

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. 10,219,661

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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 1-16 of U.S. Patent No. 10,219,661 (the “’661 Patent”) in this petition for *inter partes* review (“IPR”). I refer to these as the “Challenged Claims.”
3. I have been asked to consider whether certain references invalidate the Challenged Claims.
4. I am a salaried employee of Fusion Engineering, LLC. Fusion Engineering is being compensated for my time in connection with this matter at the consulting rate of \$410 per hour. My compensation is not affected by the content of my opinions, testimony, or the outcome of this matter.
5. The prior art references on which my opinions are based are:
 - PCT Publication No. 2007/084543 (“Butler,” attached as Ex1005)
 - Japanese Patent Publication No. JPS48107459U (“Tsukuji,” attached as Ex1007)
 - French Patent No. 1,094,603 (“Martelliere,” attached as Ex1009)

- Chinese Patent Publication No. CN103784081A (“Wenjie,” attached as Ex1023)
6. In my opinion, the Challenged Claims are invalid based on the following:
- Butler anticipates claims 1-16.
 - Butler renders claims 1-16 obvious.
 - The combinations of Tsukuji and Martelliere render claims 1-5, 7-12, 15, and 16 obvious.
 - The combination of Tsukuji, Martelliere, and Wenjie renders claims 6, 13, and 14 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 Senior Vice President 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 holistic 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 considered the materials referenced herein, including the '661 patent and its file history, the Butler, Tsukuji, Martelliere, and Wenjie prior art references on which my opinions are based, and other documents listed in the Exhibit List of the Petition. 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, *Certain Surface Cleaning Devices and Components Thereof*, Dkt. No. 337-TA-1404 (the "ITC Litigation").

IV. LEGAL PRINCIPLES

33. Dyson's counsel has informed me of certain legal standards. I have applied these understandings in my analysis as detailed below. I am not an attorney and offer no legal opinions.
34. I have been informed and understand that a patent claim is invalid if it is obvious, and that obviousness requires that the claim be obvious from

the perspective of a person of ordinary skill in the relevant art at the time of the alleged invention. I have been informed and understand that a claim may be obvious in view of a single prior art reference, or may be obvious in view of a combination of two or more prior art references.

35. I have been informed and understand that the level of ordinary skill in the art may be determined by considering such factors as the education level of those working in the field, the sophistication of the technology, the types of problems encountered in the art, the prior art solutions to those problems, and the speed at which innovations are made. I have been informed and understand that not all of these factors need be considered and that one or more of these factors may control.
36. I have been informed and understand that an obviousness analysis is based on several factors, including the scope and content of the prior art, what differences, if any, existed between the alleged invention and the prior art, and the level of ordinary skill in the pertinent art at the time of the alleged invention.
37. I have been informed and understand that to determine whether a claim is obvious, it is appropriate to consider, among other factors:
- (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.

38. 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.
39. 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.

40. 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

41. In my opinion, a Person of Ordinary Skill in the Art ("POSA") in the

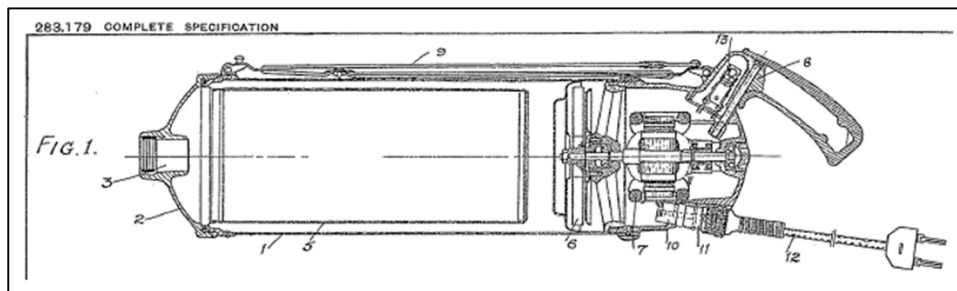
subject matter of the '661 Patent would have had a bachelor's degree in mechanical engineering or a similar field and 2-3 years of experience in machine design, including machines that include fluid dynamics or fluid paths, such as vacuum cleaners. Additional education could offset less experience and vice versa, and a POSA could have also obtained similar knowledge and experience through other means.

42. 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

43. The Challenged Claims are directed to hand vacuum cleaner configurations and features, including alignment of certain vacuum components, "a dirty air inlet," "a handle," "a suction motor and fan assembly," and "a cyclone unit." Ex1001, Claims.
44. In my opinion, these features and configurations were well-known, as were the '661 Patent's claims' remaining elements. *Id.*
45. For over a century, vacuum cleaners have been using the features that are described in the '661 Patent, such as a suction motor that draws

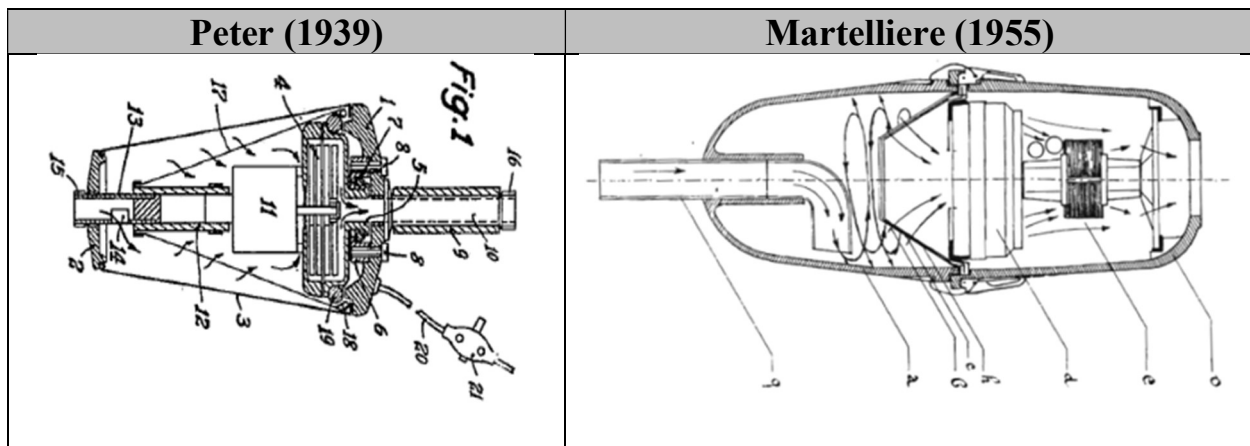
dirty air into a dirty air inlet, filtration processes that clean the air, and clean air outlets that exhaust the cleaned air. Many early vacuum cleaners, such as the vacuum cleaner described in U.K Patent Publication No. GB283,179 to Inventia Patent-Verwertungs-Gesellschaft (“IPVG”), used disposable dust bags to separate dust from the air, as shown in the figure below:



IPVG, Fig. 1; *see also id.*, 1:22-33 (“According to the present invention the apparatus comprises a casing containing a motor driven fan and a dust bag or like member through which the air stream passes and provided with a handle by which the apparatus may be readily lifted during operation, the handle being formed at its end to be connected to the casing with a conical portion fitting in a conical bore of the casing and secured therein by a longitudinally acting screw arranged eccentrically of the bore.”).

46. Those skilled in the art at the time of the '661 Patent's alleged invention recognized that this dust-bag method is costly (dust bags must be replaced), loses effectiveness during use (dust-bag cleaners lose suction

as they fill), and prevents the user from seeing how full the bag is, leaving a user to guess as to when to empty or replace the bag. However, those skilled in the art also recognized, more than 80 years ago, that vacuum cleaners that use cyclonic separation units—which use cyclonic airflow to separate heavier-than-air dust particles from the dirty air—have certain advantages over vacuum cleaners that use dust bag filtration units, as was taught by Swiss Patent No. CH203,675 to Peter (“Peter”) in 1939, and by French Patent No. 1,094,603 to Martelliere in 1955, as shown in the figures below:

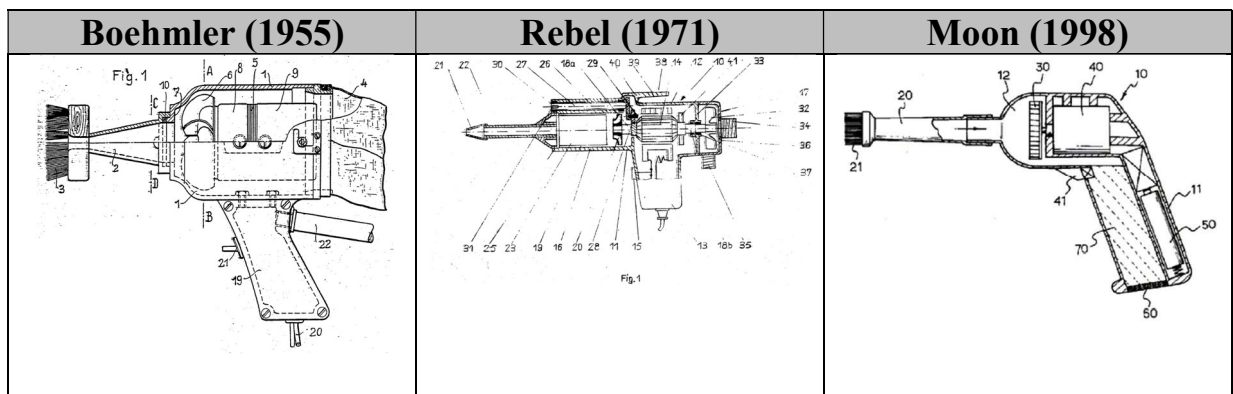


Peter, Fig. 1; Ex1009¹, 1, Fig. 1.

¹ Ex1009 is a certified English translation of Ex1008, originally published in French. Citations to Ex1009 are by page, as the English translation does not include column or line numbers.

47. For example, Martelliere explains that “[b]y application of the ‘Whirlwind’ principle,” i.e., cyclonic filtration, “the materials are deposited in the bottom of the container, after having separated from the air, before it passes through the filter screen,” which “prevent[s] clogging” and creates “stable suction,” and by using a transparent cyclonic chamber, “the user is able, when stopped, to see where the filling of the container is” and “can therefore better judge when it must be emptied.” Ex1009, 1.

48. Further, vacuum cleaners having features that assist with maneuverability and usability, such as handles positioned underneath and/or adjacent the suction motor, have also been known in the art for nearly 70 years, including as taught by German Patent No. DE1691786 to Boehmler in 1955, German Patent Publication No. DE1680208 to Rebel in 1971, and Korean Patent Publication No. KR19980020751 to Moon in 1998, as shown in the figures below:



Ex1014, Fig. 1; Ex1016, Fig. 1; Ex1018, Fig. 2.

VII. BACKGROUND OF THE '661 PATENT

49. The '661 Patent is titled "Surface Cleaning Apparatus." Ex1001, Title. The '661 Patent states that it issued on March 5, 2019, from U.S. Patent Application No. 15/085,830, filed on March 30, 2016. *Id.*, Cover. The '661 Patent states that it is a continuation of application No. 14/822,211, filed on August 10, 2015. The '661 Patent also states that it claims priority to provisional application No. 62/093,189, filed on December 17, 2014. *Id.*

A. Summary of the '661 Patent's Specification

50. The '661 Patent identifies "limited dirt collection capacity" as a problem with existing hand vacuums, which it purports to solve with an "auxiliary dirt collection chamber" to provide "an enlarged dirt collection capacity," such that "the surface cleaning apparatus may operate for longer intervals before ... need[ing] to be emptied." Ex1001, 1:31-32, 11:39-48.

51. However, the '661 Patent does not claim a supplemental bin or any other purported dirt-collection-capacity solution; it instead claims a mix-and-match of well-known, interchangeable features and configurations. *Id.*, Claims. These well-known features include "a

dirty air inlet,” “a handle,” “a suction motor and fan assembly,” and “a cyclone unit.” *Id.*

52. I have reviewed the '661 Patent's specification, and the combination of these claimed elements does not purport to provide any technical benefit or solve any purported problem.

B. Prosecution History of the '661 Patent

53. I have reviewed the prosecution history of the '661 Patent. The following is my understanding:

54. During prosecution, the Examiner allowed the '661 Patent's claims without any prior-art-based rejections. Ex1004. The Examiner's Reasons for Allowance stated that the “the prior art of record fails to teach or suggest [the full text of then-pending claim 1].” *Id.*, 520-21. After allowance, PO submitted an Amendment After Allowance to amend certain claims, and after issuance sought and received a Certificate of Correction for certain claims. *Id.*, 605, 623-26, 629-30.

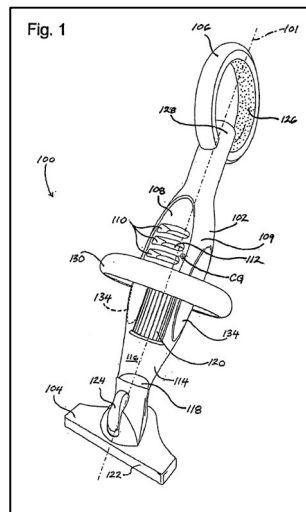
C. Priority Date of the Challenged Claims

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

VIII. BACKGROUND OF THE PRIOR ART

A. Butler

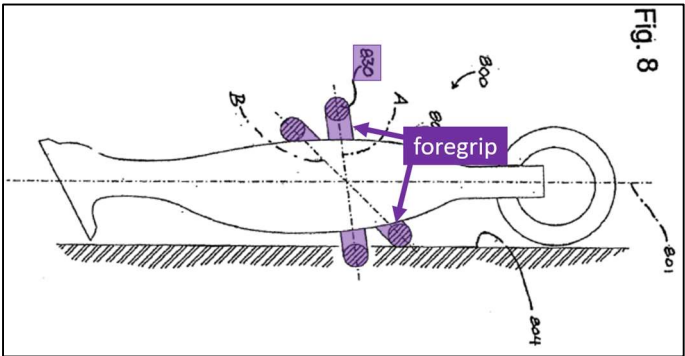
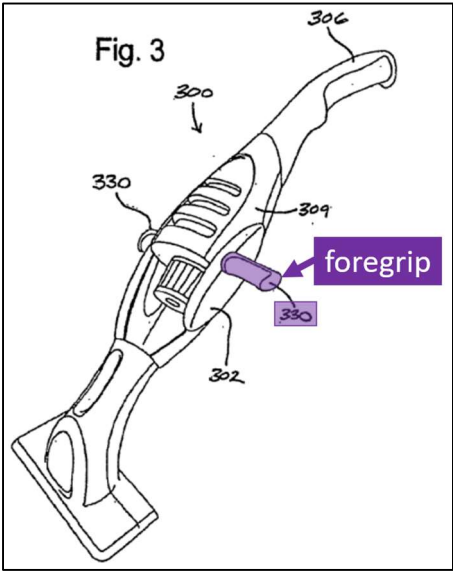
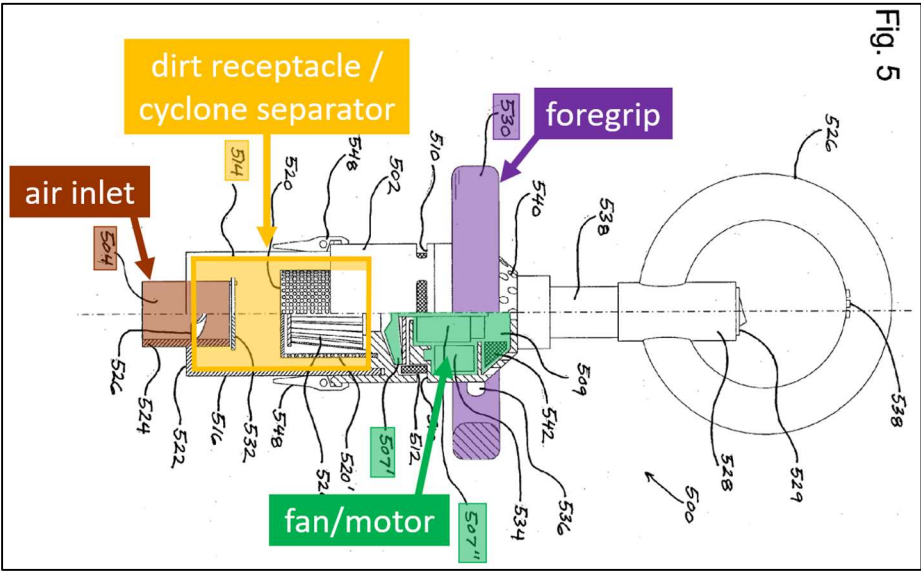
56. Butler is a 2007 PCT publication for “an improved vacuum cleaner for cleaning raised and vertical surfaces” including stairs, as shown in the figure below:



Ex1005, 3:10-12, Fig. 1.

57. Butler is a single vacuum cleaner system that is reconfigurable and optimizable. Butler’s various components, such as its dirt receptacle, “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.” Ex1005, 16:25-29, 43:29-44:3; *see also id.*, 4:17-28, 18:22-28, 19:9-15, 34:12-13.
58. Butler’s cleaner includes an “**air inlet**,” a “**dirt receptacle** compris[ing] a **cyclone separator**,” a “**vacuum fan and a motor**,” and

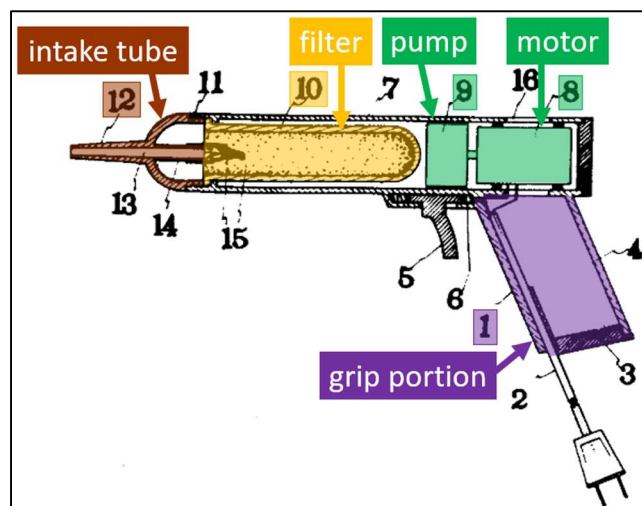
several “foregrip[s]” that “may be pivotable or otherwise articulated to provide even greater ergonomic flexibility and control of the device,” as shown in the annotated images below:



Ex1005, 3:20-28, 22:14-22, 22:26-28, Figs. 3, 5, 8.²

B. Tsukuji³

59. Tsukuji is a 1972 Japanese Patent Publication for a “small electric vacuum cleaner.” Ex1007, 2. Tsukuji’s vacuum cleaner includes an “**intake tube 12**,” “**filter 10**,” “**motor 8**” that “rotate[s] the turbofan inside the **pump 9**,” and a “**grip portion 1**” that “can be reliably grasped,” as shown in the annotated image below:



² All emphasis, and all coloring and annotations to figures, added unless otherwise noted. Where a figure has been otherwise altered to illustrate Petitioner’s argument, the citation to the figure is labeled as modified.

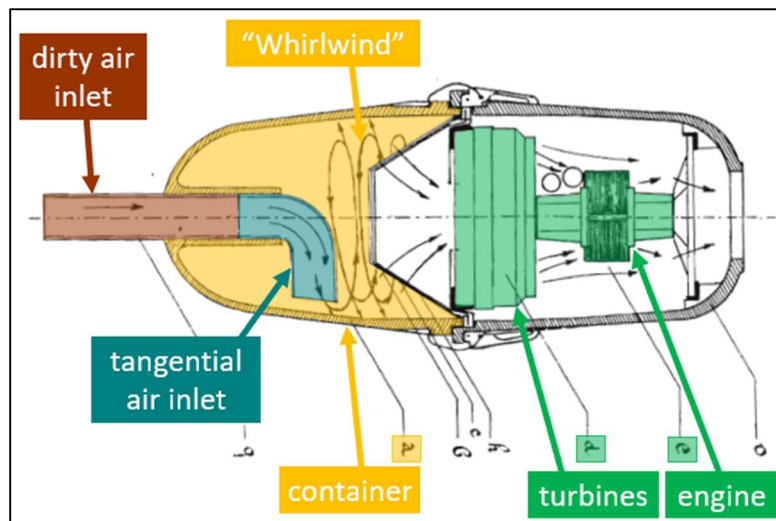
³ For the Tsukuji and Martelliere references, citations are by page, as the English translations do not include column or line numbers.

Id., 2, 4, Fig. 1.

C. Martelliere

60. Martelliere is a 1955 French patent for a cyclonic hand vacuum cleaner.

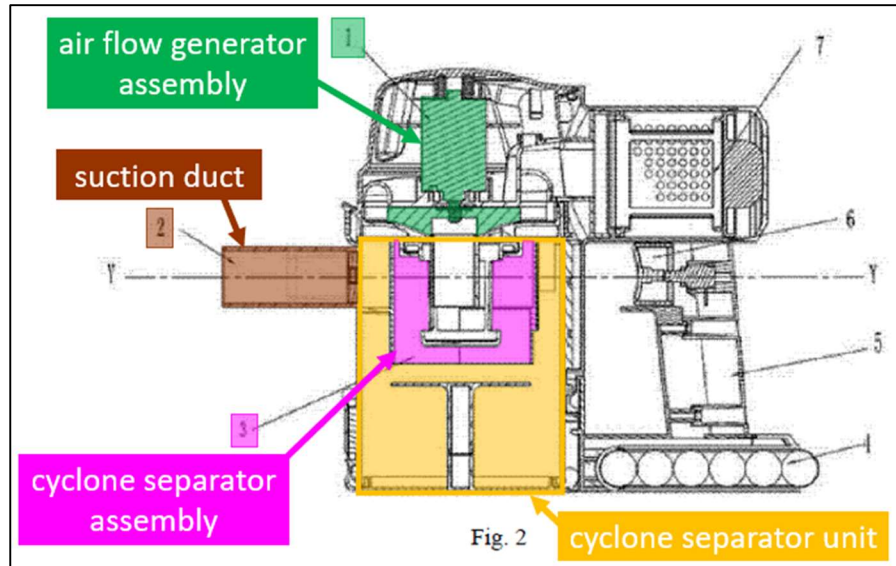
Ex1009, 1. Martelliere's cleaner has a **dirty air inlet** connected to a **"tangential[]" air inlet**, which creates a **"Whirlwind"** (*i.e.*, a cyclone) within a **"container"** to separate dirt, and is powered by **"turbines d,"** and **"engine e,"** as shown in the annotated image below:



Ex1009, 1, Fig. 1.

D. Wenjie

61. Wenjie is a 2014 Chinese Patent Publication for a hand-held vacuum cleaner. Ex1023, Abstract. Wenjie teaches a "hand-held vacuum cleaner includ[ing] an **air flow generator assembly 1**, a **suction duct 2**," and a **cyclone separator unit** comprising a **"cyclone separator assembly 3**," as shown in the annotated image below:



Ex1023 ¶21, Fig. 2.

IX. CLAIM CONSTRUCTION

62. I am unaware of any claim construction determinations related to the '661 Patent.

63. 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: '661 PATENT

64. In my opinion, the Challenged Claims of the '661 Patent are invalid based on the following references and combinations: claims 1-16 are anticipated or rendered obvious by Butler; claims 1-5, 7-12, 15, and 16 are rendered obvious by the combinations of Tsukuji and Martelliere; and claims 6, 13, and 14 are rendered obvious by the combination of

Tsukuji, Martelliere, and Wenjie; and it would have been obvious to a POSA to combine the teachings of these references.

65. 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 '661 Patent, as discussed above. I have also considered the level of ordinary skill in the pertinent art.

66. 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 '661 Patent.

A. Ground 1: Butler Anticipates Claims 1-16

1. [1]

a. [1pre]

Reference Number	Claim Limitation
[1pre]	“A hand vacuum cleaner having a front end having a dirty air inlet, a clean air outlet, an upper end and a lower end, the hand vacuum cleaner comprising:”

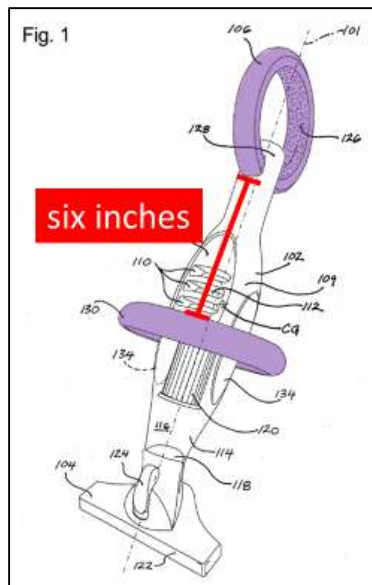
67. To the extent the preamble is limiting, in my opinion, Butler teaches a hand vacuum cleaner having a front end having a dirty air inlet, a clean air outlet, an upper end and a lower end.
68. Butler's "vacuum cleaner" is designed to be used by hand and is a hand vacuum cleaner. Ex1005, Title, Fig. 1. Butler's cleaner includes a "rear grip" and "one or more foregrips" that the user grasps during use, and Butler teaches a range of "compact" sizes, including a distance between the foregrip and the rear grip of **six inches**, and an overall vacuum length of eighteen inches, as shown in the annotated image below:

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

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

Id., 26:1-10.



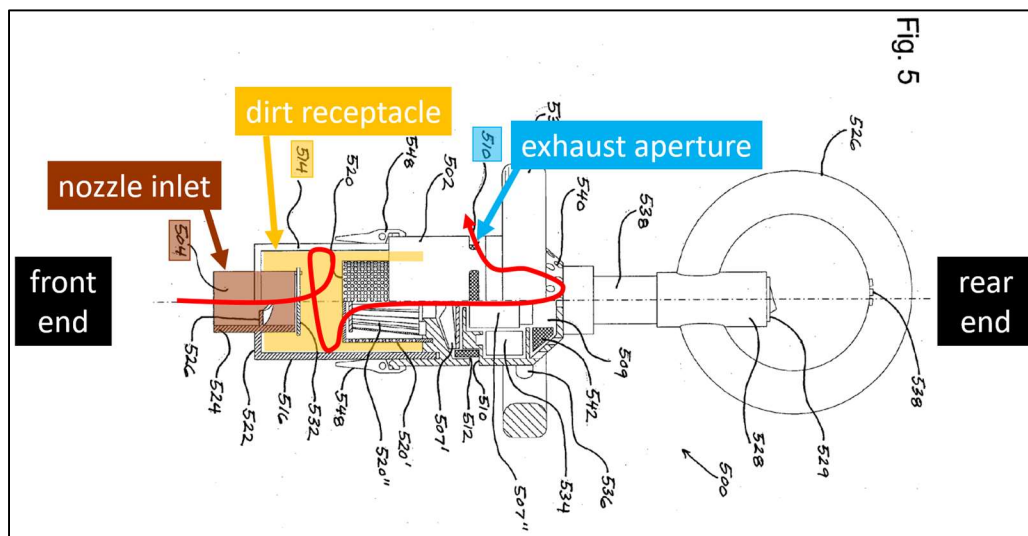
69. In my opinion, a POSA would have understood that Butler’s vacuum cleaner, including when the distance between the rear grip and foregrip is 6 inches, and the overall length is 18 inches, is a hand vacuum cleaner.

70. Further, Butler explains that its vacuum cleaner is “compact” and

“maneuverable,” “adapted for cleaning ... stairwells and other confined spaces,” and teaches telescoping handgrip members as well as extension members 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 have understood 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, and accordingly, removal of excess weight and optimization of balance are important to minimizing exertion and effort while maximizing comfort. Furthermore, optimization of weight and balance also 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, or unbalanced, can also have the same effect on a user as an

excessively heavy vacuum.

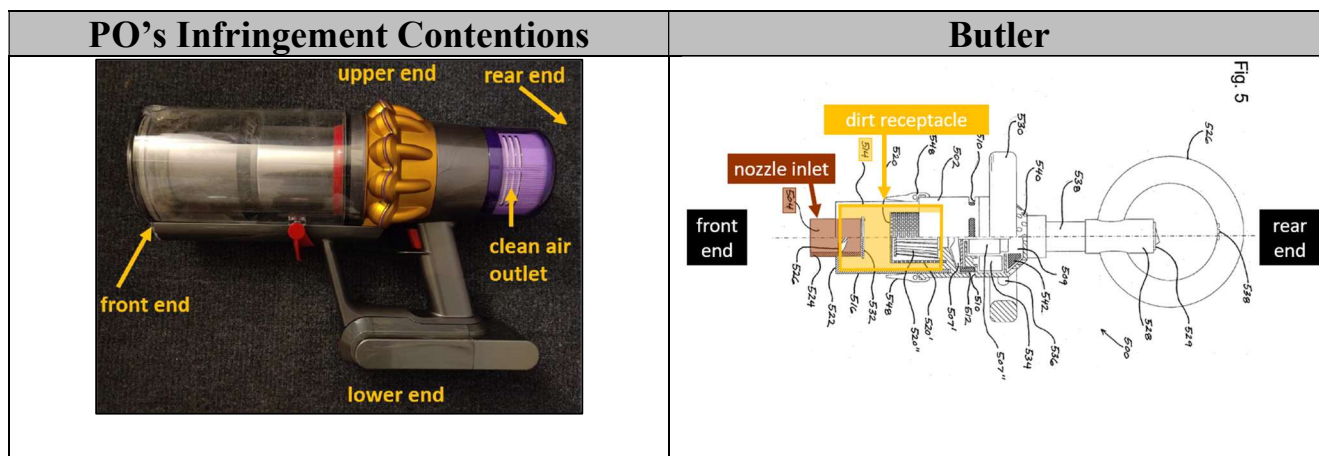
71. In my opinion, Butler teaches that its hand vacuum has a front end having a dirty air inlet, and a clean air outlet. In Butler, **air** enters the hand vacuum cleaner **front end** via “**nozzle inlet 504**,” is cleaned by “a cyclonic airflow pattern within the **dirt receptacle 514**,” and exits via “**exhaust apertures 510**,” as shown in the annotated image below:



Ex1005, 22:5-6, Fig. 5; *see also id.*, Figs. 2A, 3-4, 6-8, 16, 23.

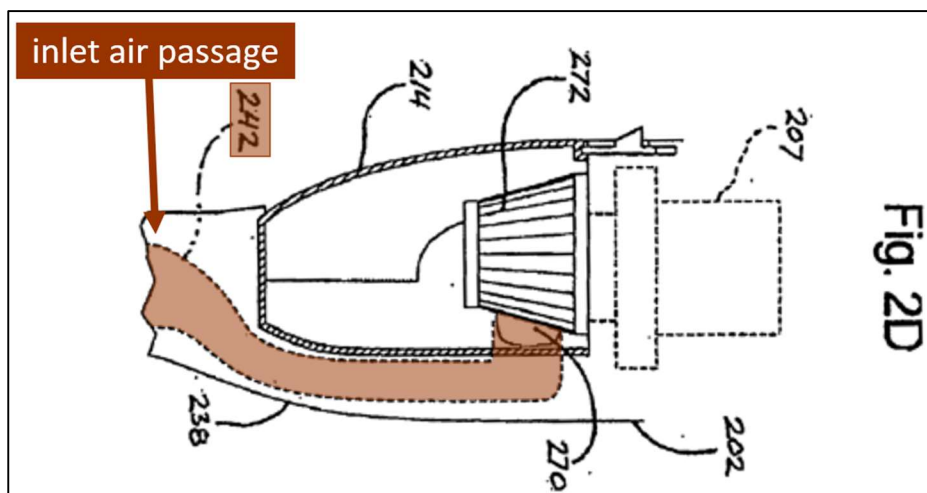
72. In my opinion, a POSA would have understood that Butler’s “nozzle inlet 504” is a dirty air inlet at Butler’s front end, and “exhaust apertures 510” are clean air outlets.
73. I have reviewed PO’s infringement contentions, and, with respect to the front and rear ends, this is at least as much disclosure of these limitations in Butler as PO has accused of infringement in the related

litigation, as shown in the annotated images below:



Ex1010, 3(PO's annotations); Ex1005, Fig. 5.

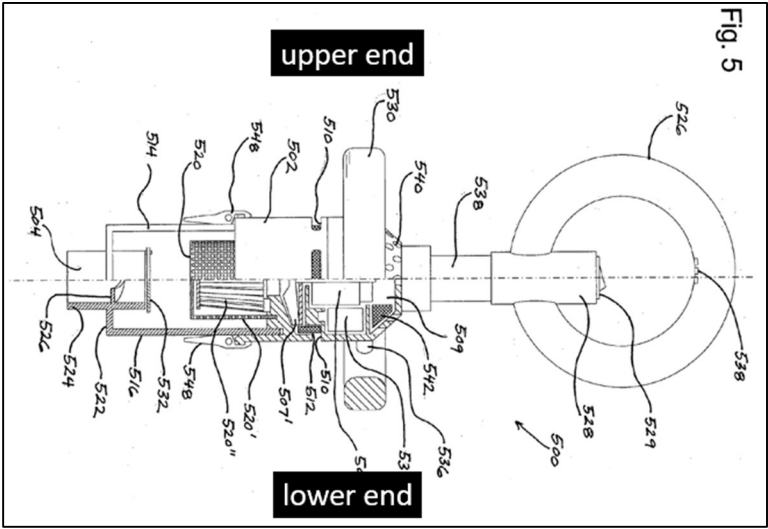
74. Further, in my opinion, a POSA would have understood that Butler's "inlet air passage 242" is also a dirty air inlet, as shown in the annotated image below:



Ex1005, 16:9-13, 18:15-21, Fig. 2D.

75. In my opinion, a POSA would have similarly understood that Butler's hand vacuum has an **upper end** and a **lower end**, as shown in the

annotated image below:



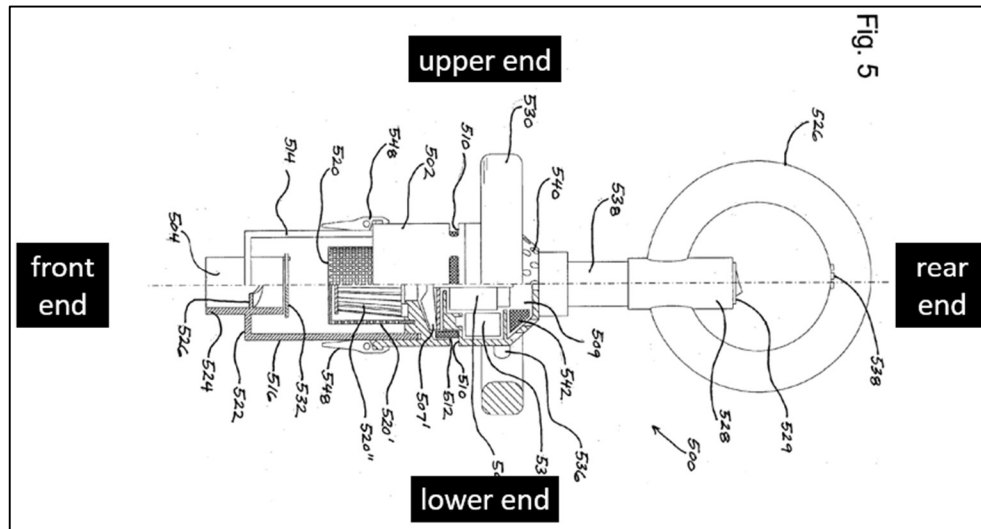
Ex1005, Fig. 5; *see also id.*, Figs. 2A, 3-4, 6-8, 16, 23.

b. [1a]

Reference Number	Claim Limitation
[1a]	“(a) a hand vacuum cleaner body comprising an upper end, a lower end, a front end, a rear end, and a handle, the handle extending between a first handle end and a second handle end, the hand vacuum cleaner body including a suction motor and fan assembly, the suction motor and fan assembly having a suction motor axis of rotation; and,”

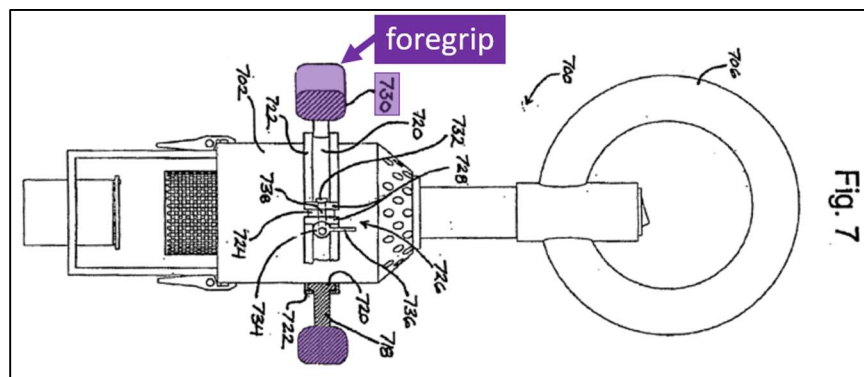
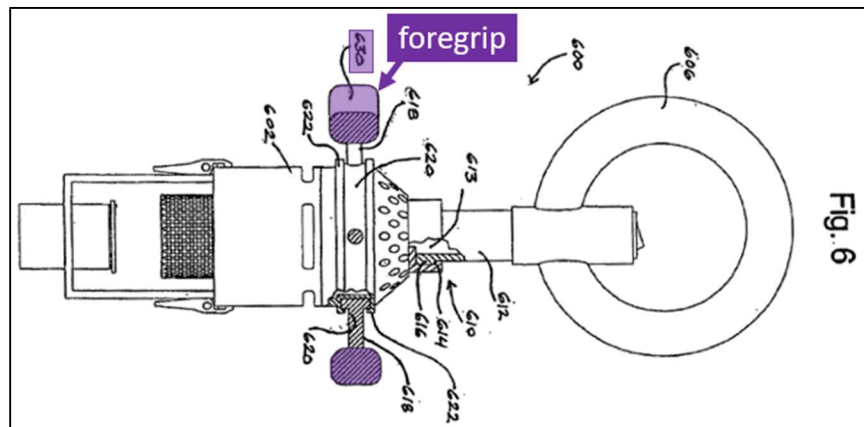
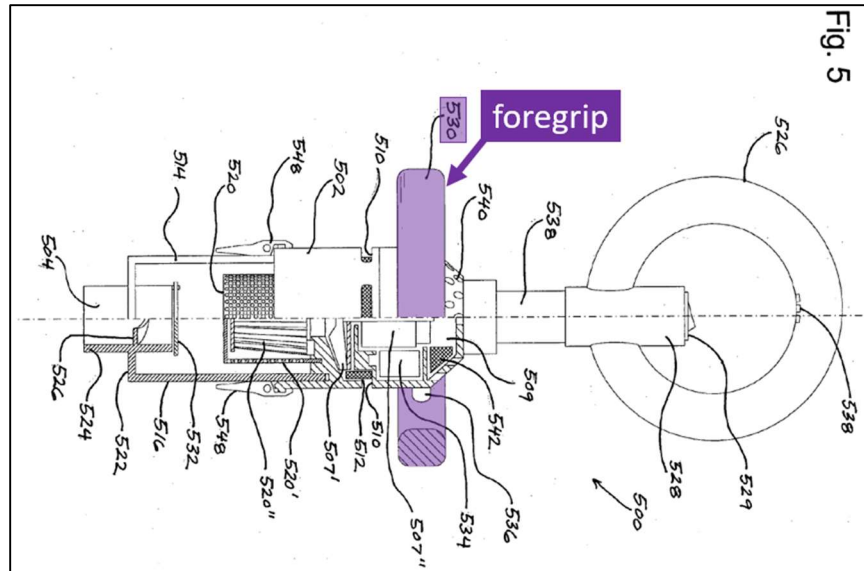
76. In my opinion, Butler teaches a hand vacuum cleaner body comprising an upper end, a lower end, a front end, a rear end, and a handle, the handle extending between a first handle end and a second handle end, the hand vacuum cleaner body including a suction motor and fan assembly, the suction motor and fan assembly having a suction motor axis of rotation.

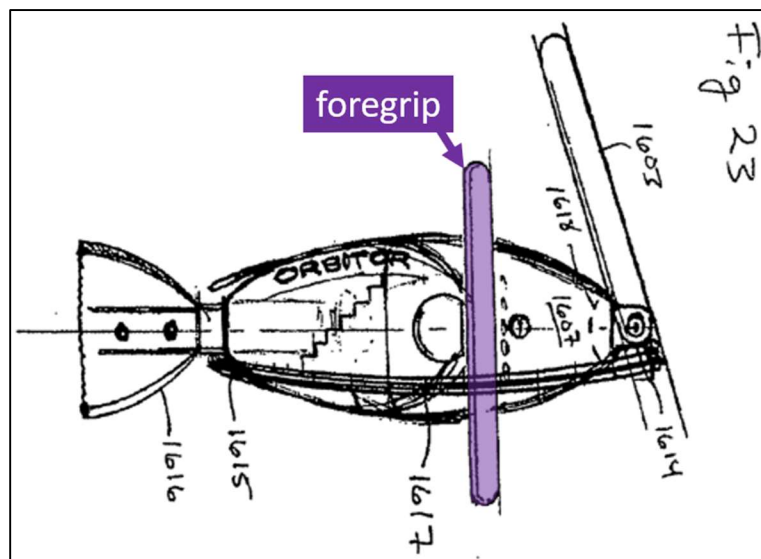
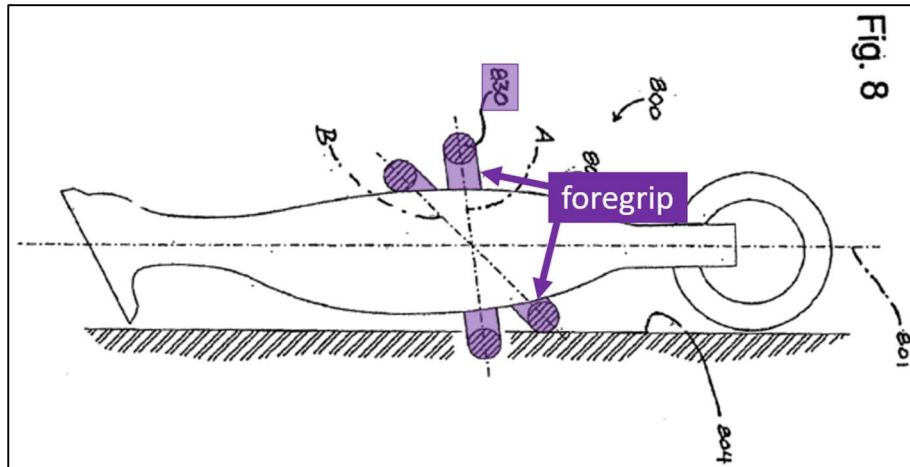
77. In my opinion, a POSA would have understood that Butler's hand vacuum cleaner has a hand vacuum cleaner body comprising an **upper end**, a **lower end**, a **front end**, and a **rear end**, as shown in the annotated image below:



Ex1005, Fig. 5; *see also id.*, Figs. 2A, 3-4, 6-8, 16, 23; Ground 1, Limitation [1pre].

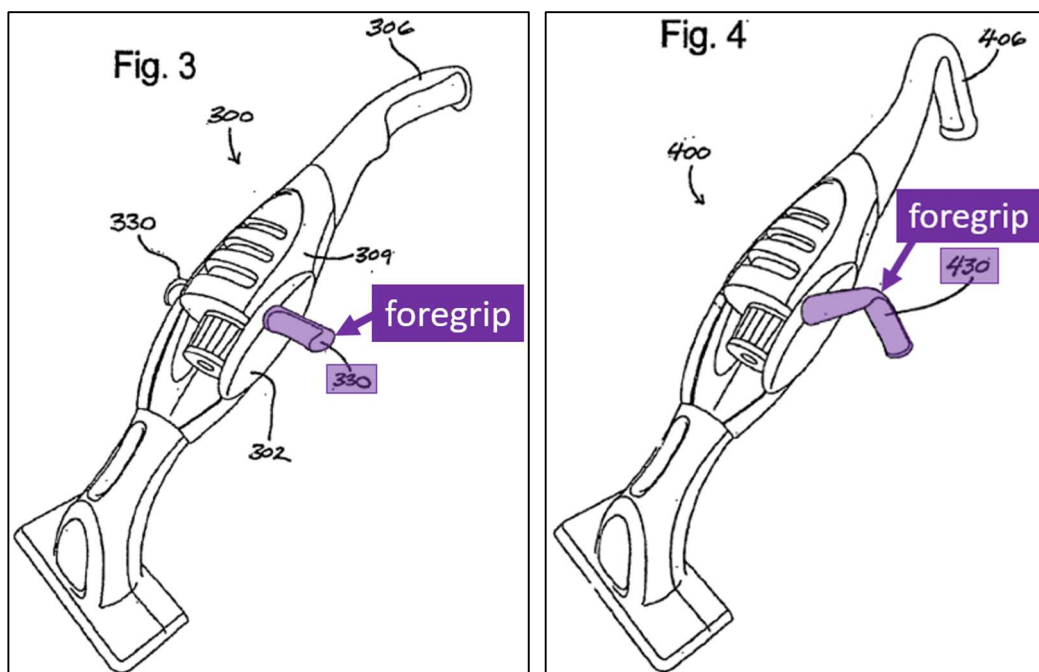
78. In my opinion, Butler teaches that the hand vacuum cleaner body comprises a handle. Butler’s cleaner body includes “a circular or looped **foregrip**” that is used to “ergonomically maneuver the device and rotate it into different positions for cleaning horizontal and inclined surfaces,” as shown in the annotated images below:





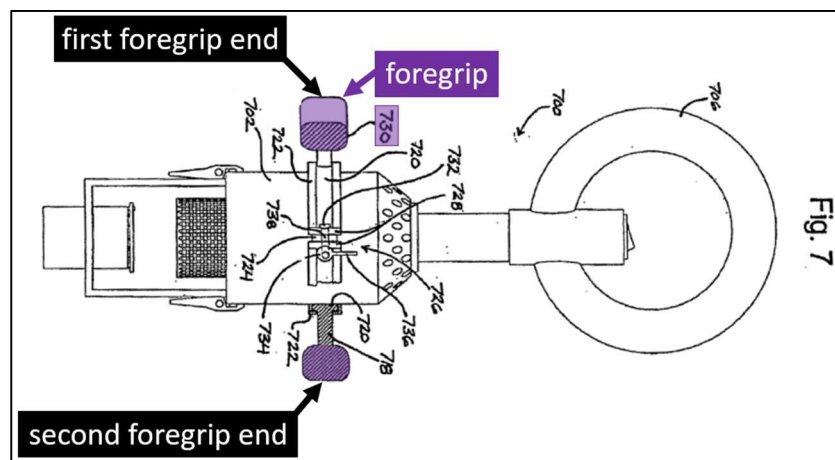
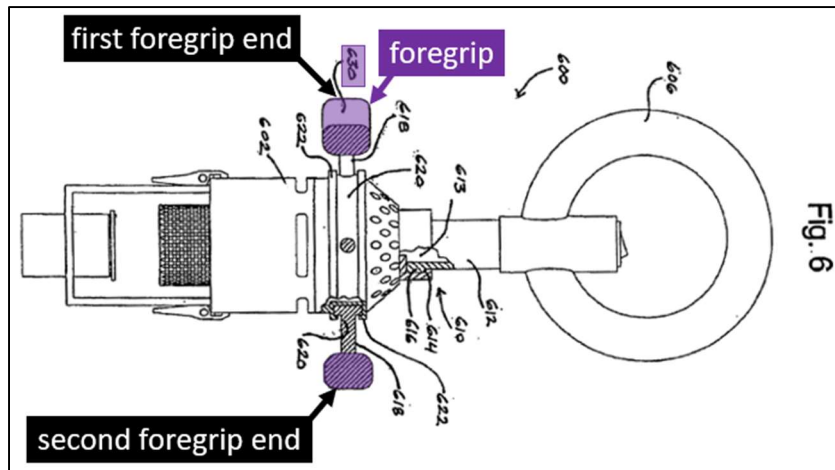
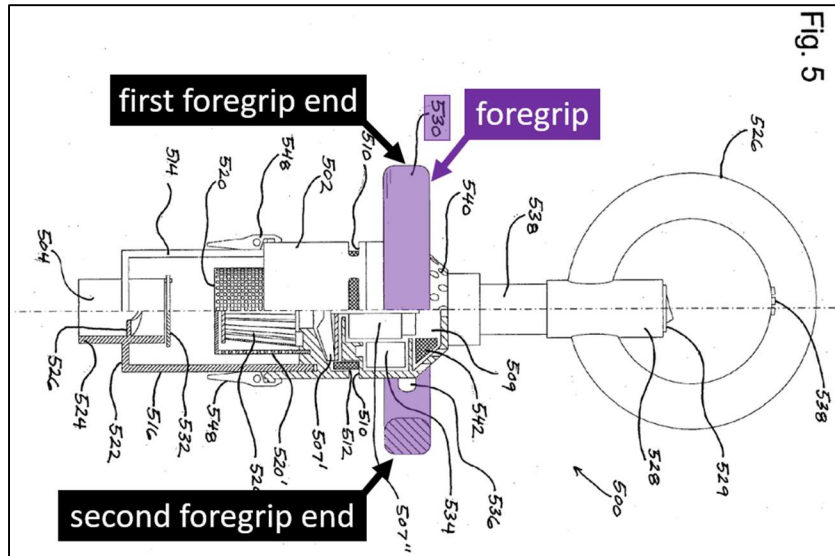
Ex1005, 19:9-12, 20:3-6, 24:3-11, 24:26-30, Figs. 5-8, 23; *see also id.*, Figs. 2A, 16.

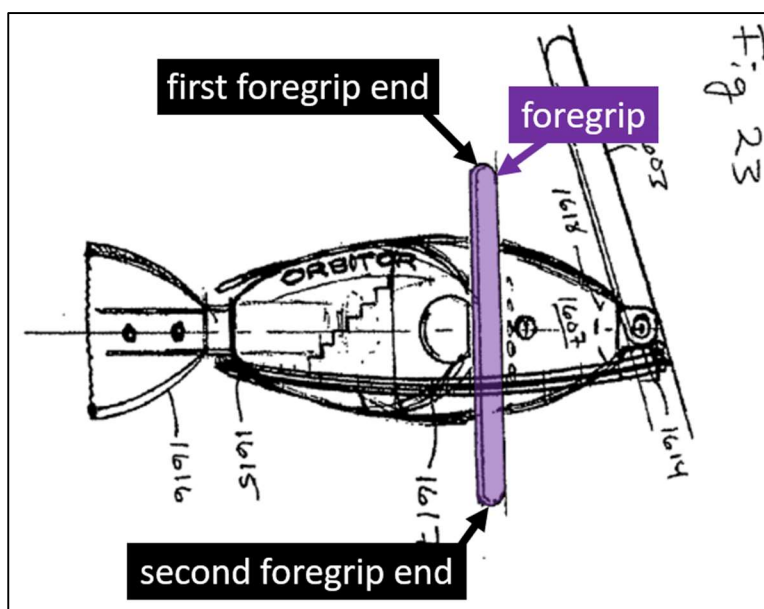
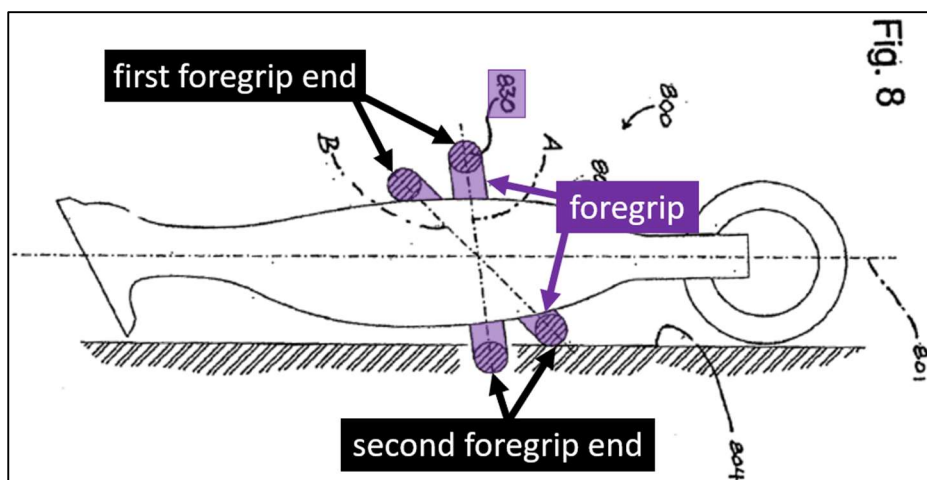
79. In my opinion, a POSA would have understood that Butler's "circular or looped foregrip" is a handle.
80. Butler further teaches "**foregrips 330, 430**" which, in my opinion, a POSA would have also understood are handles, as shown in the annotated images below:



Ex1005, 19:24-26, Figs. 3-4.

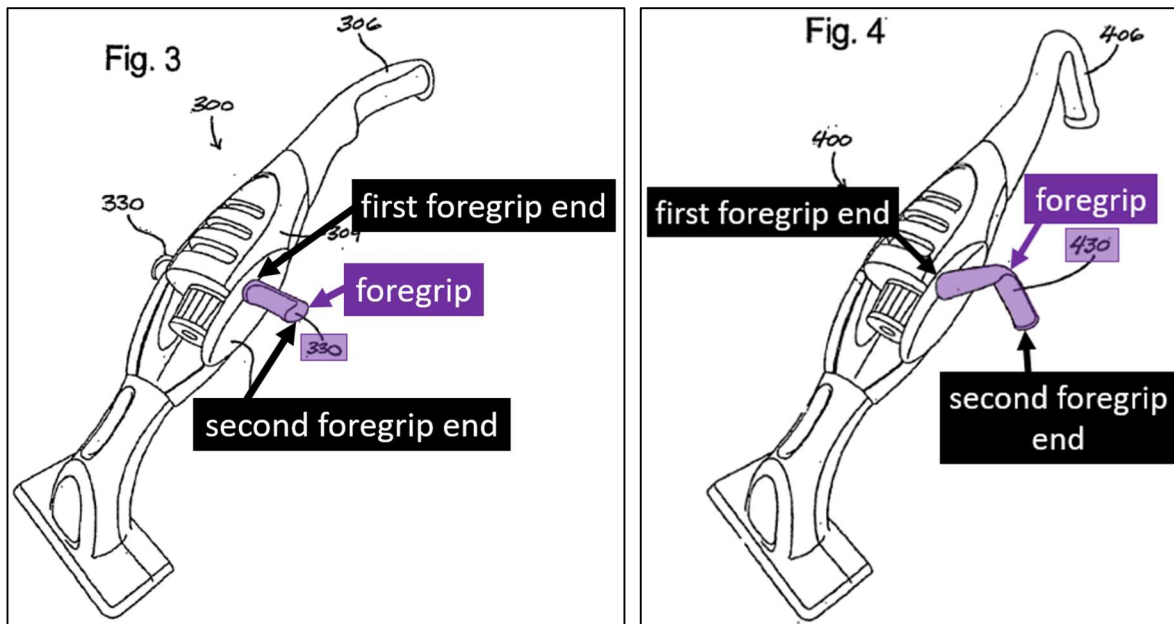
81. Butler further teaches that its foregrips are interchangeable: “the loop-shaped grips may be replaced by any combination of rear grip and foregrip that provide the user with hand positions to ergonomically maneuver the device.” Ex1005, 19:9-12.
82. In my opinion, Butler teaches that the handle extends between a first handle end and a second handle end. A POSA would have understood that Butler’s “circular or looped **foregrip**” extends between a **first foregrip end** and a **second foregrip end**, as shown in the annotated images below:





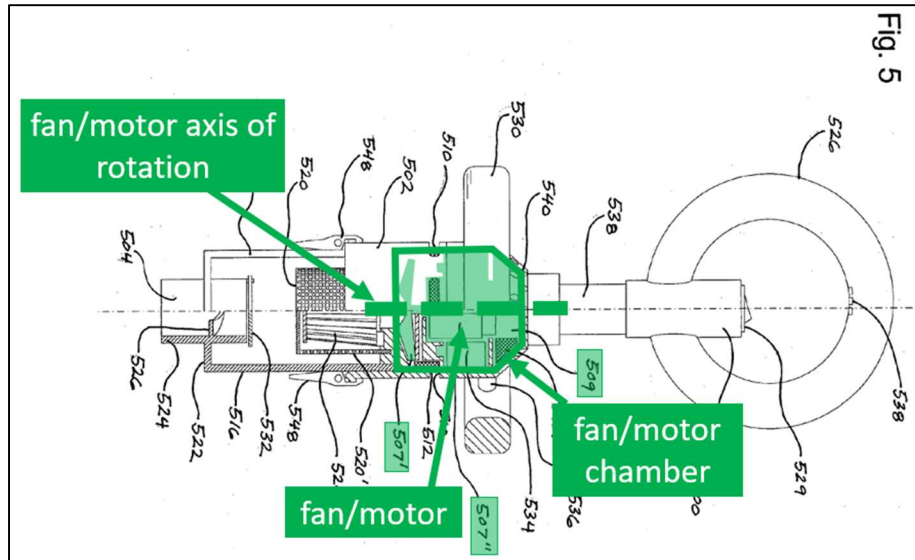
Ex1005, Figs. 5-8, 23; *see also id.*, Figs. 2A, 16.

83. Likewise, a POSA would have understood that Butler’s “**foregrips 330, 430**” also extend between a first foregrip end and a second foregrip end, as shown in the annotated images below:



Ex1005, Figs. 3-4.

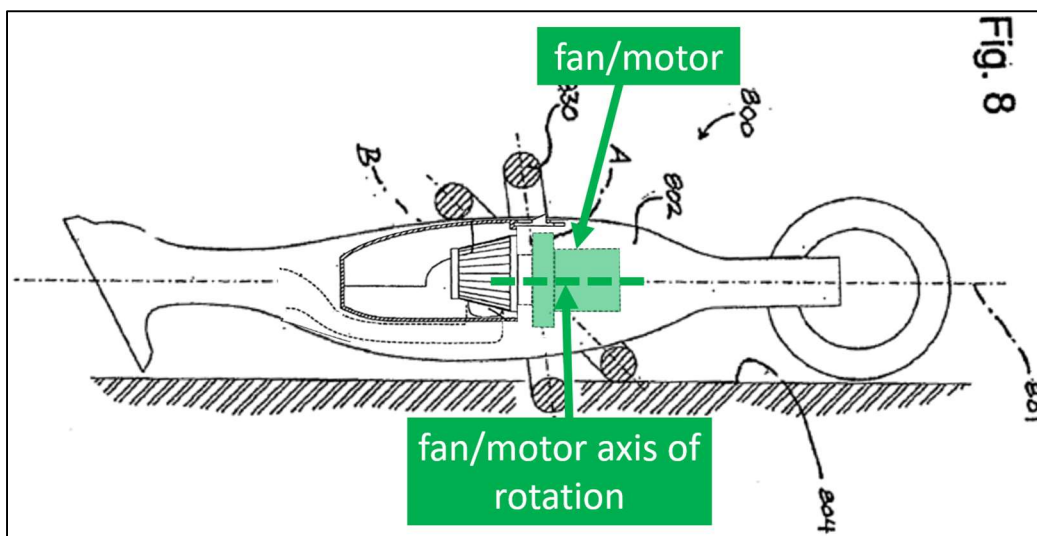
84. In my opinion, Butler teaches that the hand vacuum cleaner body includes a suction motor and fan assembly having a suction motor axis of rotation. A POSA would have understood that Butler's vacuum body has a "**fan/motor chamber 509** in which the **fan/motor 507** is located," and has a **fan/motor axis of rotation**, as shown in the annotated image below:

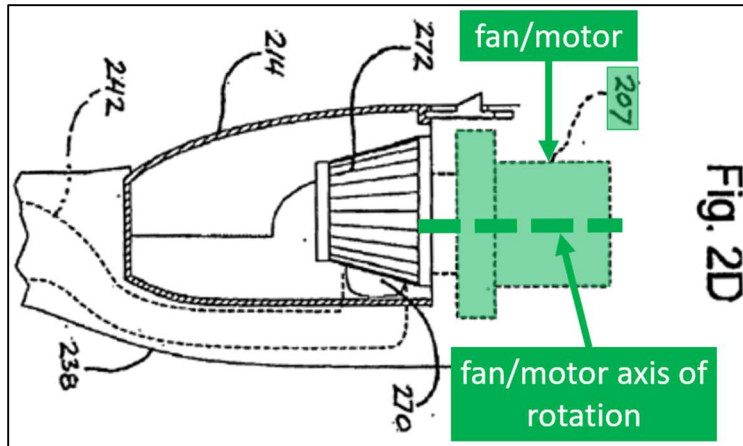


Ex1005, 20:12-14, Fig. 5; *see also id.*, Figs. 6-7, 16, 23.

85. In my opinion, a POSA would have understood that Butler’s “fan/motor 507” is a suction motor and fan assembly with a suction motor axis of rotation.

86. Further, Butler teaches a “fan/motor 207” with a fan/motor axis of rotation, as shown in the annotated images below:





Ex1005, 18:3-12, Figs. 2D, 8(modified); *see also id.*, Figs. 2A, 3-4.

87. In my opinion, a POSA would have understood that Butler’s “fan/motor 207” is also a suction motor and fan assembly with a suction motor axis of rotation.

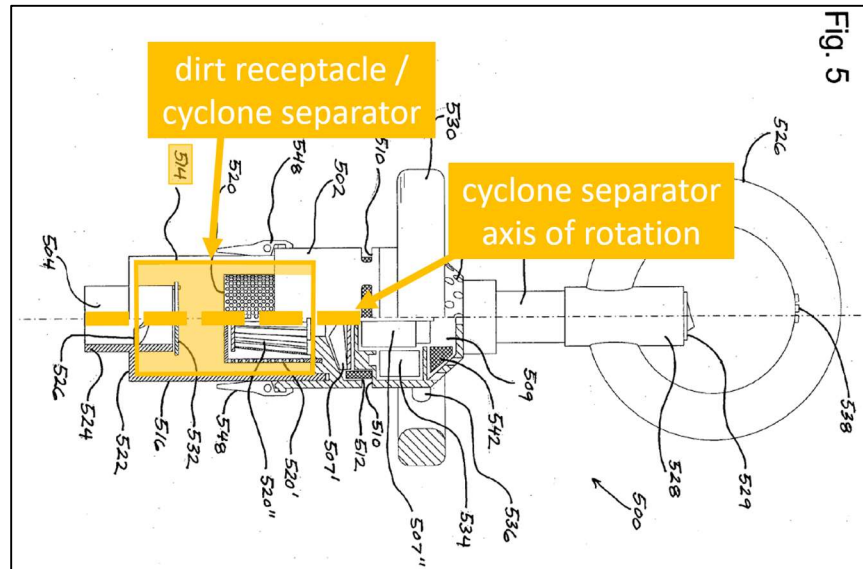
c. [1b]

Reference Number	Claim Limitation
[1b]	“(b) a cyclone unit comprising a cyclone having a cyclone axis of rotation, a cyclone air inlet, a cyclone air outlet, a front end and a rear end,”

88. In my opinion, Butler teaches a cyclone unit comprising a cyclone having a cyclone axis of rotation, a cyclone air inlet, a cyclone air outlet, a front end and a rear end.

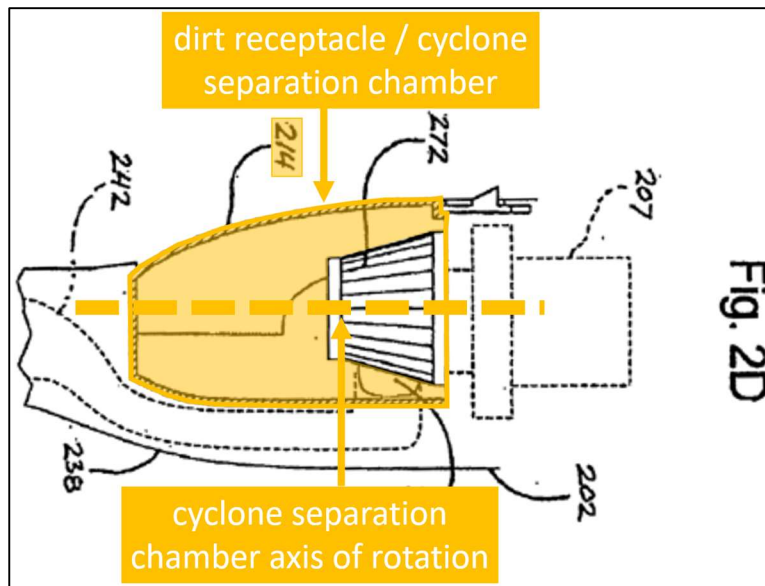
89. In my opinion, a POSA would have understood that Butler teaches a cyclone unit comprising a cyclone having a cyclone axis of rotation. Butler’s “**dirt receptacle** comprises a **cyclone separator**,” which, in

my opinion, a POSA would have understood is a cyclone unit including a cyclone with a **cyclone separator axis of rotation**, as shown in the annotated image below:



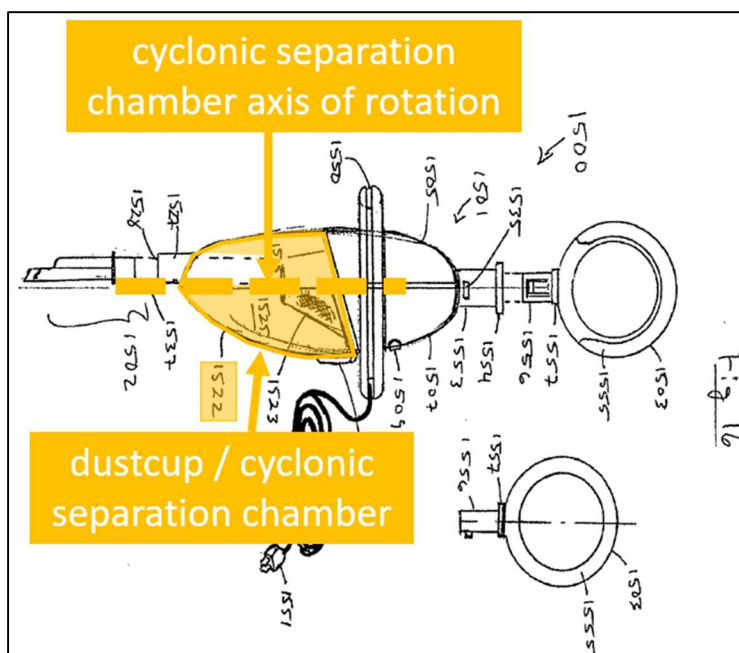
Ex1005, Claim 11, Fig. 5; *see also id.*, 22:20-22 (“It has been found that the use of the foregoing helical ramp 524 is sufficient to establish a cyclonic airflow pattern within the dirt receptacle 514, despite the presence of the flap valve 532.”), Figs. 6-7, 23.

90. Further, Butler teaches a “**dirt receptacle 214** compris[ing] a **cyclone separation chamber**” which, in my opinion, a POSA would have understood is also a cyclone unit including a cyclone with a **cyclone separation chamber axis of rotation**, as shown in the annotated image below:



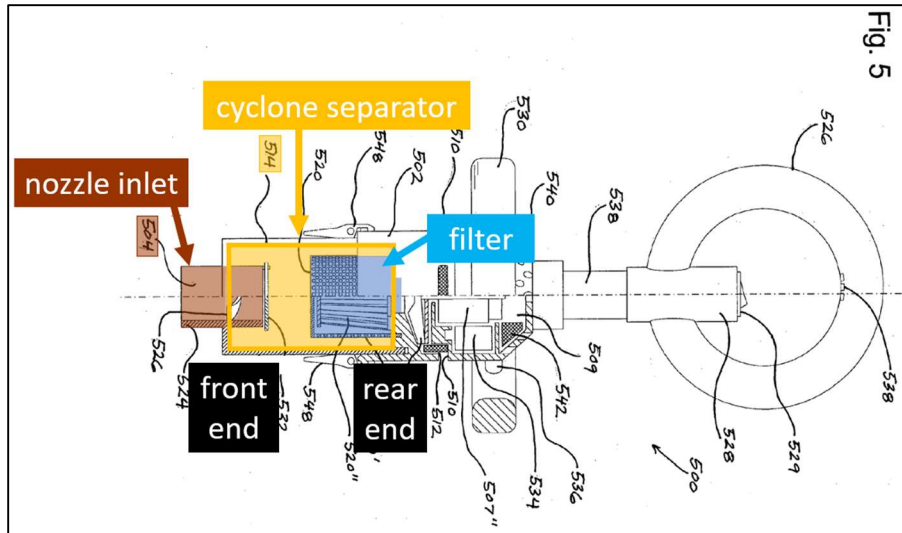
Ex1005, 18:3-5, Fig. 2D; *see also id.*, Figs. 2A, 3-4, 8.

91. Butler also teaches a “**dustcup assembly 1508** compris[ing] a **dustcup 1522**” that “may comprise ... a **cyclonic separation chamber**,” which, in my opinion a POSA would have understood is a cyclone unit including a cyclone with a **cyclonic separation chamber axis of rotation**, as shown in the annotated image below:



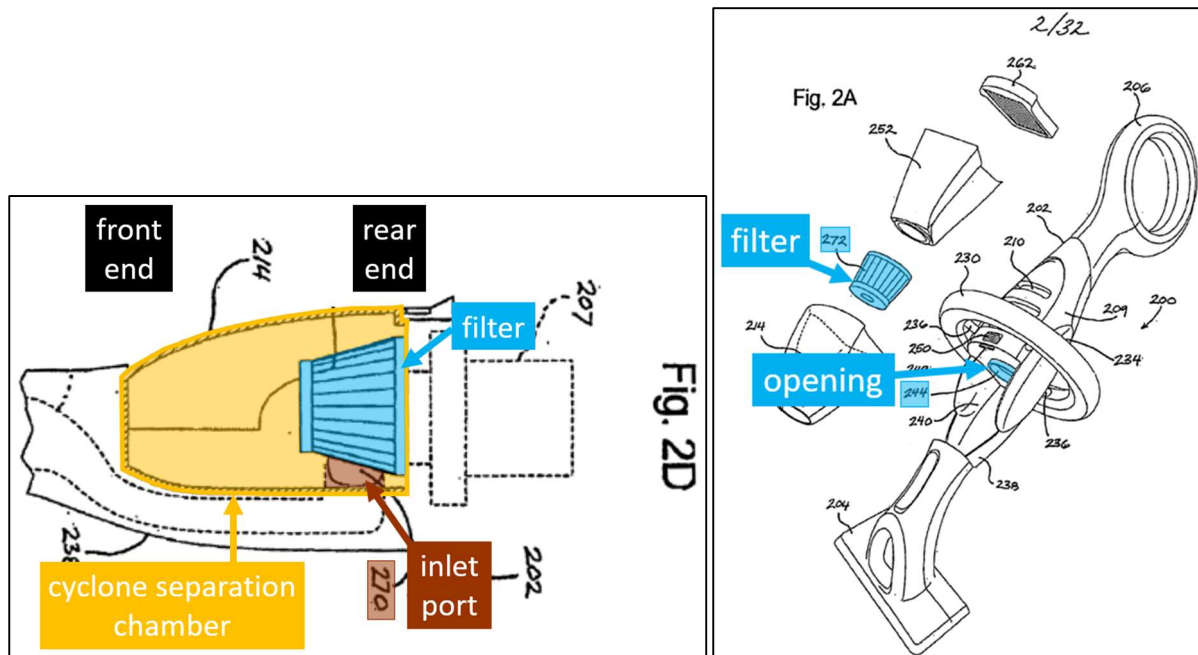
Ex1005, 35:27-36:4, Fig. 16.

92. Like Butler's grips, Butler teaches that its cyclonic separation units are interchangeable: "[t]he present invention may be used with any type of dirt separation system," and "it is envisioned that various different types of dirt receptacle ... may be interchangeable with one another to provide the user with various cleaning options." Ex1005, 16:25-28.
93. In my opinion, Butler teaches that its cyclone unit comprising a cyclone has a cyclone air inlet, a cyclone air outlet, a front end and a rear end. Butler's "**cyclone separator**" comprising a cyclone has a **front end** (including where air enters through "**nozzle inlet 504**") and a **rear end** (including where air exits through a "**filter 520** compris[ing] ... **fine filter 520'**"), as shown in the annotated image below:



Ex1005, 21:24-28, Fig. 5; *see also id.*, Figs. 6-7, 23.

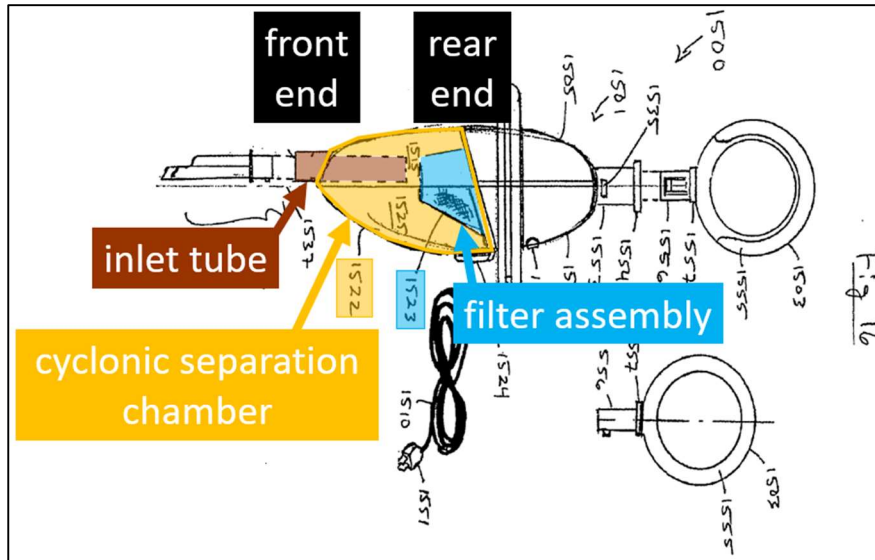
94. In my opinion, a POSA would have understood that the end at which Butler's "**nozzle inlet 504**" terminates is a cyclone air inlet, because it is the inlet through which dirty air enters Butler's cyclone with a "cyclonic airflow pattern." Ex1005, 22:20-22. Likewise, a POSA would have understood that Butler's "filter 520 compris[ing] ... fine filter 520" is a cyclone air outlet because air passes through it, and cyclonic separation ends, as it exits Butler's "cyclone separator."
95. Further, Butler's "**cyclone separation chamber**" comprising a cyclone has a **front end**, and a **rear end** (including where air enters through "**inlet port 270**" and exits through "**frusto-conical filter 272** ... located over the fan/motor inlet **opening 244**"), as shown in the annotated images below:



Ex1005, 18:3-14, Figs. 2A, 2D; *see also id.*, Figs. 3-4, 8.

96. In my opinion, a POSA would have understood that Butler’s “inlet port 270” is a cyclone air inlet, and “filter 272” and “opening 244” are, individually and collectively, a cyclone air outlet because air passes through them, and cyclonic separation ends, as it exits Butler’s “cyclone separator” / “cyclone separation chamber.”

97. Butler’s “**cyclonic separation chamber**” comprising a cyclone also has a **front end** (including where air enters through “**inlet tube 1514**”) and a **rear end** (including where air exits through “**filter assembly 1523**” compris[ing] a filter 1529”), as shown in the annotated image below:



Ex1005, 35:22-24, Fig. 16.

98. In my opinion, a POSA would have understood that the “end” at which Butler’s “inlet tube 1514” terminates (the “end” “adjacent to the dustcup chamber 1519 and forms and air passage into the dustcup chamber 1519”) is a cyclone air inlet, because it is the inlet through which dirty air enters Butler’s cyclone; and “filter assembly 1523” is a cyclone air outlet because air passes through it, and cyclonic separation ends, as it exits Butler’s “cyclonic separation chamber.” Ex1005, 35:14-16, 35:22-24.

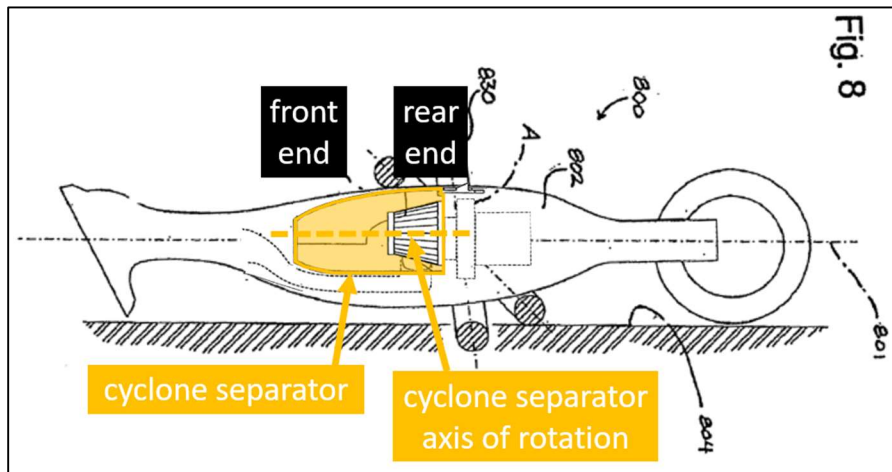
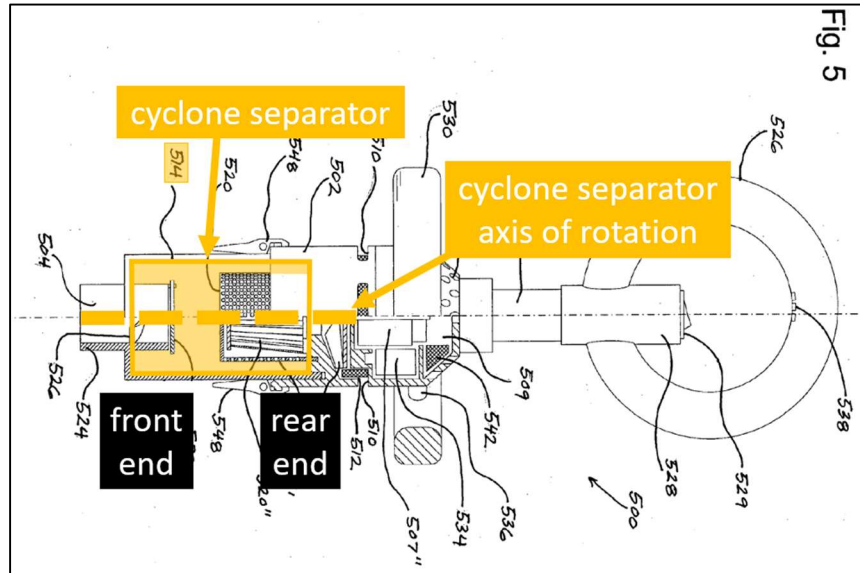
d. [1c]

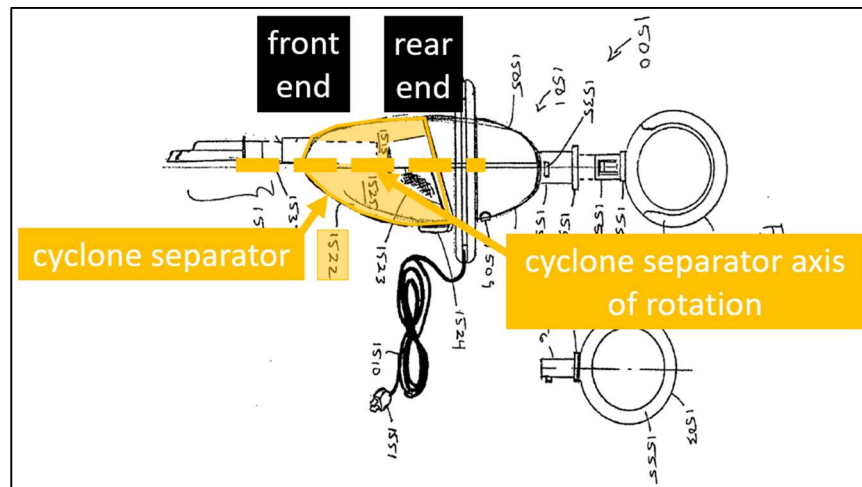
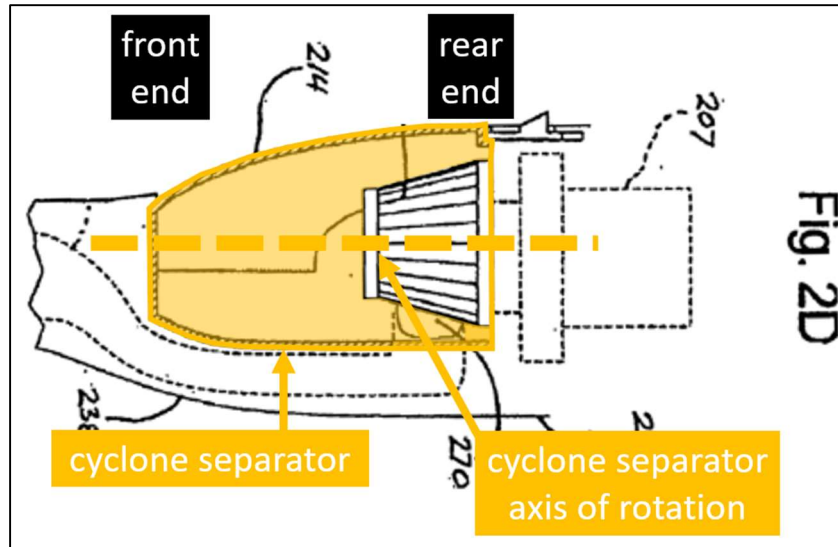
Reference Number	Claim Limitation
[1c]	“wherein when the hand vacuum cleaner is positioned with the upper end of the hand vacuum cleaner above the lower end of the hand vacuum cleaner and the lower end of the hand vacuum cleaner is on a horizontal surface, the cyclone axis of rotation is generally horizontal and extends between the front and rear ends of the cyclone, and”

99. In my opinion, Butler teaches wherein when the hand vacuum cleaner is positioned with the upper end of the hand vacuum cleaner above the lower end of the hand vacuum cleaner and the lower end of the hand vacuum cleaner is on a horizontal surface, the cyclone axis of rotation is generally horizontal and extends between the front and rear ends of the cyclone.

100. In my opinion, Butler teaches that when the hand vacuum cleaner is positioned with the upper end of the hand vacuum cleaner above the lower end of the hand vacuum cleaner and the lower end of the hand vacuum cleaner is on a horizontal surface, the cyclone axis of rotation is generally horizontal and extends between the front and rear ends of the cyclone. In my opinion, a POSA would have understood that when Butler’s hand vacuum is positioned as claimed, the “cyclone separator” axis of rotation, “cyclone separation chamber” axis of

rotation, and “cyclonic separation chamber” axis of rotation (collectively cyclone separator and cyclone separator axis of rotation) extends between the front and rear ends of the cyclone, as shown in the annotated images below:





Ex1005, Figs. 2D, 5, 8(modified), 16; *see also id.*, Figs. 2A, 3-4, 6-7, 23.

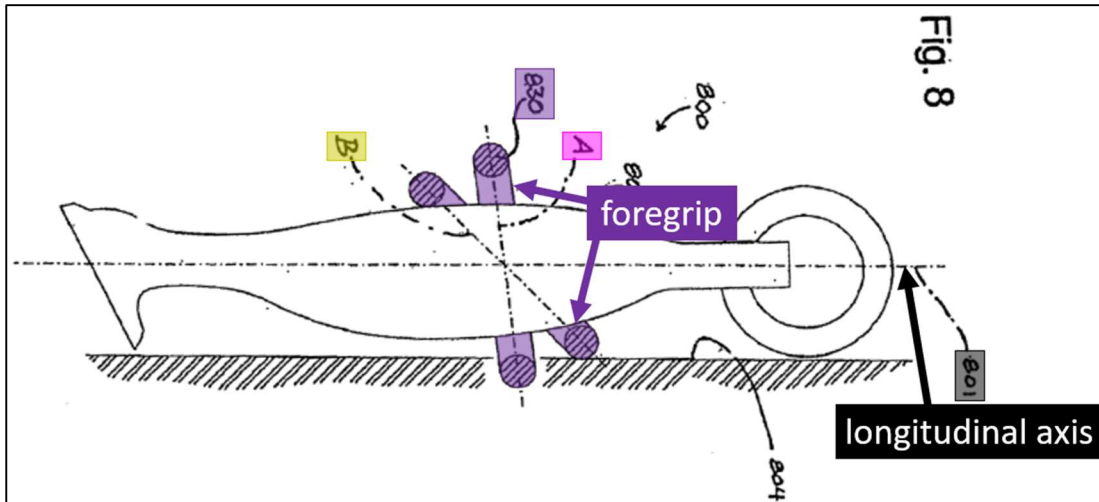
e. [1d]

Reference Number	Claim Limitation
[1d]	“wherein when the hand vacuum cleaner is positioned with the upper end of the hand vacuum cleaner above the lower end of the hand vacuum cleaner and the lower end of the hand vacuum cleaner is on a horizontal surface, the handle is inclined forwardly at an angle that is between 10 and 80 degrees from a vertical axis, and”

101. In my opinion, Butler teaches wherein when the hand vacuum cleaner

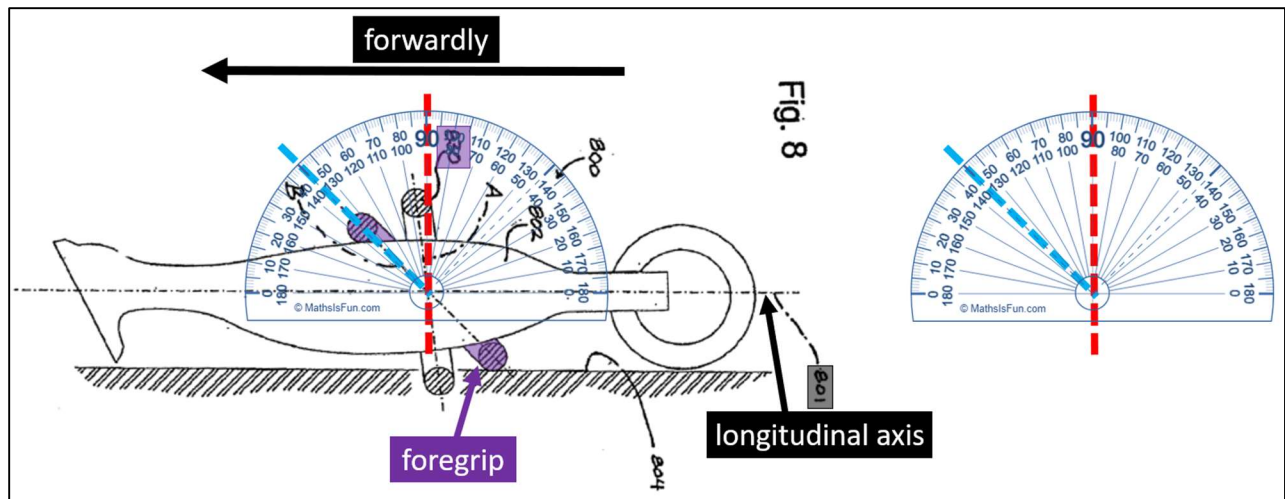
is positioned with the upper end of the hand vacuum cleaner above the lower end of the hand vacuum cleaner and the lower end of the hand vacuum cleaner is on a horizontal surface, the handle is inclined forwardly at an angle that is between 10 and 80 degrees from a vertical axis.

102. In my opinion, Butler teaches that when the hand vacuum cleaner is positioned with the upper end of the hand vacuum cleaner above the lower end of the hand vacuum cleaner and the lower end of the hand vacuum cleaner is on a horizontal surface, the handle is inclined forwardly at an angle that is between 10 and 80 degrees from a vertical axis. Butler teaches that the “foregrip[s] may be pivotable or otherwise articulated to provide even greater ergonomic flexibility and control of the device.” Ex1005, 22:26-28. For example, Butler’s “**foregrip 830** ... is pivotable about an axis generally perpendicular to the **longitudinal axis 801** of the vacuum,” as shown in the annotated image below:



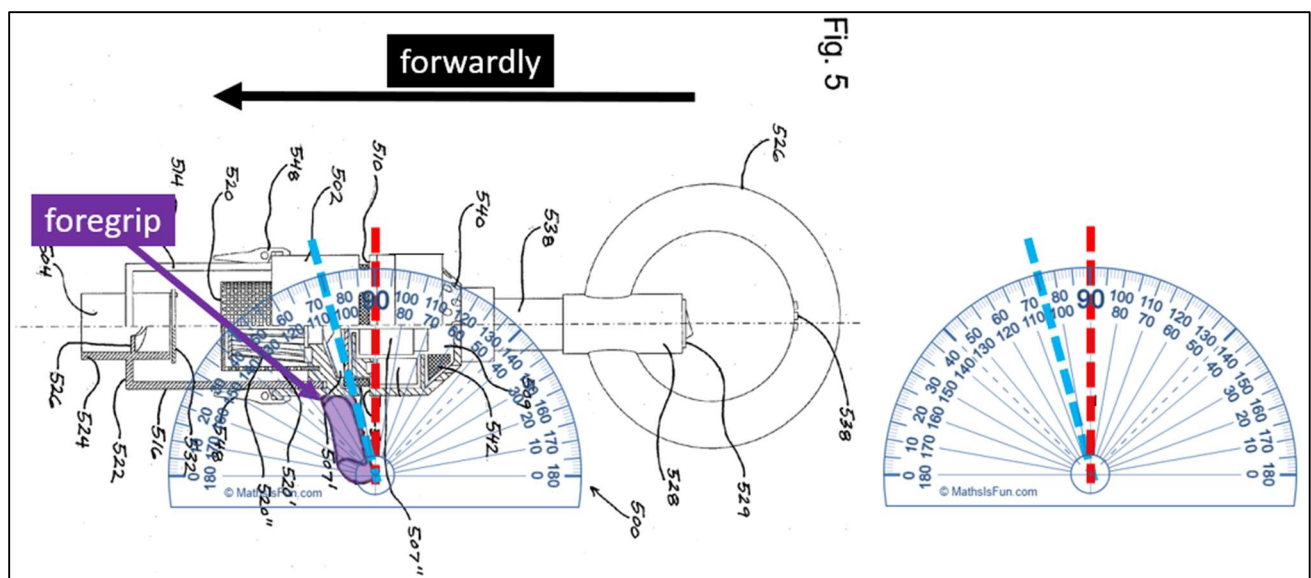
Ex1005, 24:26-30, Fig. 8.

103. Butler teaches that “[t]he foregrip 830 is movable between two positions: an operating position, designated by reference numeral **A**, and a collapsed position, designated by reference numeral **B**.” Ex1005, 25:1-3. “Of course, intermediate or other positions may also be provided.” *Id.*, 25:4. In my opinion, a POSA would have therefore understood that Butler teaches several “intermediate or other positions” between “numeral A” and “numeral B” where the “foregrip” is inclined forwardly at an angle that is between 10 and 80 degrees from “an **axis** generally perpendicular to the **longitudinal axis 801**,” i.e., a **vertical axis**, when the hand vacuum cleaner is oriented as claimed. For example, in Figure 8, Butler’s “**foregrip 830**” is inclined **forwardly** at **45 degrees** from a **vertical axis**, as shown in the annotated image below:

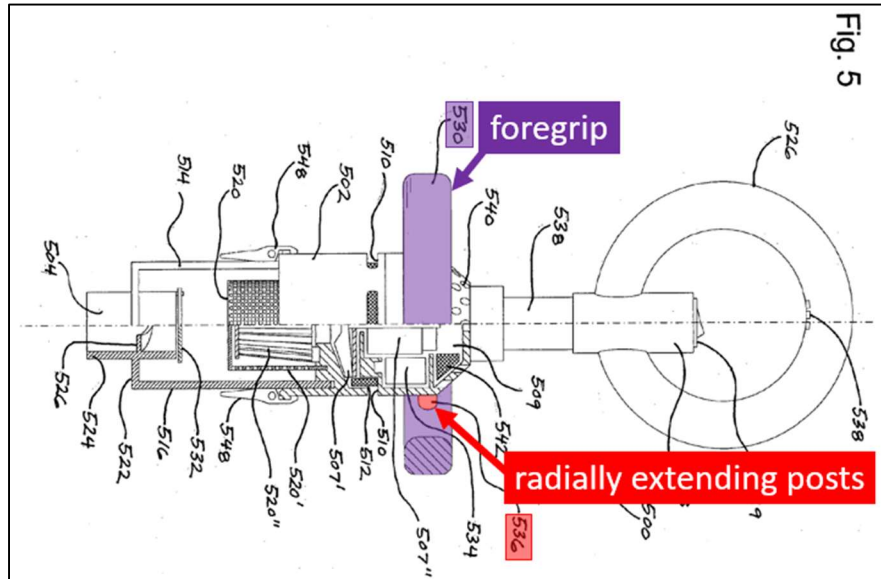


Ex1005, Fig. 8; *see also id.*, Figs. 2A, 5-7, 16, 23.

104. Likewise, Butler teaches that “**foregrips 330, 430** ... may be provided with joints or pivots to allow them to be articulated into more desirable positions,” which, in my opinion, a POSA would understand includes when Butler’s “**foregrips 330, 430**” are inclined **forwardly** at an angle that is between 10 and 80 degrees, e.g., **15 degrees** and **19 degrees**, from a **vertical axis**, as shown in the annotated images below:

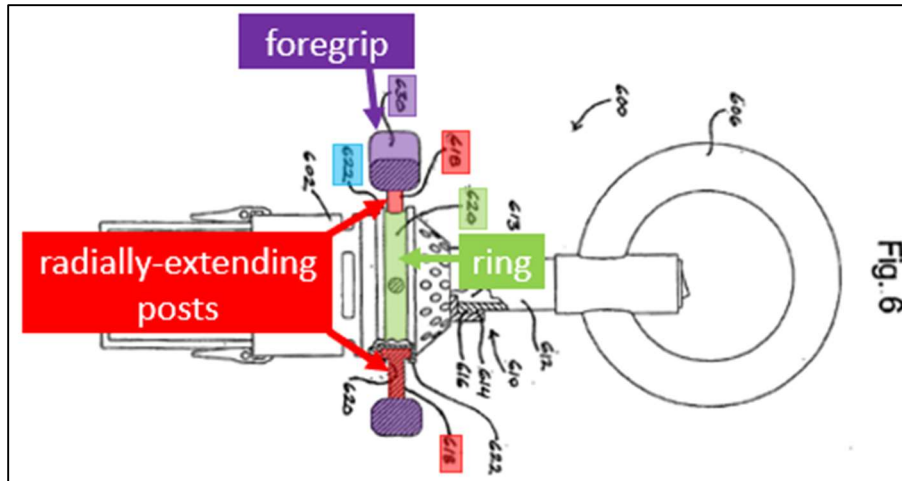


of the hand vacuum cleaner body. Butler's "cylindrical housing 502 [has] a ... circular or looped **foregrip 530**," which "is attached to the housing 502 by a number of **radially extending posts 536**," as shown in the annotated image below:



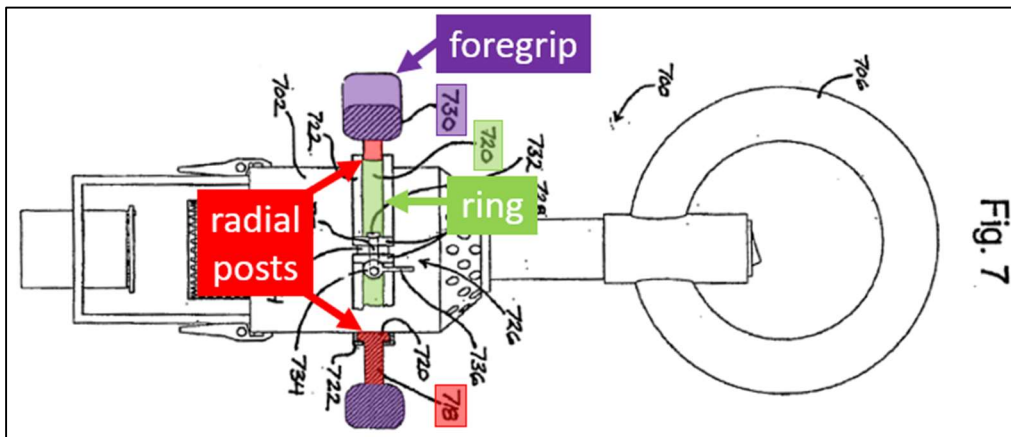
Ex1005, 20:4-6, 20:10-11, Fig. 5; *see also id.*, Figs. 16, 23.

108. Butler's "**foregrip [630]** is attached to the housing 602 by a number of **radially-extending posts 618**, which terminate at ... a **ring 620**," as shown in the annotated image below:



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

109. Likewise, Butler’s “foregrip 730 is attached to a ring 720” (located on “housing 702”) “by a number of radial posts 718,” as shown in the annotated image below:

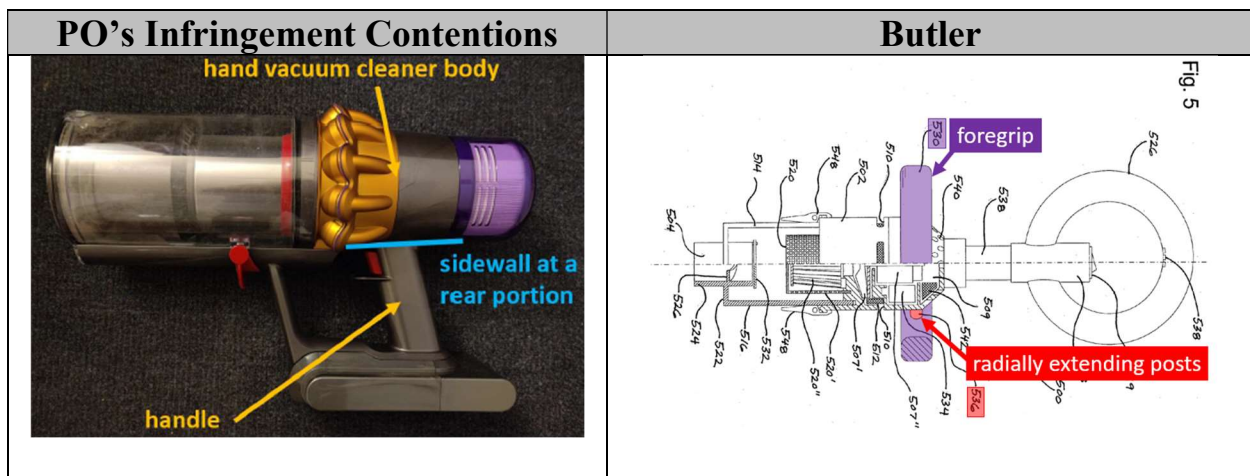


Ex1005, 24:6-8, Fig. 7.

110. Further, “foregrip 830 ... is attached to the housing 802 of a vacuum cleaner 800, much like in the embodiments of Figures 1 and 2,” i.e., by “radial posts.” Ex1005, 24:27-29, Figs. 2A, 8; *see also id.*, 15:29-16:1

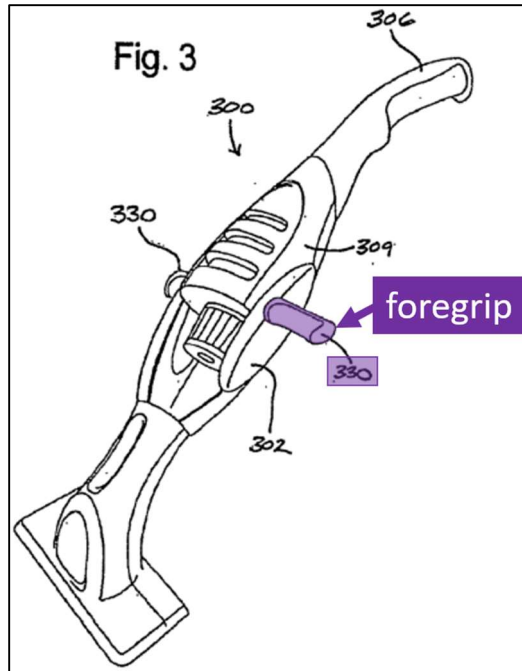
(“Like the embodiment of Figure 1, the foregrip 230 is attached to the housing by a number of radial posts 236 ...”). In my opinion, a POSA would understand that one or more of these radial posts is located on a sidewall of the hand vacuum cleaner body.

111. Further, I have reviewed PO’s infringement contentions, and this is at least as much disclosure of these limitations in Butler as PO has accused of infringement in the related litigation, as shown in the annotated images below:



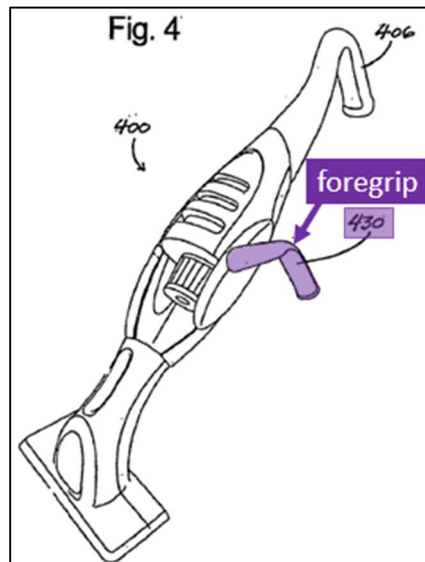
Ex1010, 11(PO’s annotations); Ex1005, Fig. 5.

112. A POSA would have understood that Butler’s “foregrip[] 330” “extend[s] generally radially from the vacuum cleaner housing,” as shown in the annotated image below:



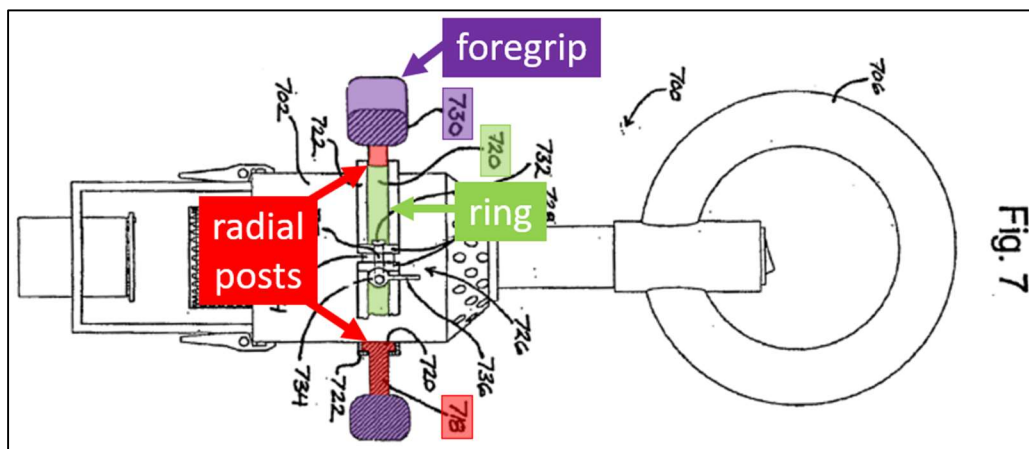
Ex1005, 19:18-26, Fig. 3.

113. A POSA would have understood that Butler’s “foregrip[] 430” is also attached to the vacuum cleaner housing, as shown in the annotated image below:



Ex1005, 19:22-24, Fig. 4.

be pivotable or otherwise articulated to provide even greater ergonomic flexibility and control of the device.” Ex1005, 22:26-28. For example, Butler’s “**foregrip 730** is attached to a **ring 720**,” “and the **ring 720** is sized such that it can slide along the length of the housing,” “allow[ing] the user to adjust the distance between the rear grip and the **foregrip**,” as shown in the annotated image below:

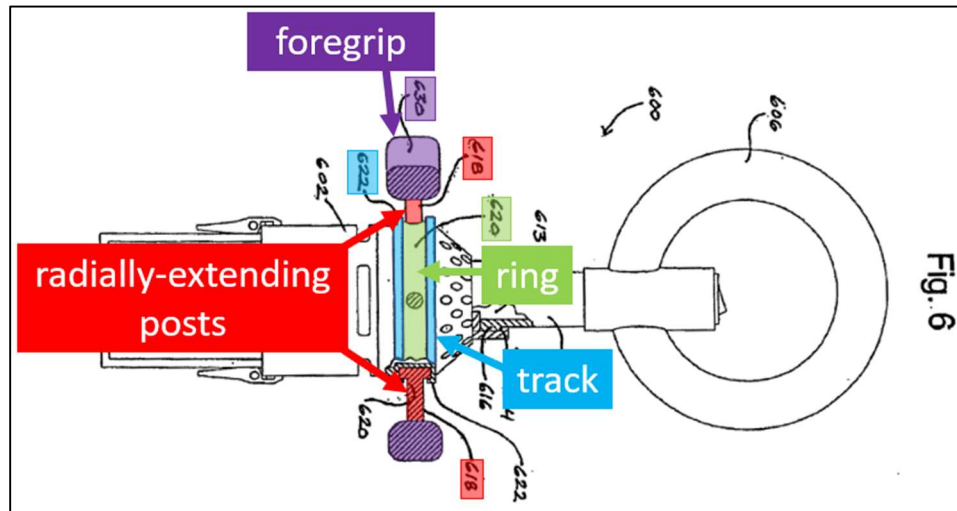


Ex1005, 24:3-11; Fig. 7; *see also id.*, Figs. 2A, 3-6, 8, 16, 23.

117. In my opinion, a POSA would have understood that, when “ring 720” “slide[s]” rearwardly “along the length of the housing,” Butler’s “foregrip” is also provided on a sidewall at a rear portion of the hand vacuum cleaner body.

118. Butler further teaches that “[t]he foregrip ... is also rotatable about the vacuum cleaner housing.” Ex1005, 23:12-13. “[T]he **foregrip** is attached to the housing 602 by a number of **radially-extending posts**

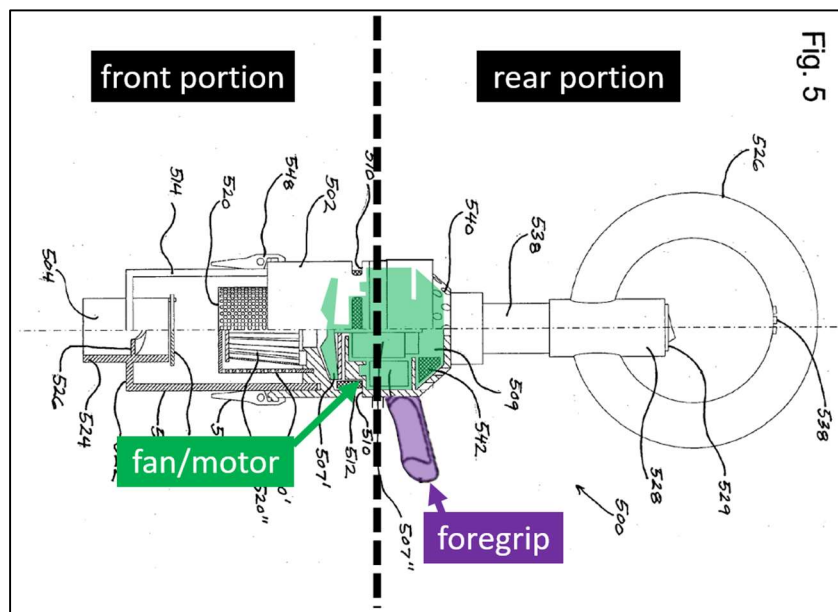
618, which terminate ... at a ring 620,” “captured within a track 622 in the housing, in which it is free to rotate,” and “a lock may be provided to prevent excessive rotation or selectively prevent any rotation,” as shown in the annotated image below:



Id., 23:14-17, Fig. 6; *see also id.*, Figs. 2A, 3-5, 7-8, 16, 23.

119. Butler explains that “the loop-shaped grips may be replaced by any combination of rear grip and foregrip,” e.g., “foregrips 330, 430,” which Butler teaches “can be removed and inserted in various different locations on the housing.” Ex1005, 19:9-12, 19:24-26. Thus, in my opinion, a POSA would have understood that each of Butler’s “foregrips” (including the “circular or looped foregrip[s]” and “foregrips 330, 430”) can be provided on any location of Butler’s “housing” (including the rear portion) by “rotat[ing],” “slid[ing],” and being “removed and inserted in various different locations.” For

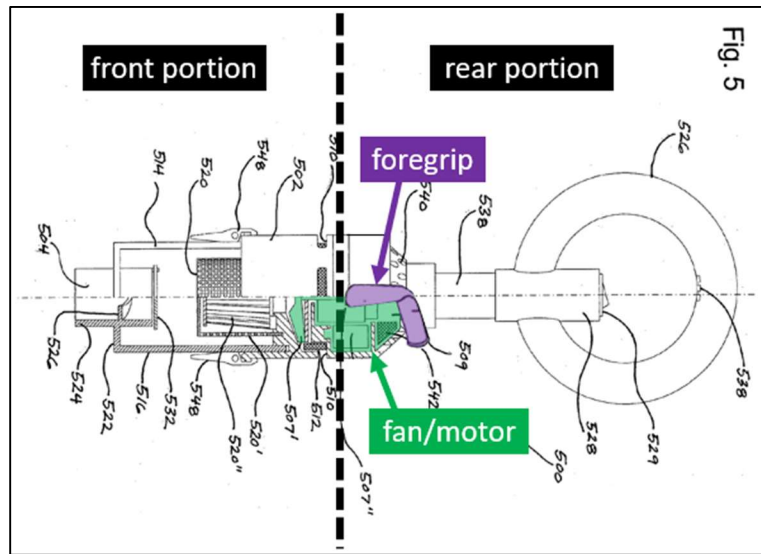
example, in my opinion, a POSA would have understood that, because Butler's "**foregrip[] 330**" is rotatable around the circumference of Butler's body, and slidable forward and rearward on Butler's body, one of the positions it would take would be a **rear portion** of Butler's "housing" (replacing "foregrip 530"), underneath the "**fan/motor**," as shown in the annotated image below:



Ex1005, Figs. 3(modified), 5(modified).

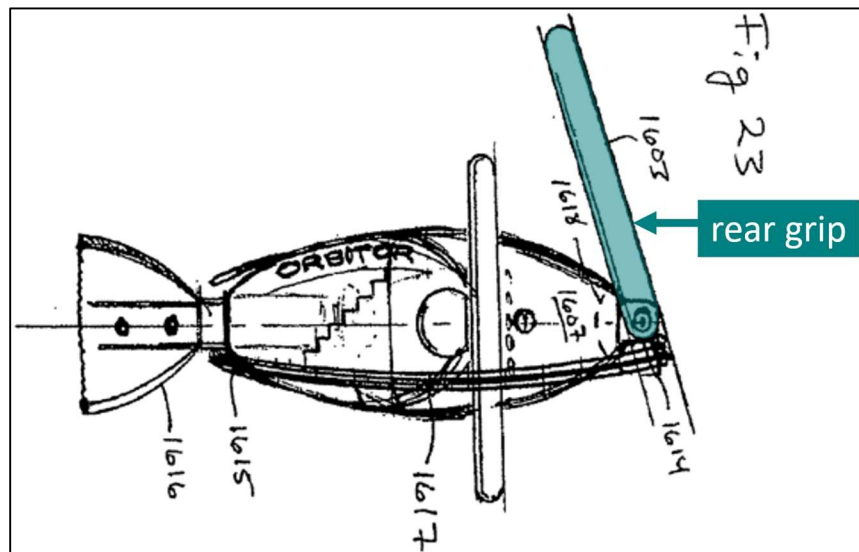
120. Likewise, in my opinion, a POSA would have understood that because Butler's "**foregrip[] 430**" is rotatable around the circumference of Butler's body, and slidable forwardly and rearwardly on Butler's body, one of the positions it would take would be on a **rear portion** of Butler's "housing" (replacing "foregrip 530"), adjacent the

“fan/motor,” as shown in the annotated image below:



Ex1005, Figs. 4(modified), 5(modified).

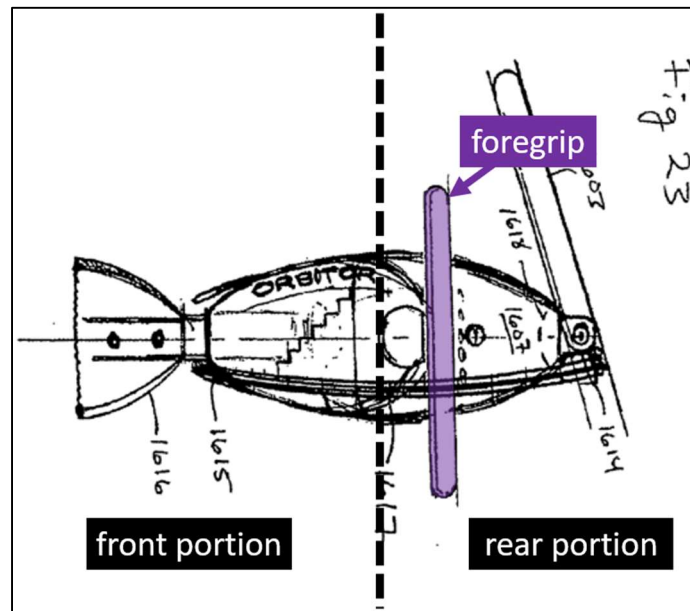
121. Butler further teaches “a pivoting rear grip 1601” “capable of being locked in” “a storage position,” as shown in the annotated image below:



Ex1005, 39:14-22, Fig. 23.

122. In my opinion, a POSA would have understood that each of Butler’s

“**foregrips**” are also provided on a sidewall at a rear portion of the hand vacuum cleaner body when the “rear grip” is “pivot[ed],” as shown in the annotated image below:



Ex1005, Fig. 23; *see also id.*, Figs. 2A, 3-8, 16.

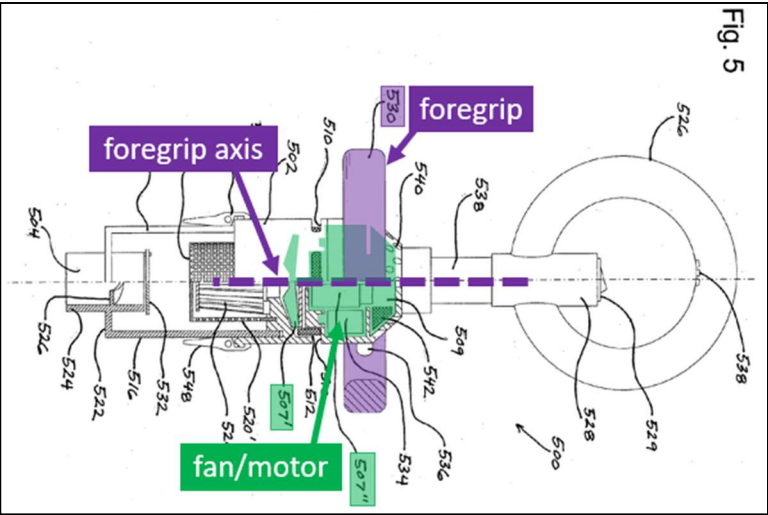
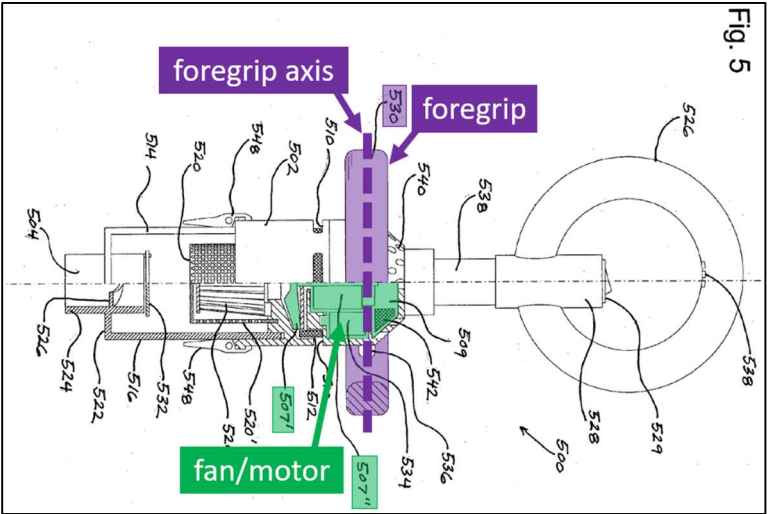
g. [1f]

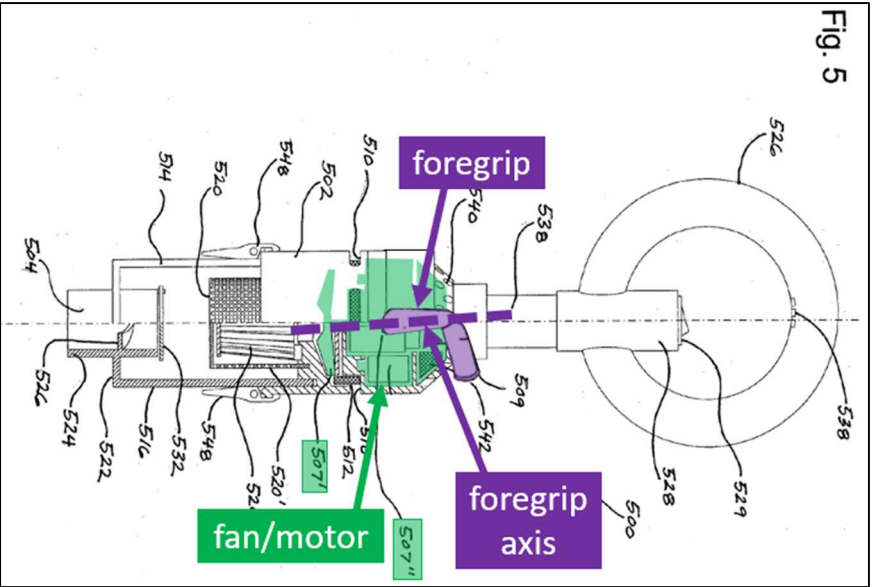
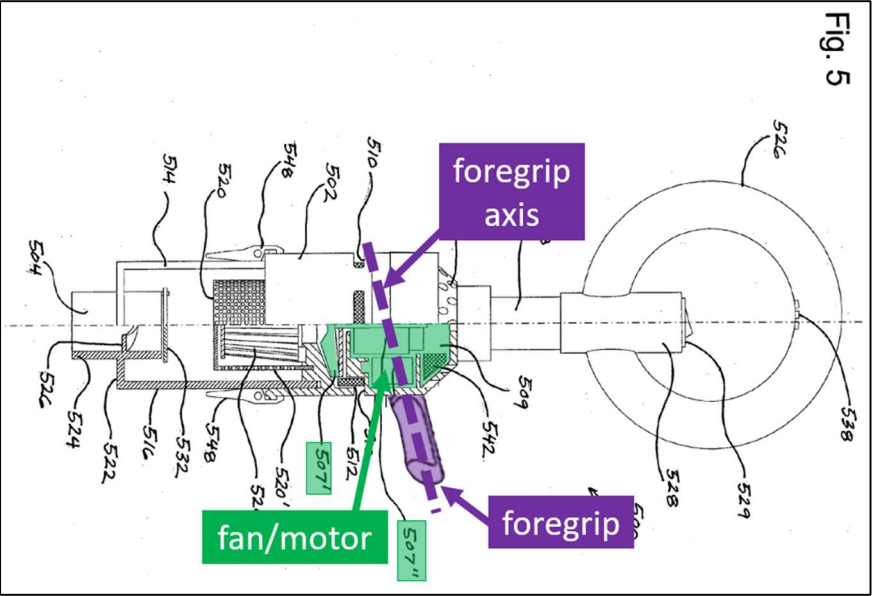
Reference Number	Claim Limitation
[1f]	“wherein the handle has a handle axis that intersects the suction motor.”

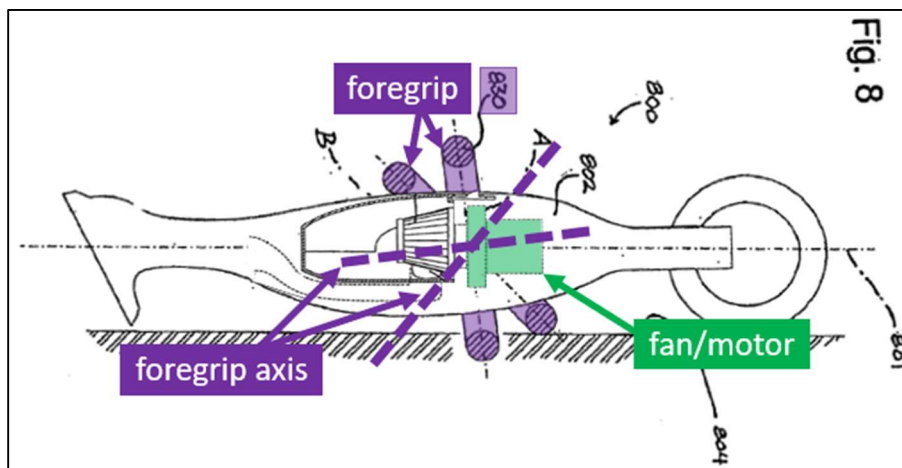
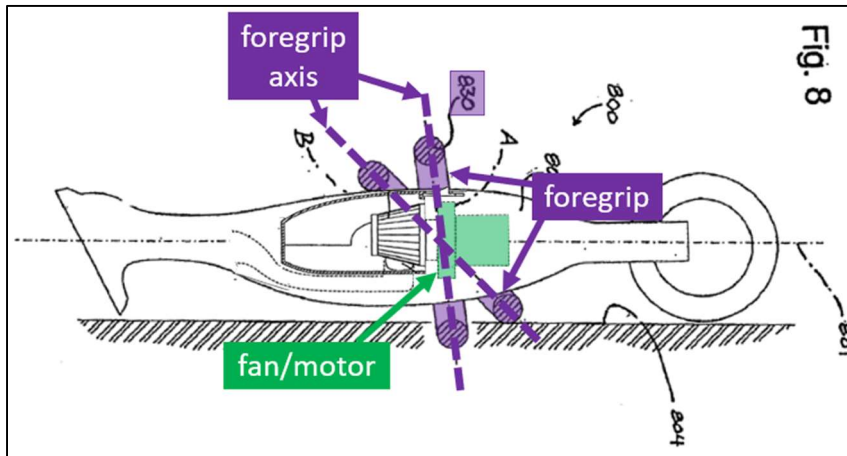
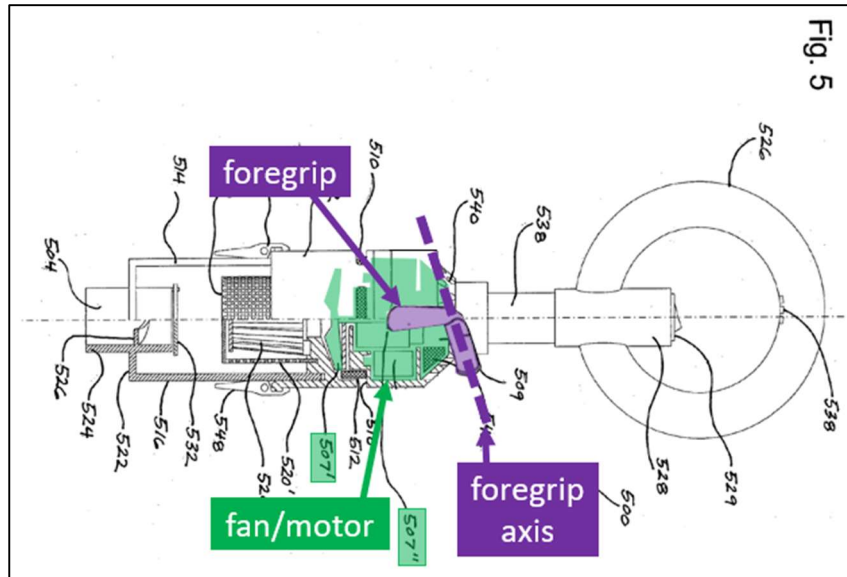
123. In my opinion, Butler teaches wherein the handle has a handle axis that intersects the suction motor.

124. In my opinion, a POSA would have understood that Butler teaches that the handle has a handle axis that intersects the suction motor. Butler’s “foregrip” has one or more foregrip axes that intersects the

“fan/motor,” as shown in the annotated images below:







Ex1005, Figs. 2D(modified), 3(modified), 4(modified), 5(modified), 8(modified); *see also id.*, Figs. 2A, 6-7, 16, 23.

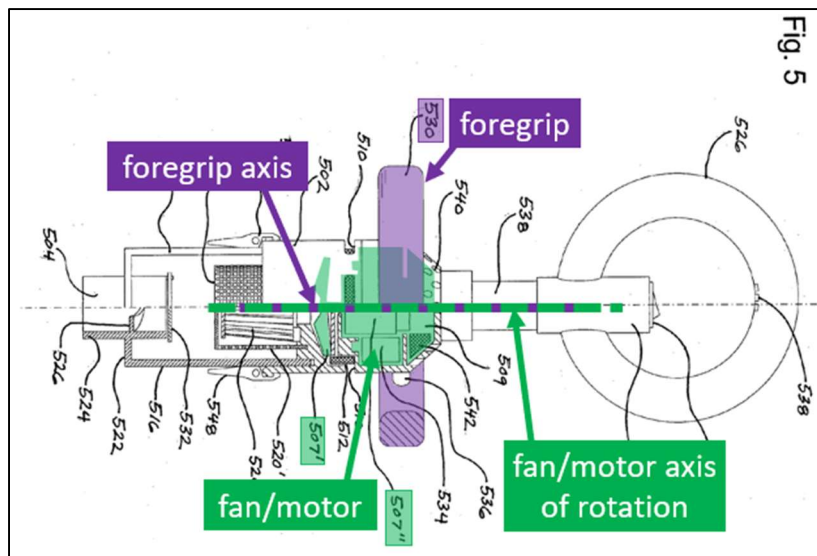
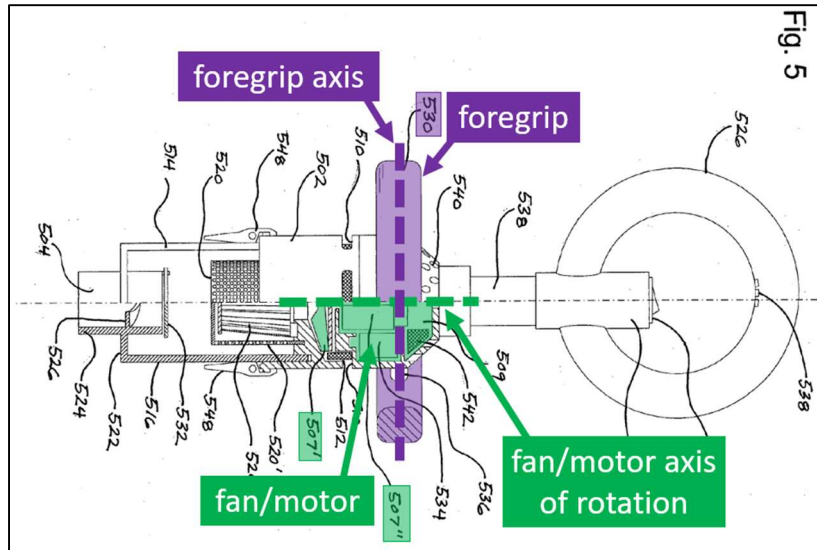
125. In my opinion, a POSA would have understood that Butler's "foregrips" have multiple **foregrip axes**, including an axis between any two points on the circumference of Butler's circulate foregrip, and another **foregrip axis** running through its radial center, each of which intersects the "fan/motor."

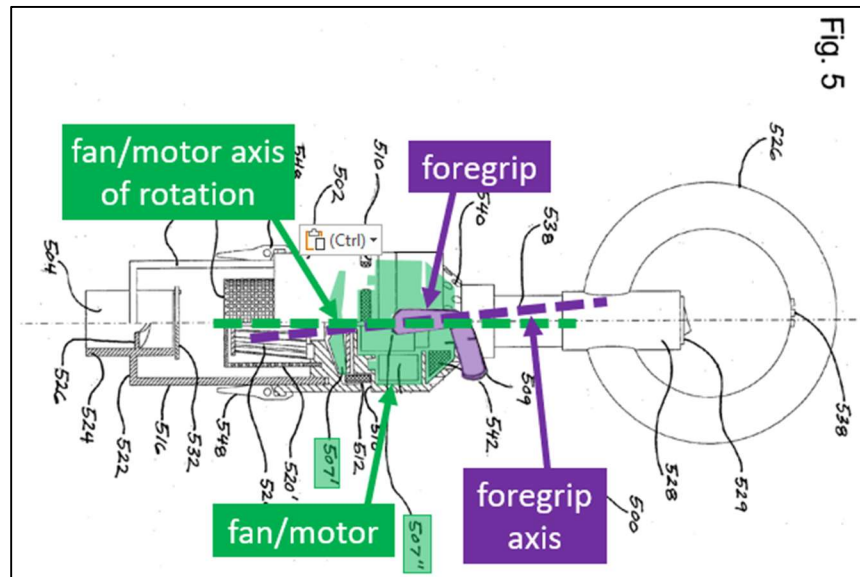
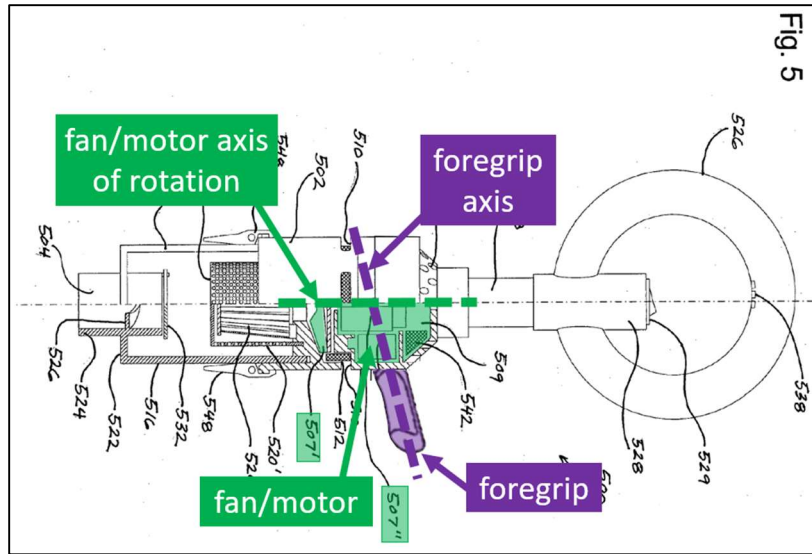
2. [2]

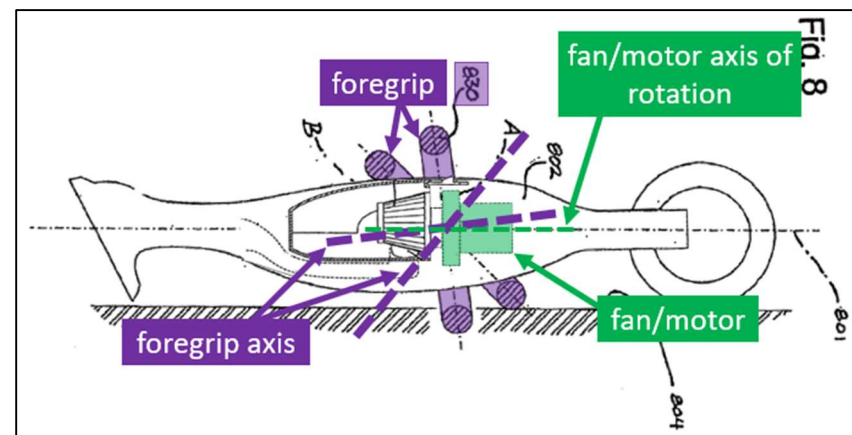
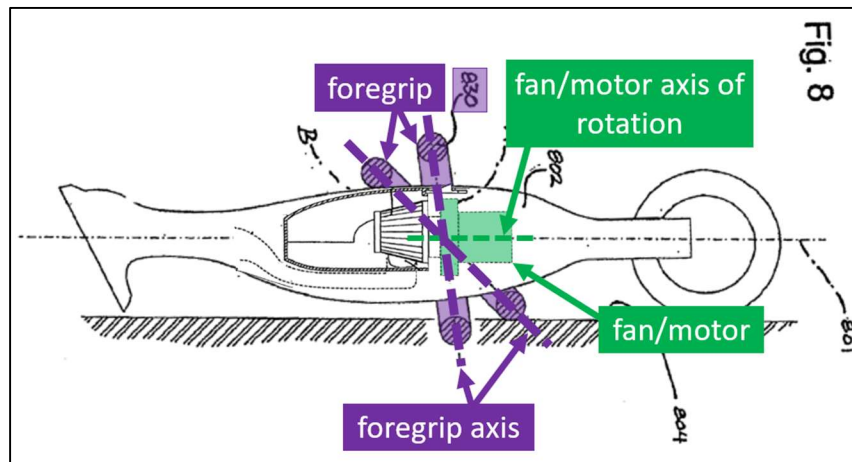
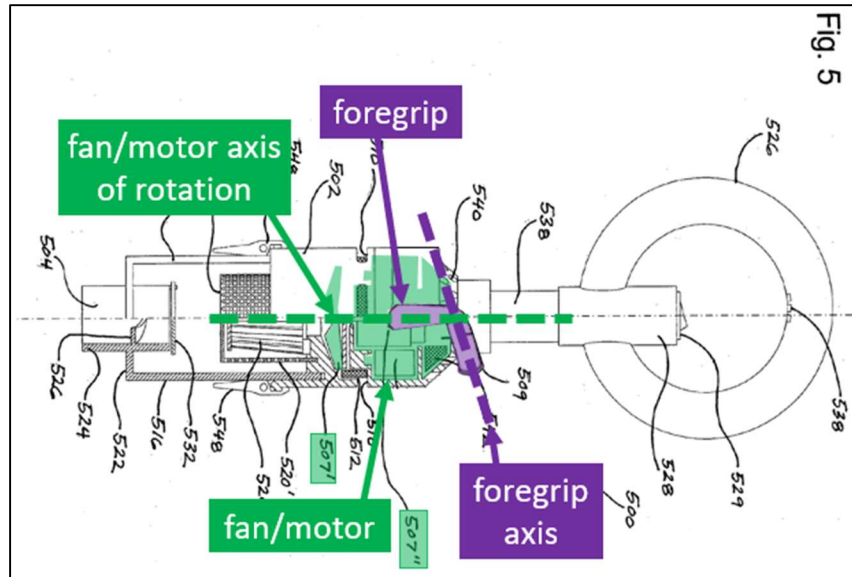
Reference Number	Claim Limitation
[2]	"The hand vacuum cleaner of claim 1 wherein the handle has a handle axis that intersects the suction motor axis of rotation."

126. In my opinion, Butler anticipates claim 1 and teaches wherein the handle has a handle axis that intersects the suction motor axis of rotation.

127. In my opinion, Butler teaches that the handle has a handle axis that intersects the suction motor axis of rotation. In Butler, the **foregrip axis** intersects the **fan/motor axis of rotation**, as shown in the annotated images below:







Ex1005, Figs. 2D(modified), 3(modified), 4(modified), 5(modified), 8(modified); *see also id.*, Figs. 2A, 6-7, 16, 23.

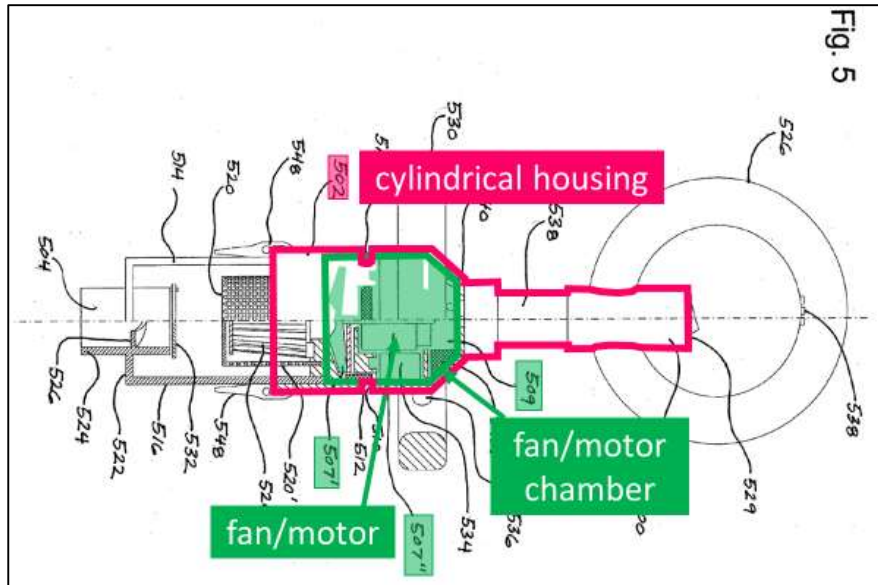
128. In my opinion, a POSA would have understood that Butler's "foregrips" have multiple **foregrip axes**, including an axis between any two points on the circumference of Butler's circulate foregrip, and another **foregrip axis** running through its radial center, each of which intersects the fan/motor axis of rotation.

3. [3]

Reference Number	Claim Limitation
[3]	"The hand vacuum cleaner of claim 1 wherein the hand vacuum cleaner body comprises a suction motor and fan assembly housing and the handle extends away from the suction motor and fan assembly housing."

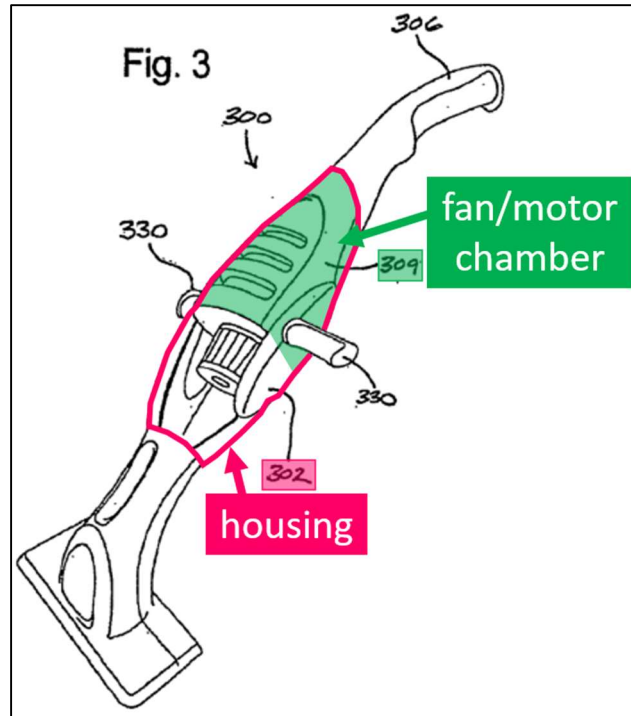
129. In my opinion, Butler anticipates claim 1 and teaches wherein the hand vacuum cleaner body comprises a suction motor and fan assembly housing and the handle extends away from the suction motor and fan assembly housing.

130. In my opinion, Butler teaches that 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:



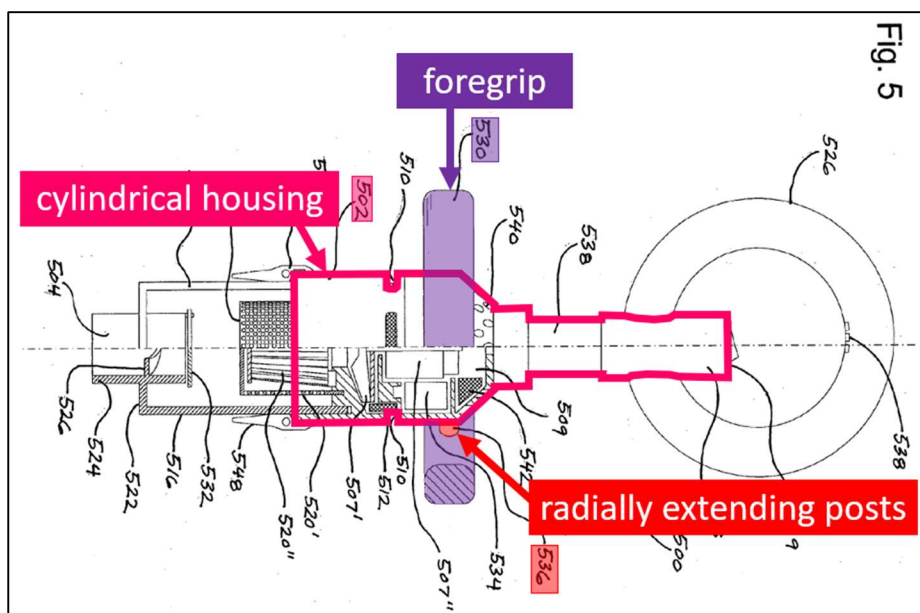
Ex1005, 20:4-14, Fig. 5; *see also id.*, Figs. 2A, 6-8, 16, 23.

131. In my opinion, a POSA would have understood that Butler’s “cylindrical housing 502” is a suction motor and fan assembly housing because it houses “fan/motor 507.” Likewise, a POSA would have understood that Butler’s “fan/motor chamber 309[, 409]” in which the fan/motor is located is housed within the body’s “housing 302, 402,” as shown in the annotated image below:



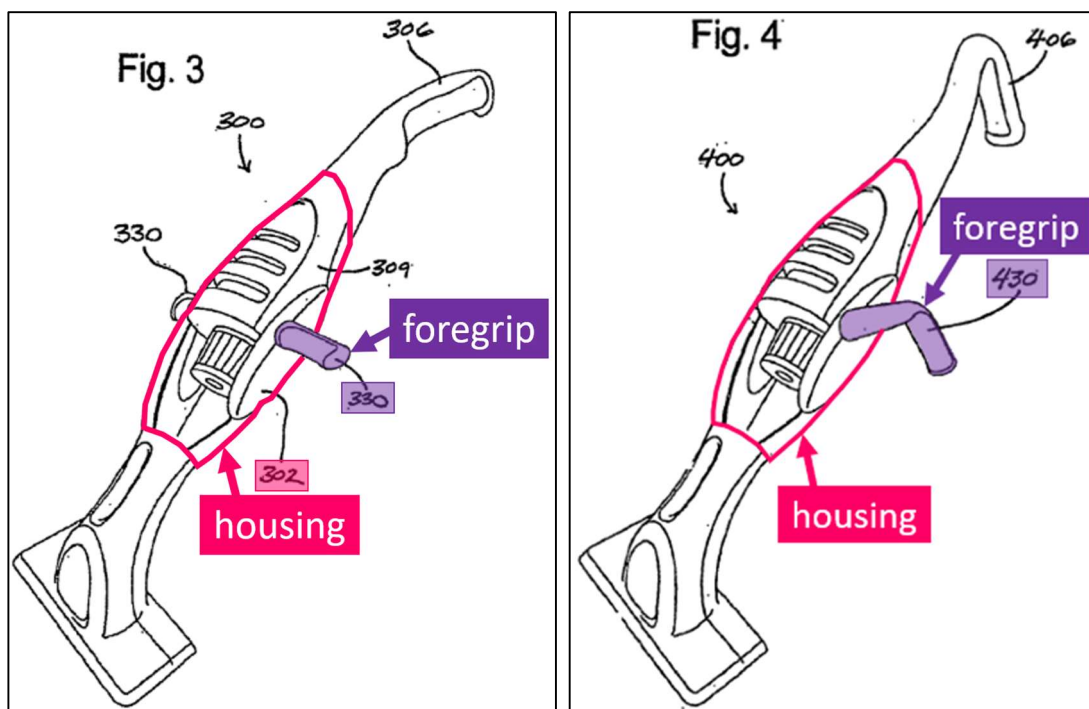
Ex1005, 19:18-22, Fig. 3; *see also id.*, Fig. 4.

132. In my opinion, a POSA would have further understood that Butler’s “housing 302, 402” is also a suction motor and fan assembly housing because it houses “fan/motor chamber 309[, 409]” having a fan/motor.
133. In my opinion, Butler teaches that the handle extends away from the suction motor and fan assembly housing. Butler’s “**foregrip**” “is attached to the **housing 502** by a number of **radially-extending posts 536**,” which, in my opinion, a POSA would have understood extend away from “**housing 502**” and cause the handle to extend away from “**housing 502**,” as shown in the annotated image below:



Ex1005, 20:4-6, 20:10-11, Fig. 5; *see also id.*, Figs. 2A, 6-8, 16, 23.

134. Likewise, a POSA would have understood that Butler’s “foregrips 330, 430” “extend generally radially from the vacuum cleaner housing 302 at a location adjacent ... the fan/motor chamber 309[, 409],” as shown in the annotated images below:



Ex1005, 19:18-22, 19:26-28; Figs. 3-4.

135. In my opinion, a POSA would have understood that Butler’s “radially” “extend[ing]” “foregrips 330, 430” extend away from the “fan/motor chamber 309[, 409].”

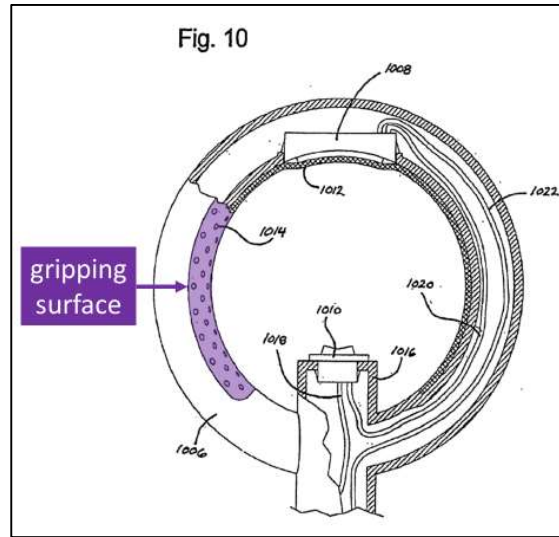
136. In my opinion, a POSA would have further understood that these limitations are met when Butler’s “foregrip” is “pivot[ed] or otherwise articulated,” as I explained for Limitations [1d]/[1e]. Ground 1, Limitations [1d]/[1e].

4. [4]/[12]

Reference Number	Claim Limitation
[4]	“The hand vacuum cleaner of claim 1 wherein the handle has a hand grip portion that extends upwardly and forwardly when the hand vacuum cleaner is positioned with the lower end of the hand vacuum cleaner on a horizontal surface.”
[12]	“The hand vacuum cleaner of claim 11 wherein the handle has a hand grip portion that extends upwardly and forwardly when the hand vacuum cleaner body is positioned with the lower end of the hand vacuum cleaner on a horizontal surface.”

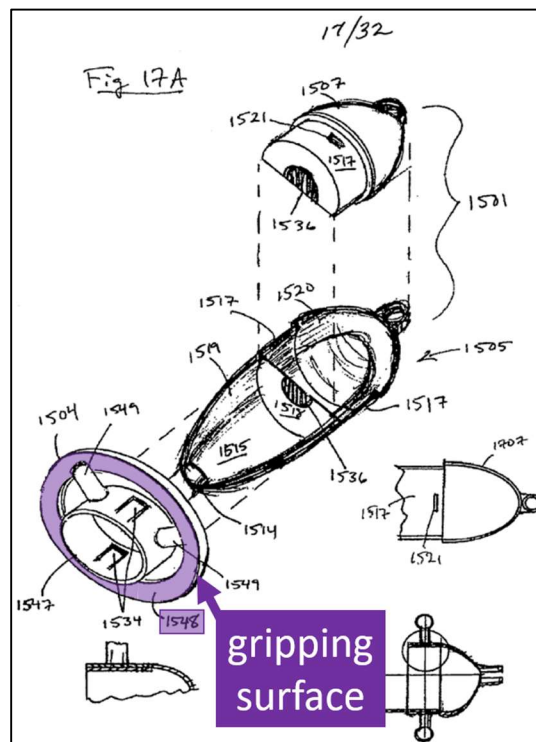
137. In my opinion, Butler anticipates claim 1 and teaches wherein the handle has a hand grip portion that extends upwardly and forwardly when the hand vacuum cleaner is positioned with the lower end of the hand vacuum cleaner on a horizontal surface.
138. In my opinion, Butler anticipates claim 11 and teaches wherein the handle has a hand grip portion that extends upwardly and forwardly when the hand vacuum cleaner body is positioned with the lower end of the hand vacuum cleaner on a horizontal surface.
139. In my opinion, a POSA would have understood that Butler’s handles include a hand grip portion. Butler teaches that a “gripping surface” may be placed on any or all portions of any of Butler’s disclosed handles: “**foregrip** ... may be made from any suitable material, and may also include **gripping surfaces** or surface treatments to enhance the user’s grip and feel,” such as “dimples, checkering, ridges or

bumps,” as shown in the annotated image below:



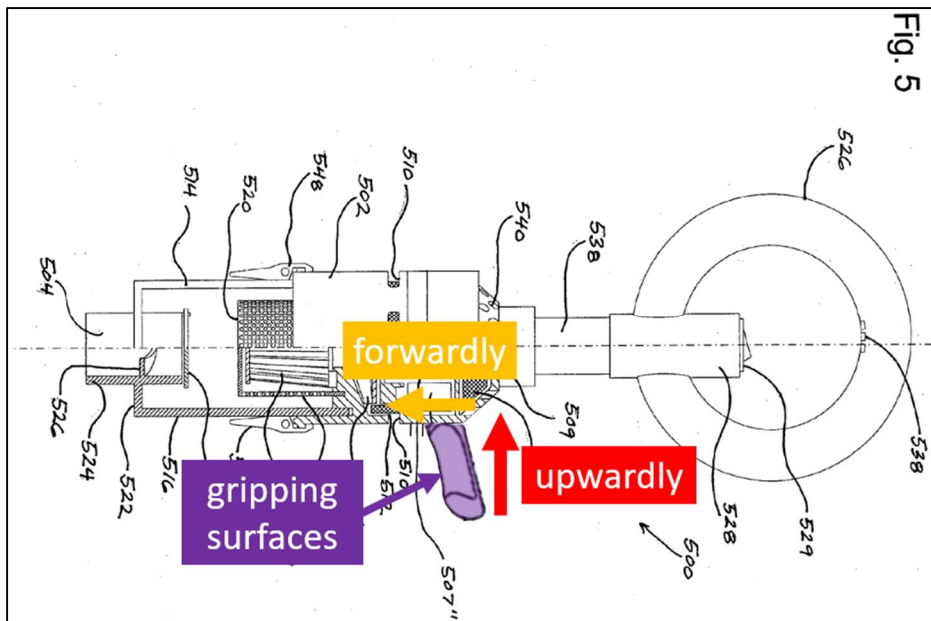
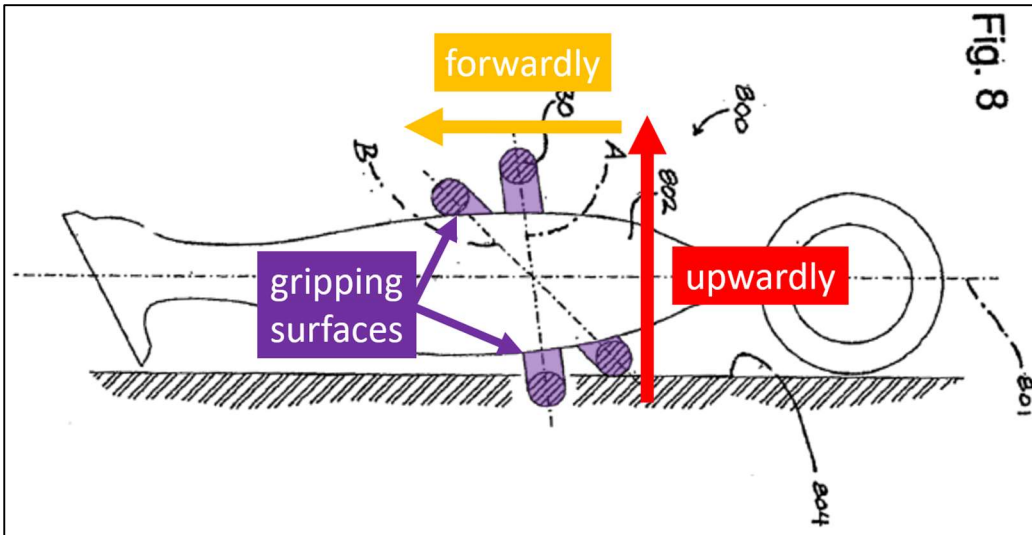
Id., 11:3-13, 11:22-24, Fig. 10.

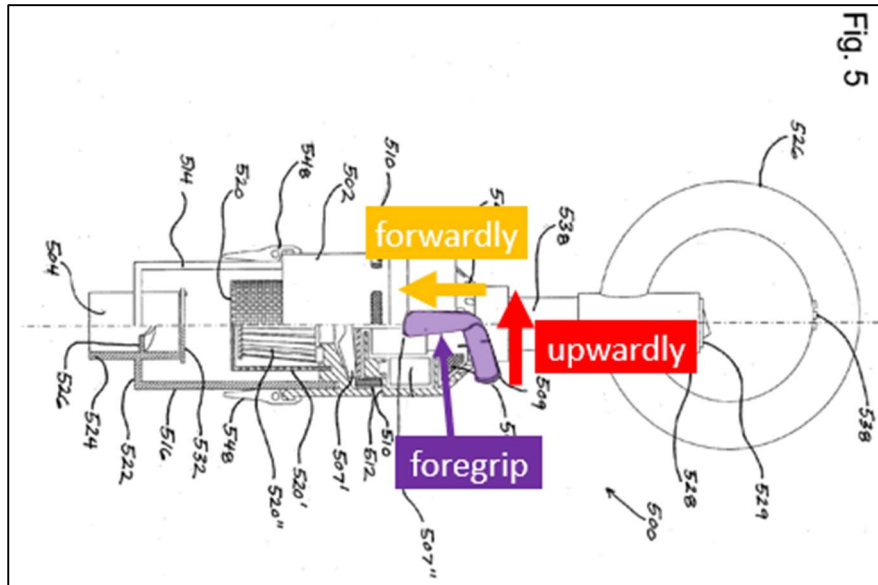
140. Butler further teaches that “the foregrip ... comprises ... a toroidal **gripping surface 1548**,” as shown in the annotated image below:



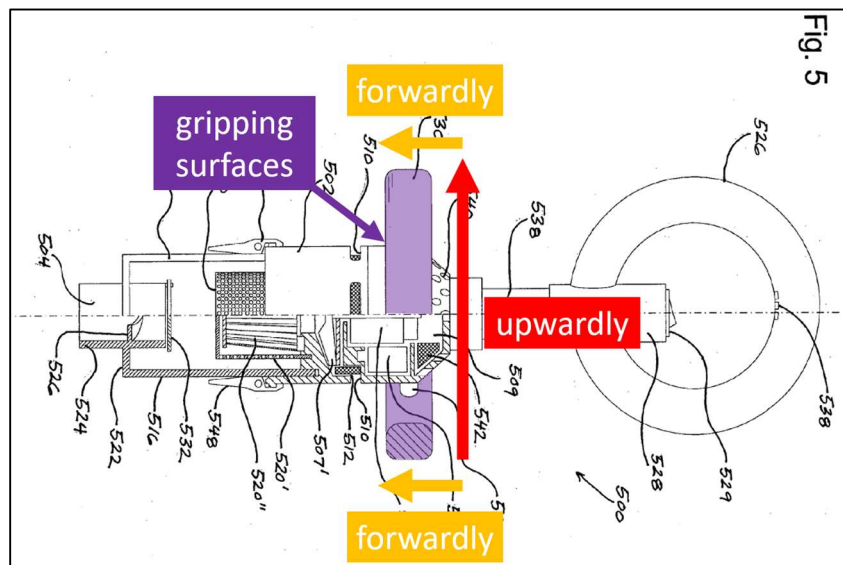
Ex1005, 37:10-13, Fig. 17A.

141. In my opinion, a POSA would have understood that Butler's "foregrip" "gripping surfaces," which a user grips with their hand, are hand grip portions.
142. In my opinion, Butler teaches that the handle has a hand grip portion that extends upwardly and forwardly when the hand vacuum cleaner is positioned with the lower end of the hand vacuum cleaner on a horizontal surface. The '661 Patent's claims do not require any particular starting point from which the handle extends "upwardly" or from which it extends "forwardly," or that the same starting point must be used for both. In my opinion, 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) are used. For example, when "pivot[ed]," Butler's "foregrip" includes "**gripping surfaces**" that extend **upwardly** and **forwardly** when the hand vacuum cleaner is oriented as claimed, as shown in the annotated images below:





Ex1005, 22:26-28, 37:10-13, Figs. 3(modified), 4(modified), 5(modified), 8; Ground 1, Limitation [1d]. So, too, in my opinion, does Butler’s “foregrip” when oriented vertically:

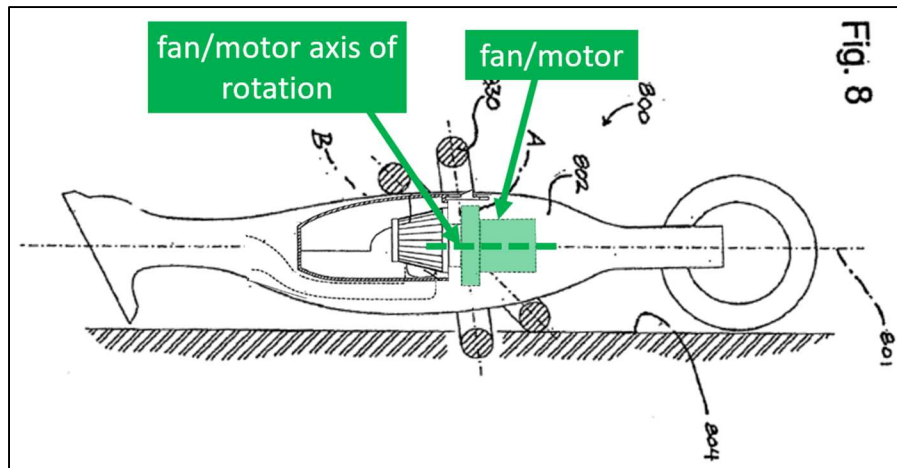
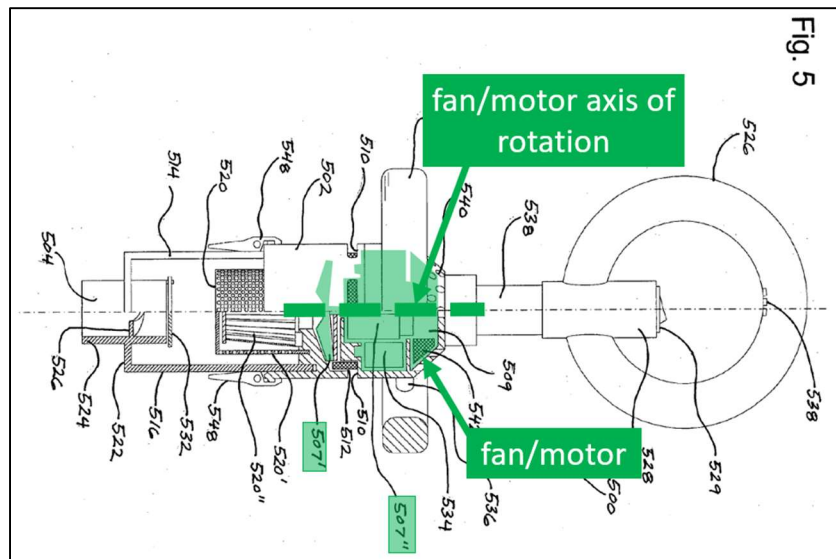


Ex1005, 20:4-6, 37:10-13, Fig. 5; *see also id.*, Figs. 2A, 6-7, 16, 23.

5. [5]

Reference Number	Claim Limitation
[5]	“The hand vacuum cleaner of claim 1 wherein when the hand vacuum cleaner is positioned with the lower end of the hand vacuum cleaner on a horizontal surface, the suction motor axis of rotation is generally horizontal.”

143. In my opinion, Butler anticipates claim 1 and teaches wherein when the hand vacuum cleaner is positioned with the lower end of the hand vacuum cleaner on a horizontal surface, the suction motor axis of rotation is generally horizontal.
144. In my opinion, Butler teaches that when the hand vacuum cleaner is positioned with the lower end of the hand vacuum cleaner on a horizontal surface, the suction motor axis of rotation is generally horizontal. A POSA would have understood that, when Butler’s hand vacuum is positioned as claimed, the **fan/motor axis of rotation** is generally horizontal, as shown in the annotated images below:



Ex1005, Figs. 2D(modified), 5, 8(modified); *see also id.*, Figs. 2A, 3, 4, 6-7, 16, 23;

Ground 1, Limitation [1a].

6. [6]/[13]

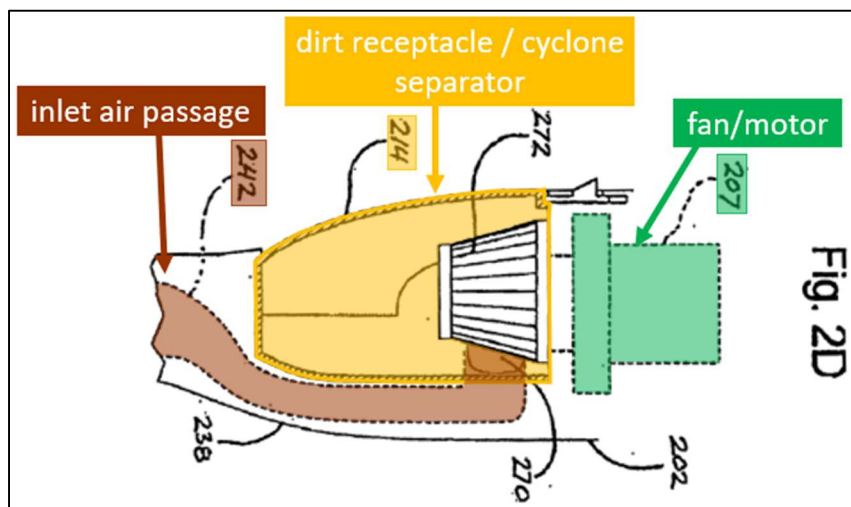
Reference Number	Claim Limitation
[6]	“The hand vacuum cleaner of claim 1 wherein when the hand vacuum cleaner is positioned with the lower end of the hand vacuum cleaner on a horizontal surface, the suction motor axis of rotation is positioned below the cyclone axis of rotation.”
[13]	“The hand vacuum cleaner of claim 11 wherein the suction motor axis of rotation is positioned below the cyclone axis of rotation when the hand vacuum cleaner body is positioned with the lower end of the hand vacuum cleaner on a horizontal surface.”

145. In my opinion, Butler anticipates claim 1 and teaches wherein when the hand vacuum cleaner is positioned with the lower end of the hand vacuum cleaner on a horizontal surface, the suction motor axis of rotation is positioned below the cyclone axis of rotation.

146. In my opinion, Butler anticipates claim 11 and teaches wherein the suction motor axis of rotation is positioned below the cyclone axis of rotation when the hand vacuum cleaner body is positioned with the lower end of the hand vacuum cleaner on a horizontal surface.

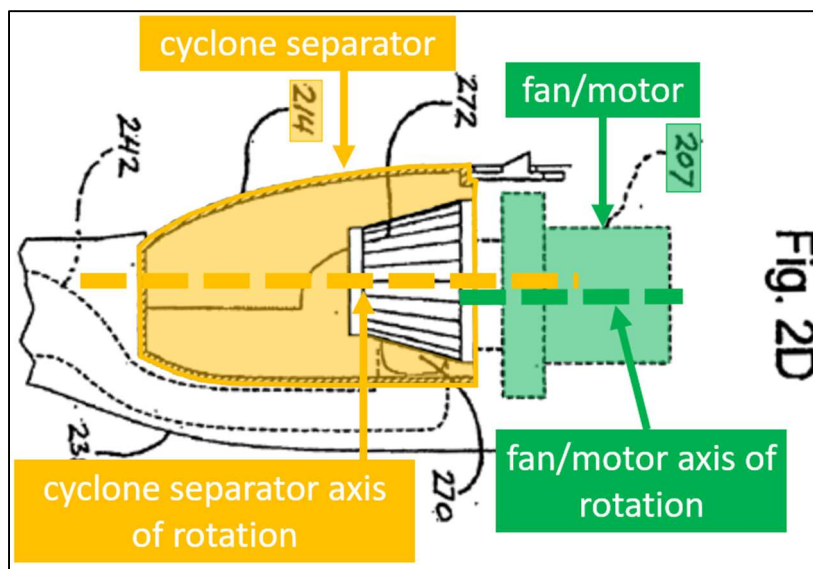
147. In my opinion, Butler teaches that when the hand vacuum cleaner is positioned with the lower end of the hand vacuum cleaner on a horizontal surface, the suction motor axis of rotation is positioned below the cyclone axis of rotation. Butler teaches that in Figure 2D, the “**inlet air passage 242** may be provided through the structural portion 238 of the housing 202 and terminate at or near the top of the

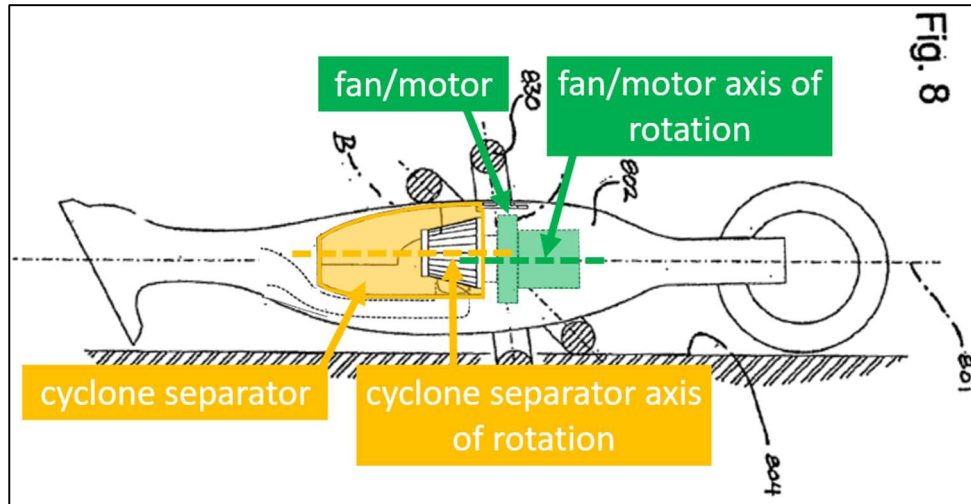
dirt receptacle 214,” which causes the “fan/motor 207” and cyclone separator to be slightly offset, as shown in the annotated image below:



Ex1005, 18:5-7, Fig. 2D.

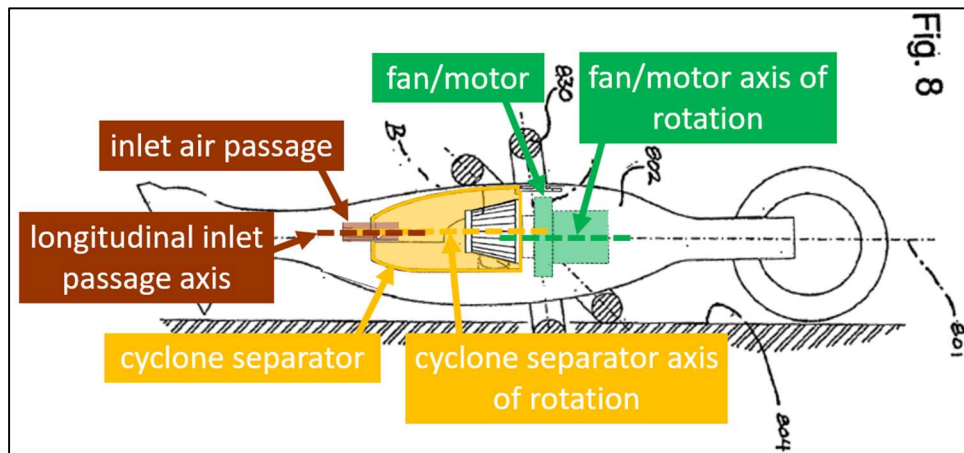
148. Thus, a POSA would have understood that, when Butler’s hand vacuum cleaner shown in Figure 2D is positioned as claimed, the fan/motor axis of rotation is positioned just below the cyclone separator axis of rotation, as shown in the annotated images below:

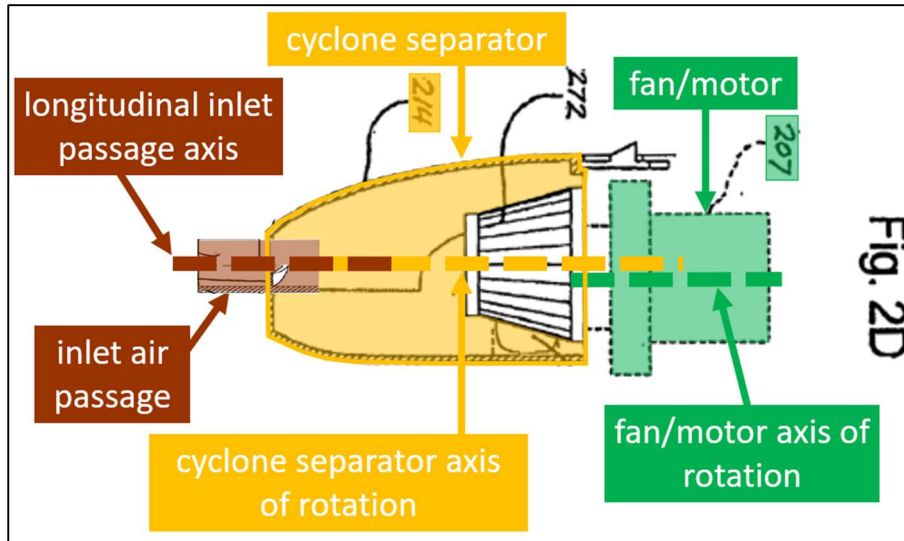




Ex1005, Fig. 2D, 8(modified); *see also id.*, Fig. 2A; Ground 1, Limitations [1a]/[1b].

149. Regarding claim 13, which depends from claim 11, in my opinion, these limitations are also met when Butler’s “**inlet air passage 242**” with a **longitudinal inlet passage axis** is “through the bottom wall of the dirt receptacle 214,” as shown in the annotated images below:





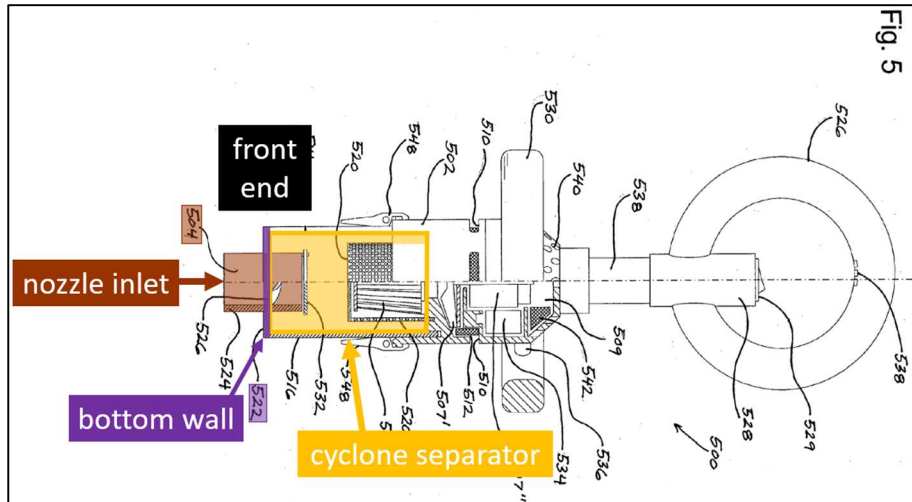
Ex1005, 18:18-20, Figs. 2D(modified), 5(modified), 8(modified); *see also id.*, Fig. 2A; Ground 1, Claims 7/11.

7. [7]

Reference Number	Claim Limitation
[7]	“The hand vacuum cleaner of claim 1 wherein the cyclone has a front end wall having the cyclone air inlet.”

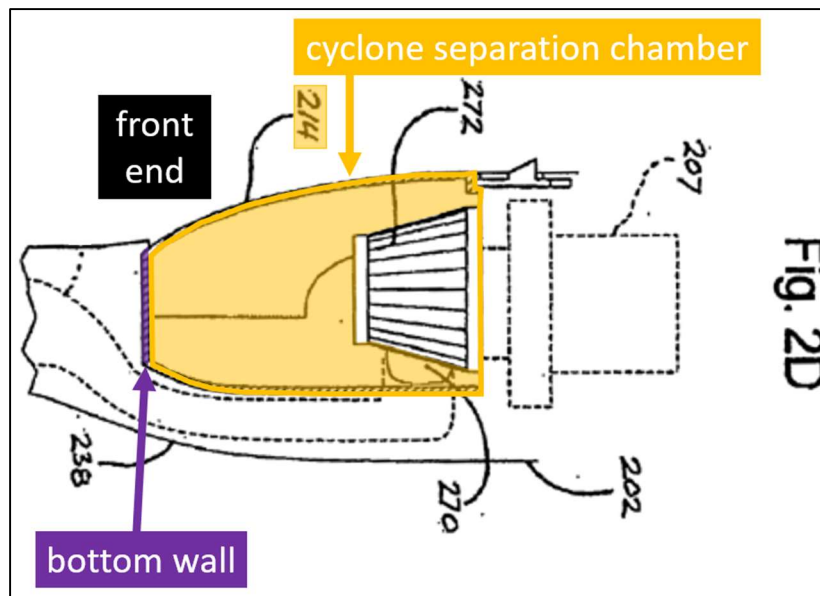
150. In my opinion, Butler anticipates claim 1 and teaches wherein the cyclone has a front end wall having the cyclone air inlet.

151. In my opinion, Butler teaches that the cyclone has a front end wall having the cyclone air inlet. A POSA would have understood that Butler teaches a “**cyclone separator**” comprising a cyclone with a front end wall (“**bottom wall 522**”) having a cyclone air inlet (“**nozzle inlet 504**”), as shown in the annotated image below:



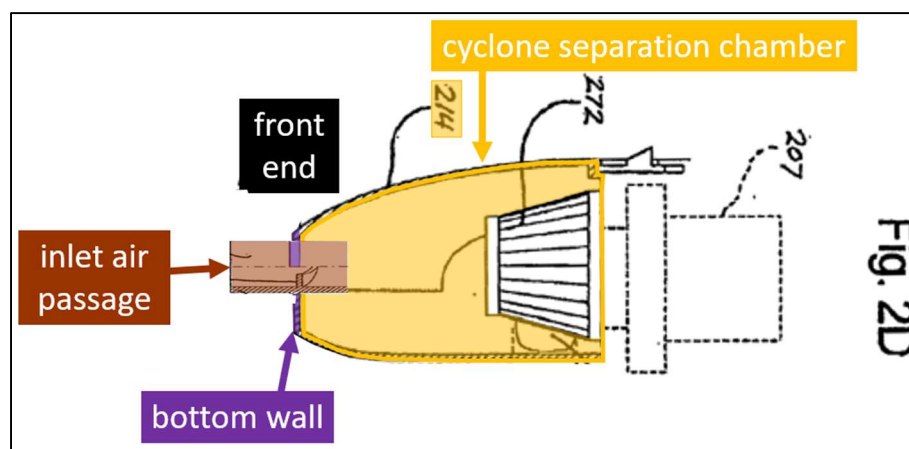
Ex1005, 21:19-23, Fig. 5; Ground 1, Limitations [1pre]/[1b]; *see also* Ex1005, 22:5-6 (“The nozzle inlet 504 of the embodiment of Figure 5 comprises an entry tube 524 that passes through the dirt receptacle bottom wall 522.”), Figs. 6-7, 16, 23.

152. Further, a POSA would have understood that Butler teaches a “**cyclone separation chamber**” comprising a cyclone with a front end wall (“**bottom wall**”), as shown in the annotated image below:



Ex1005, 18:3-5, 18:18-21, Fig. 2D; *see also id.*, Fig. 2A; Ground 1, Limitations [1pre]/[1b].

153. Butler explains that “alternative means for initiating cyclonic airflow may be used with the embodiment of Figure 2D.” Ex1005, 18:15-16. “For example, the inlet air passage 242 may ... be through the bottom wall of the dirt receptacle 214 and include a diverter to initiate cyclonic action.” *Id.*, 18:18-20. As I show above, Butler teaches a “nozzle inlet 504” with “a helical ramp 526” (diverter) “that passes through the dirt receptacle bottom wall 522.” *Id.*, 21:19-23, 22:5-6, 22:14-22, Fig. 5. In my opinion, a POSA would have understood that, like Butler’s Figure 5 embodiment, when such “alternative means” are implemented, the “**cyclone separation chamber**” comprises a cyclone with a front end wall (“**bottom wall**”) having a cyclone air inlet (“**inlet air passage 242**”), as shown in the annotated image below:



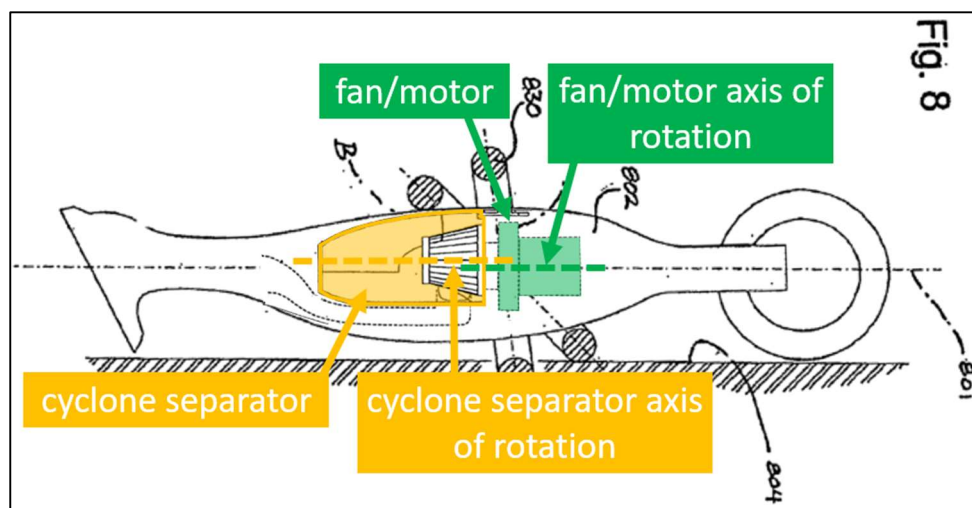
Ex1005, Figs. 2D(modified), 5(modified).

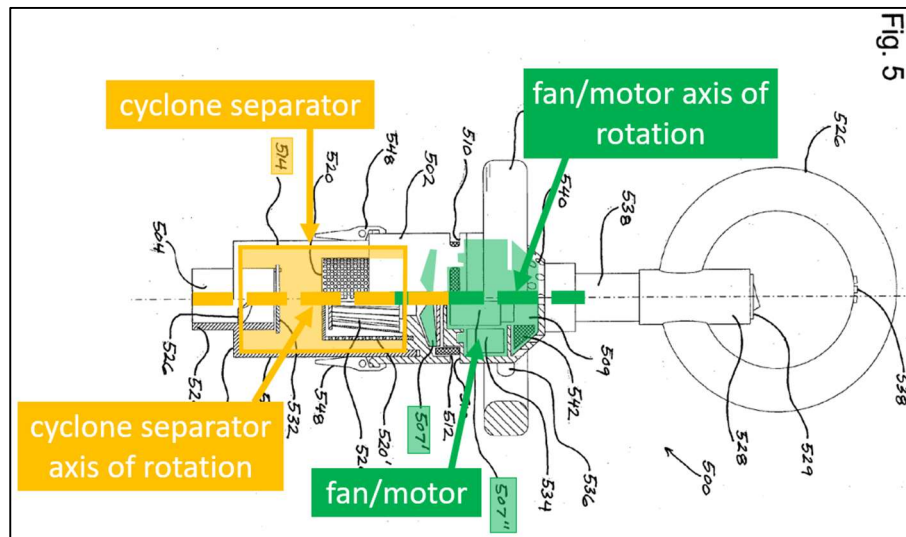
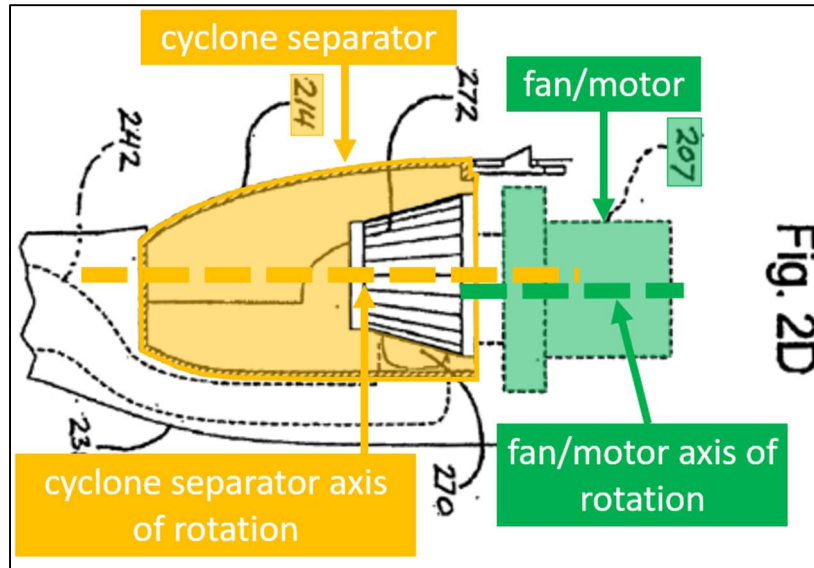
8. [8]

Reference Number	Claim Limitation
[8]	“The hand vacuum cleaner of claim 1 wherein the cyclone axis of rotation is generally parallel to the suction motor axis of rotation.”

154. In my opinion, Butler anticipates claim 1 and teaches wherein the cyclone axis of rotation is generally parallel to the suction motor axis of rotation.

155. In my opinion, Butler teaches that the cyclone axis of rotation is generally parallel to the suction motor axis of rotation. A POSA would have understood that, in Butler, the **cyclone separator axis of rotation** is generally parallel to the **fan/motor axis of rotation**, as shown in the annotated images below:





Ex1005, Fig. 5; *see also id.*, Figs. 2A, 6-7, 16, 24.

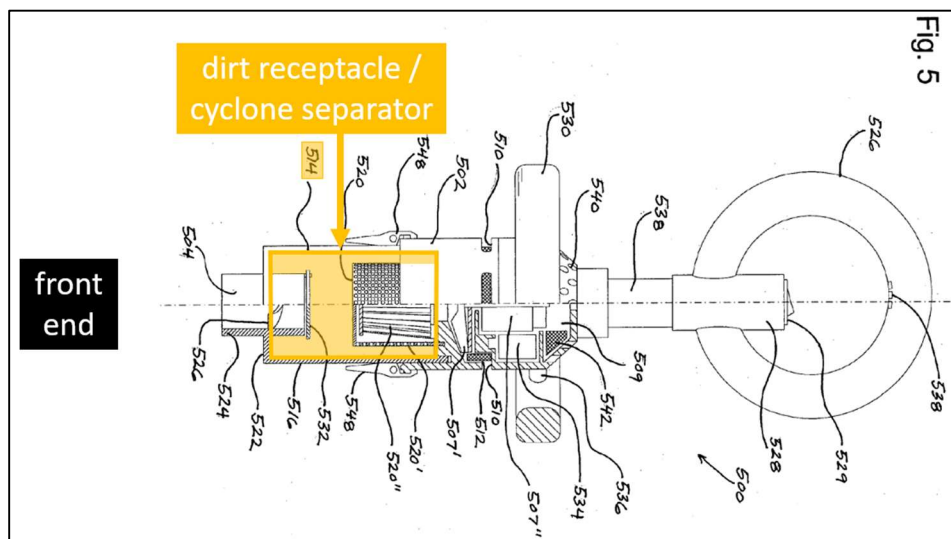
156. To the extent Butler's fan/motor axis and cyclone separator axis are depicted as co-axial in Figure 5, in my opinion, a POSA would have understood that these axes are generally parallel because they extend in the same direction and maintain the same (zero) distance between them.

9. [9]

Reference Number	Claim Limitation
[9]	“The hand vacuum cleaner of claim 1 wherein the cyclone unit is provided at the front end of the hand vacuum cleaner body.”

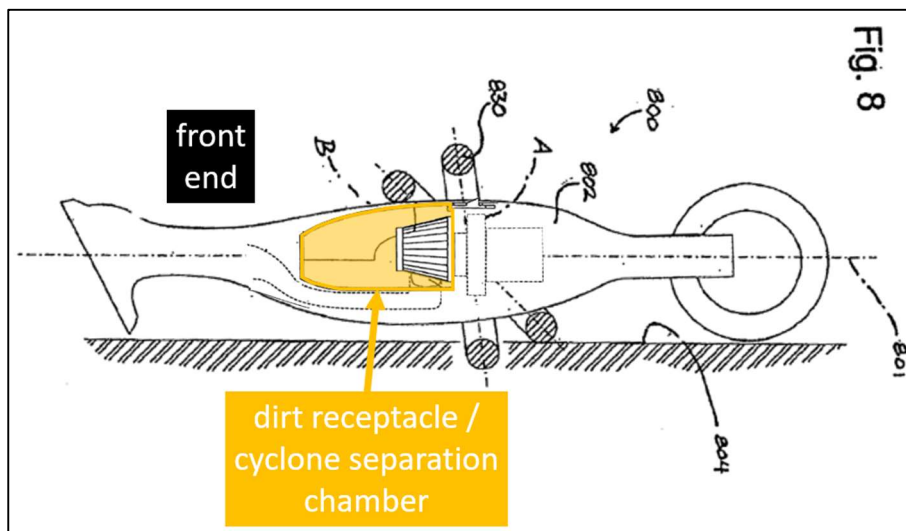
157. In my opinion, Butler anticipates claim 1 and teaches wherein the cyclone unit is provided at the front end of the hand vacuum cleaner body.

158. In my opinion, Butler teaches that the cyclone unit is provided at the front end of the hand vacuum cleaner body. A POSA would have understood that Butler’s “**dirt receptacle** compris[ing] a **cyclone separator**” (cyclone unit) is provided at the **front end** of Butler’s hand vacuum cleaner body, as shown in the annotated image below:



Ex1005, claim 11, Fig. 5; *see also id.*, Figs. 3, 4, 6-7, 16, 23; Ground 1, Limitations [1a]/[1b].

159. In my opinion, a POSA would have understood that, so, too, is Butler’s “**dirt receptacle 214** compris[ing] a **cyclone separation chamber**” (cyclone unit), as shown in the annotated image below:



Ex1005, 18:3-5, Figs. 2D(modified), 8(modified); *see also id.*, Fig. 2A.

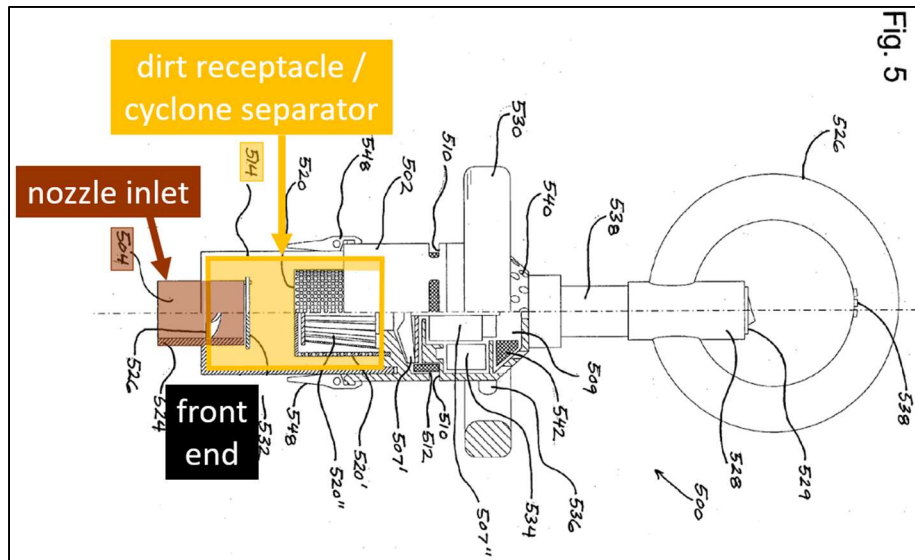
10. [10]

Reference Number	Claim Limitation
[10]	“The hand vacuum cleaner of claim 1 wherein the dirty air inlet is provided at a front end of the cyclone unit.”

160. In my opinion, Butler anticipates claim 1 and teaches wherein the dirty air inlet is provided at a front end of the cyclone unit.

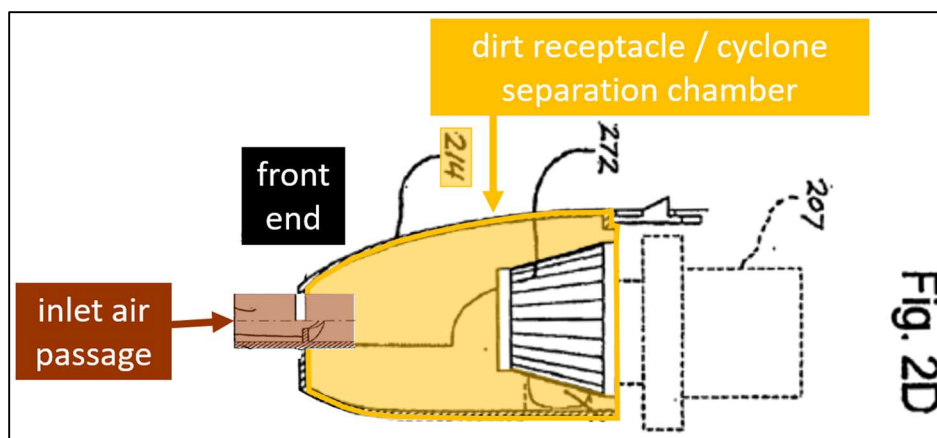
161. In my opinion, Butler teaches that the dirty air inlet is provided at a front end of the cyclone unit. A POSA would have understood that Butler’s “**nozzle inlet 504**” (dirty air inlet) is provided at a **front end** of the “**dirt receptacle** compris[ing] a **cyclone separator**” (cyclone

unit), as shown in the annotated image below:



Ex1005, Fig. 5; *see also id.*, Figs. 6-7, 16, 23; Ground 1, Limitation [1pre]/[1b].

162. In my opinion, a POSA would have understood that Butler's cyclone unit has a front end as identified above, and the dirty air inlet is provided at a front end of the cyclone unit.
163. Likewise, a POSA would have understood that when Butler's “**inlet air passage 242**” (dirty air inlet) is “through the bottom wall of the dirt receptacle 214,” it is provided at a **front end** of the “**dirt receptacle 214** compris[ing] a **cyclone separation chamber**” (cyclone unit), as shown in the annotated image below:



Ex1005, 18:18-20, Figs. 2D(modified), 5(modified); *see also id.*, Fig. 2A; Ground 1, Limitations [1pre]/[1b], Claim 7.

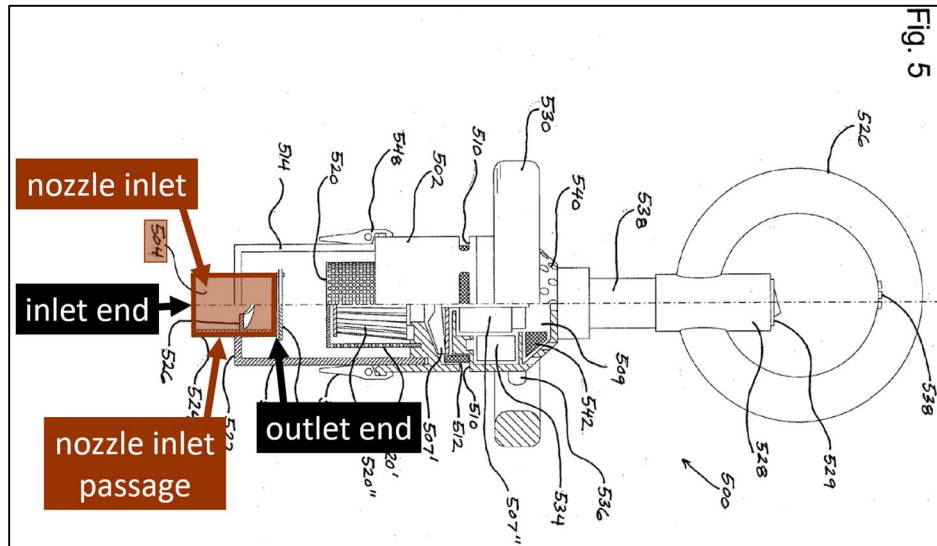
11. [11]

Reference Number	Claim Limitation
[11]	“The hand vacuum cleaner of claim 1 wherein the dirty air inlet comprises an inlet passage that extends longitudinally between an inlet end and an outlet end and has a longitudinal passage axis that is coaxial with the cyclone axis and the outlet end communicates with the cyclone air inlet.”

164. In my opinion, Butler anticipates claim 1 and teaches wherein the dirty air inlet comprises an inlet passage that extends longitudinally between an inlet end and an outlet end and has a longitudinal passage axis that is coaxial with the cyclone axis and the outlet end communicates with the cyclone air inlet.

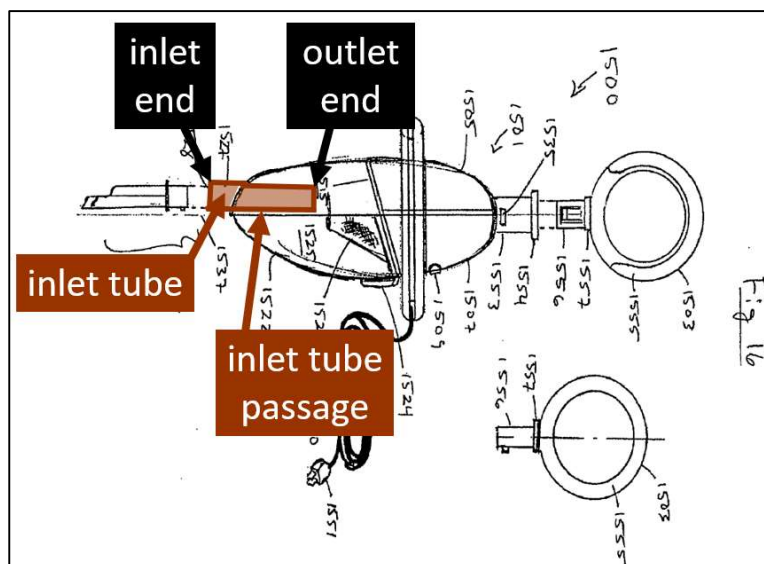
165. In my opinion, Butler teaches that the dirty air inlet comprises an inlet passage that extends longitudinally between an inlet end and an outlet end. A POSA would have understood that Butler’s “**nozzle inlet 504**”

(dirty air inlet) comprises a **nozzle inlet passage** that extends longitudinally between an **inlet end** and an **outlet end**, as shown in the annotated image below:



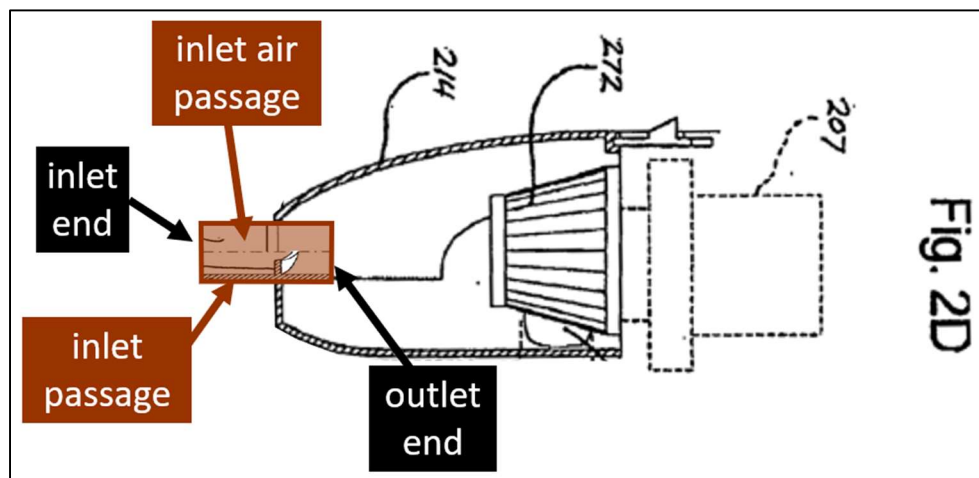
Ex1005, Figs. 5; *see also id.*, Figs. 6-7, 16, 23; Ground 1, Limitation [1pre].

166. A POSA would have understood that, so, too, does Butler’s “**inlet tube 1514**,” as shown in the annotated image below:



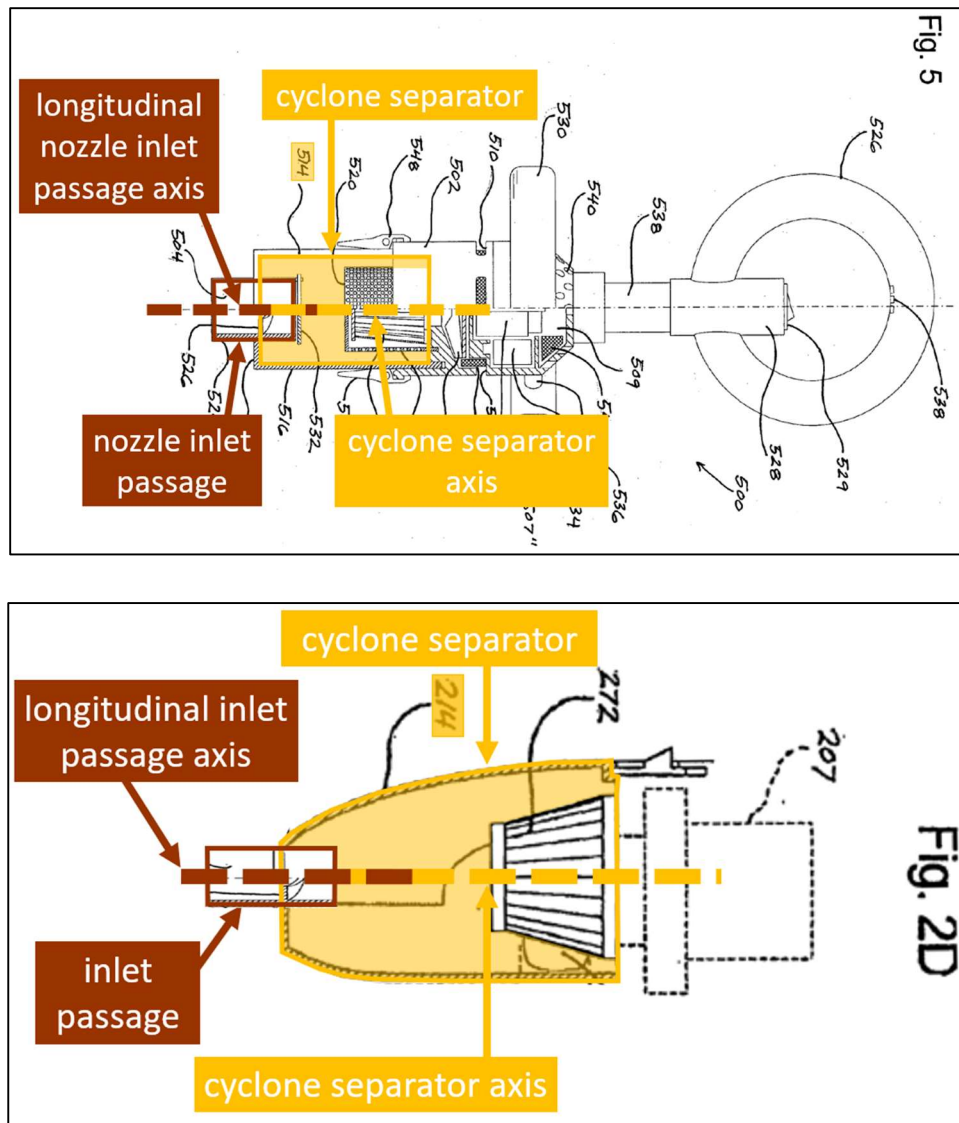
Ex1005, 35:22-24, Fig. 16.

167. Likewise, in my opinion, a POSA would have understood that when “**inlet air passage 242**” (dirty air inlet) is “through the bottom wall of the dirt receptacle 214,” it comprises an **inlet passage** that extends longitudinally between an **inlet end** and an **outlet end**, as shown in the annotated image below:



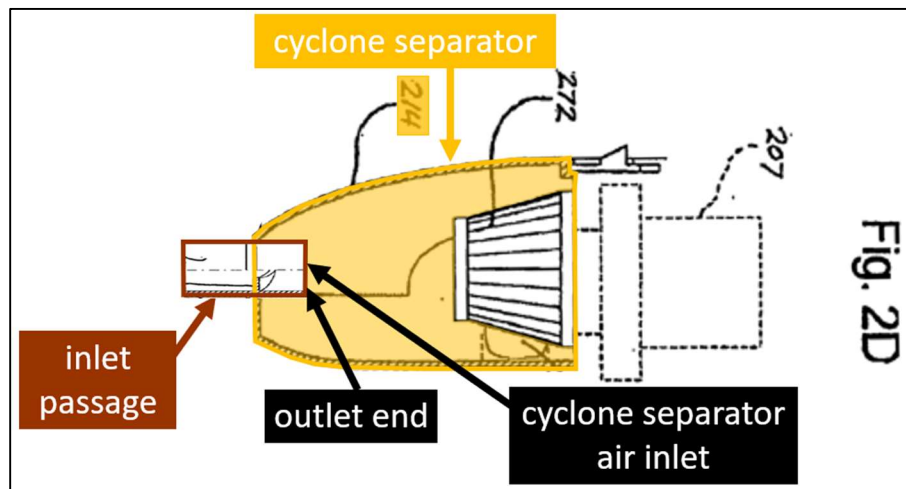
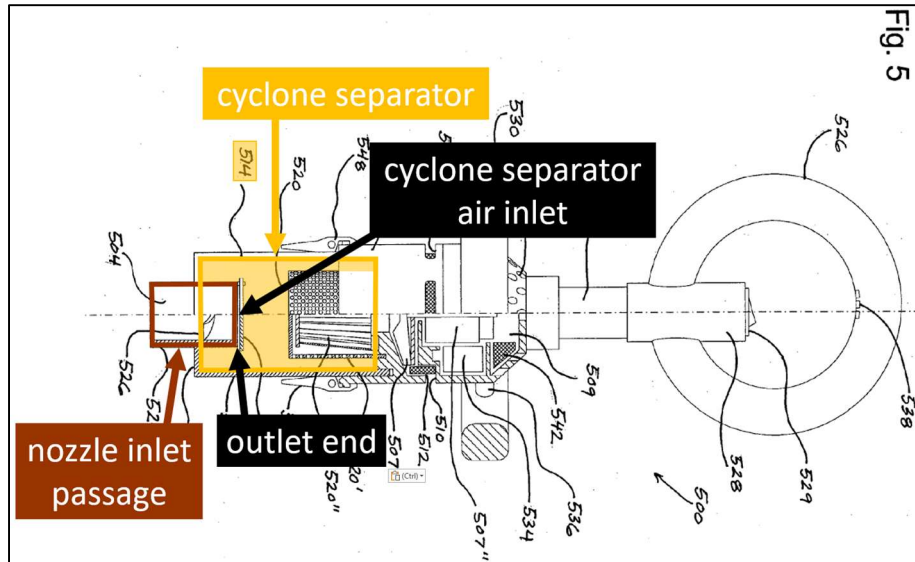
Ex1005, 18:18-20, Figs. 2D(modified), 5(modified); *see also* Ex1005, Fig. 2A; Ground 1, Claim 7.

168. In my opinion, Butler teaches that the inlet passage has a longitudinal passage axis that is coaxial with the cyclone axis. A POSA would have understood that Butler’s **nozzle inlet passage** has a **longitudinal axis** that is coaxial with the **cyclone separator axis**, as shown in the annotated images below:



Ex1005, Figs. 2D(modified), 5(modified); *see also id.*, Figs. 6-7; 23.

169. In my opinion, Butler teaches that the inlet passage outlet end communicates with the cyclone air inlet. A POSA would have understood that Butler's **nozzle inlet passage outlet end** communicates with the **cyclone separator air inlet**, as shown in the annotated images below:

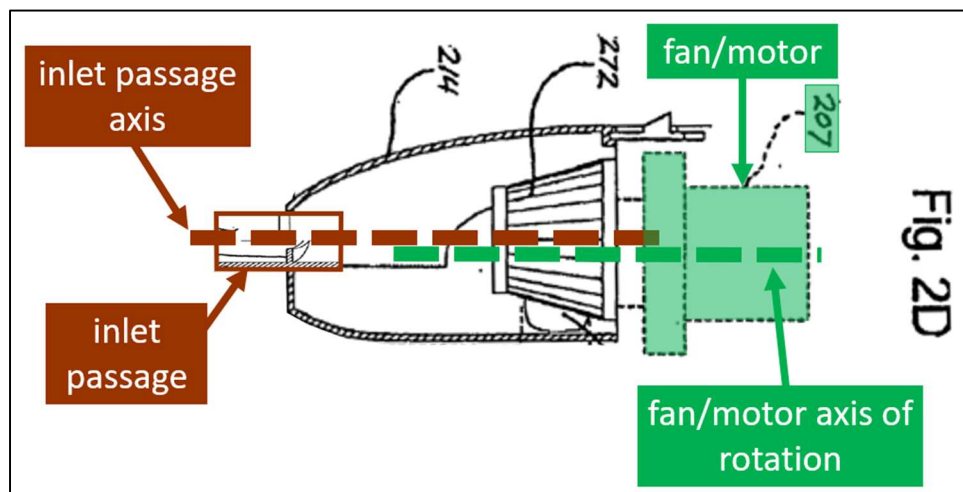


Ex1005, Figs. 2D(modified), 5(modified); *see also id.*, Figs. 6-7, 16, 23; Ground 1, Limitation [1b].

12. [14]

Reference Number	Claim Limitation
[14]	“The hand vacuum cleaner of claim 11 wherein the suction motor axis of rotation is position below the passage axis when the hand vacuum cleaner body is positioned with the lower end of the hand vacuum cleaner on a horizontal surface.”

172. Likewise, in my opinion, a POSA would have understood that when Butler’s “**inlet air passage 242**” is “through the bottom wall of the dirt receptacle 214,” the **fan/motor axis of rotation** is positioned below the **inlet passage axis**, as shown in the annotated image below:



Ex1005, 18:18-20, Figs. 2D(modified), 5(modified); Ground 1, Limitation [1a], Claims 7/11.

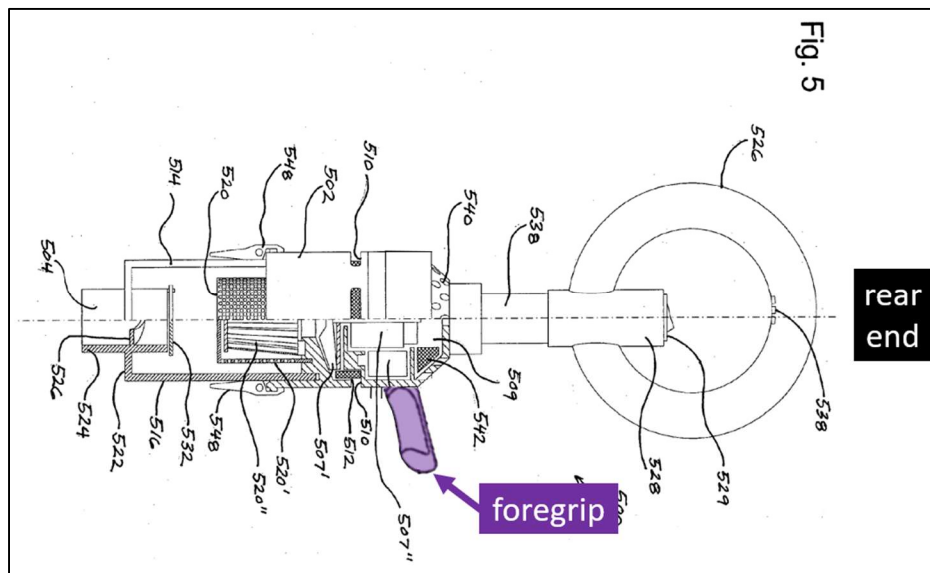
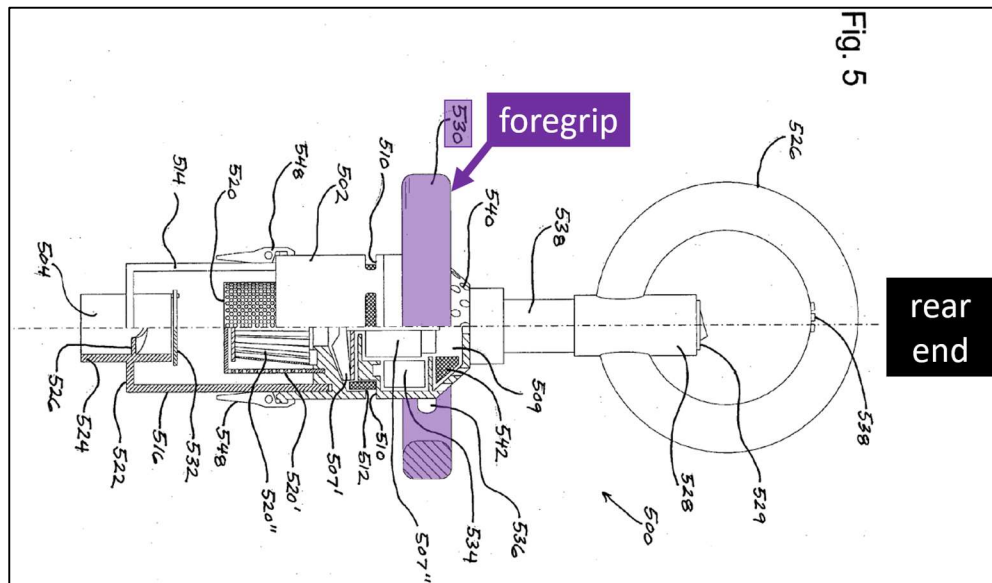
13. [15]

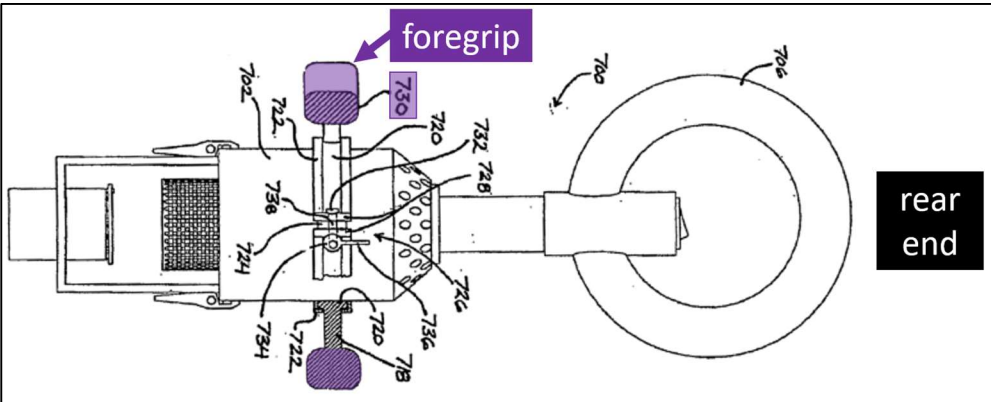
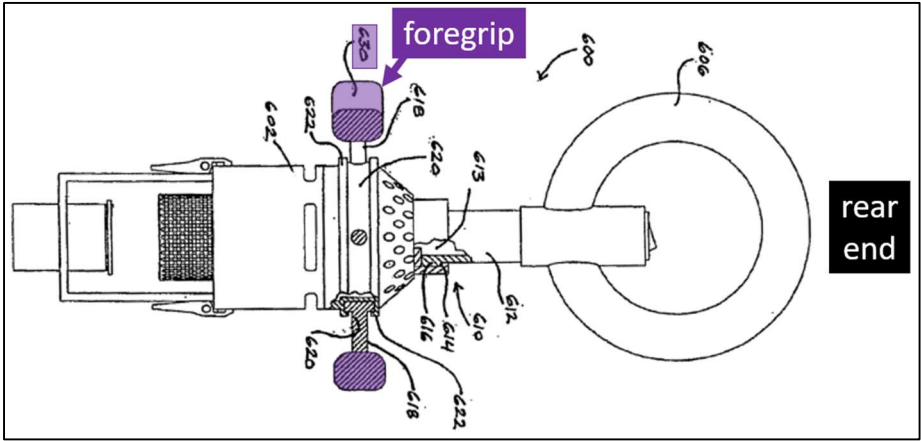
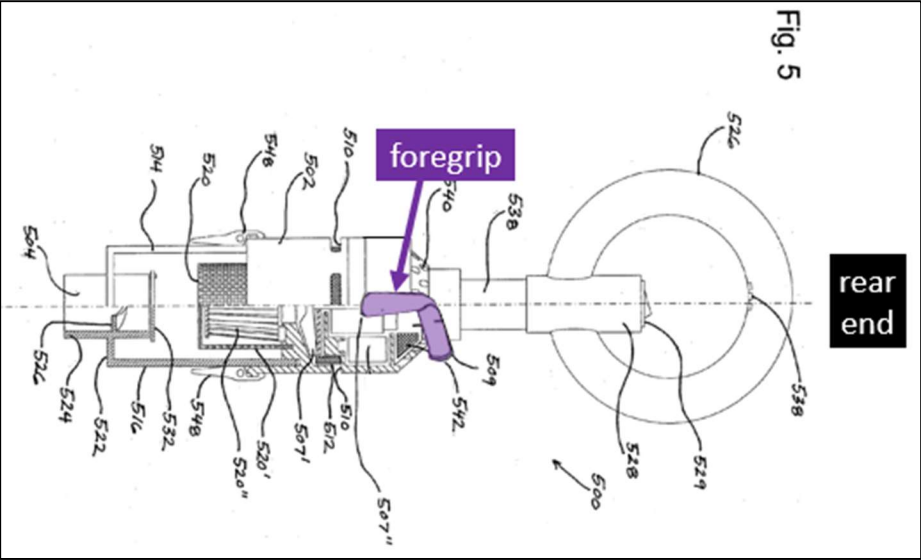
Reference Number	Claim Limitation
[15]	“The hand vacuum cleaner of claim 1 wherein the handle is forward of a rear end of the hand vacuum cleaner body.”

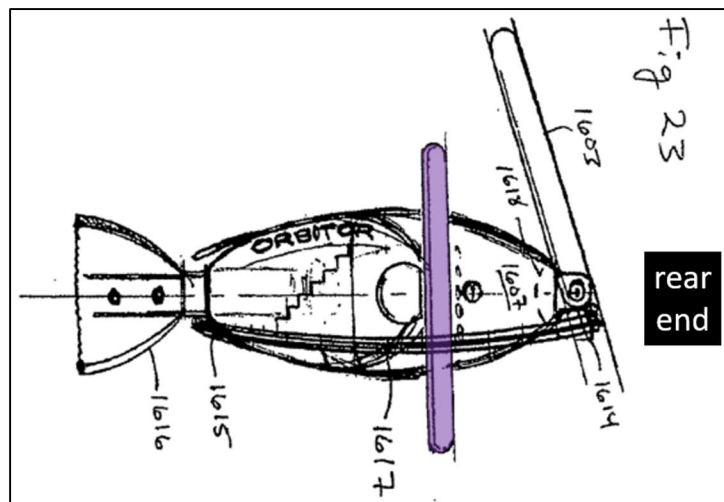
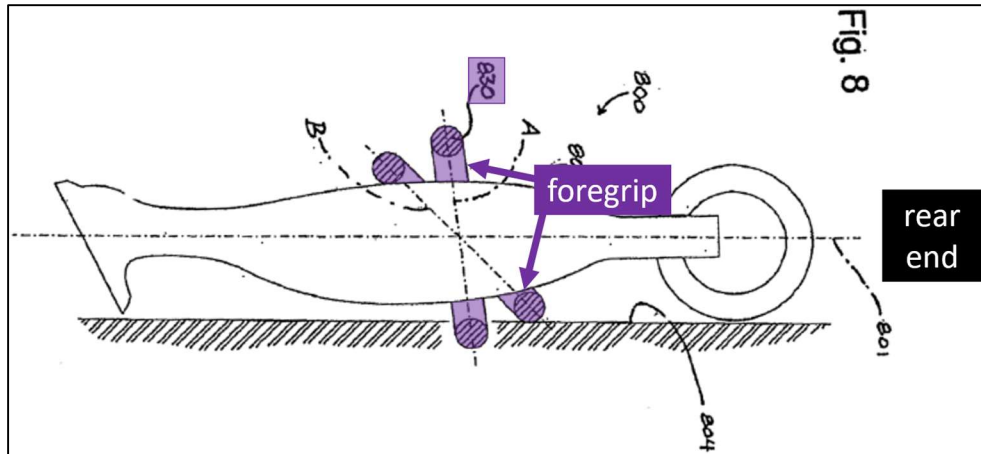
173. In my opinion, Butler anticipates claim 1 and teaches wherein the handle is forward of a rear end of the hand vacuum cleaner body.

174. In my opinion, Butler teaches that the handle is forward of a rear end of the hand vacuum cleaner body. A POSA would have understood

that Butler’s “**foregrip**” is forward of a **rear end** of Butler’s hand vacuum cleaner body, as shown in the annotated images below:







Ex1005, Figs. 3(modified), 4(modified), 5(modified), 6-8, 23; *see also id.*, Figs. 2A, 16; Ground 1, Limitation [1a].

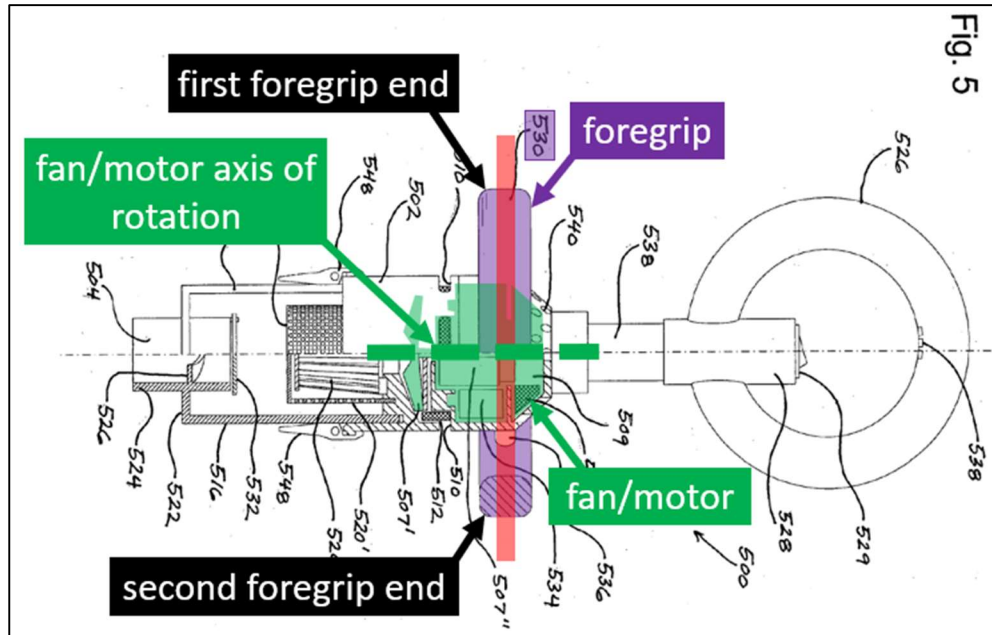
14. [16]

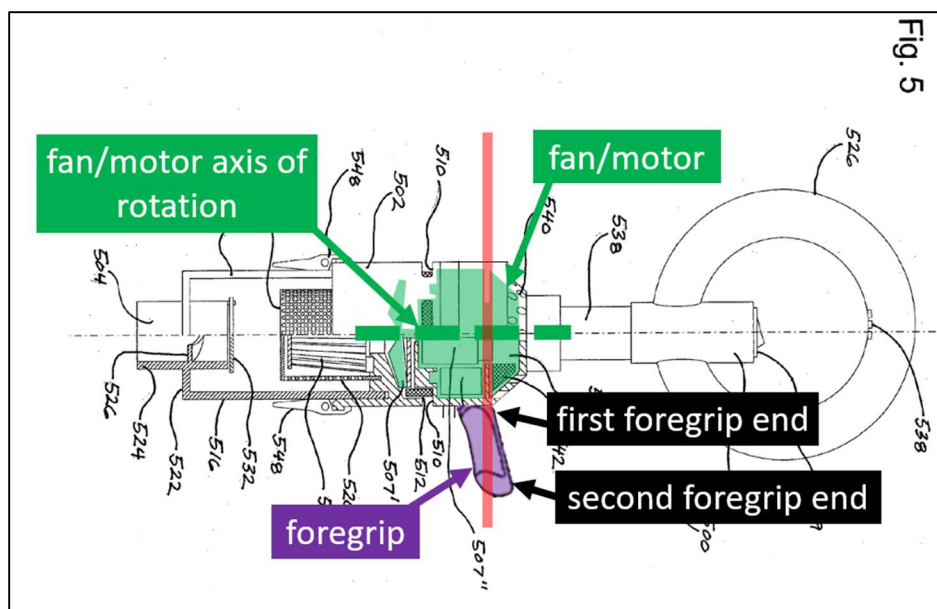
Reference Number	Claim Limitation
[16]	“The hand vacuum cleaner of claim 1 wherein a plane that is perpendicular to the motor axis extends through the handle from the first handle end to the second handle end.”

175. In my opinion, Butler anticipates claim 1 and teaches wherein a plane that is perpendicular to the motor axis extends through the handle from

the first handle end to the second handle end.

176. In my opinion, Butler teaches that a plane that is perpendicular to the motor axis extends through the handle from the first handle end to the second handle end. A POSA would have understood that Butler teaches a **plane** that is perpendicular to the **fan/motor axis** that extends through the “**foregrip**” from the **first foregrip end** to the **second foregrip end**, as shown in the annotated images below:





Ex1005, Figs. 3(modified), 5(modified); *see also id.*, Figs. 2A, 6-7, 16, 23.

B. Ground 2: Butler Renders Claims 1-16 Obvious

177. To the extent PO argues that Butler does not anticipate claims 1-16, 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

178. In my opinion, a POSA would have understood that Butler teaches a single vacuum system that is configurable, including with various handles and cleaning tools, such that a POSA would immediately envisage all elements arranged as in the challenged claims, and therefore anticipates. *See* Ground 1.

179. 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 teaches that its hand vacuum components, such as its dirt receptacle, are combinable and "may be interchangeable with one another to provide the user with various cleaning options," Ex1005, 16:25-29; and that "the present invention includes embodiments in which the features described herein are used individually or in various other inventive combinations." *id.*, 43:29-44:3.

180. 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.

Id., 4:17-28.

181. 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, 18:22-28.

182. 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.

Id., 19:9-15.

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

184. 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.” *Id.*, 18:22-24.

185. In my opinion, combining Butler's components would have been obvious because it would have involved combining prior art elements (e.g., hand vacuum handles, grips, filters, cleaning tools, and dust chambers) according to known methods to yield predictable results (ergonomic and efficient cleaning for different use cases), it would have involved a simple substitution of these known parts, which Butler expressly teaches are interchangeable, Ex1005, 16:25-29, and it would have involved applying known techniques (e.g., air filtration, attaching grips to a hand vacuum housing, and attaching cleaning tools to a hand vacuum air inlet).
186. Further, in my opinion, optimizing Butler's cleaner for different uses 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.
187. Also, in my opinion, a POSA would have reasonably expected success, because these simple hand vacuum components were well known, 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 (Limitation [1pre])

188. To the extent PO argues that the preamble is 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. Ground 1, Limitation [1pre]; Ex1005, Abstract, 1:2-3, 13:1-19, 15:12-18, 26:1-10, 27:12-29.
189. As such, Butler’s cleaner would be even more “maneuver[able]” and “compact,” to achieve its purpose of cleaning “stairwells and other confined spaces.” *Id.* In my opinion, a POSA would have reasonably expected success, because it would involve simply reducing the size of certain components, such as Butler’s “cylindrical housing,” “dirt receptacle,” and “nozzle inlet,” which would make Butler’s cleaner smaller, and simply increasing the size of Butler’s “connector” to ensure a user could easily clean the floor and other surfaces while holding Butler’s hand vacuum.

3. Butler Renders Obvious The Handle Is Provided On A Sidewall Of The Hand Vacuum Cleaner Body Underneath And/Or Adjacent The Suction Motor (Limitations [1d]/[1e])

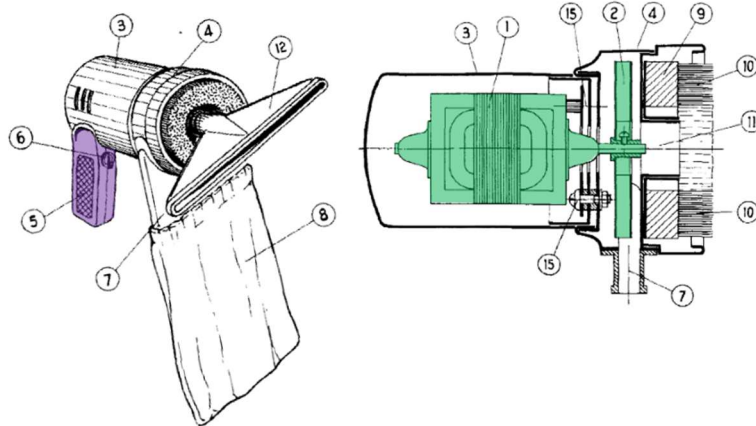
190. To the extent PO argues that locating Butler’s foregrips underneath and/or adjacent the suction motor and fan assembly requires modifying or combining Butler’s disclosures, in my opinion, a POSA would have

been motivated to do so.

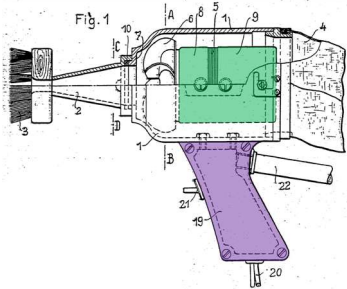
191. In my opinion, a POSA reading Butler's disclosures that "foregrips 330, 430" can "pivot[]," "rotate," "slide," and may be "removed and inserted in various different locations" on Butler's vacuum cleaner body "to be articulated into more desirable positions," Ex1005, 19:9-12, 19:24-28, 23:12-17, 24:3-11, would have understood that one "desirable position" for "foregrip[] 330" would have been underneath the suction motor, and one "desirable position" for "foregrip[] 430" would have been adjacent the suction motor, and—to the extent PO argues Butler does not teach these limitations—would have been motivated to modify Butler or combine its disclosures to achieve such handle positionings.
192. In my opinion, a POSA would have understood that locating heavy components, such as a suction motor, above or directly adjacent a handle had certain benefits, including improved weight balance, reduced strain on the user's wrist, and increased maneuverability. Thus, in my opinion, a POSA would have been motivated to achieve these benefits by positioning Butler's "foregrips, 330, 430" directly underneath and/or adjacent the suction motor.
193. Hand vacuums having **handles** positioned directly underneath and/or adjacent the **suction motor** have been known in the art for nearly 70

years, as shown in the annotated images below:

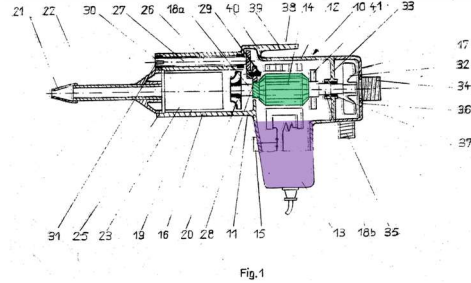
Ex1012, page 3 (1954)



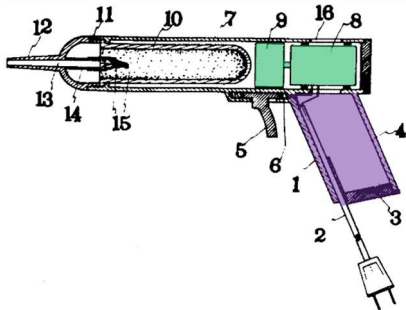
Ex1014, Fig. 1 (1955)



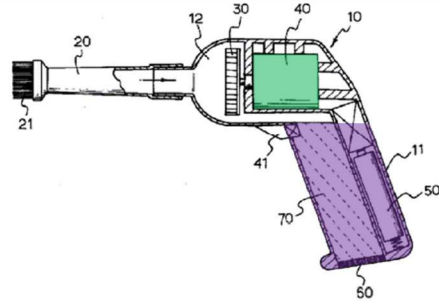
Ex1016, Fig. 1 (1971)



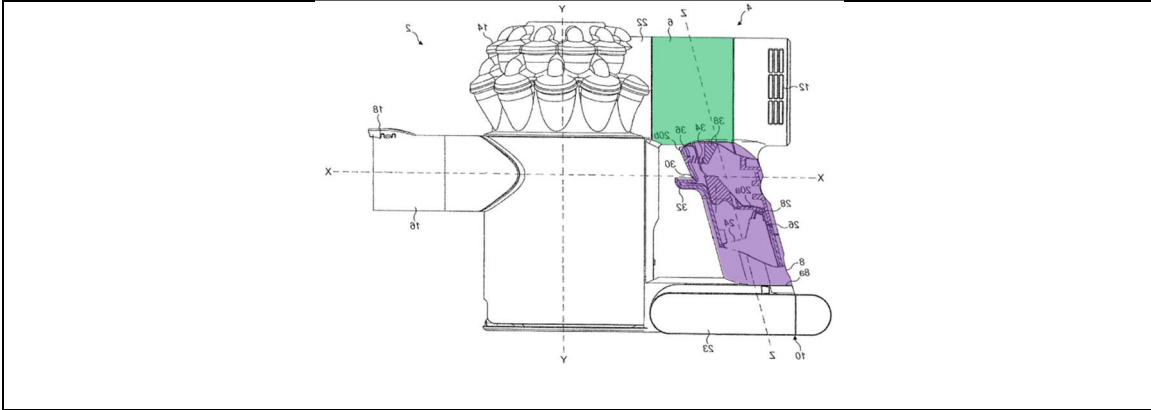
Ex1007, Fig. 1 (1973)



Ex1018, Fig. 2 (1998)



Ex1019, Fig. 2 (2013)



194. In my opinion, a POSA would have reasonably expected success modifying Butler or combining its disclosures as described because it would have involved a straightforward relocation of Butler's existing handles, and because Butler itself teaches that its handles may rotate, slide, and be positioned at any location on Butler's vacuum cleaner body. Ground 1, Limitations [1d]/[1e].

195. Further, in my opinion, positioning Butler's handles underneath and/or adjacent the suction motor would have been at least obvious to try, particularly given Butler's express teachings; easy to implement, using nearly 70-year-old teachings; and would have yielded the predictable result of "even greater ergonomic flexibility and control of the device," which is one of Butler's stated objectives. Ex1005, 22:26-28.

4. Butler Renders Obvious The Suction Motor Axis Of Rotation Is Positioned Below the Cyclone Axis Of Rotation And The Passage Axis (Claims 6/13/14)

196. To the extent PO argues that Butler does not teach the claims regarding

the suction motor axis of rotation positioning, in my opinion, Butler renders them obvious.

197. In my opinion, a POSA would have been motivated by Butler's disclosures to increase the size of Butler's "inlet air passage 242," which would increase the amount of airflow into Butler's cleaner and further offset Butler's cyclone separator and "fan/motor." Ex1005, 18:5-7; Ground 1, Claims 6/13. Likewise, in my opinion a POSA would have been motivated to further offset Butler's cyclone separator and "fan/motor" to allow room for other vacuum components that are too large to accommodate on either side of the motor when it is centered, such as wires and electronics that power the suction motor and fan assembly, as was well known in the art. Ex1023, Fig. 2. Further, in my opinion, a POSA also would have been motivated to offset Butler's cyclone separator and "fan/motor" to allow for different exterior shapes, such as an asymmetrical downward slope, and would have understood that locating the fan/motor closer to the user's hand would reduce strain on their wrist during operation, as was well known in the art. Ex1023, Fig. 2. In my opinion, a POSA would have understood that these modifications would make Butler's cleaner even more "maneuver[able]" and "compact," which would further its

purpose of cleaning “in confined spaces.” Ex1005, 26:1-10.

198. In my opinion, it would have been at least obvious to try these modifications. There were a finite number of identified cyclone unit/suction motor and fan assembly orientations, and it would have been obvious to try to achieve the known benefits described above, would have been simple to implement using known techniques, and would have yielded the predictable results of increased vacuum effectiveness and ergonomics.

199. Also, in my opinion, a POSA would have reasonably expected success making these modifications, including because such modification involves a simple relocation of Butler’s existing elements performing similar functions in similar ways, and because of the express motivations in Butler to perform such modification.

200. In my opinion, a POSA would have understood that, when so modified, the suction motor axis of rotation is positioned below the cyclone axis of rotation and the passage axis. Ground 1, Claims 6/13/14.

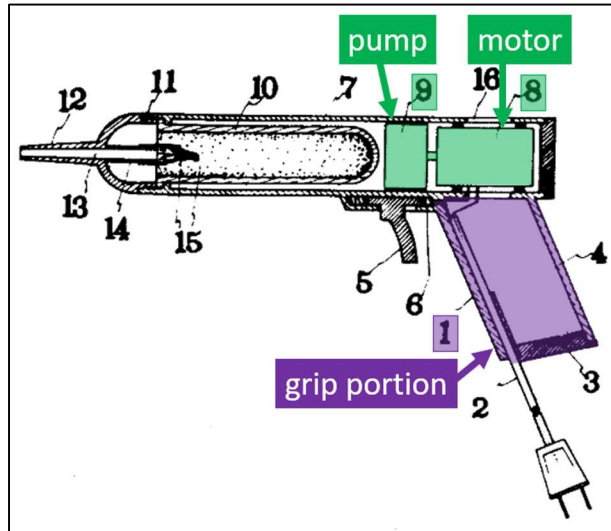
C. Ground 3: Tsukuji in Combination with Martelliere Renders Obvious Claims 1-5, 7-12, and 15-16

1. A POSA Would Have Combined Tsukuji and Martelliere

a. Scope and Content of the Tsukuji and Martelliere Prior Art References

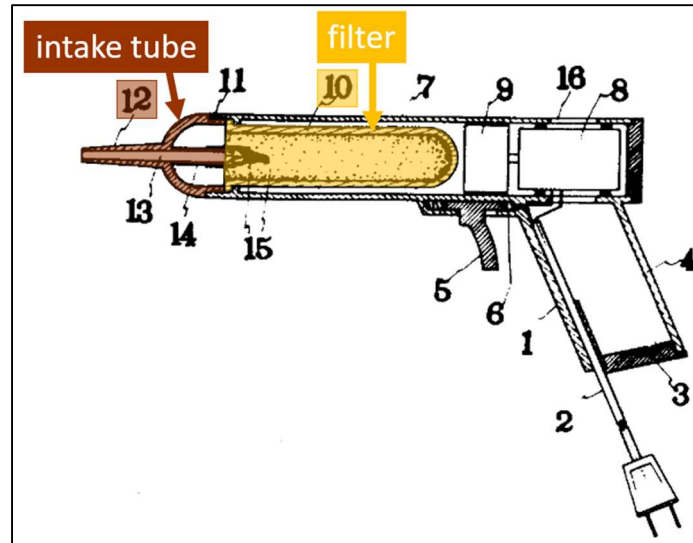
201. As noted briefly above in the Background of the Prior Art section,

Tsukuji teaches a “small electric vacuum cleaner with an overall gun shape” from 1972. Ex1007, 2. Tsukuji’s cleaner has a “**grip portion 1**” positioned underneath “the **motor 8**” that “rotate[s] the turbofan inside the **pump 9**,” as shown in the annotated image below:



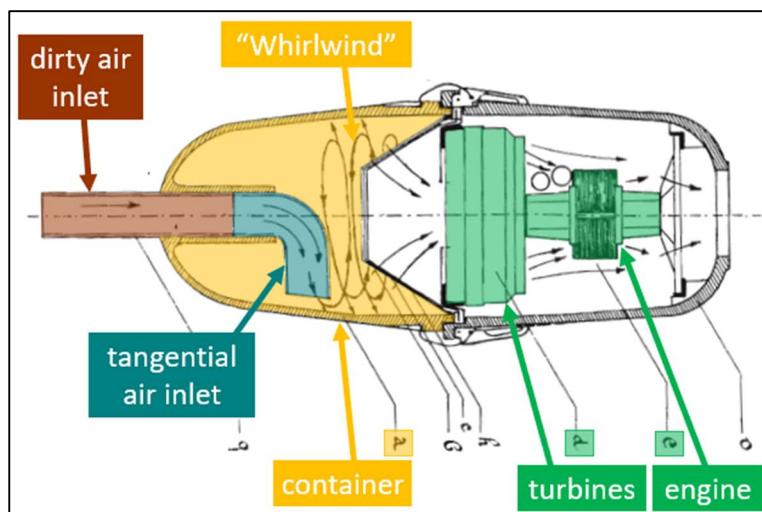
Ex1007, 1-2, Fig. 1.

202. Tsukuji teaches that dirty “[a]ir is taken in from...the **intake tube 12**,” “and the dust and debris is separated from the air by the **filter 10** and collected,” as shown in the annotated image below:



Ex1007, 3, Fig. 1.

203. As described briefly above in the background of the prior art section, Martelliere is a French patent from 1955. Ex1009, 1. Martelliere teaches a “broom type vacuum cleaner” with “**turbines *d*,**” “**engine *e*,**” and a **dirty air inlet** connected to a “**tangential[]**” **air inlet** that creates a “**Whirlwind**” within a “**container**” to cyclonically separate dirt from air, as shown in the annotated image below:

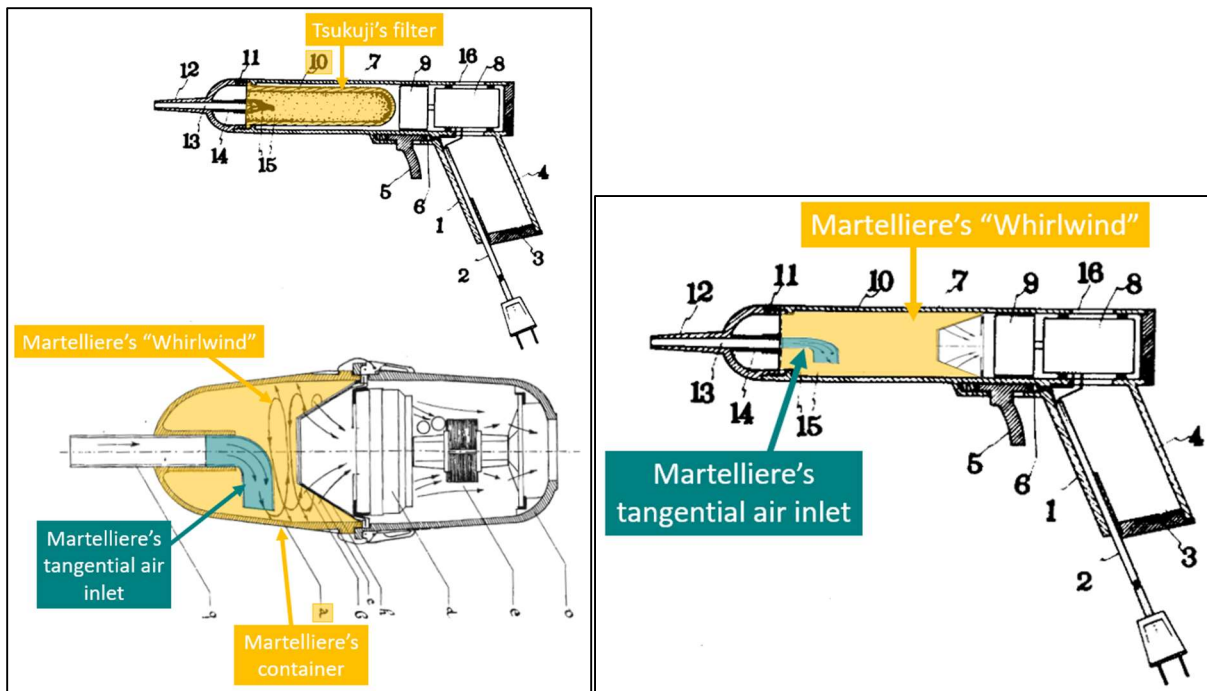


Ex1009, 1, Fig. 1.

b. A POSA Would Have Been Motivated to Combine the Teachings of Tsukuji and Martelliere

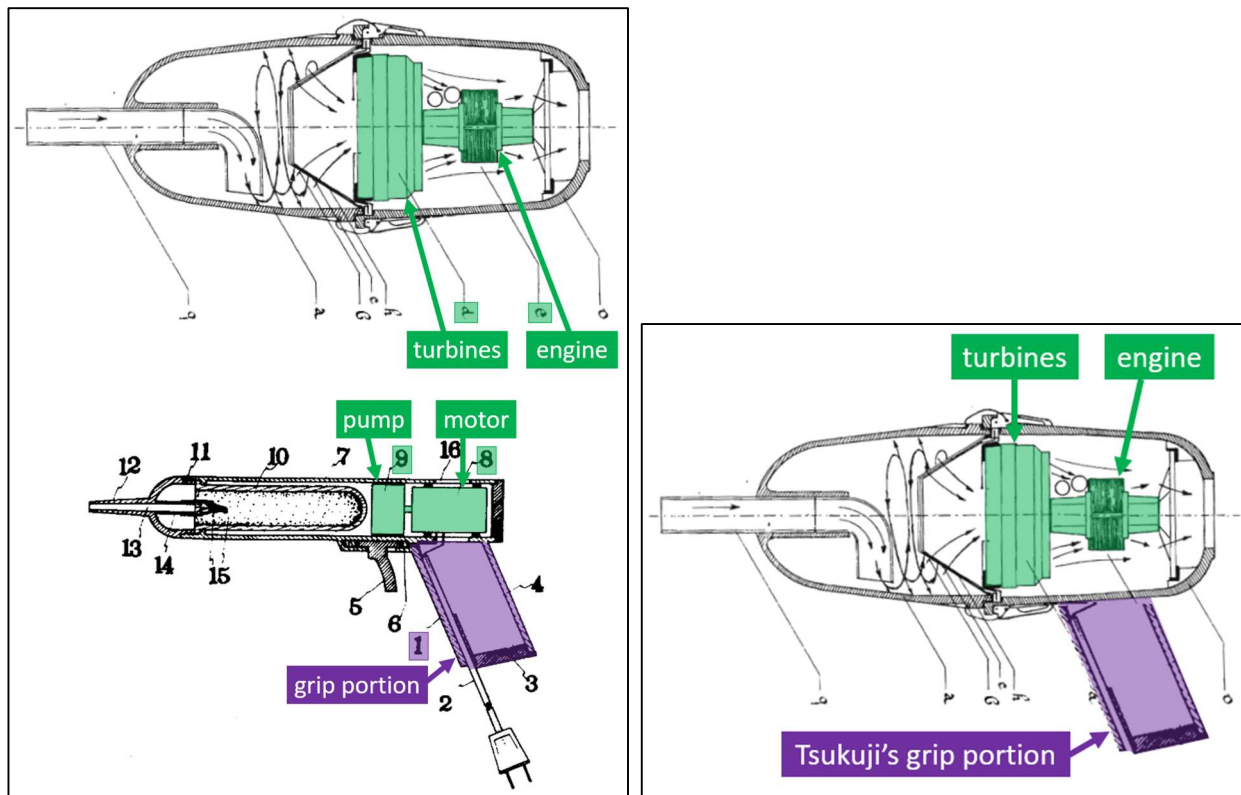
204. Having reviewed the teachings of both Tsukuji and Martelliere, in my opinion, a POSA reading Tsukuji as of the priority date of the '661 Patent would have been motivated to modify Tsukuji to achieve the benefits of Martelliere's cyclonic-separation system. Also, in my opinion, a POSA reading Martelliere as of the priority date of the '661 Patent would have been motivated to modify Martelliere to achieve the benefits of Tsukuji's handle. Specifically, in my opinion, a POSA would have been motivated to combine the teachings of Tsukuji and Martelliere as follows:

205. In my opinion, a POSA would have been motivated to modify Tsukuji's dust-separation unit ("filter 10") to use a cyclonic-filtration unit, such as Martelliere's "container," which through the use of a curved pipe has a "tangential[] air inlet" that creates a "Whirlwind" (which, in my opinion, a POSA would have understood is cyclonic air filtration) to separate dust from air, as shown in the annotated images below:



Ex1007, 3, Fig. 1(modified); Ex1009, 1, Fig. 1(modified).

206. In my opinion, a POSA also would have been motivated to modify Martelliere to include an angled handle positioned below “**turbines *d***” and “**engine *e***”, such as Tsukui’s “**grip portion 1**” positioned below the “**motor 8**” and “**pump 9**,” as shown in the annotated images below:



Ex1007, 3, Fig. 1(modified); Ex1009, 1, Fig. 1(modified).

207. In my opinion, a POSA would have been motivated to combine Tsukuji and Martelliere as described for multiple reasons. First, a POSA would have understood that Tsukuji and Martelliere are analogous art with very similar layouts. Like Tsukuji, which teaches a “small” vacuum cleaner with a dirty air inlet (“intake tube 12”) that extends into an air-filtration unit (“filter 10”) that is positioned upstream of and “in series” with a suction motor and fan assembly (“motor 8”/“pump 9”), Ex1007, 3, Fig. 1, Martelliere teaches a compact vacuum cleaner with a dirty air inlet connected to a “tangential[.]” air inlet that extends into an air-

filtration unit (“container,” which uses a “Whirlwind” to separate dust from air) that is positioned upstream of and in series with a suction motor and fan assembly (“turbines *d*”/“engine *e*”), Ex1009, 1, Fig. 1.

208. Second, in my opinion, a POSA would have understood that Tsukuji and Martelliere each provide motivations for this combination. Tsukuji teaches that its filtration unit is a “filter 10” that “separate[s]” “dust and debris...from the air.” Ex1007, 3. Tsukuji recognizes that “air not being discharged via the filter leads to relatively weak suction force, so obstruction of suction force must be avoided as much as possible.” *Id.*, 4. In my opinion, a POSA would have looked for alternative ways for filtering air with reduced “obstruction of suction force,” including a cyclonic air-filtration unit. In my opinion, a POSA would have understood that cyclonic filtration had benefits over dust-bag filtration, including: (1) no bag needs to be replaced, reducing recurring costs; (2) cyclonic cleaners experience comparatively less suction loss as they fill, because most of the separated dust does not reach the physical filter; and (3) cyclonic cleaners give the user a visual indication of how full the container is and when to empty it. In my opinion, these benefits were well-known in the art at the time the ’661 Patent’s priority application was filed. For example, a 2002 PCT Publication explained

that “so called bagless vacuum cleaners,” or “cyclonic” cleaners, “are becoming increasingly popular” because they “avoid[ed] the use of a filter bag as the primary form of separation” and thus “maintain a consistently high level of suction, even as the collecting chamber fills with dirt.” Ex1020, 1:5-10. A 2007 U.S. patent explained that cyclonic cleaners “provide[] an economic advantage that, unlike conventional cleaners, it can be used semipermanently without any replacement of disposable paper bag.” Ex1021, 7:53-57. Martelliere itself teaches that “[b]y application of the ‘Whirlwind’ principle,” i.e., cyclonic filtration, “the materials are deposited in the bottom of the container, after having separated from the air, before it passes through the filter screen,” which “prevent[s] clogging” and creates “stable suction,” and by using a transparent cyclonic chamber, “the user is able, when stopped, to see where the filling of the container is” and “can therefore better judge when it must be emptied.” Ex1009, 1.

209. Tsukuji further recognizes that “reverse flow of dust and debris that has already been collected toward the intake tube is a concern,” because it can cause “a certain amount of air resistance [to] develop,” and includes a “check valve” to “reduce[]” that “concern.” Ex1007, 4-5. In my opinion, Tsukuji’s identification of “reverse flow” as a “concern”

would have further motivated a POSA to include Martelliere's "tangential[]" air inlet when implementing Martelliere's cyclonic filtration teachings, because a POSA would have understood that using a curved pipe (as taught by Martelliere) would further reduce the "reverse flow of dust and debris" because it would be more difficult for dust and debris to travel backwards through a 90 degree corner (as taught by Martelliere) compared to the straight path used in Tsukuji.

210. Third, in my opinion, a POSA would have understood that Tsukuji's "grip portion 1" had benefits over Martelliere's "broom type vacuum," where the user grasps the rear portion of the cleaner during operation. Tsukuji explains that its cleaner "may be used while being oriented in a direction that is not vertical," and includes a "grip portion 1" with a "grip [that] can be reliably grasped." Ex1007, 5. Likewise, Martelliere's vacuum is designed to be "easy to handle" and may be "held vertically or slightly inclined" during use. Ex1009, 1. In my opinion, a POSA would have looked for vacuum components that could make Martelliere's vacuum "eas[ier] to handle," including an angled handle positioned below the suction motor and fan assembly. Further, in my opinion, a POSA would have understood that a handle positioned below Martelliere's suction motor and fan assembly had benefits over

Martelliere's rear gripping portion, including (1) less strain on the user's wrist, (2) more versatile gripping, and (3) closer location to the vacuum's center of gravity, increasing vacuum maneuverability and ergonomics. These benefits were well-known in the art, in my opinion, at the time the '661 Patent's priority application was filed. For example, a 2013 PCT publication explained that positioning "[t]he motor and fan unit 6...above" "pistol-grip" "handle 8" "reduces stress on a user's wrist during cleaning." Ex1019, 1:6-7, 5:17-18, 6:11-12.

211. Fourth, in my opinion, this combination would have involved a simple substitution of known elements for others to obtain predictable results. Tsukuji teaches a vacuum having a dirty air inlet that extends into a dust-separation unit (a filter), and a handle. Ex1007, Fig. 1. Martelliere teaches a vacuum having a dirty air inlet connected to a tangential air inlet that extends into a dust-separation unit (cyclonic airflow within a container), and a rear portion that the user grips with their hand. Ex1009, Fig. 1. In my opinion, a POSA would have understood that the simple substitution of these types of dust-separation units and gripping mechanisms would achieve the predictable results of filtering air and increased vacuum ergonomics and maneuverability. Further, as I depicted and explained above, Tsukuji and Martelliere are directed to

vacuums having a similar orientation of separation unit relative to dirty air inlet and suction motor and fan assembly, which, in my opinion, would have further motivated a POSA to make the substitution. Ex1007, Fig. 1; Ex1009, Fig. 1.

212. Fifth, in my opinion, it would have been at least obvious to try this combination. In my opinion, a POSA would have understood that there were a finite number of identified dust-separation solutions, including dust filters (as Tsukuji teaches) and cyclonic separators (as Martelliere teaches), and gripping solutions, including an angled handle (as Tsukuji teaches) and a rear gripping portion (as Martelliere teaches), and it would have been obvious to try to achieve the known benefits I described above.

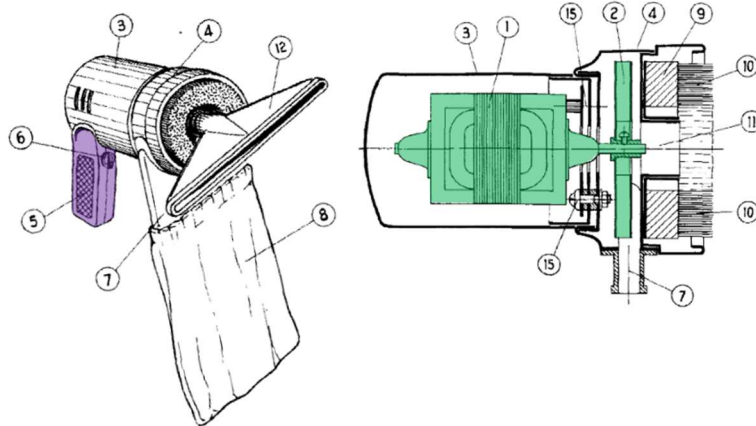
c. A POSA Would Have Had A Reasonable Expectation of Success Combining the Teachings of Tsukuji and Martelliere

213. In my opinion, a POSA would have reasonably expected success combining Tsukuji's and Martelliere's teachings as described. In my opinion, a POSA would have understood that these two types of dust-separation units could have been used interchangeably. A POSA would have further expected success, in my opinion, for the reasons stated above, including because such modification involves a simple

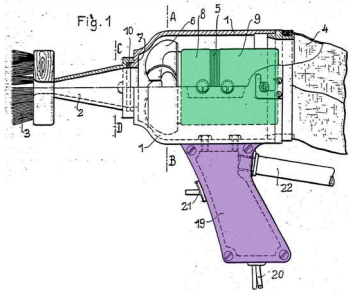
substitution of known elements that perform similar functions in similar ways, and because of the express motivations found in Tsukuji and Martelliere to perform such substitution.

214. Further, in my opinion, a POSA would have reasonably expected success incorporating Tsukuji's handle teachings into Martelliere because **handles** positioned below the **suction motor and fan assembly** have existed for nearly 70 years, as shown in the annotated images below:

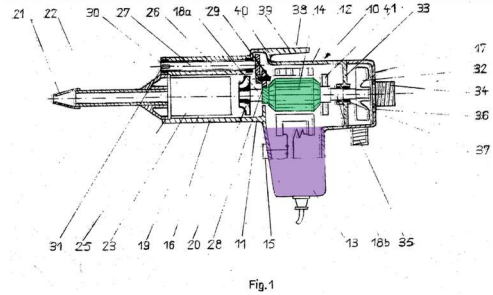
Ex1012, page 3 (1954)



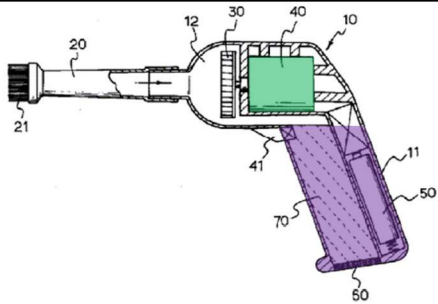
Ex1014, Fig. 1 (1955)



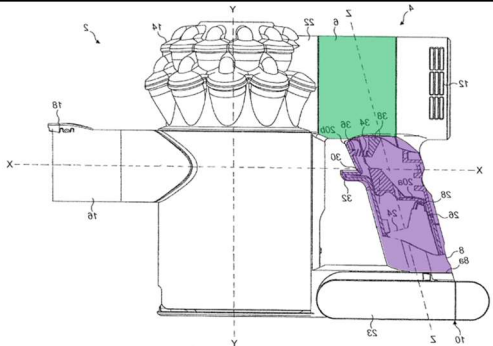
Ex1016, Fig. 1 (1971)



Ex1018, Fig. 2 (1998)



Ex1019, Fig. 2 (2013)



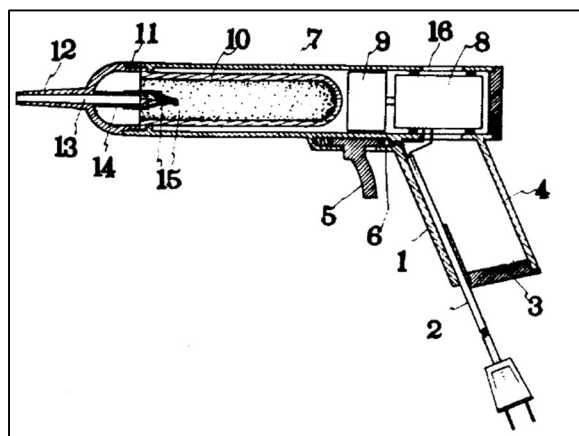
2. [1]

a. [1pre]

Reference Number	Claim Limitation
[1pre]	“A hand vacuum cleaner having a front end having a dirty air inlet, a clean air outlet, an upper end and a lower end, the hand vacuum cleaner comprising:”

215. To the extent the preamble is limiting, in my opinion, Tsukuji and Martellire each teach, and the combination of Tsukuji and Martelliere teach, a hand vacuum cleaner having a front end having a dirty air inlet, a clean air outlet, an upper end and a lower end.

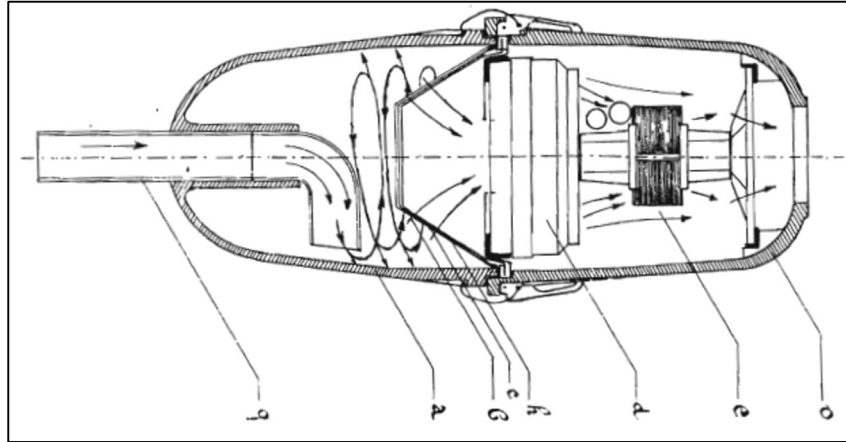
216. In my opinion, a POSA would have understood that Tsukuji teaches a “portable electric vacuum cleaner...[that] is small and de[s]igned for desktop use,” which is a hand vacuum cleaner, as shown in the figure below:



Ex1007, 1, 4, Fig. 1.

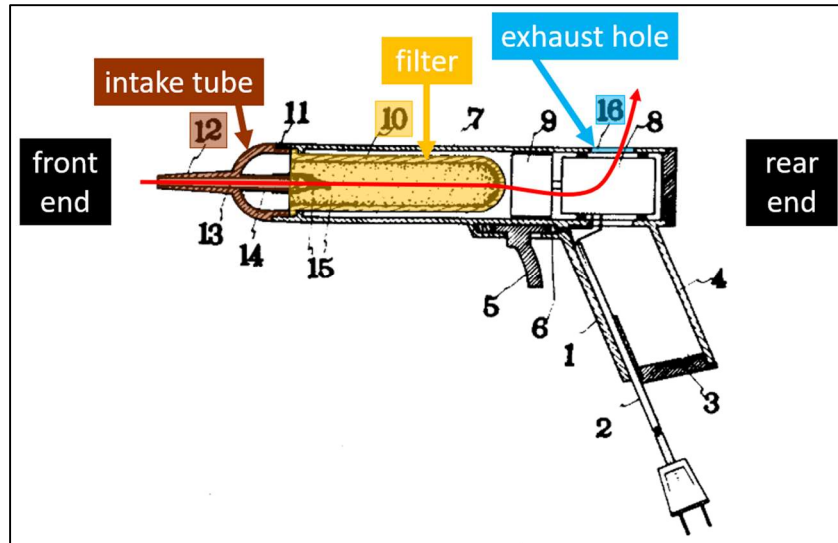
217. Likewise, in my opinion, Martelliere teaches a compact-sized “vacuum

cleaner” that is “held vertically or slightly inclined,” which is also a hand vacuum cleaner, as shown in the figure below:



Ex1009, 1, Fig. 1.

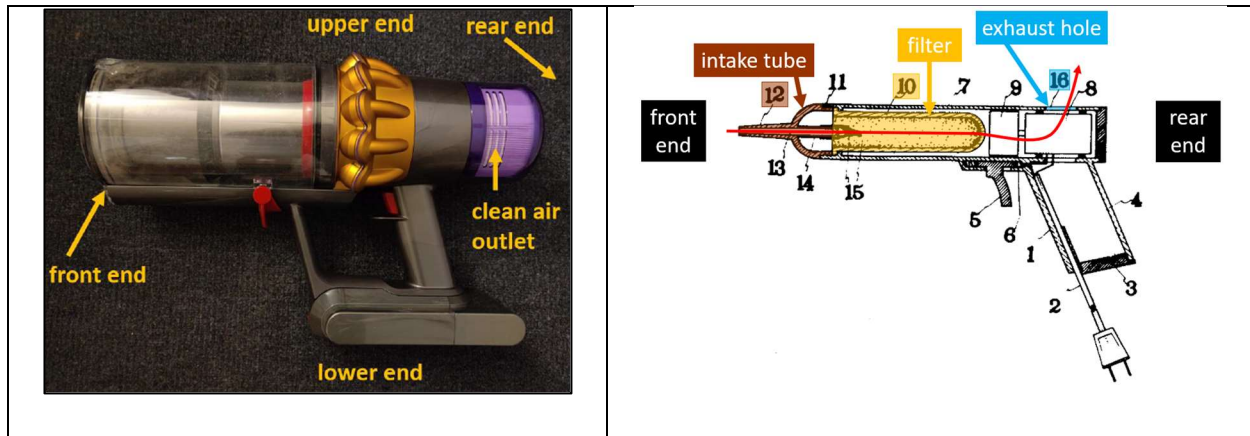
218. In my opinion, Tsukuji teaches that the hand vacuum cleaner has a front end having a dirty air inlet, and a clean air outlet. Tsukuji teaches that, in use, “**air** is taken in from the through-hole 13 in the **intake tube 12**” (located at the vacuum **front end**), “taken into the **filter 10**,” and “discharged...from the **exhaust hole 16**,” as shown in the annotated image below:



Ex1007, 3, Fig. 1.

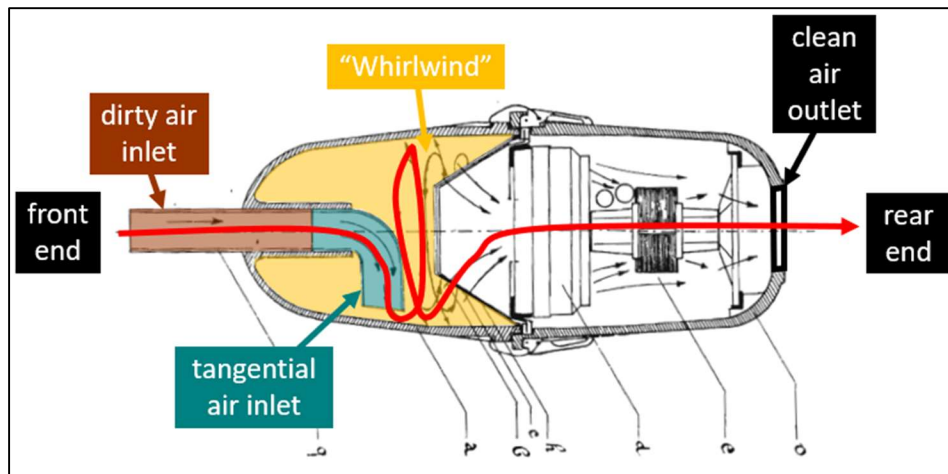
219. In my opinion, a POSA would have understood that Tsukuji’s “intake tube 12” is a dirty air inlet at Tsukuji’s front end, and “exhaust hole 16” is a clean air outlet. Also, in my opinion, a POSA would have understood that Tsukuji has **front and rear ends** as shown above. I have reviewed PO’s infringement contentions, and, with respect to the front and rear ends, this is at least as much disclosure of these limitations in Tsukuji as PO has accused of infringement in the related litigation, as shown in the annotated images below:

PO’s Infringement Contentions	Tsukuji
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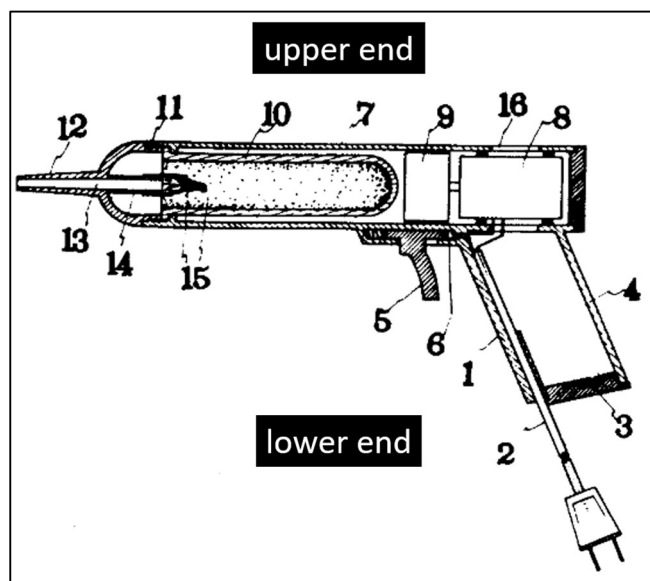
Ex1010, 3(PO's annotations); Ex1007, Fig. 5.

220. Likewise, in my opinion, a POSA would have understood that Martelliere teaches that the hand vacuum cleaner has a front end having a dirty air inlet, and a clean air outlet: “**air** [is] sucked” into Martelliere’s **dirty air inlet** (located at the vacuum **front end**), passes through the “**tangential**” **air inlet** that initiates a “**Whirlwind**,” which “separate[s]” dust from air “before it passes through the filter screen,” and then, “perfectly filtered, the **air** can then pass through the turbines *d* and into the engine *e*” and out the cleaner (through what a POSA would have understood is a **clean air outlet**), as shown in the annotated image below:



Ex1009, 1, Fig. 1.

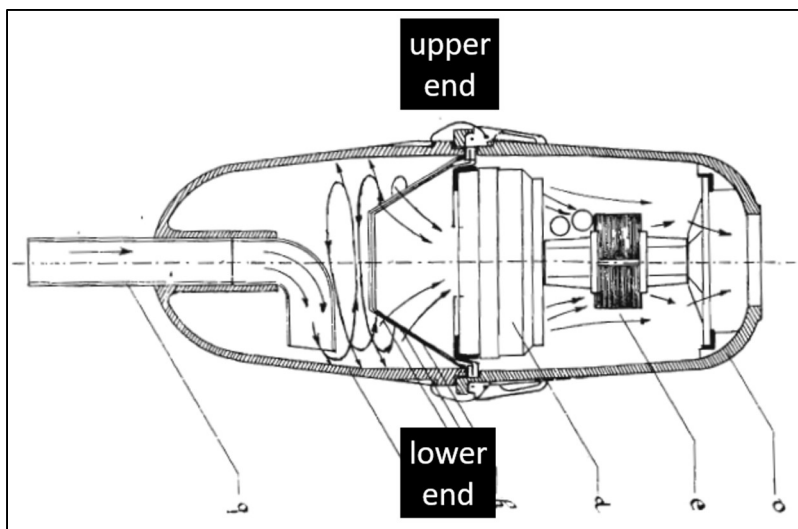
221. In my opinion, a POSA would have understood that Tsukuji's vacuum has an **upper end** and a **lower end**, as shown in the annotated image below:



Ex1007, Fig. 1.

222. Also, in my opinion, a POSA would have understood that Martelliere's vacuum also has an **upper end** and a **lower end**, as shown in the

annotated image below:



Ex1009, Fig. 1.

223. As I explained above, in my opinion a POSA would have been motivated to combine Tsukuji and Martelliere and would have reasonably expected success. Ground 3, §1. In my opinion, the Tsukuji and Martelliere combinations described in §1 likewise teach this limitation for the same reasons I discussed above. *Id.*

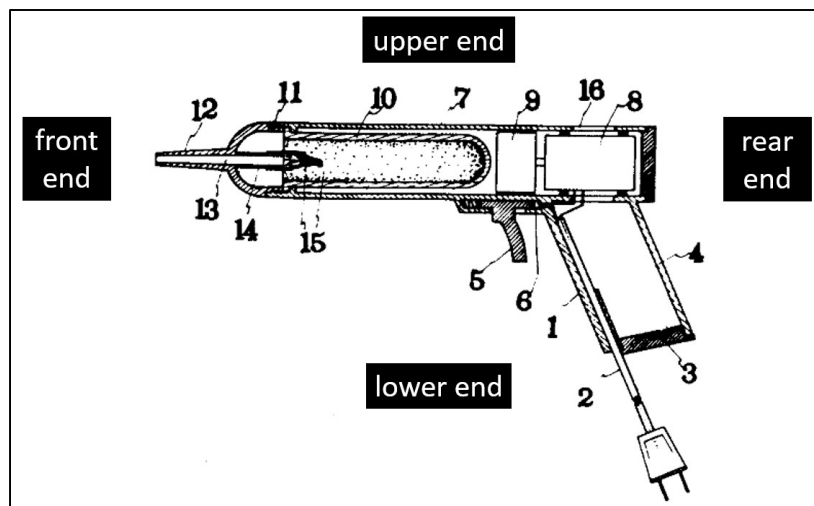
b. [1a]

Reference Number	Claim Limitation
[1a]	“(a) a hand vacuum cleaner body comprising an upper end, a lower end, a front end, a rear end, and a handle, the handle extending between a first handle end and a second handle end, the hand vacuum cleaner body including a suction motor and fan assembly, the suction motor and fan assembly having a suction motor axis of rotation; and,”

224. In my opinion, Tsukuji teaches, and the combinations of Martelliere

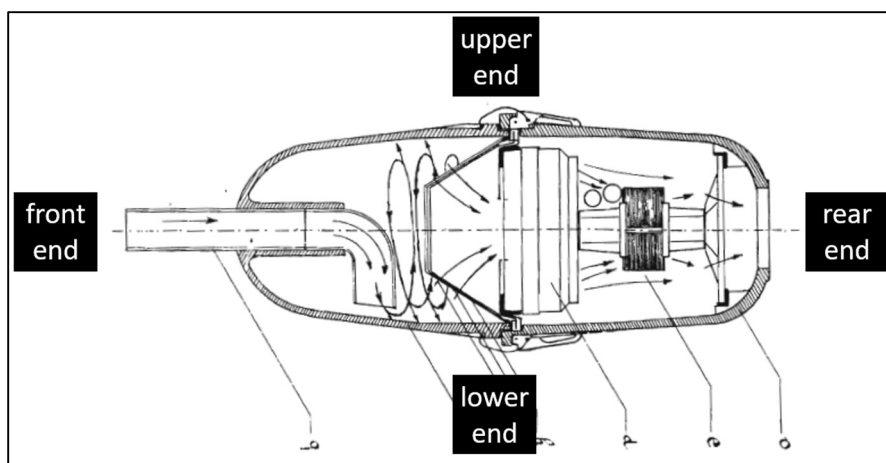
and Tsukuji teach a hand vacuum cleaner body comprising an upper end, a lower end, a front end, a rear end, and a handle, the handle extending between a first handle end and a second handle end, the hand vacuum cleaner body including a suction motor and fan assembly, the suction motor and fan assembly having a suction motor axis of rotation.

225. In my opinion, a POSA would have understood that Tsukuji's hand vacuum has a hand vacuum cleaner body comprising an **upper end**, a **lower end**, a **front end**, and a **rear end**, as shown in the annotated image below:



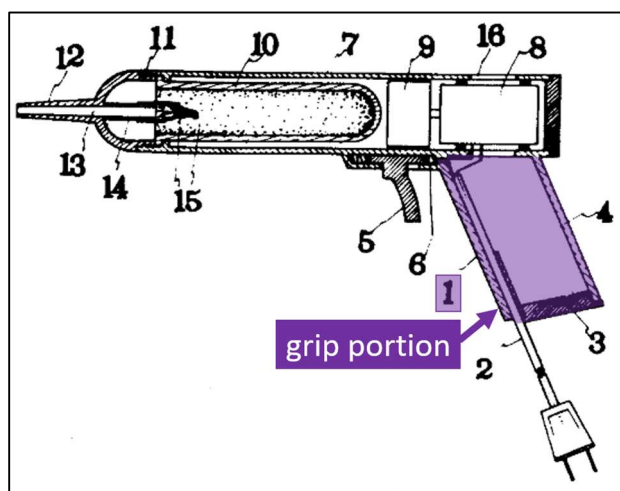
Ex1007, Fig. 1; Ground 3, Limitation [1pre].

226. A POSA would have understood, in my opinion, that Martelliere's hand vacuum also has a hand vacuum cleaner body comprising an **upper end**, a **lower end**, a **front end**, and a **rear end**, as shown in the annotated image below:



Ex1009, Fig. 1.

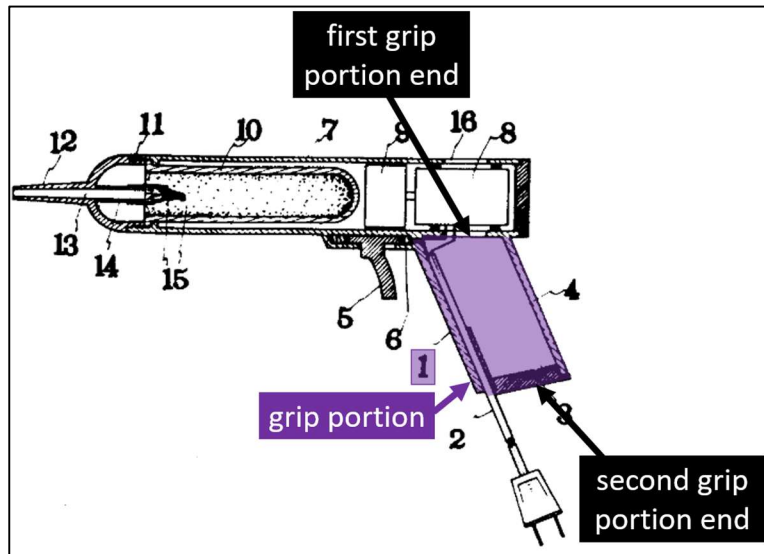
227. In my opinion, Tsukuji teaches that the hand vacuum cleaner body comprises a handle. Tsukuji's cleaner body includes a “**grip portion 1**” that “can be reliably grasped” when “the device [is] used,” as shown in the annotated image below:



Ex1007, 3, 5, Fig. 1.

228. A POSA would have understood that Tsukuji's “grip portion 1” is a handle.

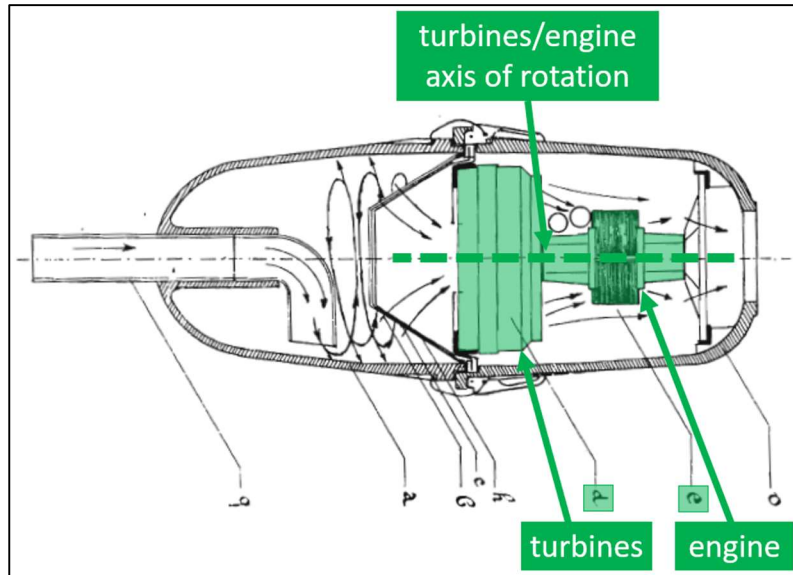
229. In my opinion, Tsukuji teaches that the handle extends between a first handle end and a second handle end. Tsukuji’s “**grip portion 1**” extends between a **first grip portion end** and a **second grip portion end**, as shown in the annotated image below:



Ex1007, Fig. 1.

230. As I explained above, in my opinion a POSA would have been motivated to combine Tsukuji and Martelliere and would have reasonably expected success. Ground 3, §1. A POSA would have understood that, when Tsukuji’s “**grip portion 1**” is incorporated into Martelliere’s cleaner, it has a **first grip portion end** and a **second grip portion end**, as shown in the annotated image below:

232. In my opinion, a POSA would have understood that Tsukuji's "motor 8" and "pump 9," (which contains the "turbofan"), individually and collectively, are a suction motor and fan assembly with a suction motor axis of rotation.
233. Likewise, Martelliere teaches "**turbines *d***" and "**engine *e***" with a **turbines/engine axis of rotation**, as shown in the annotated image below:



Ex1009, 1, Fig. 1.

234. In my opinion, a POSA would have understood that Martelliere's "engine *e*" and "turbines *d*," individually and collectively, are also a suction motor and fan assembly with a suction motor axis of rotation.
235. Further, in my opinion, a POSA would have understood that the combination of Tsukuji and Martelliere likewise meets this limitation

when Martelliere’s cyclonic filtration teachings are incorporated into Tsukuji’s vacuum cleaner, for the same reasons I discussed above.

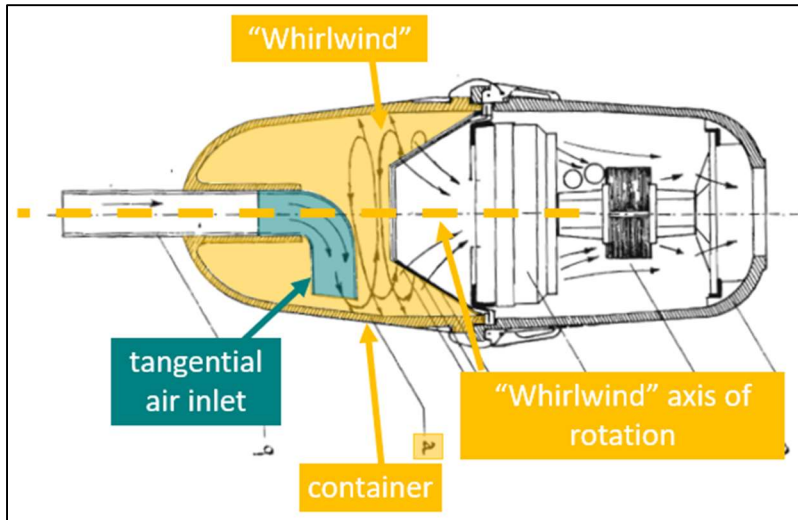
c. [1b]

Reference Number	Claim Limitation
[1b]	“(b) a cyclone unit comprising a cyclone having a cyclone axis of rotation, a cyclone air inlet, a cyclone air outlet, a front end and a rear end,”

236. In my opinion, Martelliere teaches, and the combinations of Tsukuji and Martelliere teach a cyclone unit comprising a cyclone having a cyclone axis of rotation, a cyclone air inlet, a cyclone air outlet, a front end and a rear end.

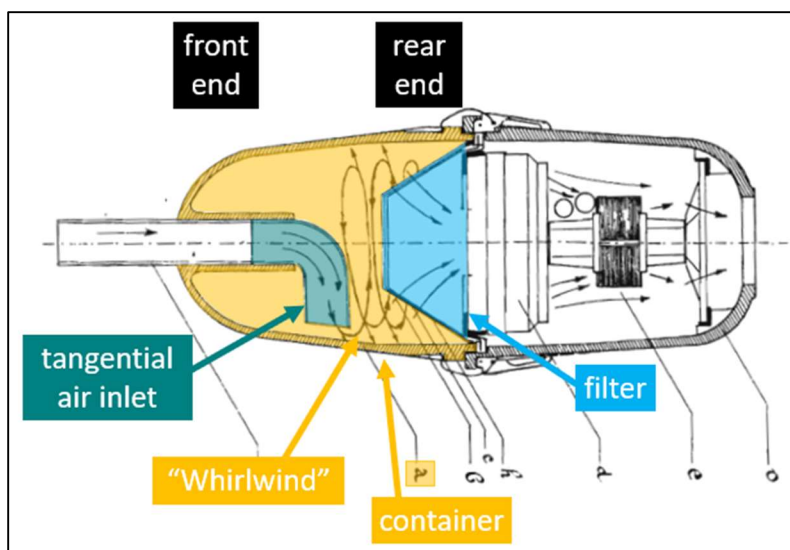
237. A POSA would have understood that Tsukuji teaches a “filter 10” that “separate[s]” “dust and debris,” which is an air-filtration unit. Ex1007, 3.

238. In my opinion, Martelliere teaches a cyclone unit comprising a cyclone having a cyclone axis of rotation. Martelliere teaches a “**container**” with a “**tangential[]**” **air inlet** that creates a “**Whirlwind**” to cyclonically separate air from dirt that deposits “in the bottom of the **container**,” as shown in the annotated image below:



Ex1009, 1, Fig. 1.

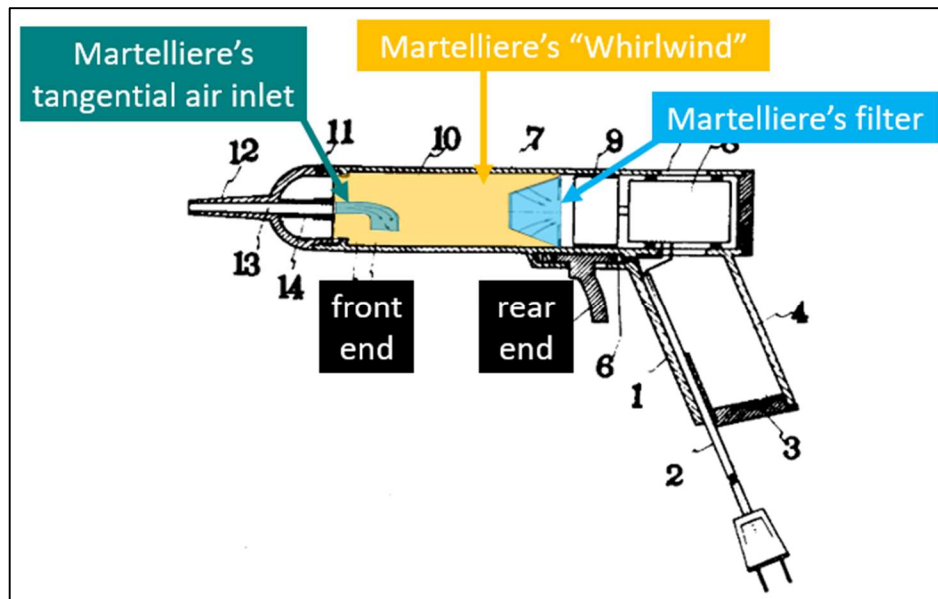
239. In my opinion, a POSA would have understood that Martelliere’s “**container**” is a cyclone unit and includes a cyclone (separating debris by a “**Whirlwind**”) with a **cyclone axis of rotation**.
240. In my opinion, Martelliere teaches a cyclone unit having a cyclone air inlet, a cyclone air outlet, a front end and a rear end. Martelliere’s “**container**” comprising a cyclone has a **front end** (where air enters via a “**tangential[]**” **air inlet**), and a **rear end** (where air exits via “**filter b**”), as shown in the annotated image below:



Ex1009, 1, Fig. 1.

241. In my opinion, a POSA would have understood that Martelliere’s “tangential[]” air inlet is a cyclone air inlet because it initiates cyclonic airflow as air enters Martelliere’s “container,” and Martelliere’s “filter *b*” is a cyclone air outlet because air passes through it, and cyclonic separation ends, as it exits Martelliere’s cyclone. Ex1009, 1.

242. As I explained above, in my opinion, a POSA would have been motivated to combine Tsukuji and Martelliere and would have reasonably expected success. Ground 3, §1. In my opinion, the combination teaches this limitation when Tsukuji’s “filter 10” is modified in view of Martelliere’s cyclonic filtration teachings, including “container” with a “**Whirlwind**,” “**tangential[]**” air inlet, and “**filter *b***,” as shown in the annotated image below:



Ex1007, Fig. 1(modified); Ex1009, Fig. 1(modified).

243. Further, in my opinion, the combination of Martelliere and Tsukuji likewise teaches this limitation when Tsukuji's handle is incorporated into Martelliere's vacuum cleaner, for the same reasons discussed above.

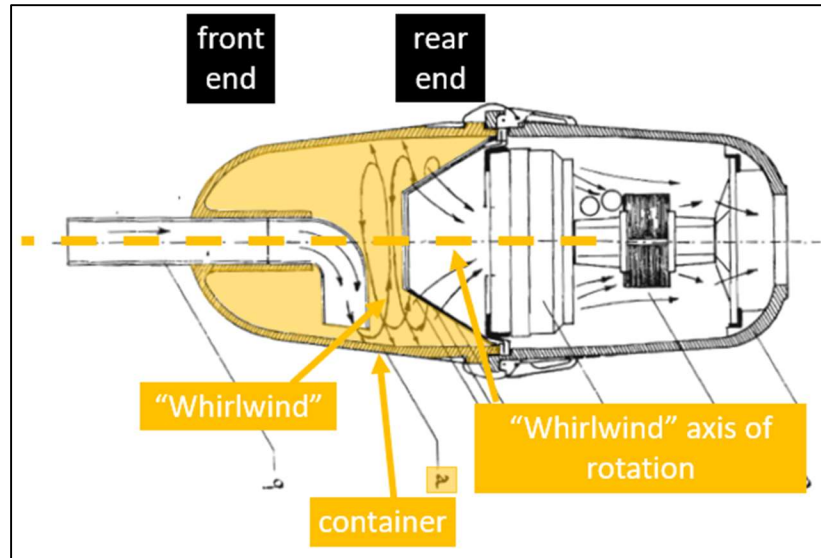
d. [1c]

Reference Number	Claim Limitation
[1c]	"wherein when the hand vacuum cleaner is positioned with the upper end of the hand vacuum cleaner above the lower end of the hand vacuum cleaner and the lower end of the hand vacuum cleaner is on a horizontal surface, the cyclone axis of rotation is generally horizontal and extends between the front and rear ends of the cyclone, and"

244. In my opinion, Martelliere teaches, and the combinations of Tsukuji and Martelliere teach wherein when the hand vacuum cleaner is

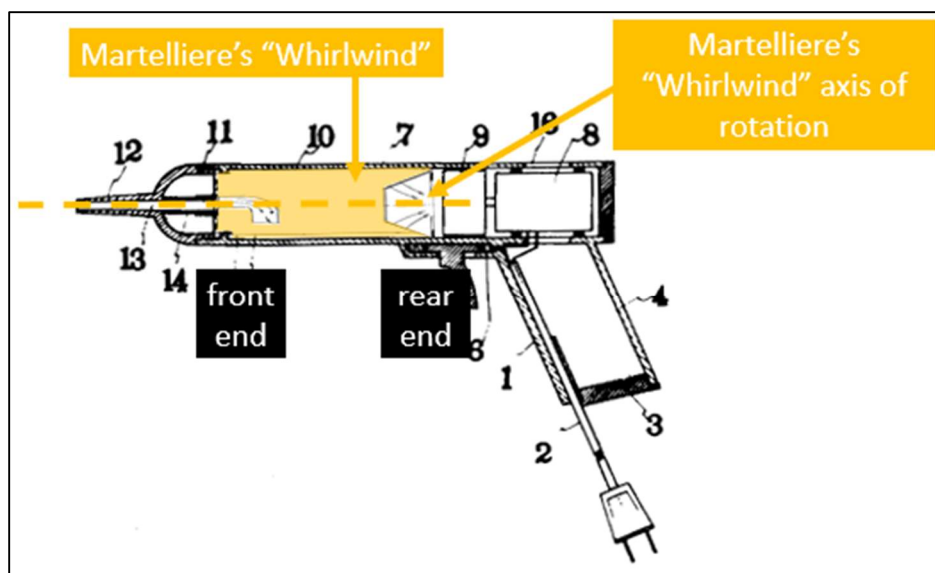
positioned with the upper end of the hand vacuum cleaner above the lower end of the hand vacuum cleaner and the lower end of the hand vacuum cleaner is on a horizontal surface, the cyclone axis of rotation is generally horizontal and extends between the front and rear ends of the cyclone.

245. In my opinion, Martelliere teaches that when the hand vacuum cleaner is positioned with the upper end of the hand vacuum cleaner above the lower end of the hand vacuum cleaner and the lower end of the hand vacuum cleaner is on a horizontal surface, the cyclone axis of rotation is generally horizontal and extends between the front and rear ends of the cyclone. A POSA would have understood that, when Martelliere's vacuum is positioned as claimed, the “**Whirlwind**” **axis of rotation** is generally horizontal and extends between the **front** and **rear ends** of the “**container**” (cyclone unit) comprising the “**Whirlwind**” (cyclone), as shown in the annotated image below:



Ex1009, 1, Fig. 1; Ground 3, Limitation [1pre].

246. As I explained above, in my opinion, a POSA would have been motivated to combine Tsukuji and Martelliere and would have reasonably expected success. Ground 3, §1. In my opinion, this limitation is likewise met when Tsukuji's handle is incorporated into Martelliere and Martelliere's cleaner is oriented as claimed, for the same reasons discussed above. In my opinion, the combined teachings also meet this limitation when Martelliere's cyclonic filtration teachings are incorporated into Tsukuji's cleaner, as shown in the annotated image below:



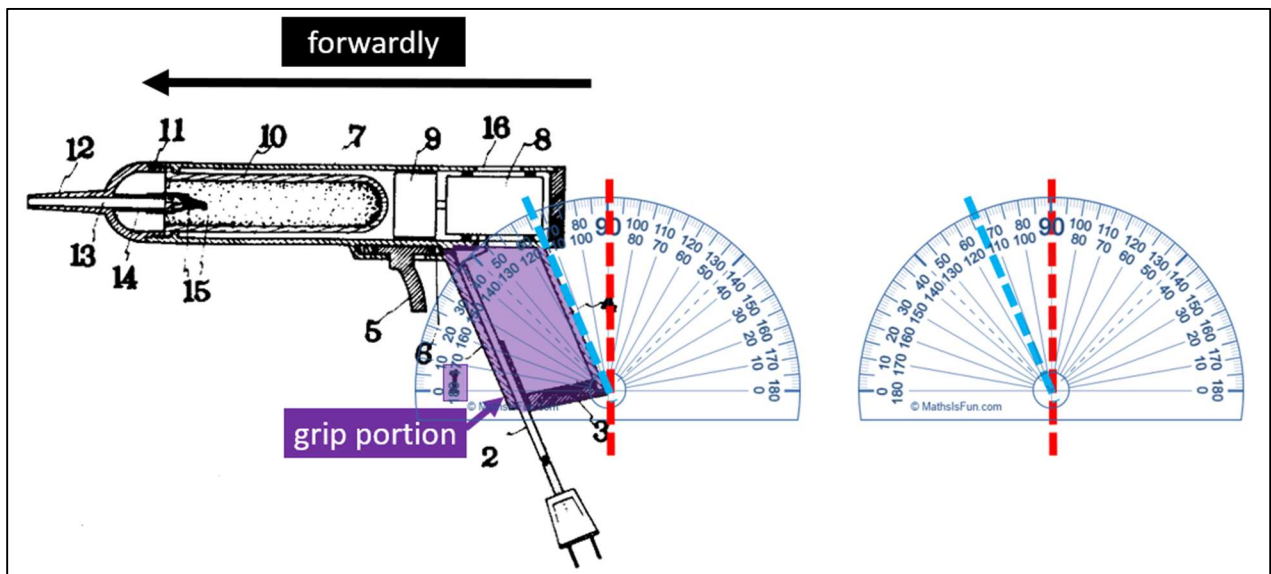
Ex1007, Fig. 1(modified), Ex1009, Fig. 1(modified).

e. [1d]

Reference Number	Claim Limitation
[1d]	“wherein when the hand vacuum cleaner is positioned with the upper end of the hand vacuum cleaner above the lower end of the hand vacuum cleaner and the lower end of the hand vacuum cleaner is on a horizontal surface, the handle is inclined forwardly at an angle that is between 10 and 80 degrees from a vertical axis, and”

247. In my opinion, Tsukuji teaches, and the combinations of Martelliere and Tsukuji teach wherein when the hand vacuum cleaner is positioned with the upper end of the hand vacuum cleaner above the lower end of the hand vacuum cleaner and the lower end of the hand vacuum cleaner is on a horizontal surface, the handle is inclined forwardly at an angle that is between 10 and 80 degrees from a vertical axis.

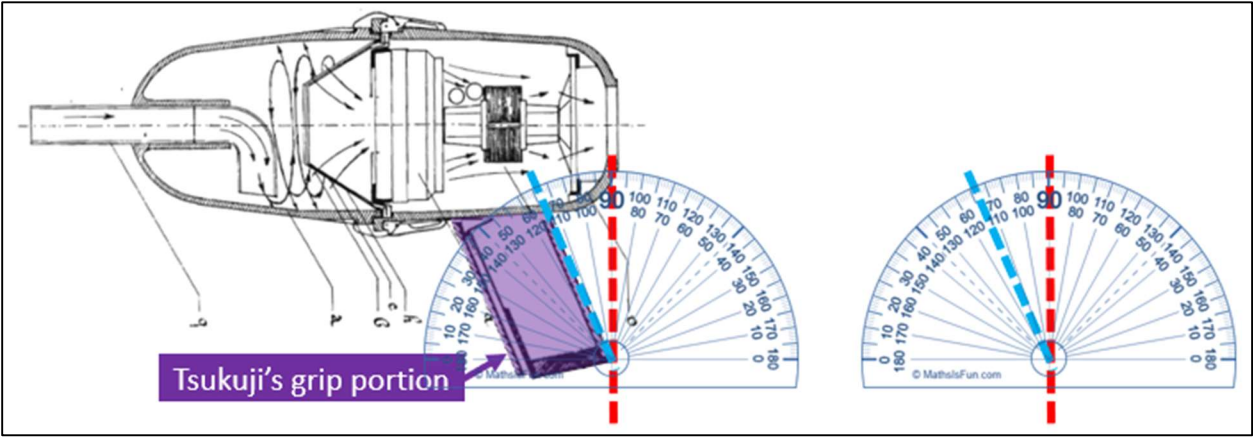
248. In my opinion, Tsukuji teaches that when the hand vacuum cleaner is positioned with the upper end of the hand vacuum cleaner above the lower end of the hand vacuum cleaner and the hand vacuum cleaner is on a horizontal surface, the handle is inclined forwardly at an angle that is between 10 and 80 degrees from a vertical axis. A POSA would have understood that, when positioned as claimed, Tsukuji's "grip portion 1" is inclined forwardly at approximately 23 degrees from a vertical axis, as shown in the annotated image below:



Ex1007, 3, Fig. 1; Ground 3, Limitation [1pre].

249. As I explained above, in my opinion, a POSA would have been motivated to combine Tsukuji and Martelliere and would have reasonably expected success. Ground 3, §1. In my opinion, this limitation is likewise met when Martelliere's cyclonic filtration

teachings are incorporated into Tsukuji’s cleaner, for the same reasons discussed above. Further, a POSA would have understood that when Tsukuji’s “**grip portion 1**” is incorporated into Martelliere’s cleaner, it is also inclined forwardly at approximately **23 degrees** from a **vertical axis**, as shown in the annotated image below:



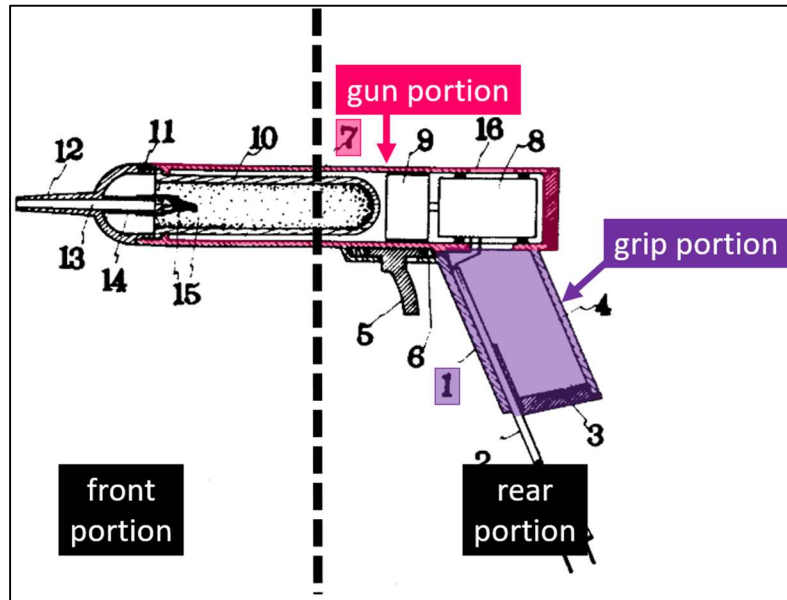
Ex1007, Fig. 1(modified); Ex1009, Fig. 1(modified).

f. [1e]

Reference Number	Claim Limitation
[1e]	“wherein the handle is provided on a sidewall at a rear portion of the hand vacuum cleaner body, and”

250. In my opinion, Tsukuji teaches, and the combinations of Martelliere and Tsukuji teach wherein the handle is provided on a sidewall at a rear portion of the hand vacuum cleaner body.
251. In my opinion, Tsukuji teaches that the handle is provided on a sidewall at a rear portion of the hand vacuum cleaner body. Tsukuji’s “**grip**

portion 1” is provided on a “gun portion 7” at a rear portion of the hand vacuum cleaner body, as shown in the annotated image below:

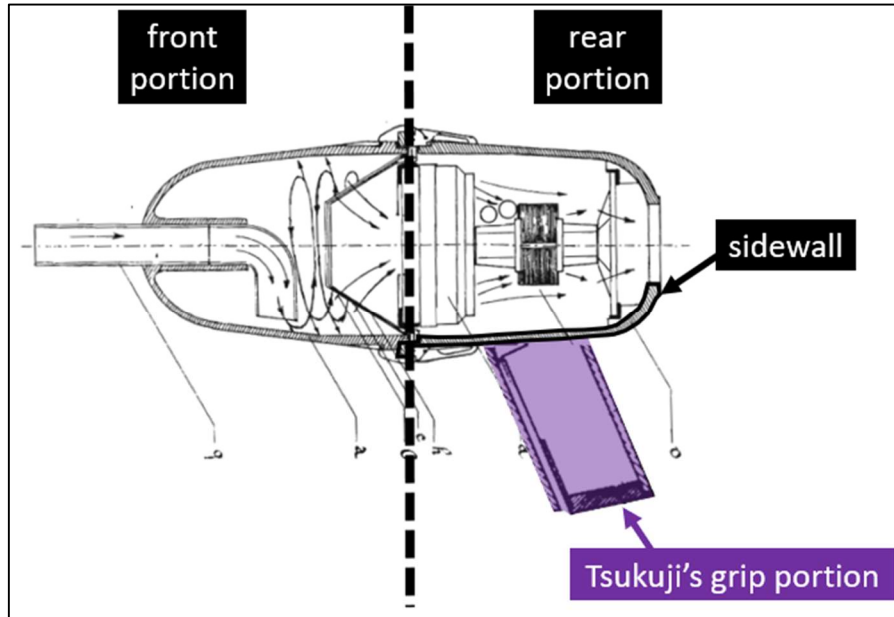


Ex1007, 3, Fig. 1; Ground 3, Limitation [1a].

252. In my opinion, a POSA would have understood that Tsukuji’s “gun portion 7” is a sidewall of the hand vacuum cleaner body, and Tsukuji’s “grip portion 1” is a handle provided on a sidewall at a rear portion of the hand vacuum cleaner body.

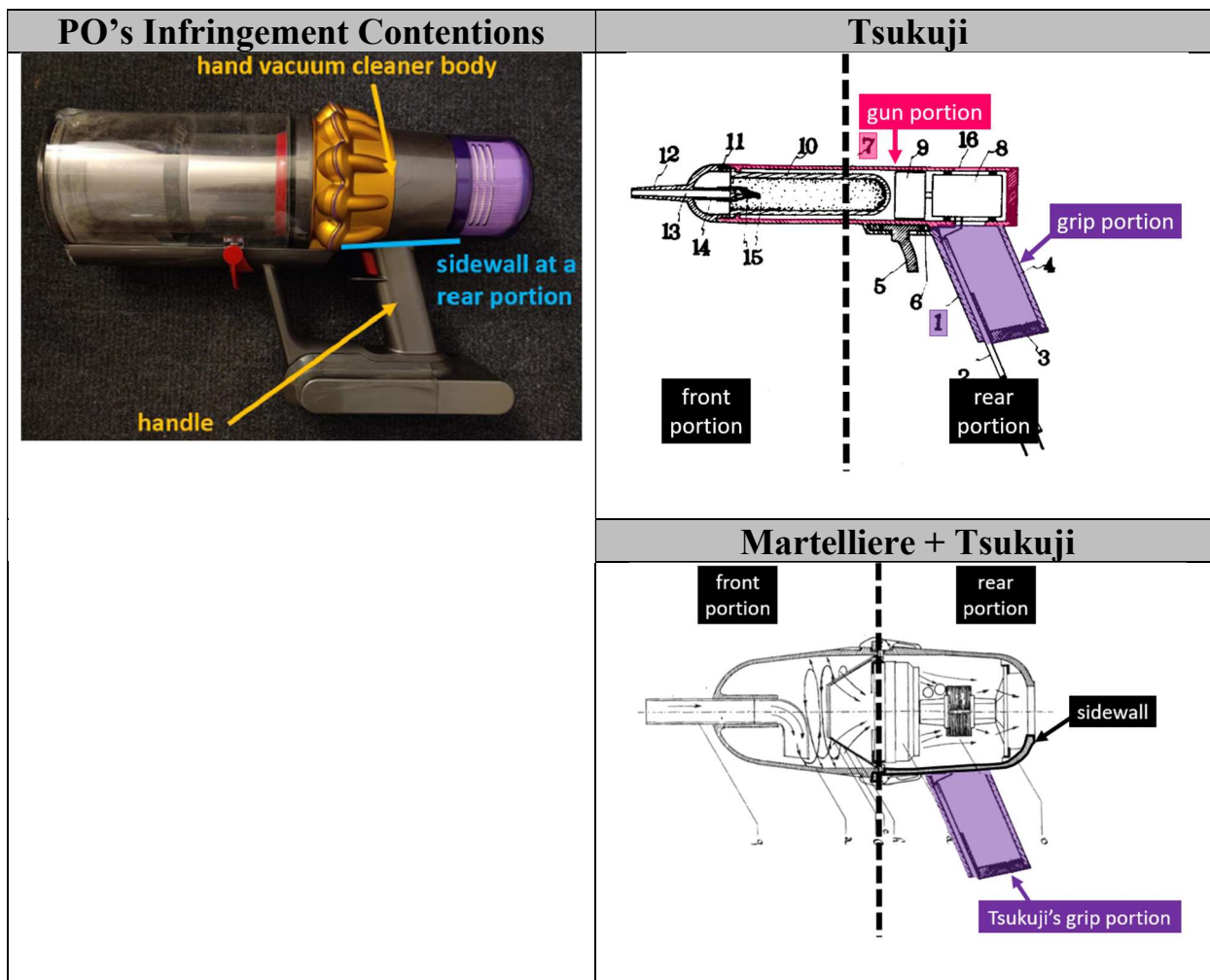
253. As I explained above, in my opinion, a POSA would have been motivated to combine Tsukuji and Martelliere and would have reasonably expected success. Ground 3, §1. In my opinion, this limitation is likewise met when Martelliere’s cyclonic filtration teachings are incorporated into Tsukuji’s vacuum cleaner, for the same reasons discussed above. Further, a POSA would have understood that

when Tsukuji's "**grip portion 1**" is incorporated into Martelliere's cleaner, it is also provided on a **sidewall** at a rear portion of Martelliere's hand vacuum cleaner body, as shown in the annotated image below:



Ex1007, Fig. 1(modified); Ex1009, Fig. 1(modified); Ground 3, Limitation [1pre].

254. Further, I have reviewed PO's infringement contentions, and this is at least as much disclosure of these limitations in Tsukuji and Martelliere as PO has accused of infringement in the related litigation, as shown in the annotated images below:



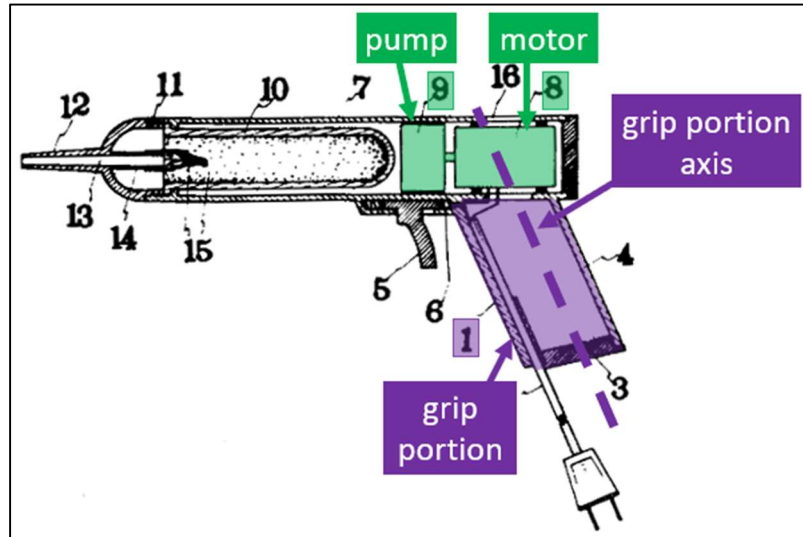
Ex1010, 11(PO's annotations); Ex1007, Fig. 1; Ex1009, Fig. 1(modified).

g. [1f]

Reference Number	Claim Limitation
[1f]	"wherein the handle has a handle axis that intersects the suction motor."

255. In my opinion, Tsukuji teaches, and the combinations of Martelliere and Tsukuji teach wherein the handle has a handle axis that intersects the suction motor.

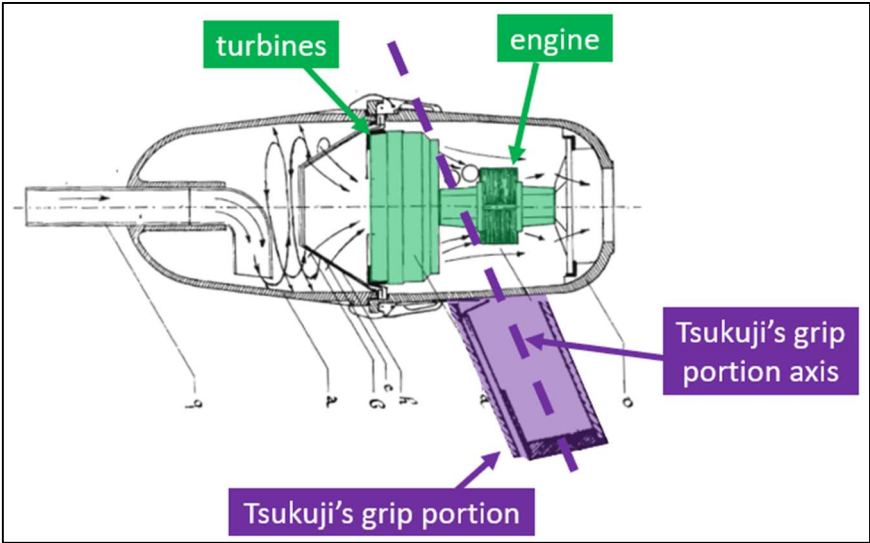
256. In my opinion, Tsukuji teaches that the handle has a handle axis that intersects the suction motor. Tsukuji’s “grip portion 1” (handle) has a grip portion axis that intersects the “motor 8” that “rotate[s] the turbofan inside the pump 9,” as shown in the annotated image below:



Ex1007, 3, Fig. 1.

257. As I explained above, in my opinion, a POSA would have been motivated to combine Tsukuji and Martelliere and would have reasonably expected success. Ground 3, §1. In my opinion, this limitation is likewise met when Martelliere’s cyclonic filtration teachings are incorporated into Tsukuji’s vacuum cleaner, for the same reasons discussed above. Further, a POSA would have understood that when Tsukuji’s “grip portion 1” is incorporated into Martelliere’s cleaner, its axis also intersects each of Martelliere’s “turbines d” and

“**engine e,**” as shown in the annotated image below:



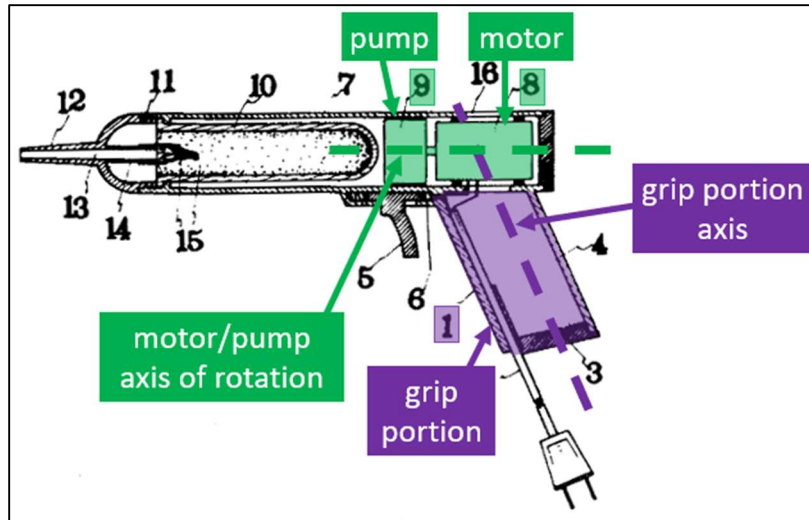
Ex1007, Fig. 1(modified); Ex1009, Fig. 1(modified).

3. [2]

Reference Number	Claim Limitation
[2]	“The hand vacuum cleaner of claim 1 wherein the handle has a handle axis that intersects the suction motor axis of rotation.”

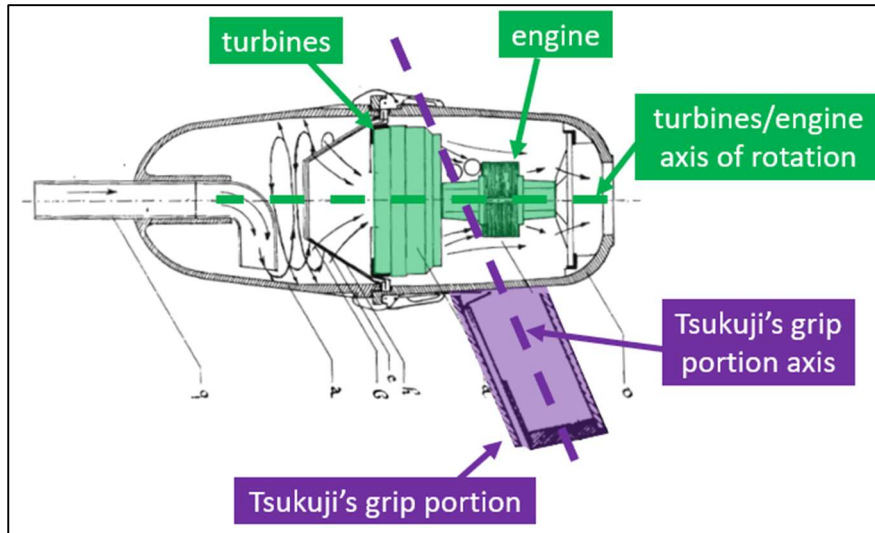
258. In my opinion, Tsukuji in combination with Martelliere teaches claim 1, and Tsukuji teaches, and the combinations of Martelliere and Tsukuji teach, wherein the handle has a handle axis that intersects the suction motor axis of rotation.

259. In my opinion, Tsukuji teaches that the handle axis intersects the suction motor axis of rotation. A POSA would have understood that Tsukuji’s **grip portion axis** intersects the **motor/pump axis of rotation**, as shown in the annotated image below:



Ex1007, 3, Fig. 1.

260. As I explained above, in my opinion, a POSA would have been motivated to combine Tsukuji and Martelliere and would have reasonably expected success. Ground 3, §1. In my opinion, these limitations are likewise met when Martelliere’s cyclonic filtration teachings are incorporated into Tsukuji’s vacuum cleaner, for the same reasons discussed above. Further, a POSA would have understood that when Tsukuji’s “**grip portion 1**” is incorporated into Martelliere’s cleaner, its **axis** also intersects Martelliere’s **turbines/engine axis of rotation**, as shown in the annotated image below:



Ex1007, Fig. 1(modified); Ex1009, Fig. 1(modified).

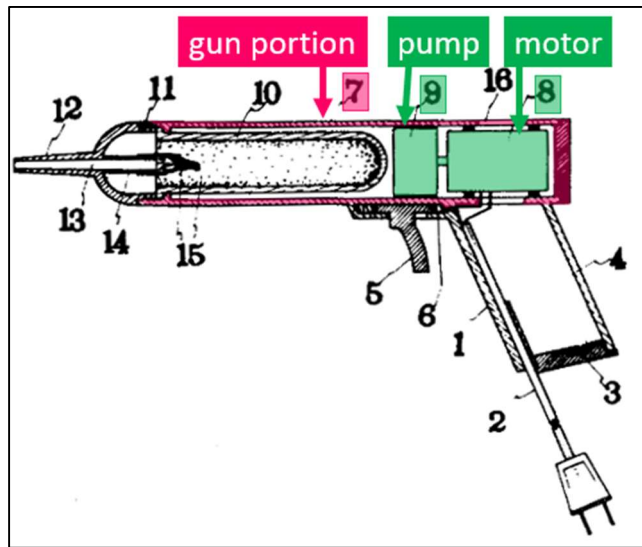
4. [3]

Reference Number	Claim Limitation
[3]	“The hand vacuum cleaner of claim 1 wherein the hand vacuum cleaner body comprises a suction motor and fan assembly housing and the handle extends away from the suction motor and fan assembly housing.”

261. In my opinion, Tsukuji in combination with Martelliere teaches claim 1, and Tsukuji teaches, and the combinations of Tsukuji and Martelliere teach, wherein the hand vacuum cleaner body comprises a suction motor and fan assembly housing and the handle extends away from the suction motor and fan assembly housing.

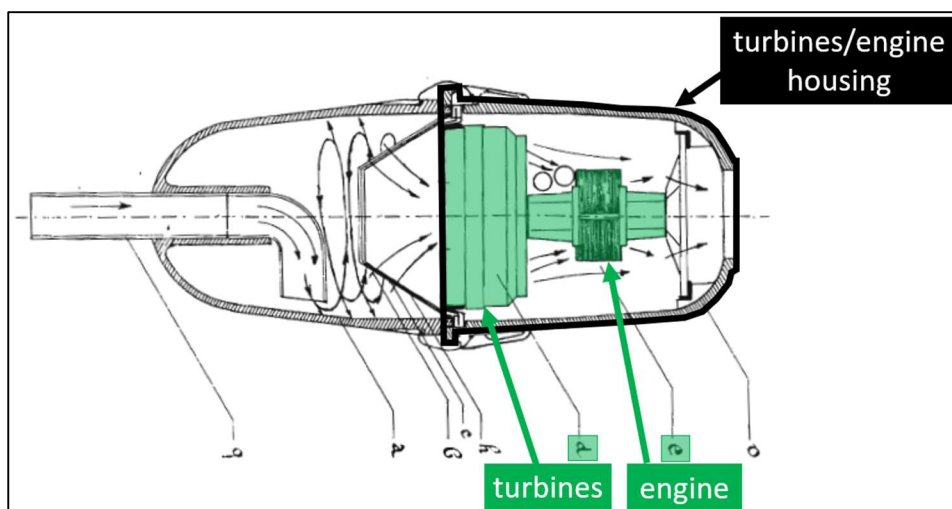
262. In my opinion, Tsukuji and Martelliere each teach that the hand vacuum cleaner body comprises a suction motor and fan assembly housing. Tsukuji’s “**motor 8**” and “turbofan inside the **pump 9**” “are arranged

... in the **gun portion 7**,” as shown in the annotated image below:



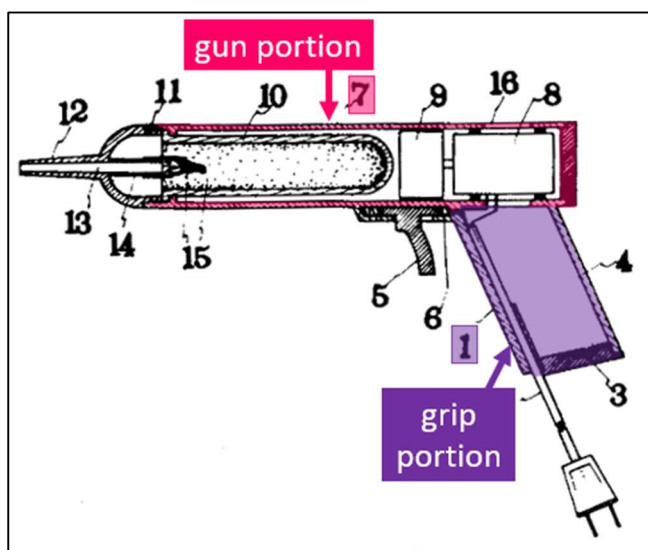
Ex1007, 3, Fig. 1.

263. In my opinion, a POSA would have understood that Tsukuji’s “gun portion 7” is a suction motor and fan assembly housing because it houses “motor 8”/“pump 9.”
264. Likewise, in my opinion, a POSA would have understood that Martelliere’s “**turbines *d***” and “**engine *e***” are housed in a **turbines/engine housing**, as shown in the annotated image below:



Ex1009, 1, Fig. 1.

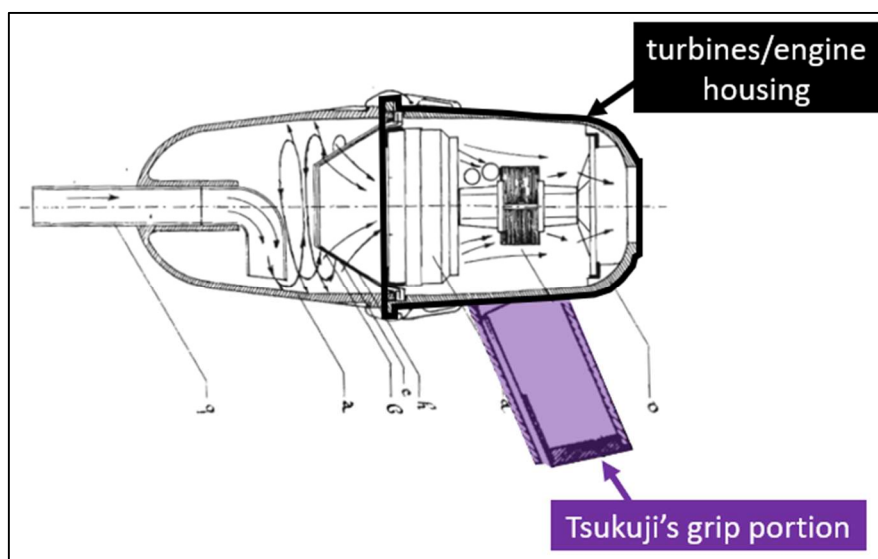
265. In my opinion, Tsukuji further teaches that the handle extends away from the suction motor and fan assembly housing. A POSA would have understood that Tsukuji's “**grip portion 1**” extends away from “**gun portion 7**,” as shown in the annotated image below:



Ex1007, 3, Fig. 1.

266. As I explained above, in my opinion, a POSA would have been

motivated to combine Tsukuji and Martelliere and would have reasonably expected success. Ground 3, §1. In my opinion, these limitations are likewise met when Martelliere's cyclonic filtration teachings are incorporated into Tsukuji's vacuum cleaner, for the same reasons discussed above. Further, a POSA would have understood that when Tsukuji's "**grip portion 1**" is incorporated into Martelliere's cleaner, it extends away from the **turbines/engine housing**, as shown in the annotated image below:



Ex1007, Fig. 1(modified); Ex1009, Fig. 1(modified).

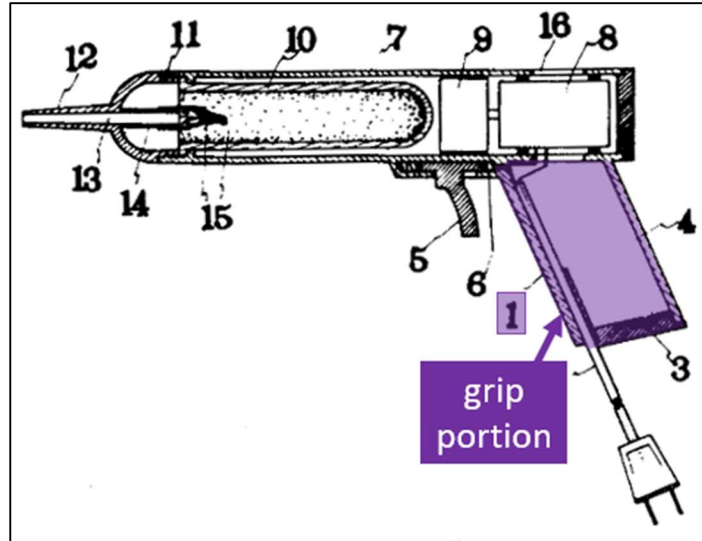
5. [4]/[12]

Reference Number	Claim Limitation
[4]	“The hand vacuum cleaner of claim 1 wherein the handle has a hand grip portion that extends upwardly and forwardly when the hand vacuum cleaner is positioned with the lower end of the hand vacuum cleaner on a horizontal surface.”
[12]	“The hand vacuum cleaner of claim 11 wherein the handle has a hand grip portion that extends upwardly and forwardly when the hand vacuum cleaner body is positioned with the lower end of the hand vacuum cleaner on a horizontal surface.”

267. In my opinion, Tsukuji in combination with Martelliere teaches claim 1, and Tsukuji teaches, and the combinations of Martelliere and Tsukuji teach, wherein the handle has a hand grip portion that extends upwardly and forwardly when the hand vacuum cleaner is positioned with the lower end of the hand vacuum cleaner on a horizontal surface.

268. In my opinion, Tsukuji in combination with Martelliere teaches claim 11, and Tsukuji teaches, and the combinations of Martelliere and Tsukuji teach, wherein the handle has a hand grip portion that extends upwardly and forwardly when the hand vacuum cleaner body is positioned with the lower end of the hand vacuum cleaner on a horizontal surface.

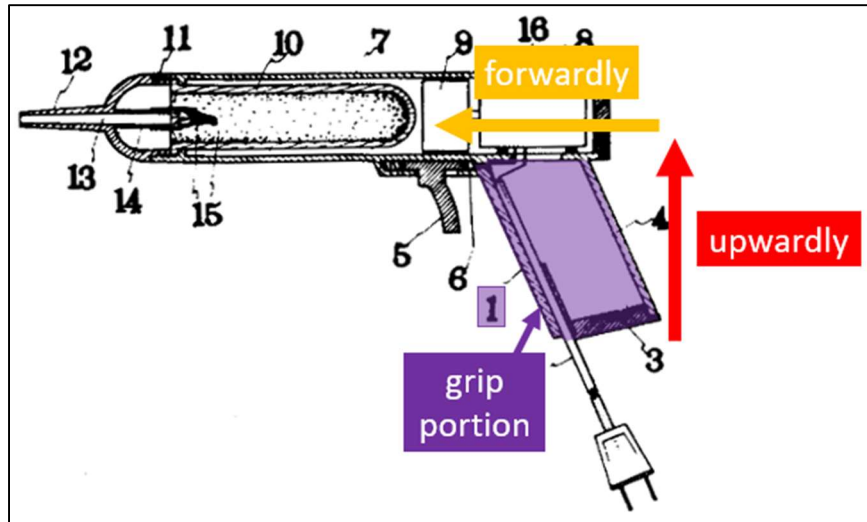
269. In my opinion, Tsukuji teaches that the handle has a hand grip portion. Tsukuji teaches a “**grip portion 1** [that] is gripped” by the user, as shown in the annotated image below:



Ex1007, 3, Fig. 1.

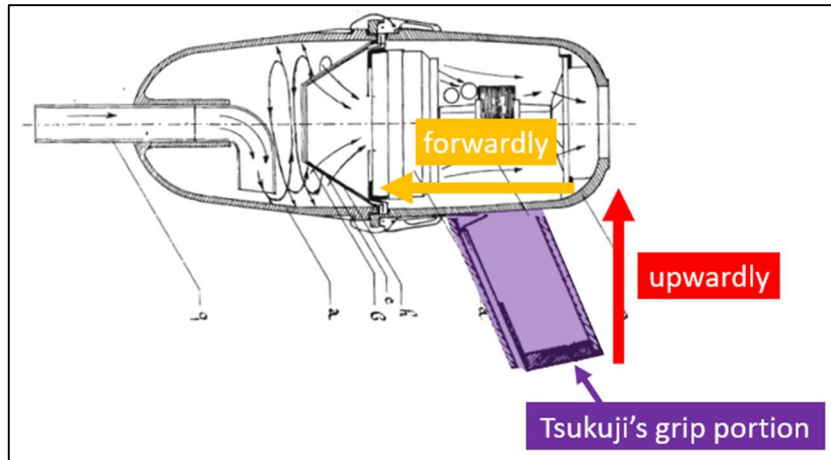
270. In my opinion, a POSA would have understood that Tsukuji’s “grip portion 1” is a handle having a hand grip portion based on its disclosure of a “grip.”

271. In my opinion, Tsukuji further teaches that the hand grip portion extends upwardly and forwardly when the hand vacuum cleaner is positioned with the lower end of the hand vacuum cleaner on a horizontal surface. In my opinion, a POSA would have understood that, when Tsukuji’s vacuum is positioned as claimed, Tsukuji’s “**grip portion 1**” extends **upwardly** and **forwardly**, as shown in the annotated image below:



Ex1007, 3, Fig. 1.

272. As I explained above, in my opinion, a POSA would have been motivated to combine Tsukuji and Martelliere and would have reasonably expected success. Ground 3, §1. In my opinion, these limitations are likewise met when Martelliere’s cyclonic filtration teachings are incorporated into Tsukuji’s vacuum cleaner, for the same reasons discussed above. Further, a POSA would have understood that when Tsukuji’s “**grip portion 1**” having a hand grip portion is incorporated into Martelliere’s cleaner, it extends **upwardly** and **forwardly**, as shown in the annotated image below:



Ex1007, Fig. 1(modified); Ex1009, Fig. 1(modified).

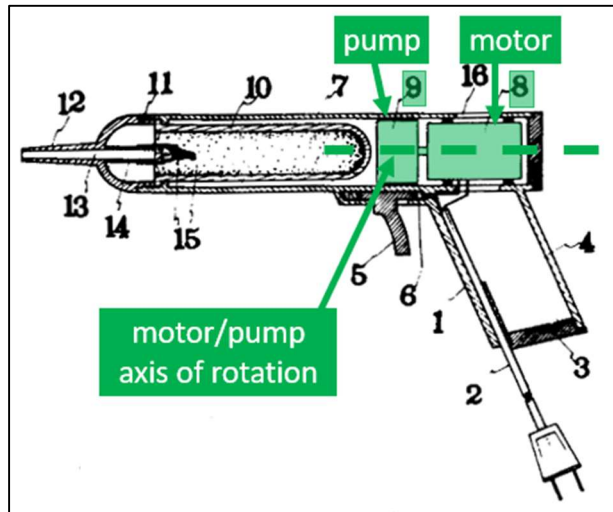
6. [5]

Reference Number	Claim Limitation
[5]	“The hand vacuum cleaner of claim 1 wherein when the hand vacuum cleaner is positioned with the lower end of the hand vacuum cleaner on a horizontal surface, the suction motor axis of rotation is generally horizontal.”

273. In my opinion, Tsukuji in combination with Martelliere teaches claim 1, and Tsukuji and Martelliere, individually and in combination, teach wherein when the hand vacuum cleaner is positioned with the lower end of the hand vacuum cleaner on a horizontal surface, the suction motor axis of rotation is generally horizontal.

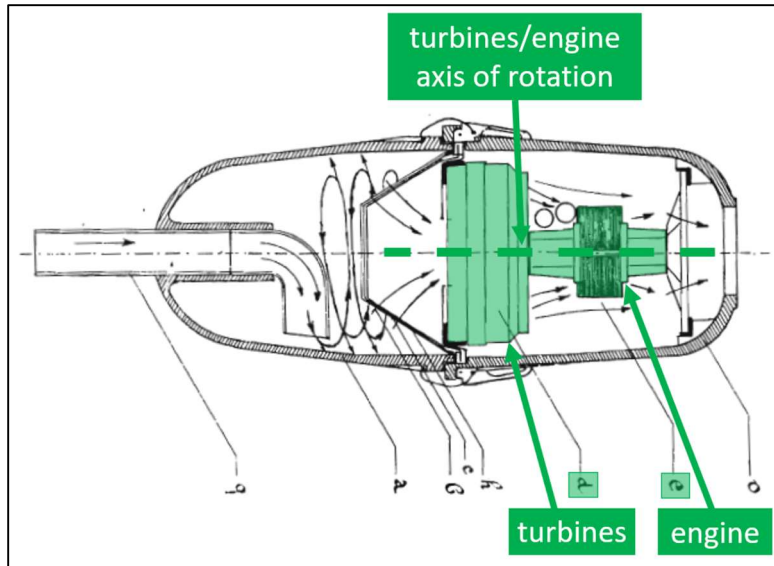
274. In my opinion, Tsukuji and Martelliere each teach that when the hand vacuum cleaner is positioned with the lower end of the hand vacuum cleaner on a horizontal surface, the suction motor axis of rotation is generally horizontal. A POSA would have understood that, when

Tsukuji's vacuum is positioned as claimed, Tsukuji's **motor/pump axis of rotation** is generally horizontal, as shown in the annotated image below:



Ex1007, 3, Fig. 1; Ground 1, Limitation [1pre].

275. Likewise, a POSA would have understood that when Martelliere's vacuum is positioned as claimed, Martelliere's **turbines/engine axis of rotation** is generally horizontal, as shown in the annotated image below:



Ex1009, Fig. 1.

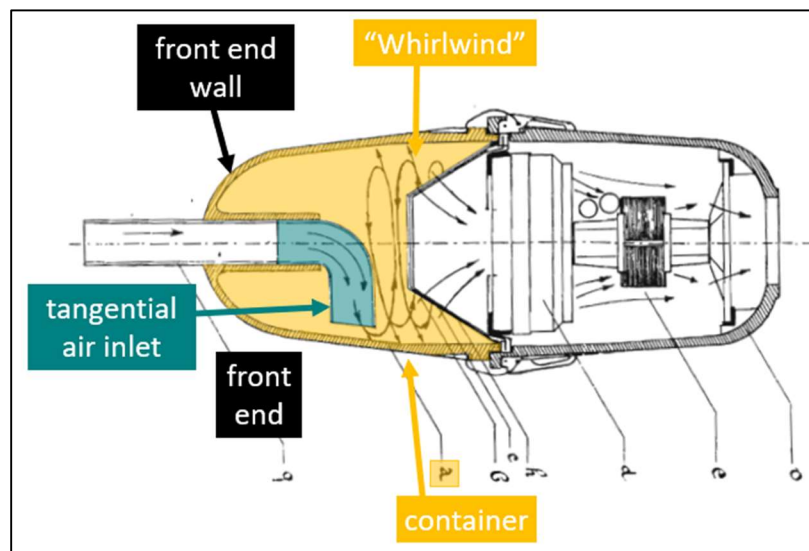
276. As I explained above, in my opinion, a POSA would have been motivated to combine Tsukuji and Martelliere as discussed in §1 and would have reasonably expected success. Ground 3, §1. In my opinion, each combination likewise teaches this claim for the same reasons discussed above.

7. [7]

Reference Number	Claim Limitation
[7]	“The hand vacuum cleaner of claim 1 wherein the cyclone has a front end wall having the cyclone air inlet.”

277. In my opinion, Tsukuji in combination with Martelliere teaches claim 1, and Martelliere teaches, and the combinations of Tsukuji and Martelliere teach, wherein the cyclone has a front end wall having the cyclone air inlet.

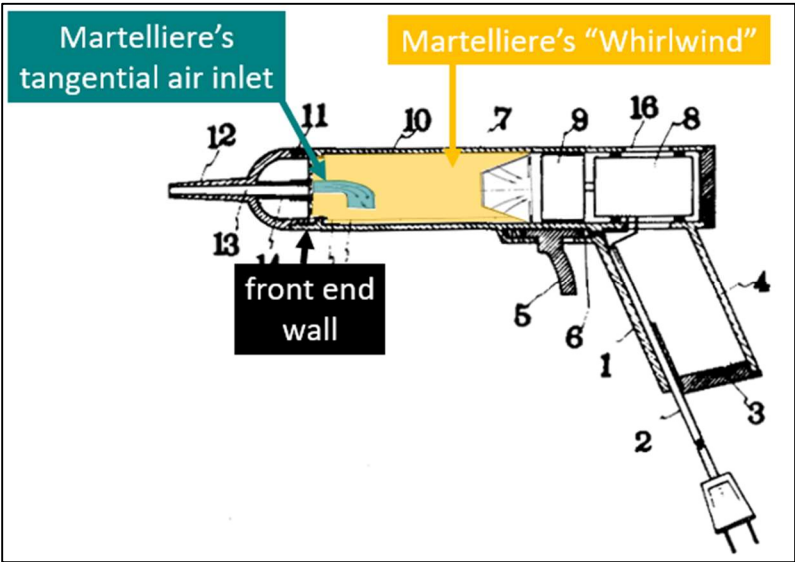
278. In my opinion, Martelliere teaches that the cyclone has a front end wall having the cyclone air inlet. A POSA would have understood that the **front end** of Martelliere's "**container**" comprising a "**Whirlwind**" (cyclone) is a **front end wall**, and that the **front end wall** has the "**tangential[]**" **air inlet** (cyclone air inlet), as shown in the annotated image below:



Ex1009, 1, Fig. 1.

279. As I explained above, in my opinion., a POSA would have been motivated to combine Tsukuji and Martelliere and would have reasonably expected success. Ground 3, §1. In my opinion, these limitations are likewise met when Tsukuji's handle teachings are incorporated into Martelliere's vacuum cleaner, for the same reasons discussed above. A POSA would have understood that the combined

teachings also meet these limitations when Martelliere’s cyclonic filtration teachings are incorporated into Tsukuji’s vacuum cleaner, as shown in the annotated image below:



Ex1007, Fig. 1(modified); Ex1009, Fig. 1(modified).

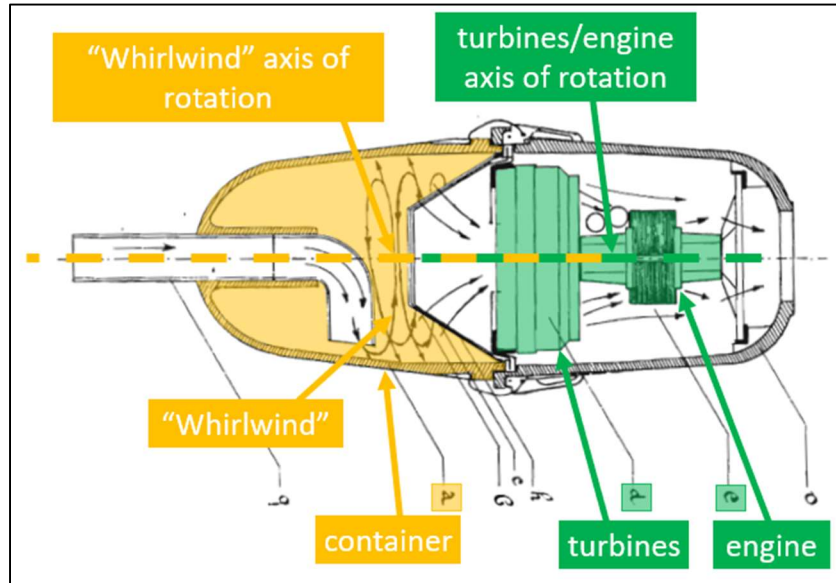
8. [8]

Reference Number	Claim Limitation
[8]	“The hand vacuum cleaner of claim 1 wherein the cyclone axis of rotation is generally parallel to the suction motor axis of rotation.”

280. In my opinion, Tsukuji in combination with Martelliere teaches claim 1, and Martelliere teaches, and the combinations of Tsukuji and Martelliere teach, wherein the cyclone axis of rotation is generally parallel to the suction motor axis of rotation.

281. In my opinion, Martelliere teaches that the cyclone axis of rotation is

generally parallel to the suction motor axis of rotation. A POSA would have understood that Martelliere's "**Whirlwind**" (cyclone) **axis of rotation** is generally parallel to the **turbines/engine** (suction motor) **axis of rotation**, as shown in the annotated image below:

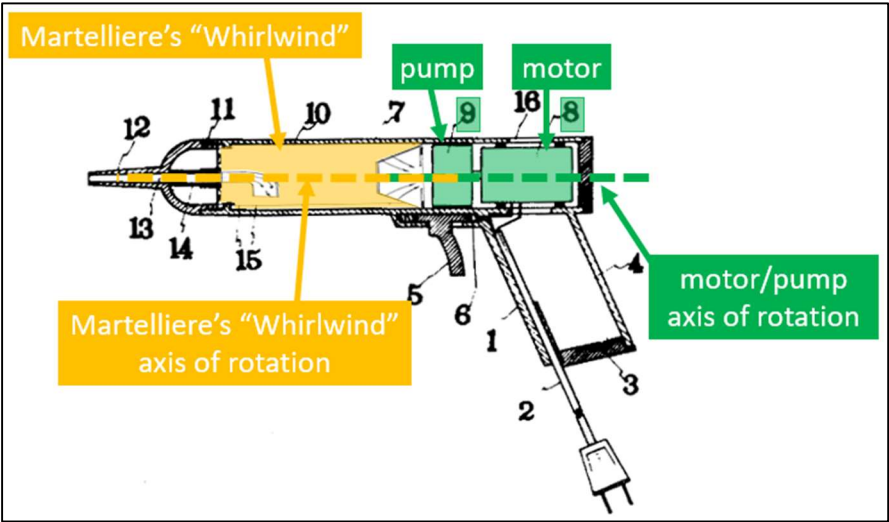


Ex1009, 1, Fig. 1.

282. To the extent Martelliere's turbines/engine axis of rotation and cyclone axis of rotation are depicted as co-axial in Figure 1, in my opinion, a POSA would have understood these axes are generally parallel because they extend in the same direction and maintain the same (zero) distance between them.

283. As I explained above, in my opinion, a POSA would have been motivated to combine Tsukuji and Martelliere and would have reasonably expected success. Ground 3, §1. In my opinion, these

limitations are also met when Tsukuji’s handle teachings are incorporated into Martelliere’s vacuum cleaner, for the same reasons discussed above. Further, a POSA would have understood that the combined teachings also meet these limitations when Martelliere’s cyclonic filtration teachings are incorporated into Tsukuji’s vacuum cleaner, as shown in the annotated image below:



Ex1007, Fig. 1(modified).

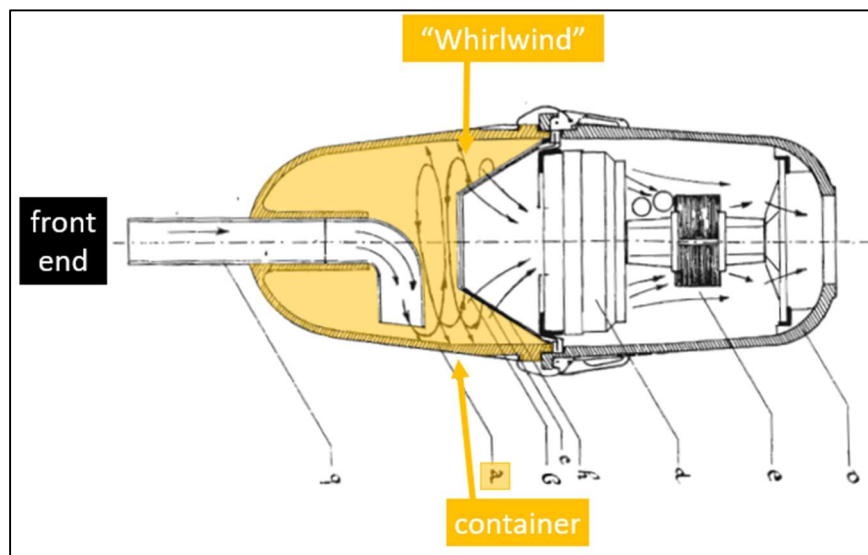
9. [9]

Reference Number	Claim Limitation
[9]	“The hand vacuum cleaner of claim 1 wherein the cyclone unit is provided at the front end of the hand vacuum cleaner body.”

284. In my opinion, Tsukuji in combination with Martelliere teaches claim 1, and Martelliere teaches, and the combinations of Tsukuji and Martelliere teach, wherein the cyclone unit is provided at the front end

of the hand vacuum cleaner body.

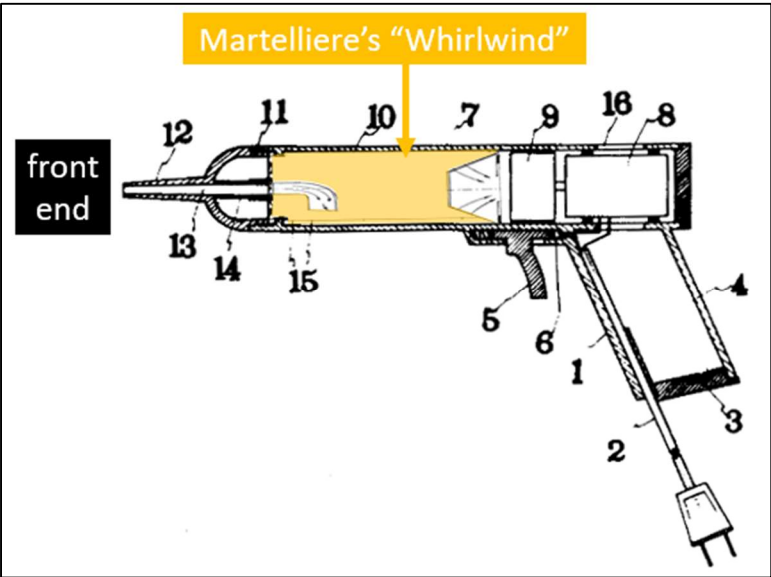
285. In my opinion, Martelliere teaches that the cyclone unit is provided at the front end of the hand vacuum cleaner body. A POSA would have understood that Martelliere's "**container**" (cyclone unit) comprising a "**Whirlwind**" (cyclone) is provided at the **front end** of Martelliere's hand vacuum cleaner body, as shown in the annotated image below:



Ex1009, 1, Fig. 1.

286. As I explained above, in my opinion, a POSA would have been motivated to combine Tsukuji and Martelliere and would have reasonably expected success. Ground 3, §1. In my opinion, these limitations are also met when Tsukuji's handle teachings are incorporated into Martelliere's vacuum cleaner, for the same reasons discussed above. A POSA would have understood that the combined

teachings likewise meet this claim when Martelliere’s cyclonic filtration teachings are incorporated into Tsukuji’s vacuum cleaner, as shown in the annotated image below:



Ex1007, Fig. 1(modified); Ex1009, Fig. 1(modified).

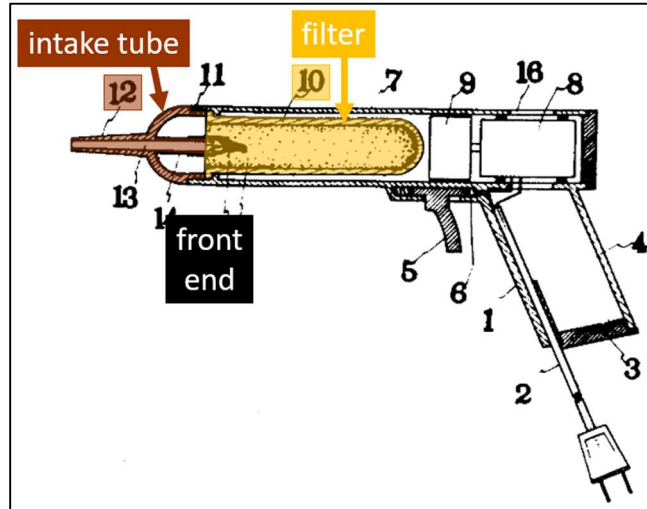
10. [10]

Reference Number	Claim Limitation
[10]	“The hand vacuum cleaner of claim 1 wherein the dirty air inlet is provided at a front end of the cyclone unit.”

287. In my opinion, Tsukuji in combination with Martelliere teaches claim 1, and Martelliere teaches, and the combinations of Tsukuji and Martelliere teach, wherein the dirty air inlet is provided at a front end of the cyclone unit.

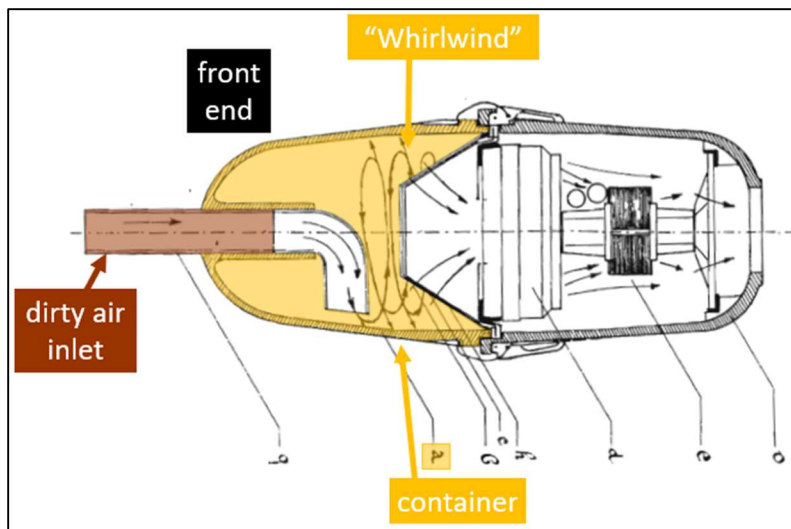
288. Tsukuji teaches that the “**intake tube 12**” is provided at a **front end** of

“**filter 10**,” which is an air-filtration unit, as shown in the annotated image below:



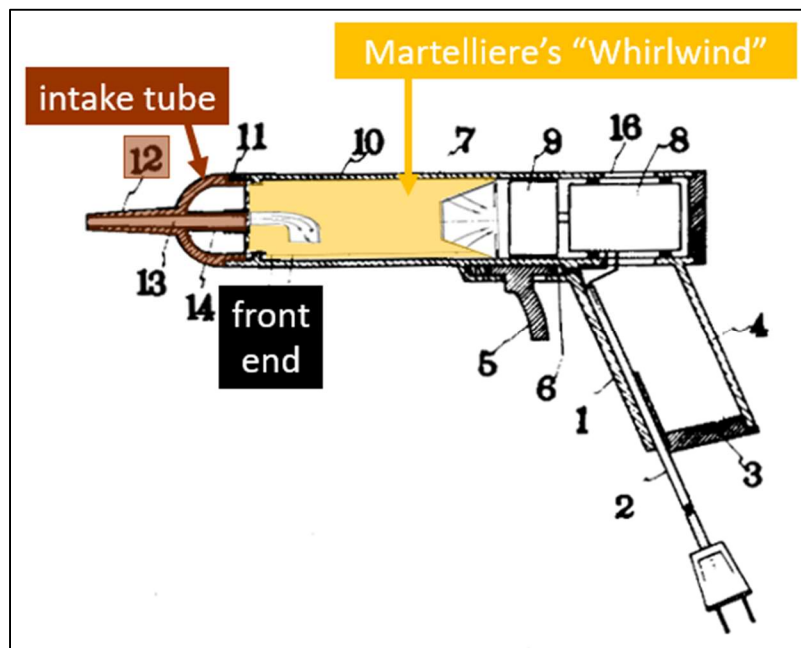
Ex1007, 3, Fig. 1.

289. In my opinion, Martelliere teaches that the dirty air inlet is provided at a front end of the cyclone unit. A POSA would have understood that Martelliere’s **dirty air inlet** is provided at a **front end** of the “**container**” (cyclone unit), as shown in the annotated image below:



Ex1009, 1, Fig. 1.

290. As I explained above, in my opinion, a POSA would have been motivated to combine Tsukuji and Martelliere and would have reasonably expected success. Ground 3, §1. In my opinion, these limitations are also met when Tsukuji's handle teachings are incorporated into Martelliere's vacuum cleaner, for the same reasons discussed above. A POSA would have understood that the combined teachings likewise meet these limitations when Martelliere's cyclonic filtration teachings are incorporated into Tsukuji's vacuum cleaner, as shown in the annotated image below:

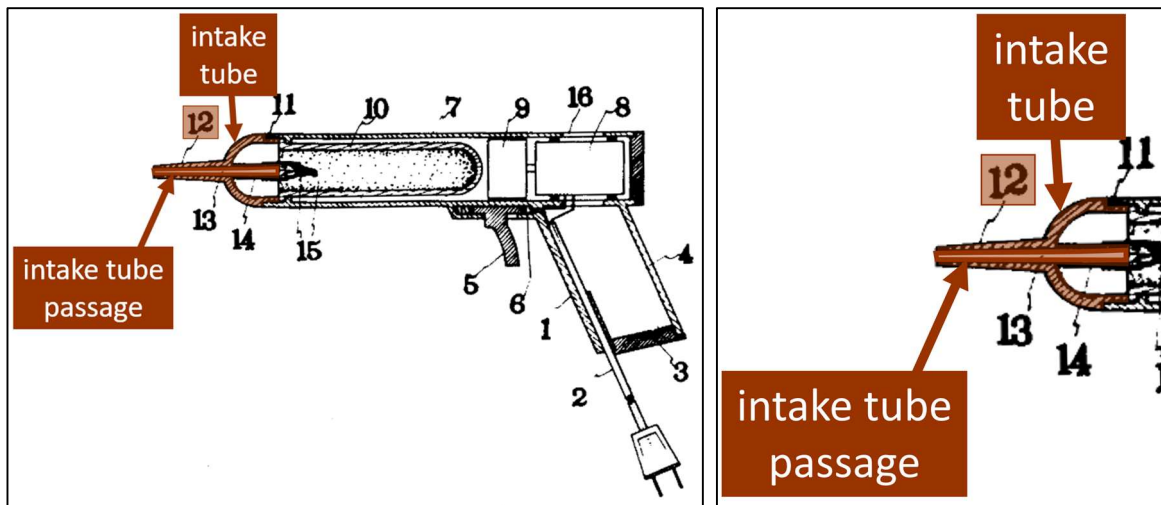


Ex1007, Fig .1(modified); Ex1009, Fig. 1(modified).

11. [11]

Reference Number	Claim Limitation
[11]	“The hand vacuum cleaner of claim 1 wherein the dirty air inlet comprises an inlet passage that extends longitudinally between an inlet end and an outlet end and has a longitudinal passage axis that is coaxial with the cyclone axis and the outlet end communicates with the cyclone air inlet.”

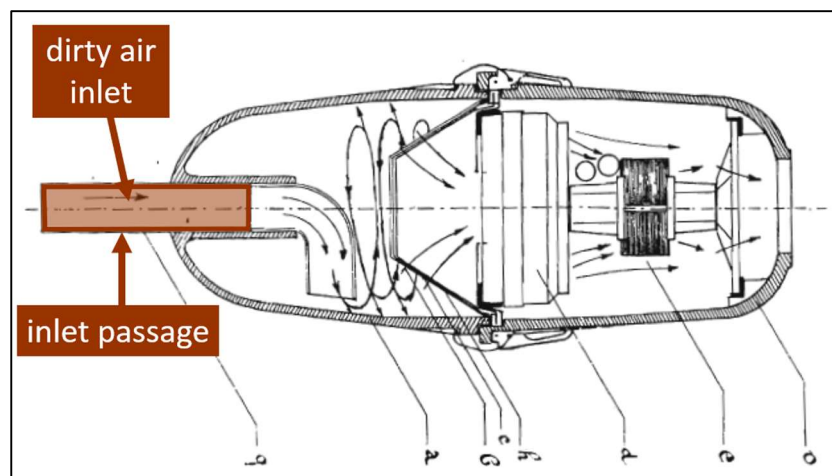
291. In my opinion, Tsukuji in combination with Martelliere teaches claim 1, and Martelliere teaches, and the combinations of Tsukuji and Martelliere teach, wherein the dirty air inlet comprises an inlet passage that extends longitudinally between an inlet end and an outlet end and has a longitudinal passage axis that is coaxial with the cyclone axis and the outlet end communicates with the cyclone air inlet.
292. In my opinion, Tsukuji and Martelliere each teach that the dirty air inlet comprises an inlet passage. A POSA would have understood that Tsukuji’s “**intake tube 12**” (dirty air inlet) has a “**guide tube 14** [that] extends inside from a **through-hole 13** in the **intake tube 12**,” as shown in the annotated images below:



Ex1007, 3, Fig. 1.

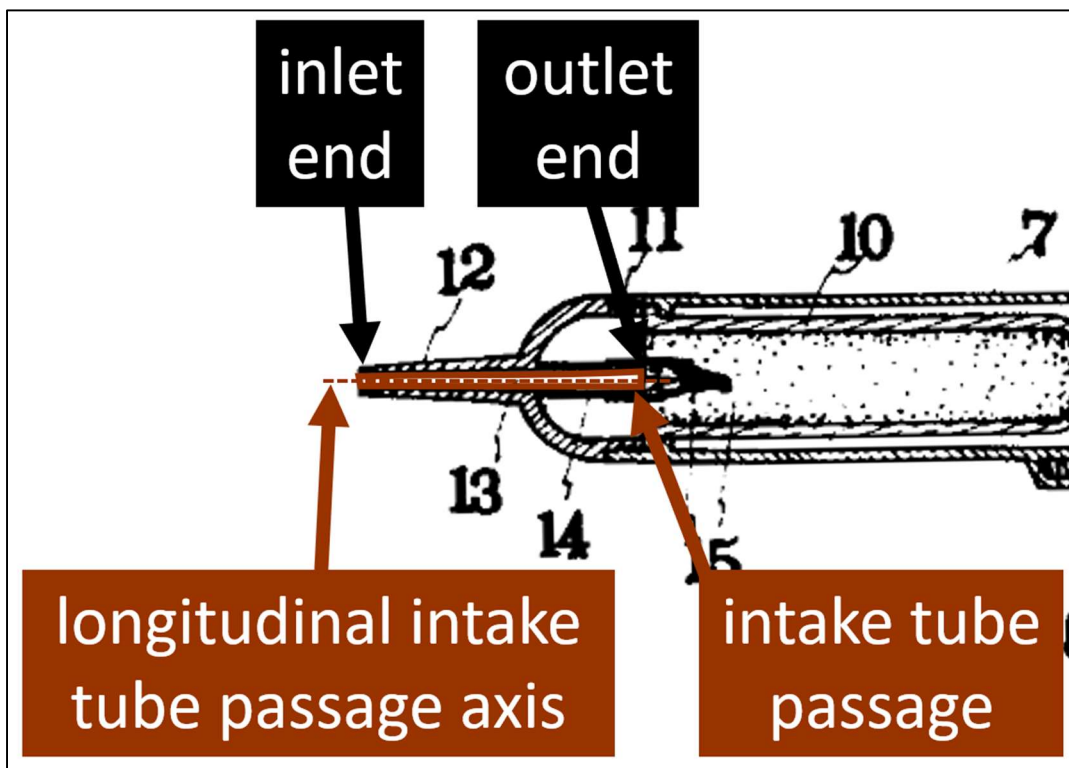
293. In my opinion, a POSA would have understood that Tsukuji’s “intake tube 12” with a “through-hole 13” and “guide tube 14” comprises an inlet passage.

294. Likewise, in my opinion, a POSA would have understood that Martelliere’s **dirty air inlet** comprises an **inlet passage**, as shown in the annotated image below:



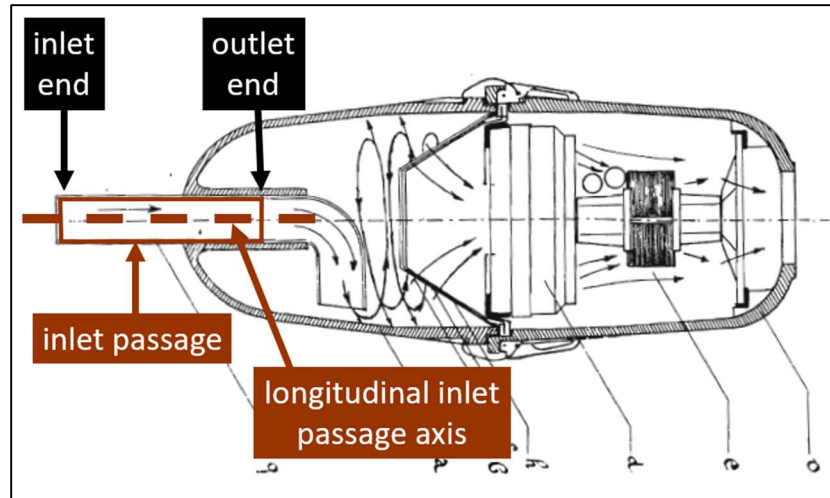
Ex1009, 1, Fig. 1.

295. In my opinion, Tsukuji and Martelliere each teach that the inlet passage extends longitudinally between an inlet end and an outlet end and has a longitudinal passage axis. A POSA would have understood that Tsukuji's **intake tube passage** extends longitudinally between an **inlet end** and an **outlet end** and has a **longitudinal intake tube passage axis**, as shown in the annotated image below:



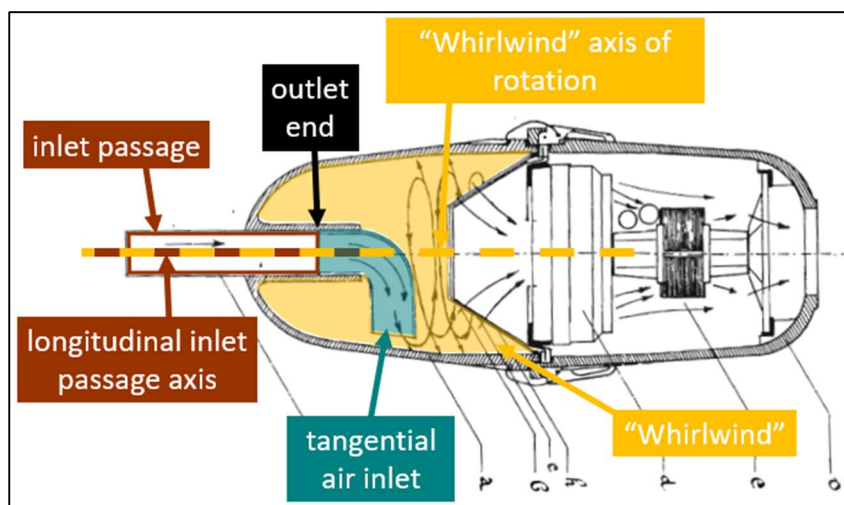
Ex1007, 3, Fig. 1.

296. In my opinion, a POSA would have understood that Martelliere's **inlet passage** also extends longitudinally between an **inlet end** and an **outlet end** and has a **longitudinal inlet passage axis**, as shown in the annotated image below:



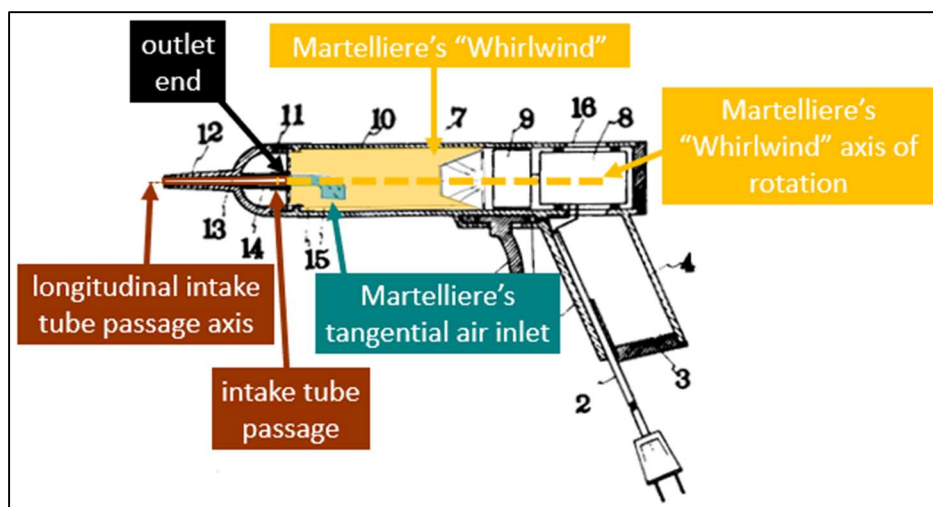
Ex1009, 1, Fig. 1.

297. In my opinion, Martelliere teaches that the longitudinal passage axis is coaxial with the cyclone axis and the outlet end communicates with the cyclone air inlet. A POSA would have understood that Martelliere's **longitudinal inlet passage axis** is coaxial with the “**Whirlwind**” axis (cyclone axis), and the **outlet end** communicates with the “**tangential[]**” **air inlet** (cyclone air inlet), as shown in the annotated image below:



Ex1009, 1, Fig. 1.

298. As I explained above, in my opinion, a POSA would have been motivated to combine Tsukuji and Martelliere and would have reasonably expected success. Ground 3, §1. In my opinion, these limitations are also met when Tsukuji's handle teachings are incorporated into Martelliere's vacuum cleaner, for the same reasons discussed above. Further, a POSA would have understood that the combined teachings also meet these limitations when Martelliere's cyclonic filtration teachings are incorporated into Tsukuji's vacuum cleaner, as shown in the annotated image below:

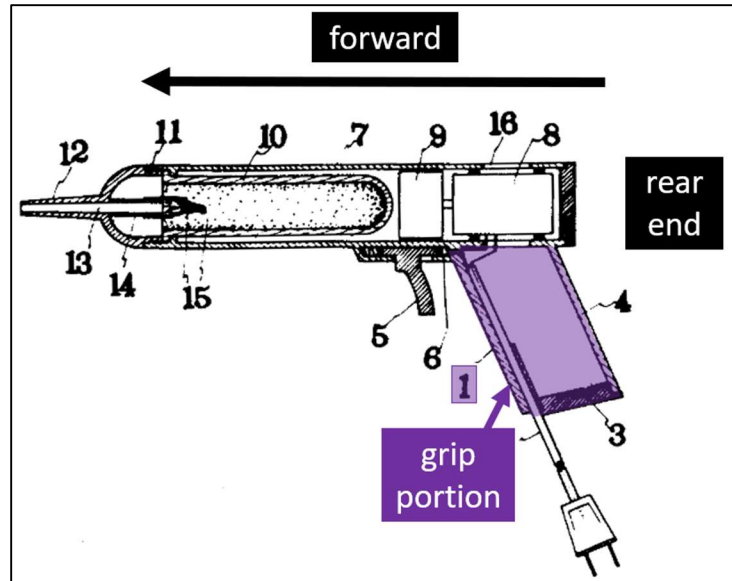


Ex1007, Fig. 1(modified); Ex1009, Fig. 1(modified).

12. [15]

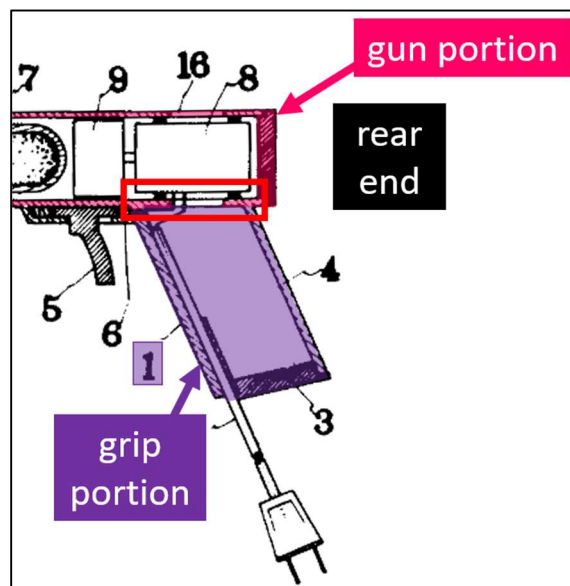
Reference Number	Claim Limitation
[15]	“The hand vacuum cleaner of claim 1 wherein the handle is forward of a rear end of the hand vacuum cleaner body.”

299. In my opinion, Tsukuji in combination with Martelliere teaches claim 1, and Tsukuji teaches and renders obvious, and the combinations of Martelliere and Tsukuji teach and render obvious, wherein the handle is forward of a rear end of the hand vacuum cleaner body.
300. In my opinion, Tsukuji teaches that the handle is forward of a rear end of the hand vacuum cleaner body. A POSA would have understood that Tsukuji’s “**grip portion 1**” (handle) is **forward** of a **rear end** of the hand vacuum cleaner body, as shown in the annotated image below:



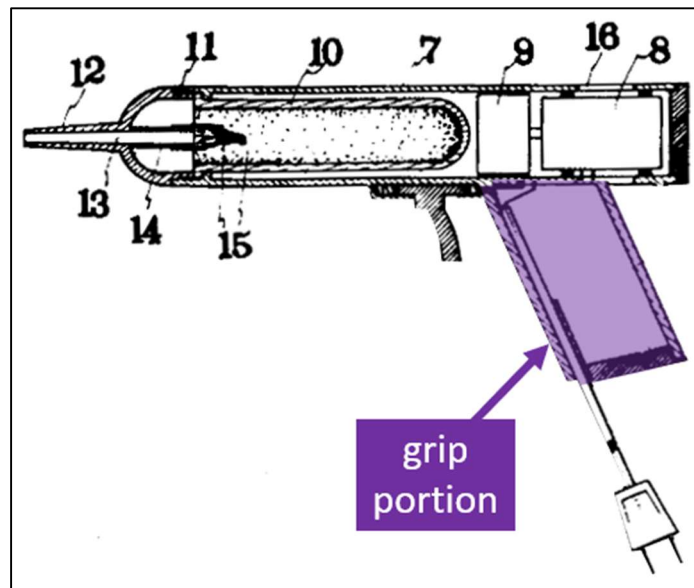
Ex1007, 3, Fig. 1.

301. In my opinion, a POSA would have understood that Tsukuji’s “**grip portion 1**” is forward of a **rear end** of the hand vacuum cleaner body, including because it is attached to the “**gun portion 7**” at a **location** forward of the **rear end**, as shown in the annotated image below:



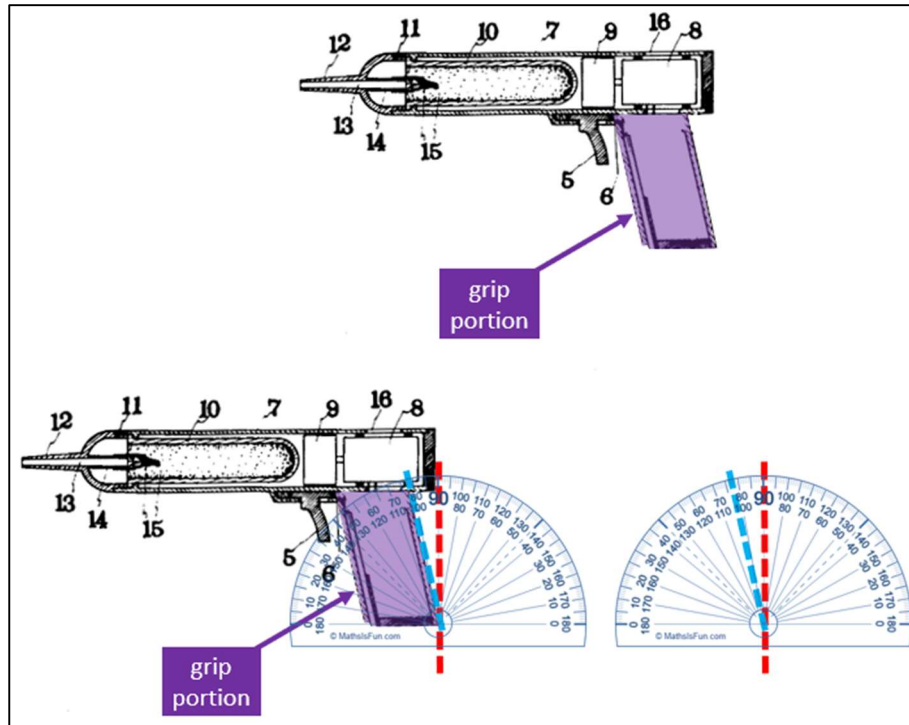
Ex1007, 3, Fig. 1.

302. To the extent PO argues Tsukuji's handle is not forward of a rear end of the hand vacuum cleaner body, in my opinion, a POSA would have been motivated to move Tsukuji's "**grip portion 1**" further forward, as shown in the annotated image below:



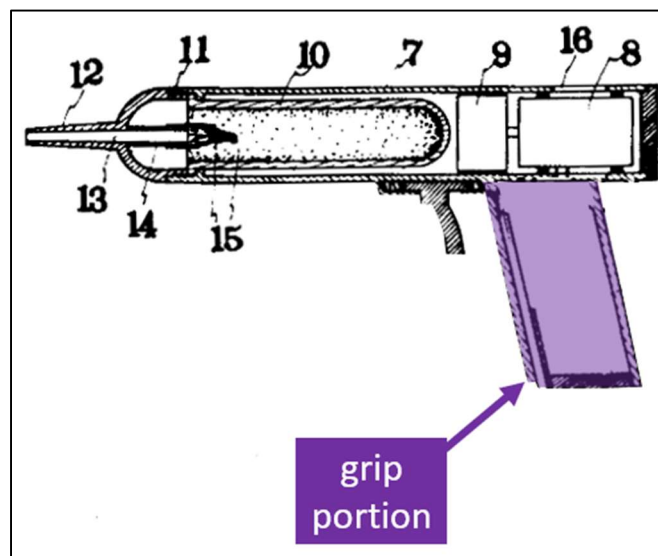
Ex1007, Fig. 1(modified).

303. Also, in my opinion, a POSA would have been motivated to change the angle of Tsukuji's "**grip portion 1**" to be more vertical, e.g., approximately **12 degrees** from a **vertical axis**, as shown in the annotated image below:



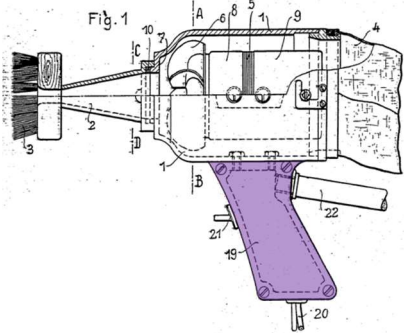
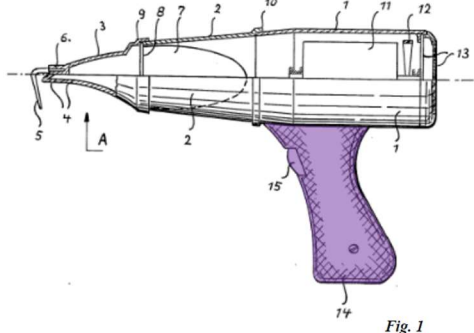
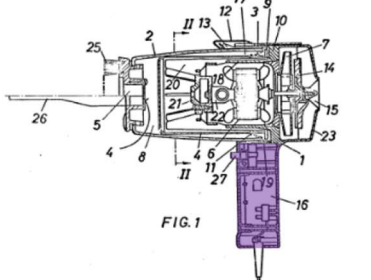
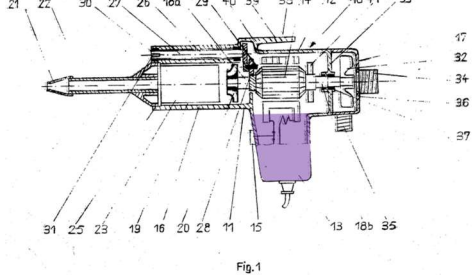
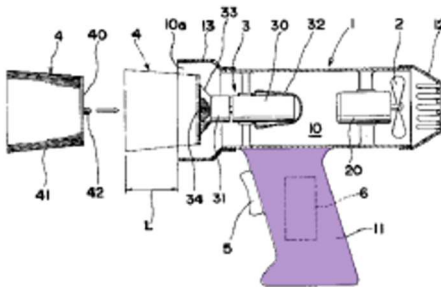
Ex1007, Fig. 1(modified).

304. Further, in my opinion, a POSA would have been motivated to move Tsukuji’s “**grip portion 1**” forward and angle it more vertically, as shown in the annotated image below:



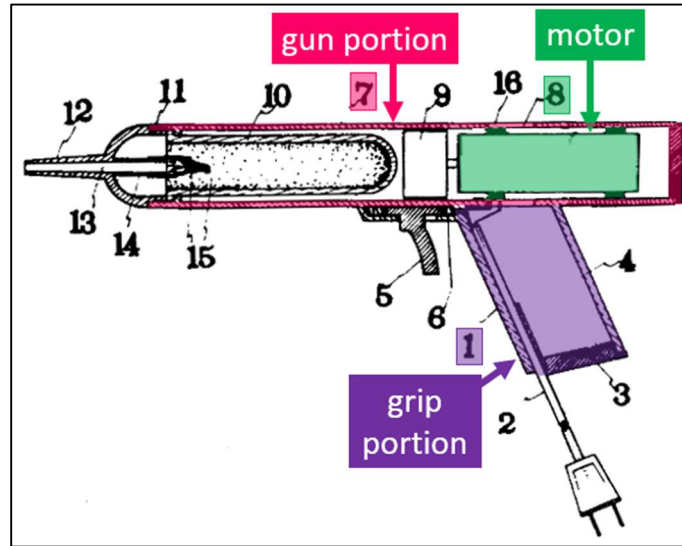
Ex1007, Fig. 1.

305. In my opinion, a POSA would have been motivated to modify Tsukuji's "grip portion 1" as shown to accommodate different user hand sizes and preferences, and would result in a favorable weight balance and ergonomics, and make it easier for different users to "reliably grasp[]" "grip portion 1," which is one of Tsukuji's stated objectives. Ex1007, 5.
306. In my opinion, a POSA would have been further motivated to modify Tsukuji's handle positioning because hand vacuums having **handles** positioned forward of a rear end of the hand vacuum cleaner body and at varying angles have been known in the art for nearly 70 years, as shown in the annotated images below:

Ex1014, Fig. 1 (1955)	Ex1025, Fig. 1 (1966)
	
Ex1027, Fig. 1 (1970)	Ex1016, Fig. 1 (1971)
	
Ex1029, Fig. 1 (1998)	
[Figure 1] 	

307. In my opinion, a POSA would have reasonably expected success modifying Tsukuji as shown and described above because it would have involved a straightforward relocation and/or re-angling of Tsukuji's handle.

308. In addition, in my opinion, a POSA would have been motivated to modify Tsukuji's "**gun portion 7**" to extend further rearward so that Tsukuji could accommodate a larger "**motor 8**," as shown in the annotated image below:



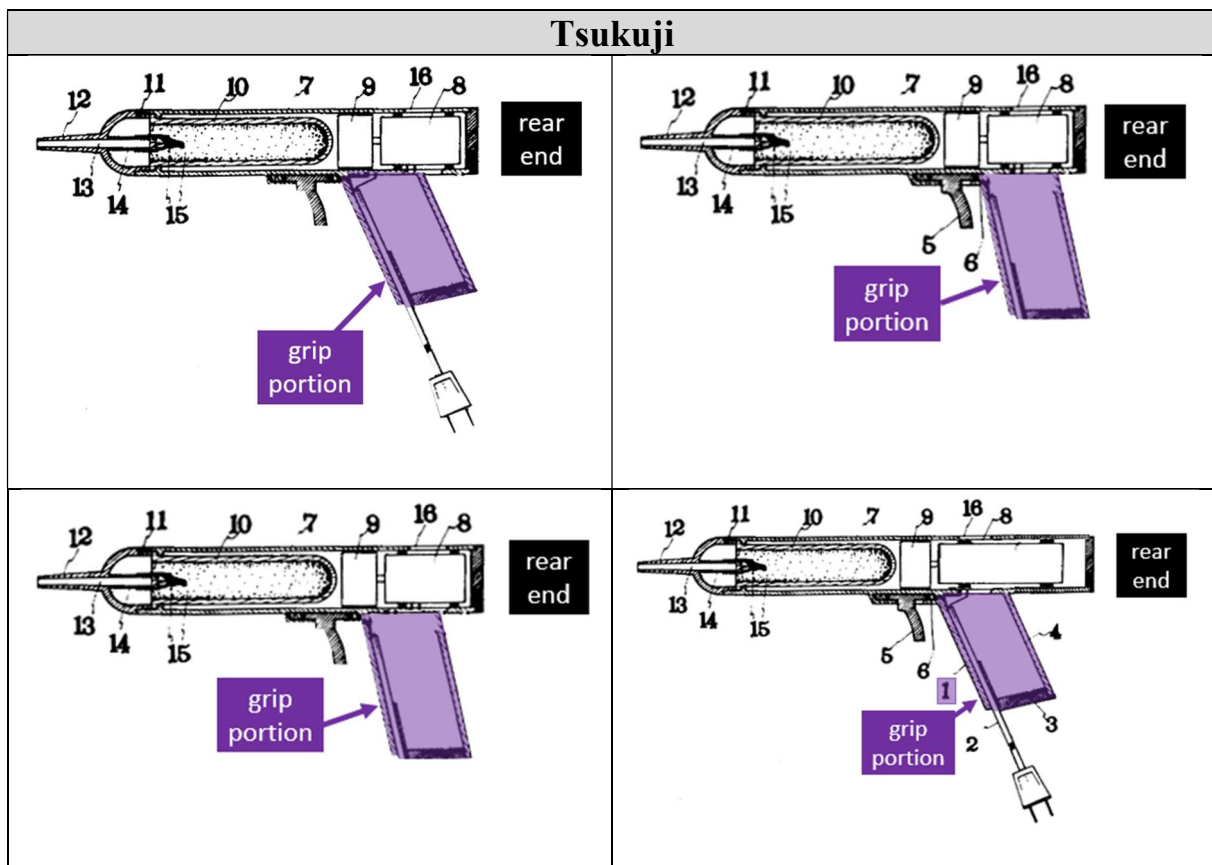
Ex1007, 3, Fig. 1(modified).

309. In my opinion, a POSA would have motivated to modify Tsukuji as shown because such modification would provide well-known benefits, including improved suction power, and enhanced cleaning efficiency and performance. Further, in my opinion, a POSA would have reasonably expected success because it would have involved the simple modification of Tsukuji's existing parts.

310. Thus, in my opinion, modifying Tsukuji as shown would have been at least obvious to try, particularly given Tsukuji's teachings of a "grip

portion 1” that a user may “reliably grasp[];” easy to implement, using nearly 70-year-old teachings; and would yield the predictable result of a “small electric vacuum cleaner” that “may be used while being oriented in a direction that is not vertical,” which is one of Tsukuji’s stated objectives. Ex1007, 2-5.

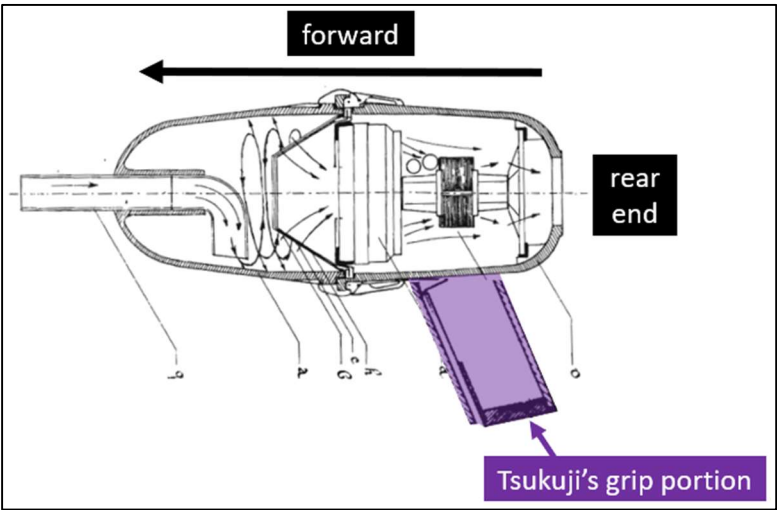
311. A POSA would have understood that, when so modified, Tsukuji’s “**grip portion 1**” is forward of a rear end of the hand vacuum cleaner body, as shown in the annotated images below:



Ex1007, Fig. 1(modified).

312. As I explained above, in my opinion, a POSA would have been

motivated to combine Tsukuji and Martelliere and would have reasonably expected success. Ground 3, §1. In my opinion, these limitations are also met when Martelliere’s cyclonic filtration teachings are incorporated into Tsukuji’s vacuum cleaner, for the same reasons discussed above. Further, a POSA would have understood that when Tsukuji’s “**grip portion 1**” is incorporated into Martelliere’s cleaner, it is **forward** of a **rear end** of Martelliere’s hand vacuum cleaner body, as shown in the annotated image below:



Ex1007, Fig. 1(modified); Ex1009, Fig. 1(modified).

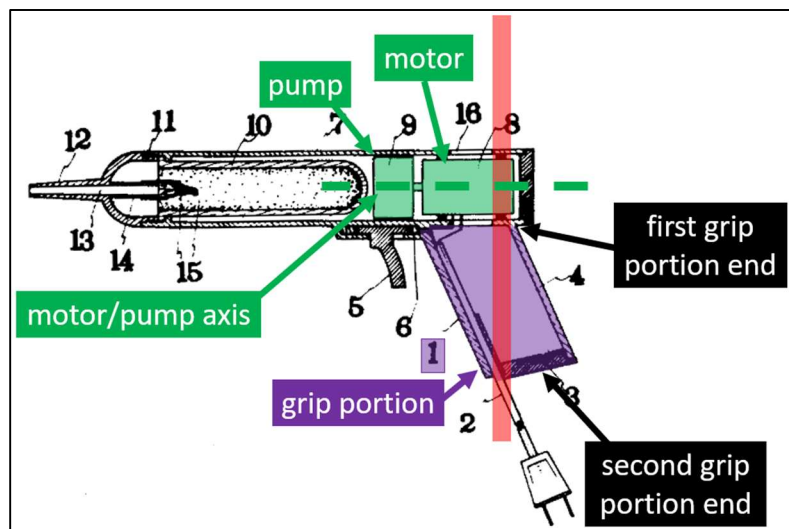
13. [16]

Reference Number	Claim Limitation
[16]	“The hand vacuum cleaner of claim 1 wherein a plane that is perpendicular to the motor axis extends through the handle from the first handle end to the second handle end.”

313. In my opinion, Tsukuji in combination with Martelliere teaches claim

1, and Tsukuji teaches, and the combinations of Martelliere and Tsukuji teach wherein a plane that is perpendicular to the motor axis extends through the handle from the first handle end to the second handle end.

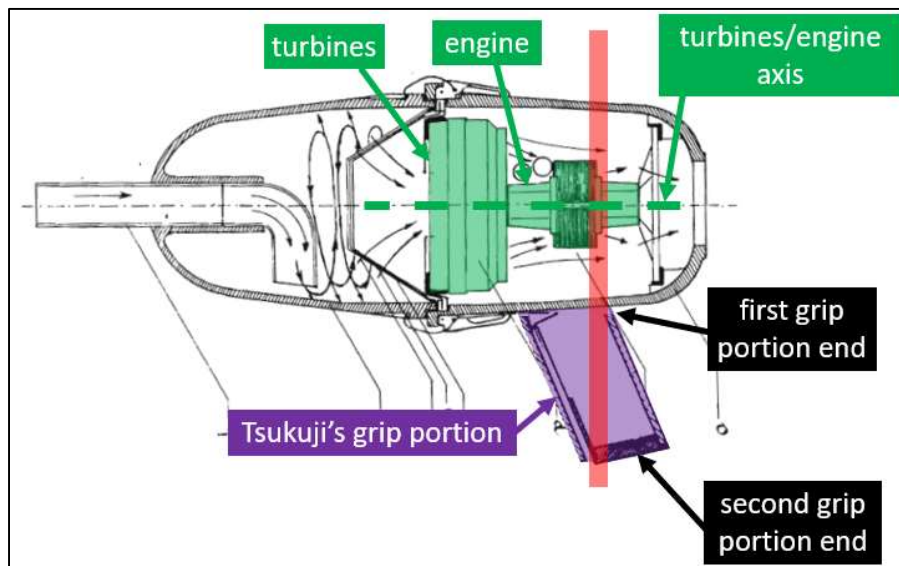
314. In my opinion, Tsukuji teaches that a plane that is perpendicular to the motor axis extends through the handle from the first handle end to the second handle end. A POSA would have understood that a **plane** that is perpendicular to Tsukuji's **motor/pump axis** extends through the **"grip portion 1"** from the **first grip portion end** to the **second grip portion end**, as shown in the annotated image below:



Ex1007, 3, Fig. 1.

315. As I explained above, in my opinion, a POSA would have been motivated to combine Tsukuji and Martelliere and would have reasonably expected success. Ground 3, §1. In my opinion, these

limitations are also met when Martelliere's cyclonic filtration teachings are incorporated into Tsukuji's vacuum cleaner, for the same reasons discussed above. Further, a POSA would have understood that, when Tsukuji's "**grip portion 1**" is incorporated into Martelliere's cleaner, a **plane** that is perpendicular to Martelliere's **turbines/engine axis** extends through Tsukuji's "**grip portion 1**" from the **first grip portion end** to the **second grip portion end**, as shown in the annotated image below:



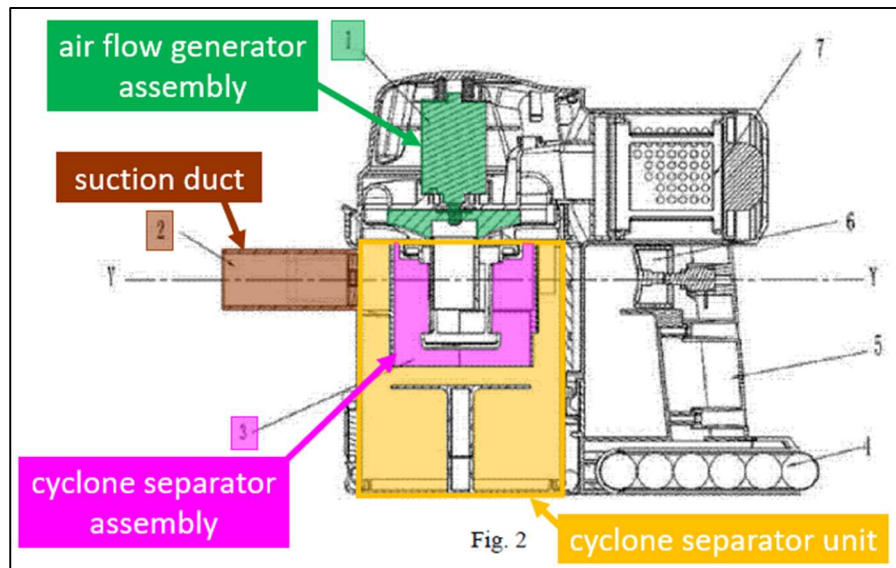
Ex1007, Fig. 1(modified); Ex1009, Fig. 1(modified).

D. Ground 4: Martelliere in Combination with Tsukuji and Wenjie Renders Obvious Claims 6, 13, and 14

1. A POSA Would Have Combined Martelliere, Tsukuji, and Wenjie

a. Scope and Content of the Tsukuji, Martelliere, and Wenjie Prior Art References

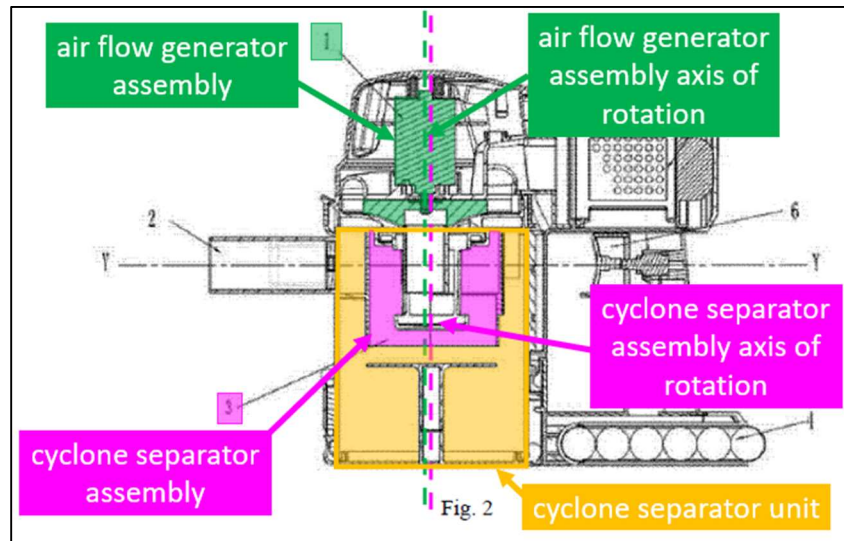
316. As noted briefly above in the Background of the Prior Art section, Wenjie is a Chinese Patent Publication from 2014. Ex1023, Cover. Wenjie teaches a “hand-held vacuum cleaner includ[ing] an **air flow generator assembly 1**, a **suction duct 2**,” and a **cyclone separator unit** comprising a “**cyclone separator assembly 3**,” as shown in the annotated image below:



Ex1023 ¶21, Fig. 2.

317. A POSA would have understood that Wenjie teaches that its motor has a rotational axis that is slightly offset from the cyclone rotational axis,

as shown in the annotated image below:

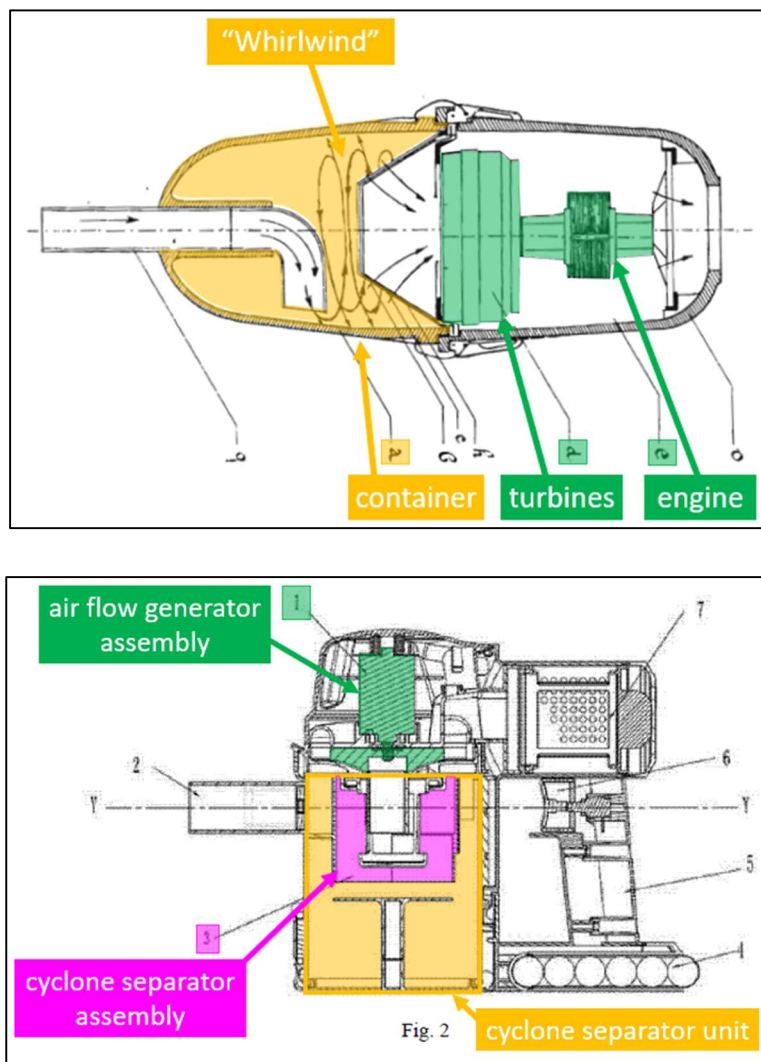


Ex1023, Fig. 2.

b. A POSA Would Have Been Motivated to Combine the Teachings of Tsukuji, Martelliere, and Wenjie

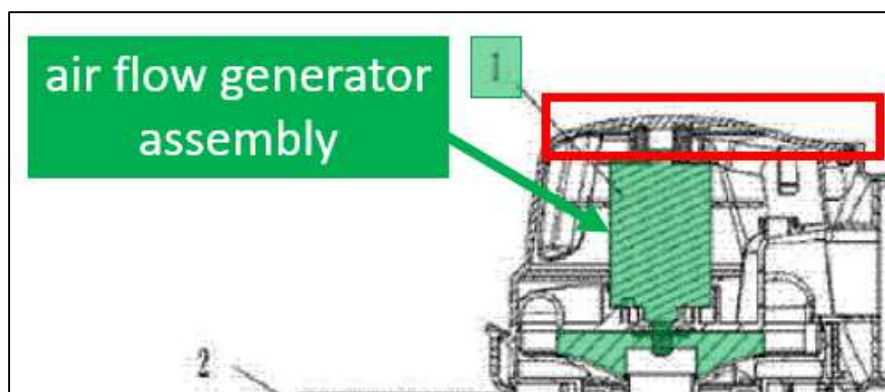
318. As I explained above, in my opinion, a POSA would have been motivated to combine Martelliere and Tsukuji and would have reasonably expected success. Ground 3, §1. Further, in my opinion, a POSA would have been motivated to modify the combination of Martelliere and Tsukuji to achieve the benefits of the relative orientation of Wenjie's cyclone unit/suction motor and fan assembly, including increased space for packaging other vacuum components. Specifically, in my opinion, a POSA would have been motivated to combine the teachings of Martelliere and Tsukuji with Wenjie as follows:

319. In my opinion, a POSA would have modified Martelliere's “**turbines** *d*” and “**engine** *e*” to be slightly offset from, and thus “below,” the “**container**” comprising a “**Whirlwind**,” as Wenjie teaches with its “**air flow generator assembly 1**” and **cyclone separator unit** comprising a “**cyclone separator assembly 3**,” as shown in the annotated images below:



Ex1009, 1, Fig. 1(modified); Ex1023 ¶21, Fig. 2.

320. In my opinion, a POSA would have been motivated to modify Martelliere in view of Wenjie as I described. First, in my opinion, a POSA would have understood that Martelliere, Tsukuji, and Wenjie are analogous art. Like Martelliere, which teaches a compact, cyclonic vacuum cleaner with the cyclone unit (“container” comprising a “Whirlwind”) and suction motor and fan assembly (“engine e”/“turbines d”) arranged in series, Ex1009, 1, Fig. 1, Wenjie teaches a “hand-held vacuum cleaner” with a cyclone unit (“cyclone separator assembly 3”) and suction motor and fan assembly (“air flow generator assembly 1”) arranged in series, Ex1023 ¶21, Fig. 2.
321. Second, in my opinion, a POSA would have understood that Wenjie’s offset “cyclone separator assembly 3”/“air flow generator assembly 1” orientation allowed for different exterior shapes, such as an **asymmetrical downward slope** enabled by its offset motor, as shown in the annotated image below:



Ex1023, Fig. 2.

322. In my opinion, a POSA would have been motivated to slightly lower Martelliere's motor to accommodate different exterior shapes of its vacuum.
323. Further, in my opinion, a POSA would have understood that offsetting the motor, as taught by Wenjie, would allow room for other vacuum components that are too large to accommodate on either side of the motor when it is centered, such as wires and electronics, and would have been motivated to offset Martelliere's motor to accommodate modern electronics used to control modern motors. Ex1023, Fig. 2.
324. Third, in my opinion, a POSA would have been motivated to slightly lower Martelliere's motor to improve weight balance, because, in my opinion, a POSA would have understood that locating heavy components, such as the suction motor, closer to the user's hand would reduce strain on the user's wrist during operation and increase vacuum maneuverability.
325. Fourth, in my opinion, it would have been at least obvious to try this modification. A POSA would have understood that there were a finite number of identified cyclone unit/suction motor and fan assembly orientations, including coaxial alignment (as Martelliere teaches), and

offset alignment (as Wenjie teaches), and, in my opinion, it would have been obvious to try to achieve the known benefits described above.

c. A POSA Would Have Had A Reasonable Expectation of Success Combining the Teachings of Tsukuji, Martelliere, and Wenjie

326. In my opinion A POSA would have reasonably expected success modifying Martelliere in view of Wenjie as I described above. In my opinion, a POSA would have understood that these two cyclone unit/suction motor and fan assembly orientations could be used interchangeably, and would have further expected success for the reasons stated above, including because such modification involves a simple relocation of Martelliere's existing elements performing similar functions in similar ways, and because of the express motivations in Martelliere and Wenjie to perform such modification.

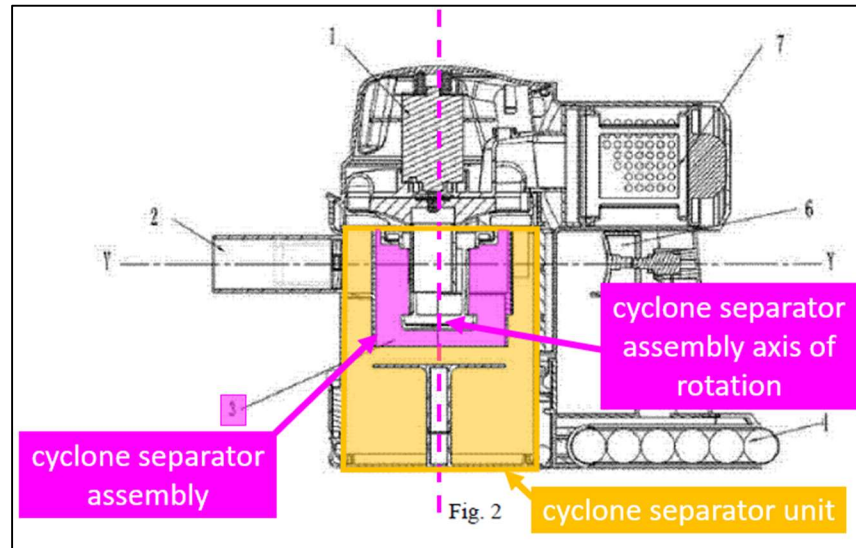
2. [6]/[13]

Reference Number	Claim Limitation
[6]	"The hand vacuum cleaner of claim 1 wherein when the hand vacuum cleaner is positioned with the lower end of the hand vacuum cleaner on a horizontal surface, the suction motor axis of rotation is positioned below the cyclone axis of rotation."
[13]	"The hand vacuum cleaner of claim 11 wherein the suction motor axis of rotation is positioned below the cyclone axis of rotation when the hand vacuum cleaner body is positioned with the lower end of the hand vacuum cleaner on a horizontal surface."

327. In my opinion, Martelliere in combination with Tsukuji teaches claim

1. Likewise, the combination of Martelliere, Tsukuji, and Wenjie teaches claim 1 for the same reasons. Further, the combination of Martelliere, Tsukuji, and Wenjie renders obvious wherein when the hand vacuum cleaner is positioned with the lower end of the hand vacuum cleaner on a horizontal surface, the suction motor axis of rotation is positioned below the cyclone axis of rotation.
328. In my opinion, Martelliere in combination with Tsukuji teaches claim 11. Likewise, the combination of Martelliere, Tsukuji, and Wenjie teaches claim 1 for the same reasons. Further, the combination of Martelliere, Tsukuji, and Wenjie renders obvious wherein the suction motor axis of rotation is positioned below the cyclone axis of rotation when the hand vacuum cleaner body is positioned with the lower end of the hand vacuum cleaner on a horizontal surface.
329. As I explained above, in my opinion, Martelliere in combination with Tsukuji teaches a hand vacuum cleaner lower end, suction motor axis of rotation, and cyclone axis of rotation. Ground 3, Limitations [1pre]/[1a]/[1b].
330. Likewise, in my opinion, Wenjie teaches a cyclone axis of rotation. Wenjie's vacuum has a **cyclone separator unit** comprising a "**cyclone separator assembly 3**," which a POSA would have understood is a

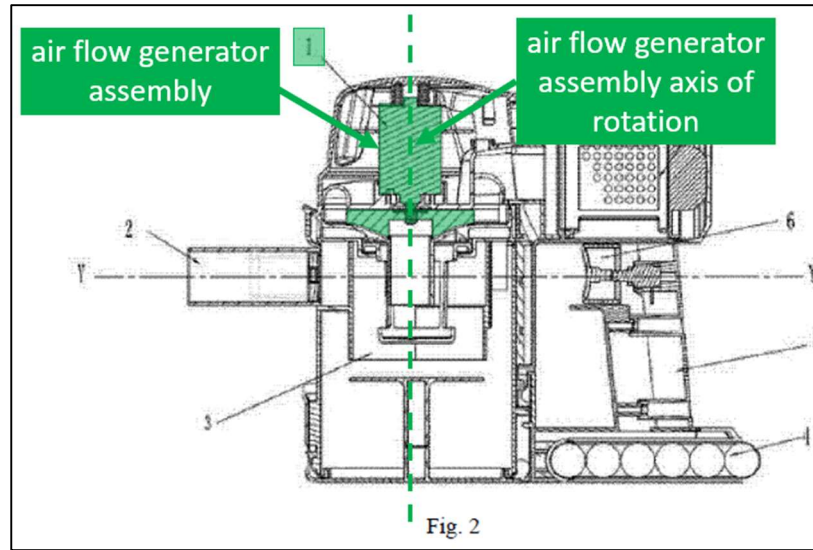
cyclone unit comprising a cyclone with a **cyclone separator assembly axis of rotation**, as shown in the annotated image below:



Ex1023 ¶21, Fig. 2.

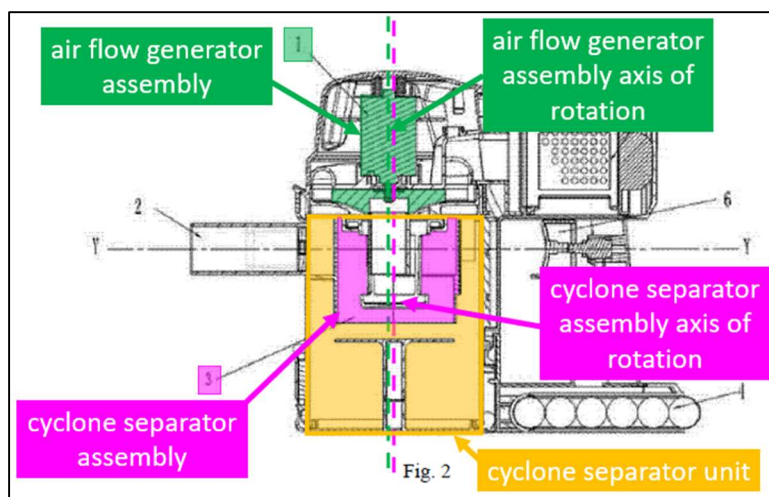
331. In my opinion, Wenjie further teaches a suction motor axis of rotation.

Wenjie's vacuum has "an **air flow generator assembly 1**," which a POSA would have understood is a suction motor and fan assembly with an **air flow generator assembly axis of rotation**, as shown in the annotated image below:



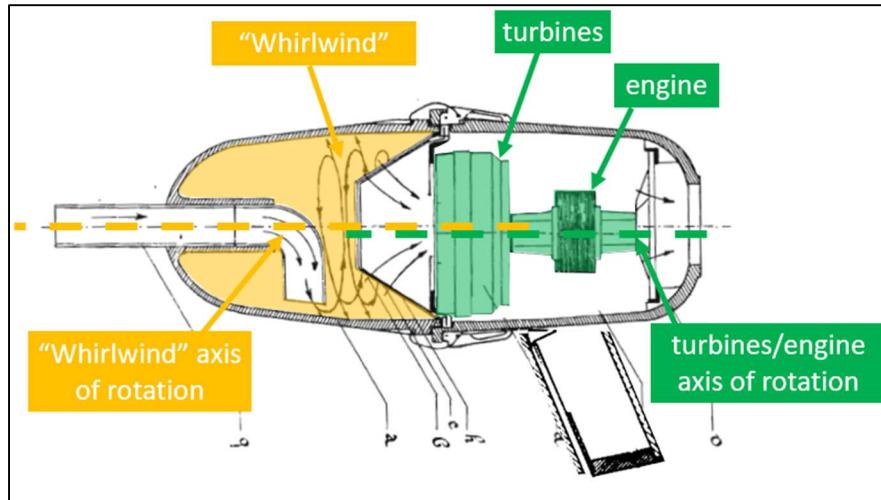
Ex1023 ¶21, Fig. 2.

332. In my opinion, Martelliere combined with Tsukuji and Wenjie renders obvious that when the hand vacuum cleaner is positioned with the lower end of the hand vacuum cleaner on a horizontal surface, the suction motor axis of rotation is positioned below the cyclone axis of rotation. In my opinion, Wenjie teaches an offset suction motor axis of rotation and cyclone axis of rotation: a POSA would have understood that Wenjie's **cyclone separator assembly axis of rotation** is offset relative to Wenjie's **air flow generator assembly axis of rotation**, as shown in the annotated image below:



Ex1023, Fig. 2.

333. As I explained above, in my opinion, a POSA would have been motivated to combine Martelliere and Tsukuji and would have reasonably expected success. Ground 3, §1. In my opinion, a POSA would have been further motivated to modify Martelliere’s “container”/“engine *e*”/“turbines *d*” orientation as taught by Wenjie and would have reasonably expected success. Ground 4, §1. A POSA would have understood, in my opinion, that when so modified and when Martelliere’s vacuum cleaner is positioned as claimed, the **turbines/engine axis of rotation** is positioned below the “**Whirlwind**” **axis of rotation**, as shown in the annotated image below:



Ex1007, Fig. 1(modified); Ex1009, Fig. 1(modified).

3. [14]

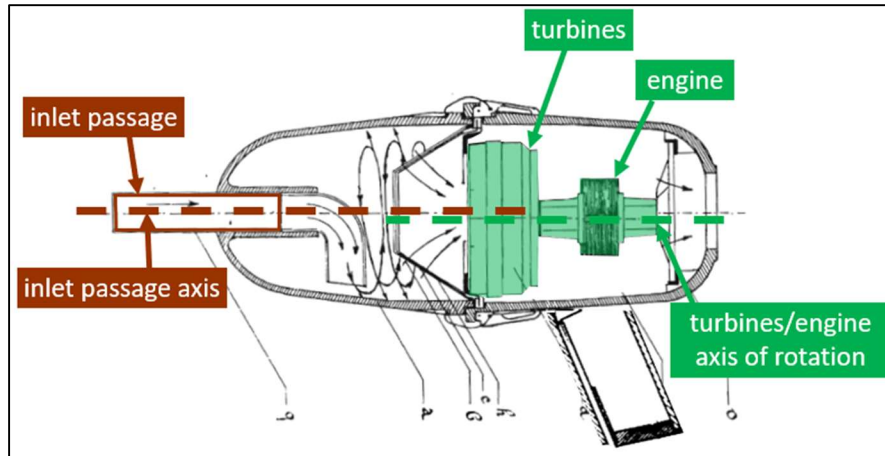
Reference Number	Claim Limitation
[14]	“The hand vacuum cleaner of claim 11 wherein the suction motor axis of rotation is position below the passage axis when the hand vacuum cleaner body is positioned with the lower end of the hand vacuum cleaner on a horizontal surface.”

334. In my opinion, Martelliere in combination with Tsukuji teaches claim 11. Likewise, the combination of Martelliere, Tsukuji, and Wenjie teaches claim 11 for the same reasons. Further, the combination of Martelliere, Tsukuji, and Wenjie renders obvious wherein the suction motor axis of rotation is position below the passage axis when the hand vacuum cleaner body is positioned with the lower end of the hand vacuum cleaner on a horizontal surface.

335. As I explained above, in my opinion, Martelliere in combination with

Tsukuji teaches a suction motor axis of rotation, a passage axis that is coaxial with the cyclone axis, and a hand vacuum cleaner body lower end. Ground 3, Limitations [1a], Claim 11. Further, in my opinion, the combination of Martelliere and Wenjie renders obvious the suction motor axis of rotation is positioned below the cyclone axis of rotation. Ground 4, Claims 6/13.

336. In my opinion, Martelliere combined with Tsukuji and Wenjie renders obvious that the suction motor axis of rotation is position below the passage axis when the hand vacuum cleaner body is positioned with the lower end of the hand vacuum cleaner on a horizontal surface. In my opinion, a POSA would have been motivated to combine Martelliere and Tsukuji and would have reasonably expected success. Ground 3, §1. Further, in my opinion, a POSA would have been motivated to modify Martelliere's "container"/"engine *e*"/turbines *d*" orientation as taught by Wenjie and would have reasonably expected success. Ground 4, §1. A POSA would have understood that, when so modified and when Martelliere's vacuum cleaner is positioned as claimed, Martelliere's **turbines/engine axis of rotation** is positioned below the **inlet passage axis**, as shown in the annotated image below:

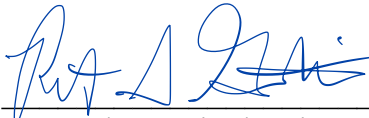


Ex1007, Fig. 1(modified); Ex1009, Fig. 1(modified).

XI. SECONDARY CONSIDERATIONS OF NON-OBVIOUSNESS

337. I am unaware of any secondary considerations of non-obviousness that provide evidence the claims of the above patents are not obvious. To the contrary, as I explained in detail above, the claims are based on an obvious combination of well-known vacuum cleaner parts and configurations. To the extent Patent Owner attempts to argue there are secondary considerations of non-obviousness, I reserve the right to evaluate Patent Owner's arguments and purported evidence at that time.

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: 8/6/24