cleaning apparatus comprising:”
[28pre]	“A surface cleaning apparatus comprising:”

73. To the extent the preambles are limiting, in my opinion, Butler teaches a surface cleaning apparatus. (Limitations [1pre]/[12pre]/[20pre]/[28pre]). 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 spaces.

Ex. 1005, Title, 7:2-5

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

b. [1a]/[12a]/[20a]/[28a]

Reference Number	Claim Limitation
[1a]	“(a) a hand vacuum cleaner comprising:”
[12a]	“(a) hand vacuum cleaner comprising:”
[20a]	“(a) a hand vacuum cleaner comprising:”
[28a]	“(a) a hand vacuum cleaner comprising:”

75. In my opinion, Butler teaches a hand vacuum cleaner. (Limitations [1a]/[12a]/[20a]/[28a]).
76. Butler teaches that its vacuum cleaner has a “**rear grip**” and “one or more **foregrips**” that the user grasps during use. Ex. 1005, Abstract. Butler describes a vacuum cleaner wherein the distance between the **foregrip** and

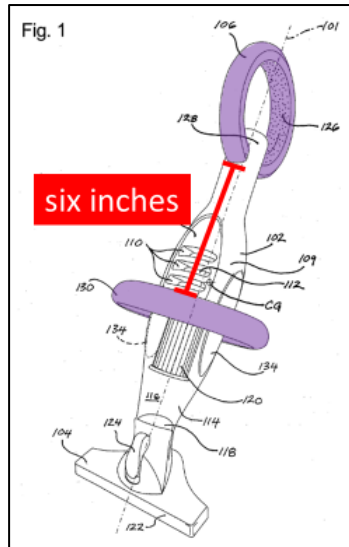
the rear grip is six inches, and the overall vacuum length is eighteen inches, as shown in the annotated image below:

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.

Ex. 1005, 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.

77. In my opinion, a POSA would understand that Butler’s vacuum cleaner, including when the distance between the rear grip and foregrip is 6 inches, and the overall length is 18 inches, is a hand vacuum cleaner.
78. Further, Butler explains that its vacuum cleaner is “compact” and “maneuverable,” “adapted for cleaning ... stairwells and other confined spaces,” and teaches telescoping handgrip members and extension tubes to reach the floor. Ex. 1005, Abstract, 1:2-3, 26:1-5, 27:12-29. These extension members would commonly be used in hand vacuum cleaners. Butler’s cleaner is also designed to have an optimal “center of gravity” and to “remov[e] excess weight.” *Id.*, 13:1-19, 15:12-18. A POSA would understand that these (center of gravity position, and weight) are considerations that are crucial to hand vacuum cleaners, particularly since

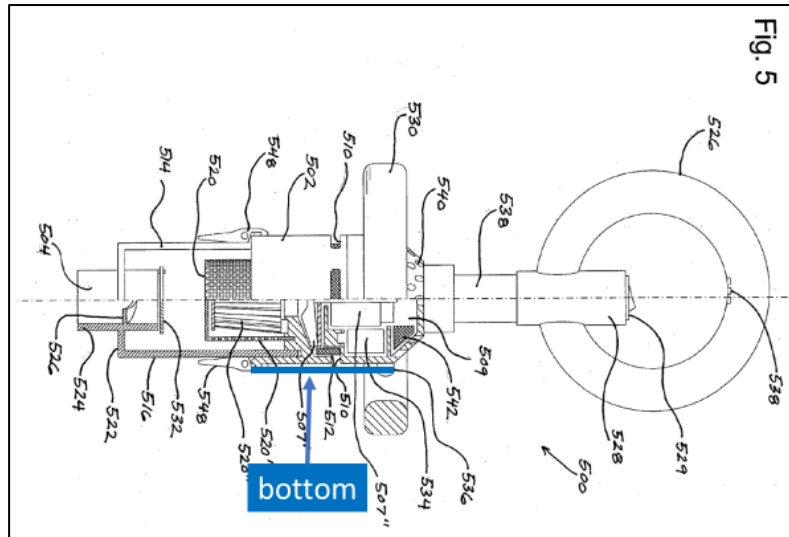
a hand vacuum is expected to be picked up and moved from place to place during use, not just during storage, removal of excess weight and optimization of balance are important to minimizing exertion and effort while maximizing comfort. Furthermore, optimization of weight and balance provides the most 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.

c. [1a.1]/[12a.1]/[20a.1]/[28a.1]

Reference Number	Claim Limitation
[1a.1]	“(i) a hand vacuum cleaner body comprising a bottom, a handle, the hand vacuum cleaner body housing a suction motor and fan assembly, the suction motor and fan assembly having a suction motor axis of rotation, the handle having a hand grip portion that extends upwardly and forwardly when the hand vacuum cleaner body is positioned with the bottom on a horizontal surface; and,”
[12a.1]	“(i) a hand vacuum cleaner body comprising a bottom, a handle, the hand vacuum cleaner body housing a suction motor and fan assembly, the suction motor and fan assembly having a suction motor axis of rotation; and,”
[20a.1]	“(i) a hand vacuum cleaner body comprising a handle, the hand vacuum cleaner body housing a suction motor and fan assembly, the suction motor and fan assembly having a suction motor axis of rotation; and,”
[28a.1]	“(i) a hand vacuum cleaner body comprising a bottom, a handle, a suction motor and fan assembly, the suction motor and fan assembly having a suction motor axis of rotation, the handle having a hand grip portion that extends upwardly and forwardly when the hand vacuum cleaner is positioned with the bottom on a horizontal surface;”

79. Butler teaches a hand vacuum cleaner body comprising a bottom, a handle, the hand vacuum cleaner body housing a suction motor and fan assembly, the suction motor and fan assembly having a suction motor axis of rotation, the handle having a hand grip portion that extends upwardly and forwardly when the hand vacuum cleaner body is positioned with the bottom on a horizontal surface. (Limitation [1a.1]).
80. Butler teaches a hand vacuum cleaner body comprising a bottom, a handle,

- the hand vacuum cleaner body housing a suction motor and fan assembly, the suction motor and fan assembly having a suction motor axis of rotation. (Limitation [12a.1]).
81. Butler teaches a hand vacuum cleaner body comprising a handle, the hand vacuum cleaner body housing a suction motor and fan assembly, the suction motor and fan assembly having a suction motor axis of rotation. (Limitation [20a.1]).
82. Butler teaches a hand vacuum cleaner body comprising a bottom, a handle, a suction motor and fan assembly, the suction motor and fan assembly having a suction motor axis of rotation, the handle having a hand grip portion that extends upwardly and forwardly when the hand vacuum cleaner is positioned with the bottom on a horizontal surface. (Limitation [28a.1]).
83. Butler teaches a hand vacuum cleaner body comprising a bottom. Butler's "vacuum cleaner" has a body with a **bottom**, as shown in the annotated image below:



Ex. 1005, Fig. 5.

84. Butler explains that the vacuum body comprises a “generally cylindrical housing 502 with a circular or looped rear grip 506, and a circular or looped foregrip 530”:

Referring now to Figure 5, another embodiment of the invention is illustrated and described in detail. In this embodiment, the invention comprises a vacuum cleaner 500, having a generally cylindrical housing 502 with a circular or looped rear grip 506, and a circular or looped foregrip 530. Of course, other grip shapes may be used, as explained previously herein. Like the embodiment of Figure 1, a protrusion 528 extends into the rear grip 506, and a power switch 529 is located on the protrusion 528 to provide quick and efficient activation and deactivation of the device. The foregrip 530 is attached to the housing 502 by a number of radially- extending posts 536.

Ex. 1005, 20:3-11.

85. In my opinion, a POSA would understand that Butler’s body, including its

“cylindrical housing 502” is a hand vacuum cleaner body with a bottom, as I identify above.

86. Butler also teaches that, “[i]n another variation, the dirt receptacle 514, or at least a portion of it, may be permanently attached to the housing 502.”

Ex. 1005, 21:19-23.

87. Butler also teaches that:

Referring back to Figure 15, the housing 1501 generally comprises a main body 1505, a fan/ motor assembly 1506, a fan/ motor cover 1507, and a dustcup assembly 1508. The housing 1501 further comprises means to power the fan/ motor assembly 1506 such as a power switch 1509 and power supply cord 1510 or batteries (not shown). The nozzle assembly 1502 serves as an inlet for a dirt and dust laden airstream coming into the vacuum 1500 during operation and generally comprises an inlet nozzle 1511 having a brush 1512, a nozzle connector 1513 and an inlet tube 1514.

The body 1505 comprises a dustcup chamber 1519 and a fan/ motor housing 1520, which are aligned along the vacuum centerline 1537. Attaching the fan/ motor cover 1507 to the main body forms the fan/ motor housing 1520. The fan/motor assembly 1506 is positioned in the fan/ motor housing 1520 and the dustcup 1522 is removably installed in the dustcup chamber 1519. A dividing mid wall 1518 is positioned between the chamber 1519 and the fan/ motor housing 1520 and includes openings 1536 or vents to allow air to pass from the dustcup 1522 to the fan/ motor assembly 1506. The fan/ motor housing 1520

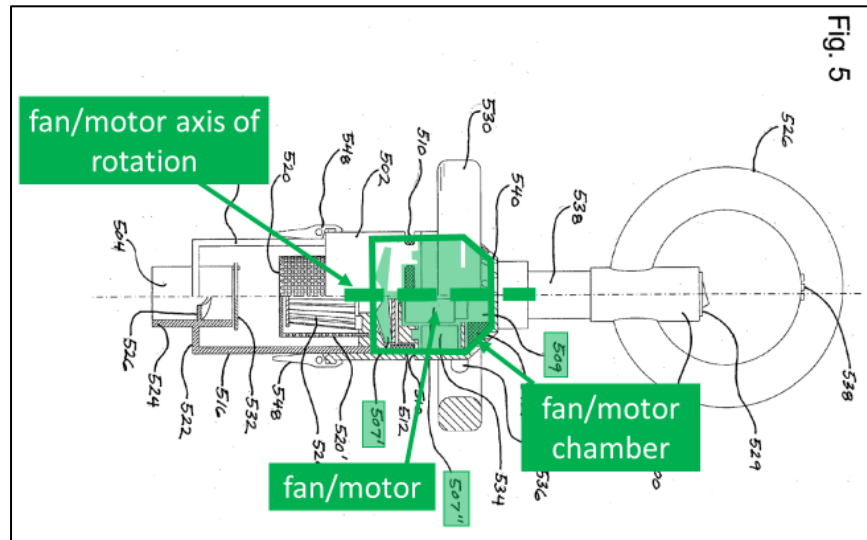
also comprises vents 1538 in the sidewalls, which form an exhaust path for the fan/ motor assembly 1506. A pre- motor filter 1545 may be located to cover the vent opening 1536 and attached in any known way, such as by being fit into ribs 1546 in front of the opening 1536. The inlet tube 1514 is attached to the housing 1501 at an end adjacent to the dustcup chamber 1519 and forms an air passage into the dustcup chamber 1519. The rear grip 1503 is attached at the end opposite the inlet tube 1514 to one or both of the main body 1505 or the fan/ motor cover 1507.

Ex. 1005, 35:4-26, Fig. 15.

88. Butler also teaches the hand vacuum cleaner body houses a suction motor and fan assembly having a suction motor axis of rotation. Butler's hand vacuum cleaner body has a "**fan/motor chamber 509** in which the **fan/motor 507** is located," and in my opinion, a POSA would understand the fan/motor 507 has an axis of rotation, as shown in the annotated image below:

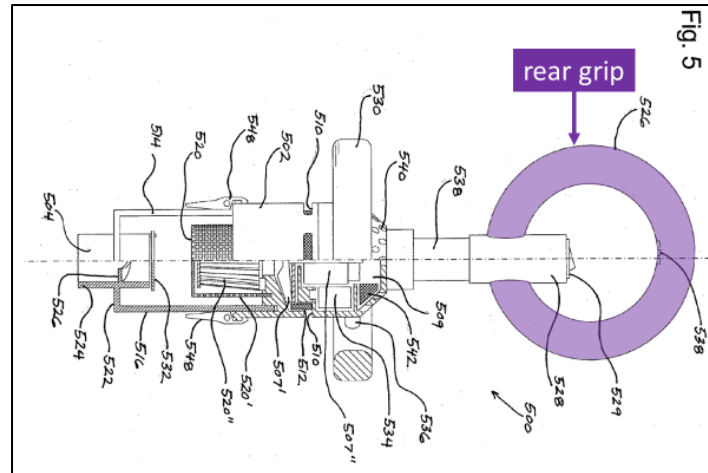
The foregrip 530 surrounds a fan/ motor chamber 509 in which the fan/ motor 507 is located. The impeller fan 507' is adjacent the bottom end of the housing 502, and the motor 507" located between the fan 507' and the rear grip 506. If motor cooling is required, the motor 507" may be cooled by the working 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.



Ex. 1005, 20:12-20, Fig. 5.

89. In my opinion, a POSA would understand that Butler's fan/motor has a fan/motor axis of rotation because the fan and motor shaft would rotate about the central axis shown above.
90. Butler teaches the hand vacuum cleaner body comprises a handle. Butler's vacuum cleaner body includes "a circular or looped rear grip 506," as shown in the annotated image below:

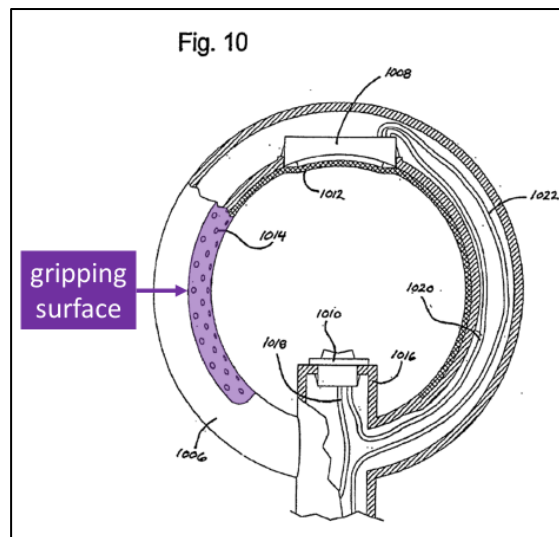


Ex. 1005, 20:4-6, Fig. 5.

91. In my opinion, a POSA would understand that Butler’s rear grip is a handle because the user grasps it with their hand during use.
92. Relevant to Limitations [1a.1]/[28a.1], Butler teaches the handle includes a hand grip portion. Butler describes a “gripping surface” that may be placed on any or all portions of any of Butler’s handles. Butler explains that “**rear grip** ... may be made from any suitable material” and “include[s] one or more **gripping surfaces** ... comprising a material that is more particularly adapted to provide a favorable tactile feel and/or enhanced gripping friction,” such as “dimples, checkering, ridges or bumps,” as shown in the annotated image below:

The rear grip 106, and any other part of the vacuum cleaner 100, may be made from any suitable material, such as ABS plastic (i.e., acrylonitrile-butadiene-styrene copolymers), other plastics, metal, and so on. Plastics are generally preferred as a relatively inexpensive,

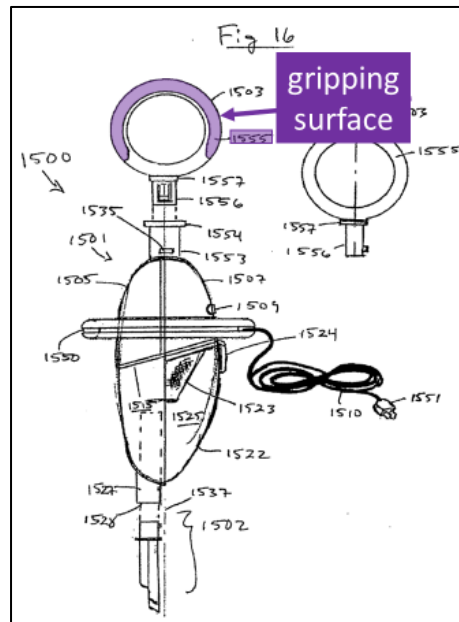
moldable and structurally rigid material. The rear grip 106 may also include one or more gripping surfaces 126 comprising a material that is more particularly adapted to provide a favorable tactile feel and/ or enhanced gripping friction. The gripping surfaces 126 may be formed by treating the surface of the material that forms the rear grip 106, such as by including dimples, checkering, ridges or bumps, or may be provided as a separate tactile material applied to the rear grip 106 itself by mechanical or adhesive attachment, overmolding, or the like. Of course, surface treatments and a separate tactile material may both be used, if desired.



Ex. 1005, 11:3-14, Fig. 10; *see also id.*, Fig. 1.

93. 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.
94. Butler describes another handle embodiment where “[t]he rear grip ... comprises a generally toroidal shaped **gripping surface 1555**,” as shown

in the annotated image below:



Ex. 1005, 38:25-28, Fig. 16.

95. Butler explains that its grip embodiments are interchangeable and versatile, and that they “may have any shape suitable for” “maneuver[ing] the back of the vacuum cleaner,” and “may be replaced by any combination of rear grip and foregrip that provide the user with hand positions to ergonomically maneuver the device”:

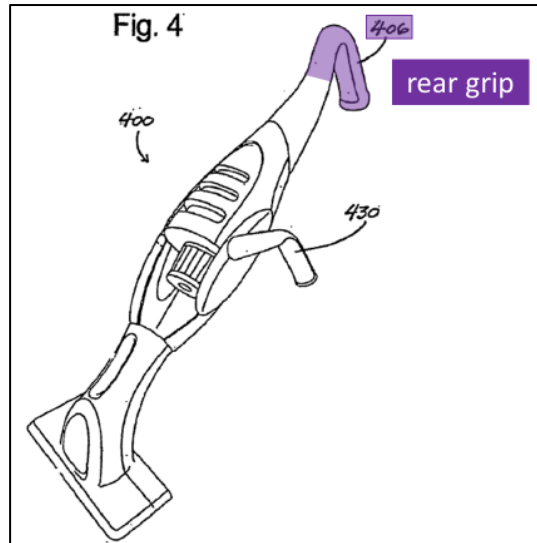
In still other embodiments, the loop-shaped grips may be replaced by any combination of rear grip and foregrip that provide the user with hand positions to ergonomically maneuver the device and rotate it into different positions for cleaning horizontal and inclined surfaces. The looped foregrip may also 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. The

looped foregrip may also be formed as a partial loop to provide multiple hand positions around a portion of the vacuum cleaner housing, or separated into multiple separate grips located around the housing.

Ex. 1005, 10:17-19; 19: 9-12.

96. For example, Butler teaches “a pistol-grip style **rear grip 406**, and pistol-grip style foregrips 430,” and “[t]he foregrips 330, 430 also may be provided with joints or pivots to allow them to be articulated into more desirable positions” to “allow greater flexibility and control,” as shown in the annotated image below:

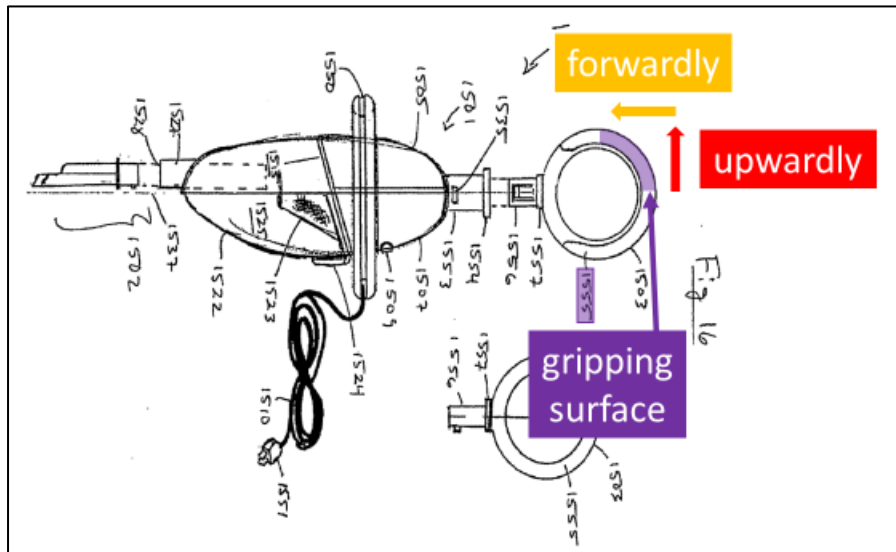
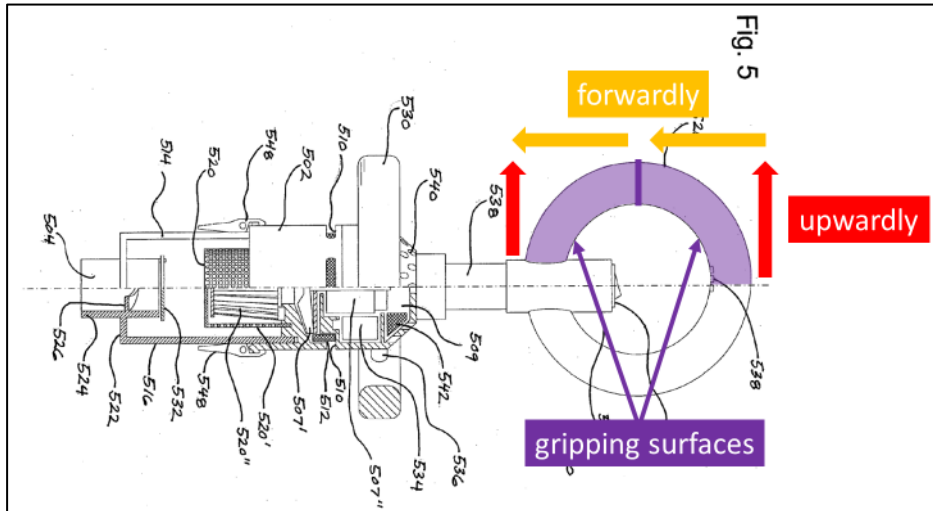
A similar variation is shown in Figure 4, in which the vacuum cleaner 400 includes a pistol-grip style rear grip 406, and pistol-grip style foregrips 430 (only one of which is visible). In either of these embodiments, it may be desirable to construct the foregrips 330, 430 such that they can be removed and inserted in various different locations on the housing. The foregrips 330, 430 also may be provided with joints or pivots to allow them to be articulated into more desirable positions. In still other variations, the foregrips 330, 430 may be formed as extensions of the housing 302, 402, or as graspable depressions or openings in the housing 302, 402. While the variations of Figures 3 and 4 do not allow unlimited hand positions on the foregrip, they still allow greater flexibility and control than grips on conventional vacuum cleaners.



Ex. 1005, 19:22-20:2, Fig. 4.

97. In my opinion, a POSA would understand that Butler's "**rear grip 506**" and "pistol-grip style **rear grip 406**" are handles, that the handles are interchangeable, and that Butler's "**gripping surfaces**" are handgrip portions.
98. Relevant to Limitations [1a.1]/[28a.1], Butler teaches the handle includes a hand grip portion that extends upwardly and forwardly when the hand vacuum cleaner body is positioned with the bottom on a horizontal surface. The '550 patent's claims do not require any particular starting point from which the handle extends "upwardly" or "forwardly," or that the same starting point must be used for both. In my opinion, a POSA would understand that Butler's handle includes multiple portions that both (1) include a gripping surface and (2) extend upwardly and forwardly,

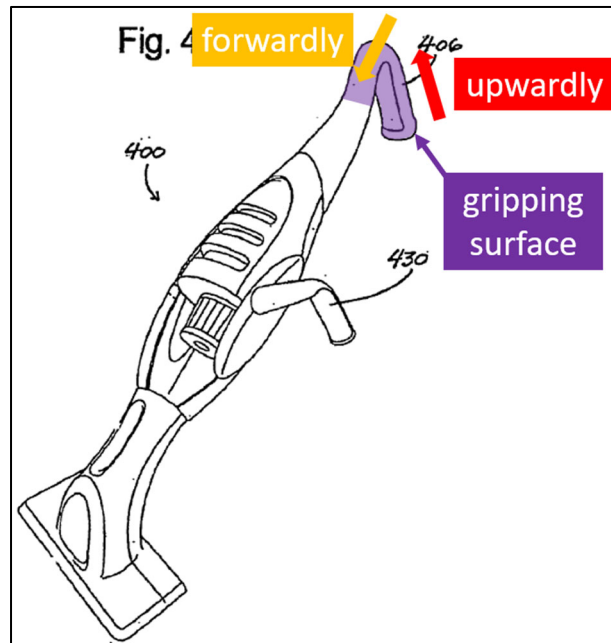
regardless of what starting point(s) or orientations are used. For example, the below two portions of Butler’s “circular” or “toroidal-shaped rear grip” each include “gripping surfaces” that extend **upwardly** and **forwardly**, as shown in the annotated images below:



Ex. 1005, 10:19-21, 34:21-23, Figs. 5, 16.

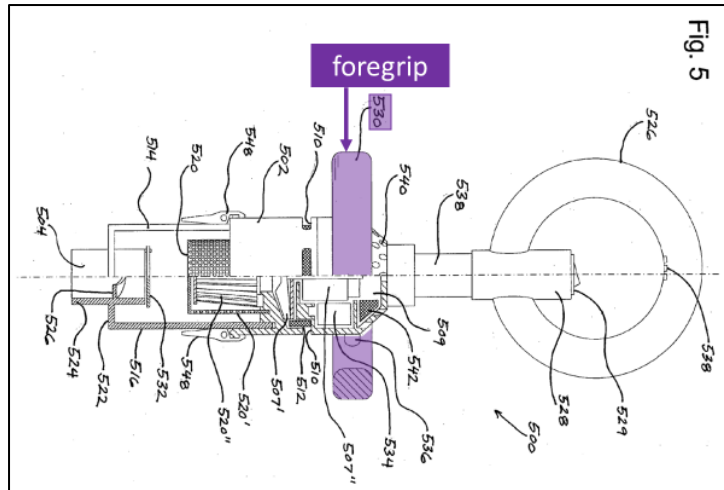
99. Further, Butler’s “pistol-grip style rear grip” also has “gripping surfaces” that extend **upwardly** and **forwardly**, as shown in the annotated image

below:



Id., 19:22-24, Fig. 4.

100. In my opinion, a POSA would understand that Butler teaches a handle with a hand grip portion that extends upwardly and forwardly when the hand vacuum body is oriented with the bottom on a horizontal surface.
101. Relevant to Limitation [20a.1], in my opinion, a POSA would understand that Butler's "circular or looped **foregrip 530**" is also a handle, as shown in the annotated image below:



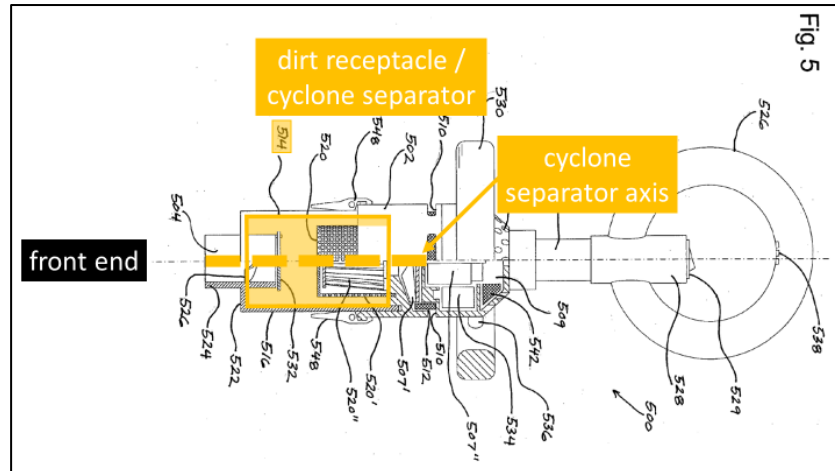
Ex. 1005, 20:4-11, Fig. 5.

d. [1a.2]/[12a.2]/[20a.2]/[28a.2]

Reference Number	Claim Limitation
[1a.2]	“(ii) a cyclone unit provided at a front end of the hand vacuum cleaner body, the cyclone unit comprising a cyclone chamber having a cyclone axis of rotation, a front end of the cyclone unit having a hand vacuum cleaner air inlet and a rear end wherein the hand vacuum cleaner air inlet is provided in a centre of the front end of the cyclone unit; and,”
[12a.2]	“(ii) an air treatment member provided at a front end of the hand vacuum cleaner body, the air treatment member having a front end of the air treatment member and a rear end, a hand vacuum cleaner air inlet and the rear end having an air treatment member air outlet whereby air exits the air treatment member in a rearward direction, wherein the hand vacuum cleaner air inlet is provided in a centre of the front end of the air treatment member; and,”
[20a.2]	“(ii) a cyclone unit provided at a front end of the hand vacuum cleaner body, the cyclone unit comprising a cyclone chamber having a cyclone axis of rotation, a front end of the cyclone unit having a hand vacuum cleaner air inlet and a rear end wherein the hand vacuum cleaner air inlet is provided in a centre of the front end of the cyclone unit; and,”
[28a.2]	“(ii) a cyclone unit provided at a front end of the hand vacuum cleaner body, the cyclone unit comprising a cyclone chamber having a cyclone axis of rotation, a centre of the front end of the cyclone unit having a hand vacuum cleaner air inlet; and,”

102. Butler teaches a cyclone unit provided at a front end of the hand vacuum cleaner body, the cyclone unit comprising a cyclone chamber having a cyclone axis of rotation, a front end of the cyclone unit having a hand vacuum cleaner air inlet and a rear end wherein the hand vacuum cleaner air inlet is provided in a centre of the front end of the cyclone unit. (Limitations [1a.2]/[20a.2]).

103. Butler teaches an air treatment member provided at a front end of the hand vacuum cleaner body, the air treatment member having a front end of the air treatment member and a rear end, a hand vacuum cleaner air inlet and the rear end having an air treatment member air outlet whereby air exits the air treatment member in a rearward direction, wherein the hand vacuum cleaner air inlet is provided in a centre of the front end of the air treatment member. (Limitation [12a.2]).
104. Butler teaches a cyclone unit provided at a front end of the hand vacuum cleaner body, the cyclone unit comprising a cyclone chamber having a cyclone axis of rotation, a centre of the front end of the cyclone unit having a hand vacuum cleaner air inlet. (Limitation [28a.2]).
105. Butler teaches a cyclone unit provided at the front end of the hand vacuum cleaner body, the cyclone unit comprising a cyclone chamber having a cyclone axis of rotation. Butler teaches a “**dirt receptacle** compris[ing] a **cyclone separator**” at the front end of the hand vacuum cleaner body, which, in my opinion, a POSA would understand is a cyclone unit with a cyclone chamber and includes a **cyclone separator axis** of rotation, as shown in the annotated image below:



Ex. 1005, Claim 11, Fig. 5.

106. As I explained, Butler teaches a “rear grip.” *See* Ground 1, Limitation [1a.1]. In my opinion, a POSA would understand that Butler’s “rear grip” is located at the rear of the vacuum cleaner body, and that Butler’s “cyclone separator” is located at the opposite end, i.e., the front of the vacuum cleaner body.

107. Butler explains how cyclonic airflow is initiated within Butler’s cyclone separator:

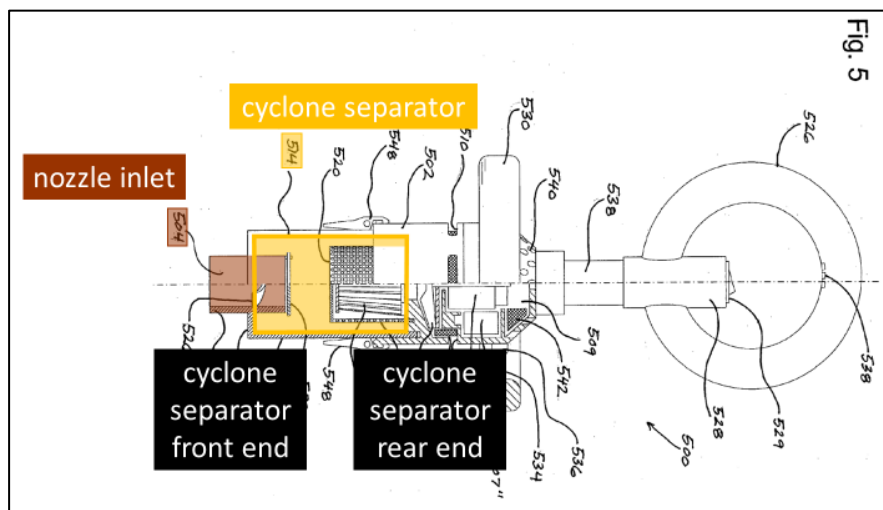
Located inside the entry tube 524 is a helical ramp 526. The helical ramp 526 extends radially inward from the entry tube's inner wall, and may terminate short of the entry tube's centerline, as shown, to allow an unobstructed central path through the entry tube 524, or may extend to the centerline (or 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.

Ex. 1005, 22:14-22.

108. 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.

109. Butler further teaches a front end of the cyclone unit having a hand vacuum cleaner air inlet. Butler teaches a "nozzle inlet 504," which "comprises an entry tube 524 that passes through the dirt receptacle bottom wall 522," as shown in the annotated image below:



Ex. 1005, 22:5-6, Fig. 5.

110. In my opinion, a POSA would understand that Butler's "cyclone separator" has a front end, located at the front end of the hand vacuum cleaner body, and a rear end, as shown above. In my opinion, a POSA would also understand that Butler's nozzle inlet 504 is a hand vacuum cleaner air inlet, because that is how dirty air enters Butler's vacuum, and that it is provided in the center of the front end of the cyclone unit, as shown above.
111. Regarding Limitation [12a.2], in my opinion, a POSA would understand that Butler's cyclone unit is an air treatment member because it cleans the dirty air by separating out particulate. Further, Butler explains that several air treatment members can be used: "[w]hile the foregoing cyclonic arrangement for the dirt receptacle 514 is preferred, other types of dirt separation system may alternatively be used, as will be appreciated by those of ordinary skill in the art in view of the present disclosure." Ex. 1005, 22:23-25. In my opinion, a POSA would understand that "other types of dirt separation system[s]" are also air treatment members. Butler further teaches an air treatment member air outlet, e.g., the "filter 520," as I explain for claim 7, which is where clean air exits the air treatment member in a rearward direction. *See* Ground 1, Claim 7.

e. [1a.3]/[12a.3]/[20a.3]/[28a.3]

Reference Number	Claim Limitation
[1a.3]	“(iii) an electrical connector provided on the front end of the cyclone unit wherein electrical cables extend rearwardly from the electrical connector through a central portion of the cyclone unit toward the suction motor and fan assembly,”
[12a.3]	“(iii) an electrical connector provided on the front end of the air treatment member wherein electrical cables extend rearwardly from the electrical connector through a central portion of the air treatment member toward the suction motor and fan assembly,”
[20a.3]	“(iii) an electrical connector provided on the front end of the cyclone unit,”
[28a.3]	“(iii) a cyclone unit electrical connector provided at the front end of the cyclone unit at a location adjacent the hand vacuum cleaner air inlet, wherein electrical cables extend rearwardly from the electrical connector through a central portion of the cyclone unit toward the suction motor and fan assembly,”

112. Butler teaches an electrical connector provided on the front end of the cyclone unit wherein electrical cables extend rearwardly from the electrical connector through a central portion of the cyclone unit toward the suction motor and fan assembly. (Limitation [1a.3]).

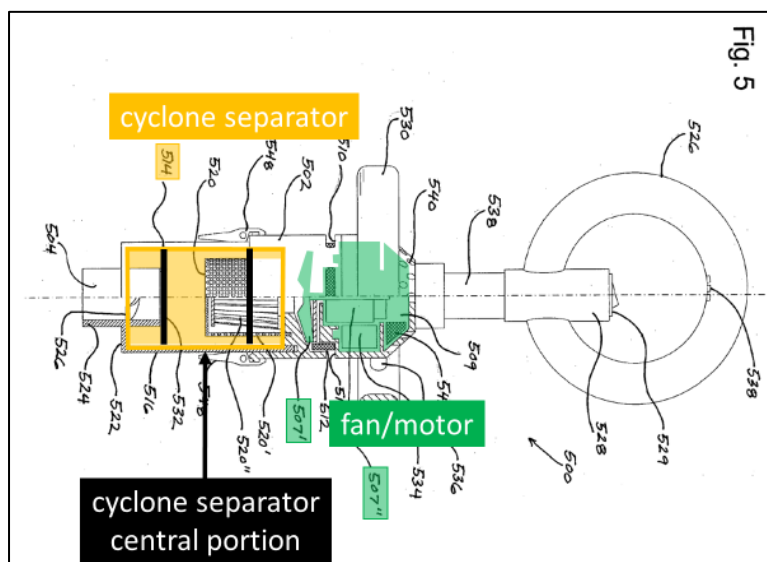
113. Butler teaches an electrical connector provided on the front end of the air treatment member wherein electrical cables extend rearwardly from the electrical connector through a central portion of the air treatment member toward the suction motor and fan assembly. (Limitation [12a.3]).

114. Butler teaches an electrical connector provided on the front end of the cyclone unit. (Limitation [20a.3]).

115. Butler teaches a cyclone unit electrical connector provided at the front end of the cyclone unit at a location adjacent the hand vacuum cleaner air inlet, wherein electrical cables extend rearwardly from the electrical connector through a central portion of the cyclone unit toward the suction motor and fan assembly. (Limitation [28a.3]).
116. Butler teaches an electrical connector provided on the front end of the cyclone unit. Butler explains that “**nozzle inlet 504**,” located at the front of Butler’s cyclone separator, “comprises an **entry tube 524** that passes through the dirt receptacle bottom wall 522.” Ex. 1005, 22:5-11. Butler further explains that “any type of cleaning device can be attached to the **entry tube 524**,” and “[o]f course, if a powered attachment is provided, suitable power leads can be provided to connect the powered attachment to the electric circuit,” as shown in the annotated image below:

Id., 22:5-11, Fig. 5.

117. In my opinion, a POSA would understand that Butler's "entry tube 524" includes an electrical connector that is provided on the front end of the cyclone separator to connect to "power leads" and provide power to Butler's powered attachment. Ex. 1005, 22:6-11.
118. Butler further teaches the electrical cables extend rearwardly from the electrical connector through a central portion of the cyclone unit toward the suction motor and fan assembly. Butler's "power leads" pass from the "powered attachment" "through the dirt receptacle" and toward the "fan/motor 507," as shown in the annotated image below:



Ex. 1005, 22:6-13, Fig. 5.

119. Butler further describes the wiring pathway from power source to powered cleaning head:

One or more brushrolls may be positioned in the inlet nozzle 104 to further agitate the surface being cleaned and enhance cleaning performance. Such brushrolls may be powered by the fan/ motor, a separate motor, by an airflow-powered impeller drive, or by other known means.

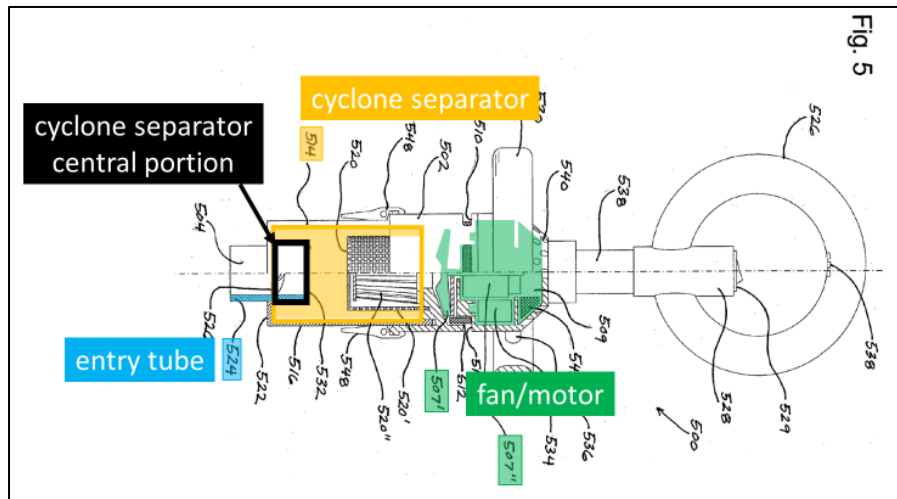
Ex. 1005, 9:18-21.

120. In my opinion, a POSA would understand that Butler's "power leads" are electrical cables that extend rearwardly through a central portion of the cyclone separator, because they attach at the inlet end and extend rearwardly through a central portion of the cyclone separator and toward the fan/motor assembly (which provides the power), as I show and explain above. Further, the '550 patent's claims do not limit "a central portion" to any particular orientation. In my opinion, a POSA would understand that the "central portion" of Butler's cyclone unit can include central from left-to-right, or radially central. One central portion of Butler's cyclone unit is the portion I identify in the above figure.

121. Another central portion of Butler's cyclone unit is the radial center,³ as

³ The claims do not require that "a central portion" has any required depth; all that is required is that the electrical cables extend through any "portion" of the cyclone unit that is "central."

shown in the annotated image below:



Ex. 1005, Fig. 5.

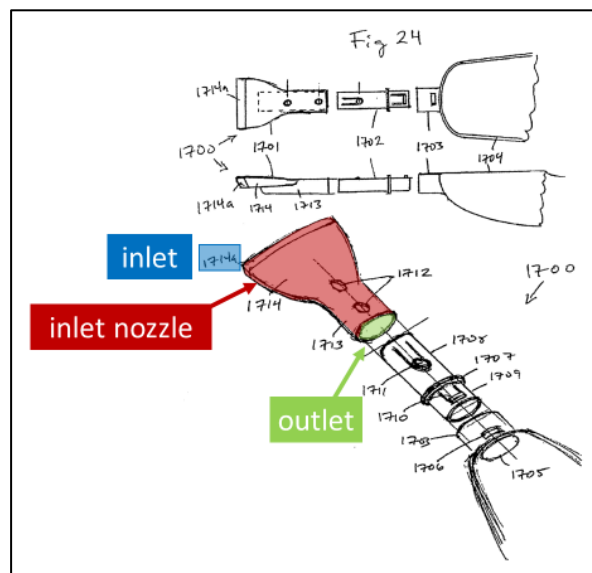
122. In my opinion, a POSA would understand that Butler’s “power leads” also extend rearwardly from “entry tube 524,” which is in the radially central portion of Butler’s “cyclone separator,” as shown above. The power leads, i.e., the electrical wiring, travels rearwardly to provide electrical continuity and communication with the electrical components in the vacuum, including the power supply and power switch 529, depicted in Figure 5.
123. Regarding Limitation [28a.3], in my opinion, a POSA would also understand that Butler’s cyclone unit electrical connector is provided at a location adjacent the hand vacuum cleaner air inlet, as shown and explained above, and because Butler explains that “nozzle inlet 504 of the embodiment of Figure 5 comprises an entry tube 524 that passes through the dirt receptacle bottom wall 522.” Ex. 1005, 22:5-6.

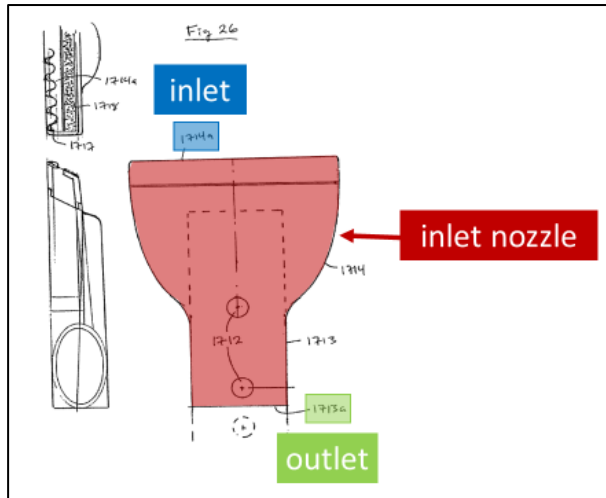
f. [1b]/[12b]/[20b]/[28b]

Reference Number	Claim Limitation
[1b]	“(b) a surface cleaning head having a front end, a rear end, a dirt air inlet and a cleaning head air outlet; and,”
[12b]	“(b) a surface cleaning head having a front end, a rear end, a dirt air inlet and a cleaning head air outlet; and,”
[20b]	“(b) a surface cleaning head having a front end, a rear end, a dirt air inlet and a cleaning head air outlet; and,”
[28b]	“(b) a surface cleaning head having a front end, a rear end, a dirt air inlet and a cleaning head air outlet; and,”

124. Butler teaches a surface cleaning head having a front end, a rear end, a dirt air inlet and a cleaning head air outlet. (Limitations [1b]/[12b]/[20b]/[28b]).

125. Butler teaches a surface cleaning head having a front end and a rear end. Butler teaches an “inlet nozzle 1701” having an “inlet 1714a” and an “outlet 1713a,” as shown in the annotated images below:

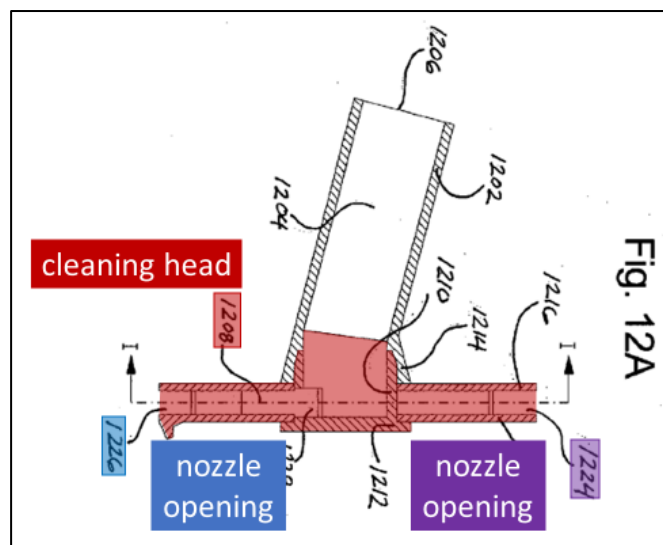




Ex. 1005, 42:6-9, Figs. 24, 26.

126. In my opinion, a POSA would understand that Butler’s “**inlet nozzle 1701**” is a surface cleaning head, and that “**inlet 1714a**” is at a front end, opposite “**outlet 1713a**,” which is at a rear end.

127. Butler describes another component, “**cleaning head 1208**,” with “**nozzle opening 1226**” and “**nozzle opening 1224**,” as shown in the annotated image below:



Ex. 1005, 31:24-27, Fig. 12A.

128. In my opinion, a POSA would also understand that Butler's "**cleaning head 1208**" is a surface cleaning head, and that "**nozzle opening 1226**" is at a front end, opposite "**nozzle opening 1224**," which is at a rear end.

129. Butler teaches that its surface cleaning heads, including those I identify above, are interchangeable: "[a]ny type of cleaning device may be attached" Ex. 1005, 22:6-9.

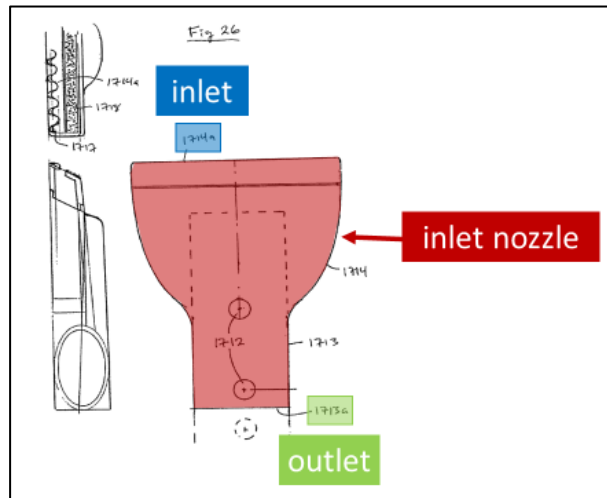
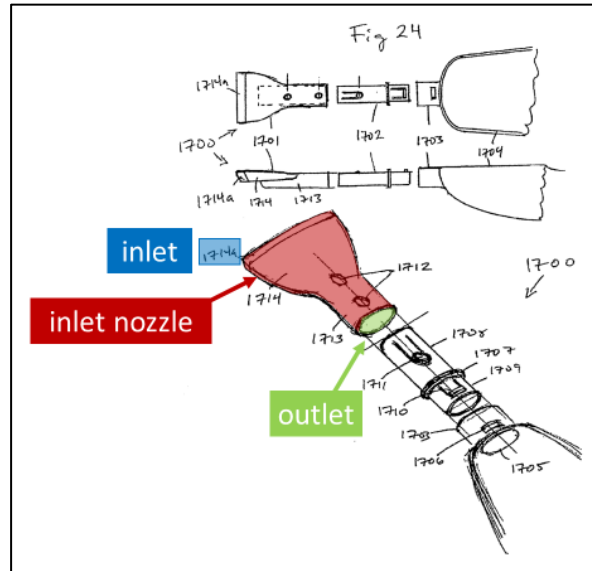
130. For example, Butler teaches a powered attachment: "inlet nozzle 1100 compris[ing]" a "motor 1114" that "drive[s] the brushroll 1106":

Referring to Figure 11, a first embodiment of an inlet nozzle 1100 comprises a brushroll chamber 1102 having a downwardly facing opening 1104 in which a rotatable brushroll 1106 is located. The brushroll 1106 comprises any rotating agitator design, such as a cylindrical spindle 1108 with a number of cleaning bristles 1110 extending radially therefrom. The brushroll 1106 is mounted to the inlet nozzle 1100 by bearings 1112 or journals. A motor 1114 is mounted in the inlet nozzle 1100 to drive the brushroll 1106 through a belt 1116.

Ex1005, 30:7-13

131. Butler further teaches a surface cleaning head having a dirt air inlet and a cleaning head air outlet. 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:

Referring to Figure 26 and 27, the inlet nozzle 1701 comprises an outlet duct 1713 and an intake duct 1714. The outlet duct 1713 comprises the outlet 1713a for the inlet nozzle 1701 and the intake duct 1714 comprises the inlet 1714a for the inlet nozzle 1701.



Ex. 1005, 42:6-9, Figs. 24, 26.

132. Thus, in my opinion, a POSA would understand that Butler's "**inlet 1714a**" is a dirt air inlet and Butler's "**outlet 1713a**" is a cleaning head air outlet.

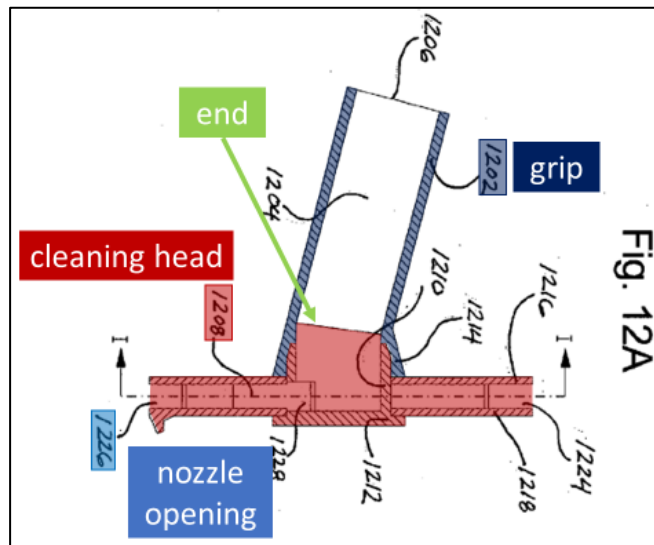
133. Further, Butler teaches that air flows into “**nozzle opening 1226**,” which “comprises an air passage” and is “placed in communication with the vacuum passage 1204” and the “**grip 1202**,” and air exits the “**cleaning head 1208**” at an “**end** to a cleaning head 1208” that is “attach[ed]” to “grip 1202,” as shown in the annotated image below:

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 is 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.



Ex. 1005, 31:6-27, Fig. 12A.

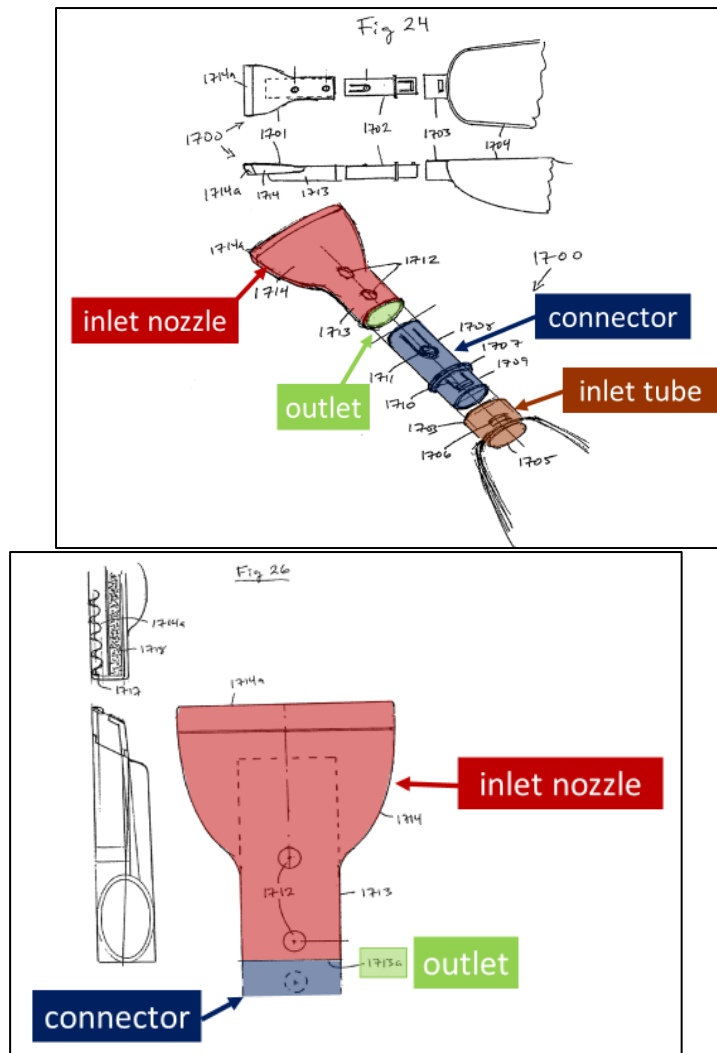
134. In my opinion, a POSA would understand that Butler’s “**nozzle opening 1226**” is also a dirt air inlet and Butler’s “**end**” is also a cleaning head air outlet.

g. [1c]/[20c]

Reference Number	Claim Limitation
[1c]	“(c) a rigid air flow conduit extendable between the cleaning head air outlet and the hand vacuum cleaner air inlet, the rigid air flow conduit having a longitudinally extending conduit axis which is parallel to the cyclone axis of rotation when the rigid air flow conduit extends between the cleaning head air outlet and the hand vacuum cleaner air inlet,”
[20c]	“(c) a rigid air flow conduit extendable between the cleaning head air outlet and a hand vacuum cleaner air inlet, the rigid air flow conduit having a longitudinally extending conduit axis which is parallel to the cyclone axis of rotation when the rigid air flow conduit extends between the cleaning head air outlet and the hand vacuum cleaner air inlet,”

135. Butler teaches a rigid air flow conduit extendable between the cleaning head air outlet and the hand vacuum cleaner air inlet, the rigid air flow conduit having a longitudinally extending conduit axis which is parallel to the cyclone axis of rotation when the rigid air flow conduit extends between the cleaning head air outlet and the hand vacuum cleaner air inlet. (Limitations [1c]/[20c]).

136. Butler teaches a rigid air flow conduit extendable between the cleaning head air outlet and the hand vacuum cleaner air inlet. Butler teaches a “**nozzle connector 1702**” that extends between “the **outlet 1713a** for the **inlet nozzle 1701**” and “**inlet tube 1703** located on the housing,” as shown in the annotated images below:



Ex. 1005, 41:8-11, Figs. 24, 26.

137. Butler explains that “**inlet tube 1703**,” is “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.” *Id.*, 41:15-18.

138. Butler further explains “**connector 1702** is a hollow tube” “divided into two portions by a collar 1707:” an upstream “inlet portion 1708,” which is

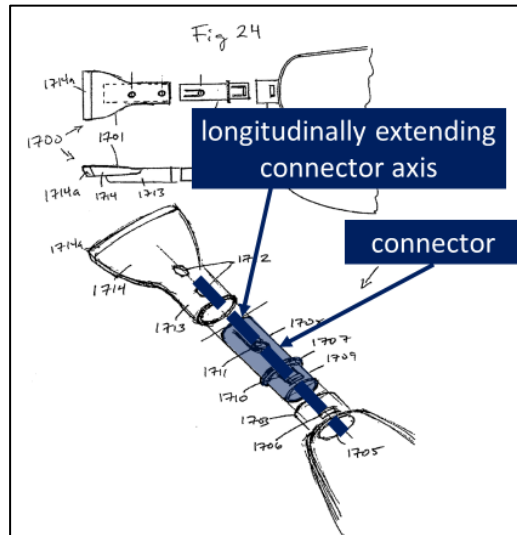
“telescopically received within the **nozzle 1701**,” and a downstream “outlet portion 1709,” which is “telescopically received within or around the **inlet tube 1703**”:

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.

Id., 41:19-29.

139. In my opinion, a POSA would understand that Butler’s “connector 1702” is a rigid air flow conduit; “inlet nozzle 1701” is a surface cleaning head; “outlet 1713a” is a cleaning head air outlet; “inlet tube 1703” is a hand vacuum cleaner air inlet; and therefore that Butler teaches a rigid air flow conduit extendable between the cleaning head air outlet and the hand vacuum cleaner air inlet.

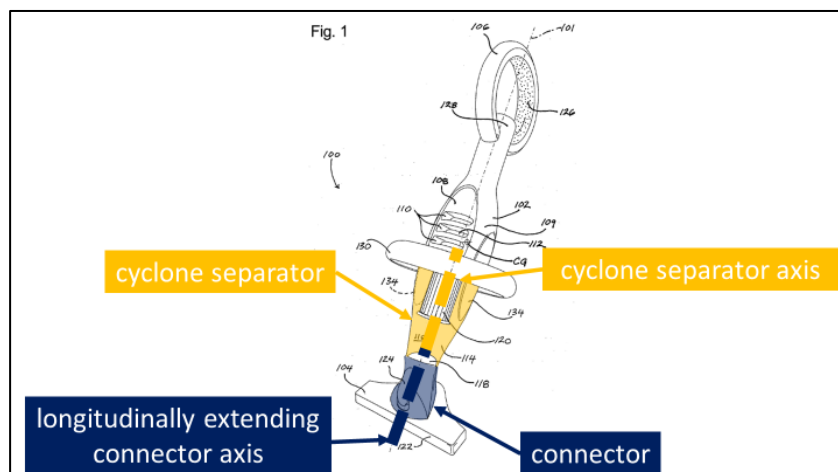
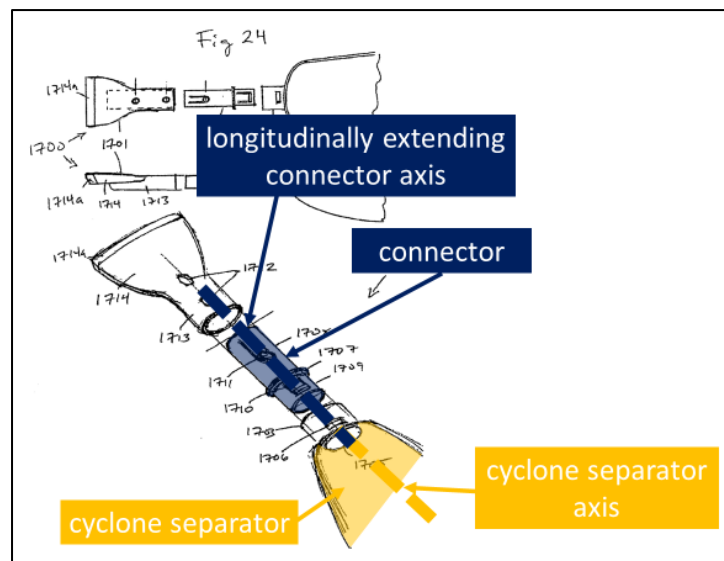
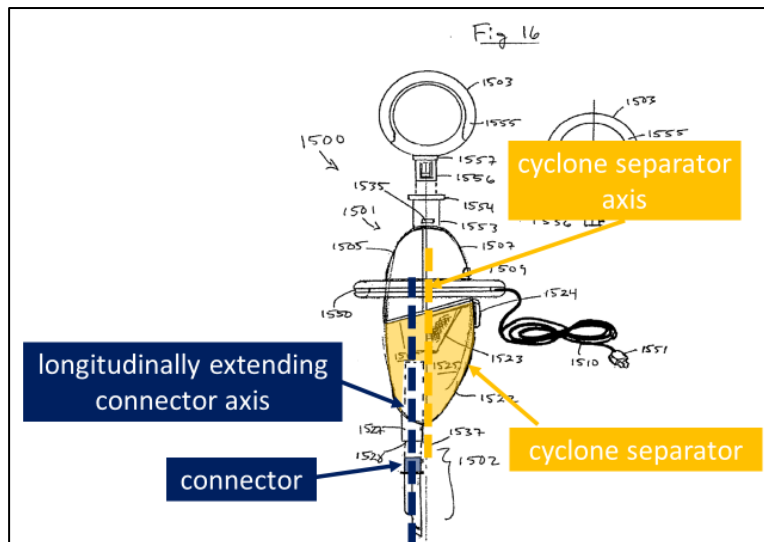
140. Butler teaches a rigid air flow conduit having a longitudinally extending conduit axis. Butler's **connector 1702** has a **longitudinally extending connector axis**, as shown in the annotated image below:



Ex. 1005, Fig. 24.

141. In my opinion, a POSA would understand that Butler's longitudinally extending connector axis is a longitudinally extending conduit axis.

142. Butler teaches the longitudinally extending conduit axis is parallel to the cyclone axis of rotation when the rigid air flow conduit extends between the cleaning head air outlet and the hand vacuum cleaner air inlet. Butler's **connector 1702's axis** is parallel to the **cyclone separator's axis of rotation** when **connector 1702** extends between "outlet 1713a" and the "inlet tube 1703," as shown in the annotated images below:



Ex. 1005, Figs. 16, 24, 1.

143. In Butler's Fig. 16, the longitudinally extending connector axis and cyclone separator axis are parallel and offset, while in Figs. 24 and 1, they are coaxial. Furthermore, in my opinion, a POSA would understand that the coaxial axes in Figs. 24 and 1 are parallel because they extend in the same direction and maintain the same (zero) distance between them. In addition, PO contends co-axial axes meet this limitation in PO's infringement contentions. Ex. 1013 (Ex A-2) at 15-17. Further, Claim 11, which depends from Claim 9, requires a "hand vacuum cleaner inlet passage [that] is coaxial with the longitudinally extending conduit axis," while Claim 9 requires "a hand vacuum cleaner inlet passage that is generally parallel to the longitudinally extending conduit axis." Compare Ex. 1001, Claim 11 with *id.*, Claim 9. This further supports that "generally parallel" includes "co-axial" in the context of this patent. A POSA would have understood that coaxial is generally regarded as a special case of parallelism where the axes of two shapes overlap so that they share a single axis.

h. [12c]

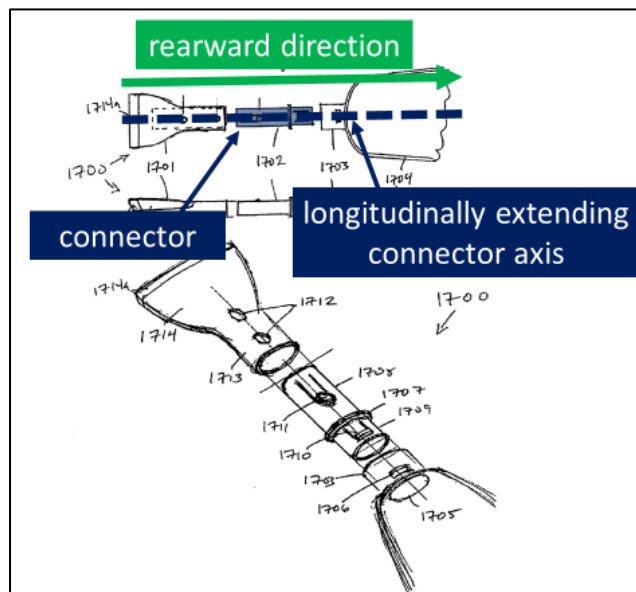
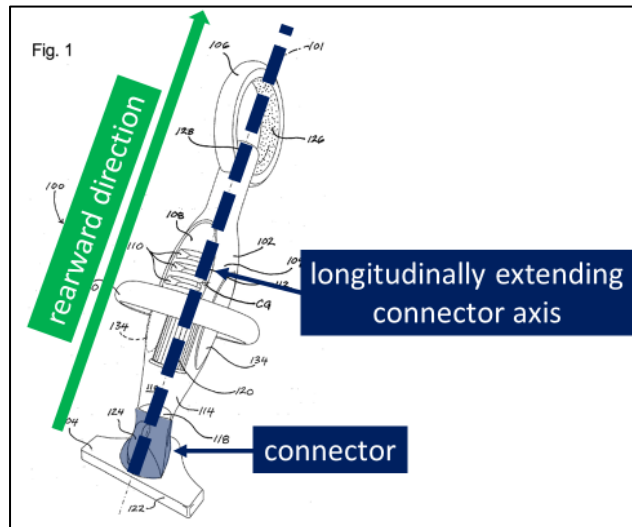
Reference Number	Claim Limitation
[12c]	“(c) a rigid air flow conduit extendable between the cleaning head air outlet and the hand vacuum cleaner air inlet, the rigid air flow conduit having a longitudinally extending conduit axis which is parallel to the rearward direction when the rigid air flow conduit extends between the cleaning head air outlet and the hand vacuum cleaner air inlet and when the hand vacuum cleaner is mounted to a downstream end of the rigid air flow conduit, the handle is a driving handle for the surface cleaning apparatus.”

144. Butler teaches a rigid air flow conduit extendable between the cleaning head air outlet and the hand vacuum cleaner air inlet, the rigid air flow conduit having a longitudinally extending conduit axis which is parallel to the rearward direction when the rigid air flow conduit extends between the cleaning head air outlet and the hand vacuum cleaner air inlet and when the hand vacuum cleaner is mounted to a downstream end of the rigid air flow conduit, the handle is a driving handle for the surface cleaning apparatus. (Limitation [12c]).

145. As I explained, Butler teaches a rigid air flow conduit extendable between the cleaning head air outlet and the hand vacuum cleaner air inlet, the rigid air flow conduit having a longitudinally extending conduit axis. *See* Ground 1, Limitation [1c].

146. Butler further teaches the rigid air flow conduit having a longitudinally

extending conduit axis which is parallel to the rearward direction. Butler's **longitudinally extending conduit axis** (Butler's connector 1702's axis) is parallel to the **rearward direction** when oriented as claimed, as shown in the annotated images below:



Ex. 1005, Figs. 1, 24.

147. In my opinion, a POSA would understand that Butler's connector 1702's

outlet portion 1709 is the downstream end of the rigid air flow conduit, where air flows out of the connector, opposite the upstream end, where air flows into the connector.

148. Further, Butler teaches when the hand vacuum cleaner is mounted to a downstream end of the rigid air flow conduit, the handle is a driving handle for the surface cleaning apparatus for the reasons I explain for Limitation [1d]. *See* Ground 1, Limitation [1d].

i. [28c]

Reference Number	Claim Limitation
[28c]	“(c) a rigid air flow conduit extendable between the cleaning head air outlet and the hand vacuum cleaner air inlet, the rigid air flow conduit having a longitudinally extending conduit axis, and when the rigid air flow conduit is extending between the cleaning head air outlet and the hand vacuum cleaner air inlet conduit axis is parallel to the cyclone axis of rotation and a rigid air flow conduit electrical connector that is aligned with and connected to the cyclone unit electrical connector when the hand vacuum cleaner is mounted to the rigid air flow conduit,”

149. Butler teaches a rigid air flow conduit extendable between the cleaning head air outlet and the hand vacuum cleaner air inlet, the rigid air flow conduit having a longitudinally extending conduit axis, and when the rigid air flow conduit is extending between the cleaning head air outlet and the hand vacuum cleaner air inlet conduit axis is parallel to the cyclone axis of rotation and a rigid air flow conduit electrical connector that is aligned with

- and connected to the cyclone unit electrical connector when the hand vacuum cleaner is mounted to the rigid air flow conduit. (Limitation [28c]).
150. As I explained, Butler teaches a rigid air flow conduit extendable between the cleaning head air outlet and the hand vacuum cleaner air inlet, the rigid air flow conduit having a longitudinally extending conduit axis, and when the rigid air flow conduit is extending between the cleaning head air outlet and the hand vacuum cleaner air inlet the conduit axis is parallel to the cyclone axis of rotation. *See* Ground 1, Limitation [1c].
151. As I discussed in Limitation [1a.3], Butler teaches a rigid air flow conduit electrical connector that is aligned with and connected to the cyclone unit electrical connector when the hand vacuum cleaner is mounted to the rigid air flow conduit. *See* Ground 1, Limitation [1a.3]. In my opinion, a POSA would understand that Butler's hand vacuum cleaner includes a rigid air flow conduit electrical connector to provide power to a powered surface cleaning head, and that the rigid air flow conduit electrical connector would be aligned with and connected to the cyclone unit electrical connector to provide such power. *See* Ground 1, Limitation [1a.3].

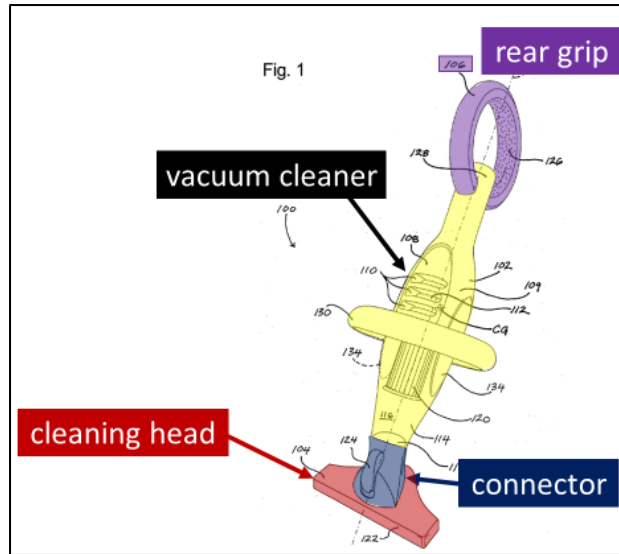
j. [1d]/[20d]/[28d]

Reference Number	Claim Limitation
[1d]	“wherein the hand vacuum cleaner is removably mountable to a downstream end of the rigid air flow conduit and when the hand vacuum cleaner is mounted to the downstream end of the rigid air flow conduit, the rigid air flow conduit extends between the surface cleaning head and the hand vacuum cleaner, the handle is a driving handle for the surface cleaning apparatus.”
[20d]	“wherein the hand vacuum cleaner is removably mountable to a downstream end of the rigid air flow conduit and when the hand vacuum cleaner is mounted to the downstream end of the rigid air flow conduit, the handle is a driving handle for the surface cleaning apparatus, and”
[28d]	“wherein the hand vacuum cleaner is removably mountable to a downstream end of the rigid air flow conduit and when the hand vacuum cleaner is mounted to the downstream end of the rigid air flow conduit, the handle is a driving handle for the surface cleaning apparatus.”

152. Butler teaches wherein the hand vacuum cleaner is removably mountable to a downstream end of the rigid air flow conduit and when the hand vacuum cleaner is mounted to the downstream end of the rigid air flow conduit, the rigid air flow conduit extends between the surface cleaning head and the hand vacuum cleaner, the handle is a driving handle for the surface cleaning apparatus (Limitation [1d]).

153. Butler teaches wherein the hand vacuum cleaner is removably mountable to a downstream end of the rigid air flow conduit and when the hand vacuum cleaner is mounted to the downstream end of the rigid air flow

- conduit, the handle is a driving handle for the surface cleaning apparatus (Limitation [20d]).
154. Butler teaches wherein the hand vacuum cleaner is removably mountable to a downstream end of the rigid air flow conduit and when the hand vacuum cleaner is mounted to the downstream end of the rigid air flow conduit, the handle is a driving handle for the surface cleaning apparatus (Limitation [28d]).
155. As I explained, Butler teaches the hand vacuum cleaner is removably mountable to a downstream end of the rigid air flow conduit, and the rigid air flow conduit extends between the surface cleaning head and the hand vacuum cleaner. *See* Ground 1, Limitation [1c].
156. Further, Butler teaches when the rigid air flow conduit extends between the surface cleaning head and the hand vacuum cleaner, the handle is a driving handle for the surface cleaning apparatus. Butler explains that “**rear grip 106**” “is used to support and maneuver the back of the vacuum cleaner 100” during use, as shown in the annotated image below:



Ex. 1005, 10:17-19, Fig. 1.

157. In my opinion, a POSA would understand that Butler’s “rear grip 106” is a driving handle because the user applies forces and movements to the handle to drive the cleaner during operation.
158. Further, Butler teaches a “foregrip 530” that “provides improved flexibility in handling the device,” and in my opinion, a POSA would understand it is also a driving handle, as shown in the annotated image below:

The foregrip 130 includes various features to enhance the ergonomics and control of the vacuum cleaner 100. For example, the foregrip 130 shown in Figure 1 has 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. This provides improved flexibility in handling the device, and allows the user to rotate the housing to point the inlet nozzle 104 horizontally to

[illegible]

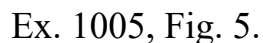
k. [20e]

Reference Number	Claim Limitation
[20e]	“wherein when the rigid air flow conduit extends between the cleaning head air outlet and the hand vacuum cleaner air inlet, the hand vacuum cleaner air inlet comprises a hand vacuum cleaner inlet passage that is generally coaxial with the longitudinally extending conduit axis and the cyclone axis of rotation, the hand vacuum cleaner air inlet passage is positioned inside the cyclone unit and the electrical cables extend rearwardly from the electrical connector through the cyclone unit adjacent the hand vacuum cleaner inlet passage towards the suction motor and fan assembly.”

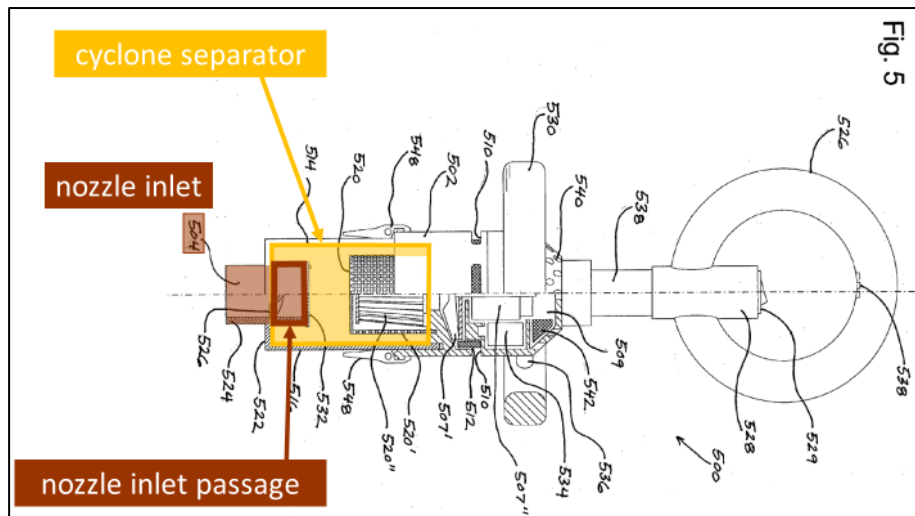
159. Butler teaches wherein when the rigid air flow conduit extends between the cleaning head air outlet and the hand vacuum cleaner air inlet, the hand vacuum cleaner air inlet comprises a hand vacuum cleaner inlet passage that is generally coaxial with the longitudinally extending conduit axis and the cyclone axis of rotation, the hand vacuum cleaner air inlet passage is positioned inside the cyclone unit and the electrical cables extend rearwardly from the electrical connector through the cyclone unit adjacent the hand vacuum cleaner inlet passage towards the suction motor and fan assembly (Limitation [20e]).

160. As I explained, Butler teaches when the rigid air flow conduit extends between the cleaning head air outlet and the hand vacuum cleaner air inlet, the hand vacuum cleaner air inlet comprises a hand vacuum cleaner inlet passage that is generally coaxial with the longitudinally extending conduit

161. Butler further teaches the hand vacuum cleaner inlet passage is generally coaxial with the cyclone axis of rotation. Butler's **nozzle inlet passage** is generally coaxial with the **cyclone separator axis**, as shown in the annotated image below:



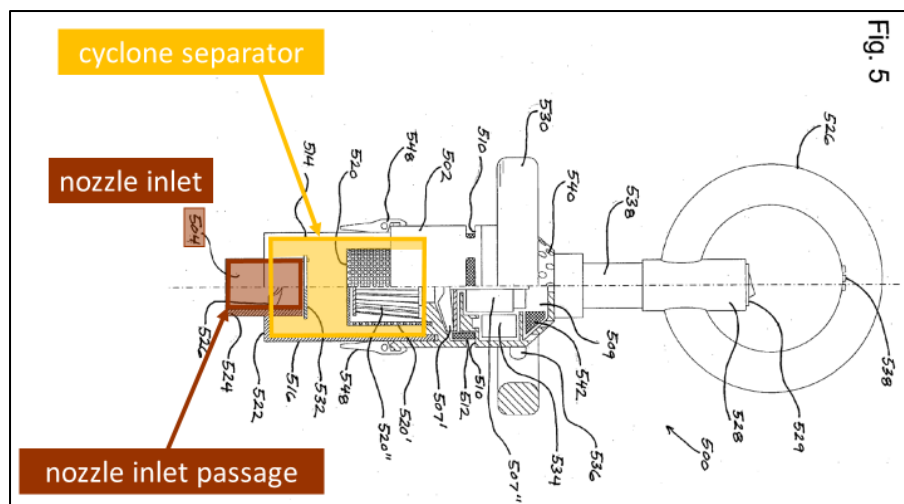
163. Butler teaches the hand vacuum cleaner air inlet passage is positioned inside the cyclone unit. Butler’s “**nozzle inlet 504** ... comprises an entry tube 524 that passes through the dirt receptacle bottom wall 522” and into the **cyclone separator**, as shown in the annotated image below:



Ex. 1005, 22:5-6, Fig. 5.

164. In my opinion, a POSA would understand that Butler's nozzle inlet passage is positioned inside the cyclone separator as I depict above.

165. Alternatively, Butler's hand vacuum cleaner inlet passage is the air passage that extends the entire length of "**nozzle inlet 504**," which "comprises an **entry tube 524** that passes through the dirt receptacle bottom wall 522," as shown in the annotated image below:



Ex. 1005, 22:5-6, Figs. 16, 5.

166. In my opinion, a POSA would understand that, as I depict above, Butler’s “**nozzle inlet 504**” is positioned inside Butler’s **cyclone separator**.

167. For the reasons I stated for Limitation [1a.3], Butler teaches the electrical cables extend rearwardly from the electrical connector through the cyclone unit adjacent the hand vacuum cleaner inlet passage towards the suction motor fan and assembly. *See* Ground 1, Limitation [1a.3].

2. Butler Anticipates Claim 2

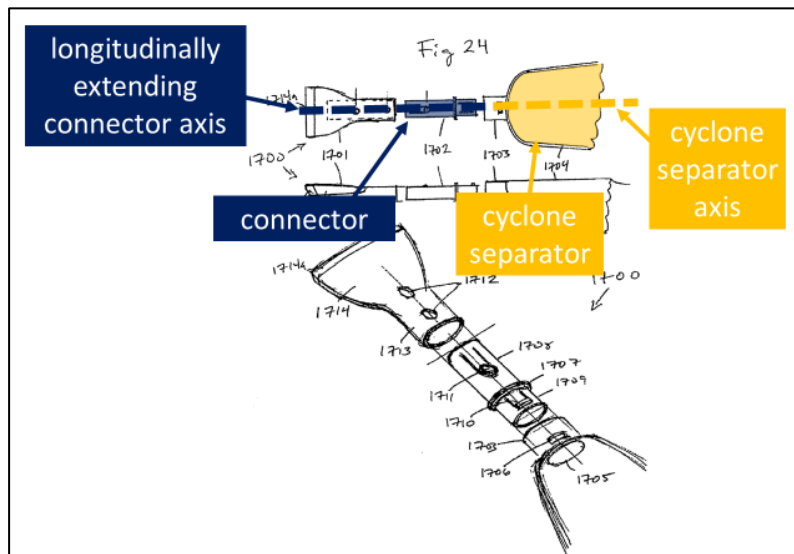
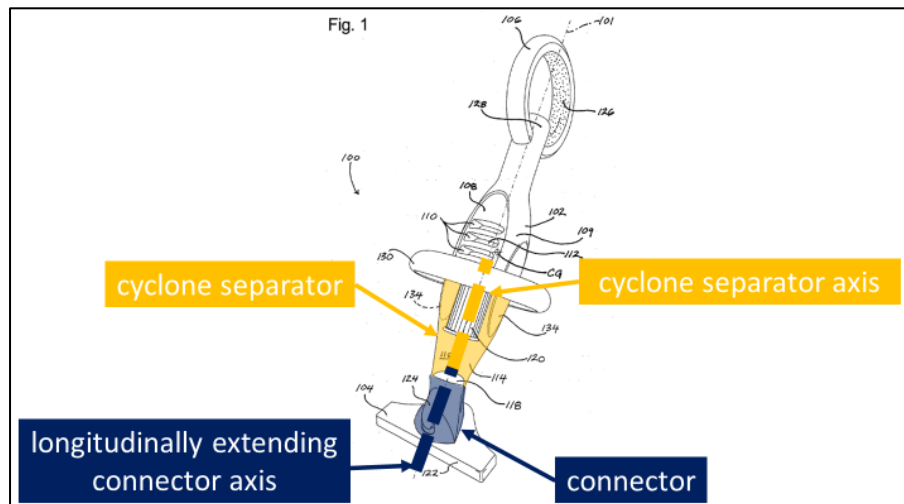
Reference Number	Claim Limitation
[2]	“The surface cleaning apparatus of claim 1 wherein the cyclone axis of rotation is rearward of the longitudinally extending conduit axis when the hand vacuum cleaner is mounted to the rigid air flow conduit and the rigid air flow conduit extends generally vertically upwardly from the surface cleaning head.”

168. As I explained in Section X.A.1, Butler anticipates Claim 1 of the ’550 patent.

169. Butler anticipates the surface cleaning apparatus of claim 1 wherein the cyclone axis of rotation is rearward of the longitudinally extending conduit axis when the hand vacuum cleaner is mounted to the rigid air flow conduit and the rigid air flow conduit extends generally vertically upwardly from the surface cleaning head (Claim 2).

170. Butler teaches the cyclone axis of rotation is rearward of the longitudinally

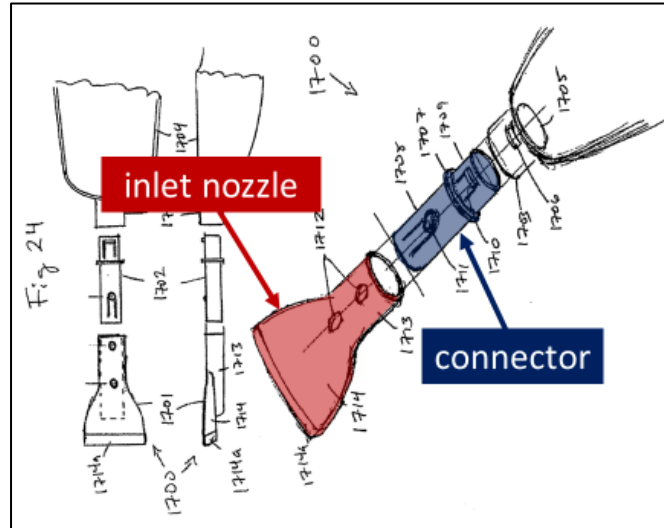
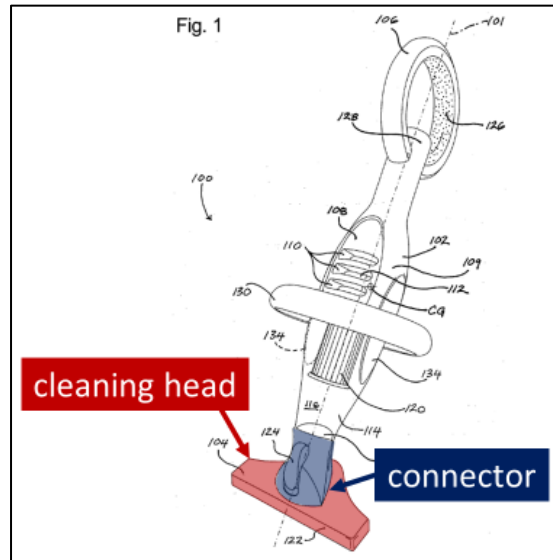
extending conduit axis when the hand vacuum cleaner is mounted to the rigid air flow conduit. Butler's **cyclone separator axis** is rearward of the **longitudinally extending connector axis** when the hand vacuum cleaner is mounted to the **connector 1702**, as shown in the annotated images below:



Ex. 1005, Figs. 1, 24; *see also* Ground 1, Limitations [1c]/[1d].

171. Butler further teaches the rigid air flow conduit extends generally

vertically upwardly from the surface cleaning head. Butler's **connector 1702** extends generally vertically upwardly from the **cleaning head 1208** and from **inlet nozzle 1701**, as shown in the annotated images below:



Ex. 1005, Figs. 1, 24; *see also* Ground 1, Limitations [1c]/[1d].

3. Butler Anticipates Claims 3, 5, and 15

Reference Number	Claim Limitation
[3]	“The surface cleaning apparatus of claim 2 wherein a projection of the longitudinally extending conduit axis intersects the hand grip portion when the hand vacuum cleaner is mounted to the rigid air flow conduit.”
[5]	“The surface cleaning apparatus of claim 1 wherein a projection of the longitudinally extending conduit axis intersects the hand grip portion when the hand vacuum cleaner is mounted to the rigid air flow conduit.”
[15]	“The surface cleaning apparatus of claim 14 wherein a projection of the longitudinally extending conduit axis intersects a hand grip portion of the handle when the hand vacuum cleaner is mounted to the rigid air flow conduit.”

172. As I explained in Sections X.A.1, X.A.2, and X.A.10, Butler anticipates Claims 1, 2, and 14 of the '550 patent.

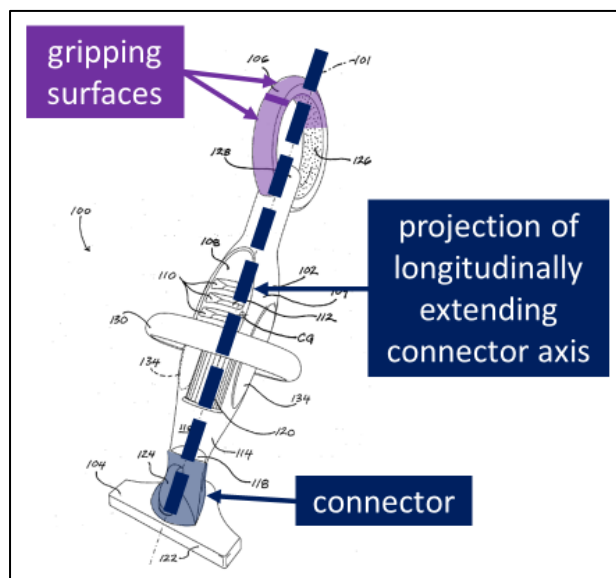
173. Butler anticipates the surface cleaning apparatus of claim 2 wherein a projection of the longitudinally extending conduit axis intersects the hand grip portion when the hand vacuum cleaner is mounted to the rigid air flow conduit (Claim 3).

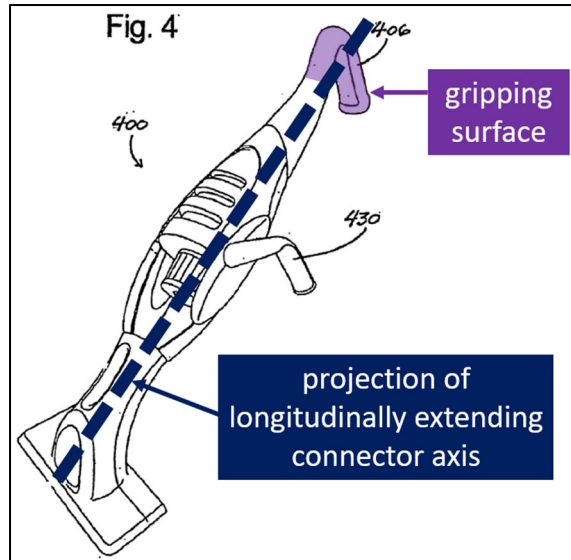
174. Butler anticipates the surface cleaning apparatus of claim 1 wherein a projection of the longitudinally extending conduit axis intersects the hand grip portion when the hand vacuum cleaner is mounted to the rigid air flow conduit (Claim 5).

175. Butler anticipates the surface cleaning apparatus of claim 14 wherein a projection of the longitudinally extending conduit axis intersects a hand

grip portion of the handle when the hand vacuum cleaner is mounted to the rigid air flow conduit (Claim 15).

176. Butler teaches a projection of the longitudinally extending conduit axis intersects the hand grip portion when the hand vacuum cleaner is mounted to the rigid air flow conduit. Butler's **projection of the longitudinally extending connector axis** intersects the **gripping surface** when the hand vacuum cleaner is mounted to the **connector 1702**, as shown in the annotated images below:





Ex. 1005, Figs. 1, 4, 9b, 16.

177. As depicted above, this is true for each Butler rear grip I identified for Claims 1, 2, and 14. As I explained, Butler’s “gripping surfaces” can be applied to any portion of Butler’s rear grip, including portions that extend upwardly and forwardly. *See* Ground 1, Limitation [1a.1]. Thus, in my opinion, a POSA would understand a projection of Butler’s longitudinally extending connector axis intersects the gripping surfaces when the hand vacuum cleaner is mounted to the connector, as shown above.

4. **Butler Anticipates Claims 4, 6, 16, and 17**

Reference Number	Claim Limitation
[4]	“The surface cleaning apparatus of claim 2 wherein the suction motor axis of rotation is generally parallel to the longitudinally extending conduit axis.”
[6]	“The surface cleaning apparatus of claim 1 wherein the suction motor axis of rotation is generally parallel to the longitudinally extending conduit axis.”
[16]	“The surface cleaning apparatus of claim 15 wherein the suction motor axis of rotation is generally parallel to the longitudinally extending conduit axis.”
[17]	“The surface cleaning apparatus of claim 12 wherein the suction motor axis of rotation is generally parallel to the longitudinally extending conduit axis.”

178. As I explained in Sections X.A.1, X.A.2, and X.A.3, Butler anticipates Claims 1, 2, 12, and 15 of the '550 patent.

179. Butler anticipates the surface cleaning apparatus of claim 2 wherein the suction motor axis of rotation is generally parallel to the longitudinally extending conduit axis (Claim 4).

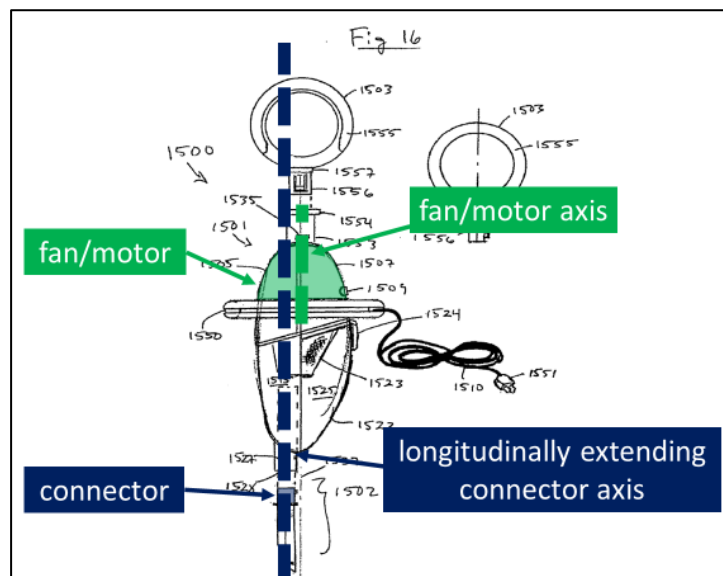
180. Butler anticipates the surface cleaning apparatus of claim 1 wherein the suction motor axis of rotation is generally parallel to the longitudinally extending conduit axis (Claim 6).

181. Butler anticipates the surface cleaning apparatus of claim 15 wherein the suction motor axis of rotation is generally parallel to the longitudinally extending conduit axis (Claim 16).

182. Butler anticipates the surface cleaning apparatus of claim 12 wherein the

suction motor axis of rotation is generally parallel to the longitudinally extending conduit axis (Claim 17).

183. Butler teaches the suction motor axis of rotation is generally parallel to the longitudinally extending conduit axis. Butler's **fan/motor axis** is generally parallel to the **longitudinally extending connector axis**, as shown in the annotated image below:



Ex. 1005, Fig. 16; *see also* Ground 1, Limitations [1a.1]/[12a.1].

5. Butler Anticipates Claim 7

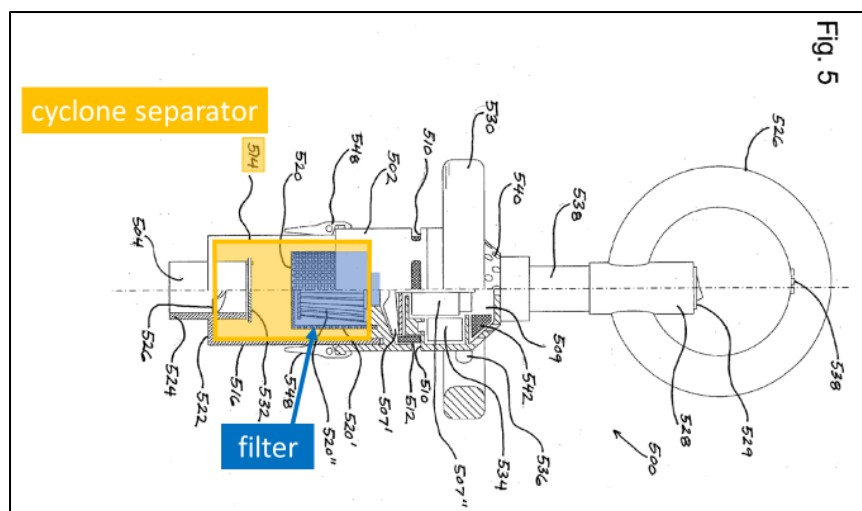
Reference Number	Claim Limitation
[7]	"The surface cleaning apparatus of claim 1 wherein the cyclone unit has an outlet conduit and the outlet conduit extends in a direction that is generally parallel to the cyclone axis of rotation."

184. As I explained in Section X.A.1, Butler anticipates Claim 1 of the '550

patent.

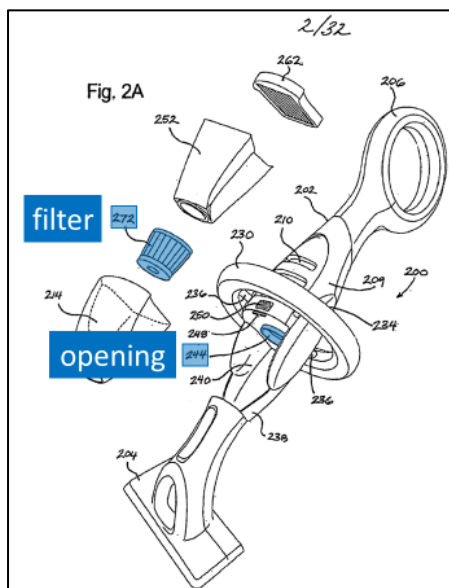
185. Butler anticipates the surface cleaning apparatus of claim 1 wherein the cyclone unit has an outlet conduit and the outlet conduit extends in a direction that is generally parallel to the cyclone axis of rotation (Claim 7).
186. As I explained, Butler teaches a cyclone unit with a cyclone axis of rotation. *See* Ground 1, Limitation [1a.2].
187. Butler further teaches the cyclone unit has an outlet conduit. Butler explains that, in use, air flows into “dirt receptacle 514” comprising a “cyclone separator,” and exits through “filter 520 compris[ing] ... a fine filter 520',” as shown in the annotated image below:

A filter 520 is provided in or above the dirt receptacle 514, and attached by any suitable means to the housing 502, the dirt receptacle 514, or both. In the shown embodiment, the filter 520 comprises a coarse perforated shroud 520" that acts as a preliminary filter, and a pleated fine filter 520' that acts as a fine particle filter. Of course, other filter arrangements may be used, as explained previously herein.



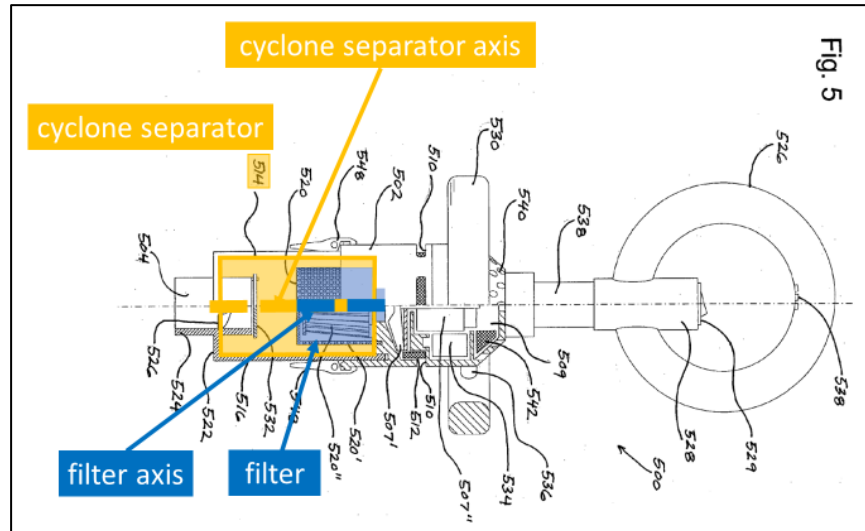
Ex. 1005, 21:24-28, claim 11, Fig. 5.

188. Butler also teaches “frusto-conical **filter 272** ... located over the fan/motor inlet **opening 244**” that “prevent[s] dirt and debris that is not separated by cyclonic action from entering the fan/motor 207,” as shown in the annotated image below:



Ex. 1005, 18:10-12, Fig. 2A.

189. In my opinion, a POSA would understand that Butler’s “**filter 520**,” “**filter 272**,” and “**opening 244**” are, individually and collectively, outlet conduits because air passes through them as it exits Butler’s “cyclone separator.”
190. Butler teaches the outlet conduit extends in a direction that is generally parallel to the cyclone axis of rotation. Butler’s “**filter 520**” extends in a direction that is generally parallel to the **cyclone separator axis**, as shown in the annotated image below:



Ex. 1005, Fig. 5.

191. As I explained, in my opinion, a POSA would understand that co-axial axes are “generally parallel.” See Ground 1, Limitation [1c].

6. Butler Anticipates Claim 8

Reference Number	Claim Limitation
[8]	“The surface cleaning apparatus of claim 1 wherein the rigid air flow conduit is removably attachable to the hand vacuum cleaner air inlet.”

192. As I explained in Section X.A.1, Butler anticipates Claim 1 of the ’550 patent.

193. Butler anticipates the surface cleaning apparatus of claim 1 wherein the rigid air flow conduit is removably attachable to the hand vacuum cleaner air inlet (Claim 8).

194. For the reasons I explained for Limitation [1d], Butler teaches the surface cleaning apparatus of claim 1 wherein the rigid air flow conduit is removably attachable to the hand vacuum cleaner air inlet. *See* Ground 1, Limitation [1d].

7. **Butler Anticipates Claims 9, 11, 18, and 19**

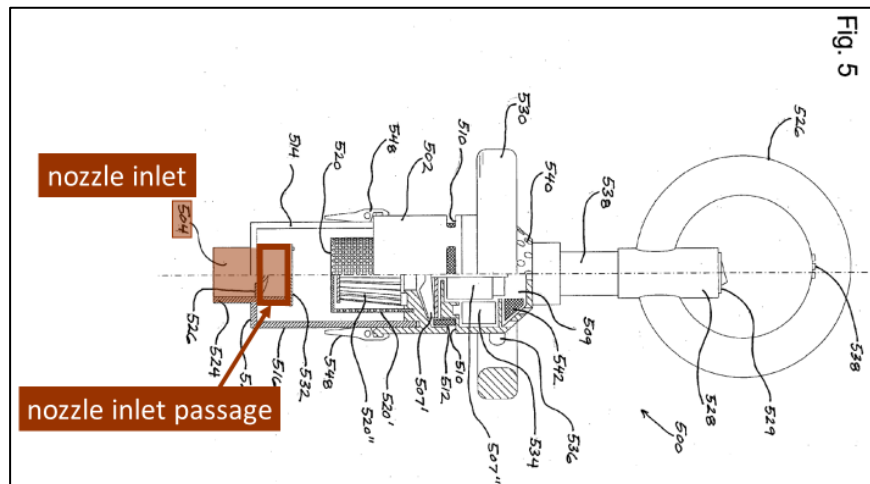
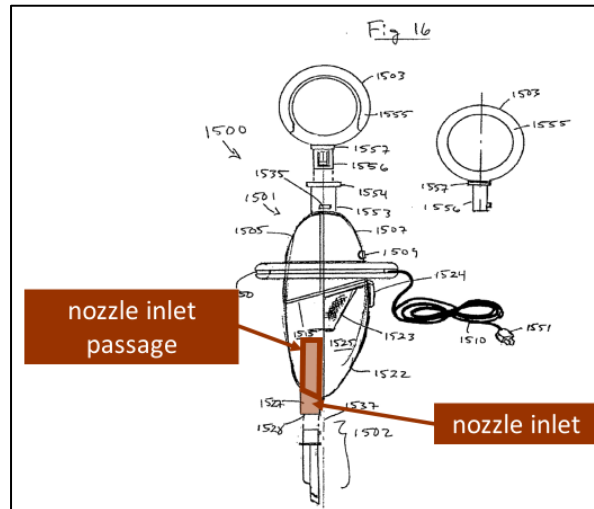
Reference Number	Claim Limitation
[9]	“The surface cleaning apparatus of claim 8 wherein the hand vacuum cleaner air inlet comprises a hand vacuum cleaner inlet passage that is generally parallel to the longitudinally extending conduit axis and the cyclone axis of rotation, the hand vacuum cleaner inlet passage having an inlet end and an outlet end, the outlet end communicating with a cyclone chamber air inlet and the electrical cables extend rearwardly adjacent the hand vacuum cleaner inlet passage.”
[11]	“The surface cleaning apparatus of claim 9 wherein the hand vacuum cleaner inlet passage is coaxial with the longitudinally extending conduit axis.”
[18]	“The surface cleaning apparatus of claim 12 wherein the rigid air flow conduit is removably attachable to the hand vacuum cleaner air inlet and the hand vacuum cleaner air inlet comprises a hand vacuum cleaner inlet passage that is generally parallel to the longitudinally extending conduit axis when the rigid air flow conduit is attached to the hand vacuum cleaner air inlet, the hand vacuum cleaner inlet passage having an inlet end and an outlet end, the outlet end communicating with an air treatment member air inlet and the electrical cables extend rearwardly adjacent the hand vacuum cleaner inlet passage.”
[19]	“The surface cleaning apparatus of claim 18 wherein the hand vacuum cleaner inlet passage is coaxial with the longitudinally extending conduit axis.”

195. As I explained in Sections X.A.1 and X.A.6, Butler anticipates Claims 8/12 of the '550 patent.

196. Butler anticipates the surface cleaning apparatus of claim 8 wherein the hand vacuum cleaner air inlet comprises a hand vacuum cleaner inlet passage that is generally parallel to the longitudinally extending conduit axis and the cyclone axis of rotation, the hand vacuum cleaner inlet passage

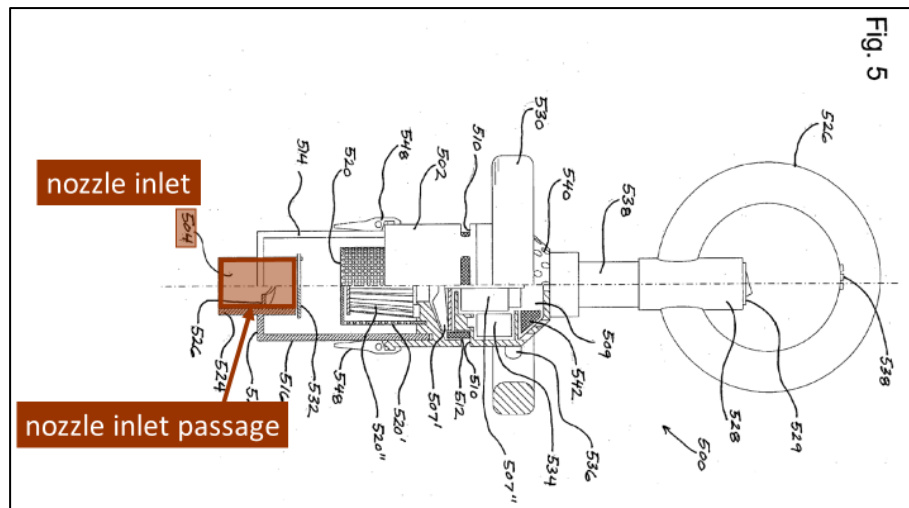
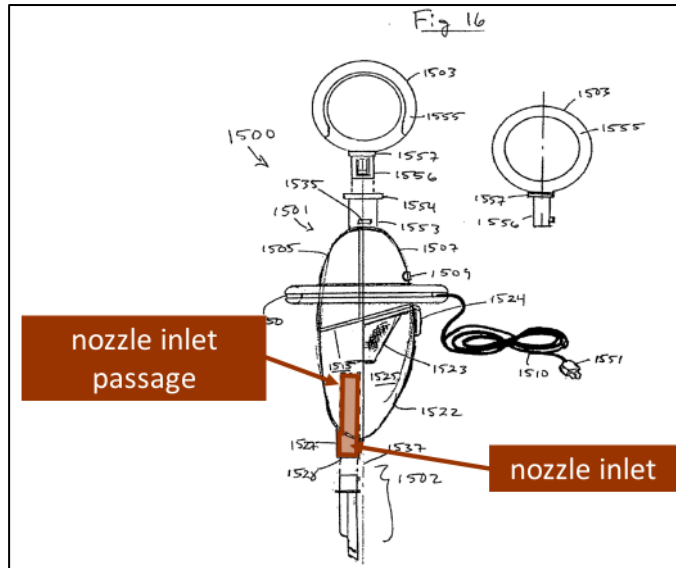
- having an inlet end and an outlet end, the outlet end communicating with a cyclone chamber air inlet and the electrical cables extend rearwardly adjacent the hand vacuum cleaner inlet passage (Claim 9).
197. Butler anticipates the surface cleaning apparatus of claim 9 wherein the hand vacuum cleaner inlet passage is coaxial with the longitudinally extending conduit axis (Claim 11).
198. Butler anticipates the surface cleaning apparatus of claim 12 wherein the rigid air flow conduit is removably attachable to the hand vacuum cleaner air inlet and the hand vacuum cleaner air inlet comprises a hand vacuum cleaner inlet passage that is generally parallel to the longitudinally extending conduit axis when the rigid air flow conduit is attached to the hand vacuum cleaner air inlet, the hand vacuum cleaner inlet passage having an inlet end and an outlet end, the outlet end communicating with an air treatment member air inlet and the electrical cables extend rearwardly adjacent the hand vacuum cleaner inlet passage (Claim 18).
199. Butler anticipates the surface cleaning apparatus of claim 18 wherein the hand vacuum cleaner inlet passage is coaxial with the longitudinally extending conduit axis (Claim 19).
200. Butler teaches a hand vacuum cleaner air inlet comprising a hand vacuum cleaner inlet passage. In my opinion, a POSA would understand that

Butler's “**nozzle inlet 504**” has a **nozzle inlet passage**, as shown in the annotated images below:



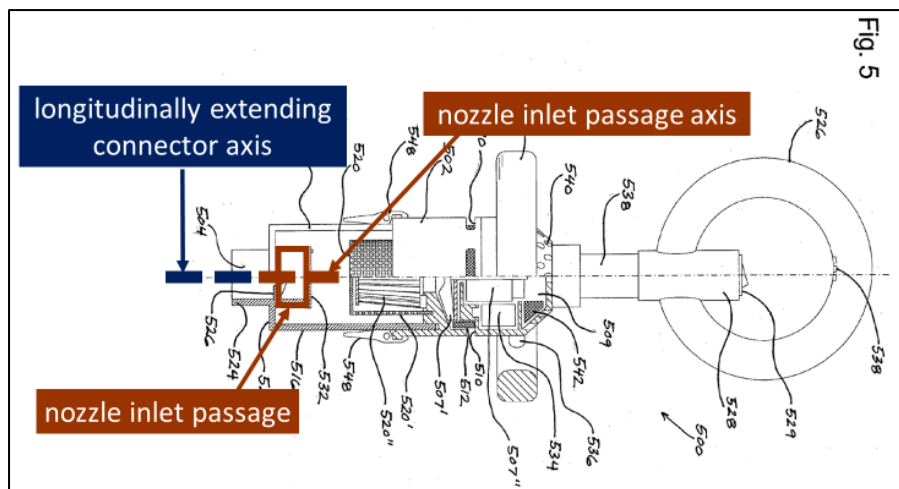
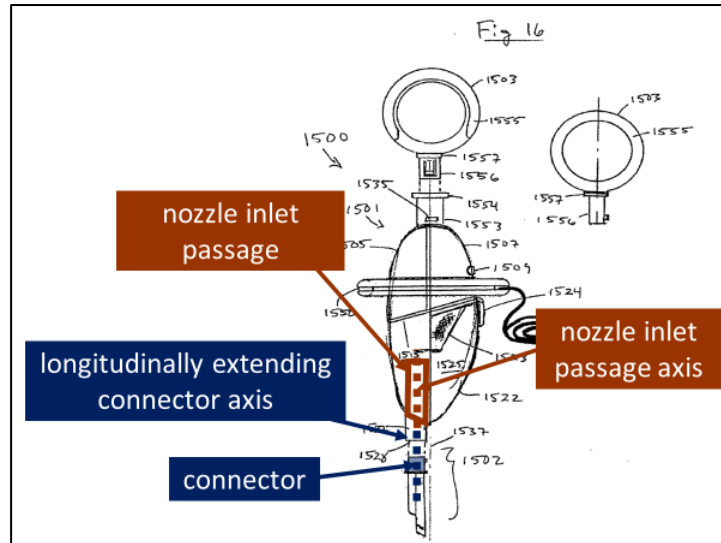
Ex. 1005, Figs. 16, 5.

201. Alternatively, Butler's hand vacuum cleaner inlet passage is the air passage that extends the entire length of “**nozzle inlet 504**,” which “comprises an **entry tube 524** that passes through the dirt receptacle bottom wall 522,” as shown in the annotated images below:



Ex. 1005, 22:5-6, Figs. 16, 5.

202. Butler teaches the hand vacuum cleaner inlet passage is generally parallel to the longitudinally extending conduit axis. Butler's **nozzle inlet passage** is generally parallel to the **longitudinally extending connector axis**, as shown in the annotated images below:



Ex. 1005, Figs. 16, 5.

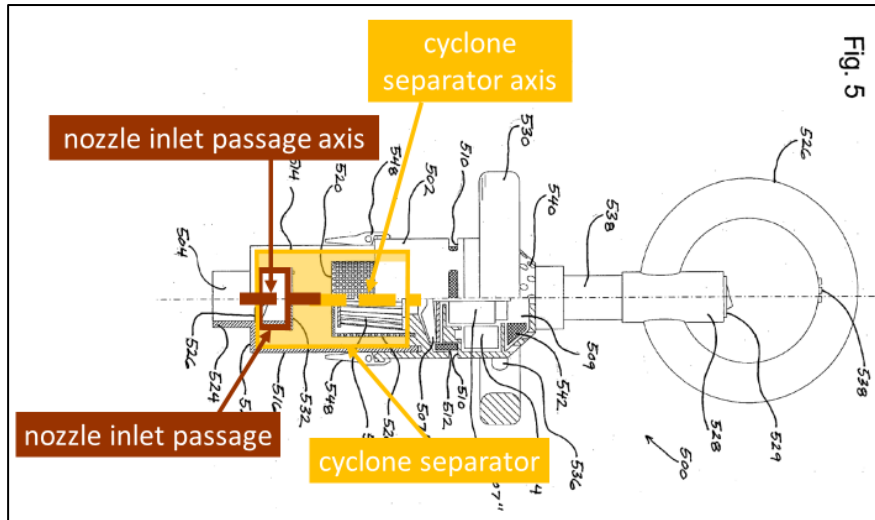
203. As I explained, in my opinion, a POSA would understand that co-axial axes are “generally parallel.” See Ground 1, Limitation [1c].

204. Regarding Claims 11/19, in my opinion, a POSA would understand that Butler’s hand vacuum cleaner inlet passage is coaxial with the longitudinally extending conduit axis, as shown above.

205. Regarding Claim 18, in my opinion, a POSA would understand that

206. Butler teaches the hand vacuum cleaner inlet passage is generally parallel to the cyclone axis of rotation. Butler's **nozzle inlet passage** is generally parallel the **cyclone separator axis**, as shown in the annotated images below:

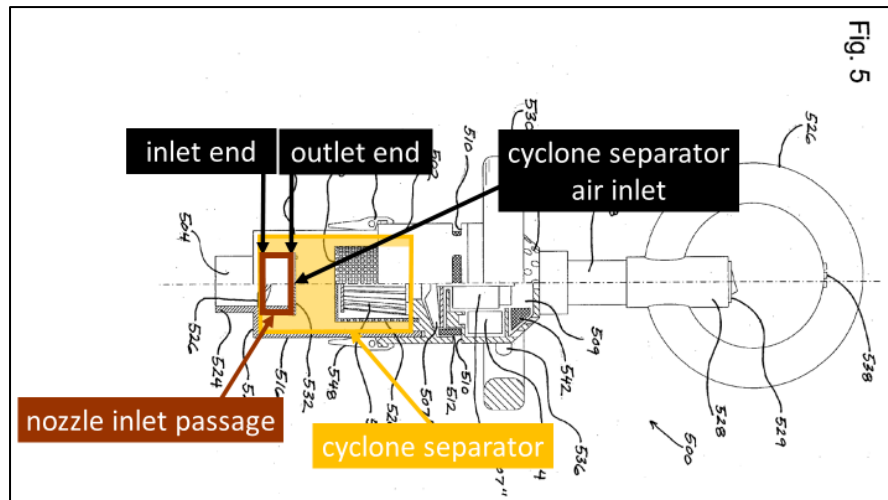
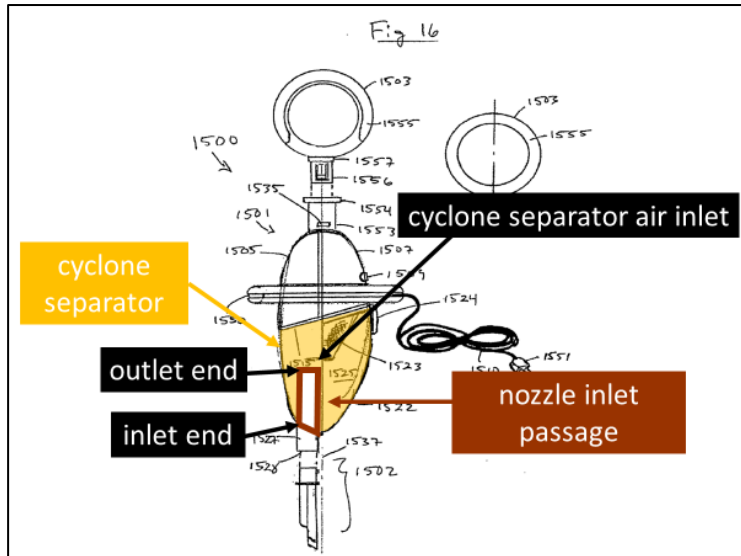




Ex. 1005, Figs. 16, 5.

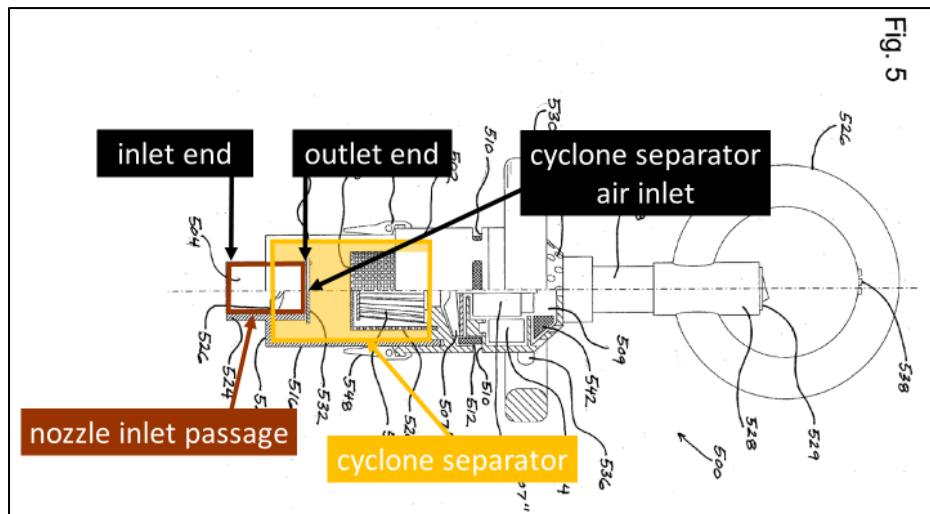
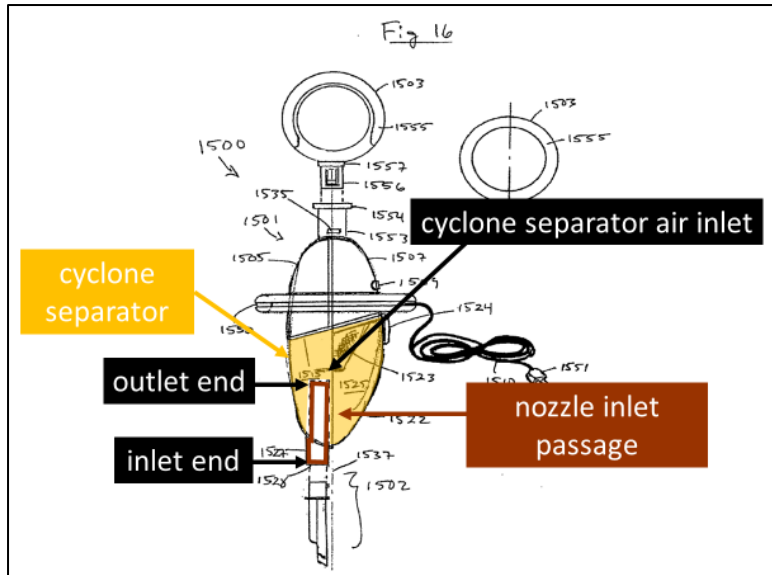
207. As I explained, in my opinion, a POSA would have understood that co-axial axes are “generally parallel.” *See* Ground 1, Limitation [1c].

208. Butler teaches a hand vacuum cleaner inlet passage having an inlet end and an outlet end, the outlet end communicating with a cyclone chamber air inlet. Butler’s **nozzle inlet passage** has an inlet end and an outlet end, the outlet end communicating with a **cyclone separator air inlet**, as shown in the annotated images below:



Ex. 1005, Figs. 16, 5.

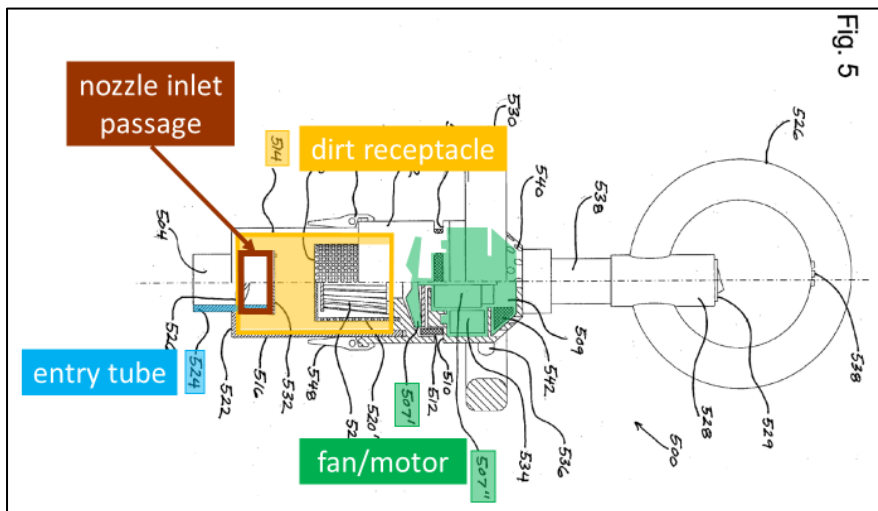
209. Further, the claimed “inlet passage” is also met by Butler’s hand vacuum cleaner inlet passage extending the entire length of “**nozzle inlet 504**,” which has an inlet end and outlet end, and where the outlet end communicates with a cyclone chamber air inlet, as shown in the annotated images below:



Ex. 1005, Figs. 16, 5.

210. As I explained, Butler teaches the electrical cables extend rearwardly adjacent the hand vacuum cleaner inlet passage. *See* Ground 1, Limitations [1a.3]/[28a.3]. Butler’s electrical cables extend rearwardly adjacent the **nozzle inlet passage**, as “[a]ny type of cleaning device can 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,” with the leads passing rearwardly “through the **dirt receptacle**” and toward the “**fan/motor 507**,” as shown in the annotated image below:



Ex. 1005, 20:12-13, 22:9-13, Fig. 5.

211. For these reasons, in my opinion, a POSA would understand that this limitation is also met by Butler’s nozzle inlet passage that extends the entire length of “**nozzle inlet 504.**”

8. Butler Anticipates Claim 10

Reference Number	Claim Limitation
[10]	“The surface cleaning apparatus of claim 9 wherein the cyclone chamber air inlet comprises a tangential air inlet provided at the outlet end of the hand vacuum cleaner inlet passage.”

212. As I explained in Section X.A.7, Butler anticipates Claim 9 of the '550

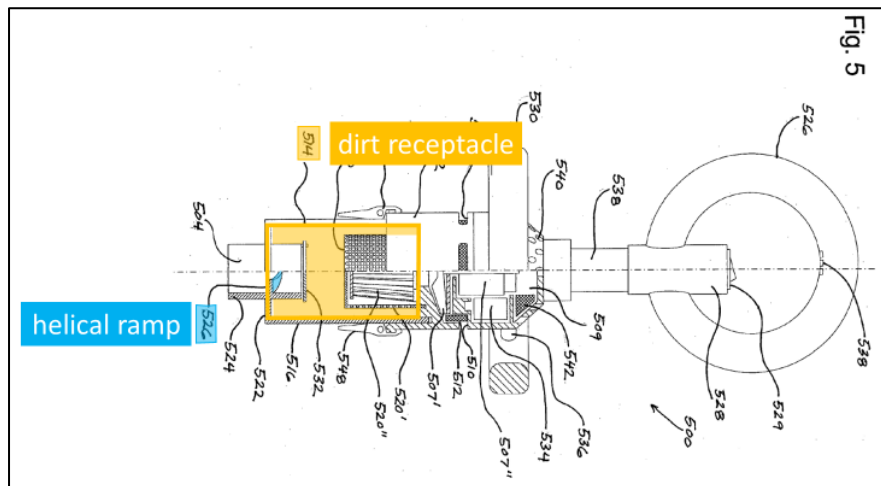
patent.

213. Butler anticipates the surface cleaning apparatus of claim 9 wherein the cyclone chamber air inlet comprises a tangential air inlet provided at the outlet end of the hand vacuum cleaner inlet passage (Claim 10).
214. As I explained, Butler teaches a hand vacuum cleaner air inlet passage with an outlet end and a cyclone chamber air inlet. *See* Ground 1, Claim 9.
215. Butler teaches a tangential air inlet. Butler teaches “**helical ramp 526**,” which “block[s] any direct flow of air through the entry tube 524” and “establish[es] a cyclonic airflow pattern within the **dirt receptacle 514**,” as shown in the annotated image below:

The nozzle inlet 504 of the embodiment of Figure 5 comprises an entry tube 524 that passes through the dirt receptacle bottom wall 522. It will be appreciated that any type of cleaning device may be attached to the entry tube 524, such as an elongated cleaning head as shown in the previous embodiments, a crevice tool, a dusting attachment, a so-called powerhead having a rotating agitator, and so on. Of course, if a powered attachment is provided, suitable power leads can be provided to connect the powered attachment to the electric circuit. These leads may pass around or through the dirt receptacle, or may be integrated into the dirt receptacle body.

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

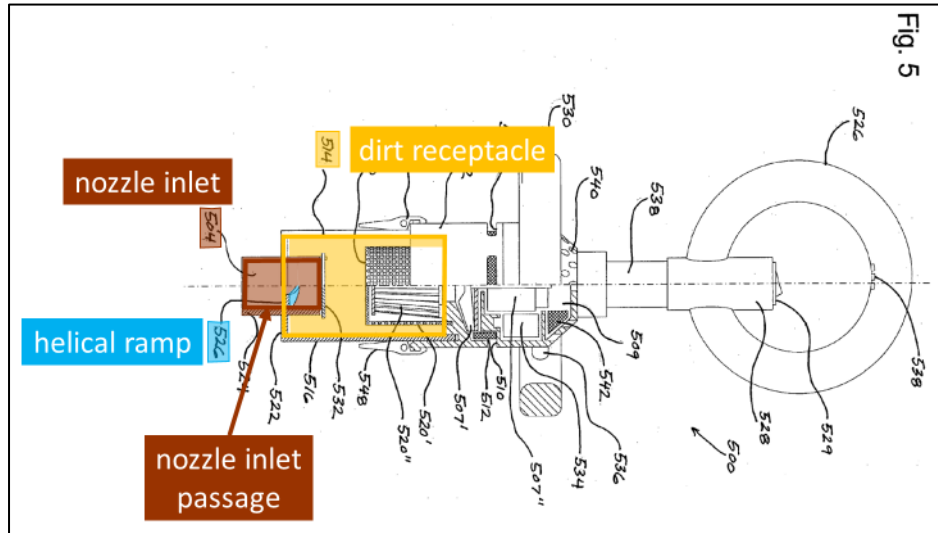
an unobstructed central path through the entry tube 524, or may extend to the centerline (or beyond) to block any direct flow of air through the entry tube 524. A one-way flap valve 532 made of a flexible material, such as are known in the art, is provided at the end of the entry tube 524 to prevent 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.



Ex. 1005, 22:5-22, Fig. 5.

216. Butler further teaches the cyclone chamber air inlet comprises a tangential air inlet provided at the outlet end of the hand vacuum cleaner inlet passage. Butler’s “helical ramp 526” creates tangential airflow, including tangential airflow at the outlet end of the nozzle inlet passage; that is where air enters Butler’s cyclone separator. Ex. 1005, 22:5-22, Fig. 5. Thus, in my opinion, a POSA would understand that Butler teaches a tangential air inlet at the outlet end of the hand vacuum cleaner inlet passage.

217. This limitation is also met when Butler’s hand vacuum cleaner inlet passage spans the entire length of “**nozzle inlet 504.**” Butler’s “**helical ramp 526**” likewise creates tangential airflow at the outlet end of the **nozzle inlet passage**, as shown in the annotated image below:



Ex. 1005, Fig. 5.

9. Butler Anticipates Claim 13

Reference Number	Claim Limitation
[13]	“The surface cleaning apparatus of claim 12 wherein the air treatment member air outlet comprises an outlet conduit having an outlet conduit axis that is generally parallel to longitudinally extending conduit axis.”

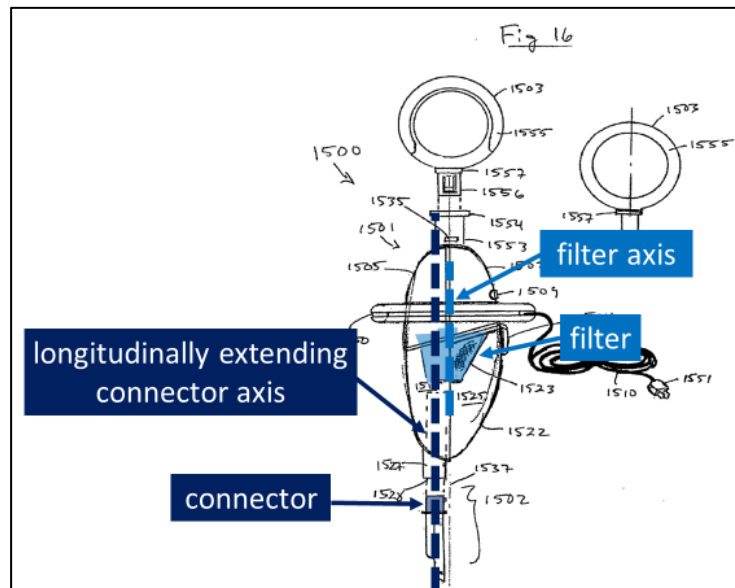
218. As I explained in Section X.A.1, Butler anticipates Claim 12 of the ’550 patent.

219. Butler anticipates the surface cleaning apparatus of claim 12 wherein the

air treatment member air outlet comprises an outlet conduit having an outlet conduit axis that is generally parallel to longitudinally extending conduit axis (Claim 13).

220. As I explained, Butler teaches the cyclone unit air outlet comprises an outlet conduit. *See* Ground 1, Claim 7.

221. Butler teaches an outlet conduit having an outlet conduit axis that is generally parallel to the longitudinally extending conduit axis. Butler’s “**filter 520**” has a **filter axis** that is generally parallel to the **longitudinally extending connector axis**, as shown in the annotated image below:



Ex. 1005, Fig. 5.

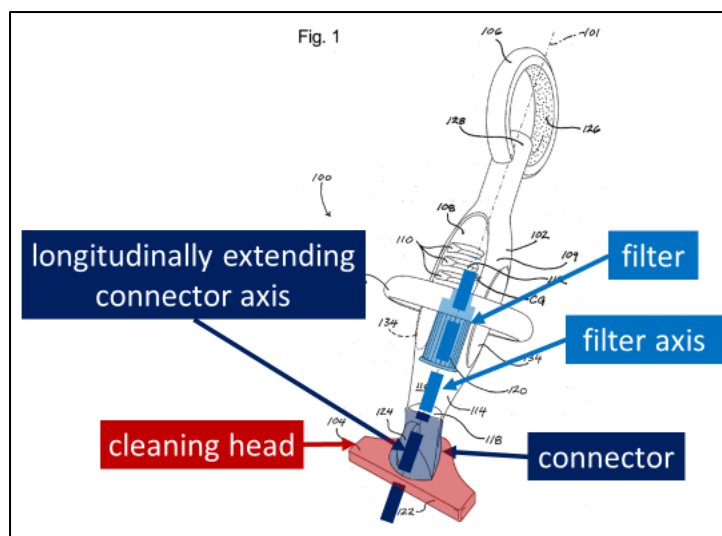
10. Butler Anticipates Claim 14

Reference Number	Claim Limitation
[14]	“The surface cleaning apparatus of claim 12 wherein the outlet conduit axis is rearward of the longitudinally extending conduit axis when the hand vacuum cleaner is mounted to the rigid air flow conduit and the rigid air flow conduit extends generally vertically upwardly from the surface cleaning head.”

222. As I explained in Section X.A.1, Butler anticipates Claim 12 of the '550 patent.

223. Butler anticipates the surface cleaning apparatus of claim 12 wherein the outlet conduit axis is rearward of the longitudinally extending conduit axis when the hand vacuum cleaner is mounted to the rigid air flow conduit and the rigid air flow conduit extends generally vertically upwardly from the surface cleaning head (Claim 14).

224. Butler teaches the outlet conduit axis is rearward of the longitudinally extending conduit axis when the hand vacuum cleaner is mounted to the rigid air flow conduit and the rigid air flow conduit extends generally vertically upwardly from the surface cleaning head. Butler's **filter axis** is rearward of the **longitudinally extending connector axis** when the cleaner is mounted to **connector 1702** and **connector 1702** extends generally vertically upwardly from **cleaning head 1208** or **inlet nozzle 1701**, as shown in the annotated image below:



Ex. 1005, Fig. 1; *see also id.*, Figs. 15, 24.

11. **Butler Anticipates Claim 21**

Reference Number	Claim Limitation
[21]	“The surface cleaning apparatus of claim 20 wherein the hand vacuum cleaner body comprises a suction motor and fan assembly housing and the handle extends from a sidewall of the suction motor and fan assembly housing.”

225. As I explained in Section X.A.1, Butler anticipates Claim 20 of the ’550 patent.

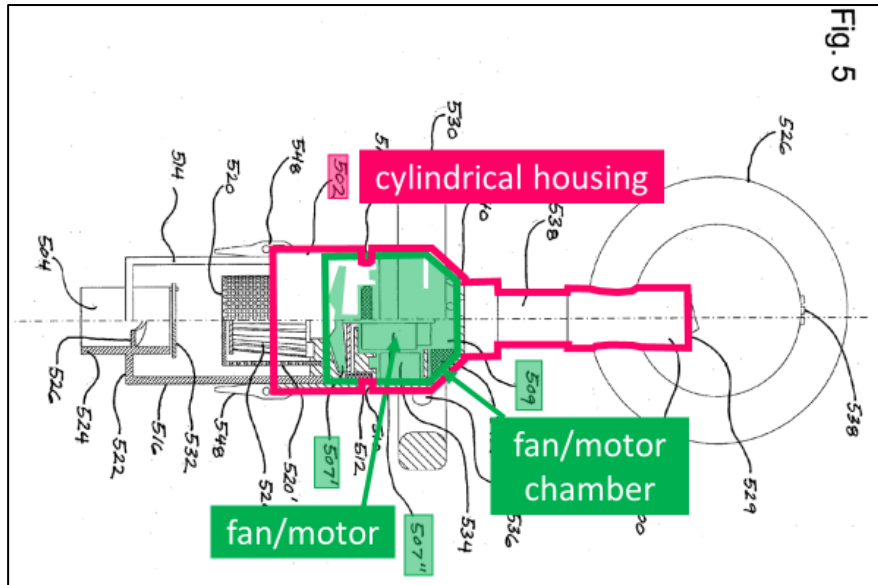
226. Butler anticipates the surface cleaning apparatus of claim 20 wherein the hand vacuum cleaner body comprises a suction motor and fan assembly housing and the handle extends from a sidewall of the suction motor and fan assembly housing (Claim 21).

227. Butler teaches the hand vacuum cleaner body comprises a suction motor

and fan assembly housing. Butler's "fan/motor chamber 509 in which the fan/motor 507 is located" is housed within the body's "cylindrical housing 502," as shown in the annotated image below:

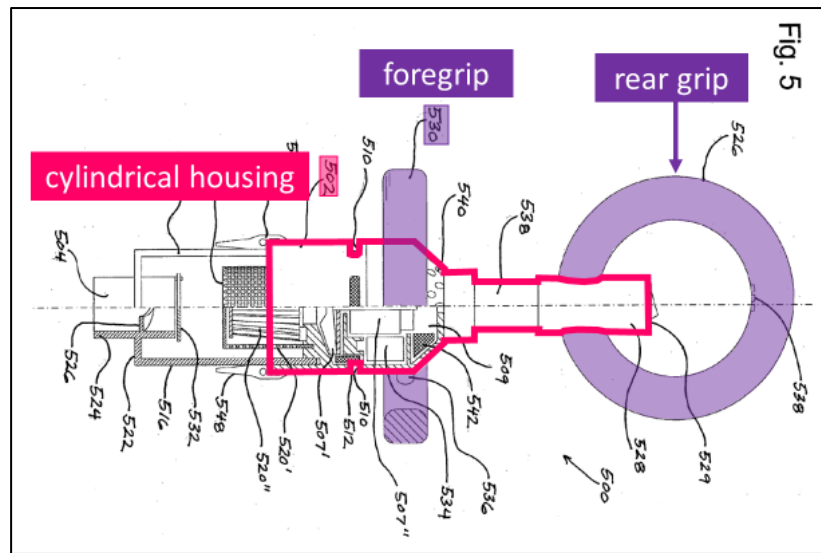
Referring now to Figure 5, another embodiment of the invention is illustrated and described in detail. In this embodiment, the invention comprises a vacuum cleaner 500, having a generally cylindrical housing 502 with a circular or looped rear grip 506, and a circular or looped foregrip 530. Of course, other grip shapes may be used, as explained previously herein. Like the embodiment of Figure 1, a protrusion 528 extends into the rear grip 506, and a power switch 529 is located on the protrusion 528 to provide quick and efficient activation and deactivation of the device. The foregrip 530 is attached to the housing 502 by a number of radially- extending posts 536.

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.



Ex. 1005, 20:4-14, Fig. 5.

228. In my opinion, a POSA would understand that Butler’s “cylindrical housing 502” is a suction motor and fan assembly housing because it houses “fan/motor 507.”
229. Further, Butler teaches the handle extends from a sidewall of the suction motor and fan assembly housing. Butler’s “**cylindrical housing 502** [has] a circular or looped **rear grip 506**, and a circular or looped **foregrip 530**,” as shown in the annotated image below:



Ex. 1005, 20:4-6, Fig. 5.

230. Butler explains that the “rear grip 506” extends from a sidewall of “the portion of the housing 502 between the fan/motor chamber 509 and the rear grip 506” (i.e., the “protrusion 528”), and the “foregrip 530 is attached to the housing 502 by a number of radially extending posts 536.” *Id.*, 20:7-11, 20:28-30.

231. In my opinion, a POSA would understand that Butler’s “cylindrical housing 502” is a sidewall of the suction motor and fan assembly housing, and Butler’s “foregrip 530” and “rear grip 506” are each handles that extend from a sidewall of the suction motor and fan assembly housing, for the reasons I explained for Limitation [20a.1]. *See* Ground 1, Limitation [20a.1].

12. Butler Anticipates Claim 22

Reference Number	Claim Limitation
[22]	“The surface cleaning apparatus of claim 1 wherein the hand vacuum cleaner inlet passage has an inlet axis and a projection of each of the inlet axis and the cyclone axis intersects the suction motor.”

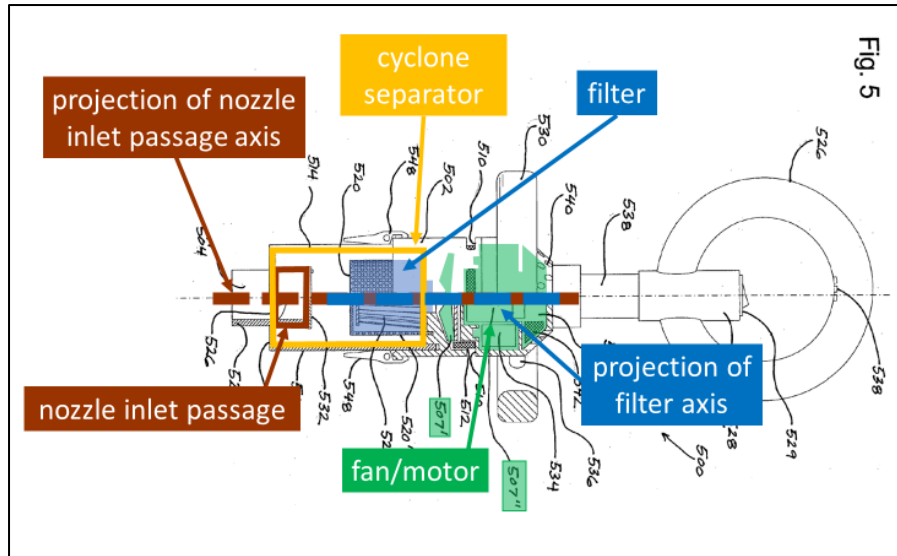
232. As I explained in Section X.A.1, Butler anticipates Claim 1 of the ’550 patent.

233. Butler anticipates the surface cleaning apparatus of claim 1 wherein the hand vacuum cleaner inlet passage has an inlet axis and a projection of each of the inlet axis and the cyclone axis intersects the suction motor (Claim 22).

234. As I explained, Butler teaches the hand vacuum cleaner inlet passage has an inlet axis. *See* Ground 1, Claim 9.

235. Butler teaches a projection of each of the inlet axis and the cyclone axis intersects the suction motor. A projection of each of Butler’s **nozzle inlet passage axis** and **cyclone separator axis** intersects the **fan/motor 507**, as shown in the annotated image below:

238. Butler anticipates the surface cleaning apparatus of claim 12 wherein the hand vacuum cleaner air inlet comprises a hand vacuum cleaner inlet passage that has an inlet axis, and when the rigid air flow conduit extends between the cleaning head air outlet and the hand vacuum cleaner air inlet, the inlet axis is generally parallel to the longitudinally extending conduit axis and a projection of each of the inlet axis and an outlet conduit axis of the air treatment member intersects the suction motor (Claim 23).
239. As I explained, Butler teaches the hand vacuum cleaner air inlet comprises a hand vacuum cleaner inlet passage that has an inlet axis, and when the rigid air flow conduit extends between the cleaning head air outlet and the hand vacuum cleaner air inlet, the inlet axis is generally parallel to the longitudinally extending conduit axis. *See* Ground 1, Limitation [1c], Claim 9.
240. Further, Butler teaches a projection of each of the inlet axis and an outlet conduit axis of the air treatment member intersects the suction motor. A projection of each of Butler's **nozzle inlet passage axis** and **filter axis** of the **cyclone separator** intersects the **fan/motor 507**, as shown in the annotated image below:



Ex. 1005, Fig. 5.

241. In my opinion, a POSA would understand that this limitation is also met when Butler's inlet passage extends the length of Butler's **"nozzle inlet 504."**

14. Butler Anticipates Claim 24

Reference Number	Claim Limitation
[24]	"The surface cleaning apparatus of claim 20 wherein the hand vacuum cleaner comprises a hand vacuum cleaner inlet passage that has an inlet axis, and when the rigid air flow conduit extends between the cleaning head air outlet and the hand vacuum cleaner air inlet, the inlet axis is generally parallel to the longitudinally extending conduit axis and a projection of each of the inlet axis and the cyclone axis intersects the suction motor."

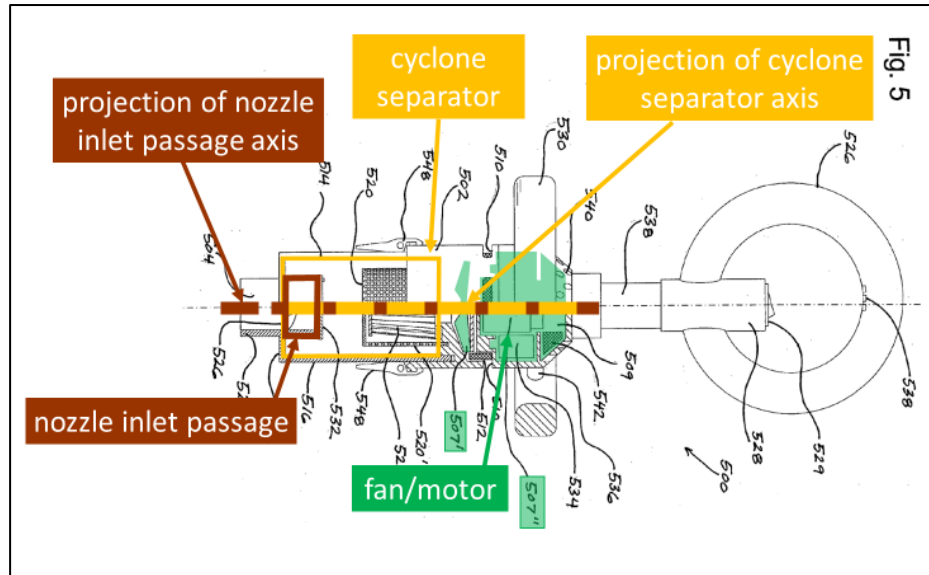
242. As I explained in Section X.A.1, Butler anticipates Claim 20 of the '550 patent.

243. Butler anticipates the surface cleaning apparatus of claim 20 wherein the

hand vacuum cleaner comprises a hand vacuum cleaner inlet passage that has an inlet axis, and when the rigid air flow conduit extends between the cleaning head air outlet and the hand vacuum cleaner air inlet, the inlet axis is generally parallel to the longitudinally extending conduit axis and a projection of each of the inlet axis and the cyclone axis intersects the suction motor (Claim 24).

244. As I explained, Butler teaches the hand vacuum cleaner comprises a hand vacuum cleaner inlet passage that has an inlet axis, and when the rigid air flow conduit extends between the cleaning head air outlet and the hand vacuum cleaner air inlet, the inlet axis is generally parallel to the longitudinally extending conduit axis. *See* Ground 1, Limitation [1c], Claim 9.

245. Butler teaches a projection of each of the inlet axis and the cyclone axis intersects the suction motor. Butler's **nozzle inlet passage axis** and **cyclone separator axis** intersects the **fan/motor 507**, as shown in the annotated image below:



Ex. 1005, Fig. 5.

246. In my opinion, a POSA would understand that this limitation is also met when Butler's inlet passage extends the length of Butler's "nozzle inlet 504."

15. Butler Anticipates Claims 25, 26, and 27

Reference Number	Claim Limitation
[25]	“The surface cleaning apparatus of claim 1, wherein when the hand vacuum cleaner is mounted to the downstream end of the rigid air flow conduit and the rigid air flow conduit is in an upright storage position, the handle is at an upper end of the surface cleaning apparatus and a portion of the handle is rearward of the wand axis.”
[26]	“The surface cleaning apparatus of claim 12, wherein when the hand vacuum cleaner is mounted to the downstream end of the rigid air flow conduit and the rigid air flow conduit is in an upright storage position, the handle is at an upper end of the surface cleaning apparatus and a portion of the handle is rearward of the wand axis.”
[27]	“The surface cleaning apparatus of claim 20, wherein when the hand vacuum cleaner is mounted to the downstream end of the rigid air flow conduit and the rigid air flow conduit is in an upright storage position, the handle is at an upper end of the surface cleaning apparatus and a portion of the handle is rearward of the wand axis.”

247. As I explained in Section X.A.1, Butler anticipates Claims 1, 12, and 20 of the '550 patent.

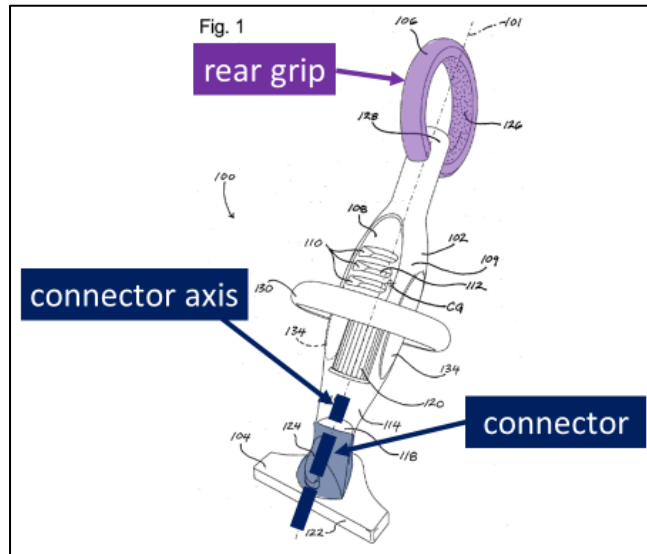
248. Butler anticipates the surface cleaning apparatus of claim 1, wherein when the hand vacuum cleaner is mounted to the downstream end of the rigid air flow conduit and the rigid air flow conduit is in an upright storage position, the handle is at an upper end of the surface cleaning apparatus and a portion of the handle is rearward of the wand axis (Claim 25).

249. Butler anticipates the surface cleaning apparatus of claim 12, wherein when the hand vacuum cleaner is mounted to the downstream end of the rigid air flow conduit and the rigid air flow conduit is in an upright storage position, the handle is at an upper end of the surface cleaning apparatus

and a portion of the handle is rearward of the wand axis (Claim 26).

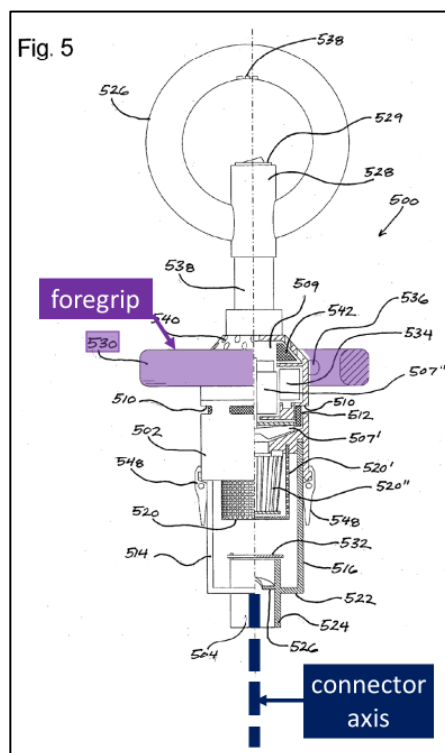
250. Butler anticipates the surface cleaning apparatus of claim 20, wherein when the hand vacuum cleaner is mounted to the downstream end of the rigid air flow conduit and the rigid air flow conduit is in an upright storage position, the handle is at an upper end of the surface cleaning apparatus and a portion of the handle is rearward of the wand axis (Claim 27).
251. As I explained, Butler teaches the hand vacuum cleaner is mounted to the downstream end of the rigid air flow conduit. *See* Ground 1, Limitation [12c].
252. Butler teaches when the rigid air flow conduit is in an upright storage position, the handle is at an upper end of the surface cleaning apparatus and a portion of the handle is rearward of the wand axis. For example, Butler teaches that its vacuum may be “hung by the rear grip 506 in a vertical orientation to ... store the device,” Ex. 1005, 21:3-7, and in my opinion, a POSA would understand that Butler’s vacuum would also be stored upright as shown in Fig. 1. *Id.*, Fig. 1. When Butler’s rigid air flow conduit is in an upright storage position, the handle is at an upper end of the surface cleaning apparatus and a portion of the handle is rearward of the wand axis. Likewise, when Butler’s **connector 1702** is in an upright storage position, **rear grip 506** is at an upper end of the vacuum 500 and

rear grip 506 is rearward of the **connector 1702 axis**, as shown in the annotated image below:



Ex. 1005, Fig. 5.

253. Regarding Claim 27, when Butler's **connector 1702** is in an upright storage position, "**foregrip 530**" is at an upper end of the vacuum 500 and is rearward of the **connector 1702 axis**, as shown in the annotated image below:



Ex. 1005, Fig. 5.

B. Ground 2: Butler Renders Claims 1-28 Obvious

254. To the extent PO argues that Butler does not anticipate claims 1-28, Butler alone also renders them obvious.

1. Butler Teaches A Single Anticipatory System, But To The Extent PO Argues Otherwise, A POSA Would Have Combined Butler's Teachings

255. In my opinion, a POSA would understand that Butler teaches a single vacuum system that is configurable and optimizable such that a POSA would immediately envisage all elements arranged as in the challenged claims, and therefore anticipates. *See* Ground 1.

256. 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," *id.*, 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.

257. 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.

Ex. 1005, 4:17-28

258. 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.” Ex. 1005, 18:27-28.

259. 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.

Ex. 1005, 19:9-15.

260. Butler explains that “[v]arious alternatives to the embodiments of Figures 14A and 14B are envisioned.” Ex. 1005, 34:12-13.

261. Butler further teaches that its components are readily optimizable and reconfigurable: “any other suitable variation to the foregoing embodiments may be practiced with the present invention.” Ex. 1005, 18:22-24.

262. 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, Ex. 1005, 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).
263. 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.
264. 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 Obvious A Hand Vacuum Cleaner
(Limitations [1a]/[12a]/[20a]/[28a])**

265. To the extent PO argues that the preambles are limiting and that Butler does not teach "a hand vacuum," in my opinion, it would have been obvious for a POSA to further reduce Butler's size. *See* Ground 1, Limitations [1a]/[12a]/[20a]/[28a]; Ex. 1005, Abstract, 1:2-3, 13:1-19,

15:12-18, 26:1-10, 27:12-29.

266. As such, Butler's cleaner would be even more "maneuver[able]" and "compact," to achieve its purpose of cleaning "stairwells and other confined spaces." In my opinion, a POSA would have a reasonable expectation of success doing so, because it would involve a straightforward reduction in the size of certain components, like Butler's "cylindrical housing 502," "dirt receptacle 514," "nozzle inlet 504," which would make Butler's cleaner smaller, and lengthening "connector 1702," would ensure that the user could easily reach and clean the floor and other surfaces while holding Butler's cleaner.

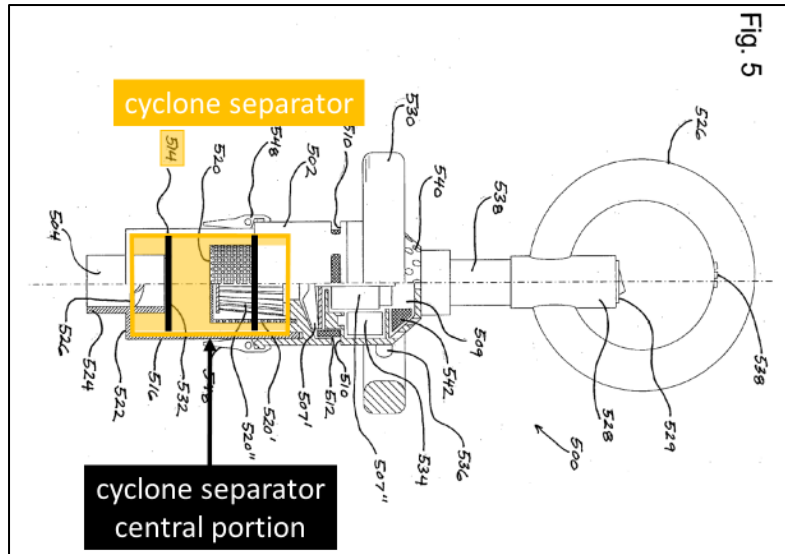
3. Butler Renders Obvious The Electrical Connector And Cable Limitations (Limitations [1a.3]/[12a.3]/[20a.3]/[28a.3], [28c])

267. To the extent PO argues that Butler does not teach the limitations regarding electrical connectors and cables, Butler renders them obvious.
268. In my opinion, a POSA reading Butler's disclosures that "any type of cleaning device can 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" would have been motivated to place an electrical connector on entry tube 524, at a location on the front end of the cyclone separator provided at a location adjacent the hand

vacuum cleaner air inlet, and aligned with and connected to a rigid air flow conduit electrical connector when the hand vacuum cleaner is mounted to the rigid air flow conduit, which would have a corresponding rigid air flow conduit electrical connector. *See* Ground 1, Limitations [1a.3]/[12a.3]/[20a.3]/[28a.3], [28c]; Ex. 1005, 22:5-13, Fig. 5.

269. Using an electrical connector was a well-known technique to predictably connect power leads, and it would have been obvious to try, as—if not the only solution—at most one of a finite number of solutions for doing so. Locating the electrical connector at the cyclone unit’s front end, adjacent the hand vacuum cleaner air inlet would have been obvious as—if not the only location—at most a finite number of identified locations for the connector in light of Butler’s disclosure, and it would have been the most logical location to connect the powered attachment to Butler’s power leads, because that is where the powered attachment (and connecting rigid airflow conduit) connects to Butler’s cleaner. *See* Ex. 1005, 22:6-11 (“any type of cleaning device can be attached to the entry tube 524,” which is located adjacent Butler’s hand vacuum cleaner air inlet, “nozzle inlet 504,” and if a “powered attachment is provided, suitable power leads can be provided to connect the powered attachment to the electric circuit”); *id.* Fig. 5 (depicting “entry tube 524” as adjacent to “nozzle inlet 504”).

270. In my opinion, a POSA would have at least reasonably expected success because it would have involved incorporating a well-known feature (an electrical connector) at a location where Butler teaches such a feature should be incorporated.
271. In my opinion, a POSA would have been further motivated by Butler's disclosures to modify Butler to include electrical cables extending rearwardly from the electrical connector through a central portion of the cyclone unit toward the suction motor and fan assembly. *See* Ground 1, Limitations [1a.3]/[12a.3]/[20a.3]/[28a.3], [28c]; Ex. 1005, 22:5-13, Fig. 5. It would have been obvious to have Butler's "power leads" extend rearwardly through the entirety of the cyclone unit, including each and every "central portion" of the cyclone unit. There were a finite number of solutions to implement Butler's teaching that the power leads extend "through the dirt receptacle"—namely, two: through Butler's cyclone unit at or near its radial center, or at or near its inner perimeter, both of which would have been obvious to try, simple to implement using known techniques, would have yielded predictable results of transmitting electricity, and would extend rearwardly through the center (from front-to-back) of Butler's cyclone unit / air treatment member ("**cyclone separator**"), as shown in the annotated image below:



Ex. 1005, 22:5-13, Fig. 5.

272. To the extent PO argues that these Limitations require the electrical cables extend through the cyclone's entire radial center (they do not), this too would have been obvious. In my opinion, a POSA would have understood that this is where there is the least airflow and dirt exist, so 1) this is the location where the electrical components would interfere with the cyclonic action the least and 2) it also minimizes dirt build up on the electrical cables/conduit. This path is also the shortest distance through the cyclone unit, thereby reducing the amount of material needed and reducing costs.
273. In my opinion, a POSA would have reasonably expected success in making these routings because they would have involved running power leads from one end of Butler's "cyclone separator" to another, which was straightforward and routine.

4. Butler Renders Obvious A Tangential Air Inlet At The Vacuum Cleaner Inlet Passage's Outlet End (Claim 10)

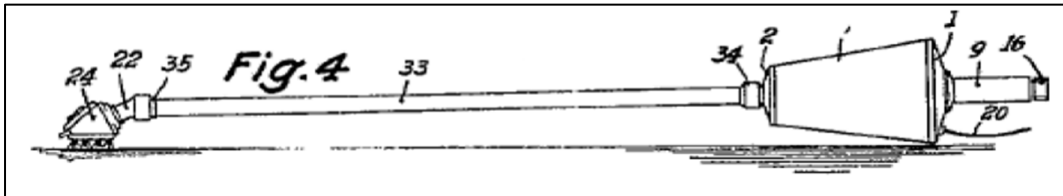
274. To the extent PO argues that Butler's tangential air inlet is not located at the "outlet end" of the hand vacuum cleaner air inlet passage, it would have been obvious to move it further rearward.
275. If necessary, in my opinion, a POSA would be motivated by Butler's disclosures to generate tangential airflow further rearward on "nozzle inlet 504" using Butler's "helical ramp." *See* Ground 1, Claim 10; Ex. 1005, 22:14-22, Fig. 5. There were a finite number of positions to locate Butler's helical ramp to create cyclonic flow, and it would have been obvious to move it rearward towards the cyclone chamber because doing so continues to create cyclonic flow, would have been simple to implement using known techniques, and would have yielded predictable results of initiating a cyclonic airflow within the cyclone chamber, with at least a reasonable expectation of success.
276. Further, Butler teaches that "alternative means for initiating cyclonic airflow may be used," which would, in my opinion, motivate a POSA to try alternative locations for Butler's "helical ramp," including further rearward. Ex. 1005, 18:15-16.

C. The Peter/Neroni Combination

1. A POSA Would Have Been Motivated to Combine Peter and Neroni

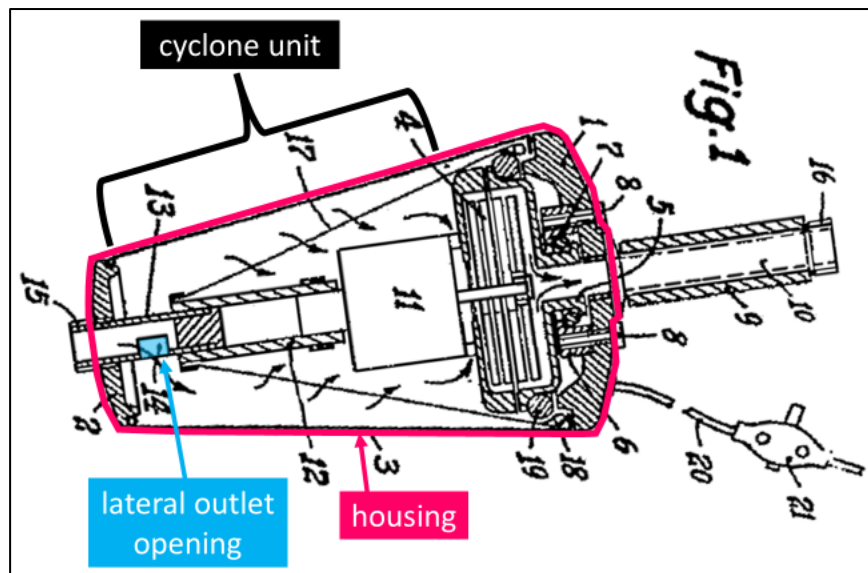
277. Peter teaches a hand/stick vacuum cleaner from 1939, as shown in Peter

Figure 4 below:



Ex. 1007, Fig. 4.

278. Peter's cleaner has a conical “**housing**” with a tangential “**lateral outlet opening 14**,” which creates cyclonic airflow within a **cyclone unit**, as shown in the annotated image below:



Ex. 1007, 2, Fig. 1.

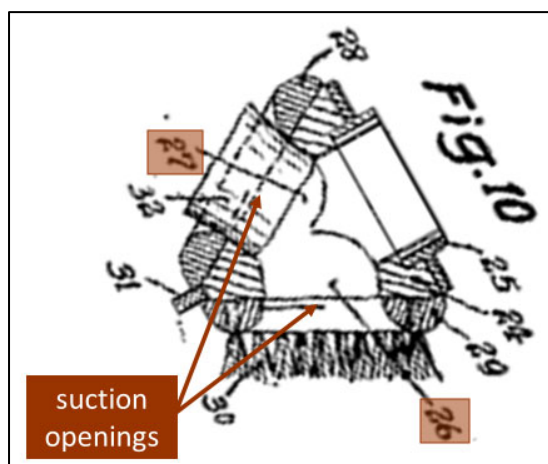
279. Peter describes “an **extension rod 33**,” which can be “inserted between the vacuum cleaner housing and the **pipe angle [22]**,” which is “[t]he main

Fig. 4

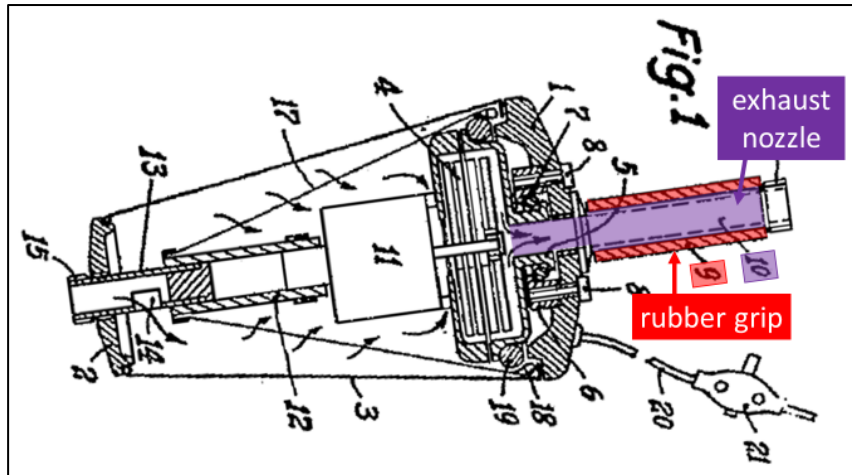
suction piece and pipe angle

extension rod

280. Peter’s “suction piece 24” has “**suction opening[s] 26, 27,**” which enable multi-directional cleaning from its top and bottom, as shown in the annotated image below:



281. Peter further describes a “**rubber grip 9**” on “**exhaust nozzle 10**,” as shown in the annotated image below:



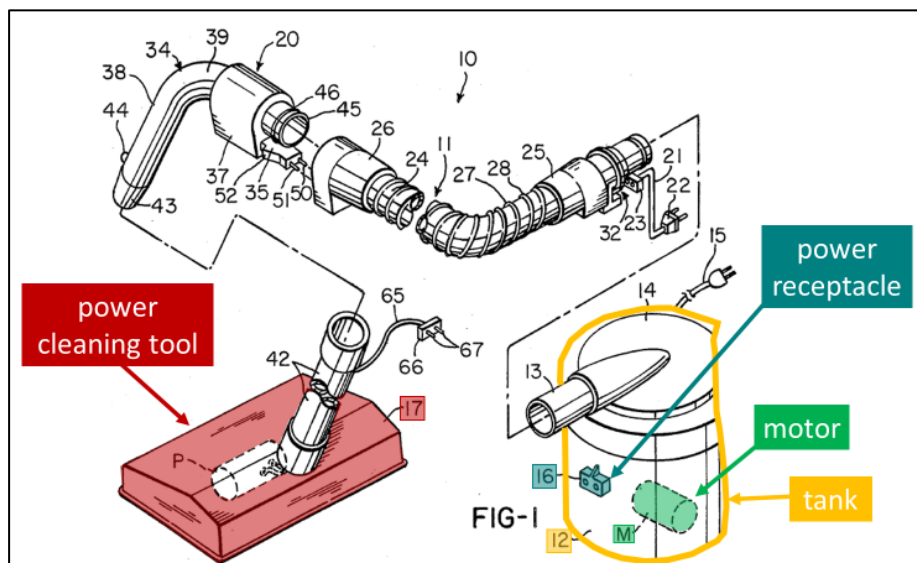
Ex. 1007, 2, Fig. 1.

282. Neroni teaches a vacuum cleaner with an electrically-powered tool.

Neroni's vacuum runs 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:



Ex. 1011, 3:34-42, 6:42-45, Fig. 1.

283. Neroni explains that “tank 12,” also referred to as “cleaner 12[,] has an

integral vacuum unit” and that “because such vacuum unit is of conventional construction, it will not be shown or described.” *Id.*, 3:29-33, Fig. 1. In my opinion, a POSA would have understood that a cyclone unit is one such “conventional construction” of a vacuum unit, including because Neroni’s tank/cleaner 12 is cylindrical and therefore adapted to cyclonic separation.

284. In my opinion, a POSA reading Peter would have been motivated to incorporate Neroni’s teachings.
285. In my opinion, a POSA would have been motivated to use a powered cleaning tool with Peter (either by modifying Peter’s suction “accessory” (“suction piece 24” and “pipe angle 22”), or by using a separate powered cleaning tool) and to incorporate Neroni’s teachings of a power cleaning tool adaptor. In my opinion, a POSA would have understood that powered cleaning tools were common, as Neroni explains. Ex. 1011, 1:17-49. In my opinion, a POSA would have also 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 Peter’s stated purpose of “effortlessly” cleaning “upholstered furniture,” “floors,

carpets, and the like,” and would have reasonably expected success. Ex. 1007, 1-2.

286. 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.” Ex. 1012 ¶¶6, 20, 22. 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 Peter to achieve these benefits.
287. In my opinion, a POSA would have reasonably expected success incorporating Neroni’s teachings into Peter’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 (Ex. 1011, 1:17-49), that their incorporation would have required the addition of well-known and common 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. Ex. 1011, 3:34-49. Further, 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.

2. The Combined Teachings of Peter and Neroni Render Obvious Claims 1, 12, 20, and 28

a. [1pre]/[12pre]/[20pre]/[28pre]

Reference Number	Claim Limitation
[1pre]	“A surface cleaning apparatus comprising:”
[12pre]	“A surface cleaning apparatus comprising:”
[20pre]	“A surface cleaning apparatus comprising:”
[28pre]	“A surface cleaning apparatus comprising:”

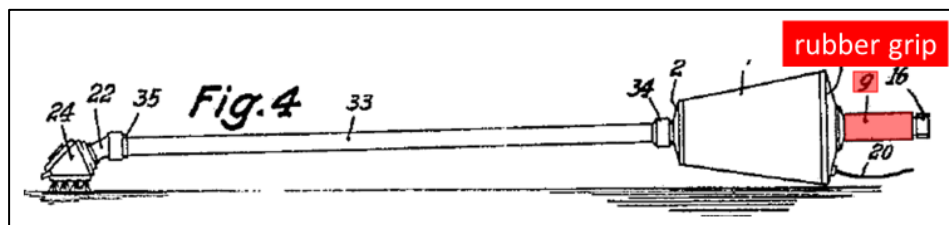
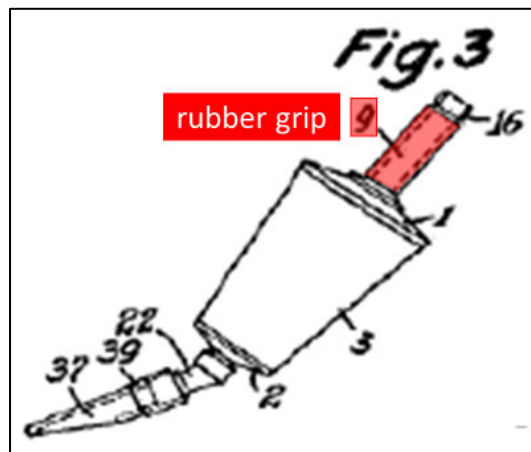
288. To the extent the preambles are limiting, Peter teaches a surface cleaning apparatus (Limitations [1pre]/[12pre]/[20pre]/[28pre]). Peter teaches a “vacuum cleaner” for “cleaning floors, carpets” and other “surface[s] to be cleaned.” Ex. 1007, Title, 2.

b. [1a]/[12a]/[20a]/[28a]

Reference Number	Claim Limitation
[1a]	“(a) a hand vacuum cleaner comprising:”
[12a]	“(a) hand vacuum cleaner comprising:”
[20a]	“(a) a hand vacuum cleaner comprising:”
[28a]	“(a) a hand vacuum cleaner comprising:”

289. Peter teaches a hand vacuum cleaner (Limitations [1a]/[12a]/[20a]/[28a]).

Peter teaches a “vacuum cleaner” designed to be used by hand and that includes “exhaust nozzle 10” surrounded by “**rubber grip 9**” for handling, as shown in the annotated images below:



Ex. 1007, 1, Figs. 3-4.

290. In my opinion, a POSA would understand that Peter’s “vacuum cleaner”

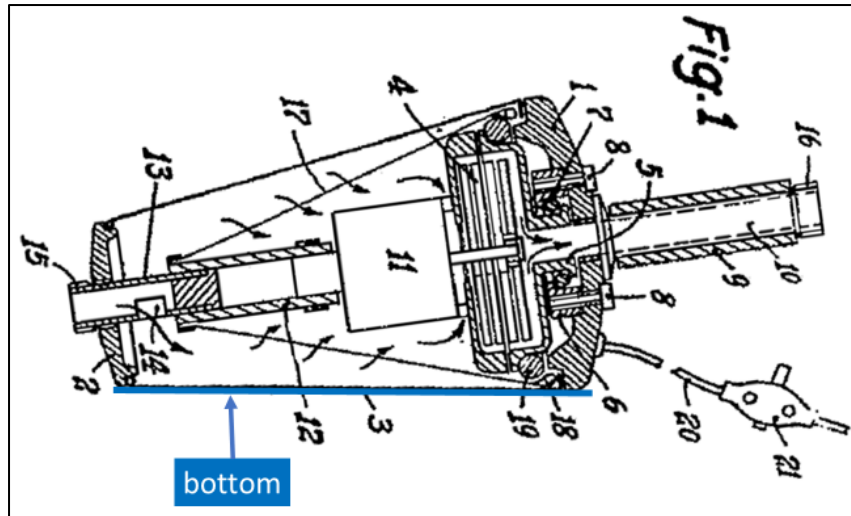
is a hand vacuum cleaner as claimed, including because of its compact size,
as shown above.

c. [1a.1]/[12a.1]/[20a.1]/[28a.1]

Reference Number	Claim Limitation
[1a.1]	“(i) a hand vacuum cleaner body comprising a bottom, a handle, the hand vacuum cleaner body housing a suction motor and fan assembly, the suction motor and fan assembly having a suction motor axis of rotation, the handle having a hand grip portion that extends upwardly and forwardly when the hand vacuum cleaner body is positioned with the bottom on a horizontal surface; and,”
[12a.1]	“(i) a hand vacuum cleaner body comprising a bottom, a handle, the hand vacuum cleaner body housing a suction motor and fan assembly, the suction motor and fan assembly having a suction motor axis of rotation; and,”
[20a.1]	“(i) a hand vacuum cleaner body comprising a handle, the hand vacuum cleaner body housing a suction motor and fan assembly, the suction motor and fan assembly having a suction motor axis of rotation; and,”
[28a.1]	“(i) a hand vacuum cleaner body comprising a bottom, a handle, a suction motor and fan assembly, the suction motor and fan assembly having a suction motor axis of rotation, the handle having a hand grip portion that extends upwardly and forwardly when the hand vacuum cleaner is positioned with the bottom on a horizontal surface;”

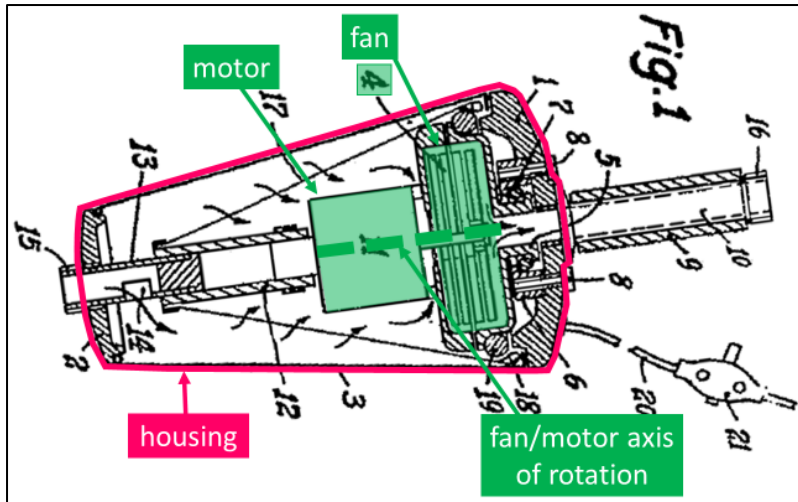
291. Peter teaches or renders obvious a hand vacuum cleaner body comprising a bottom, a handle, the hand vacuum cleaner body housing a suction motor and fan assembly, the suction motor and fan assembly having a suction motor axis of rotation, the handle having a hand grip portion that extends upwardly and forwardly when the hand vacuum cleaner body is positioned

- with the bottom on a horizontal surface (Limitation [1a.1]).
292. Peter teaches or renders obvious a hand vacuum cleaner body comprising a bottom, a handle, the hand vacuum cleaner body housing a suction motor and fan assembly, the suction motor and fan assembly having a suction motor axis of rotation (Limitation [12a.1]).
293. Peter teaches or renders obvious a hand vacuum cleaner body comprising a handle, the hand vacuum cleaner body housing a suction motor and fan assembly, the suction motor and fan assembly having a suction motor axis of rotation (Limitation [20a.1]).
294. Peter teaches or renders obvious a hand vacuum cleaner body comprising a bottom, a handle, a suction motor and fan assembly, the suction motor and fan assembly having a suction motor axis of rotation, the handle having a hand grip portion that extends upwardly and forwardly when the hand vacuum cleaner is positioned with the bottom on a horizontal surface (Limitation [28a.1]).
295. Peter teaches a hand vacuum cleaner body comprising a bottom. Peter's "vacuum cleaner" has a body comprising a **bottom**, as shown in the annotated image below:



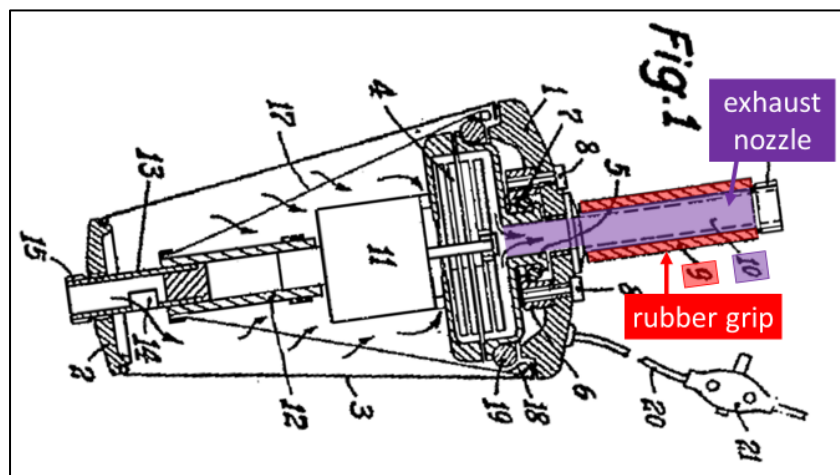
Ex. 1007, 2, Fig. 1.

296. In my opinion, a POSA would understand that when Peter's body is placed on a horizontal surface, the bottom is the portion identified in the above figure.
297. Peter further teaches the hand vacuum cleaner body houses a suction motor and fan assembly, the suction motor and fan assembly having a suction motor axis of rotation. Peter explains that the vacuum body includes a "housing" with a "fan" and a "motor 11," which, in my opinion, a POSA would understand includes a fan/motor axis of rotation, as shown in the annotated image below:



Ex. 1007, 2, Fig. 1.

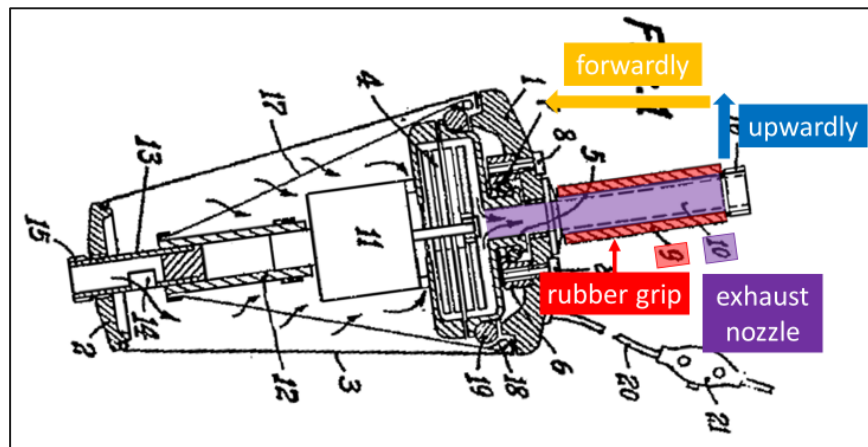
298. Peter teaches the hand vacuum cleaner body comprises a handle. Peter teaches the body includes “**exhaust nozzle 10**,” which is covered by “**rubber grip 9**,” as shown in the annotated image below:



Ex. 1007, 2, Fig. 1.

299. In my opinion, a POSA would understand that Peter’s “exhaust nozzle 10” including a “rubber grip 9” is a handle as claimed, because the user grasps it with their hand while handling the vacuum.

300. Related to Limitations [1a.1]/[28a.1], Peter teaches the handle having a hand grip portion that extends upwardly and forwardly when the hand vacuum cleaner body is positioned with the bottom on a horizontal surface. Peter's "**rubber grip 9**" extends **upwardly** and **forwardly** when oriented as claimed, as shown in the annotated image below:



Ex. 1007, 2, Fig. 1.

301. Alternatively, such a hand grip orientation would have been obvious. Peter uses "articulated parts so as to be rotatable" for maximum utility. Ex. 1007, 3. In my opinion, a POSA would therefore have been motivated to pivot "exhaust nozzle 10" and "rubber grip 9" at an upward/forward angle such that the hand grip portion extends upwardly and forwardly, including by angling the exhaust nozzle outlet downward, as was commonly-known in the art. Ex1020, US 6,829,804 at Fig. 1.

302. In my opinion, a POSA would have been further motivated to pivot Peter's

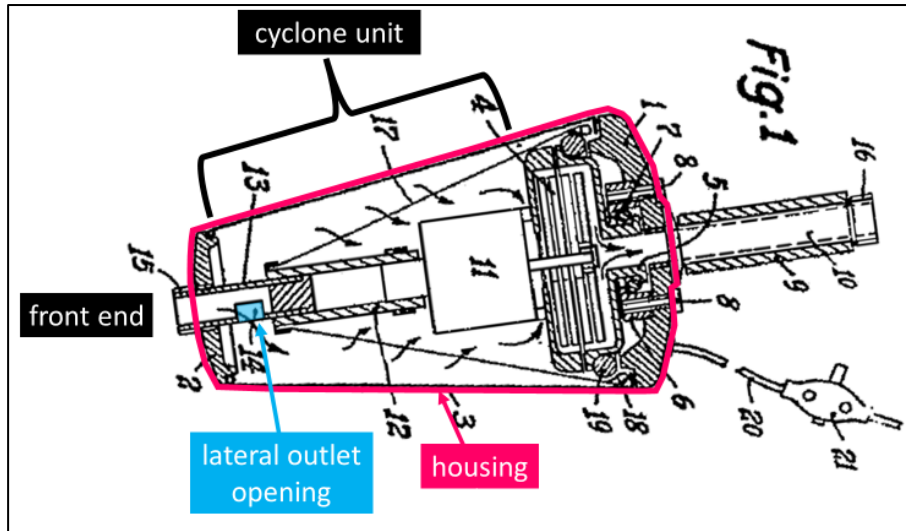
exhaust nozzle because different hand grip angles are more comfortable for different types of cleaning, e.g., the most ergonomic grip for cleaning under low furniture differs from the most ergonomic grip for cleaning high drapes or for cleaning floors. For example, in my opinion, a POSA would have understood that pivoting Peter's exhaust nozzle outlet downward would be more comfortable for above-floor cleaning because it would align the handle with the user's natural hand position. In my opinion, a POSA would have been motivated to modify Peter's handle and grip to pivot to allow a user to select the most ergonomic position, including various upward/forward configurations, for each particular use case, and would have had at least a reasonable expectation of success doing so.

d. [1a.2]/[12a.2]/[20a.2]/[28a.2]

Reference Number	Claim Limitation
[1a.2]	“(ii) a cyclone unit provided at a front end of the hand vacuum cleaner body, the cyclone unit comprising a cyclone chamber having a cyclone axis of rotation, a front end of the cyclone unit having a hand vacuum cleaner air inlet and a rear end wherein the hand vacuum cleaner air inlet is provided in a centre of the front end of the cyclone unit; and,”
[12a.2]	“(ii) an air treatment member provided at a front end of the hand vacuum cleaner body, the air treatment member having a front end of the air treatment member and a rear end, a hand vacuum cleaner air inlet and the rear end having an air treatment member air outlet whereby air exits the air treatment member in a rearward direction, wherein the hand vacuum cleaner air inlet is provided in a centre of the front end of the air treatment member; and,”
[20a.2]	“(ii) a cyclone unit provided at a front end of the hand vacuum cleaner body, the cyclone unit comprising a cyclone chamber having a cyclone axis of rotation, a front end of the cyclone unit having a hand vacuum cleaner air inlet and a rear end wherein the hand vacuum cleaner air inlet is provided in a centre of the front end of the cyclone unit; and,”
[28a.2]	“(ii) a cyclone unit provided at a front end of the hand vacuum cleaner body, the cyclone unit comprising a cyclone chamber having a cyclone axis of rotation, a centre of the front end of the cyclone unit having a hand vacuum cleaner air inlet; and,”

303. Peter teaches a cyclone unit provided at a front end of the hand vacuum cleaner body, the cyclone unit comprising a cyclone chamber having a cyclone axis of rotation, a front end of the cyclone unit having a hand vacuum cleaner air inlet and a rear end wherein the hand vacuum cleaner air inlet is provided in a centre of the front end of the cyclone unit (Limitations [1a.2]/[20a.2]).

304. Peter teaches an air treatment member provided at a front end of the hand vacuum cleaner body, the air treatment member having a front end of the air treatment member and a rear end, a hand vacuum cleaner air inlet and the rear end having an air treatment member air outlet whereby air exits the air treatment member in a rearward direction, wherein the hand vacuum cleaner air inlet is provided in a centre of the front end of the air treatment member (Limitation [12a.2]).
305. Peter teaches a cyclone unit provided at a front end of the hand vacuum cleaner body, the cyclone unit comprising a cyclone chamber having a cyclone axis of rotation, a centre of the front end of the cyclone unit having a hand vacuum cleaner air inlet (Limitation [28a.2]).
306. Peter teaches a cyclone unit provided at the front end of the hand vacuum cleaner body. Peter teaches a conically shaped “**housing**” with a tangential “**lateral outlet opening 14**,” which, in my opinion, a POSA would understand creates cyclonic airflow within a cone-shaped **cyclone unit** containing a cyclone chamber, as shown in the annotated image below:



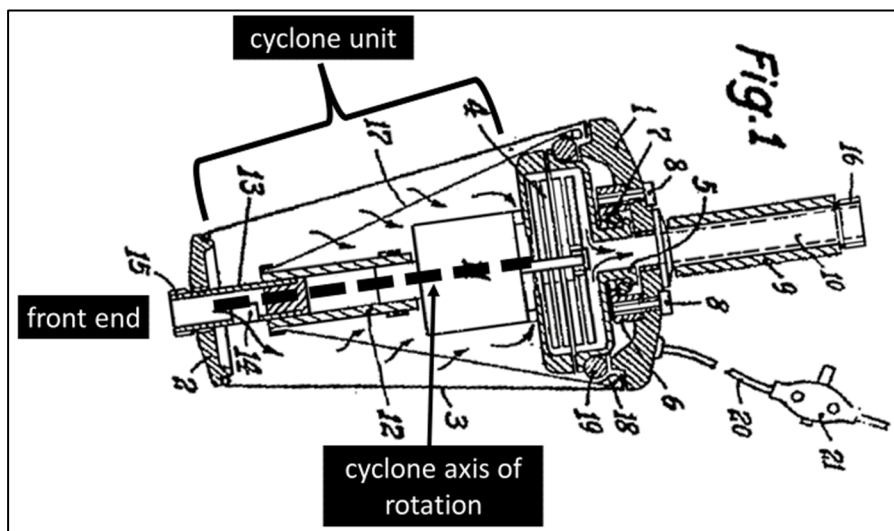
Ex. 1007, 2, Fig. 1.

307. In my opinion, a POSA would understand that Peter’s “lateral outlet opening 14” is a tangential air inlet because it directs air tangentially towards the sidewall of the “housing.” In my opinion, a POSA would further understand that tangential introduction of air into a conically shaped chamber, such as Peter’s “housing,” would create cyclonic airflow, and that Peter therefore teaches a cyclone unit containing a cyclone chamber.

308. To the extent PO argues Peter’s hand vacuum does not contain a cyclone unit, in my opinion, a POSA would have been motivated by Peter’s disclosures to modify Peter to include a cyclone unit containing a cyclone chamber. Vacuum cleaners have used cyclone units for over 80 years. See Ex1015, 1:50-58, Fig. 3 (“inlet 8 of a centrifugal separator” “discharges

the air tangentially within the casing producing a whirling annulus of air within the casing which centrifugally separates the dust from the air”). Thus, implementing a cyclone unit into Peter’s hand vacuum would have been obvious to try, easy to implement using nearly century-old teachings, and would have yielded the predictable result of “effortless[]” cleaning, which is one of Peter’s objectives. Ex1007, 2. In my opinion, a POSA would have reasonably expected success based on Peter’s express teachings of a conically shaped “housing” and “lateral outlet opening 14,” which are both well-known features of cyclone units.

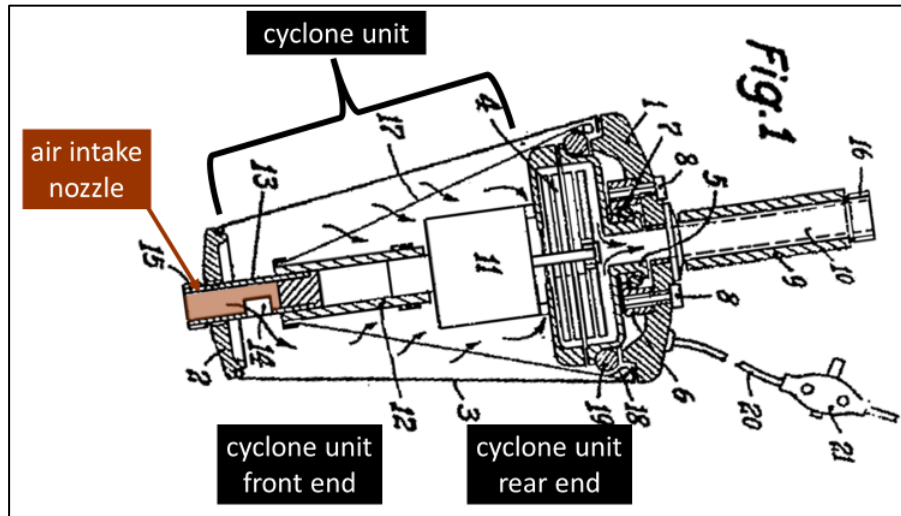
309. Peter further teaches the **cyclone unit** comprises a **cyclone chamber** having a **cyclone axis of rotation**, as shown in the annotated image below:



Ex. 1007, Fig. 1.

310. Peter teaches a front end of the **cyclone unit** having a hand vacuum cleaner

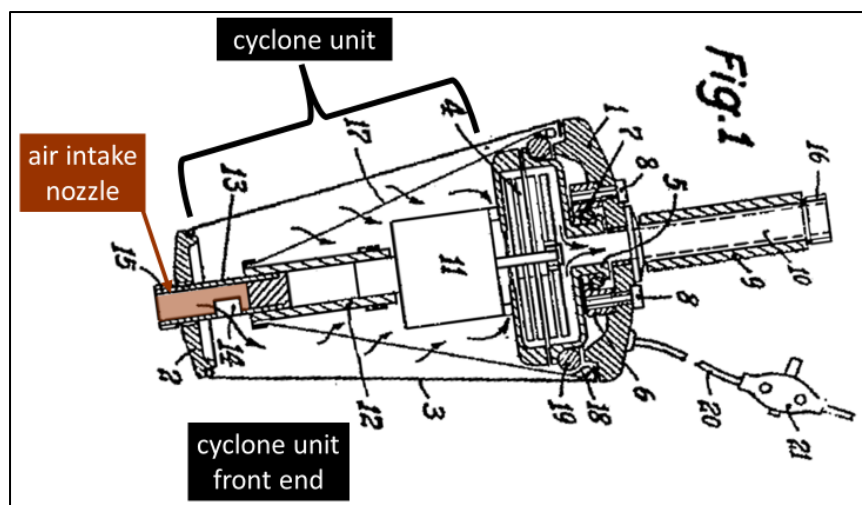
air inlet. The front end of Peter's **cyclone unit** has a hand vacuum cleaner air inlet: air enters Peter's hand vacuum via "**air intake nozzle 13**," as shown in the annotated image below:



Ex. 1007, 2, Fig. 1.

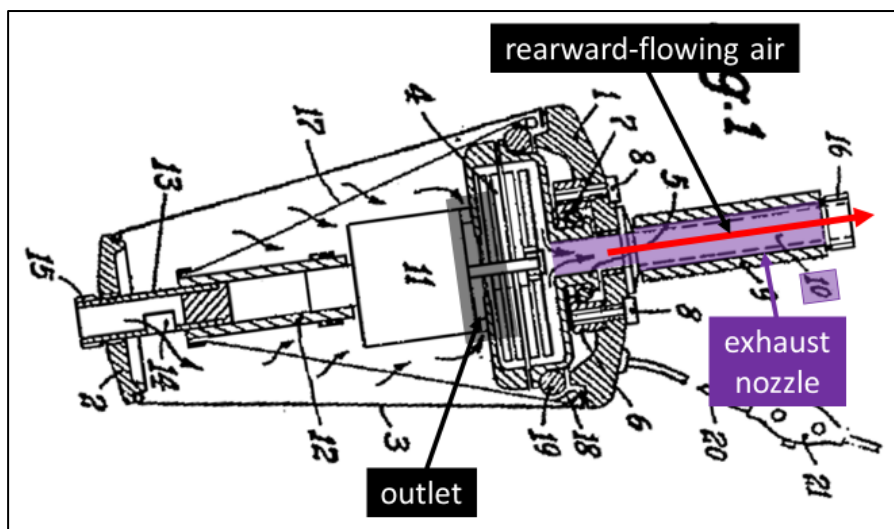
311. In my opinion, a POSA would understand that Peter's "cyclone unit" has a front and rear end as I identify above.

312. Peter teaches the hand vacuum cleaner air inlet is provided in a center of the front end of the **cyclone unit**, as shown in the annotated image below:



Ex. 1007, Fig. 1.

313. Regarding Limitation [12a.2], in my opinion, a POSA would understand that Peter's cyclone unit is an air treatment member at least because it treats air by separating dirt and particulate from the air. Further, Peter teaches an air treatment member air **outlet** whereby air exits the air treatment member in a rearward direction, toward “**exhaust nozzle 10**,” as I explain in Claim 7 and show in the annotated image below:



See Ground 3, Claim 7; Ex. 1007, 2, Fig. 1.

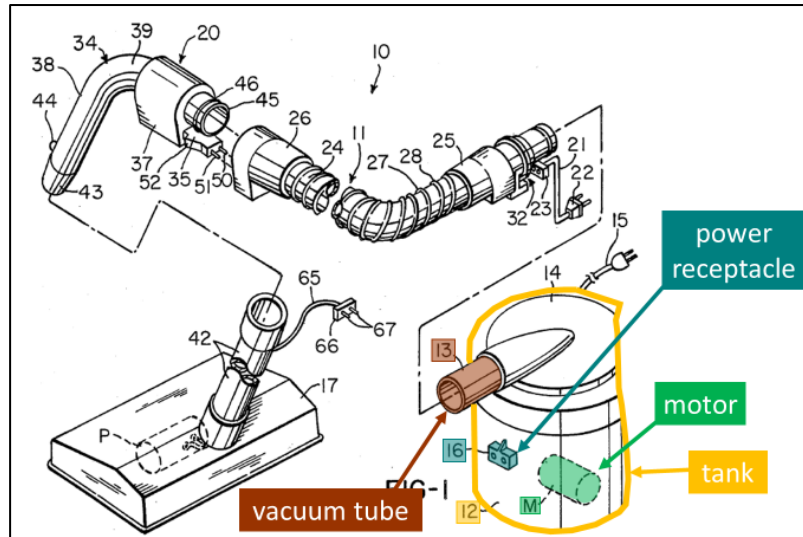
e. [1a.3]/[12a.3]/[20a.3]/[28a.3]

Reference Number	Claim Limitation
[1a.3]	“(iii) an electrical connector provided on the front end of the cyclone unit wherein electrical cables extend rearwardly from the electrical connector through a central portion of the cyclone unit toward the suction motor and fan assembly,”
[12a.3]	“(iii) an electrical connector provided on the front end of the air treatment member wherein electrical cables extend rearwardly from the electrical connector through a central portion of the air treatment member toward the suction motor and fan assembly,”
[20a.3]	“(iii) an electrical connector provided on the front end of the cyclone unit,”
[28a.3]	“(iii) a cyclone unit electrical connector provided at the front end of the cyclone unit at a location adjacent the hand vacuum cleaner air inlet, wherein electrical cables extend rearwardly from the electrical connector through a central portion of the cyclone unit toward the suction motor and fan assembly,”

314. Peter in combination with Neroni renders obvious an electrical connector provided on the front end of the cyclone unit wherein electrical cables extend rearwardly from the electrical connector through a central portion of the cyclone unit toward the suction motor and fan assembly (Limitation [1a.3]).

315. Peter in combination with Neroni renders obvious an electrical connector provided on the front end of the air treatment member wherein electrical cables extend rearwardly from the electrical connector through a central portion of the air treatment member toward the suction motor and fan

- assembly (Limitation [12a.3]).
316. Peter in combination with Neroni renders obvious an electrical connector provided on the front end of the cyclone unit (Limitation [20a.3]).
317. Peter in combination with Neroni renders obvious a cyclone unit electrical connector provided at the front end of the cyclone unit at a location adjacent the hand vacuum cleaner air inlet, wherein electrical cables extend rearwardly from the electrical connector through a central portion of the cyclone unit toward the suction motor and fan assembly (Limitation [28a.3]).
318. Neroni teaches an electrical connector provided on the front end of a separation unit, below the air inlet. Neroni explains that the vacuum has a “female **power receptacle 16** disposed on the outside surface of its **tank 12**,” adjacent “**vacuum tube 13**,” and electricity runs from the power cleaning tool to “**receptacle 16A**, and to **motor M**,” as shown in the annotated image below:



The 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. The vacuum cleaner has an electrical cord assembly 21 which is provided with a male fitting 22 at one end thereof for connection to the receptacle 16 and the cord assembly 21 has a female fitting 23 at its opposite end which is adapted to be electrically connected to the hose assembly 11 once the assembly 11 is connected to the cleaner 12; and, as will be described in detail subsequently.

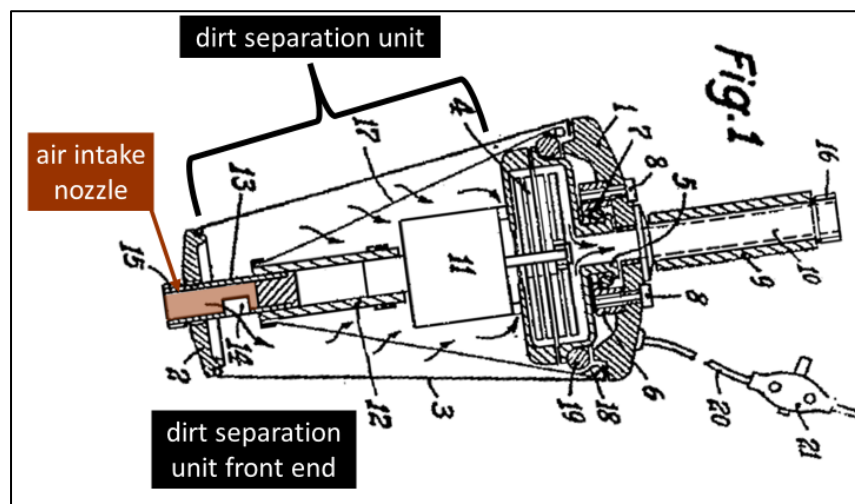
Ex. 1011, 3:34-49, Fig. 1.

Electrical continuity is thus completed to the power cleaning tool in the same manner as before; namely by inserting plug 66 into opening 68 so that prongs 67 fit into tubular plugs 62 and 64. Electrical continuity is made through connector 26A, hose assembly 11A, connector 25A, cord

assembly 21A, male fitting 22A, receptacle 16A, and to motor M via relay R.

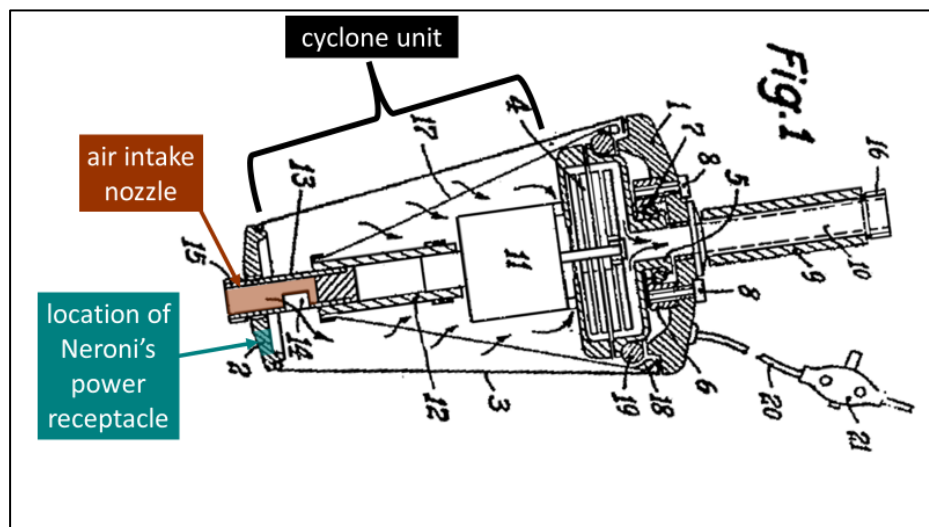
Id., 6:39-45

319. Neroni explains that “tank 12,” also referred to as “**cleaner 12**[,] has an integral vacuum unit” and that “because such vacuum unit is of conventional construction, it will not be shown or described.” *Id.*, 3:29-33, Fig. 1. In my opinion, a POSA would have understood that a cyclone unit is one such “conventional construction” of a vacuum unit, including because Neroni’s tank/cleaner 12 is cylindrical and therefore adapted to cyclonic separation. In my opinion, a POSA would have further understood that Neroni’s “power receptacle 16” is an electrical connector, and that it is disposed on the front end of the vacuum unit, as I depict above.
320. Like Neroni, Peter’s “**air intake nozzle 13**” is at the front of the **dirt separation unit**, as shown in the annotated image below:



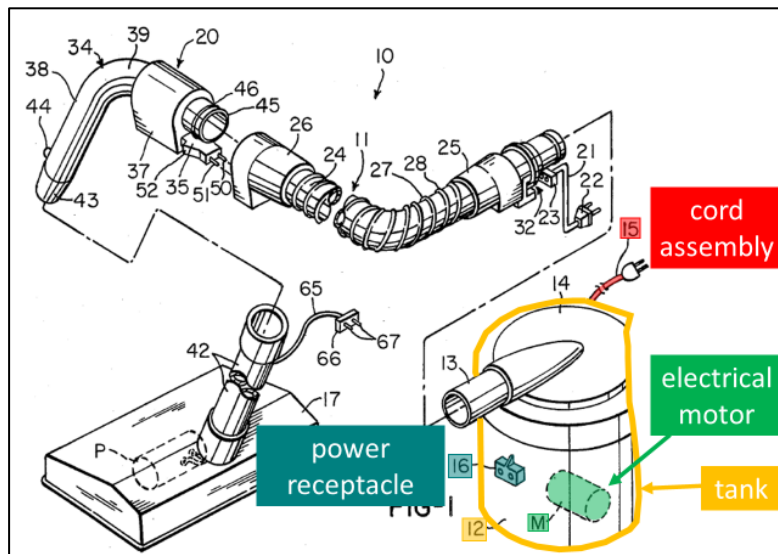
Ex. 1007, 1, Fig. 1; *see also* Ground 3, Limitation [1a.2].

321. In my opinion, a POSA would have been motivated to implement Neroni's "power receptacle 16" on the front end of Peter's cyclone unit, adjacent the hand vacuum cleaner air inlet, and would have reasonably expected success. In my opinion, a POSA would have understood that this was one of a finite number of identified locations for the connector, and it would have been the most convenient location to connect a powered attachment to Neroni's "cord assembly 21A," because that is where the powered attachment (and rigid airflow conduit connecting the powered attachment to the vacuum cleaner) connects to Peter's cleaner. In the combined teachings of Peter and Neroni, an electrical connector is provided on the front end of the **cyclone unit**, as shown in the annotated image below:



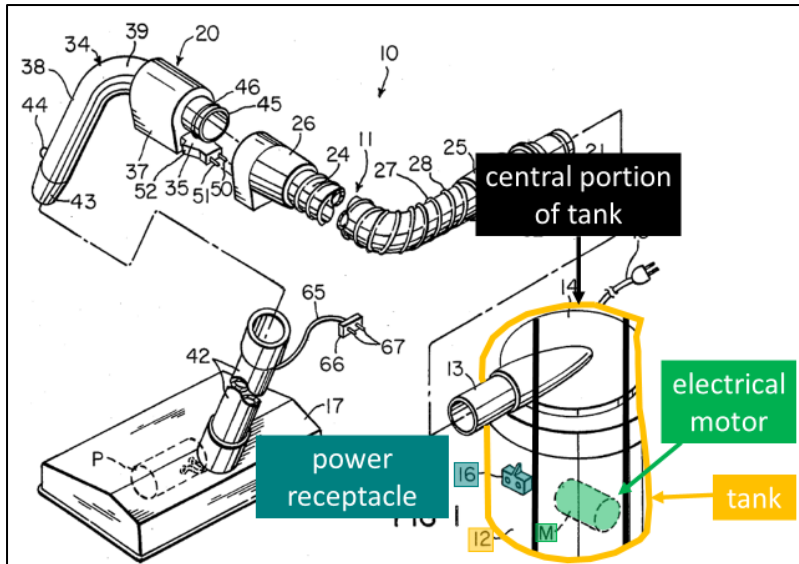
Ex. 1007, Fig. 1.

322. Neroni further teaches electrical cables extending rearwardly from the electrical connector through a central portion of the separation unit toward the suction motor and fan assembly. Neroni explains that “**tank 12**” comprises an “**electrical motor [M]** receiving electrical power through a **cord assembly 15**,” as shown in the annotated image below:



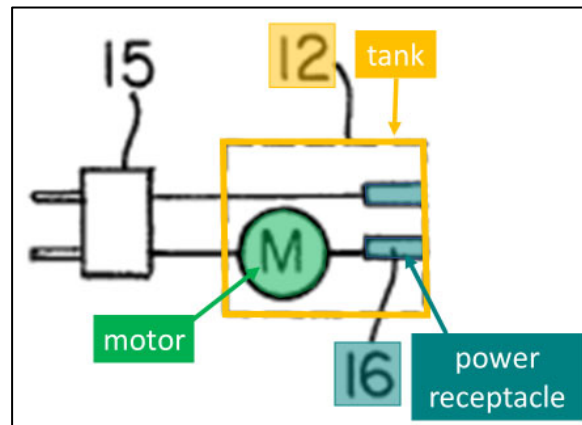
Ex. 1011, 3:22-36, Fig. 3.

323. Neroni further explains that electricity runs from the power cleaning tool to “**receptacle 16A**,” and to **motor M**” which is positioned in a central portion of “**tank 12**,” as shown in the annotated image below:



Ex. 1011, 3:29-33, 6:42-45, Fig. 3.

324. Neroni further illustrates this electrical connection in the “wiring diagram” of Figure 4, as shown in the annotated image below:

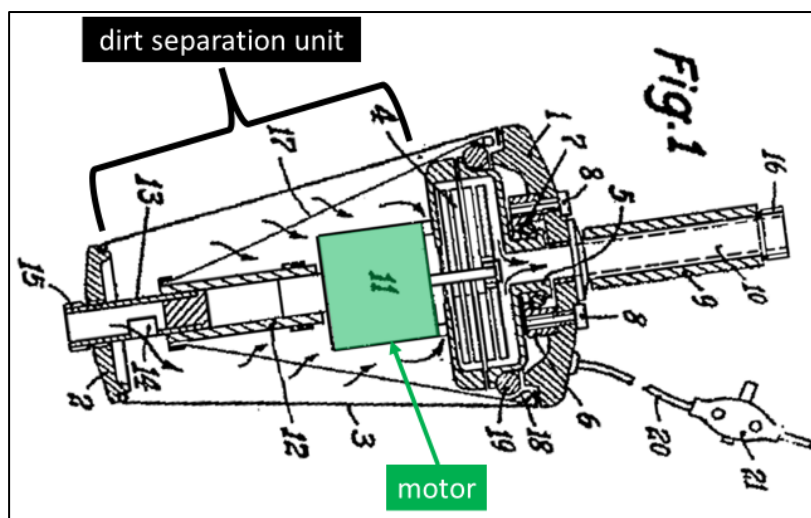


Ex. 1011, 3:1-2, Fig. 4.

325. In my opinion, a POSA would therefore understand that electrical cables extend rearwardly from Neroni’s power receptacle to the motor, and from the motor as a “cord assembly,” including through a central portion of the separation unit, including a radially central portion shown above, and a

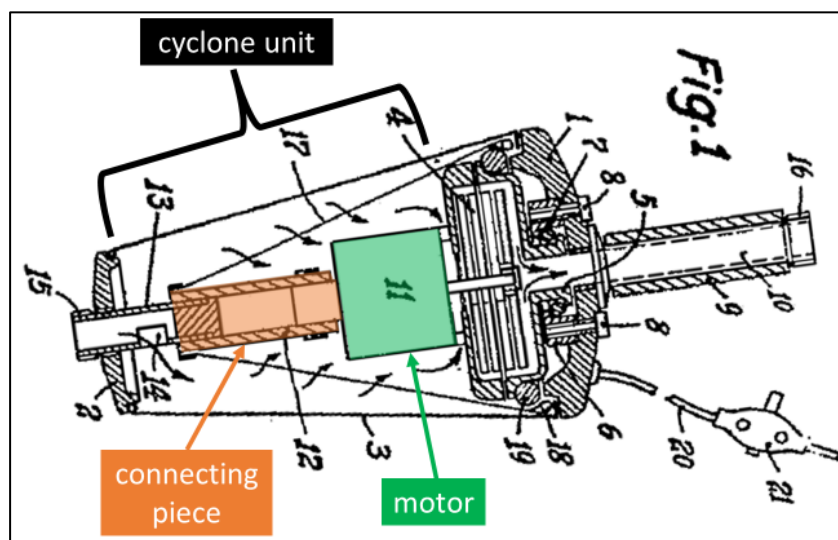
central portion from top to bottom, since power receptacle 16 is located approximately halfway between the top and bottom of the tank.

326. Further, it would have been obvious to have Neroni's cord assembly 15 extend rearwardly through a central portion (centered both front-to-back and top-to-bottom) of the "tank 12." There were a finite number of solutions to implement Neroni's teaching that electricity runs from "receptacle 16A, and to motor M"—and the most direct route—running an existing electrical cord through the center of Neroni's tank 12 would have been obvious to try, simple to implement using known techniques, and would have yielded predictable results of transmitting electricity. Ex. 1011, 3:22-36, 6:42-45, Fig. 1. In my opinion, a POSA would have been motivated to run Neroni's cord assembly 15 through the tank's center because a POSA would have understood that, when implemented as a cyclone, this is where there is the least airflow and dirt in the tank, so 1) this is the location where the electrical components would interfere with the cyclonic action the least and 2) it also minimizes dirt build up on the electrical cables/conduit and is the shortest distance through the cyclone unit, thereby reducing the amount of material needed and reducing costs.
327. Like Neroni, Peter's "**motor 11**" is positioned in the **dirt separation unit**, as shown in the annotated image below:



Ex. 1007, 2, Fig. 1; *see also* Ground 3, Limitation [1a.1].

328. It would have been obvious to extend the electrical cables rearwardly through Peter's “**connecting piece 12**,” which extends rearwardly through each central portion of the **cyclone unit** and connects to “**motor 11**,” as shown in the annotated image below:



Ex. 1007, 2, Fig. 1.

329. In my opinion, a POSA would understand that there were a finite number

of solutions to implement Neroni's cable teachings into Peter—namely, two: through Peter's "dust filter 17," which would require routing the cables through the filter every time it needed to be changed, introducing the possibility of reduced filtering with additional filter boundaries/openings, or directly to "motor 11" through Peter's "connecting piece 12," which would avoid this inconvenience. Running the cables through "connecting piece 12" would have been obvious to try, simple to implement using known techniques, would have yielded the predictable result of transmitting electricity, and would extend rearwardly through the center (from front-to-back and radially) of Peter's cyclone unit, and would facilitate filter changing.

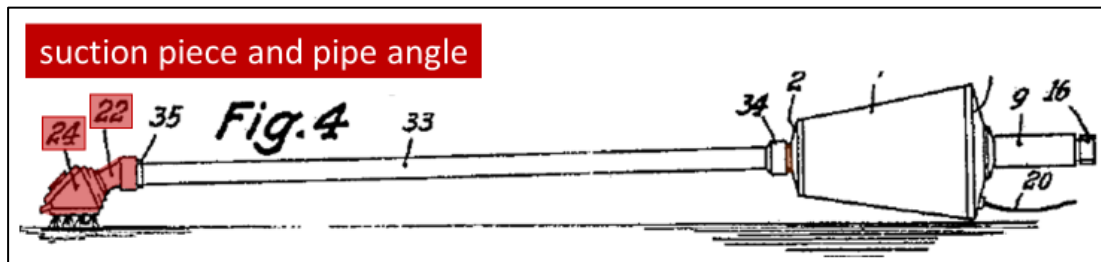
330. In my opinion, a POSA would have been motivated to combine Neroni and Peter, including to combine Neroni's electrical connectors and cables with Peter's cyclone unit and would have reasonably expected success, for the same reasons as discussed above. *See supra* Ground 3, Limitation [1a.3]; Ground 3, §1. In the combined teachings of Peter and Neroni, electrical cables extend rearwardly from the electrical connector through a central portion of the cyclone unit toward the suction motor and fan assembly.

f. [1b]/[12b]/[20b]/[28b]

Reference Number	Claim Limitation
[1b]	“(b) a surface cleaning head having a front end, a rear end, a dirt air inlet and a cleaning head air outlet; and,”
[12b]	“(b) a surface cleaning head having a front end, a rear end, a dirt air inlet and a cleaning head air outlet; and,”
[20b]	“(b) a surface cleaning head having a front end, a rear end, a dirt air inlet and a cleaning head air outlet; and,”
[28b]	“(b) a surface cleaning head having a front end, a rear end, a dirt air inlet and a cleaning head air outlet; and,”

331. Peter teaches a surface cleaning head having a front end, a rear end, a dirt air inlet and a cleaning head air outlet (Limitations [1b]/[12b]/[20b]/[28b]).

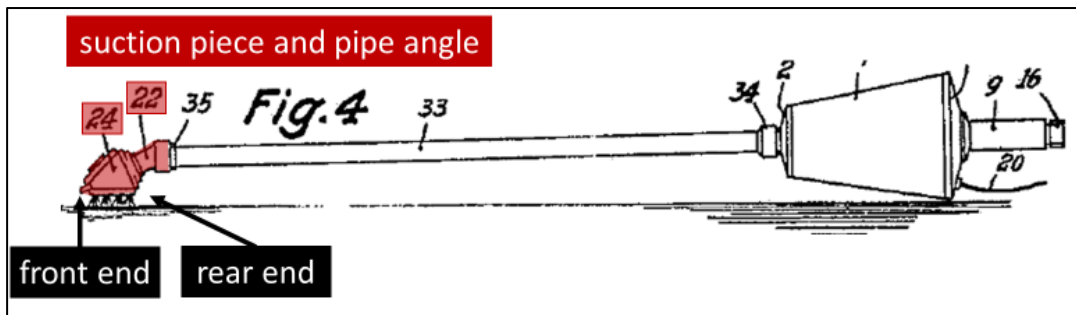
332. Peter teaches a surface cleaning head. Peter teaches a “**suction piece 24**” connected to “**pipe angle 22**,” as shown in the annotated image below:



Ex. 1007, 2, Fig. 4.

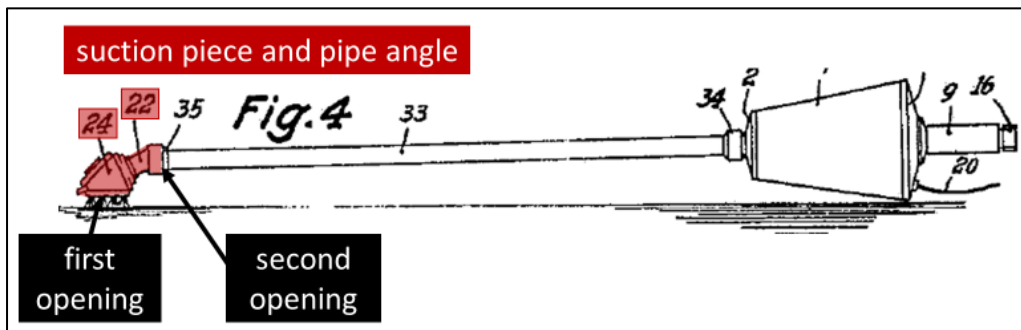
333. In my opinion, a POSA would understand that, together, “suction piece 24” and “pipe angle 22” are a surface cleaning head.

334. Peter teaches a surface cleaning head having a front end and a rear end. Peter’s “**suction piece 24**” and “**pipe angle 22**” assembly has a **front end** and a **rear end**, as shown in the annotated image below:



Ex. 1007, Fig. 4.

335. Peter teaches the surface cleaning head having a dirt air inlet and a cleaning head outlet. In Peter, air flows into the “**suction piece 24**” via a **first opening**, and exits “**pipe angle 22**” via a **second opening**, as shown in the annotated image below:



Ex. 1007, Fig. 4.

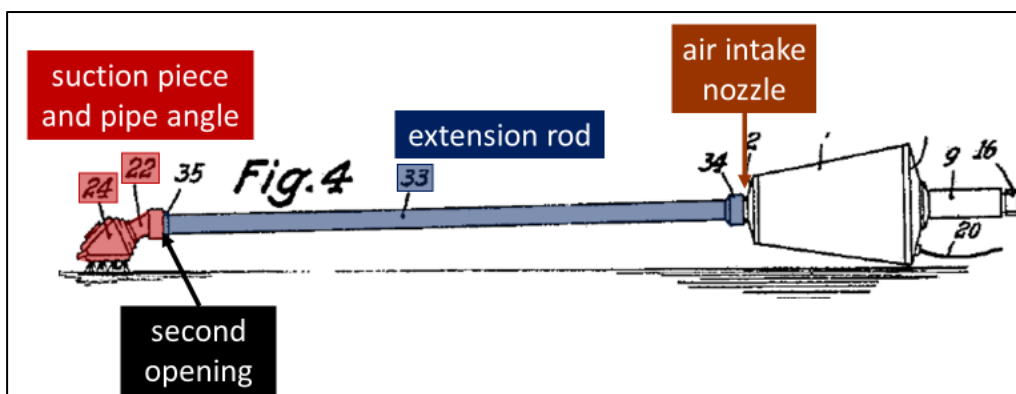
336. In my opinion, a POSA would understand that Peter’s first opening is a dirt air inlet, and that Peter’s second opening is a cleaning head air outlet. In my opinion, a POSA would have been motivated to incorporate a powered surface cleaning head with Peter, including by modifying Peter’s surface cleaning head (“suction piece 24” and “pipe angle 22”). See Ground 3, §1. When so modified, Peter likewise meets these limitations.

g. [1c]/[20c]

Reference Number	Claim Limitation
[1c]	“(c) a rigid air flow conduit extendable between the cleaning head air outlet and the hand vacuum cleaner air inlet, the rigid air flow conduit having a longitudinally extending conduit axis which is parallel to the cyclone axis of rotation when the rigid air flow conduit extends between the cleaning head air outlet and the hand vacuum cleaner air inlet,”
[20c]	“(c) a rigid air flow conduit extendable between the cleaning head air outlet and a hand vacuum cleaner air inlet, the rigid air flow conduit having a longitudinally extending conduit axis which is parallel to the cyclone axis of rotation when the rigid air flow conduit extends between the cleaning head air outlet and the hand vacuum cleaner air inlet,”

337. Peter teaches a rigid air flow conduit extendable between the cleaning head air outlet and the hand vacuum cleaner air inlet, the rigid air flow conduit having a longitudinally extending conduit axis which is parallel to the cyclone axis of rotation when the rigid air flow conduit extends between the cleaning head air outlet and the hand vacuum cleaner air inlet (Limitations [1c]/[20c]).

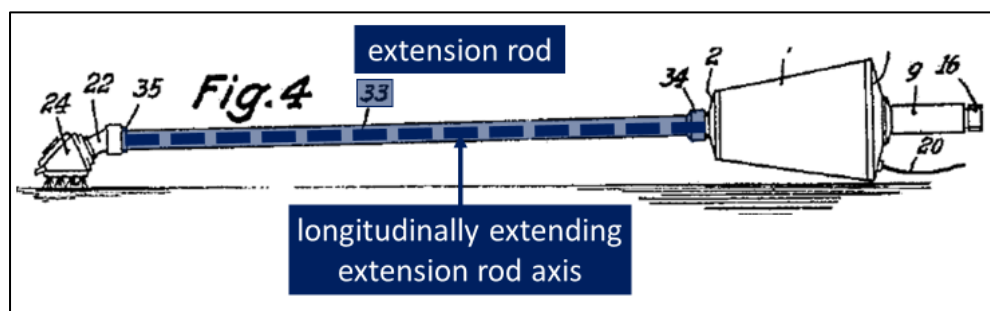
338. Peter teaches a rigid air flow conduit extendable between the cleaning head air outlet and the hand vacuum cleaner air inlet. Peter’s “**extension rod 33**” can be “inserted between the vacuum cleaner housing,” at “**air intake nozzle 13**,” and “**pipe angle 22**,” at the **second opening**, as shown in the annotated image below:



Ex. 1007, 2-3, Fig. 4.

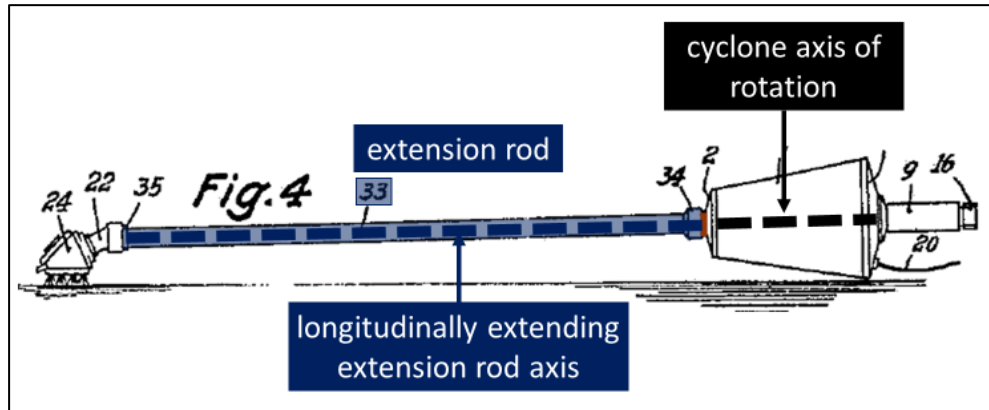
339. Peter explains that “extension rod 33 has a connection sleeve 34 at one end” that connects to “connecting thread 15 of the air intake nozzle 13,” and a “connecting thread 35 at the other end” that connects to “pipe angle 22 ... connection sleeve 23.” Ex. 1007, 2. In my opinion, a POSA would understand that that “extension rod 33” is a rigid air flow conduit extendable between the cleaning head air outlet and the hand vacuum cleaner air inlet.

340. Peter teaches the rigid air flow conduit having a longitudinally extending conduit axis. Peter’s **extension rod 33** has a **longitudinally extending conduit axis**, as shown in the annotated image below:



Ex. 1007, 2, Fig. 4.

341. Peter teaches the longitudinally extending conduit axis is parallel to the cyclone axis of rotation when the rigid air flow conduit extends between the cleaning head air outlet and the hand vacuum cleaner air inlet. Peter's **extension rod's axis** is parallel to the **cyclone axis of rotation** when **extension rod 33** extends between the second opening and air intake nozzle 13, as shown in the annotated image below:



Ex. 1007, Fig. 4.

342. To the extent Peter's longitudinally extending extension rod axis and cyclone unit axis are depicted as co-axial in Fig. 4, "parallel" includes co-axial for the reasons I explained in Ground 1, Limitation [1c]. See Ground 1, Limitation [1c].

h. [12c]

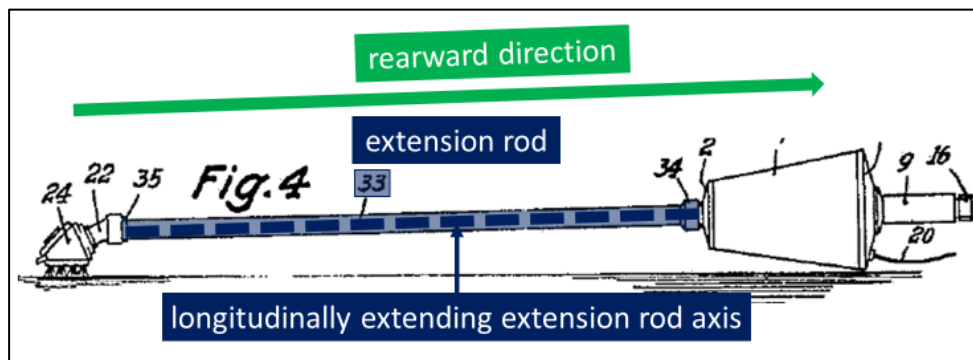
Reference Number	Claim Limitation
[12c]	“(c) a rigid air flow conduit extendable between the cleaning head air outlet and the hand vacuum cleaner air inlet, the rigid air flow conduit having a longitudinally extending conduit axis which is parallel to the rearward direction when the rigid air flow conduit extends between the cleaning head air outlet and the hand vacuum cleaner air inlet and when the hand vacuum cleaner is mounted to a downstream end of the rigid air flow conduit, the handle is a driving handle for the surface cleaning apparatus.”

343. Peter teaches a rigid air flow conduit extendable between the cleaning head air outlet and the hand vacuum cleaner air inlet, the rigid air flow conduit having a longitudinally extending conduit axis which is parallel to the rearward direction when the rigid air flow conduit extends between the cleaning head air outlet and the hand vacuum cleaner air inlet and when the hand vacuum cleaner is mounted to a downstream end of the rigid air flow conduit, the handle is a driving handle for the surface cleaning apparatus (Limitation [12c]).

344. As I explained, Peter teaches a rigid air flow conduit extendable between the cleaning head air outlet and the hand vacuum cleaner air inlet, the rigid air flow conduit having a longitudinally extending conduit axis. *See* Ground 3, Limitation [1c].

345. Peter teaches the longitudinally extending conduit axis is parallel to the

rearward direction. Peter's **longitudinally extending conduit axis** ("extension rod 33"'s axis) is parallel to the **rearward direction** when oriented as claimed, and as I show in the annotated image below:



Ex. 1007, Fig. 4.

346. In my opinion, a POSA would understand that Peter's connection sleeve 34 is at the downstream end of Peter's extension rod 33.

347. Further, as I explain for Limitation [1d], Peter teaches that when the hand vacuum cleaner is mounted to a downstream end of the rigid air flow conduit, the handle is a driving handle for the surface cleaning apparatus. See Ground 3, Limitation [1d].

i. [28c]

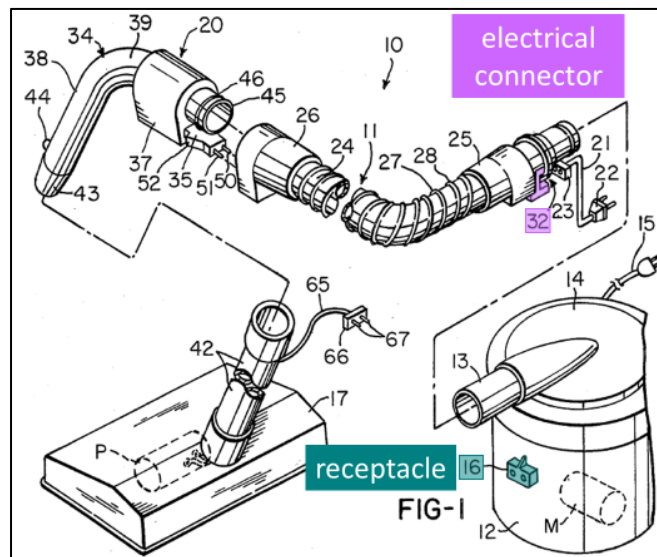
Reference Number	Claim Limitation
[28c]	“(c) a rigid air flow conduit extendable between the cleaning head air outlet and the hand vacuum cleaner air inlet, the rigid air flow conduit having a longitudinally extending conduit axis, and when the rigid air flow conduit is extending between the cleaning head air outlet and the hand vacuum cleaner air inlet conduit axis is parallel to the cyclone axis of rotation and a rigid air flow conduit electrical connector that is aligned with and connected to the cyclone unit electrical connector when the hand vacuum cleaner is mounted to the rigid air flow conduit,”

348. Peter in combination with Neroni renders obvious a rigid air flow conduit extendable between the cleaning head air outlet and the hand vacuum cleaner air inlet, the rigid air flow conduit having a longitudinally extending conduit axis, and when the rigid air flow conduit is extending between the cleaning head air outlet and the hand vacuum cleaner air inlet conduit axis is parallel to the cyclone axis of rotation and a rigid air flow conduit electrical connector that is aligned with and connected to the cyclone unit electrical connector when the hand vacuum cleaner is mounted to the rigid air flow conduit (Limitation [28c]).

349. As I explained, Peter teaches a rigid air flow conduit extendable between the cleaning head air outlet and the hand vacuum cleaner air inlet, the rigid air flow conduit having a longitudinally extending conduit axis, and when the rigid air flow conduit is extending between the cleaning head air outlet

and the hand vacuum cleaner air inlet the conduit axis is parallel to the cyclone axis of rotation. *See* Ground 3, Limitation [1c]. As I explained, Peter in combination with Neroni renders obvious a cyclone unit electrical connector. *See* Ground 3, Limitation [1a.3].

350. Neroni teaches an air flow conduit electrical connector. Neroni teaches “hose assembly 11” with “**electrical connector 32**” attaches to “female fitting 23,” and “male fitting 22 ... for connection to the **receptacle 16**,” as shown in the annotated image below:



Ex. 1011, 3:42-49; 4:7-10, Fig. 1; *See* Ground 3, Limitation [1a.3].

351. Neroni describes its electrical connectivity further:

The 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. The vacuum cleaner has an electrical cord assembly 21 which is provided with a male fitting 22 at one end thereof for connection to the receptacle 16 and the cord assembly 21 has a female fitting 23 at its opposite end which is adapted to be electrically connected to the hose assembly 11 once the assembly 11 is connected to the cleaner 12; and, as will be described in detail subsequently.

Ex. 1007, 3:34-49.

352. Neroni also explains that “[i]n this example of the invention a male electrical connector 32 is provided at one end of the hose assembly 11 and is an integral part of the hose connector 25.” Ex. 1011, 4:7-10.

353. Thus, in my opinion, a POSA would understand that these connectors and fittings are individually (and together) an air flow conduit electrical connector.

354. In my opinion, a POSA would have been motivated to incorporate Neroni’s “electrical connector 32” teachings, including “female fitting 23” and “male fitting 22,” into Peter’s rigid extension rod 33 and would have a reasonable expectation of success for the same reasons I discussed in Limitation [1a.3]. *See* Ground 3, Limitation [1a.3]. Thus, the combined teachings of Peter and Neroni teach these limitations.

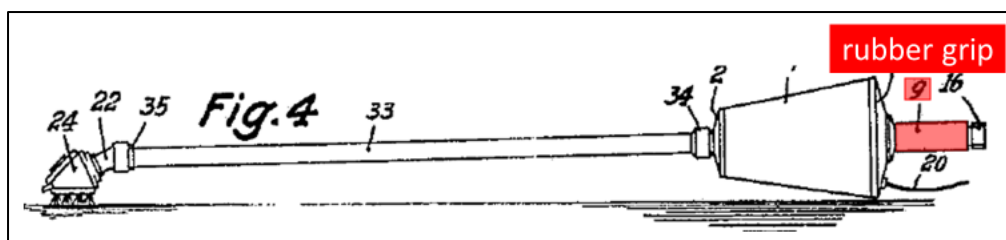
j. [1d]/[20d]/[28d]

Reference Number	Claim Limitation
[1d]	“wherein the hand vacuum cleaner is removably mountable to a downstream end of the rigid air flow conduit and when the hand vacuum cleaner is mounted to the downstream end of the rigid air flow conduit, the rigid air flow conduit extends between the surface cleaning head and the hand vacuum cleaner, the handle is a driving handle for the surface cleaning apparatus.”
[20d]	“wherein the hand vacuum cleaner is removably mountable to a downstream end of the rigid air flow conduit and when the hand vacuum cleaner is mounted to the downstream end of the rigid air flow conduit, the handle is a driving handle for the surface cleaning apparatus, and”
[28d]	“wherein the hand vacuum cleaner is removably mountable to a downstream end of the rigid air flow conduit and when the hand vacuum cleaner is mounted to the downstream end of the rigid air flow conduit, the handle is a driving handle for the surface cleaning apparatus.”

355. Peter teaches wherein the hand vacuum cleaner is removably mountable to a downstream end of the rigid air flow conduit and when the hand vacuum cleaner is mounted to the downstream end of the rigid air flow conduit, the rigid air flow conduit extends between the surface cleaning head and the hand vacuum cleaner, the handle is a driving handle for the surface cleaning apparatus (Limitation [1d]).

356. Peter teaches wherein the hand vacuum cleaner is removably mountable to a downstream end of the rigid air flow conduit and when the hand vacuum cleaner is mounted to the downstream end of the rigid air flow conduit, the

- handle is a driving handle for the surface cleaning apparatus (Limitation [20d]).
357. Peter teaches wherein the hand vacuum cleaner is removably mountable to a downstream end of the rigid air flow conduit and when the hand vacuum cleaner is mounted to the downstream end of the rigid air flow conduit, the handle is a driving handle for the surface cleaning apparatus (Limitation [28d]).
358. As I explained, Peter teaches the hand vacuum cleaner is removably mountable to a downstream end of the rigid air flow conduit, and the rigid air flow conduit extends between the surface cleaning head and the hand vacuum cleaner. *See* Ground 3, Limitation [1c].
359. Peter teaches when the rigid air flow conduit extends between the surface cleaning head and the hand vacuum cleaner, the handle is a driving handle for the surface cleaning apparatus. Peter's "exhaust nozzle 10" has "**rubber grip 9**," as shown in the annotated image below:



Ex. 1007, 2, Fig. 4.

360. In my opinion, a POSA would understand that "exhaust nozzle 10," with

“rubber grip 9,” is a driving handle because the user applies force and torque on the handle to move the vacuum cleaner.

k. [20e]

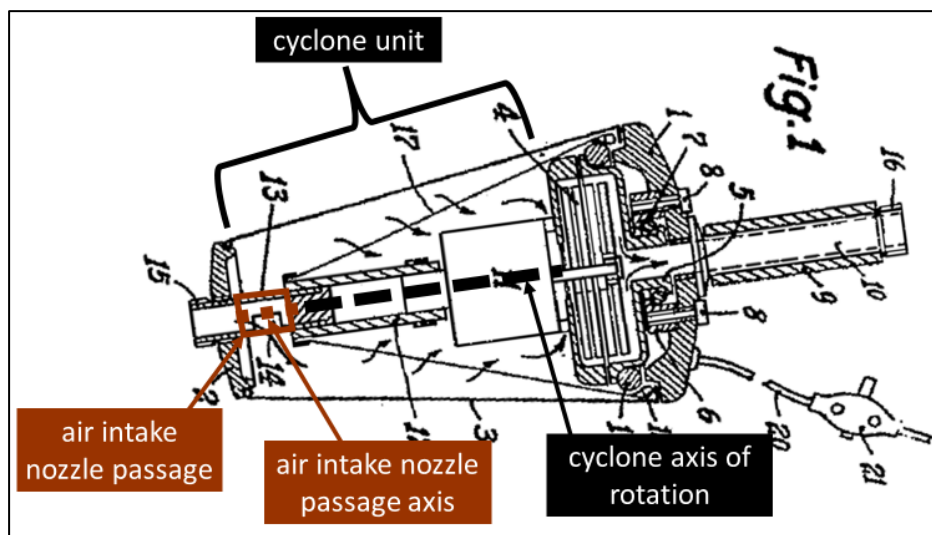
Reference Number	Claim Limitation
[20e]	“wherein when the rigid air flow conduit extends between the cleaning head air outlet and the hand vacuum cleaner air inlet, the hand vacuum cleaner air inlet comprises a hand vacuum cleaner inlet passage that is generally coaxial with the longitudinally extending conduit axis and the cyclone axis of rotation, the hand vacuum cleaner air inlet passage is positioned inside the cyclone unit and the electrical cables extend rearwardly from the electrical connector through the cyclone unit adjacent the hand vacuum cleaner inlet passage towards the suction motor and fan assembly.”

361. Peter in combination with Neroni renders obvious wherein when the rigid air flow conduit extends between the cleaning head air outlet and the hand vacuum cleaner air inlet, the hand vacuum cleaner air inlet comprises a hand vacuum cleaner inlet passage that is generally coaxial with the longitudinally extending conduit axis and the cyclone axis of rotation, the hand vacuum cleaner air inlet passage is positioned inside the cyclone unit and the electrical cables extend rearwardly from the electrical connector through the cyclone unit adjacent the hand vacuum cleaner inlet passage towards the suction motor and fan assembly (Limitation [20e]).

362. As I explained, Peter teaches when the rigid air flow conduit extends between the cleaning head air outlet and the hand vacuum cleaner air inlet,

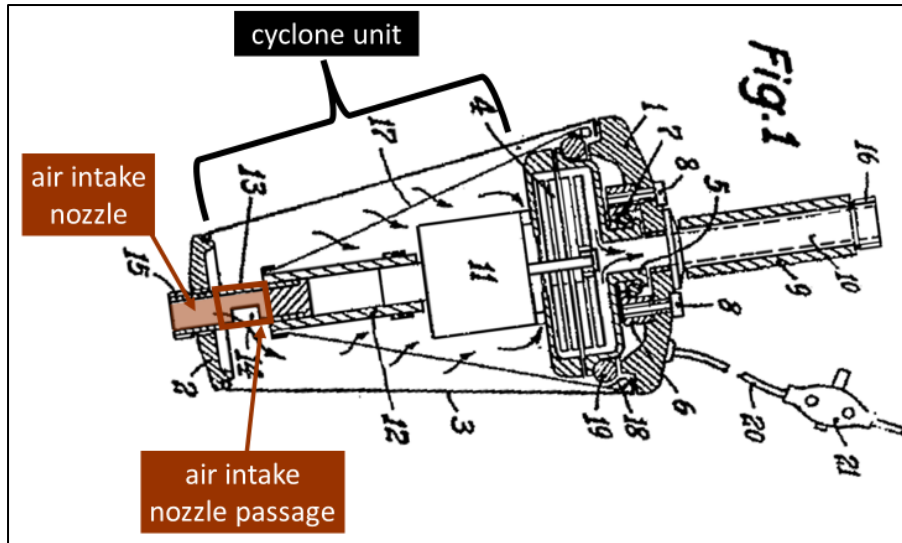
the hand vacuum cleaner air inlet comprises a hand vacuum cleaner inlet passage that is generally coaxial with the longitudinally extending conduit axis. See Ground 3, Limitation [1c], Claim 9.

363. Peter teaches the hand vacuum cleaner inlet passage is generally coaxial with the cyclone axis of rotation. Peter's **air intake nozzle 13's passage** is generally coaxial with the **cyclone axis of rotation**, as shown in the annotated image below:



Ex. 1007, Fig. 1.

364. Peter further teaches the hand vacuum cleaner air inlet passage is positioned inside the cyclone unit. Peter's "air **intake nozzle 13** protrud[es] **through** the housing cover 2" and the cyclone unit, as shown in the annotated image below:



Ex. 1007, 2, Fig. 1.

365. In my opinion, a POSA would understand that Peter's air intake nozzle passage is positioned inside the cyclone unit as depicted above.

366. As I explained, Peter in combination with Neroni renders obvious the electrical cables extend rearwardly from the electrical connector through the cyclone unit adjacent the hand vacuum cleaner inlet passage towards the suction motor fan and assembly. *See* Ground 3, Limitation [1a.3]; Ground 3, §1.

3. The Combined Teachings of Peter and Neroni Render Obvious Claims 2 and 14

Reference Number	Claim Limitation
[2]	“The surface cleaning apparatus of claim 1 wherein the cyclone axis of rotation is rearward of the longitudinally extending conduit axis when the hand vacuum cleaner is mounted to the rigid air flow conduit and the rigid air flow conduit extends generally vertically upwardly from the surface cleaning head.”
[14]	“The surface cleaning apparatus of claim 12 wherein the outlet conduit axis is rearward of the longitudinally extending conduit axis when the hand vacuum cleaner is mounted to the rigid air flow conduit and the rigid air flow conduit extends generally vertically upwardly from the surface cleaning head.”

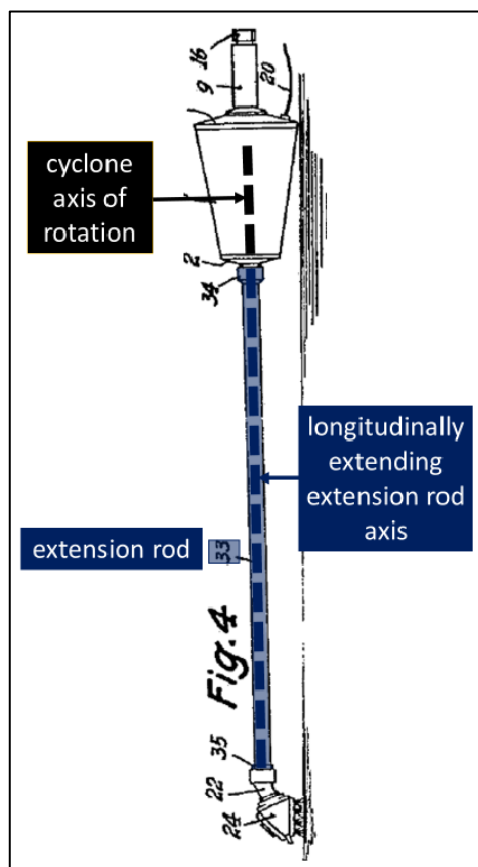
367. As I explained in Section X.C.2, Peter in combination with Neroni renders obvious Claims 1 and 12 of the '550 patent.

368. Peter in combination with Neroni teaches the surface cleaning apparatus of claim 1 wherein the cyclone axis of rotation is rearward of the longitudinally extending conduit axis when the hand vacuum cleaner is mounted to the rigid air flow conduit and the rigid air flow conduit extends generally vertically upwardly from the surface cleaning head (Claim 2).

369. Peter in combination with Neroni teaches the surface cleaning apparatus of claim 12 wherein the outlet conduit axis is rearward of the longitudinally extending conduit axis when the hand vacuum cleaner is mounted to the rigid air flow conduit and the rigid air flow conduit extends generally vertically upwardly from the surface cleaning head (Claim 14).

370. Peter teaches the cyclone axis of rotation is rearward of the longitudinally

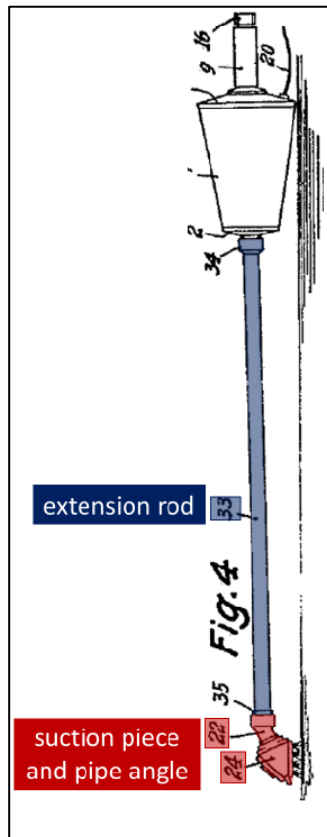
extending conduit axis when the hand vacuum cleaner is mounted to the rigid air flow conduit. Peter's **cyclone axis of rotation** is rearward of the **longitudinally extending extension rod axis** when the hand vacuum cleaner is mounted to the **extension rod 33**, as shown in the annotated image below:



Ex. 1007, Fig. 4.

371. Peter teaches the rigid air flow conduit extends generally vertically upwardly from the surface cleaning head. When oriented as claimed, Peter's **extension rod 33** extends generally vertically upwardly from “**suction nozzle 24**” and “**pipe angle 22**,” as shown in the annotated image

below:

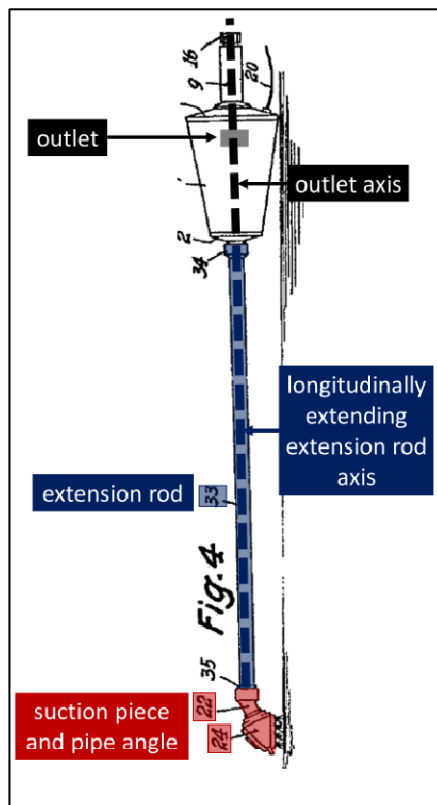


Ex. 1007, Fig. 4; *see also* Ground 3, Limitations [1c]/[1d].

372. Peter explains that “connecting threads between the pipe angle 22 and the suction piece 24” “rotate” such that “the suction piece [can] always rest well on the surface to be cleaned, whereby the inclination of the extension rod in relation to the floor can be changed,” and “rotatability between the vacuum cleaner housing and [the] suction piece” can occur. Ex. 1007, 2, claim 4.

373. Regarding Claim 14, as I explain for Claim 7, Peter teaches an outlet conduit with an axis. *See* Ground 3, Claim 7. Further, Peter’s **outlet axis**

is rearward of the **longitudinally extending extension rod axis** when oriented as claimed, as shown in the annotated image below:



Ex. 1007, Fig. 4.

4. **The Combined Teachings of Peter and Neroni Render Obvious Claims 3, 5, and 15**

Reference Number	Claim Limitation
[3]	“The surface cleaning apparatus of claim 2 wherein a projection of the longitudinally extending conduit axis intersects the hand grip portion when the hand vacuum cleaner is mounted to the rigid air flow conduit.”
[5]	“The surface cleaning apparatus of claim 1 wherein a projection of the longitudinally extending conduit axis intersects the hand grip portion when the hand vacuum cleaner is mounted to the rigid air flow conduit.”
[15]	“The surface cleaning apparatus of claim 14 wherein a projection of the longitudinally extending conduit axis intersects a hand grip portion of the handle when the hand vacuum cleaner is mounted to the rigid air flow conduit.”

374. As I explained in Sections X.C.2 and X.C.3, Peter in combination with Neroni renders obvious Claims 1, 2, and 14 of the '550 patent.

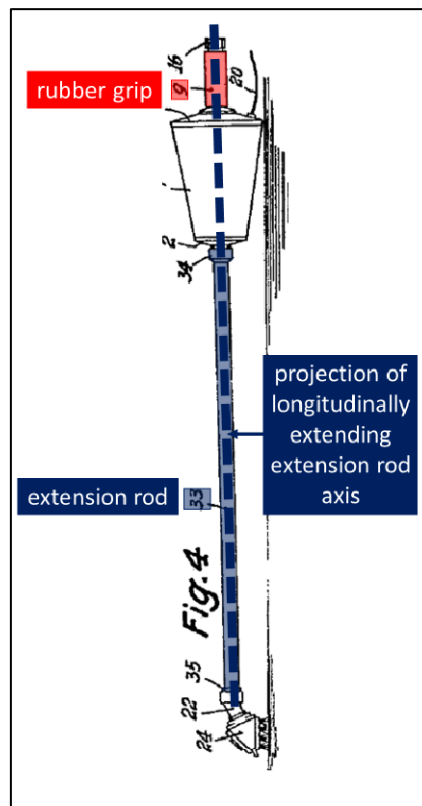
375. Peter in combination with Neroni teaches the surface cleaning apparatus of claim 2 wherein a projection of the longitudinally extending conduit axis intersects the hand grip portion when the hand vacuum cleaner is mounted to the rigid air flow conduit (Claim 3).

376. Peter in combination with Neroni teaches the surface cleaning apparatus of claim 1 wherein a projection of the longitudinally extending conduit axis intersects the hand grip portion when the hand vacuum cleaner is mounted to the rigid air flow conduit (Claim 5).

377. Peter in combination with Neroni teaches the surface cleaning apparatus of claim 14 wherein a projection of the longitudinally extending conduit

axis intersects a hand grip portion of the handle when the hand vacuum cleaner is mounted to the rigid air flow conduit (Claim 15).

378. Peter teaches a projection of the longitudinally extending conduit axis intersects the hand grip portion when the hand vacuum cleaner is mounted to the rigid air flow conduit. A **projection of Peter's longitudinally extending extension rod axis** intersects Peter's "**rubber grip 9**" when Peter's cleaner is mounted to **extension rod 33**, as shown in the annotated image below:



Ex. 1007, Fig. 4.

379. Further, when modified to pivot the handle angle as I described in

Limitation [1a.1], the projection likewise intersects Peter's rubber grip.

See Ground 3, Limitation [1a.1].

**5. The Combined Teachings of Peter and Neroni Render
Obvious Claims 4, 6, 16, and 17**

Reference Number	Claim Limitation
[4]	"The surface cleaning apparatus of claim 2 wherein the suction motor axis of rotation is generally parallel to the longitudinally extending conduit axis."
[6]	"The surface cleaning apparatus of claim 1 wherein the suction motor axis of rotation is generally parallel to the longitudinally extending conduit axis."
[16]	"The surface cleaning apparatus of claim 15 wherein the suction motor axis of rotation is generally parallel to the longitudinally extending conduit axis."
[17]	"The surface cleaning apparatus of claim 12 wherein the suction motor axis of rotation is generally parallel to the longitudinally extending conduit axis."

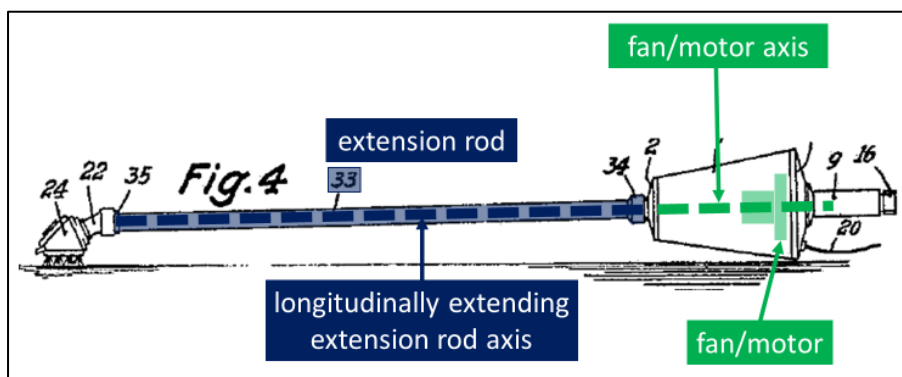
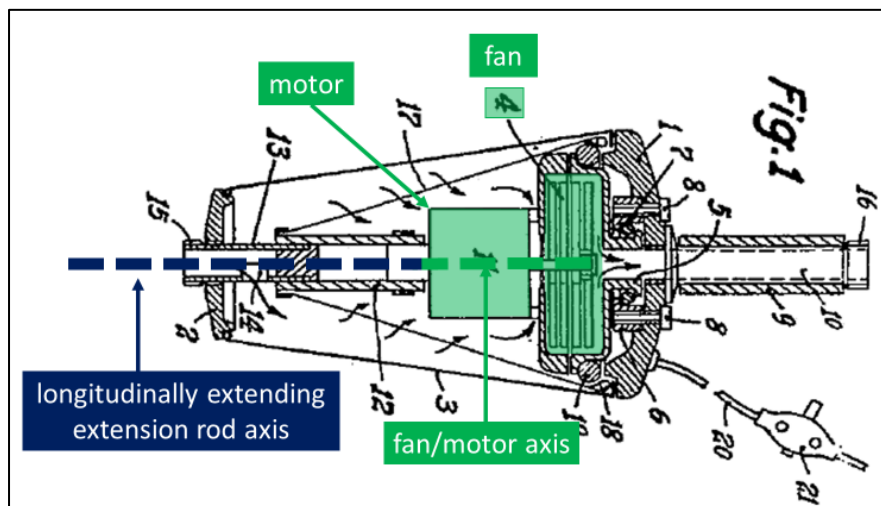
380. As I explained in Sections X.C.2, X.C.3, and X.C.4, Peter in combination with Neroni renders obvious Claims 1, 2, 12, and 15 of the '550 patent.

381. Peter in combination with Neroni teaches the surface cleaning apparatus of claim 2 wherein the suction motor axis of rotation is generally parallel to the longitudinally extending conduit axis (Claim 4).

382. Peter in combination with Neroni teaches the surface cleaning apparatus of claim 1 wherein the suction motor axis of rotation is generally parallel to the longitudinally extending conduit axis (Claim 6).

383. Peter in combination with Neroni teaches the surface cleaning apparatus

- of claim 15 wherein the suction motor axis of rotation is generally parallel to the longitudinally extending conduit axis (Claim 16).
384. Peter in combination with Neroni teaches the surface cleaning apparatus of claim 12 wherein the suction motor axis of rotation is generally parallel to the longitudinally extending conduit axis (Claim 17).
385. Peter teaches the suction motor axis of rotation is generally parallel to the longitudinally extending conduit axis. Peter's **fan/motor axis** is generally parallel to the **longitudinally extending extension rod axis**, as shown in the annotated images below:



Ex. 1007, Figs. 1, 4.

386. As I explained, in my opinion, a POSA would understand that co-axial axes are “generally parallel.” *See* Ground 1, Limitation [1c]. Thus, Peter’s suction motor axis of rotation is generally parallel to Peter’s longitudinally extending conduit axis.

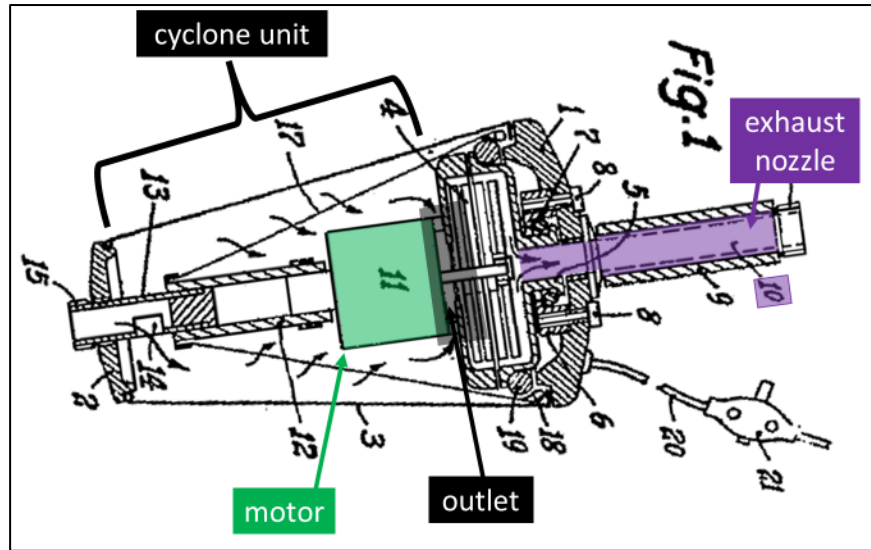
6. **The Combined Teachings of Peter and Neroni Render Obvious Claim 7**

Reference Number	Claim Limitation
[7]	“The surface cleaning apparatus of claim 1 wherein the cyclone unit has an outlet conduit and the outlet conduit extends in a direction that is generally parallel to the cyclone axis of rotation.”

387. As I explained in Section X.C.2, Peter in combination with Neroni renders obvious Claim 1 of the ’550 patent.

388. Peter in combination with Neroni teaches the surface cleaning apparatus of claim 1 wherein the cyclone unit has an outlet conduit and the outlet conduit extends in a direction that is generally parallel to the cyclone axis of rotation (Claim 7).

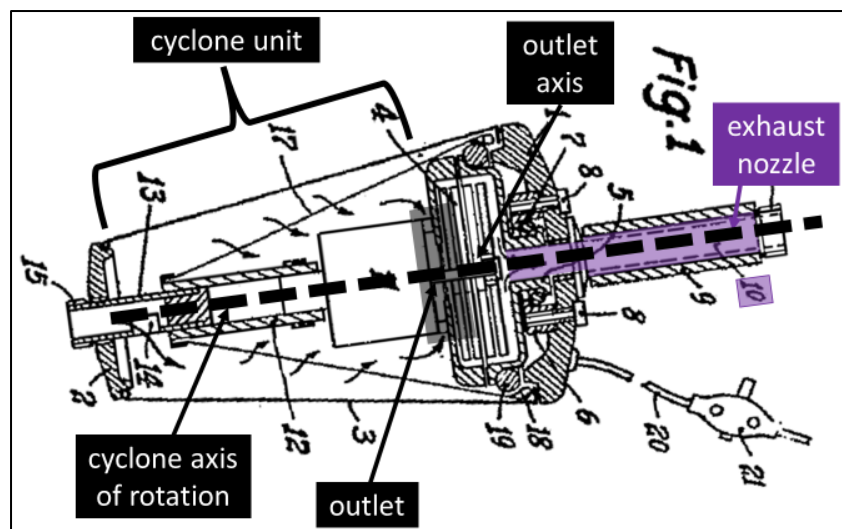
389. Peter teaches the cyclone unit has an outlet conduit. Peter explains that, in use, air exits the **cyclone unit** through an **outlet** behind “**motor 11**” before exiting through “**exhaust nozzle 10**,” as shown in the annotated image below:



Ex. 1007, 2, Fig. 1.

390. In my opinion, a POSA would understand that Peter's outlet is an outlet conduit because it is where air exits the cyclone unit.

391. Peter teaches the outlet conduit extends in a direction that is generally parallel to the cyclone axis of rotation. Peter's **outlet** extends in a direction that is generally parallel to the **cyclone axis of rotation**, as shown in the annotated image below:



Ex. 1007, Fig .1.

392. As I explained, in my opinion, a POSA would understand that co-axial axes are “generally parallel.” *See* Ground 1, Limitation [1c].

7. The Combined Teachings of Peter and Neroni Render Obvious Claim 8

Reference Number	Claim Limitation
[8]	“The surface cleaning apparatus of claim 1 wherein the rigid air flow conduit is removably attachable to the hand vacuum cleaner air inlet.”

393. As I explained in Section X.C.2, Peter in combination with Neroni renders obvious Claim 1 of the '550 patent.

394. Peter in combination with Neroni teaches the surface cleaning apparatus of claim 1 wherein the rigid air flow conduit is removably attachable to the hand vacuum cleaner air inlet (Claim 8).

395. As I explained, Peter teaches the rigid air flow conduit is removably attachable to the hand vacuum cleaner air inlet. *See* Ground 3, Limitations [1c]/[1d].

8. The Combined Teachings of Peter and Neroni Render Obvious Claims 9, 11, 18, and 19

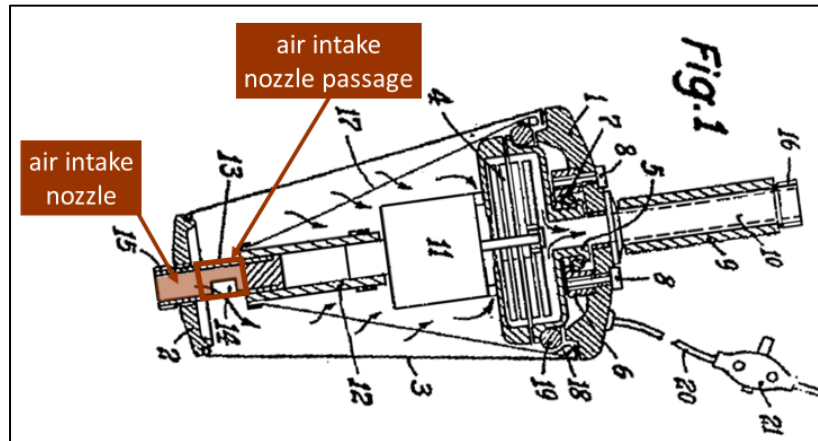
Reference Number	Claim Limitation
[9]	“The surface cleaning apparatus of claim 8 wherein the hand vacuum cleaner air inlet comprises a hand vacuum cleaner inlet passage that is generally parallel to the longitudinally extending conduit axis and the cyclone axis of rotation, the hand vacuum cleaner inlet passage having an inlet end and an outlet end, the outlet end communicating with a cyclone chamber air inlet and the electrical cables extend rearwardly adjacent the hand vacuum cleaner inlet passage.”
[11]	“The surface cleaning apparatus of claim 9 wherein the hand vacuum cleaner inlet passage is coaxial with the longitudinally extending conduit axis.”
[18]	“The surface cleaning apparatus of claim 12 wherein the rigid air flow conduit is removably attachable to the hand vacuum cleaner air inlet and the hand vacuum cleaner air inlet comprises a hand vacuum cleaner inlet passage that is generally parallel to the longitudinally extending conduit axis when the rigid air flow conduit is attached to the hand vacuum cleaner air inlet, the hand vacuum cleaner inlet passage having an inlet end and an outlet end, the outlet end communicating with an air treatment member air inlet and the electrical cables extend rearwardly adjacent the hand vacuum cleaner inlet passage.”
[19]	“The surface cleaning apparatus of claim 18 wherein the hand vacuum cleaner inlet passage is coaxial with the longitudinally extending conduit axis.”

396. As I explained in Sections X.C.2 and X.C.7, Peter in combination with Neroni renders obvious Claim 8 and 12 of the '550 patent.

397. Peter in combination with Neroni renders obvious the surface cleaning apparatus of claim 8 wherein the hand vacuum cleaner air inlet comprises a hand vacuum cleaner inlet passage that is generally parallel to the longitudinally extending conduit axis and the cyclone axis of rotation, the

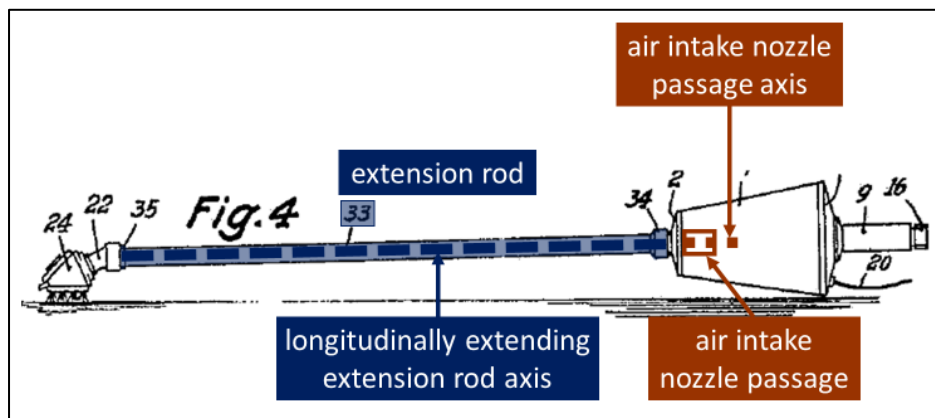
- hand vacuum cleaner inlet passage having an inlet end and an outlet end, the outlet end communicating with a cyclone chamber air inlet and the electrical cables extend rearwardly adjacent the hand vacuum cleaner inlet passage (Claim 9).
398. Peter in combination with Neroni renders obvious the surface cleaning apparatus of claim 9 wherein the hand vacuum cleaner inlet passage is coaxial with the longitudinally extending conduit axis (Claim 11).
399. Peter in combination with Neroni renders obvious the surface cleaning apparatus of claim 12 wherein the rigid air flow conduit is removably attachable to the hand vacuum cleaner air inlet and the hand vacuum cleaner air inlet comprises a hand vacuum cleaner inlet passage that is generally parallel to the longitudinally extending conduit axis when the rigid air flow conduit is attached to the hand vacuum cleaner air inlet, the hand vacuum cleaner inlet passage having an inlet end and an outlet end, the outlet end communicating with an air treatment member air inlet and the electrical cables extend rearwardly adjacent the hand vacuum cleaner inlet passage (Claim 18).
400. Peter in combination with Neroni renders obvious the surface cleaning apparatus of claim 18 wherein the hand vacuum cleaner inlet passage is coaxial with the longitudinally extending conduit axis (Claim 19).

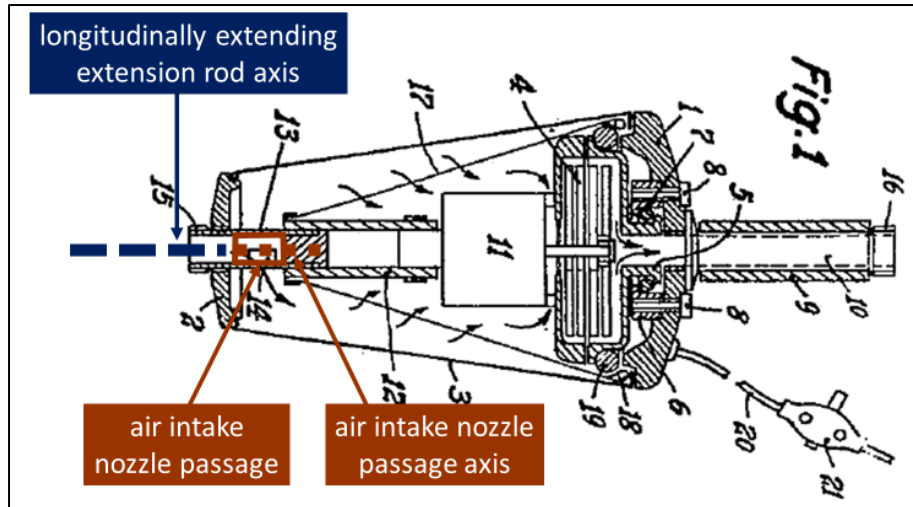
401. Peter teaches the hand vacuum cleaner air inlet comprises a hand vacuum cleaner inlet passage. Peter's "**air intake nozzle 13**" comprises an **air intake nozzle passage**, as shown in the annotated image below:



Ex. 1007, Fig. 1.

402. Peter teaches the hand vacuum cleaner inlet passage is generally parallel to the longitudinally extending conduit axis. Peter's **air intake nozzle passage** is generally parallel to the **longitudinally extending extension rod axis**, as shown in the annotated images below:





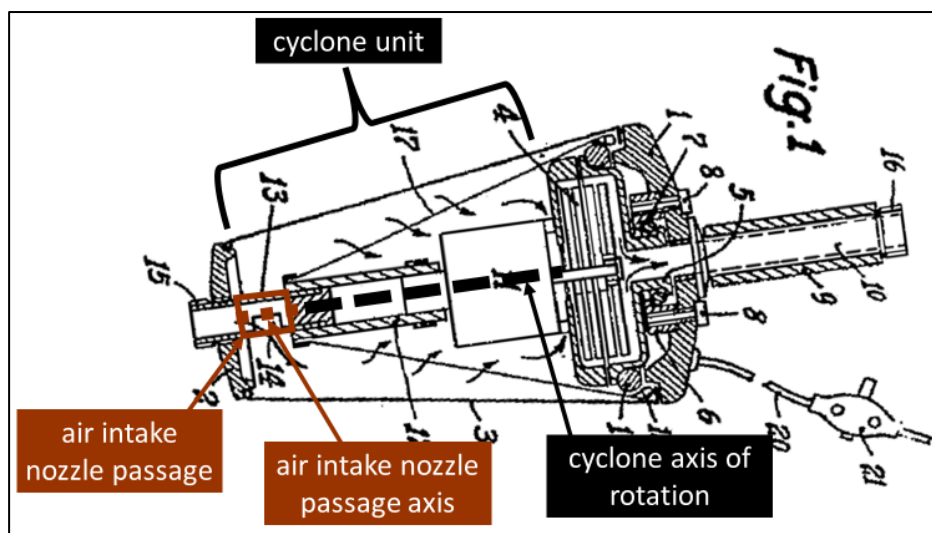
Ex. 1007, Figs. 4, 1.

403. As I explained, in my opinion, a POSA would understand that co-axial axes are “generally parallel.” *See* Ground 1, Limitation [1c].

404. Regarding Claims 11/19, Peter’s hand vacuum cleaner inlet passage is coaxial with the longitudinally extending conduit axis, as shown above.

405. Regarding Claim 18, Peter’s hand vacuum cleaner inlet passage is also generally parallel to the longitudinally extending conduit axis when the rigid air flow conduit is attached to the hand vacuum cleaner air inlet, as shown above, and for the reasons I explained in Limitation [1c]. *See* Ground 3, Limitation [1c].

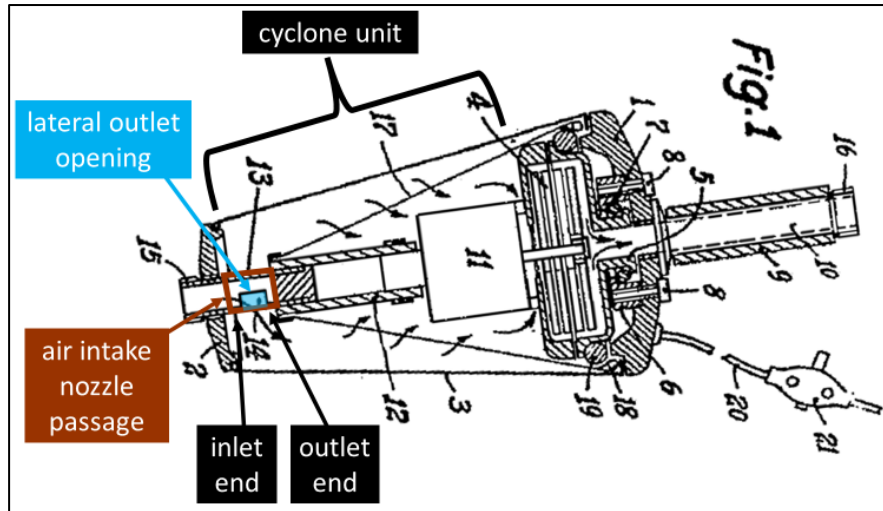
406. Peter teaches the hand vacuum cleaner inlet passage is generally parallel to the cyclone axis of rotation. Peter’s **air intake nozzle passage** is generally parallel to the **cyclone axis of rotation**, as shown in the annotated image below:



Ex. 1007, Fig. 1.

407. As I explained, in my opinion, a POSA would understand that co-axial axes are “generally parallel.” *See* Ground 1, Limitation [1c].

408. Peter teaches the hand vacuum cleaner inlet passage has an inlet end and an outlet end, the outlet end communicating with a cyclone chamber air inlet. Peter’s **air intake nozzle passage** has an **inlet end** and an **outlet end**, the outlet end communicating with a **cyclone unit** “**lateral outlet opening 14**,” as shown in the annotated image below:



Ex. 1007, 2, Fig. 1.

409. In my opinion, a POSA would understand that Peter’s air intake nozzle passage has an inlet end and an outlet end; that Peter’s “lateral opening 14” is the dust filtering unit air inlet; and that Peter’s air intake nozzle passage outlet end communicates with Peter’s cyclone chamber air inlet.

410. As I explained, Peter in combination with Neroni renders obvious electrical cables extending rearwardly adjacent the hand vacuum cleaner inlet passage. See Ground 3, Limitation [1a.3]; Ground 3, §1.

9. The Combined Teachings of Peter and Neroni Render Obvious Claim 10

Reference Number	Claim Limitation
[10]	“The surface cleaning apparatus of claim 9 wherein the cyclone chamber air inlet comprises a tangential air inlet provided at the outlet end of the hand vacuum cleaner inlet passage.”

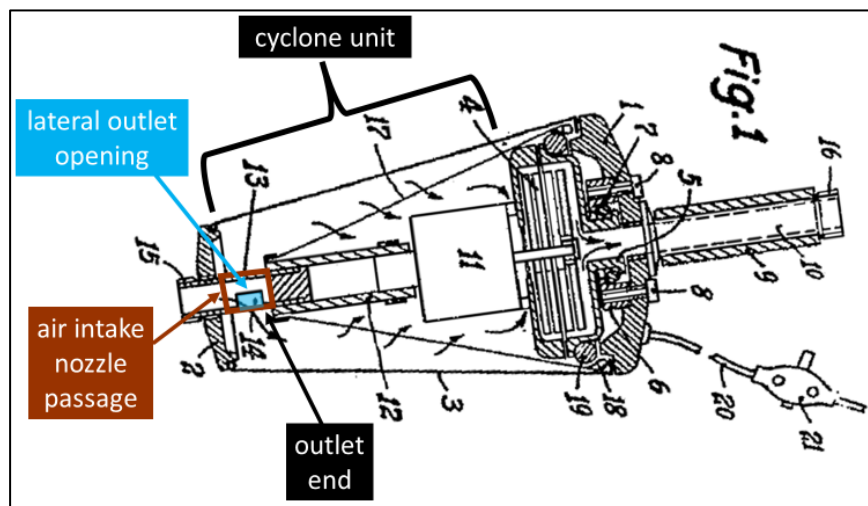
411. As I explained in Section X.C.8, Peter in combination with Neroni renders

obvious Claim 9 of the '550 patent.

412. Peter in combination with Neroni teaches the surface cleaning apparatus of claim 9 wherein the cyclone chamber air inlet comprises a tangential air inlet provided at the outlet end of the hand vacuum cleaner inlet passage (Claim 10).

413. As I explained, Peter teaches a hand vacuum cleaner air inlet passage with an outlet end and a cyclone chamber air inlet. *See* Ground 3, Claim 9.

414. Peter teaches the cyclone chamber air inlet comprises a tangential air inlet provided at the outlet end of the hand vacuum cleaner inlet passage. Peter's "**lateral outlet opening 14**" directs air towards the sidewall of the **cyclone unit** as it enters the cleaner, as shown in the annotated image below:



Ex. 1007, 2, Fig. 1.

415. In my opinion, a POSA would understand that Peter's "lateral outlet

opening 14” is a tangential air inlet because it directs air tangentially towards the sidewall of the cyclone unit. In my opinion, POSA would also understand that Peter’s “lateral outlet opening 14” is located at the **outlet end** of the **air intake nozzle passage**.

10. **The Combined Teachings of Peter and Neroni Render Obvious Claim 13**

Reference Number	Claim Limitation
[13]	“The surface cleaning apparatus of claim 12 wherein the air treatment member air outlet comprises an outlet conduit having an outlet conduit axis that is generally parallel to longitudinally extending conduit axis.”

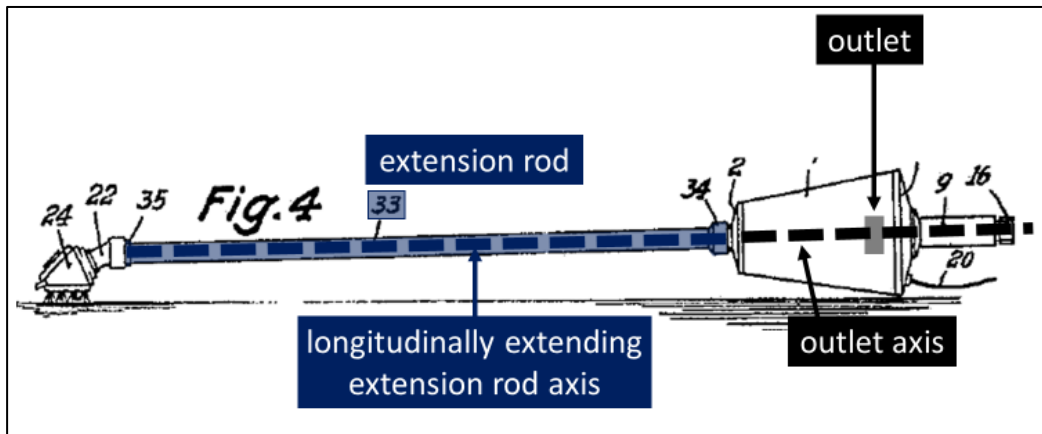
416. As I explained in Section X.C.2, Peter in combination with Neroni renders obvious Claim 12 of the ’550 patent.

417. Peter in combination with Neroni teaches the surface cleaning apparatus of claim 12 wherein the air treatment member air outlet comprises an outlet conduit having an outlet conduit axis that is generally parallel to longitudinally extending conduit axis (Claim 13).

418. As I explained, Peter teaches the cyclone unit air outlet comprises an outlet conduit. *See* Ground 3, Claim 7.

419. Peter teaches the outlet conduit has an outlet conduit axis that is generally parallel to the longitudinally extending conduit axis. Peter’s **outlet** has an **outlet axis** that is generally parallel to the **longitudinally extending**

extension rod axis, as shown in the annotated image below:



Ex. 1007, Fig. 4.

420. As I explained, in my opinion, a POSA would understand that co-axial axes are “generally parallel.” See Ground 1, Limitation [1c].

11. The Combined Teachings of Peter and Neroni Render Obvious Claim 21

Reference Number	Claim Limitation
[21]	“The surface cleaning apparatus of claim 20 wherein the hand vacuum cleaner body comprises a suction motor and fan assembly housing and the handle extends from a sidewall of the suction motor and fan assembly housing.”

421. As I explained in Section X.C.2, Peter in combination with Neroni renders obvious Claim 20 of the ’550 patent.

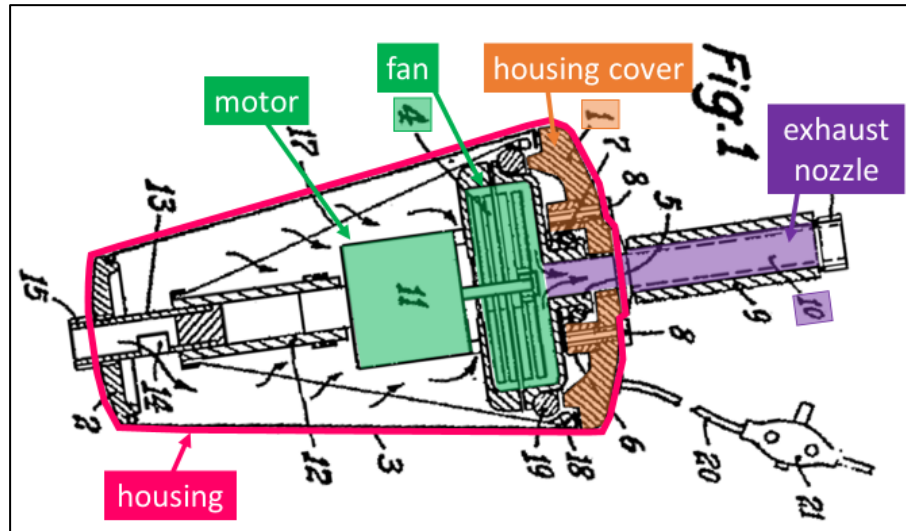
422. Peter in combination with Neroni teaches the surface cleaning apparatus of claim 20 wherein the hand vacuum cleaner body comprises a suction motor and fan assembly housing and the handle extends from a sidewall of

the suction motor and fan assembly housing (Claim 21).

423. As I explained, Peter teaches the hand vacuum cleaner body comprises a suction motor and fan assembly housing. *See* Ground 3, Limitation [1a.1].

424. As I explained, Peter teaches a handle. *See* Ground 3, Limitation [1a.1].

425. Peter further teaches the handle extends from a sidewall of the suction motor and fan assembly housing. Peter’s “**exhaust nozzle 10** [is] inserted into the **housing cover 1**,” as shown in the annotated image below:

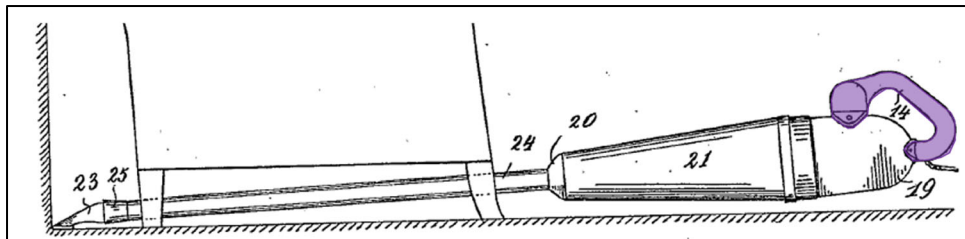
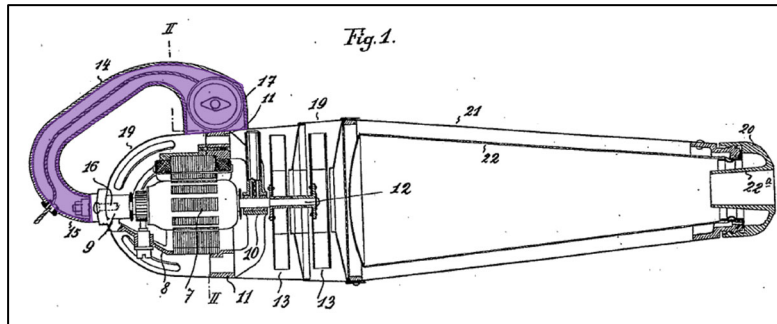


Ex. 1007, Fig. 1.

426. In my opinion, a POSA would understand that “housing cover 1” is a sidewall of the suction motor and fan assembly housing from which “exhaust nozzle 10” extends.

427. Alternatively, in my opinion, a POSA would have been motivated to modify Peter’s handle by relocating it, extending it, (or by placing a second

handle) on the top side of Peter's housing. This would further Peter's purpose of providing "easy" and "effortless[]" cleaning "under tables, chairs," and "[p]articularly hard-to-reach areas," because a user would not need to bend down as far, and would be especially beneficial for users with less flexibility or mobility. Ex. 1007, 2. Further, **handles** extending from the top of the vacuum housing have existed for over a century, as shown in the annotated images below:



Ex. 1014, Figs. 1, 6.

428. Modifying Peter's handle would have involved adding or substituting one known feature (a handle extending from the top of the housing and into the back) for another to achieve the predictable result of ergonomic handling. Because there were only a finite number of possible handle positions, it would have been obvious to try. In my opinion, a POSA would have a

reasonable expectation of success implementing such a handle because it would involve a simple addition of a handle or a simple substitution of one handle for another, and as shown above, provides the benefit of ergonomic cleaning in low areas, such as below furniture.

12. **The Combined Teachings of Peter and Neroni Render Obvious Claim 22**

Reference Number	Claim Limitation
[22]	“The surface cleaning apparatus of claim 1 wherein the hand vacuum cleaner inlet passage has an inlet axis and a projection of each of the inlet axis and the cyclone axis intersects the suction motor.”

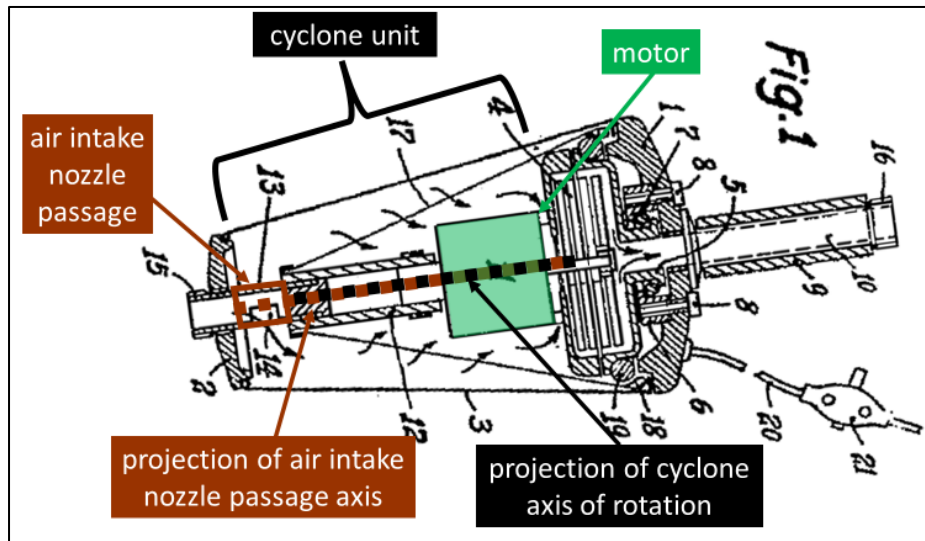
429. As I explained in Section X.C.2, Peter in combination with Neroni renders obvious Claim 1 of the '550 patent.

430. Peter in combination with Neroni teaches the surface cleaning apparatus of claim 1 wherein the hand vacuum cleaner inlet passage has an inlet axis and a projection of each of the inlet axis and the cyclone axis intersects the suction motor (Claim 22).

431. As I explained, Peter teaches the hand vacuum cleaner inlet passage has an inlet axis. *See* Ground 3, Claim 9.

432. Peter teaches a projection of each of the inlet axis and the cyclone axis intersects the suction motor. A projection of Peter's **air intake nozzle passage axis** and **cyclone axis of rotation** intersects the **motor 11**, as

shown in the annotated image below:



Ex. 1007, Fig. 1.

13. The Combined Teachings of Peter and Neroni Render Obvious Claim 23

Reference Number	Claim Limitation
[23]	“The surface cleaning apparatus of claim 12 wherein the hand vacuum cleaner air inlet comprises a hand vacuum cleaner inlet passage that has an inlet axis, and when the rigid air flow conduit extends between the cleaning head air outlet and the hand vacuum cleaner air inlet, the inlet axis is generally parallel to the longitudinally extending conduit axis and a projection of each of the inlet axis and an outlet conduit axis of the air treatment member intersects the suction motor.”

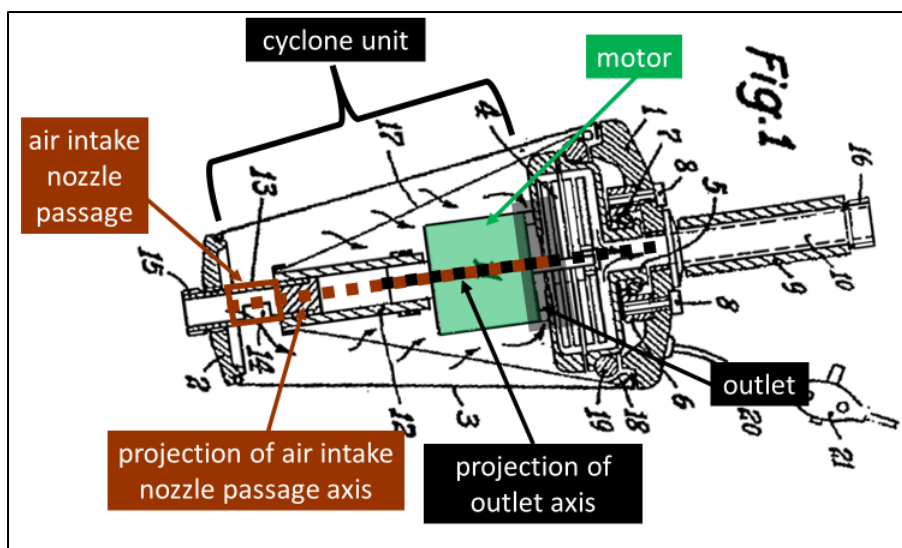
433. As I explained in Section X.C.2, Peter in combination with Neroni renders obvious Claim 12 of the '550 patent.

434. Peter in combination with Neroni teaches the surface cleaning apparatus of claim 12 wherein the hand vacuum cleaner air inlet comprises a hand

vacuum cleaner inlet passage that has an inlet axis, and when the rigid air flow conduit extends between the cleaning head air outlet and the hand vacuum cleaner air inlet, the inlet axis is generally parallel to the longitudinally extending conduit axis and a projection of each of the inlet axis and an outlet conduit axis of the air treatment member intersects the suction motor (Claim 23).

435. As I explained, Peter teaches the hand vacuum cleaner air inlet comprises a hand vacuum cleaner inlet passage that has an inlet axis, and when the rigid air flow conduit extends between the cleaning head air outlet and the hand vacuum cleaner air inlet, the inlet axis is generally parallel to the longitudinally extending conduit axis. *See* Ground 3, Limitation [1c], Claim 9.

436. Peter teaches a projection of each the inlet axis and an outlet conduit axis of the air treatment member intersects the suction motor. Peter teaches a projection of each of Peter's **air intake nozzle passage** and **outlet axis** of the **cyclone unit** (air treatment member) intersects the **motor 11**, as shown in the annotated image below:



Ex. 1007, Fig. 1.

14. **The Combined Teachings of Peter and Neroni Render Obvious Claim 24**

Reference Number	Claim Limitation
[24]	“The surface cleaning apparatus of claim 20 wherein the hand vacuum cleaner comprises a hand vacuum cleaner inlet passage that has an inlet axis, and when the rigid air flow conduit extends between the cleaning head air outlet and the hand vacuum cleaner air inlet, the inlet axis is generally parallel to the longitudinally extending conduit axis and a projection of each of the inlet axis and the cyclone axis intersects the suction motor.”

437. As I explained in Section X.C.2, Peter in combination with Neroni renders obvious Claim 20 of the '550 patent.

438. Peter in combination with Neroni teaches the surface cleaning apparatus of claim 20 wherein the hand vacuum cleaner comprises a hand vacuum cleaner inlet passage that has an inlet axis, and when the rigid air flow

conduit extends between the cleaning head air outlet and the hand vacuum cleaner air inlet, the inlet axis is generally parallel to the longitudinally extending conduit axis and a projection of each of the inlet axis and the cyclone axis intersects the suction motor (Claim 24).

439. As I explained, Peter in combination with Neroni teaches the hand vacuum cleaner comprises a hand vacuum cleaner inlet passage that has an inlet axis, and when the rigid air flow conduit extends between the cleaning head air outlet and the hand vacuum cleaner air inlet, the inlet axis is generally parallel to the longitudinally extending conduit axis and a projection of each of the inlet axis and the cyclone axis intersects the suction motor. *See* Ground 3, Claims 9/22.

15. The Combined Teachings of Peter and Neroni Render Obvious Claims 25, 26, and 27

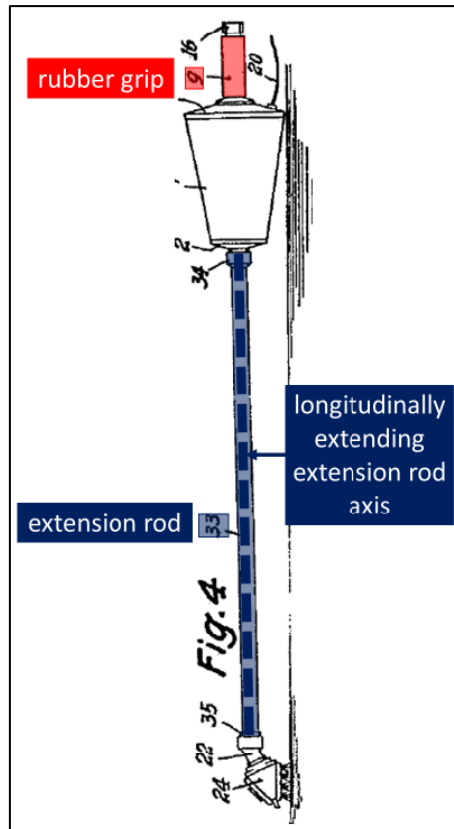
Reference Number	Claim Limitation
[25]	“The surface cleaning apparatus of claim 1, wherein when the hand vacuum cleaner is mounted to the downstream end of the rigid air flow conduit and the rigid air flow conduit is in an upright storage position, the handle is at an upper end of the surface cleaning apparatus and a portion of the handle is rearward of the wand axis.”
[26]	“The surface cleaning apparatus of claim 12, wherein when the hand vacuum cleaner is mounted to the downstream end of the rigid air flow conduit and the rigid air flow conduit is in an upright storage position, the handle is at an upper end of the surface cleaning apparatus and a portion of the handle is rearward of the wand axis.”
[27]	“The surface cleaning apparatus of claim 20, wherein when the hand vacuum cleaner is mounted to the downstream end of the rigid air flow conduit and the rigid air flow conduit is in an upright storage position, the handle is at an upper end of the surface cleaning apparatus and a portion of the handle is rearward of the wand axis.”

440. As I explained in Section X.C.2, Peter in combination with Neroni renders obvious Claims 1, 12, and 20 of the ’550 patent.

441. Peter in combination with Neroni teaches the surface cleaning apparatus of claim 1, wherein when the hand vacuum cleaner is mounted to the downstream end of the rigid air flow conduit and the rigid air flow conduit is in an upright storage position, the handle is at an upper end of the surface cleaning apparatus and a portion of the handle is rearward of the wand axis (Claim 25).

442. Peter in combination with Neroni teaches the surface cleaning apparatus of claim 12, wherein when the hand vacuum cleaner is mounted to the downstream end of the rigid air flow conduit and the rigid air flow conduit

- is in an upright storage position, the handle is at an upper end of the surface cleaning apparatus and a portion of the handle is rearward of the wand axis (Claim 26).
443. Peter in combination with Neroni teaches the surface cleaning apparatus of claim 20, wherein when the hand vacuum cleaner is mounted to the downstream end of the rigid air flow conduit and the rigid air flow conduit is in an upright storage position, the handle is at an upper end of the surface cleaning apparatus and a portion of the handle is rearward of the wand axis (Claim 27).
444. As I explained, Peter teaches the hand vacuum cleaner is mounted to the downstream end of the rigid air flow conduit. *See* Ground 3, Limitation [12c].
445. Peter teaches when the rigid air flow conduit is in an upright storage position, the handle is at an upper end of the surface cleaning apparatus and a portion of the handle is rearward of the wand axis. When oriented as claimed, Peter's **extension rod 33** is in an upright storage position, exhaust nozzle 10 with a **rubber grip 9** is at an upper end of the vacuum and a portion of exhaust nozzle 10 is rearward of the **extension rod's axis**, as shown in the annotated image below:



Ex. 1007, Fig. 4.

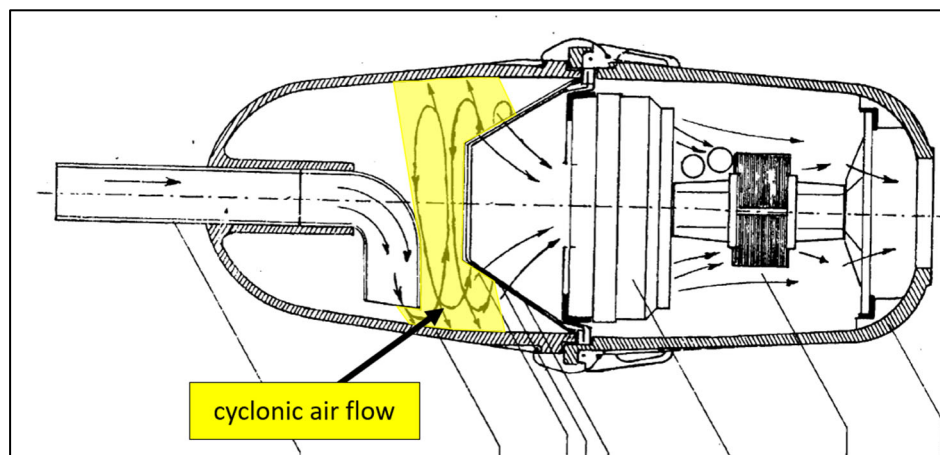
D. The Peter/Neroni/Martelliere/Jansen Combination

1. Martelliere Teaches Cyclonic Airflow That A POSA Would Have Been Motivated To Incorporate Into Peter (Limitations [1a.2]/[12a.2]/[20a.2]/[28a.2], Claim 9)

446. In my opinion, a POSA would understand that Peter's teaching of "lateral opening 14 which opens into the interior of the housing," creates cyclonic airflow by releasing air tangentially into Peter's conical chamber, "housing," however, to the extent PO argues otherwise, it would have been obvious to incorporate Martelliere's express teachings of creating cyclonic airflow using a tangential pipe for the same purpose. *See* Ground 3,

Limitations [1a.2]/[12a.2]/[20a.2]/[28a.2], Claim [9]; Ex. 1007, 2, Fig. 1.

447. Martelliere teaches a cyclonic vacuum cleaner that applies “the ‘Whirlwind’ principle” to separate dust from air, which, in my opinion, a POSA understands is a cyclonic air filtration unit, using a tangential pipe, as shown in the annotated image below:



Ex. 1010, 1, Fig. 1.

448. Martelliere explains that, in use, dirty air is “sucked tangentially to the interior wall of the transparent container,” the cyclonic airflow separates dirt from air, and the separated dirt is “deposited in the bottom of the container, after having separated from the air.” Ex. 1010, 1.

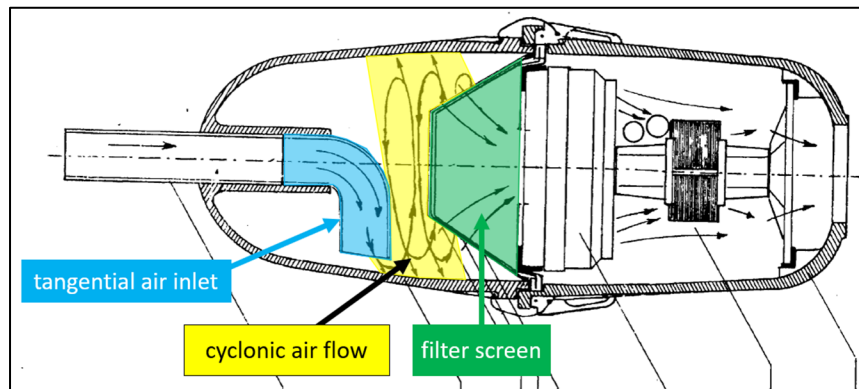
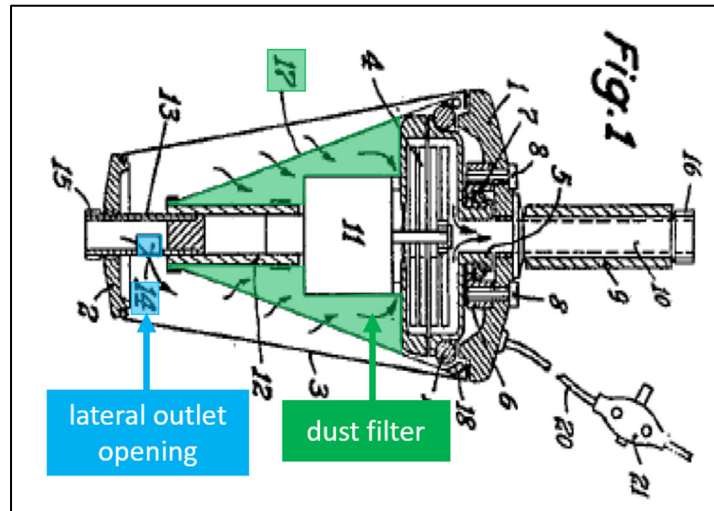
449. In my opinion, a POSA would have been motivated to employ cyclonic filtration with Peter using Martelliere’s teachings of a tangential pipe. Martelliere’s teaching of “the ‘Whirlwind’ principle” (i.e., cyclonic filtration) was well known by the time of the ’550Patent’s alleged

invention. In my opinion, a POSA would have understood that including cyclonic filtration had certain advantages, including because cyclonic separators maintain a consistently high level of suction, even as the dust collecting chamber fills with dirt. As Martelliere explains, “the ‘Whirlwind’ principle” “prevents clogging” and creates “stable suction.” Ex. 1010, 1. And as Martelliere recognizes, “dust filter[s]” must be replaced after their “pores ... become blocked,” which does not occur with cyclonic filtration units. *Id.*

450. In my opinion, a POSA would have reasonably expected success incorporating Martelliere’s cyclonic airflow teachings into Peter. Peter already teaches creating tangential airflow using “lateral opening 14,” and, in my opinion, a POSA would have been motivated to add a tangential pipe as taught in Martelliere, which serves the same purpose of creating tangential airflow, because doing so would have involved nothing more than simple substitution of known elements (a tangential pipe in place of a tangential opening) to achieve the predictable result of creating cyclonic airflow, and would have had a reasonable expectation of success in doing so.

451. Further, Peter and Martelliere are analogous art with similar configurations, including for filtration, which would, in my opinion,

further motivate a POSA to incorporate Martelliere's teachings, as shown in the annotated images below:



Ex. 1007, Fig. 1; Ex. 1010, Fig. 1.

2. **Jansen Teaches A Handle Having A Hand Grip Portion That Extends Upwardly and Forwardly That A POSA Would Have Been Motivated To Incorporate Into Peter (Limitations [1a.1]/[28a.1])**

452. While Peter teaches a hand grip portion of a handle, “rubber grip 9,” that extends upwardly and forwardly when Peter’s hand vacuum cleaner body bottom is on a horizontal surface, it also would have been obvious to

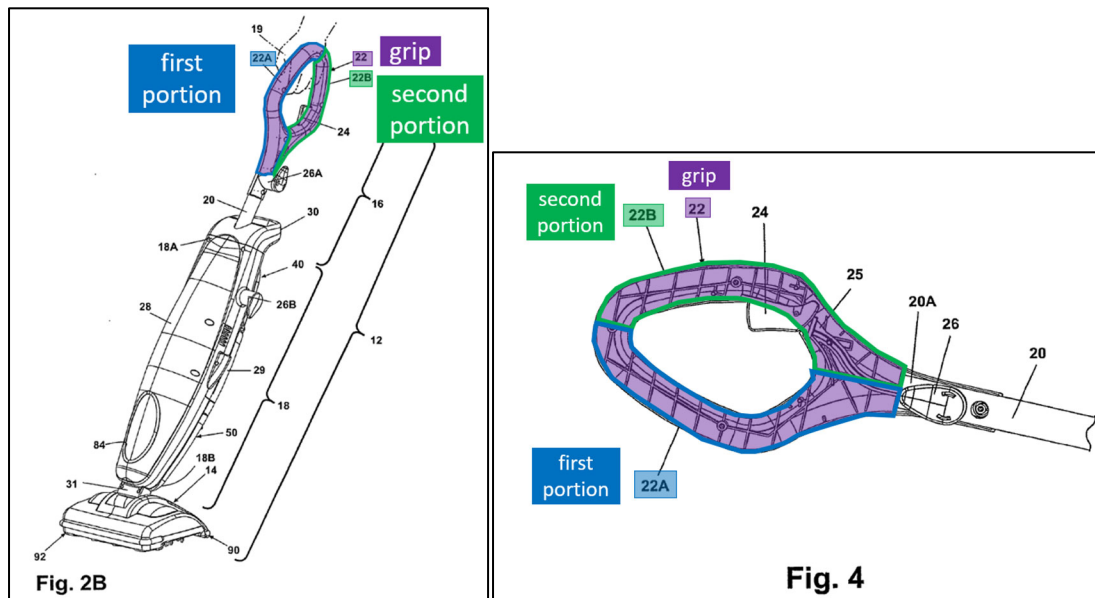
incorporate Jansen's upward/forward handle teachings into Peter. *See* Ground 3, Limitations [1a.1]/[28a.1], Ex. 1007, 2, Figs. 1-4.

453. Jansen teaches a bi-directional floor-cleaning tool that performs wet and dry suction and has a bi-directional handle to accommodate the bi-directional cleaner:

Still further according to the invention, a wet/dry bare floor cleaner according to the invention comprises a base; a handle pivotally connected to the base for movement between a dry suction position and a wet suction position; a recovery system comprising a wet suction nozzle, a dry suction nozzle, a recovery tank for receiving wet and dry debris, a working air conduit extending from each of the dry suction nozzle and the wet suction nozzle to the recovery tank, a diverter mounted in the working air conduit and movable between a dry suction position and a wet suction position for selectively at least partially blocking working air flow from the wet suction nozzle and the dry suction nozzle, respectively, to the recovery tank; and a motor/fan assembly mounted to one of the handle and the base and adapted to create a working air flow in the working air conduit from at least one of the dry suction nozzle and the wet nozzle and to the recovery tank; and the improvement comprising a bi-directional grip on the handle having a first portion adapted to be conveniently gripped by a hand of the user when the handle is in the dry suction position and a second portion which is adapted to be conveniently gripped by the hand of the user in substantially the same relative position when the handle is in the wet suction position.

Ex. 1008 ¶30.

454. Jansen teaches “a handle pivotably connected to the base for movement between” two positions, and has a “**bi-directional grip 22**” with a “**first portion 22A**” and a “**second portion 22B,**” as shown in the annotated images below:



Ex. 1008 ¶¶65-66, Figs. 2B, 4.

455. Jansen explains that “[b]ecause the grip 22 is bilaterally symmetrical, the first and second portions 22A, 22B can be grasped by the user in substantially the same relative position when the handle assembly 12 is in the first and second positions, respectively.” Ex. 1008 ¶66.

456. In my opinion, a POSA would have been motivated to modify Peter’s handle having a hand grip portion, “exhaust nozzle 10” having “rubber grip 9,” to have a “bi-directional,” “bilaterally symmetrical” shape as Jansen

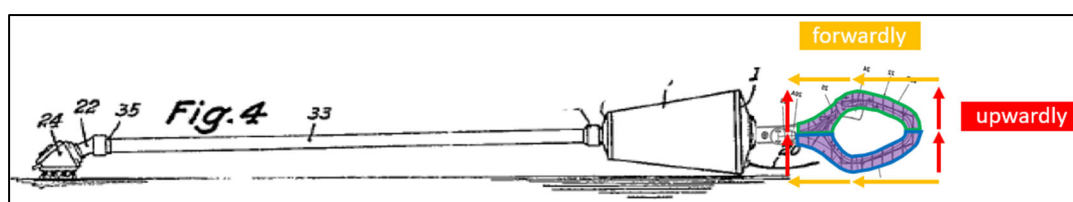
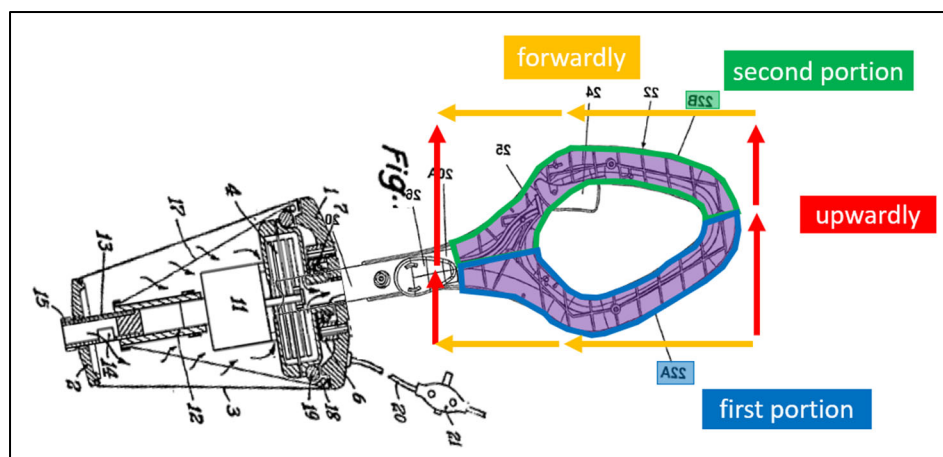
teaches. Ex. 1007, 2, Figs. 1-4; Ex. 1008 ¶¶30, 65-66, Figs. 2B, 4. Like Jansen, Peter teaches a multi-directional floor-cleaning tool (with openings on its top and bottom) and that “achieves a special articulation which allows the suction edges of the suction piece to always rest well on the surface to be cleaned, whereby the inclination of the extension rod in relation to the floor can be changed,” which “makes it easy to work under tables, chairs, and similar furniture,” as well as “hard-to-reach areas of the floor or walls.” Ex. 1007, 2.

457. As Jansen explains, “[b]ecause the grip 22 is bilaterally symmetrical, the first and second portions 22A, 22B can be grasped by the user in substantially the same relative position,” and “the feel of the grip 22 in the hand 19 is generally the same regardless of the orientation of the handle assembly 12.” Ex. 1008 ¶66. In my opinion, a POSA would recognize this increased user comfort would have certain advantages over Peter’s straight “rubber grip 9.” For example, the user would be able to grip the angled handle more loosely, and clean under low furniture more easily, as they would not need to bend down as far. In my opinion, a POSA would have found this to be a simple modification of the shape of a known element (Peter’s straight “exhaust nozzle 10” having “rubber grip 9”) into another (Jansen’s “bilaterally symmetrical,” “bi-directional grip 22”

shape) to obtain the predictable result of allowing a user to manipulate Peter's vacuum cleaner comfortably in different use cases. In my opinion, a POSA would understand that when Peter's "exhaust nozzle 10" was modified to use this bilaterally symmetrical shape, it would still allow airflow through it, as it would remain hollow and would retain an air outlet, and it would still be "provided with a rubber grip 9" along its surface as Peter teaches. Ex. 1007, 2, Figs. 1-4.

458. In my opinion, a POSA would have reasonably expected success because it would have simply involved using one handle and grip shape (Jansen's "bilaterally symmetrical" shape having "bi-directional grip 22," Ex. 1008 ¶66) instead of another (Peter's straight "exhaust nozzle 10" shape having "rubber grip 9," Ex. 1007, 2, Fig. 1). In my opinion, a POSA also would be further motivated by Peter's teaching that its vacuum cleaner "parts," including "rubber grip 9," can be "rotated, individually exchanged and combined." Ex. 1007, 1-2.

459. When so modified, Peter's bilaterally symmetrical handle having a bi-directional grip is a handle having a hand grip portion that extends upwardly and forwardly when the hand vacuum cleaner body is in any position, including when positioned with the bottom on a horizontal surface, as shown in the annotated images below:



Ex. 1007, Fig. 1, 4; Ex. 1008, Fig. 4.

460. In my opinion, a POSA would understand that Jansen's “**first portion 22A**” and “**second portion 22B**” (and portions thereof) are each a hand grip portion of Jensen's handle (“**grip 22**”) that extend upwardly and forwardly.

XI. SECONDARY CONSIDERATIONS OF NON-OBVIOUSNESS

461. I am unaware of any secondary considerations of non-obviousness that provide evidence that the claims of the '550 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. I declare under penalty of perjury that the foregoing is true and correct.

Signature: 
Dr. Robert Giachetti

Dated: March 8, 2024