

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

DYSON TECHNOLOGY LIMITED AND DYSON, INC.,

Petitioners,

v.

OMACHRON INTELLECTUAL PROPERTY INC.,

Patent Owner.

DECLARATION OF ROBERT GIACHETTI

REGARDING

U.S. Patent No. 11,910,983

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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 1-22 of U.S. Patent No. 11,910,983 (the “’983 Patent”) in this petition for *inter partes* review (“IPR”). I refer to these as the “Challenged Claims.”
3. I have been asked to consider whether certain references invalidate the Challenged Claims.
4. I am a salaried employee of Fusion Engineering, LLC. Fusion Engineering is being compensated for my time in connection with this matter at the consulting rate of \$410 per hour. My compensation is not affected by the content of my opinions, testimony, or the outcome of this matter.
5. The prior art references on which my opinions are based are:
 - PCT Publication No. 2007/084543 to Butler et al. (“Butler” attached as exhibit 1005);
 - Chinese Patent Publication No. 101,061,932 to Jianan (“JiananCN” attached as exhibit 1014) and its Certified English Translation (“Jianan” attached as exhibit 1015);
 - German Patent Publication No. 1,680,208 to Rebel (“RebelDE” attached as exhibit 1006) and its Certified English Translation (“Rebel” attached as exhibit 1007);

- French Patent No. 1,094,603 to Martelliere (“MartelliereFR” attached as exhibit 1019) and its Certified English Translation (“Martelliere” attached as exhibit 1020).
6. In my opinion, the Challenged Claims are invalid based on the following:
- Butler renders obvious claims 1-2, 4-10, 12-15, and 17-21;
 - The combination of Butler and Jianan renders claims 3, 10-11, 16, and 21-22 obvious;
 - The combination of Rebel and Martelliere renders claims 1-2, 4-10, 12-15, and 17-21 obvious;
 - The combination of Rebel, Martelliere, and Jianan renders claims 3, 10-11, 16, and 21-22 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 '983 Patent and its file history, the Butler, Jianan, Rebel, and Martelliere 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

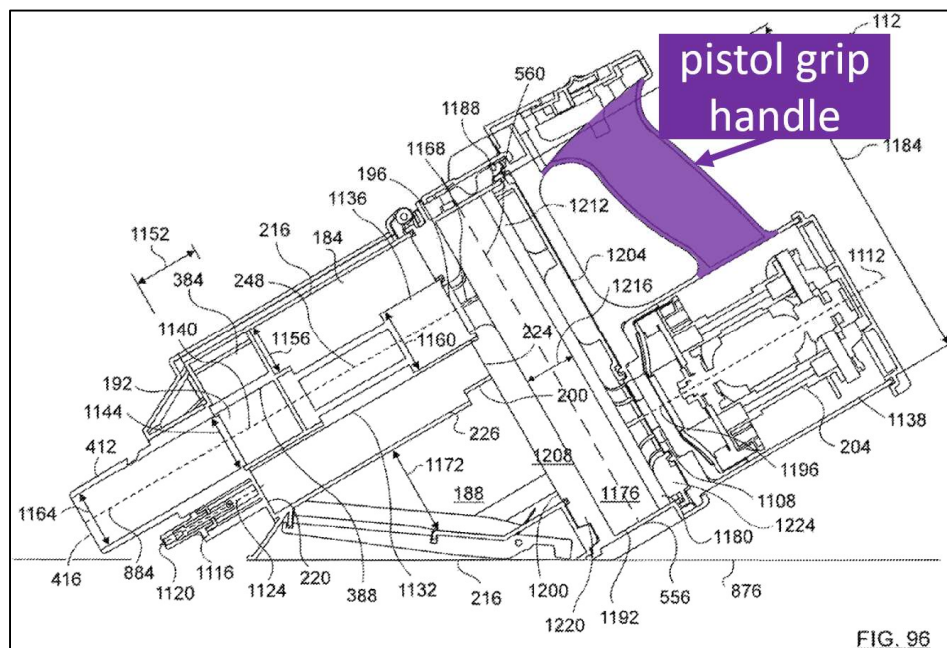
41. In my opinion, a Person of Ordinary Skill in the Art (“POSA”) in the subject matter of the ’983 Patent would have had a bachelor’s degree in mechanical engineering or a similar field and 2-3 years of experience in machine design, including machines that include fluid dynamics or fluid paths, such 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 a hand vacuum cleaner having a collection of various features, including “a rigid air flow conduit removably mountable,” “a cyclone unit,” and a “pistol grip handle [that] is

mounted.” Ex1001, Abstract, Claims.

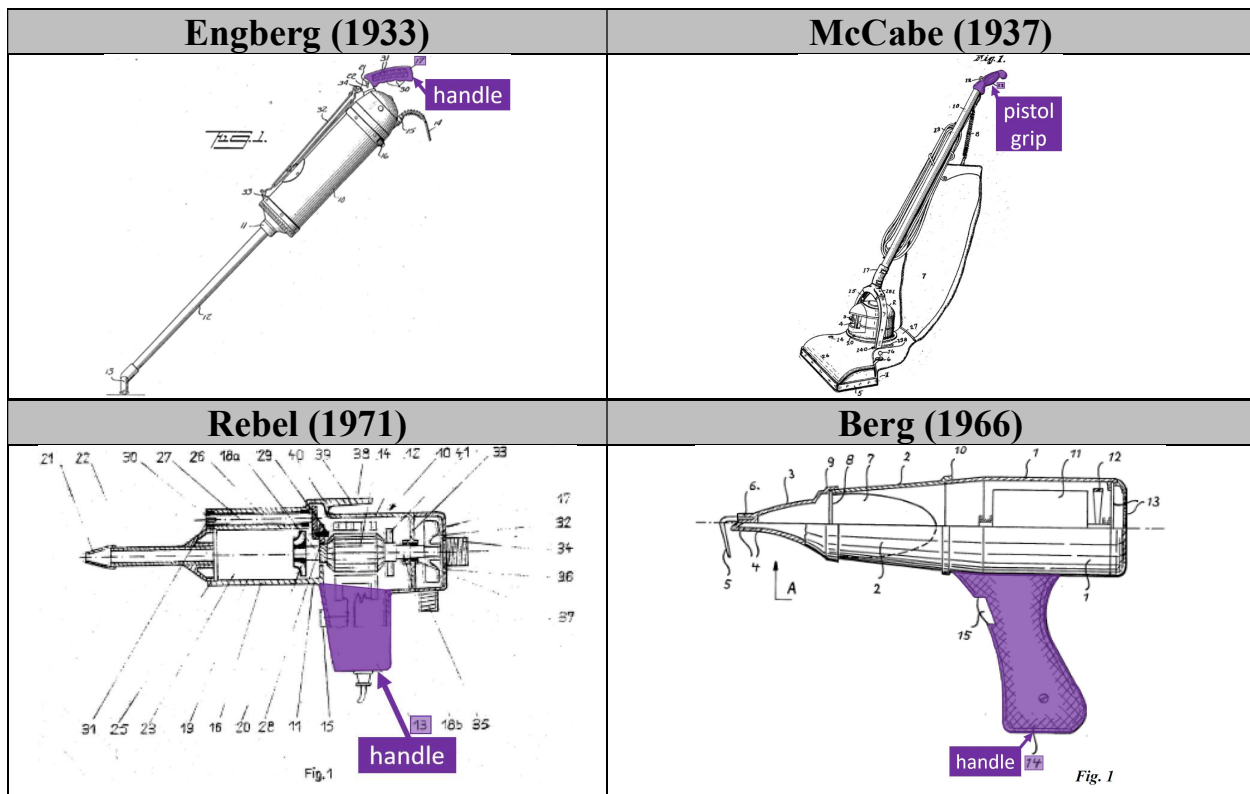
44. The '983 Patent explains that a vacuum main body has “an axially extending sidewall wherein an end of a **pistol grip handle** is mounted to the sidewall,” as shown in the annotated image below:

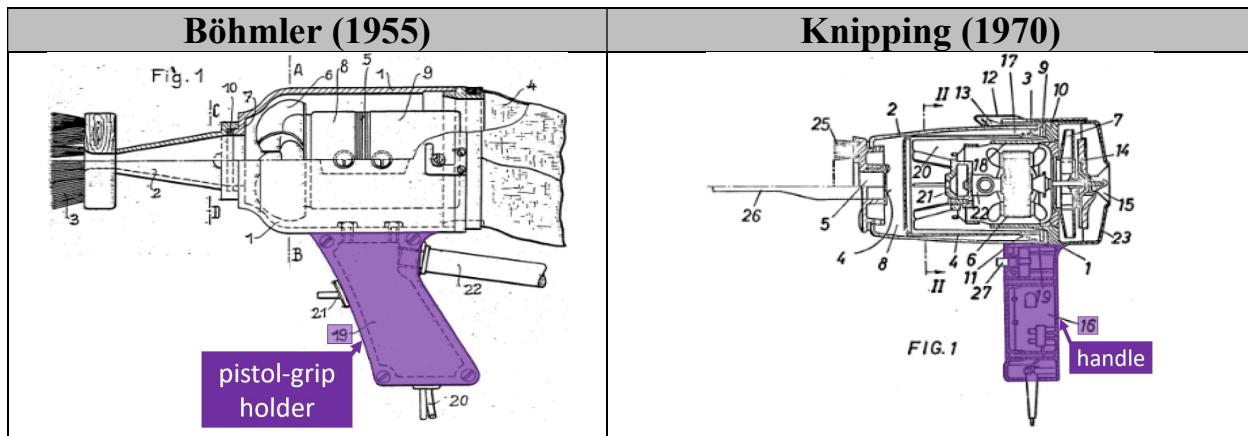


Ex1001, Abstract, Fig. 96.

45. The '983 Patent claims a pistol grip handle located “rearward of the front end and forward of a rear end of the suction motor.” Ex1001, Claims [1c.2]/[12c.2].
46. In my opinion, this feature was well-known, as were the '983 Patent's claims' remaining elements, which concern commonly used features, such as suction motors, cyclone units, surface cleaning heads, dirt collection chambers, finger grip areas, and rigid air flow conduits. *Id.*, Claims.

47. For example, for nearly a century vacuum cleaners having features that assist with maneuverability and usability, such as a pistol grip handle, have been known in the art, including as taught by U.S. Patent No 1,908,834 to Engberg et al. in 1933, U.S. Patent No. 2,099,172 to McCabe et al. in 1937, German Patent Publication No. 1,608,208 to Rebel published in 1971, German Patent Publication No. 1,213,967 to Berg published in 1966, German Patent Publication No 1,691,786 to Böhmler published in 1955, and German Patent Publication No 6,942,662 to Knipping published in 1970:



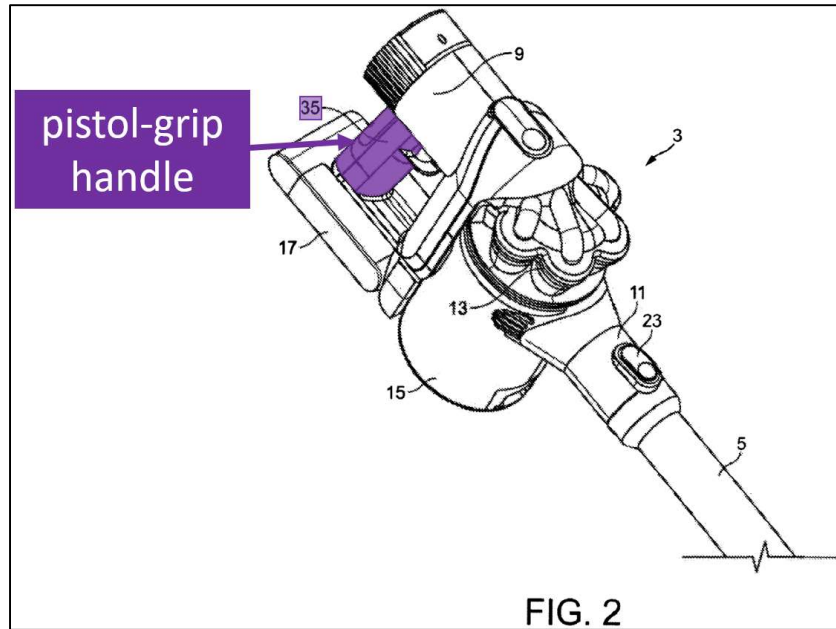


Ex1034, 1:53-54, Fig. 1 (“**Handle 17** has the general form of a pistol grip”); Ex1035, 4:62-67, Fig. 1 (“The **pistol grip 11** of the cleaner handle”); Ex1007, 4, Fig. 1, (**handle** teaching a “pistol-shaped housing 11” and “**handle 13**”); Ex1009, 3, Fig. 1, (“**handle 14** ... has the shape of a pistol grip”); Ex1011, 4, Fig. 1, (“**pistol-grip holder 19**”); Ex1013, 1, 3, Fig. 1 (teaching a “a handheld vacuum cleaner in pistol form” and “**handle 16**”);.

48. The placement of handles at ergonomically advantaged locations, such as at a vacuum’s center of gravity, was also well known in the art. For example, PCT Publication No. 2007/084543 to Butler et al. (herein referred to as “Butler”) teaches that “the foregrip 130 should generally surround the device’s center of gravity CG” such that “as the user rotates the vacuum cleaner 100, the center of gravity CG will remain at generally the same location, causing the general balance of the device to feel the same regardless of its angular orientation” and such that “the user will be able to maintain a comfortable hold on the foregrip 130, with his or her

hand above or beside the center of gravity CG, regardless of the angular orientation.” Ex1005, 13:1-9. “This prevents adverse situations often encountered ... when users attempted to orient the inlets of [] vacuums vertically.” Ex1005, 13:9-19.

49. Butler similarly teaches that locating the center of gravity between multiple grips “reduce[s] fatigue by distributing the weight between the user’s hands, and improv[ing] the ease with which the user can rotate and swing the device.” Ex1005, 15:12-18. In my opinion, POSA would have understood many similar methods of ergonomically distributing the weight of a vacuum onto a handle or multiple handles to be known in the art, such as putting the center of gravity directly above or below a single handle instead of between two handles. For example, U.K Patent Publication No. 2,484,146 to Dyson et al. (herein referred to as “Dyson146”), published on April 4, 2012, discloses a “handheld vacuum cleaner” with a “pistol grip handle,” as shown in the annotated image below:

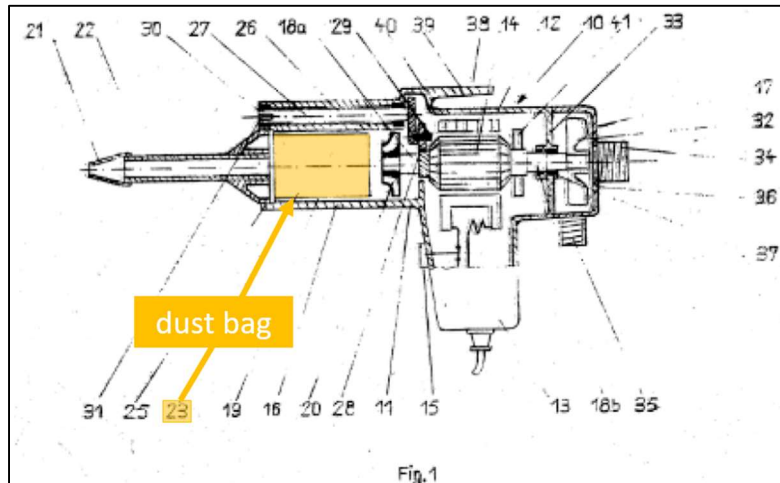


Ex1026, 4:1-6, Fig. 2.

50. Dyson146 also teaches positioning components so as to optimize the cleaner's center of gravity: "[t]he motor casing" may be "provided at the upper end of the pistol grip handle" such that "the weight of the motor inside the motor casing [] is comfortably supported on top of a user's hand during use of the cleaner." Ex1026, 8:15-17.

51. Vacuum cleaners have been using the features that are described in the '983 Patent, such as a suction motor that draws dirty air into a dirty air inlet, filtration processes that clean the air, and dirty air outlets that exhaust the cleaned air long before the '983 Patent's earliest claimed priority date. For example, many early vacuum cleaners, such as the vacuum cleaner described in German Patent Publication No. 1,608,208 to Rebel (whose

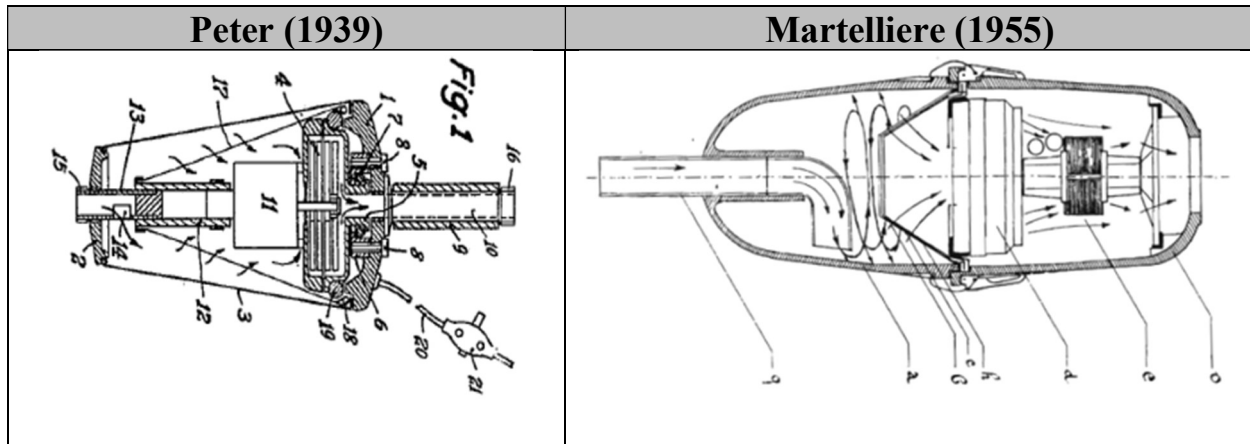
Certified English translation is referred to herein as “Rebel”), used disposable dust bags to separate dust from the air, as shown in the figure below:



Ex1007, 4, Fig. 1 (“The suction fan 20 ... sucks in the air and the dust through the suction nozzle 21 and the suction connection 22 ... [d]ust settles in the **dust bag 23** and the air escapes through the slots 24 ... [t]he **dust bag 23** is detachably attached to the suction connection 22 and can be removed from the housing 11”).

52. Those skilled in the art at the time of the '983 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. 203,675 to Peter in 1939, and French Patent No. 1,094,603 to Martelliere in 1955, as shown in the figure below:



Ex1033¹, Fig. 1; Ex1020², 1, Fig. 1.

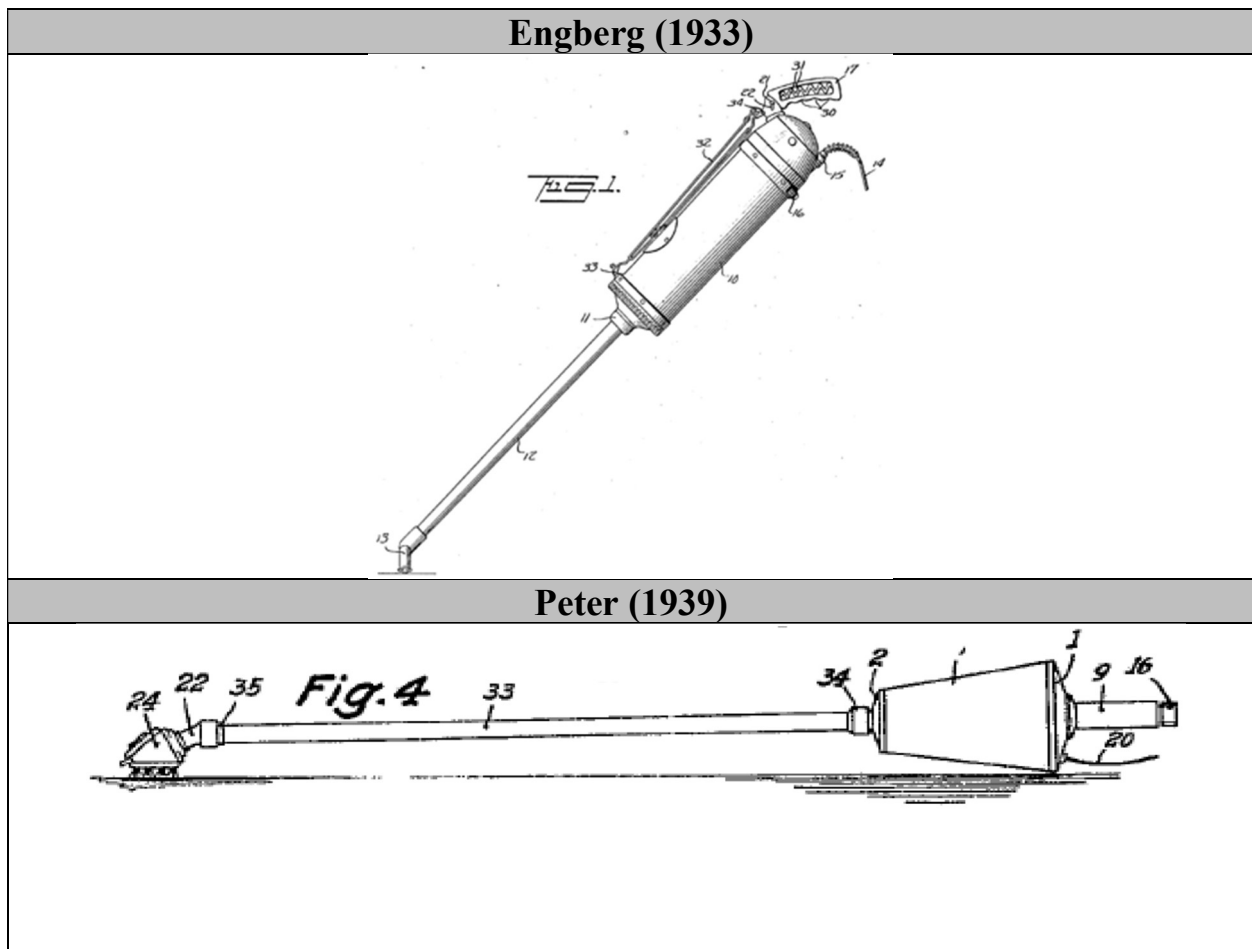
53. Martelliere explains that “[b]y application of the ‘Whirlwind’ principle,” i.e., cyclonic filtration, “the materials are deposited in the bottom of the

¹ Ex1033 is a certified English translation of Ex1032, originally published in German. Citations to Ex1033 are by page, as the English translation does not include column or line numbers.

² Ex1020 is a certified English translation of Ex1019, originally published in French. Citations to Ex1020 are by page, as the English translation does not include column or line numbers.

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.” Ex1020, 1.

54. It has also been well known in the art for nearly a century that vacuum cleaners with rigid air flow conduits and surface cleaning heads improve vacuum reach and the ability to clean under objects, as taught by Engberg in 1933 and Peter in 1939, as shown in the figures below:



Ex1034, Fig. 1; Ex1033, Fig. 4; *see also* Ex1033, 2-3 (“Particularly hard-to-reach areas of the floor or walls obstructed by furniture can also be reached effortlessly if, as Fig. 4 shows, the extension rod 33 is inserted between the vacuum cleaner housing and the pipe angle.”))

VII. BACKGROUND OF THE '983 PATENT

55. The '983 Patent is titled “Surface Cleaning Apparatus.” Ex. 1001, Title. The '983 Patent states that it issued on February 27, 2024, from U.S. Patent Application No. 17/830,507, filed on June 2, 2022. *Id.*, Cover. The '983 Patent states that it is a continuation of application No. 17/351,943, filed on June 18, 2021, which in turn claims to be a continuation-in-part of application No. 16/590,972, filed on October 2, 2019, which in turn claims to be a division of application No. 16/156,006, filed on October 10, 2018, which in turn claims to be a continuation of application No. 15/088,876, filed on April 1, 2016, which in turn claims to be a continuation of application No. 14/822,211, filed on August 10, 2015. *Id.* The '983 Patent also states that it claims priority to provisional application No. 62/093,189, filed on December 17, 2014. *Id.*

A. Summary of the '983 Patent's Specification

56. The '983 Patent identifies “limited dirt collection capacity” as a problem it purports to solve with an “external dirt collection chamber.” Ex1001,

1:36-40, 1:50-56.

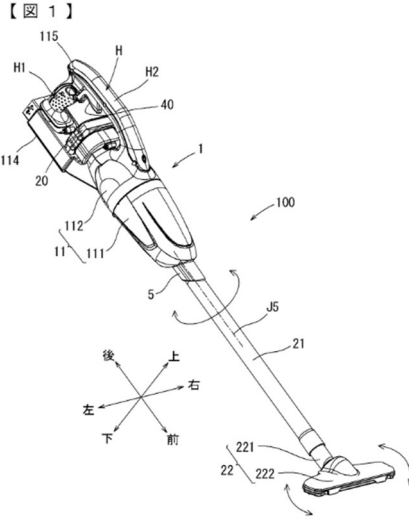
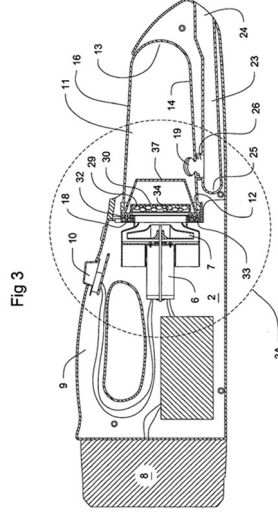
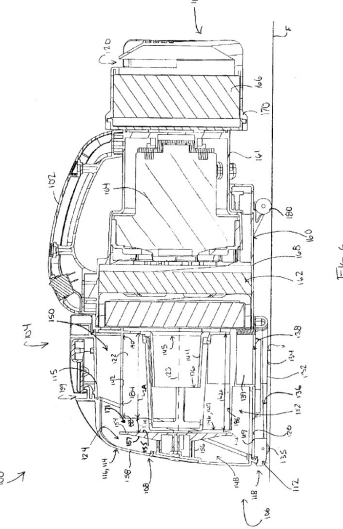
57. However, the '983 Patent's claims are directed to features such as a "dirty air inlet," "cyclone unit," "surface cleaning head," "rigid air flow conduit," and a "pistol grip handle," oriented in well-known configurations.

58. I have reviewed the '983 Patent's specification, and the combination of these claimed elements does not solve any purported problem in the art.

B. Prosecution History of the '983 Patent

59. I have reviewed the prosecution history of the '983 Patent. The following is my understanding:

60. During prosecution, the Examiner rejected certain then-pending claims as obvious over JP2014083241 ("Mori") in combination with US2006/0090290 ("Lau") or US9,204,769 ("Conrad769"):

Mori, Fig. 1	Ex1022 (Lau), Fig. 3	Ex1023 (Conrad769), Fig. 6
 Figure 1 of Mori patent shows a perspective view of a vacuum cleaner head assembly. The assembly includes a handle (100) with a trigger switch (221, 222) and a cleaning head (110). The cleaning head has a main body (111) and a side panel (112). Various components are labeled with numbers and letters, including 1, 5, 11, 111, 112, 114, 115, 20, 40, H, H1, H2, J5, 21, 22, 221, 222.	 Figure 3 of Ex1022 (Lau) patent shows a cross-sectional view of a vacuum cleaner head assembly. The assembly includes a handle (10) and a cleaning head (11). The cleaning head has a main body (11) and a side panel (12). Various components are labeled with numbers, including 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100.	 Figure 6 of Ex1023 (Conrad769) patent shows a cross-sectional view of a vacuum cleaner head assembly. The assembly includes a handle (10) and a cleaning head (11). The cleaning head has a main body (11) and a side panel (12). Various components are labeled with numbers, including 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100.

Ex1004, 258-267.

61. The Examiner stated that Mori “disclose[s] a filter 14 for separating dust particles from the dirty air and not a cyclone unit comprising a cyclone chamber,” but “Lau disclose[s] a hand vacuum cleaner comprising a cyclone chamber 11” and that “it would have been obvious to one skilled in the art at the time of the invention to substitute the cyclone unit in Lau for the separation assembly in the hand vacuum cleaner in Mori et al. since the cyclone unit in Lau is used for the same purpose of separating dust particles from air as the separation assembly in Mori et al.” Ex1004, 260-261.
62. The Examiner further stated that “Conrad[769] disclose[s] a hand vacuum 100 comprising a cyclone unit 114 comprising a cyclone chamber” and that “it would have been obvious to one skilled in the art at the time of the invention to substitute the cyclone unit in Conrad for the separation assembly in the hand vacuum cleaner in Mori et al. since the cyclone unit in Conrad is used for the same purpose of separating dust particles from air as the separation assembly in Mori.” Ex1004, 261.
63. The Applicant did not dispute that substituting a cyclonic separator for a non-cyclonic separator would have been obvious to a POSA. Ex1004, 270-281. Instead, the Applicant amended the then-pending independent

claims 1 and 12 to include limitations regarding the handle's location and orientation, and the Applicant argued that the Examiner-identified combinations failed to teach such a handle. *Id.*

64. The Examiner then allowed the claims without providing reasons for allowance. *Id.*, 282-286.

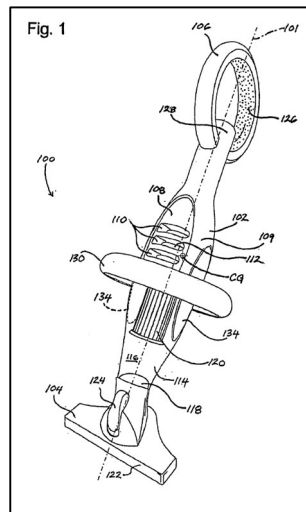
C. Priority Date of the Challenged Claims

65. 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

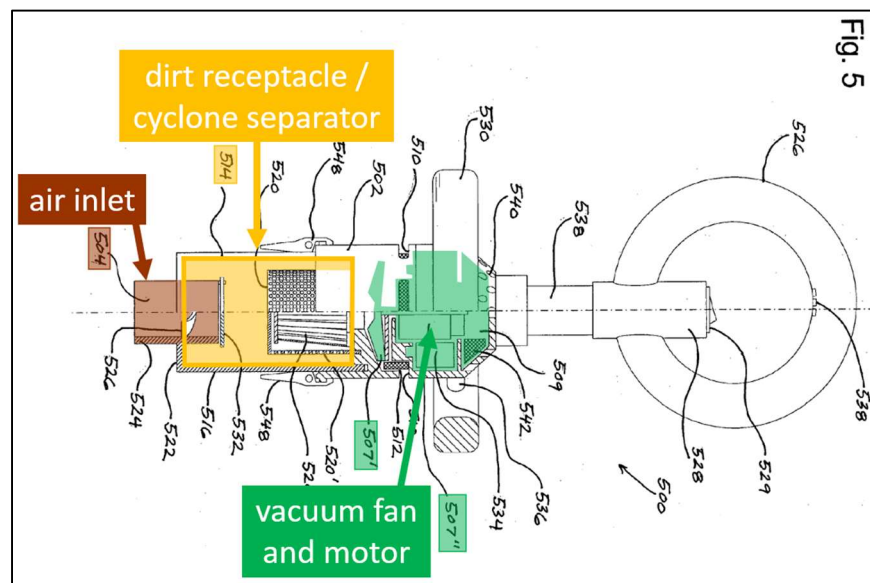
A. Butler

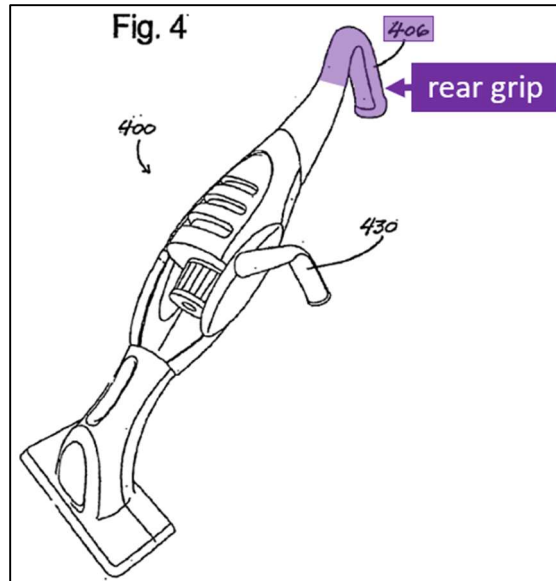
66. Butler is a 2007 PCT publication for “an improved vacuum cleaner for cleaning raised and vertical surfaces” including stairs, as shown in the figure below:



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

67. In my opinion, Butler teaches a single vacuum cleaner system that is reconfigurable and optimizable. Butler explains that its various components, including handles, grips, dirt receptacles, air filters, and cleaning tools, “may be interchangeable with one another to provide the user with various cleaning options,” and the arrangement of these components may be “used individually or in various other inventive combinations.” *Id.*, 16:25-29, 43:29-44:3; *see also id.*, 4:17-28, 18:22-28, 19:9-15, 34:12-13.
68. Butler teaches that its cleaner includes a “housing” with a “longitudinal axis,” an “air inlet,” a “dirt receptacle compris[ing] a cyclone separator,” a “vacuum fan and a motor,” and a “pistol-grip style rear grip,” as shown in the annotated figures below:



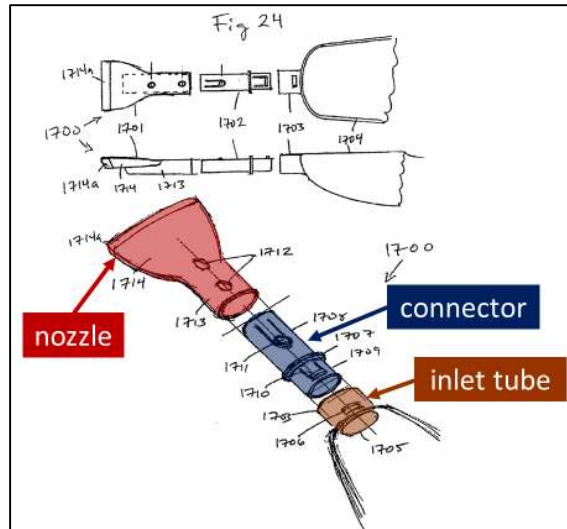


Ex1005, Abstract, 3:20-28, 19:22-24, 22:14-22, Figs. 4-5³.

69. Butler further teaches a “**connector 1702**” with an upstream “inlet portion 1708,” which is “telescopically received within the **nozzle 1701**,” and a downstream “outlet portion 1709,” which is “telescopically received within or around the **inlet tube 1703**,” as shown in the annotated figure below:

³ All emphasis, and all coloring/annotations to figures, added unless otherwise noted.

Where a figure has been otherwise altered, the figure citation is labeled “modified.”

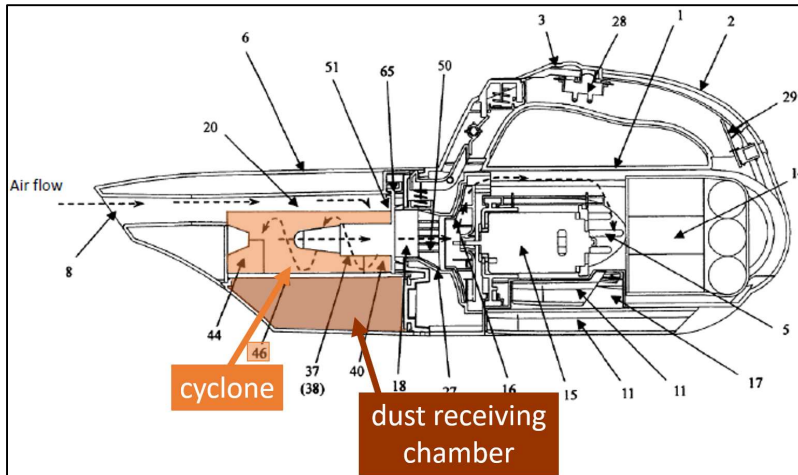


Ex1005, 41:19-29, Fig. 24.

B. Jianan⁴

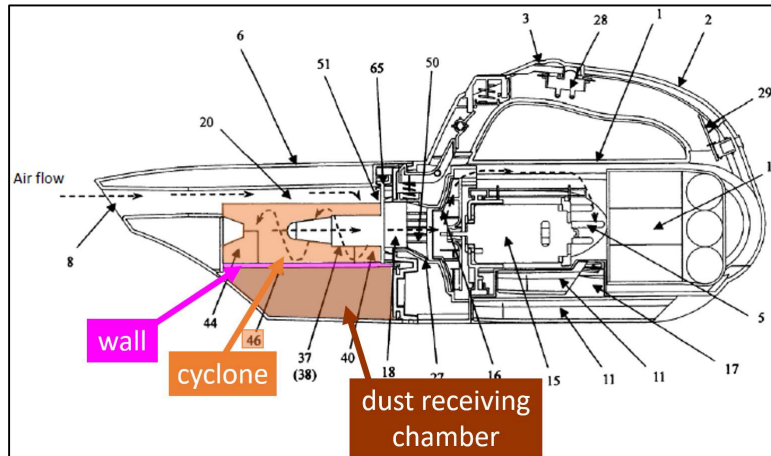
70. Jianan is a 2007 Chinese patent publication for a “handheld vacuum” with a “detachable dust cup” with “two parallel **cyclones** and separate **dust receiving chambers**,” as shown in the annotated figure below:

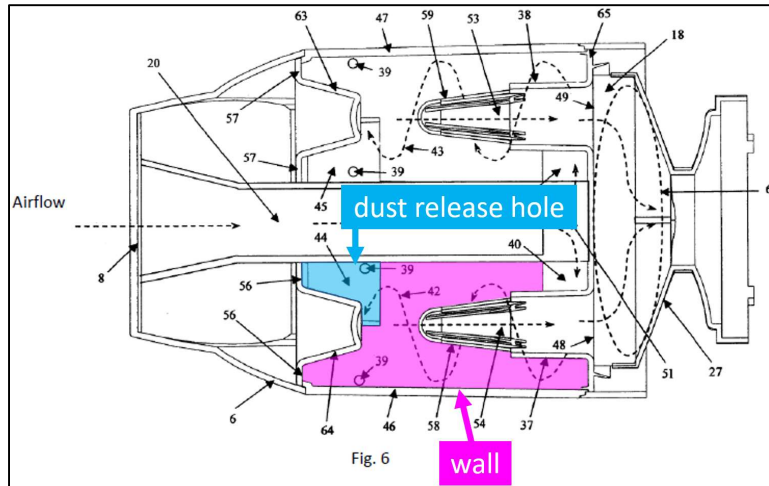
⁴ Ex1015 is a certified English translation of Ex1014, originally published in Chinese. Citations to Ex1015 are by page, as the English translation does not include column or line numbers.



Ex1015, Abstract, 4, Fig. 3.

71. Jianan teaches a “**wall 55**” with “**dust release hole**” separates “**cyclone 46**” and “independent **dust collection chamber 9**,” as shown in the annotated figures below



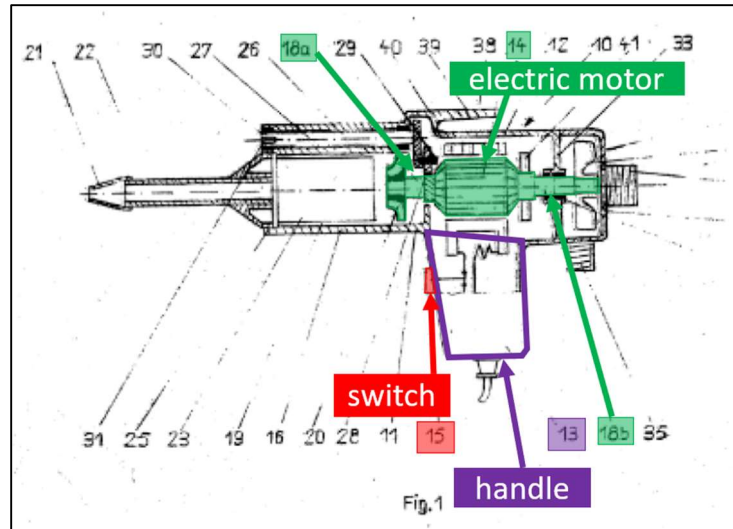


Ex1015, 9-10, Figs. 3, 6.

C. Rebel⁵

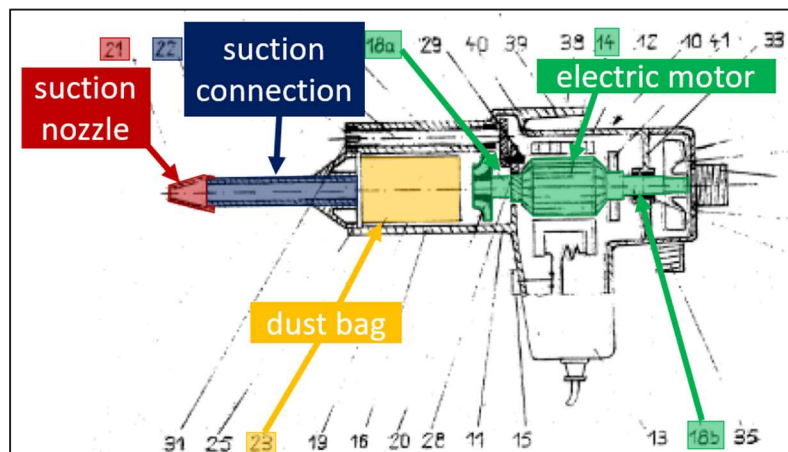
72. Rebel is a 1971 German Patent Publication for a “[m]ultipurpose device” including “a vacuum cleaner” having a “**handle 13**,” “**electric motor 14**” (including “**shaft 18**”) and “**switch 15**” for operating the vacuum, as shown in the annotated figure below:

⁵ Ex1007 is a certified English translation of Ex1006, originally published in German. Citations to Ex1007 are by page, as the English translation does not include column or line numbers.



Ex1007, 1, 4, Fig. 1.

73. Rebel teaches a “**suction fan** ... sucks in the air and the dust through the **suction nozzle 21** and the **suction connection 22**” to “**dust bag 23**,” as shown in the annotated figure below:

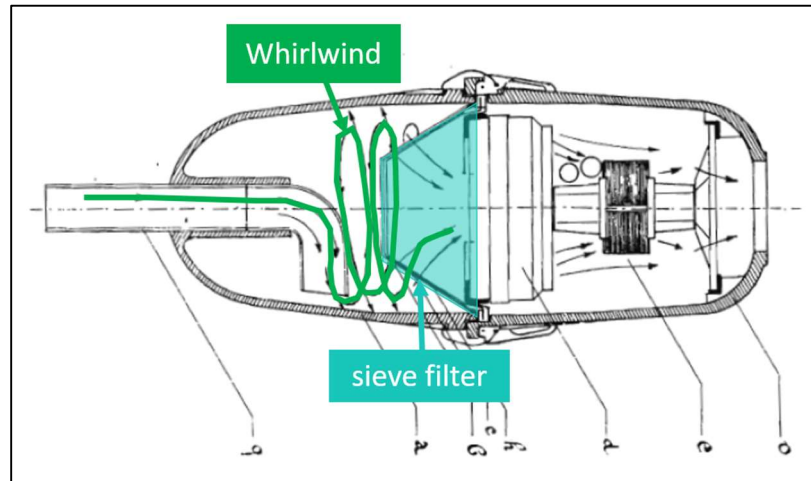


Ex1007, 4, Fig. 1.

D. Martelliere

74. Martelliere is a 1954 French patent for a cyclonic vacuum, which uses “tangential[.]” airflow to separate dust using the “**‘Whirlwind’ principle**”

and “interchangeable sieve filter *b*” to further filter dust, as shown in the annotated figure below



Ex1020, 1, Fig. 1

IX. CLAIM CONSTRUCTION

75. I am unaware of any claim construction determinations related to the '983 Patent.
76. 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: '983 PATENT

77. In my opinion, the Challenged Claims of the '983 Patent are invalid based on the following references and combinations: claims 1-2, 4-10, 12-15, and 17-21 are rendered obvious by Butler; claims 3, 10-11, 16, and 21-22 are rendered obvious by the combination of Butler and Jianan; claims 1-2, 4-

10, 12-15, and 17-21 are rendered obvious by the combination of Rebel and Martelliere; and claims 3, 10-11, 16, and 21-22 are rendered obvious by the combination of Rebel, Martelliere, and Jianan.

78. 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 '983 Patent, as discussed above. I have also considered the level of ordinary skill in the pertinent art.

79. 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 '983 Patent.

A. Ground 1: Butler Renders Obvious Claims 1-2, 4-10, 12-15, and 17-21

1. Butler Teaches A Single Vacuum Cleaner System With Interchangeable Components, But To The Extent That PO Argues Otherwise, A POSA Would Have Been Motivated To Combine Them

80. In my opinion, Butler teaches a single vacuum system that is configurable.

81. Butler teaches that its components (for example, Butler's handles, grips,

- dirt receptacles, filters, and tools) “may be interchangeable with one another to provide the user with various cleaning options.” Ex1005, 16:25-29. Butler also teaches that, as it relates to the arrangement of these components, they may be “used individually or in various other inventive combinations.” Ex1005, 43:29-44:3, 4:17-28, 18:22-28, 19:9-15, 34:12-13.
82. Butler further teaches that its invention “may be used with any type of dirt separation system using any theory of operation,” and, accordingly, Butler explains that “various different types of dirt receptacle[s] may be used, and may be interchangeable with one another.” *Id.*, 16:25-28.
83. Therefore, as described in further detail below, in my opinion, a POSA would have found it obvious to combine Butler’s components.
84. For example, in my opinion, a POSA would have understood that combining Butler’s components would have involved combining known prior art elements according to known methods and techniques to yield predictable results.
85. For example, the known prior art components taught by Butler include vacuum cleaner handles, grips, filters, cleaning tools, and dust chambers. And, combining Butler’s components would have been a straightforward rearrangement of those components using known methods and techniques.

- Further, the predictable results of that straightforward rearrangement would have been effective and efficient cleaning in different use cases.
86. It is also my opinion that combining Butler's components would have involved the simple substitution of these known elements taught by Butler (for example, vacuum handles, grips, filters, cleaning tools, and dust chambers), which, as I previously explained, Butler expressly teaches are interchangeable. Ex1005, 4:17-28, 16:25-29, 18:22-28, 19:9-15, 34:12-13, 43:20-44:3. In my opinion, configuring Butler's interchangeable components for different uses would have at least been obvious to try as there were a finite number of identified, predictable solutions for arranging Butler's well-known, interchangeable components.
87. Further, in my opinion, a POSA would have reasonably expected success in combining Butler's components. For example, as I explain in more detail in this Declaration, these components, which are all taught by Butler, were well known in the art. Further, Butler expressly teaches that these components are interchangeable and can be interchanged in order to reconfigure the vacuum cleaner for various use cases, which in my opinion would have further given a POSA a reasonable expectation of success.

2. Butler Renders Obvious Claims [1]/[12]

88. In my opinion, Butler renders claims 1 and 12 obvious.

a. [1pre]/[12pre]

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

89. In my opinion, to the extent the preambles are limiting, Butler renders obvious a surface cleaning apparatus.

90. Butler teaches a “vacuum cleaner” for cleaning surfaces, including “floors and carpets,” “horizontal surfaces,” and “vertical surfaces.” Ex1005, Title, 7:2-5. In my opinion, a POSA therefore would have understood that Butler teaches that its “vacuum cleaner” is a surface cleaning apparatus.

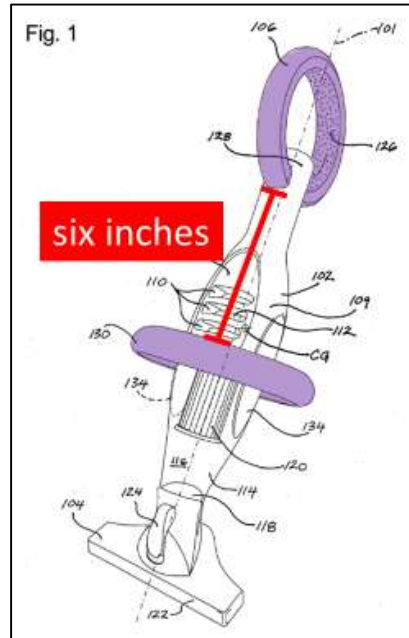
b. [1a.1]/[12a.1]

Reference Number	Claim Limitation
[1a.1]	“a hand vacuum cleaner having a front end having a dirty air inlet, a rear end, a clean air outlet, an upper end, a lower end,”
[12a.1]	“a hand vacuum cleaner having a front end having a dirty air inlet, a rear end, a clean air outlet, an upper end, a lower end,”

91. In my opinion, Butler teaches and renders obvious a hand vacuum cleaner having a front end having a dirty air inlet, a rear end, a clean air outlet, an upper end, a lower end.

92. In my opinion, Butler teaches that its “vacuum cleaner” is designed to be used by hand and is a hand vacuum cleaner. Ex1005, Title, Fig. 1. For example, Butler teaches that its vacuum cleaner includes a “**rear grip**” and

“one or more **foregrips**,” and Butler teaches that its vacuum cleaner can be 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 figure below:

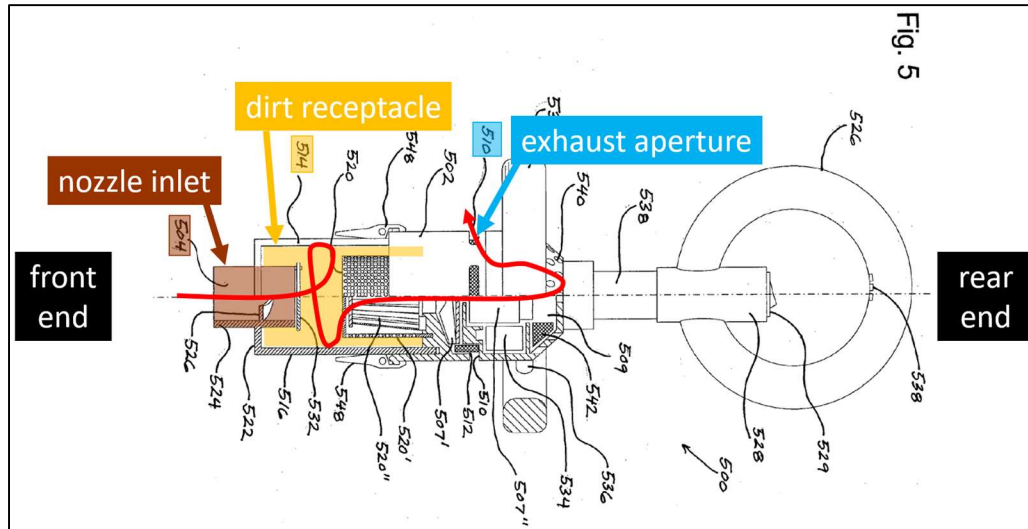


Ex1005, 15:5-6, 26:1-10, Fig. 1.

93. Butler further teaches that its “compact” design is “adapted for cleaning ... stairwells and other confined spaces.” Ex1005, 1:2-3, 16:1-5. Butler also teaches that telescoping handgrip members and extension tubes can be used to reach the floor. Ex1005, Abstract, 27:12-29. Moreover, Butler teaches that its cleaner is designed with a comfortable “center of gravity” and to “remov[e] excess weight.” Ex1005, 13:1-19, 15:12-18. In my opinion, a POSA would have understood that these considerations to apply

to hand vacuum cleaners.

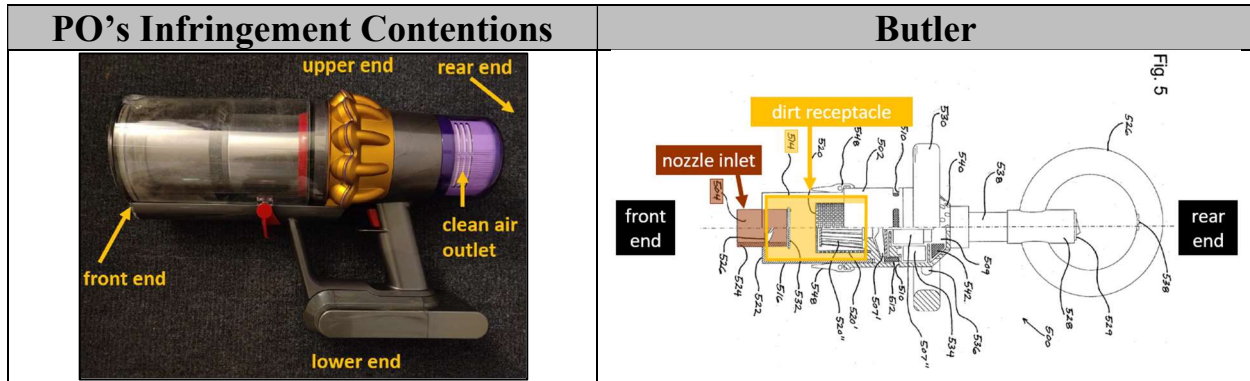
94. In my opinion, Butler teaches that its vacuum cleaner has a front end having a dirty air inlet, a rear end, and a clean air outlet.
95. In my opinion, a POSA would have understood that, in Butler, **air** enters the hand vacuum cleaner **front end** via “**nozzle inlet 504**,” is cleaned by “a cyclonic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



Ex1005, 22:5-6, Fig. 5.

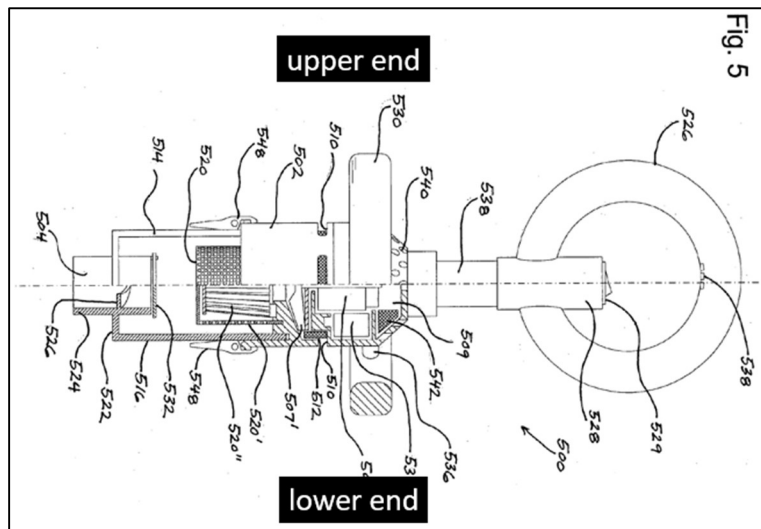
96. Also, in my opinion, a POSA would have understood that Butler teaches that its “nozzle inlet 504” is a dirty air inlet at Butler’s front end, and “exhaust apertures 510” are clean air outlets.
97. A POSA would have understood Butler to teach that its rear end is as depicted above.

98. Furthermore, in my opinion, the above is at least as much of a disclosure regarding the front/rear ends as PO accuses of infringement.



Ex1021 (Ex.28 to Complaint), 3(PO's annotations); Ex1005, Fig. 5.

99. In my opinion, a POSA would have recognized that Butler's hand vacuum is a three-dimensional object and it has an **upper end** and a **lower end**, as shown in the annotated figure below:



Ex1005, Fig. 5.

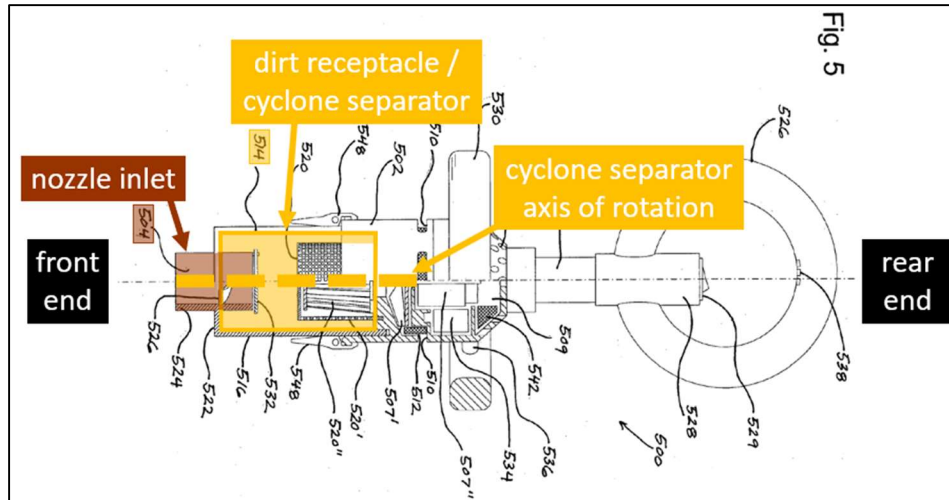
c. [1a.2]/[12a.2]

Reference Number	Claim Limitation
[1a.2]	“a cyclone unit comprising a cyclone chamber having a cyclone axis of rotation that extends in a forward/rearward direction, a suction motor and fan assembly having a suction motor axis of rotation and a pistol grip handle;”
[12a.2]	“a cyclone unit comprising a cyclone chamber having a cyclone axis of rotation that extends in a forward/rearward direction when the dirty air inlet faces forwardly, a suction motor and fan assembly having a suction motor axis of rotation and a pistol grip handle wherein the suction motor axis of rotation is generally parallel to the cyclone axis of rotation;”

100. In my opinion, Butler teaches and renders obvious a cyclone unit comprising a cyclone chamber having a cyclone axis of rotation that extends in a forward/rearward direction, a suction motor and fan assembly having a suction motor axis of rotation and a pistol grip handle. (Limitation [1a.2]).

101. In my opinion, Butler teaches and renders obvious a cyclone unit comprising a cyclone chamber having a cyclone axis of rotation that extends in a forward/rearward direction when the dirty air inlet faces forwardly, a suction motor and fan assembly having a suction motor axis of rotation and a pistol grip handle wherein the suction motor axis of rotation is generally parallel to the cyclone axis of rotation. (Limitation [12a.2]).

102. To start, in my opinion, Butler teaches a cyclone unit comprising a cyclone chamber having a cyclone axis of rotation that extends in a forward/rearward direction. Butler teaches that its “**dirt receptacle** comprises a **cyclone separator**,” which in my opinion a POSA would have understood is a cyclone unit comprising a cyclone chamber with a **cyclone separator axis of rotation** that extends in a forward/rearward direction between the **front** and **rear ends**, as shown in the annotated figure below:

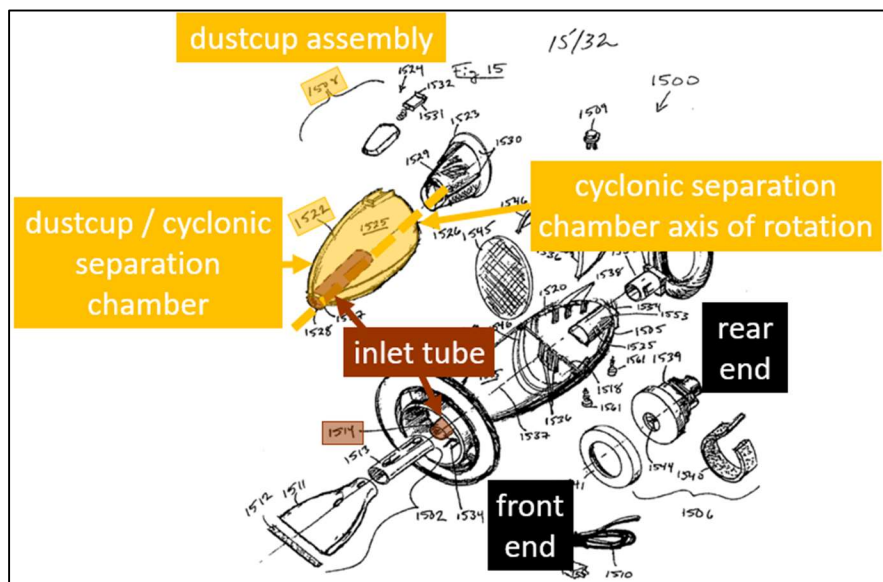
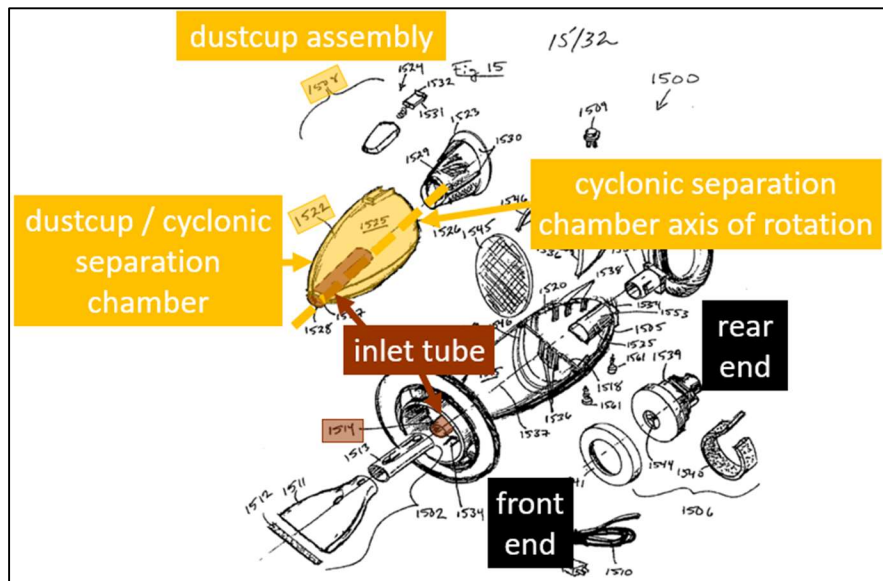


Ex1005, Claim 11, Fig. 5; Ground 1, [1a.1]/[12a.1].

103. Regarding claim element [12a.2], in my opinion a POSA would have understood that Butler teaches that its cyclone axis of rotation extends in a forward/rearward direction when the dirty air inlet faces forwardly, as shown in the annotated figure above.

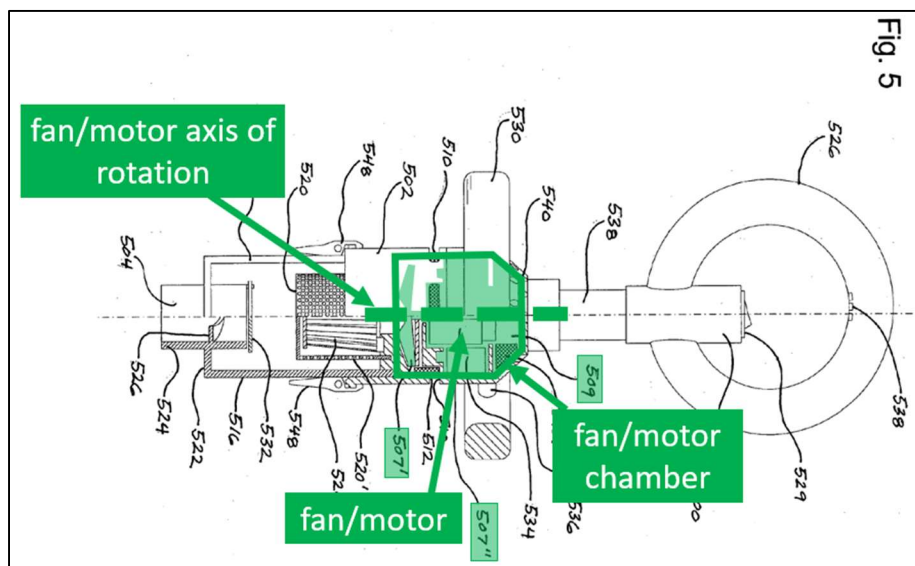
104. Further, Butler teaches a “**dustcup assembly 1508** compris[ing] a **dustcup 1522**” that “may comprise ... a **cyclonic separation chamber**,” which in

my opinion a POSA would have understood is also a cyclone unit comprising a cyclone chamber with a **cyclonic separation chamber axis of rotation of rotation** that extends in a forward/rearward direction, including when the dirty air inlet (“**inlet tube 1514**”/“ **inlet 1528**”) faces forwardly, as shown in the annotated figure below:



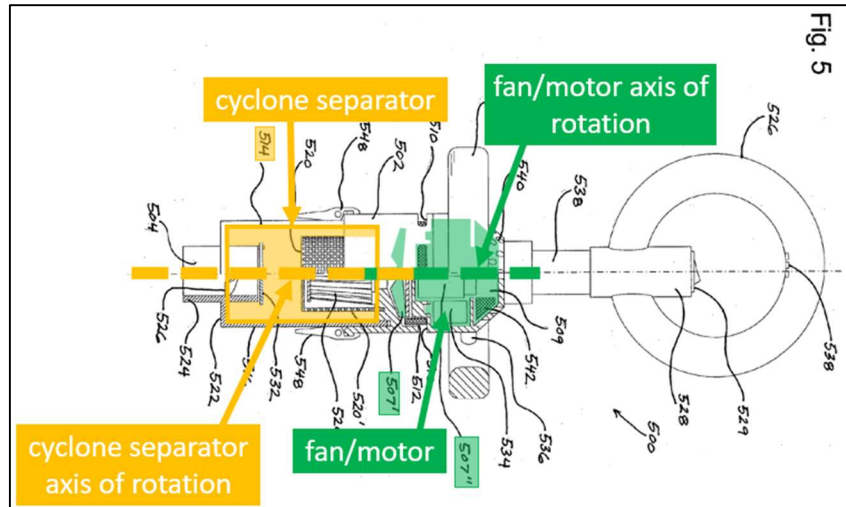
Ex1005, 35:27-36:4, Figs. 15-16.

105. Butler also teaches that its cyclonic separation units are interchangeable: “[t]he present invention may be used with any type of dirt separation system,” and “different types of dirt receptacle ... may be interchangeable with one another.” Ex1005, 16:25-28.
106. In my opinion, a POSA would have understood that Butler teaches a suction motor and fan assembly having a suction motor axis of rotation (“**fan/motor chamber 509** in which the **fan/motor 507** is located”), as shown in the annotated figure below:



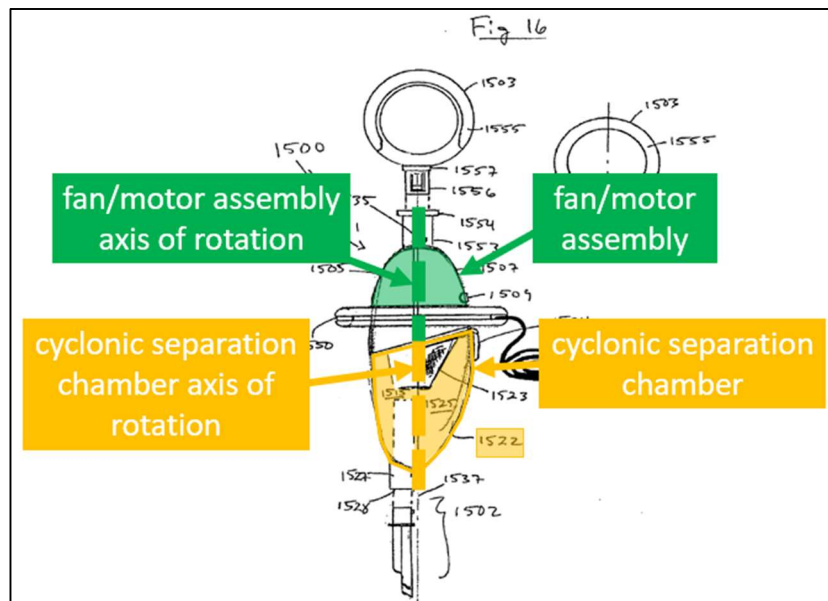
Ex1005, 20:12-14, Fig. 5.

107. Regarding the final limitation of claim element [12a.2], in my opinion a POSA would have understood that Butler teaches that its suction motor axis of rotation is generally parallel to the cyclone axis of rotation (**cyclone separator axis of rotation**), as shown in the annotated figure below:



Ex1005, Fig. 5.

108. Further, in my opinion a POSA would have understood that Butler teaches that its “**fan/motor assembly 1506[’s]**” **axis of rotation** is generally parallel to the **cyclonic separation chamber axis of rotation**, as shown in the annotated figure below:

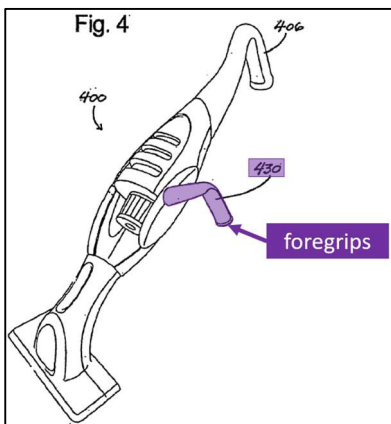


Ex1005, 35:4-6, Fig. 16.

109. In my opinion, to the extent these axes are depicted as co-axial, a POSA would have understood they are generally parallel because they extend in the same direction and maintain the same (zero) distance between them. Further, PO apparently contends co-axial axes meet this limitation. Ex1021 (Ex.28 to Complaint), 5-6.

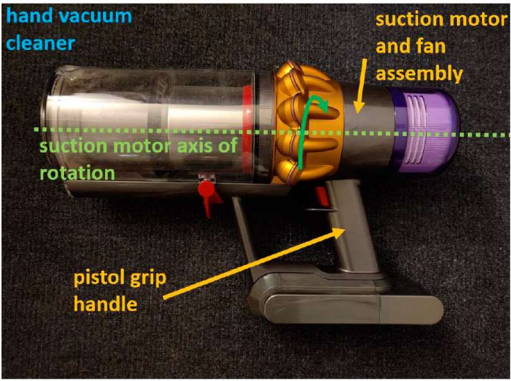
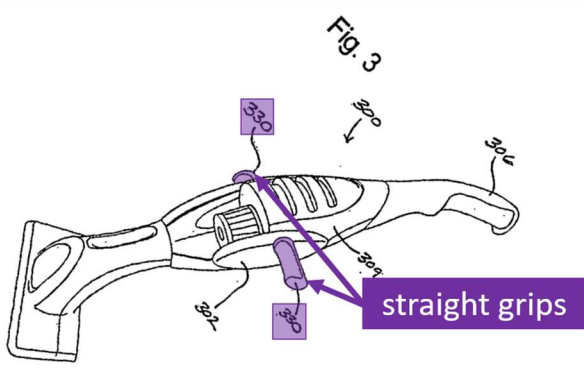
110. Next, in my opinion, Butler teaches a pistol-grip handle.

111. Butler teaches that its hand vacuum cleaner includes “pistol-grip style **foregrips 430**”:



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

112. In my opinion, a POSA also would have understood that Butler teaches that its “two separate **straight grips 330**” are pistol-grip handles, at least to the same extent as PO accuses of infringement, as shown in the annotated figures below:

PO's Infringement Contentions	Butler
	

Ex1021 (Ex.28 to Complaint), 6(PO's annotations); Ex1005, Fig. 3.

113. Furthermore, in my opinion, a POSA would have understood that Butler teaches that “any combination of rear grip and foregrip that provide the user with hand positions to ergonomically maneuver the device” and that this includes pistol-grip handles. Ex1005, 19:9-12, 19:18-24.

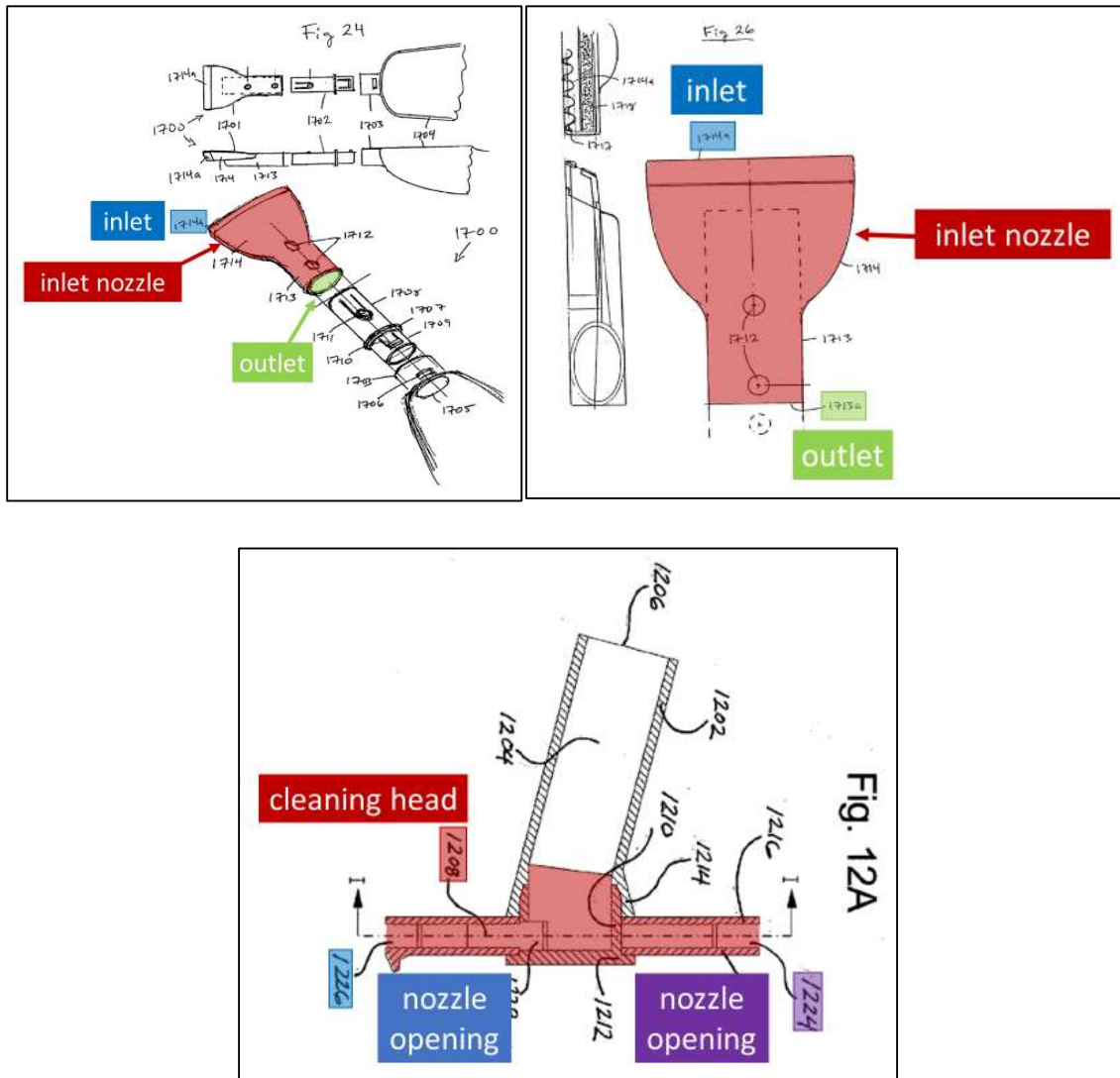
d. [1b]/[12b]

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

114. In my opinion, Butler teaches and renders obvious a surface cleaning head having a front end, a rear end, a dirty air inlet and a surface cleaning head air outlet. (Limitation [1b]).

115. In my opinion, Butler teaches and renders obvious a surface cleaning head having a front end, a rear end, a dirty air inlet and a cleaning head air outlet. (Limitation [12b]).

116. First, in my opinion, a POSA would have understood Butler to teach a three-dimensional surface cleaning head (“**inlet nozzle 1701**”/“**cleaning head 1208**”) having a front end (at “**inlet 1714a**”/“**nozzle opening 1226**”) and a rear end (at “**outlet 1713a**”/“**nozzle opening 1224**”), as shown in the annotated figures below:

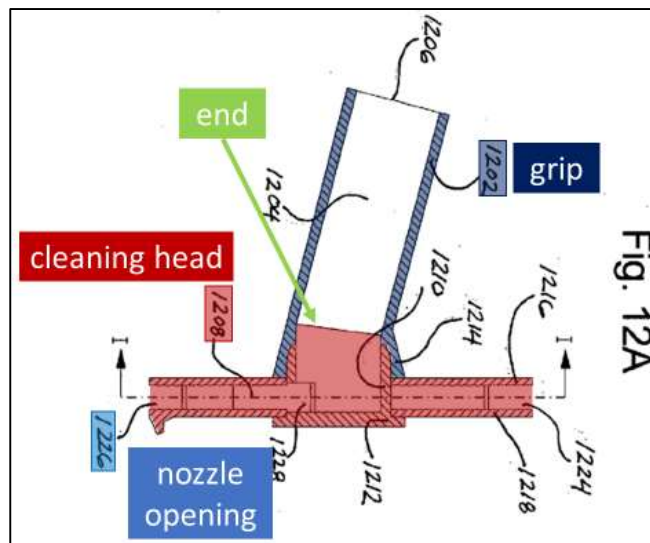
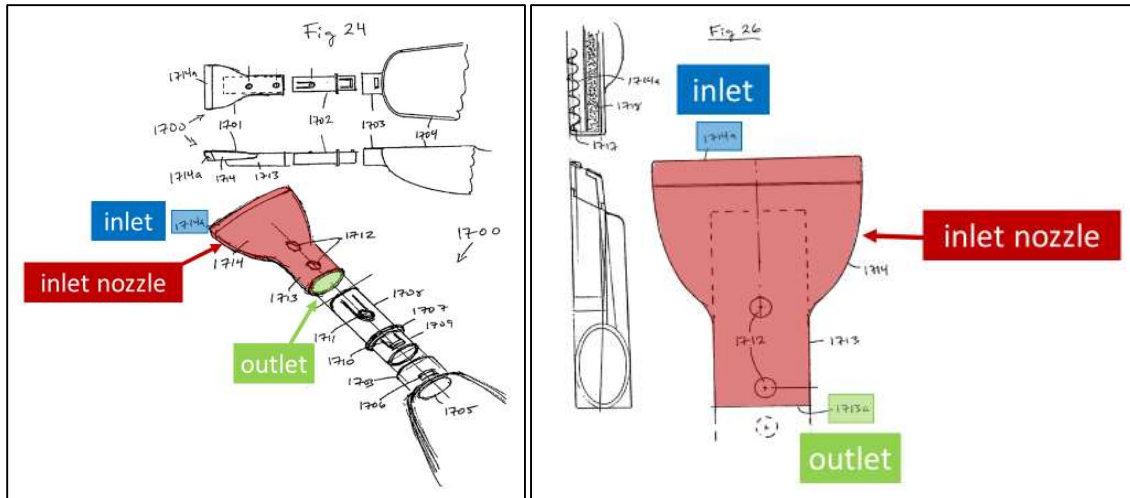


Ex1005, 31:24-27, 42:6-9, Figs. 12A, 24, 26.

117. In my opinion a POSA would have understood that Butler teaches that its

surface cleaning heads are interchangeable because Butler teaches “any type of cleaning device may be attached.” Ex1005, 22:6-9.

118. Next, in my opinion a POSA would have understood Butler to teach a surface cleaning head having a dirty air inlet (“inlet 1714a”/“nozzle opening 1226”) and a surface cleaning head air outlet (“outlet 1713a for the inlet nozzle 1701”/“end to a cleaning head 1208” that is “attach[ed]” to “grip 1202”):



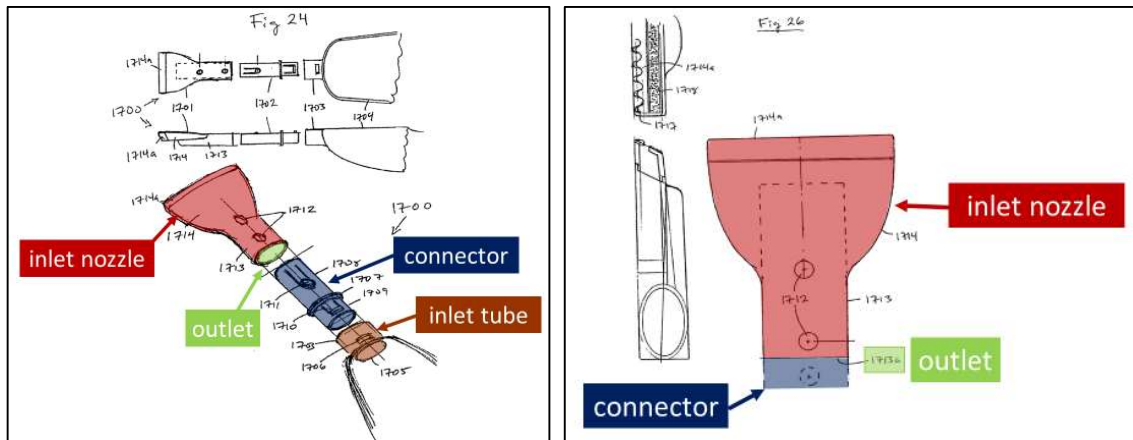
Ex1005, 31:6-27, 42:6-9, Figs. 12A, 24, 26.

e. [1c.1]/[12c.1.i]

Reference Number	Claim Limitation
[1c.1]	“a rigid air flow conduit which, when mounted to the surface cleaning head and the hand vacuum cleaner, extends between the surface cleaning head air outlet and the dirty air inlet of the hand vacuum cleaner,”
[12c.1.i]	“a rigid air flow conduit which is mountable between the cleaning head air outlet and a hand vacuum cleaner air inlet,”

119. In my opinion, Butler teaches and renders obvious a rigid air flow conduit which, when mounted to the surface cleaning head and the hand vacuum cleaner, extends between the surface cleaning head air outlet and the dirty air inlet of the hand vacuum cleaner. (Limitation [1c.1]).
120. In my opinion, Butler teaches and renders obvious a rigid air flow conduit which is mountable between the cleaning head air outlet and a hand vacuum cleaner air inlet. (Limitation [12c.1.i]).
121. In my opinion, a POSA would have understood that Butler teaches a rigid air flow conduit (“**nozzle connector 1702**”) which is mountable between the cleaning head air outlet (“**outlet 1713a** for the **inlet nozzle 1701**”) and a hand vacuum cleaner air inlet (“**inlet tube 1703** located on the housing”), and, when mounted to the surface cleaning head and the hand vacuum cleaner, extends between the surface cleaning head air outlet and the dirty air inlet of the hand vacuum cleaner, as shown in the annotated figures

below:



Ex1005, 41:8-11, 42:7-8, Figs. 24, 26.

122. Butler teaches that its “**inlet tube**” is “integrally formed with the housing 1704 and provides fluid communication between the vacuum dust receptacle (not shown) and the rest of the nozzle assembly 1700.” Ex1005, 41:15-18.
123. Butler teaches that its “**connector 1702** is a hollow tube” “divided into two portions by a collar 1707”: an upstream “inlet portion 1708,” which is “telescopically received within the **nozzle 1701**,” and a downstream “outlet portion 1709,” which is “telescopically received within or around the **inlet tube 1703**.” *Id.*, 41:19-29. The mounting includes “a flexible nozzle-attaching tab 1711 that corresponds to one or more apertures 1712 in the nozzle 1701,” such that the user may “depress this tab 1711 to remove the nozzle 1701 from the connector 1702.” *Id.*, 41:26-42:1. Likewise, “cantilever tab 1710” fits into the “inlet tube aperture 1706” of

the hand vacuum cleaner and a user can depress the “cantilever tab 1710,” clicking it out of the “inlet tube aperture 1706” to remove the “connector 1702” from the “vacuum cleaner.” *Id.*, 41:19-26.

124. In my opinion, a POSA would have understood the above to teach Limitations [1c.1] and [12c.1.i].

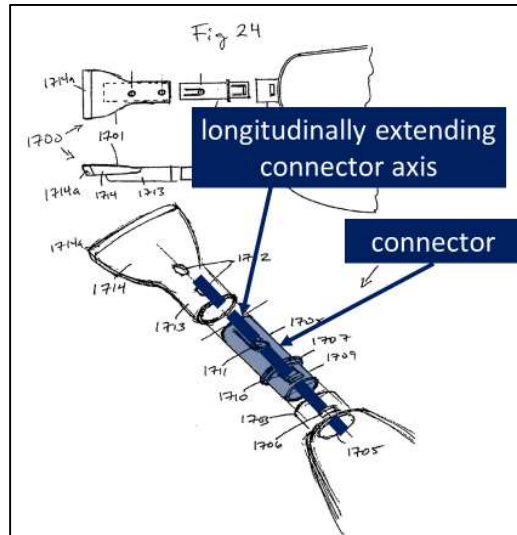
f. [12c.1.ii]

Reference Number	Claim Limitation
[12c.1.ii]	“the rigid air flow conduit having a longitudinally extending conduit axis, wherein, when the hand vacuum cleaner is mounted to the downstream end of the rigid air flow conduit, the handle is a driving handle for the surface cleaning apparatus and the longitudinally extending conduit axis of the rigid air flow conduit is parallel to the cyclone axis of rotation, and”

125. In my opinion, Butler teaches and renders obvious the rigid air flow conduit having a longitudinally extending conduit axis, wherein, when the hand vacuum cleaner is mounted to the downstream end of the rigid air flow conduit, the handle is a driving handle for the surface cleaning apparatus and the longitudinally extending conduit axis of the rigid air flow conduit is parallel to the cyclone axis of rotation.

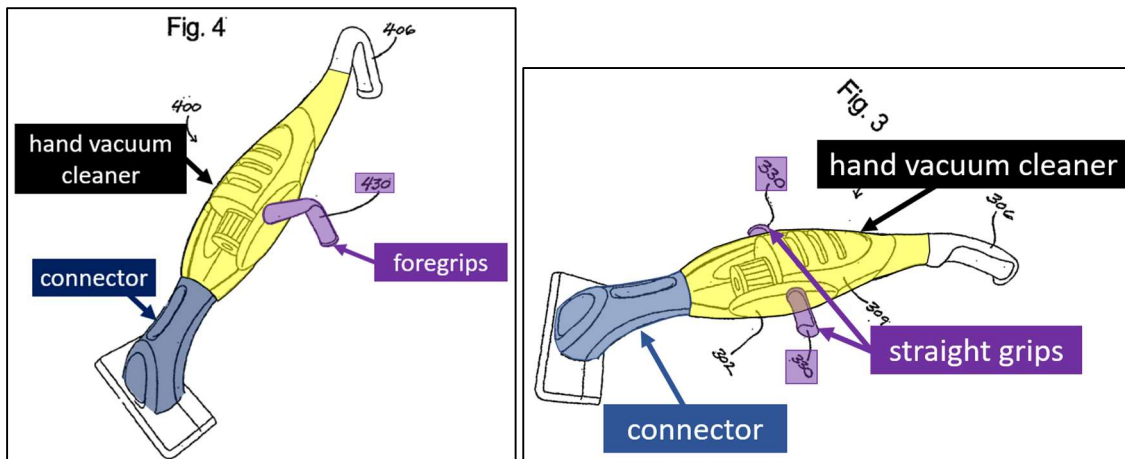
126. In my opinion, a POSA would have understood that Butler teaches a **connector** that has a **longitudinally extending connector axis**, which in my opinion a POSA would have understood is a longitudinally extending

conduit axis, as shown in the annotated figure below:



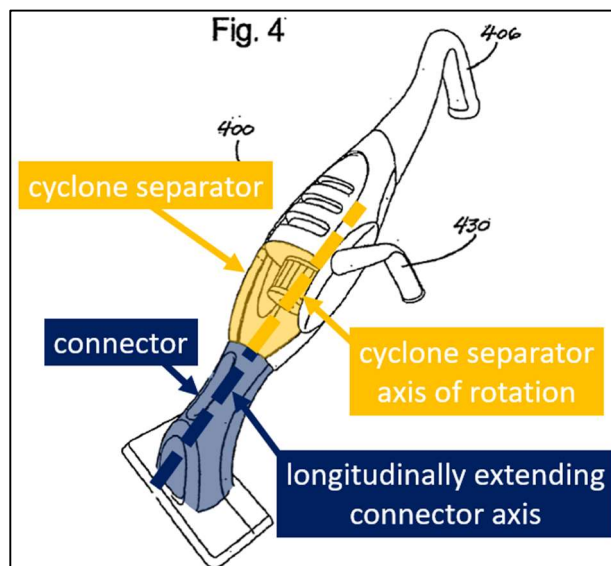
Ex1005, Fig. 24.

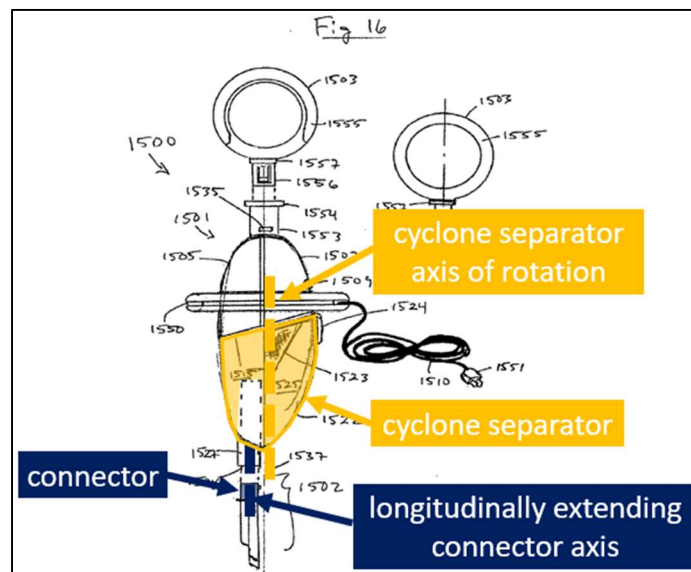
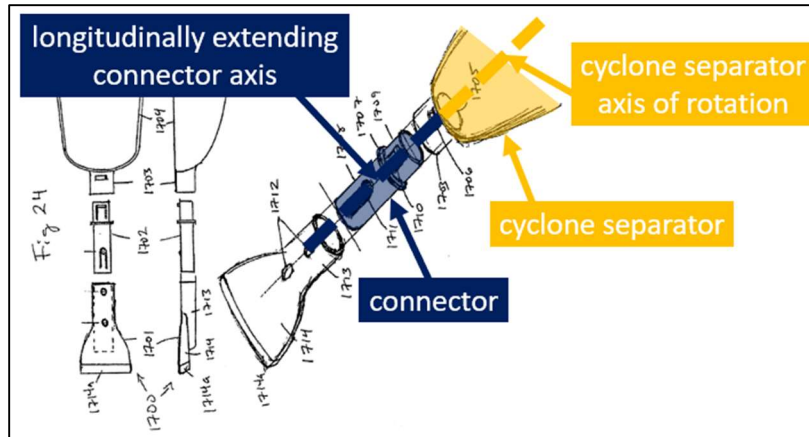
127. In my opinion, a POSA would have understood that Butler teaches that when its hand vacuum cleaner is mounted to the downstream end of the rigid air flow conduit, the handle is a driving handle for the surface cleaning apparatus.
128. Butler teaches “pistol-grip style **foregrips 430**” and “**straight grips 330**” that are used to “ergonomically maneuver the device and rotate it into different positions for cleaning horizontal and inclined surfaces,” as shown in the annotated figures below:



Ex1005, 19:9-12, 19:22-24, Figs. 3-4.

129. In my opinion, a POSA would have understood that, when so mounted, the **longitudinally extending connector axis** is parallel to the **cyclone separator's axis of rotation**, as shown in the annotated figures below:





Ex1005, Figs. 4-5, 24, 16.

130. Furthermore, in my opinion, to the extent PO argues these axes are co-axial, a POSA would have understood they are also parallel for the same reasons explained in Ground 1, [1a.2]/[12a.2].

g. [1c.2]/[12c.2]

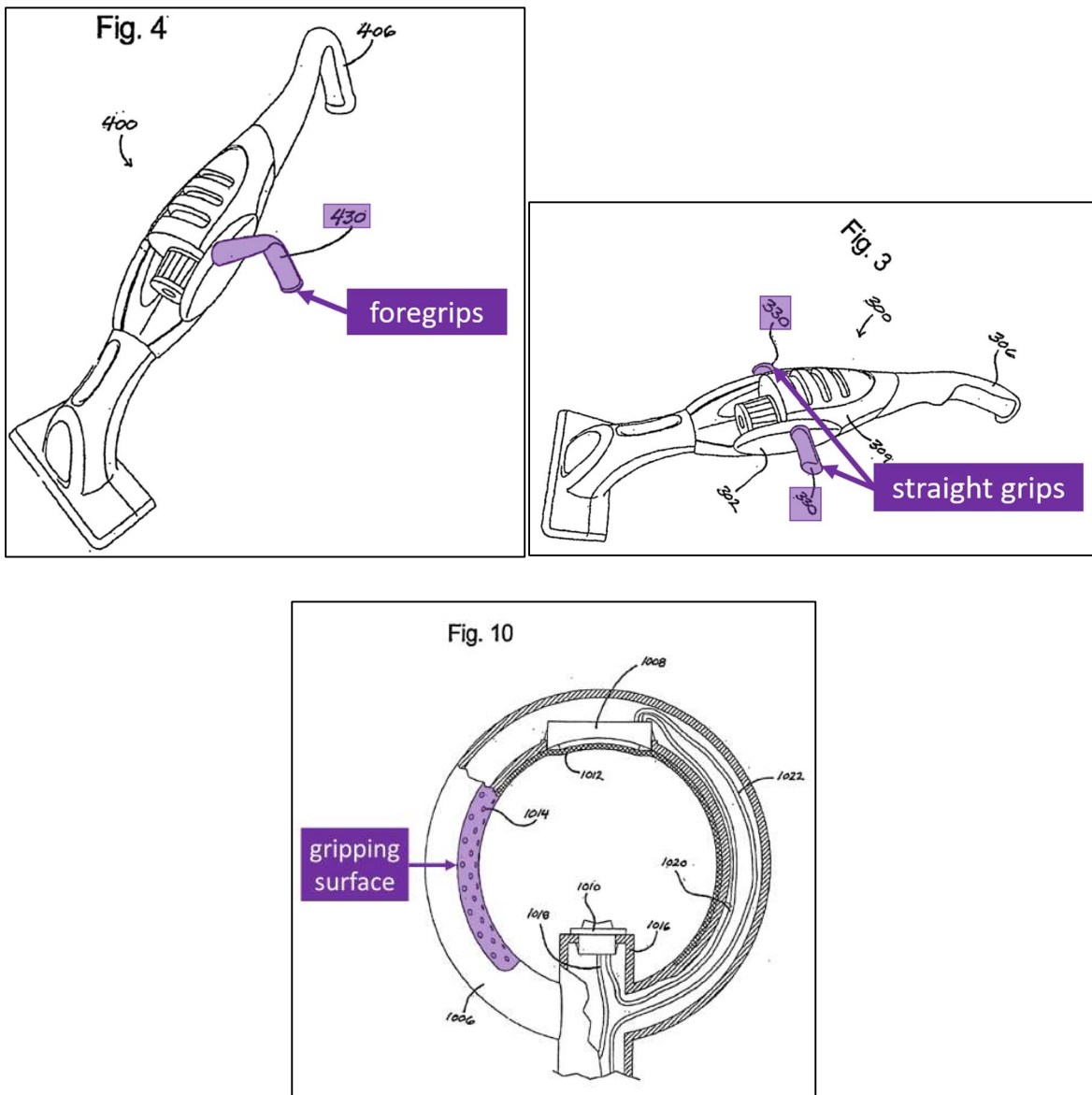
Reference Number	Claim Limitation
[1c.2]	“wherein the pistol grip handle has a pistol grip portion and an end that is mounted to an outer wall of the hand vacuum cleaner at a location rearward of the front end and forward of a rear end of the suction motor and”
[12c.2]	“wherein the pistol grip handle extends generally radially away from an outer wall of the hand vacuum cleaner at a location rearward of the front end and forward of a rear end of the suction motor.”

131. In my opinion, Butler teaches and renders obvious a hand vacuum cleaner wherein the pistol grip handle has a pistol grip portion and an end that is mounted to an outer wall of the hand vacuum cleaner at a location rearward of the front end and forward of a rear end of the suction motor. (Limitation [1c.2]).

132. In my opinion, Butler teaches and renders obvious a hand vacuum cleaner wherein the pistol grip handle extends generally radially away from an outer wall of the hand vacuum cleaner at a location rearward of the front end and forward of a rear end of the suction motor. (Limitation [12c.2]).

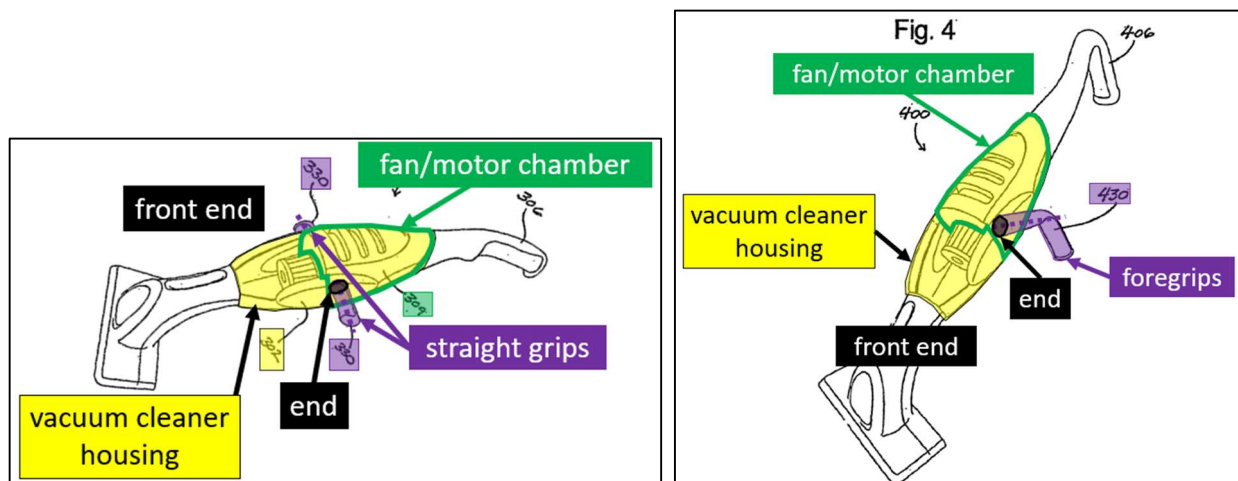
133. First, with regards to claim element [1c.2], Butler’s pistol grip handle (*see* Ground 1, [1a.2]/[12a.2]) has a pistol grip portion. In my opinion, a POSA would have understood that a “gripping surface” may be placed on any or all portions of any of Butler’s disclosed handles: “pistol-grip style **foregrips 430**” and “**straight grips 330**” “may be made from any suitable

material, and may also include **gripping surfaces** or surface treatments to enhance the user's grip and feel," and these "**gripping surfaces** ... compris[e] a material that is more particularly adapted to provide a favorable tactile feel and/or enhanced gripping friction," such as "dimples, checkering, ridges or bumps," as shown in the annotated figures below:



Ex1005, 11:3-11, 11:22-24, 19:22-20:2, Figs. 3-4, 10.

134. In my opinion, a POSA would have understood that Butler teaches that its “pistol-grip style foregrips” and “straight grips” with pistol-grip-shaped “gripping surfaces” that a user grips with their hand are a pistol-grip handle having a pistol-grip portion.
135. Further, in my opinion, a POSA would have understood that Butler teaches that its pistol-grip handle extends generally radially away from, and has an end that is mounted to, an outer wall of the hand vacuum cleaner (“**vacuum cleaner housing 302**”) at a location rearward of the front end and forward of a rear end of the suction motor at least because “**foregrip[s]** ... extend generally radially from the **vacuum cleaner housing 302** at a location adjacent ... the **fan/motor chamber 309**,” as shown in the annotated figures below:

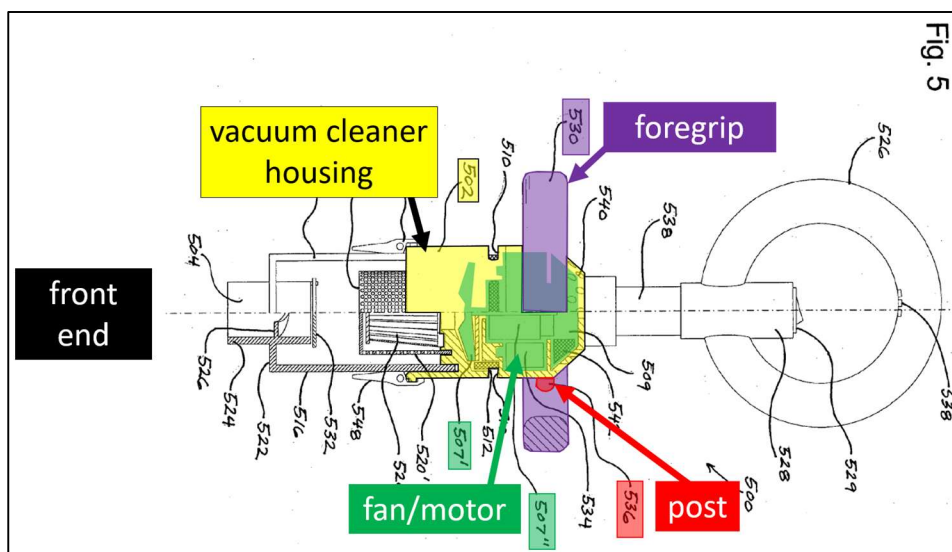


Ex1005, Figs. 3-4, 19:18-24.

136. A POSA would further understand that, as shown in the annotated figures

above, Butler teaches that its foregrips 330, 430, which “may be provided with joints or pivots to allow them to be articulated into more desirable positions,” have an **end** mounted to “vacuum cleaner housing 302” at a location rearward of the **front end** and forward of a rear end of the suction motor (in Butler’s “fan/motor chamber 309”). Ex1005, 19:22-28.

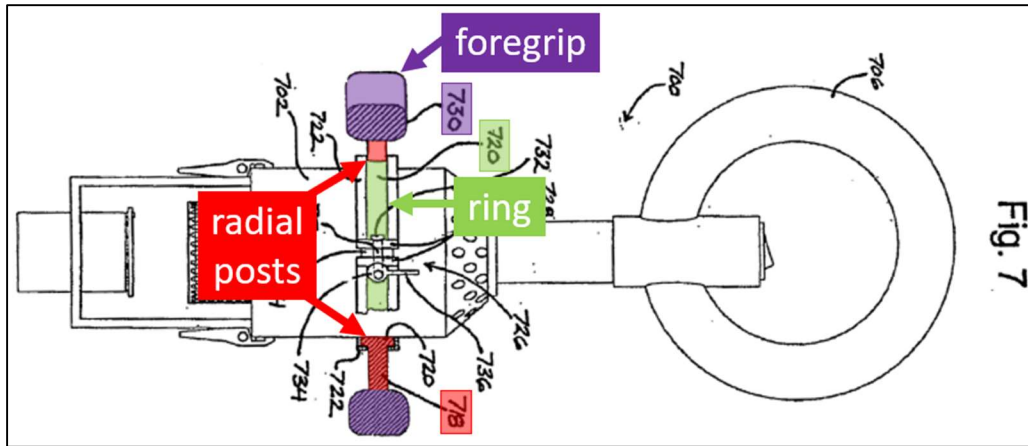
137. Further, Butler teaches that “**foregrip 530** is attached to the **housing 502** by a number of radially extending **posts 536**” and “surrounds a fan/motor chamber 509 in which the **fan/motor 507** is located,” as shown in the annotated figure below:



Ex1005, 20:10-13; Fig. 5.

138. In my opinion, a POSA would have understood that, as shown in the annotated figure above, Butler teaches that its “foregrip 530” has an end (“post 536”) that is mounted to, and extends generally radially away from,

- a hand vacuum cleaner outer wall (“housing 502”) at a location rearward of the front end and forward of a rear end of the suction motor (“fan/motor 507”). Foregrip 530 “may be replaced by any ... foregrip,” including “a grip having a single hand position,” which in my opinion a POSA would have understood includes Butler’s pistol-grip handles (“pistol-grip style foregrips” and/or “straight grips”). Ex1005, 19:9-15.
139. A POSA would further understand that Butler teaches that each of its foregrips can be provided on any portion of the vacuum cleaner housing, including at a location rearward of the front end and forward of a rear end of the suction motor: “foregrips 330, 430 ... can be removed and inserted in various different locations on the housing,” and they “may be pivotable or otherwise articulated to provide even greater ergonomic flexibility and control of the device.” Ex1005, 19:24-26, 22:26-28.
140. Furthermore, Butler teaches that its “**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 figure below:



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

141. In my opinion, a POSA would have understood because “ring 720” “slide[s]” rearwardly “along the length of the housing,” Butler teaches that its “foregrip” that is also mounted to, and extends generally radially away from, an outer wall of the hand vacuum cleaner also slides along the length of the housing. Thus, in my opinion, a POSA would have understood Butler’s foregrip can be provided on any location of Butler’s “housing,” including the claimed location: rearward of the front end and forward of a rear end of the suction motor.

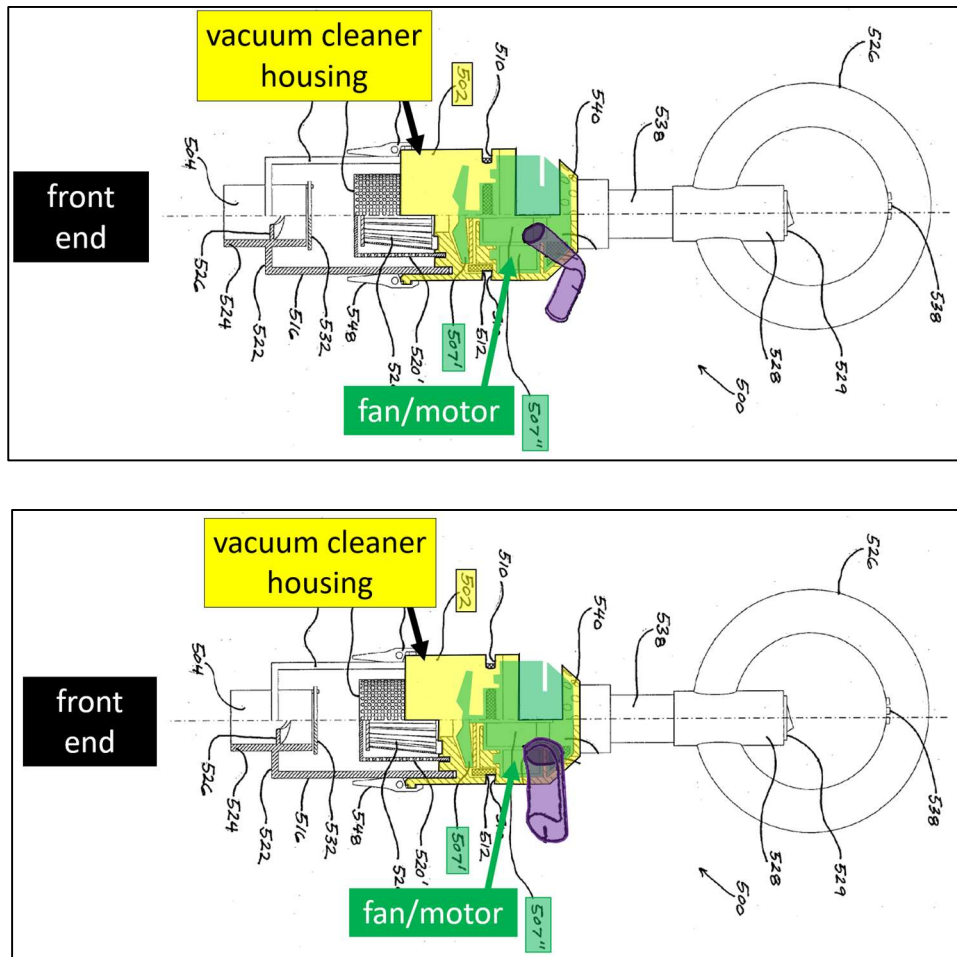
142. Further, Butler also teaches that “[t]he **foregrip** ... is also rotatable about the vacuum cleaner housing.” Ex1005, 23:12-13. “[T]he **foregrip** is attached to the housing 602 by a number of **radially-extending posts 618**, which terminate ... at a **ring 620**,” “captured within a **track 622** in the housing 602, in which it is free to rotate,” and “a lock may be provided to

Fig. 6

143. Butler teaches that “the loop-shaped grips may be replaced by any combination of rear grip and foregrip,” *e.g.*, “foregrips 330, 430,” which “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 each of Butler’s “foregrips” can be provided on any location of Butler’s “housing” (including the claimed location).

144. Therefore, in my opinion, because Butler teaches that its “**foregrips 330, 430**” are rotatable around the circumference of Butler’s body, and slideable forward and rearward on Butler’s body, a POSA would have understood that one of the available positions on Butler’s “**housing 502**” is a location rearward of the front end and forward of a rear end of the “**fan/motor**,” as

shown in the modified figures below:



Ex1005, Figs. 3(modified), 4(modified), 5(modified).

145. In my opinion, a POSA would have understood this limitation is met regardless of whether “the front end” as claimed refers back to the claimed “a front end” of the hand vacuum cleaner, the claimed “a front end” of the surface cleaning head, or refers to a front end of the suction motor, because, as shown and explained above, Butler teaches that its pistol-grip handle is rearward of the front end of the suction motor and the front ends of the

hand vacuum cleaner and surface cleaning head are forward of the front end of the suction motor.

146. In my opinion, to the extent the claimed mounting location is not expressly disclosed, a POSA would have found it obvious to optimize the ergonomic qualities and maneuverability of Butler's cleaner by mounting the handle at a location that reduces asymmetrical weight distribution caused by heavy components like the motor, thereby increasing ergonomics and maneuverability, and reducing strain on the user, which is a stated goal of Butler. Since Butler teaches "it may be beneficial to locate" the handle "to assist with manipulating the vacuum," and "the foregrip 130 should generally surround the device's center of gravity CG" so, "as the user rotates the vacuum cleaner 100, the center of gravity CG will remain at generally the same location, causing the general balance of the device to feel the same regardless of its angular orientation." Ex1005, 10:23-26, 13:3-11. And also because "The position of the center of gravity CG can be adjusted when designing the device by selectively positioning the various working parts along the length of the vacuum cleaner." *Id.*, 15:15-18. In my opinion, a POSA therefore would have been motivated to optimize weight balance by mounting Butler's pistol-grip handle at a location rearward of the front end and forward of a rear end of the suction

motor and would have reasonably expected success because Butler teaches handle relocation to assist with manipulating the vacuum can and should be done. Ex1005, 10:23-26, 13:3-11, 19:22-28.

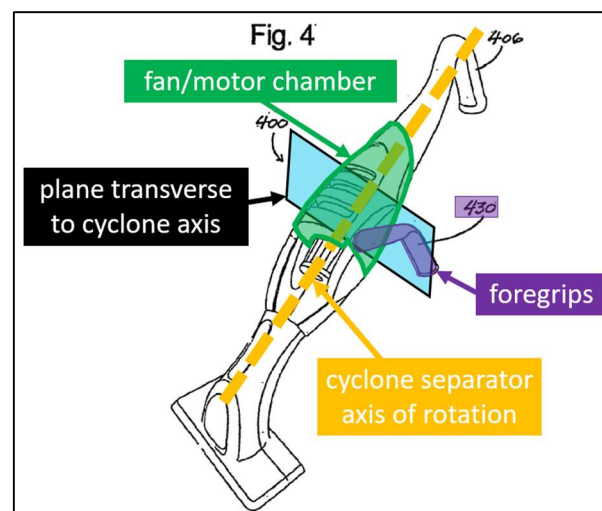
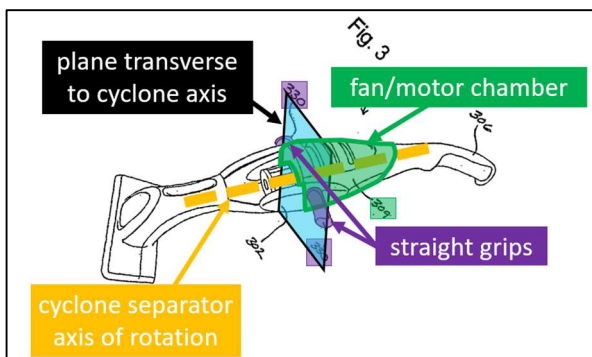
h. [1c.3]

Reference Number	Claim Limitation
[1c.3]	“wherein a plane that is transverse to the cyclone axis of rotation extends through the pistol grip portion and the hand vacuum cleaner at a location rearward of the front end and forward of a rear end of the suction motor,”

147. In my opinion, Butler teaches and renders obvious a hand vacuum cleaner wherein a plane that is transverse to the cyclone axis of rotation extends through the pistol grip portion and the hand vacuum cleaner at a location rearward of the front end and forward of a rear end of the suction motor.

148. First, Butler teaches and renders obvious mounting an end of the pistol-grip handle to an outer wall of the hand vacuum cleaner at a location rearward of the front end and forward of a rear end of the suction motor.

Ground 1, [1c.2]/[12c.2]. In my opinion, when so mounted, a POSA would have understood that a plane that is transverse to the cyclone axis of rotation (Ground 1, [1a.2]/[12a.2]) extends through the pistol-grip portion (Ground 1, [1c.2]) and the hand vacuum cleaner at a location rearward of the front end and forward of a rear end of the suction motor, as shown in the annotated figures below:



Ex1005, Figs. 3-4, 19:22-28.

149. Further, for the same reasons as explained for Ground 1, [1c.2]/[12c.2], in my opinion a POSA would have been motivated to modify Butler to locate the pistol-grip handle as claimed to optimize weight balance and would have reasonably expected success.

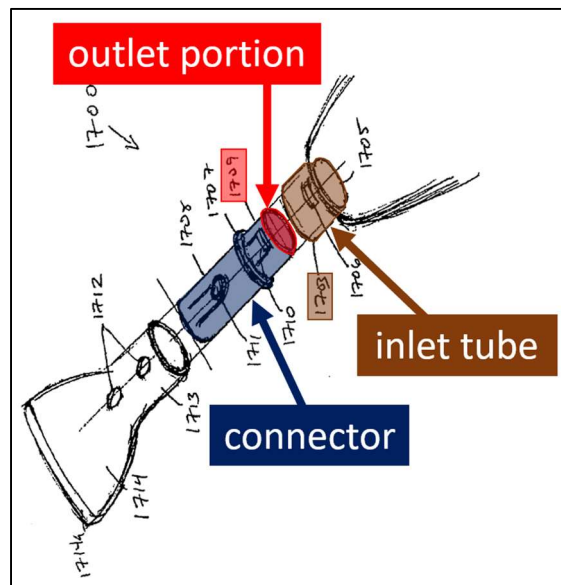
i. [1c.4]

Reference Number	Claim Limitation
[1c.4]	“wherein the dirty air inlet of the hand vacuum cleaner is removably drivingly mountable to a downstream end of the rigid air flow conduit whereby when the hand vacuum cleaner is mounted to the downstream end of the rigid air flow conduit, the pistol grip handle is a driving handle for the surface cleaning apparatus, and”

150. In my opinion, Butler teaches and renders obvious a hand vacuum cleaner wherein the dirty air inlet of the hand vacuum cleaner is removably drivingly mountable to a downstream end of the rigid air flow conduit

whereby when the hand vacuum cleaner is mounted to the downstream end of the rigid air flow conduit, the pistol grip handle is a driving handle for the surface cleaning apparatus.

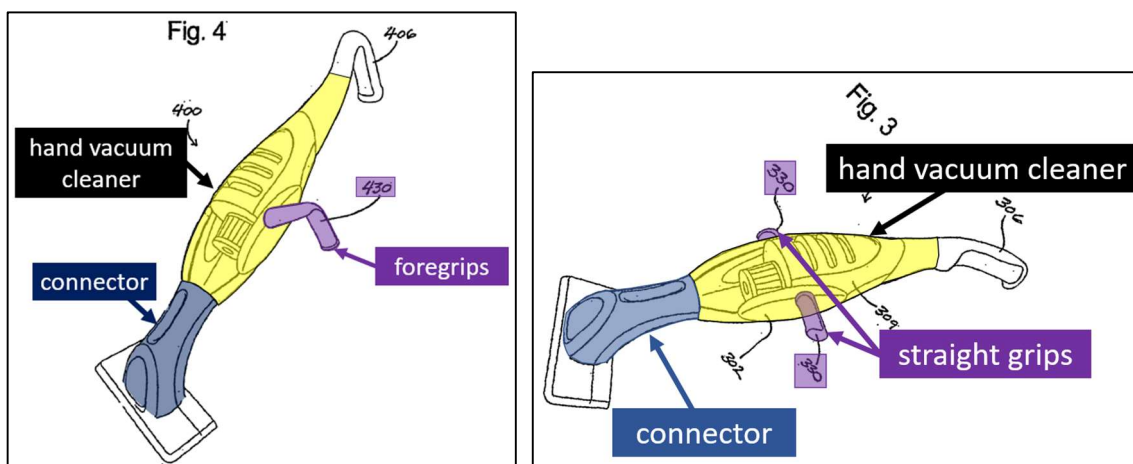
151. In my opinion, a POSA would have understood that Butler teaches that the dirty air inlet (“**inlet tube 1703**”) of the hand vacuum cleaner is removably drivingly mountable to a downstream end of the rigid air flow conduit (“**outlet portion 1709**” of “**connector 1702**”), as shown in the annotated figure below:



Ex1005, 41:9-42:5, Fig. 24; Ground 1, [1c.1]/[12c.1.i], [12c.1.ii].

152. In my opinion, a POSA also would have understood that Butler teaches that its “inlet tube 1703” is removably drivingly mountable to “outlet portion 1709” of “connector 1702” and, when the hand vacuum cleaner is mounted to “outlet portion 1709” of “connector 1702,” Butler teaches that

its pistol-grip handles (**foregrips 330, 430**) are a driving handle for the surface cleaning apparatus because they are used to “ergonomically maneuver the device and rotate it into different positions for cleaning horizontal and inclined surfaces,” and the rigid “**connector**” likewise drives surface cleaning head movement when mounted, as shown in the annotated figures below:



Ex1005, 19:9-12, 19:22-24, Figs. 3-4.

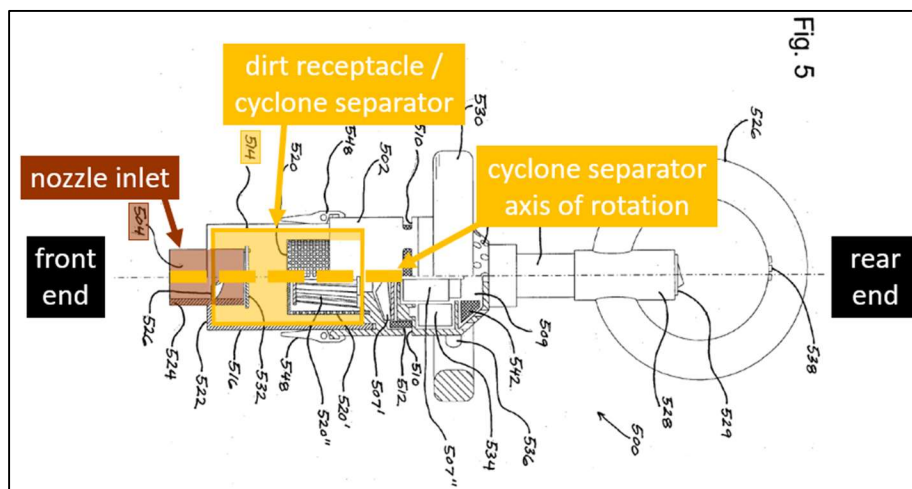
j. [1c.5]

Reference Number	Claim Limitation
[1c.5]	“wherein when the hand vacuum cleaner is positioned with the front end of the hand vacuum cleaner in front of the rear end of the hand vacuum cleaner and the dirty air inlet faces forwardly, the cyclone axis of rotation is generally horizontal.”

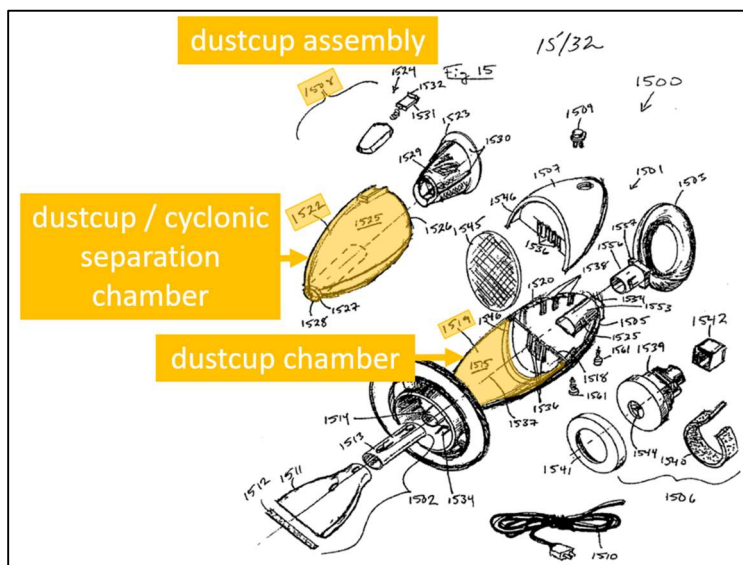
153. In my opinion, Butler teaches and renders obvious a hand vacuum cleaner wherein when the hand vacuum cleaner is positioned with the front end of the hand vacuum cleaner in front of the rear end of the hand vacuum

cleaner and the dirty air inlet faces forwardly, the cyclone axis of rotation is generally horizontal.

154. In my opinion, a POSA would have understood that Butler teaches that when its hand vacuum cleaner is positioned with the **front end** of the hand vacuum cleaner in front of the **rear end** of the hand vacuum cleaner and the dirty air inlet (“**nozzle inlet 504**”/“**inlet 1528**”) faces forwardly, the **cyclone separator axis of rotation** is generally horizontal, as shown in the annotated figures below:



158. Butler teaches that its “**dustcup 1522** is removably installed in the **dustcup chamber 1519**,” as shown in the annotated figure below:



Ex1005, 35:14-16, Fig. 15; *id.*, 21:8-9 (“dirt receptacle 514 is removably attached”), 21:16-23 (“dirt receptacle 514 may be removably attached”); Ground1, [1a.2]/[12a.2].

159. Therefore, in my opinion, because **dustcup 1522** and dirt receptacle 514 are removably installed/attached, a POSA would have understood that the cyclone unit is removably mountable as part of the hand vacuum cleaner.

4. Butler Renders Obvious Claims [4]

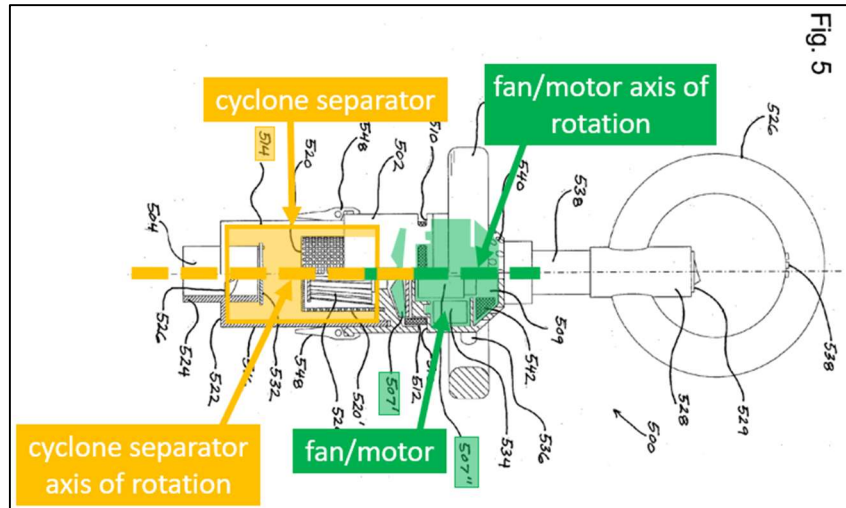
Reference Number	Claim Limitation
[4]	“The surface cleaning apparatus of claim 1 wherein the cyclone axis of rotation is generally parallel to the suction motor axis of rotation.”

160. In my opinion, Butler teaches and renders obvious the surface cleaning

apparatus of claim 1 wherein the cyclone axis of rotation is generally parallel to the suction motor axis of rotation.

161. Butler teaches and renders obvious claim [1]. Ground 1, [1].

162. In my opinion, a POSA would have understood that Butler teaches that its cyclone axis of rotation (**cyclone separator axis of rotation**) is generally parallel to the suction motor axis of rotation (**fan/motor axis of rotation**), as shown in the annotated figure below:



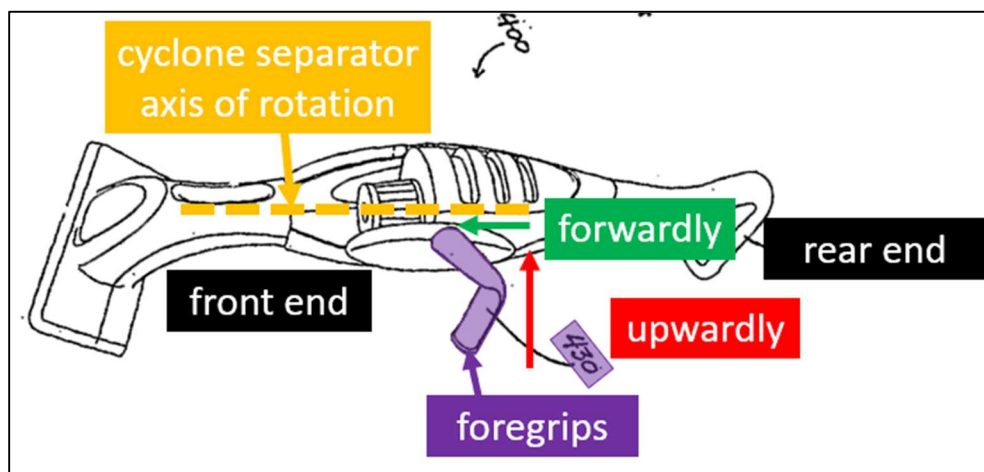
Ex1005, Fig. 5.

163. Similarly, in my opinion, a POSA would have understood that Butler teaches that its **cyclonic separation chamber axis of rotation** is generally parallel to the “**fan/motor assembly 1506[’s]**” **axis of rotation**, as shown in the annotated figure below:

the hand vacuum cleaner the cyclone axis of rotation is positioned horizontally, the pistol grip handle extends upwardly and forwardly from the location.

166. Butler teaches and renders obvious claim [1]. Ground 1, [1].

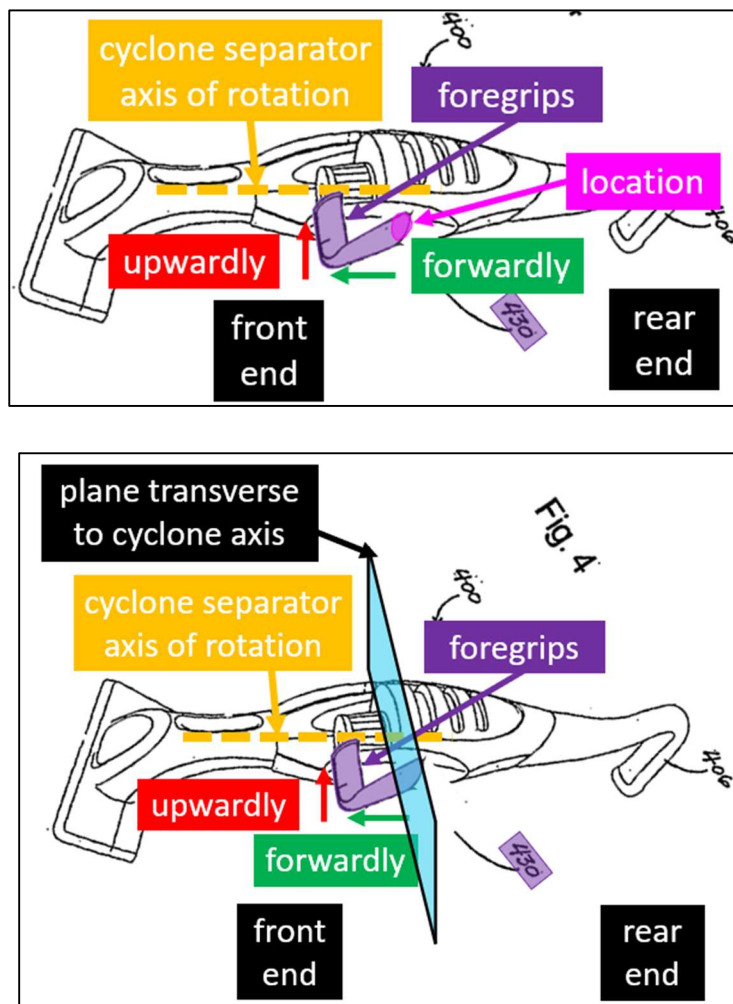
167. In my opinion, a POSA would have understood that Butler teaches that its pistol-grip handle (“**foregrips 430**”) extends **upwardly** and **forwardly** from the location when the hand vacuum cleaner is positioned with the **front end** forward of the **rear end** and the cyclone axis of rotation (**cyclone separator axis of rotation**) is positioned horizontally, as shown in the annotated figure below:



Ex1005, 19:23-24, Fig. 4; Ground 1, [1a.2]/[12a.2].

168. Furthermore, in my opinion, a POSA would have understood that Butler teaches that its “**foregrips 330, 430** also may be provided with joints or pivots to allow them to be articulated into more desirable positions,”

which, in my opinion, a POSA would have understood includes a position in which the pistol-grip style foregrips 430 extend upwardly and forwardly from **the location**, regardless of whether “the location” refers to “a location” where the handle end is mounted ([1c.2], top), or “a location” of the plane transverse to cyclone axis ([1c.3], bottom), as shown in the annotated figure below:



Ex1005, 19:26-28; Ground 1, [1c.2]/[12c.2].

169. Alternatively, in my opinion, a POSA would have been motivated to

modify Butler’s pistol-grip handles to be oriented as claimed to optimize user ergonomics for certain use cases and would have reasonably expected success. In Butler, “any combination of rear grip and foregrip that provide[s] the user with hand positions to ergonomically maneuver the device and rotate it into different positions” can be used and foregrips that “provide multiple hand positions” are beneficial. Ex1005, 19:6-17. In my opinion, a POSA would have understood that modifying Butler’s articulable foregrips to extend upwardly and forwardly from the location when the hand vacuum cleaner is orientated as claimed would have been straightforward and would have involved the simple substitution of one handle in one orientation for a different handle in a different orientation.

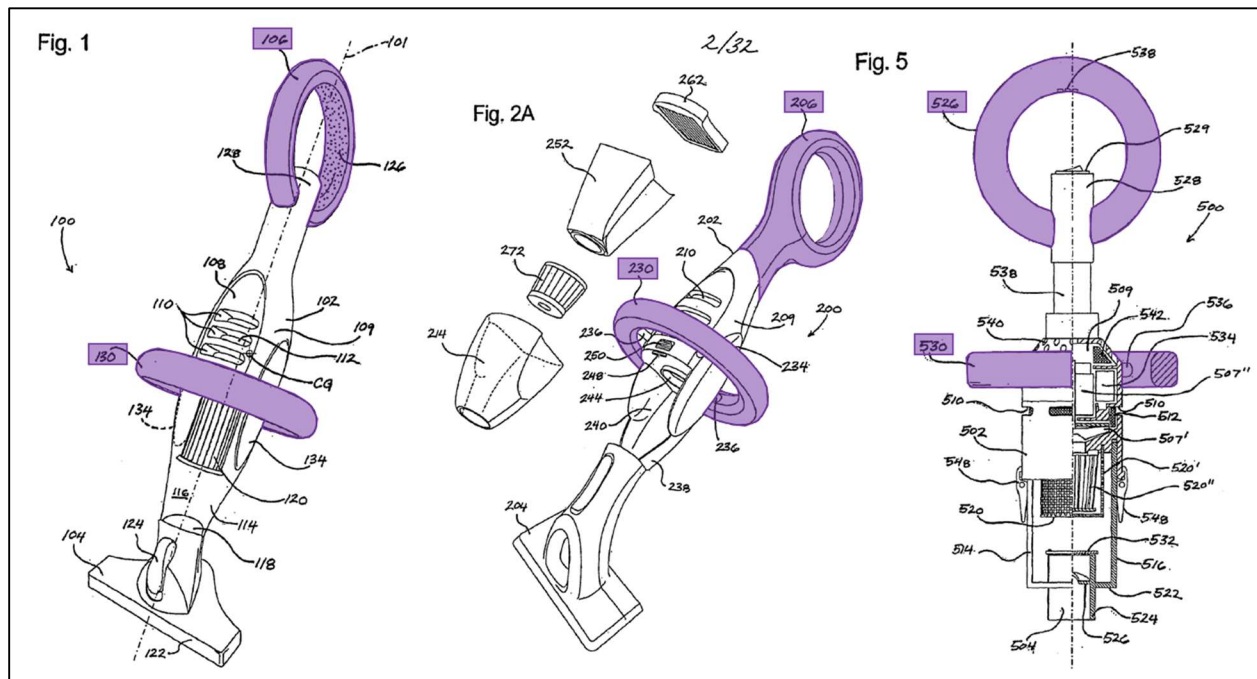
6. Butler Renders Obvious Claims [6]/[17]

Reference Number	Claim Limitation
[6]	“The surface cleaning apparatus of claim 1 wherein an enclosed finger grip area is provided on a forward side of the pistol grip handle.”
[17]	“The surface cleaning apparatus of claim 1 wherein an enclosed finger grip area is provided on a forward side of the pistol grip handle.”

170. In my opinion, Butler teaches and renders obvious the surface cleaning apparatus of claim 1 wherein an enclosed finger grip area is provided on a forward side of the pistol grip handle.

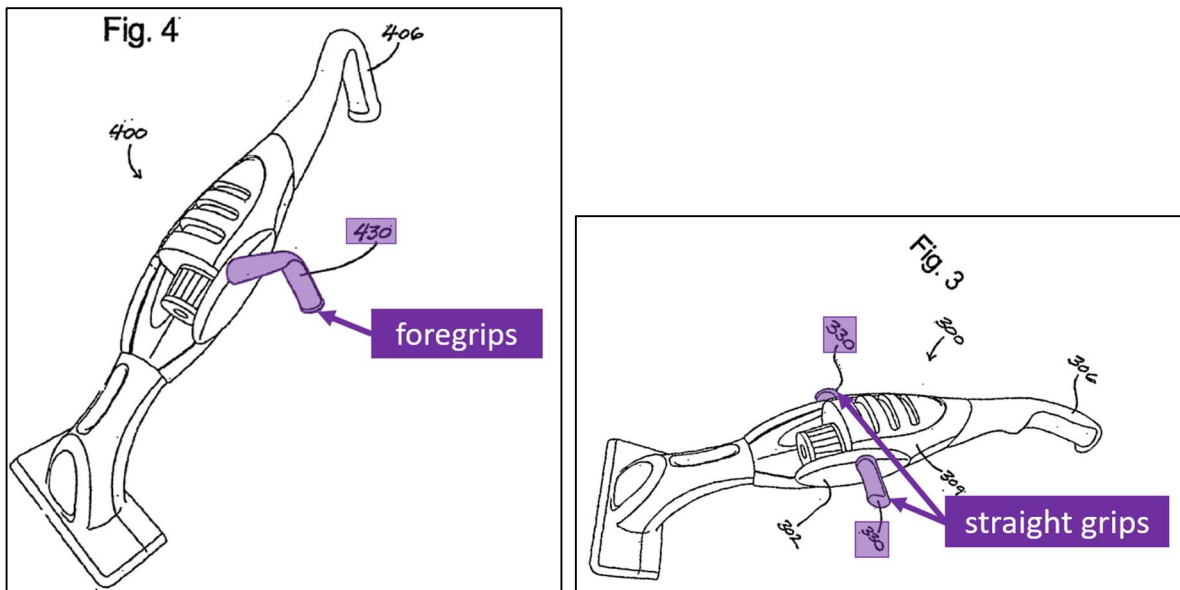
171. Butler teaches and renders obvious claim [1]. Ground 1, [1].

172. In my opinion, a POSA would have understood that Butler teaches handles—**rear grips** and **foregrips**—having enclosed finger grip areas, including those provided on the forward side of the handle, as shown in the annotated figure below:



Ex1005, Figs. 1, 2A, 5; Ground 1, [1c.2]/[12c.2] (“gripping surfaces” may be placed on any/all portions of any Butler handle).

173. Further, in my opinion a POSA would have understood that Butler teaches a finger-actuated “power trigger” and/or “power switch” for operating the vacuum cleaner which can be located on Butler’s various handles, including Butler’s pistol-grip handle (**foregrips 330, 430**), as shown in the annotated figures below:

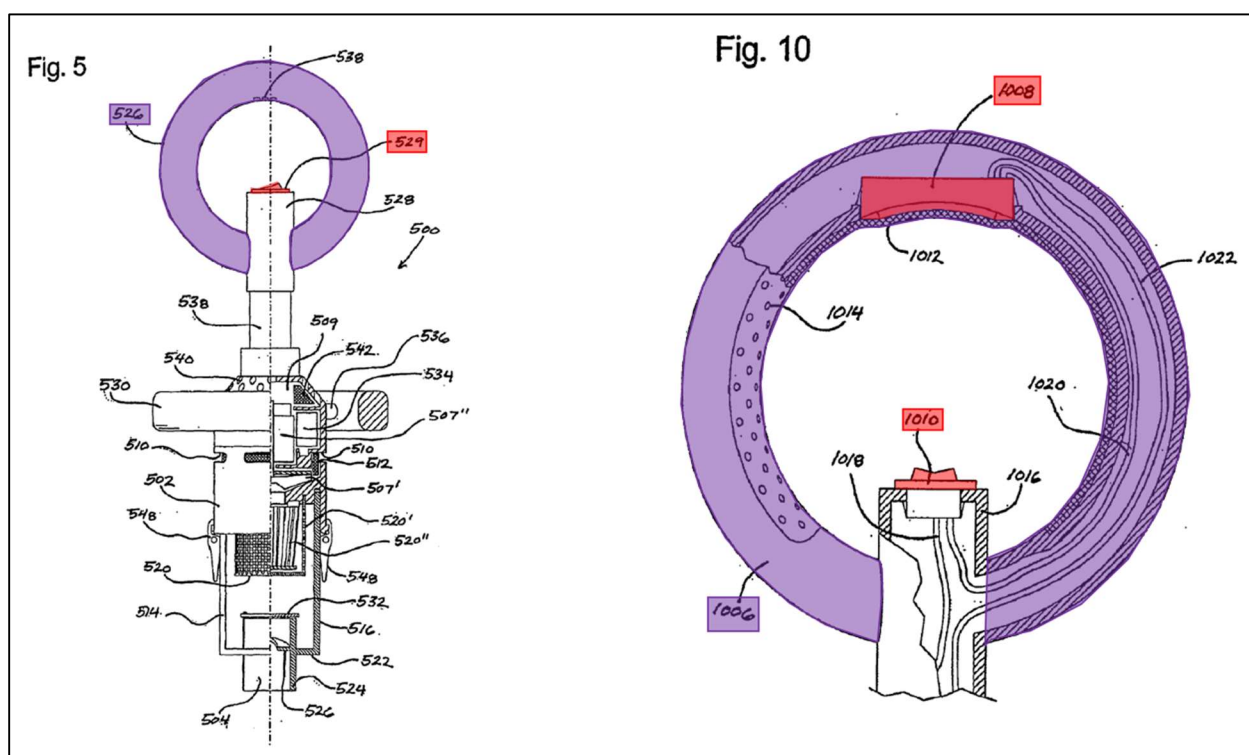


Ex1005, 19:18-24, 20:7-11, 28:22-27, 29:1-2, 29:23-25, Figs. 3-4.

174. While Butler does not explicitly depict the pistol-grip handles having an enclosed finger grip area provided on a forward side of the handle, in my opinion a POSA would have found this obvious and would have been motivated to modify Butler accordingly to achieve certain well-known benefits of such a handle, including benefits Butler expressly teaches.

175. As Butler explains, handles having enclosed finger grip portions “give[] the user flexibility in selecting an ergonomic position in which to hold the [handle]”; they “provide a natural fit in the user’s hand” “to support and maneuver the back of the vacuum cleaner”; they “allow[] the user to hold the [handle] in virtually any annular location,” which “provides improved flexibility in handling the device, and allows the user to rotate the housing to point the inlet nozzle 104 horizontally[,] ... vertically[,] ... or at any

angle in between” because “[r]egardless of which angular position the housing 102 is in, the user can still maintain a firm and comfortable grip on the rear grip 106 and foregrip 130”; and they beneficially “shield[] the power switch [529/1010] ... from being accidentally activated,” thereby “reducing the likelihood of accidental activation,” as shown in the annotated figure below:

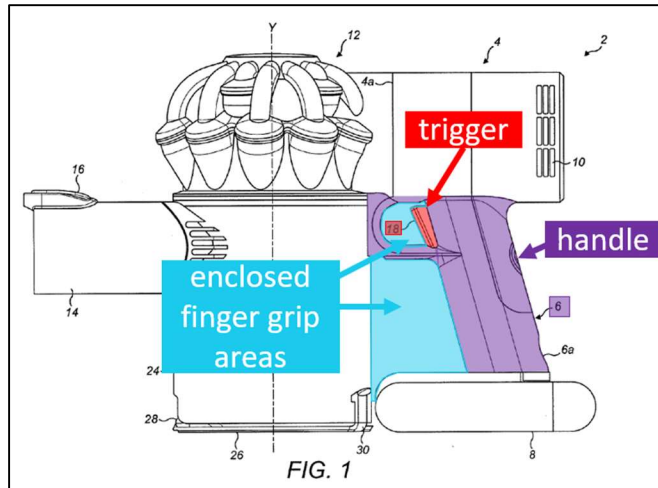


Ex1005, Figs. 5, 10, 10:16-27, 11:18-19, 12:4-12, 20:7-10, 29:1-22; *see also id.*, 29:25-29 (teaching that “the power trigger 1008 may be located ... in the foregrip” and describing another accidental device activation prevention method).

176. In my opinion, a POSA would have understood such handles also beneficially protect a user’s fingers from being pinched or injured by

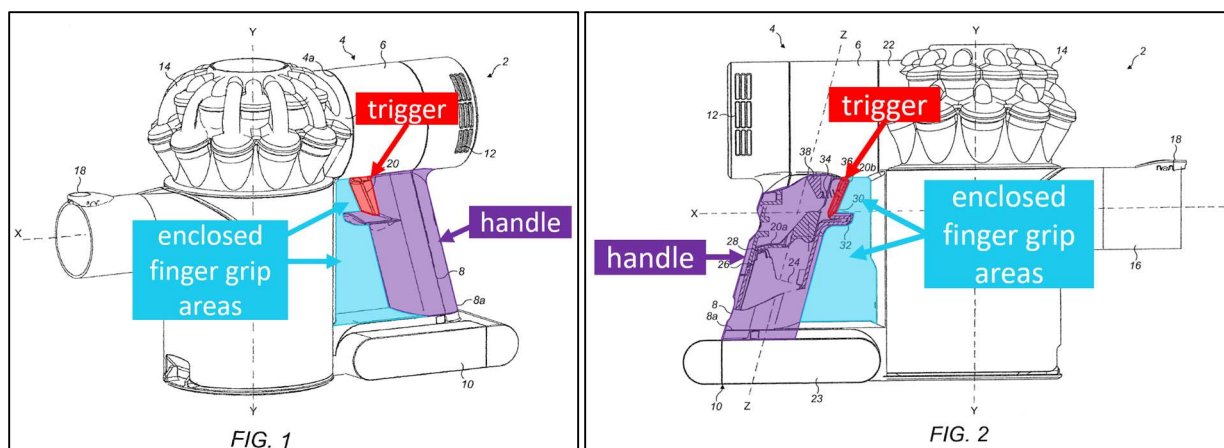
accidental contact with furniture, walls, stairs, or other obstacles, and would have understood that one of Butler's stated goals is preventing injury. Ex1005, 1:22-24 (addressing prior-art cleaners for which "unwieldy ergonomics" is "dangerous"), 28:18-20 (the prior art "tendency to keep the vacuum motor running at all times ... increases the risk of injury").

177. In my opinion, a POSA would have known that pistol-grip handles having enclosed finger grip areas provided on a forward side of the handle were well-known in the art to achieve the above benefits. For example, US2013/0160232, a patent publication published 18 months before the '983 Patent's earliest-claimed priority date, teaches a hand-held vacuum cleaner with "**handle 6** ... oriented in a pistol-grip formation" that, in my opinion, a POSA would have understood has **enclosed finger grip areas** on a forward side of the **handle** that protect the user's fingers from injury and protect against accidental activation of a finger-actuated "**trigger 18** for turning the vacuum cleaner motor on and off," as shown in the annotated figure below:



Ex1018 ¶27, Fig. 1.

178. Similarly, PCT Publication 2013/117901, a patent publication published 16 months before the '983 Patent's earliest-claimed priority date, teaches a hand-held vacuum cleaner with "**handle 8** ... oriented in a pistol-grip formation" and **enclosed finger grip areas** on a forward side of the **handle** (where the user "grasp[s] the **handle**") that, in my opinion, a POSA would have understood protect the user's fingers from injury and protect accidental activation of a finger-actuated "**trigger member 20**," including because a "plate-like finger rest 32 ... allows a user to grasp the **handle** without actuating the **trigger**, during carrying for example," as shown in the annotated figures below:



Ex1017, 5:17-18, 6:11-12, 7:31-8:4, 27:31-28:4, Figs. 1-2.

179. In my opinion, a POSA therefore would have been motivated to modify Butler's foregrips 330, 430 to incorporate one or more enclosed finger-grip areas (covering Butler's foregrip-located "power trigger"/"power switch" and/or covering all of Butler's foregrip grip portions) to achieve the above stated benefits of preventing accidental cleaner nuisance activation and injury. Further, in my opinion a POSA would have understood this modification involves a simple addition of a known element (an extension of foregrip 330, 430 enclosing "power trigger"/"power switch" and/or the entire handle) to obtain the predictable results of encasing and protecting the hand-grip portion of the handle and "shield[ing] the power switch to some degree from being accidentally activated," as Butler teaches. Ex1005, 11:18-19.

180. The above modification also would have at least been obvious to try at

least because it is one of a finite number of handle possibilities, including handles with exposed finger-grip areas and handles with enclosed finger-grip areas.

181. Therefore, in my opinion, a POSA would have reasonably expected success modifying Butler's foregrips as described at least for the reasons listed above. Further, Butler teaches that its foregrips can "include[] various features to enhance the ergonomics and control of the vacuum cleaner," and its handles "may be replaced by any combination of rear grip and foregrip that provide the user with hand positions to ergonomically maneuver the device," which in my opinion would have further given a POSA a reasonable expectation of success. Ex1005, 12:3-4, 19:6-12.

7. Butler Renders Obvious Claims [7]/[8]/[18]/[19]

Reference Number	Claim Limitation
[7]	“The surface cleaning apparatus of claim 1 wherein a projection of the pistol grip handle in a direction transverse to the cyclone axis of rotation intersects the suction motor and fan assembly.”
[8]	“The surface cleaning apparatus of claim 1 wherein a projection of the pistol grip handle in a direction transverse to the cyclone axis of rotation intersects a housing of the suction motor and fan assembly.”
[18]	“The surface cleaning apparatus of claim 1 wherein a projection of the pistol grip handle in a direction transverse to the cyclone axis of rotation intersects the suction motor and fan assembly.”
[19]	“The surface cleaning apparatus of claim 1 wherein a projection of the pistol grip handle in a direction transverse to the cyclone axis of rotation intersects a housing of the suction motor and fan assembly.”

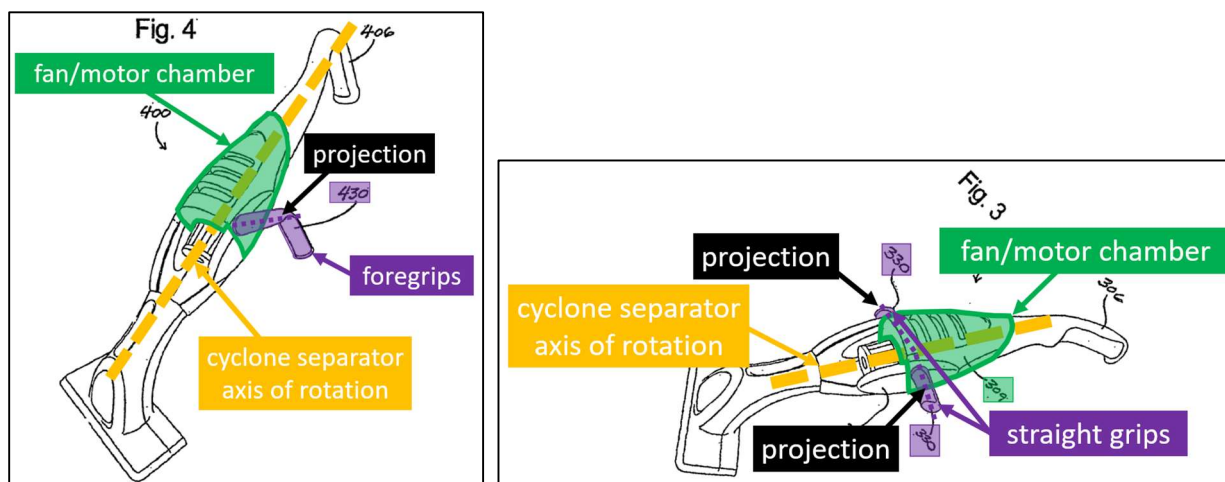
182. In my opinion, Butler teaches and renders obvious the surface cleaning apparatus of claim 1 wherein a projection of the pistol grip handle in a direction transverse to the cyclone axis of rotation intersects the suction motor and fan assembly. (Claims 7, 18).

183. In my opinion, Butler teaches and renders obvious the surface cleaning apparatus of claim 1 wherein a projection of the pistol grip handle in a direction transverse to the cyclone axis of rotation intersects a housing of the suction motor and fan assembly. (Claims 8, 19).

184. Butler teaches and renders obvious claim [1]. Ground 1, [1].

185. In my opinion, a POSA would have understood that a projection of Butler’s

pistol-grip handle (**foregrips 330, 430**) in a direction transverse to the cyclone axis of rotation (**cyclone separator axis of rotation**) intersects the suction motor and fan assembly and a housing of the suction motor and fan assembly (**fan/motor chamber 309**), as shown in the annotated figures below:



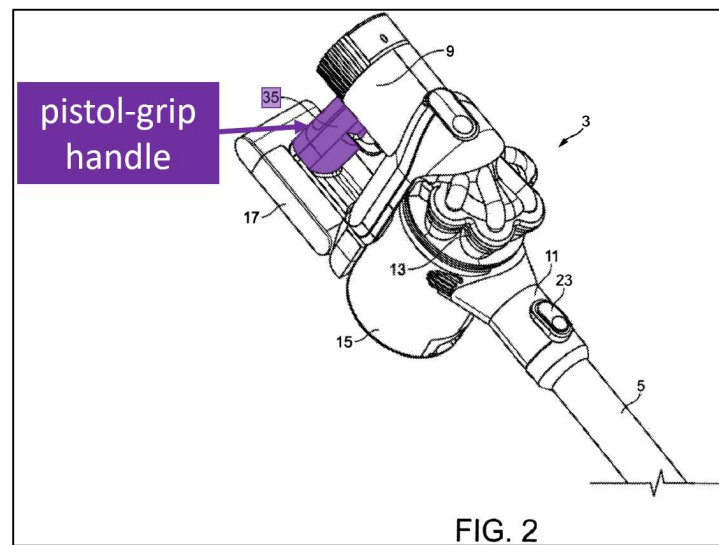
Ex1005, 19:18-24, Figs. 3-4; Ground 1, [1a.2]/[12a.2].

186. Further, Butler teaches that its “foregrips 330, 430 ... can be removed and inserted in various different locations on the housing,” including “at a location adjacent ... the fan/motor chamber 309,” which contains the “fan/motor,” and other locations at which in my opinion a POSA would have understood a projection of the pistol grip handle in a direction transverse to the cyclone axis of rotation intersects the suction motor and fan assembly and its housing. Ex1005, 19:18-26, 20:12-13.

187. Alternatively, for the reasons explained for Ground 1, [1c.2]/[12c.2], in my

opinion a POSA would have been motivated to modify Butler to locate Butler's pistol-grip handle at a location such that a projection of the pistol grip handle in a direction transverse to the cyclone axis of rotation intersects the suction motor and fan assembly and its housing, including to optimize Butler's weight balance and to increase ergonomics, usability, and comfort.

188. Locating vacuum cleaner components so as to optimize weight balance was well known in the art. As one example, Dyson146, published April 4, 2012, like Butler, discloses a handheld vacuum cleaner and further teaches positioning components so as to optimize the cleaner's center of gravity:



Ex1026, 8:15-17, Fig. 2.

189. Dyson146 teaches positioning components so as to optimize the vacuum cleaner's center of gravity: "[t]he motor casing 9 is provided at the upper

end of the pistol grip handle 35. Consequently, the weight of the motor inside the motor casing 9 is comfortably supported on top of a user's hand during use of the cleaner 1.” *Id.*, 8:15-17.

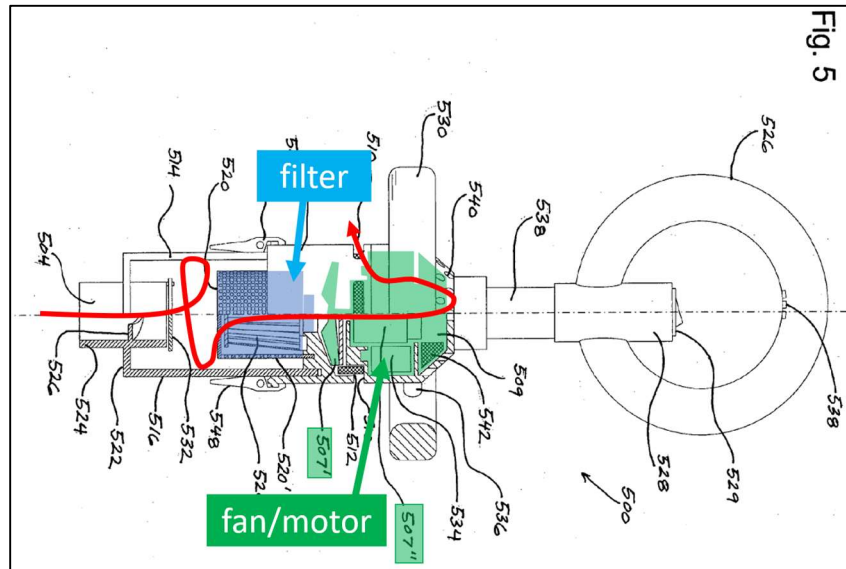
190. In my opinion a POSA would have reasonably expected success because Butler teaches that such handle-placement modifications can be done.

8. Butler Renders Obvious Claims [9]/[20]

Reference Number	Claim Limitation
[9]	“The surface cleaning apparatus of claim 2 further comprising a pre-motor filter, wherein the pre-motor filter is accessible when the cyclone unit is removed.”
[20]	“The surface cleaning apparatus of claim 14 further comprising a pre-motor filter, wherein the pre-motor filter is accessible when the cyclone unit is removed.”

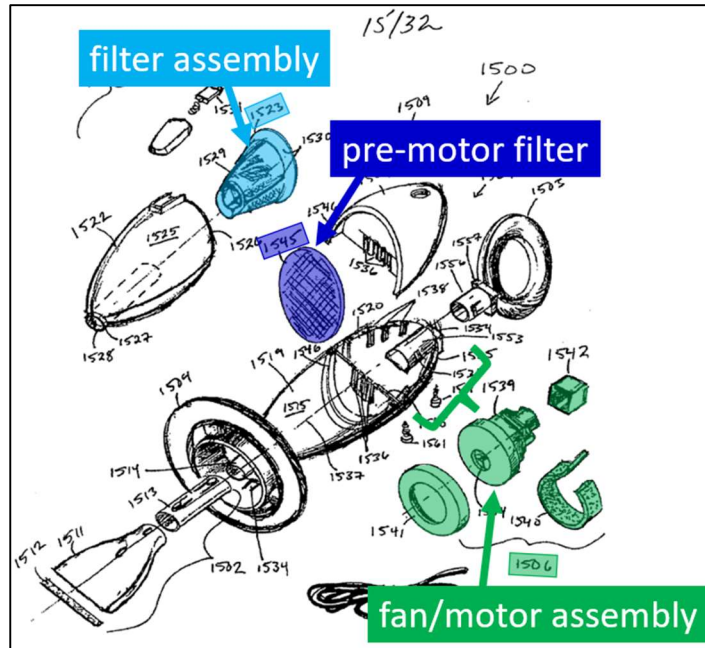
191. In my opinion, Butler teaches and renders obvious the surface cleaning apparatus of claim 2 further comprising a pre-motor filter, wherein the pre-motor filter is accessible when the cyclone unit is removed. (Claim 9).
192. In my opinion, Butler teaches and renders obvious the surface cleaning apparatus of claim 14 further comprising a pre-motor filter, wherein the pre-motor filter is accessible when the cyclone unit is removed. (Claim 20).
193. Butler teaches and renders obvious claims [2]/[14]. Ground 1, [2]/[14].
194. In my opinion, a POSA would have understood that Butler teaches a pre-motor filter. Butler teaches that its “**filter 520** compris[ing] ... **fine filter**

520' is positioned forward and upstream of “fan/motor 507,” and filters out “fine particle[s]” before the “working airflow” “cool[s] the motor 507,” as shown in the annotated figure below:



Ex1005, 20:14-26, 21:24-22:4, Fig. 5.

195. Butler further teaches that “filter assembly 1523 compris[ing] a filter 1529” and “pre-motor filter 1545” positioned forward and upstream of “fan/motor assembly 1506,” as shown in the annotated figure below:



Ex1005, 35:20-24, 36:5-7, Fig. 15.

196. In my opinion, a POSA would have understood that each of these filters (filter 520, filter assembly 1523, and pre-motor filter 1545) is a pre-motor filter because each filters air before it reaches the suction motor. Further, Butler teaches that “any alternative filter shape, material, construction or filtration grade may be used, and multiple filter layers may also be used.” Ex1005, 18:12-14. Therefore, in my opinion a POSA would have understood that Butler teaches various physical filters that filter air upstream of Butler’s motor, which are interchangeable pre-motor filters.

197. Butler also teaches a pre-motor filter that is accessible when the cyclone unit is removed. Butler teaches that when its “cyclone separator” is “remov[ed]” by unclamping “[a] set of over-center clamps 548,” “filter

Fig. 5

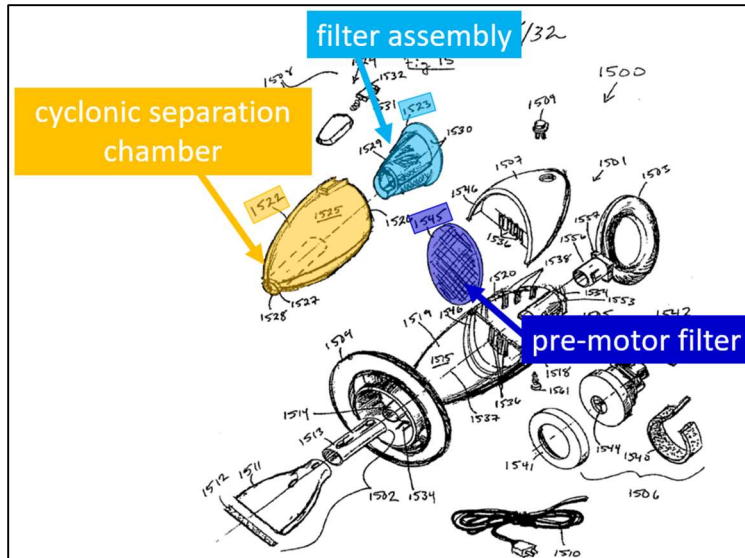
cyclone separator

clamps

filter

500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000

198. In my opinion, a POSA also would have understood that Butler teaches that when its “**cyclonic separation chamber**” is “remov[ed]” from “[t]he body 1505,” “**filter assembly 1523**” and “**pre-motor filter 1545**” are each accessible, as shown in the annotated figure below:



Ex1005, 35:12-16, 35:20-24, 36:2-7, Fig. 15

9. Butler Renders Obvious Claims [10]/[21]

Reference Number	Claim Limitation
[10]	“The surface cleaning apparatus of claim 9 wherein the pre-motor filter has a height in a direction transverse to the cyclone axis and the height is larger than a diameter of the cyclone.”
[21]	“The surface cleaning apparatus of claim 20 wherein the pre-motor filter has a height in a direction transverse to the cyclone axis and the height is larger than a diameter of the cyclone.”

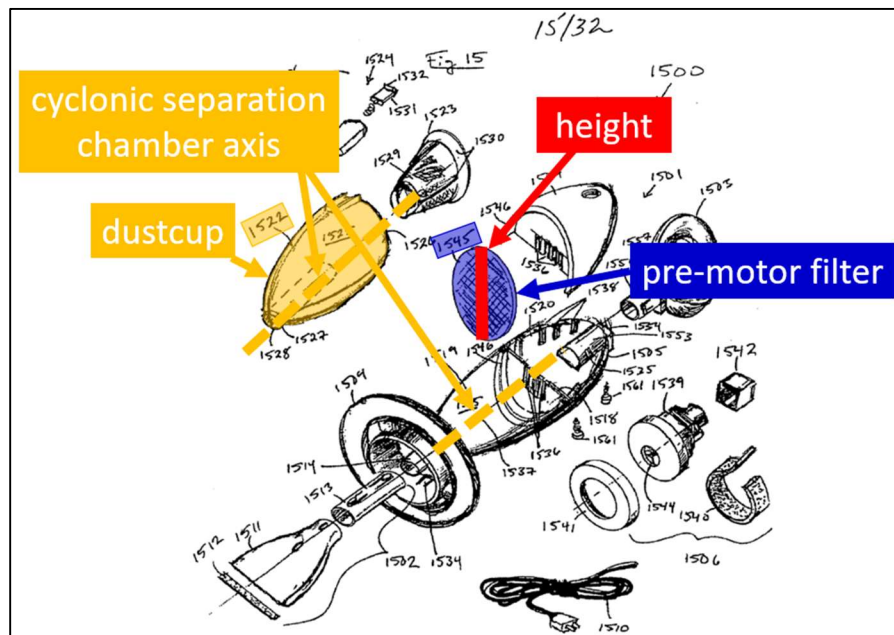
199. In my opinion, Butler teaches and renders obvious the surface cleaning apparatus of claim 9 wherein the pre-motor filter has a height in a direction transverse to the cyclone axis and the height is larger than a diameter of the cyclone. (Claim 10).

200. In my opinion, Butler teaches and renders obvious the surface cleaning apparatus of claim 20 wherein the pre-motor filter has a height in a

direction transverse to the cyclone axis and the height is larger than a diameter of the cyclone. (Claim 21).

201. Butler teaches and renders obvious claims [9]/[20]. Ground 1, [9]/[20].

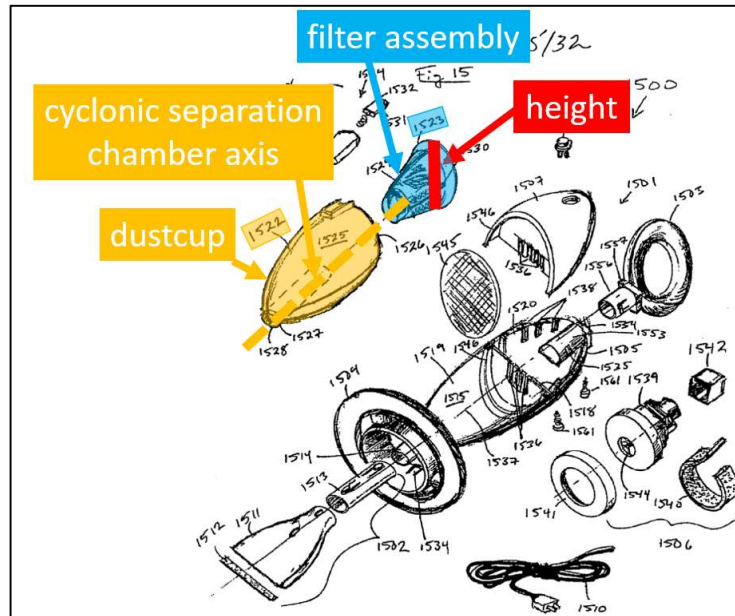
202. In my opinion, a POSA would have understood that Butler teaches a pre-motor filter having a height in a direction transverse to the cyclone axis. Butler teaches that its “**pre-motor filter 1545**” has a **height** in a direction transverse to “**dustcup 1522[’s]**” **cyclonic separation chamber axis**, as shown in the annotated figure below:



Ex1005, Fig. 15.

203. In my opinion, a POSA also would have understood Butler teaches that its “pre-motor filter 1545” has a height in a direction transverse to the cyclone axis when the “dustcup 1522” is mounted to the hand vacuum cleaner.

204. Butler teaches that its “**filter assembly 1523**” also has a height in a direction transverse to “**dustcup 1522[s]**” **cyclonic separation chamber axis**, as shown in the annotated figure below:

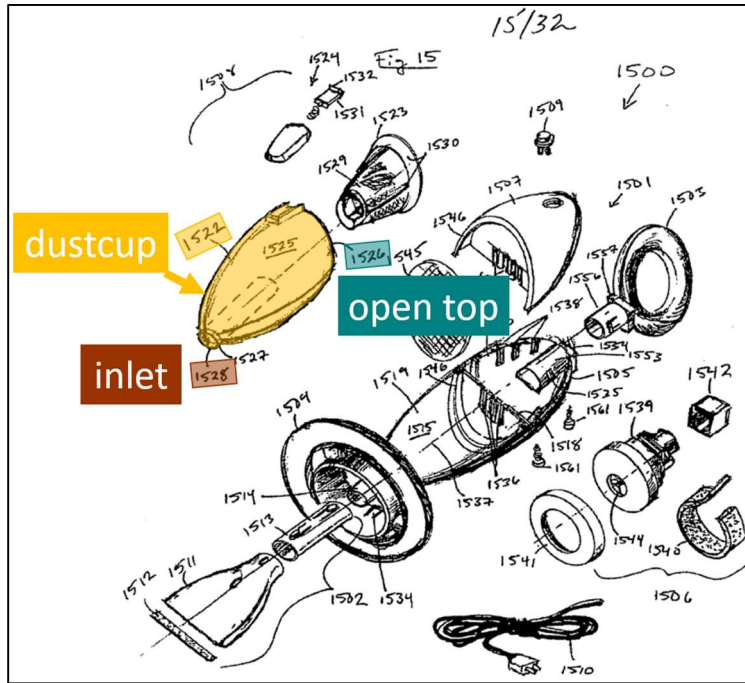


Ex1005, Fig. 15.

205. In my opinion, a POSA would have understood Butler teaches that its “filter assembly 1523” also has a height in a direction transverse to the cyclone axis when the “dustcup 1522” is mounted to the hand vacuum cleaner.

206. In my opinion, a POSA would have understood Butler to teach that its pre-motor filter height is larger than a diameter of the cyclone. Butler teaches that its “**dustcup 1522** comprises one or more sidewalls 1525 that form an **open top 1526** and taper to an **inlet 1528**,” as shown in the annotated figure

below:



Ex1005, 35:28-30, Fig. 15

207. In my opinion, a POSA would have understood the cyclone positioned in “dustcup 1522[’s]” “cyclonic separation chamber” necessarily has a diameter smaller than the height of “dustcup 1522[’s]” “sidewall” located at “open top 1526,” including because cyclonic airflow occurs within the “sidewall[s]” of “dustcup 1522.”

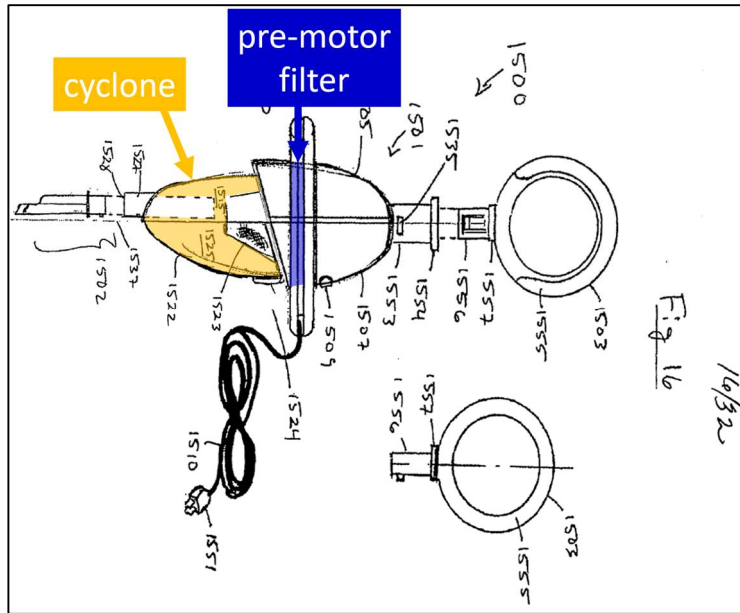
208. Further, “the filter assembly 1523 comprises a filter 1529 and a frame 1530” that “sealingly engages with the open top 1526.” Ex1005, 36:5-7. Butler teaches that its “pre-motor filter 1545” is positioned rearward of “filter assembly 1523” and covers “frame 1530.” *Id.*, 35:20-36:5, Fig. 15. Thus, in my opinion, a POSA would have understood the heights of

Butler's "filter assembly 1523" and "pre-motor filter 1545" are the same or larger than the height of "dustcup 1522['s]" "sidewall" located at "open top 1526," and therefore each of Butler's "filter assembly 1523" and "pre-motor filter 1545" have a height larger than a diameter of the cyclone contained within the "sidewall."

209. In my opinion, a POSA also would have understood that Butler teaches that its "filter assembly 1523" and "pre-motor filter 1545" each have a height that is larger than the cyclone diameter that is located at "dustcup 1522['s]" "taper[ed]" "inlet 1528," which "is generally smaller than the open top 1526," Ex1005, 35:28-36:2.
210. Therefore, in my opinion, a POSA would have understood that Butler teaches a pre-motor filter having a height that is larger than a diameter of the cyclone.
211. Furthermore, in my opinion a POSA would have understood that increasing the size of a vacuum cleaner filter (surface area and volume) increases the amount of air filtration and allows the filter to filter more particles before becoming clogged and therefore would have been motivated to increase the size of Butler's pre-motor filter 1545 to increase the amount of pre-motor filtration. Indeed, this was well known in the art. For example, U.S. Patent Publication No. 2011/0219570 to Conrad (herein

referred to as “Conrad570”), discloses a “surface cleaning apparatus” and further teaches that “[a] pre-motor filter reduces the level of entrained dirt that will reach the HEPA filter. However, the filter will become clogged with use. Increasing the surface area of the upstream side of the pre-motor filter extends the lifetime of the pre-motor filter.” Ex1031, Abstract, ¶ 33.

212. In my opinion, a POSA would have understood that this would have resulted in a pre-motor filter height larger than a diameter of the cyclone.
213. In my opinion, a POSA would have been motivated to increase the amount of pre-motor filtration to increase the overall amount of filtration to further protect the motor from damage by dirty air, and to decrease the resistance of airflow through the filter. In my opinion, a POSA further would have understood that “pre-motor filter 1545” could be increased by enlarging Butler’s “housing 502”/“fan motor housing 1520” to accommodate the larger “**pre-motor filter 1545**” and would have been motivated to do so, as shown in the modified figure below:



Ex1005, Fig. 16(modified).

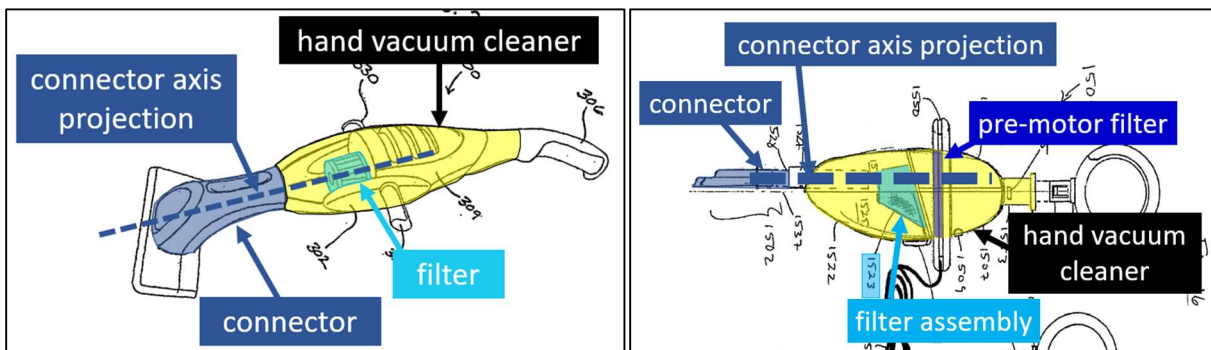
214. In my opinion, a POSA would have understood that when Butler is so modified, “**pre-motor filter 1545**” has a height larger than a diameter of the **cyclone**.

215. Further, in my opinion a POSA would have reasonably expected success making this modification because it would have involved modestly enlarging Butler’s pre-motor filter and rear housing components, which would have been straightforward.

10. Butler Renders Obvious Claims [13]

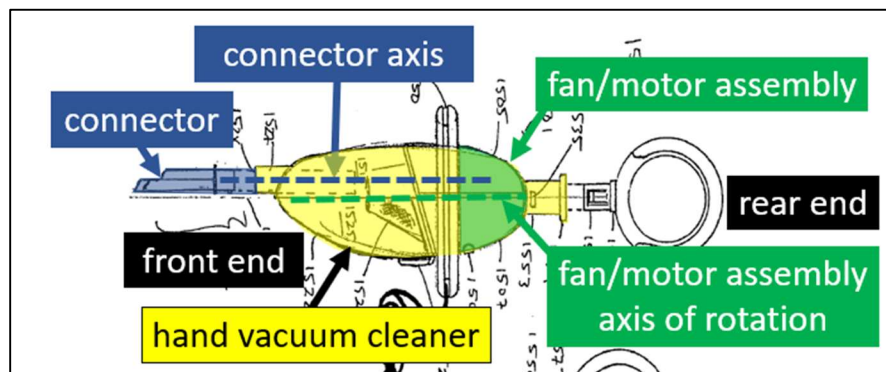
Reference Number	Claim Limitation
[13]	“The surface cleaning apparatus of claim 12 further comprising a pre-motor filter, wherein, when the hand vacuum cleaner is mounted to the downstream end of the rigid air flow conduit, a projection of the longitudinally extending conduit axis intersects the pre-motor filter.”

216. In my opinion, Butler teaches and renders obvious the surface cleaning apparatus of claim 12 further comprising a pre-motor filter, wherein, when the hand vacuum cleaner is mounted to the downstream end of the rigid air flow conduit, a projection of the longitudinally extending conduit axis intersects the pre-motor filter.
217. Butler teaches and renders obvious claim [12]. Ground 1, [12].
218. First, Butler teaches a pre-motor filter. Ground 1, [9]/[20].
219. Next, Butler teaches that when its hand vacuum cleaner is mounted to the downstream end of the rigid air flow conduit (Ground 1, [1c.1]/[12c.1.i], [12c.1.ii]), a projection of Butler's longitudinally extending conduit axis intersects the pre-motor filter, as shown in the annotated figures below:

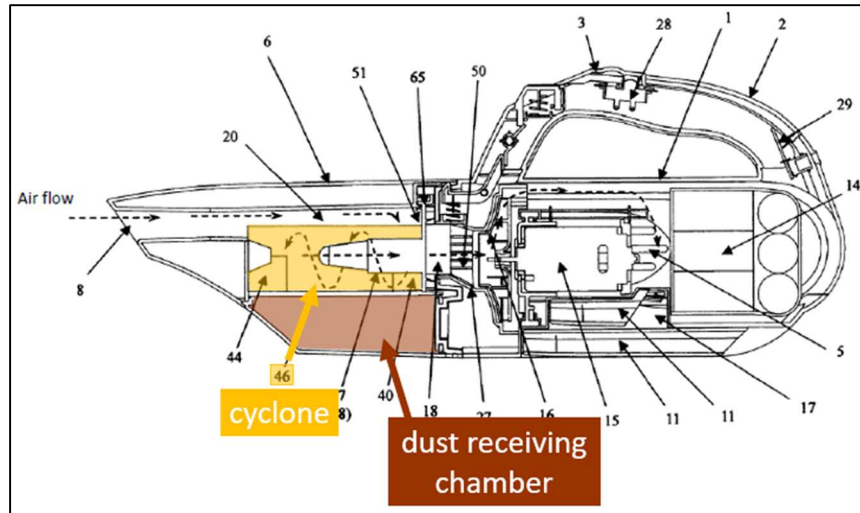


cleaner in front of the rear end of the hand vacuum cleaner, the suction motor axis of rotation is vertically spaced from the longitudinally extending conduit axis.

222. Butler teaches and renders obvious claim [12]. Ground 1, [12].
223. In my opinion, a POSA would have understood that Butler teaches that when its hand vacuum cleaner is mounted to the downstream end of the rigid air flow conduit and is positioned with the hand vacuum cleaner front end in front of the hand vacuum cleaner rear end, Butler's suction motor axis of rotation is vertically spaced from the longitudinally extending conduit axis, as shown in the annotated figure below:

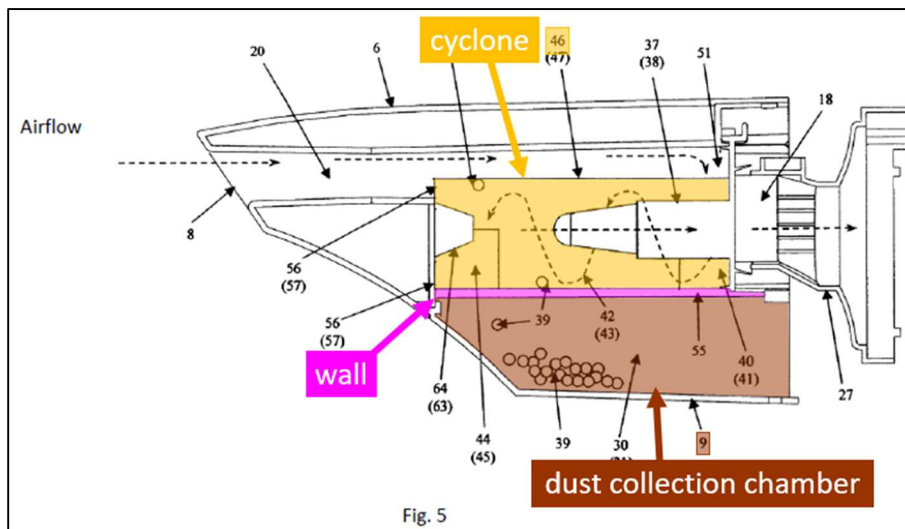


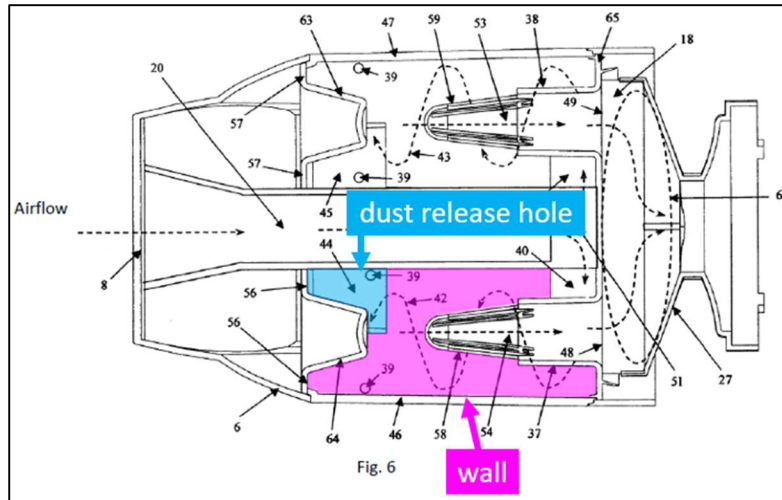
Ex1005, Fig. 16; Ground 1, [1a.2]/[12a.2], [1c.1]/[12c.1.i], [12c.1.ii], [1c.5];
Ex1005, 16:25-28 (teaching interchangeable components).



Ex1015, Abstract, 4, Fig. 3.

226. Jianan further teaches a “**wall 55**” that separates “**cyclone 46**” and the “independent **dust collection chamber 9**,” as shown in the annotated figures below:

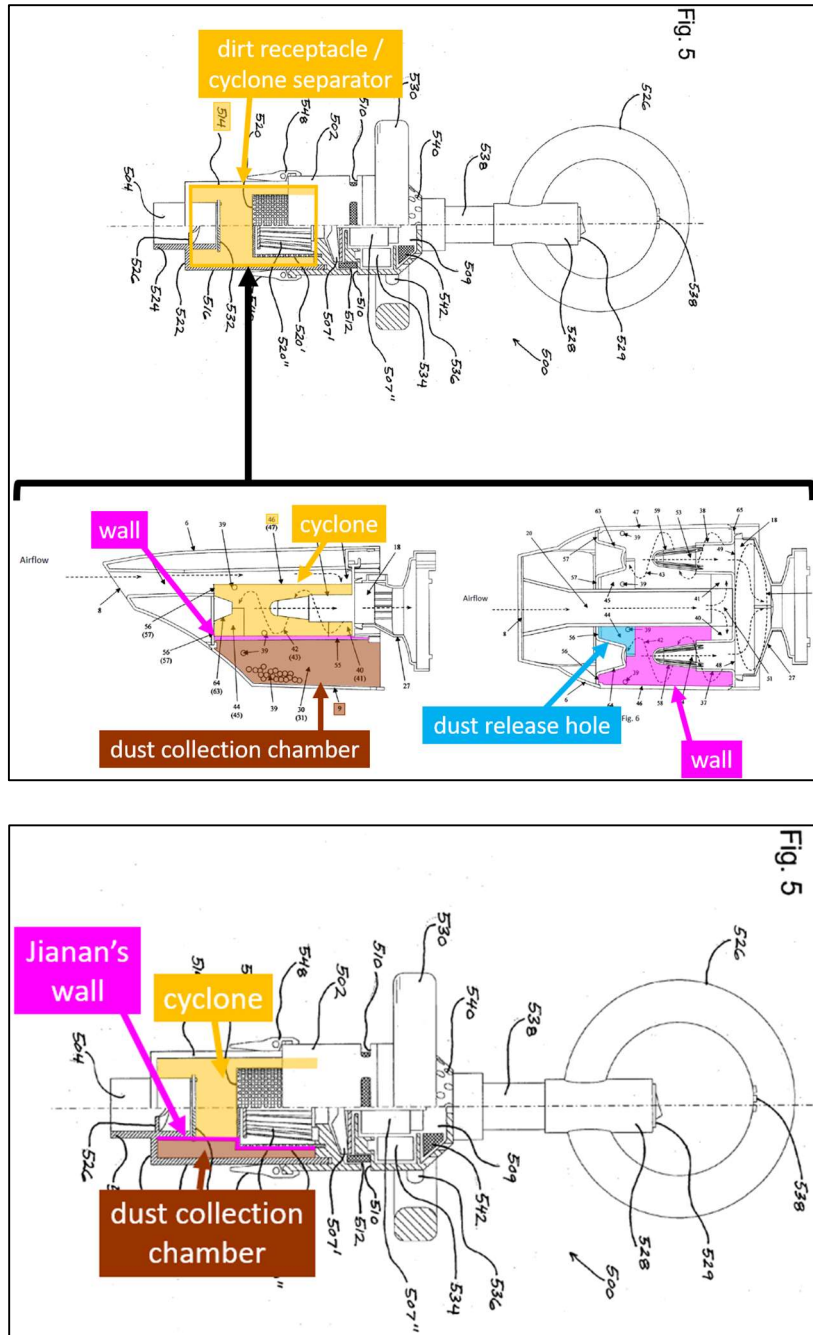




Ex1015, 9-10, Figs. 5-6. The “**dust collection chamber 9** is connected to the cyclone body via the **dust release hole**.” Ex1015, 9.

b. A POSA Would Have Been Motivated to Combine the Teachings of Butler And Jianan

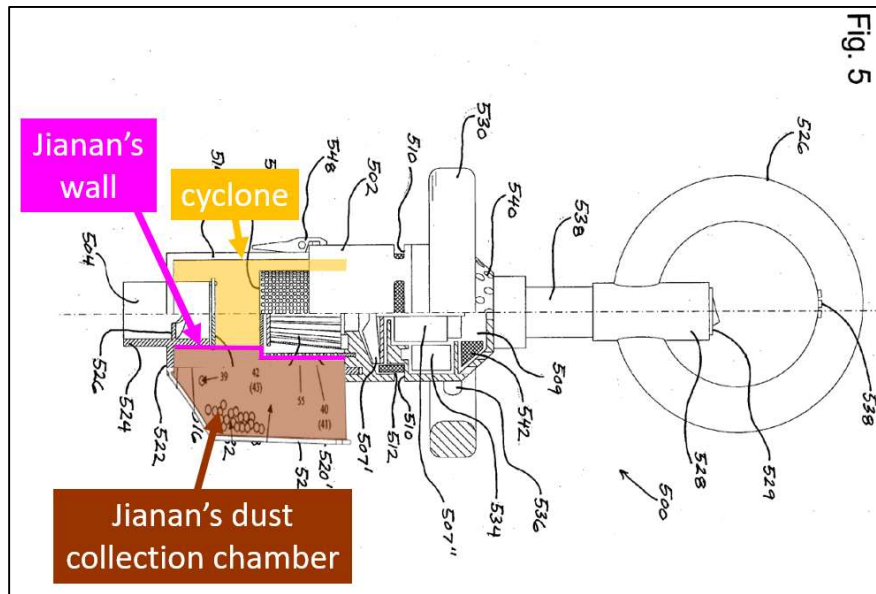
227. In my opinion, a POSA would have been motivated to modify Butler to achieve the benefits of Jianan’s cyclonic-separation system having an independent dust-collection chamber in multiple ways. For example, in my opinion a POSA would have been motivated to modify Butler’s “**dirt receptacle** compris[ing] a **cyclone separator**” to have an “independent **dust collection chamber**,” oriented and functioning in the same way that Jianan teaches—by separating the “**cyclone**” chamber from the “independent **dust collection chamber**” using a horizontal “**wall**” with a “**dust release hole**,” as shown in the modified figures below:



Ex1005, Figs. 5, 5(modified); Ex1015, Figs. 5-6, 5(modified).

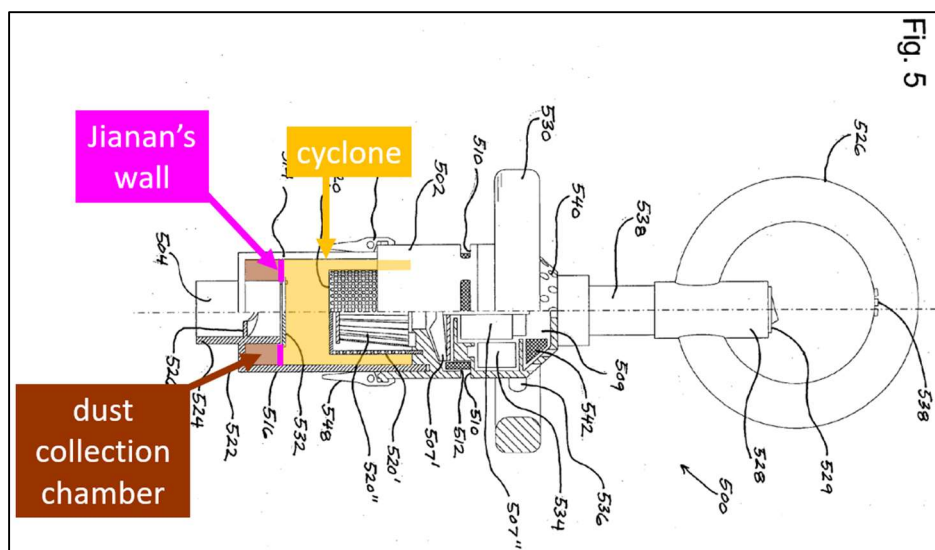
228. Furthermore, in my opinion, a POSA also would have been motivated to modify Butler's “**dirt receptacle** compris[ing] a **cyclone separator**” to include an extended “independent **dust collection chamber**” and a

horizontal “**wall**” as Jianan teaches, as shown in the modified figure below:



Ex1005, Fig. 5(modified); Ex1015, Fig. 5(modified).

229. In my opinion, a POSA also would have been motivated to modify Butler’s “**dirt receptacle** compris[ing] a **cyclone separator**” to have an “independent **dust collection chamber**” separated from the cyclone chamber by a vertically oriented “**wall**,” as shown in the modified figure below:



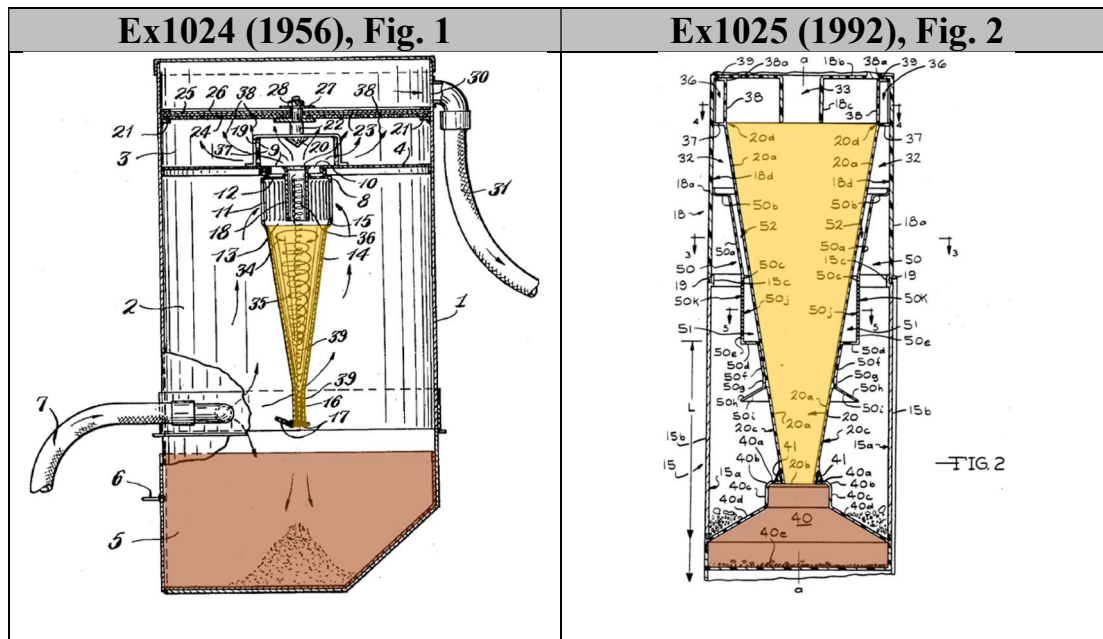
Ex1005, Fig. 5(modified); Ex1015, Fig. 5(modified).

230. In my opinion, a POSA would have been motivated to combine Butler and Jianan as described for multiple reasons.

231. **First**, in my opinion a POSA would have understood that Butler and Jianan are analogous art. Like Butler, which teaches a hand vacuum cleaner with a removable cyclone unit (“dirt receptacle compris[ing] a cyclone separator” is “remov[ed]” by unclamping “[a] set of over-center clamps 548”) and an openable door (“dirt receptacle 214 may be covered by an access panel or door” to “facilitate the chamber’s emptying”), Ex1005, 18:26-30, 21:8-23, claim 11, Jianan teaches a “handheld vacuum cleaner” with a removable cyclone unit (“detachable dust cup part” “includes” “two parallel cyclones and separate dust receiving chambers”) and an openable door (“dust [collection] chamber has ... an opening and closing device

such as a door or the like”), Ex1015, Abstract, 4, claim 3.

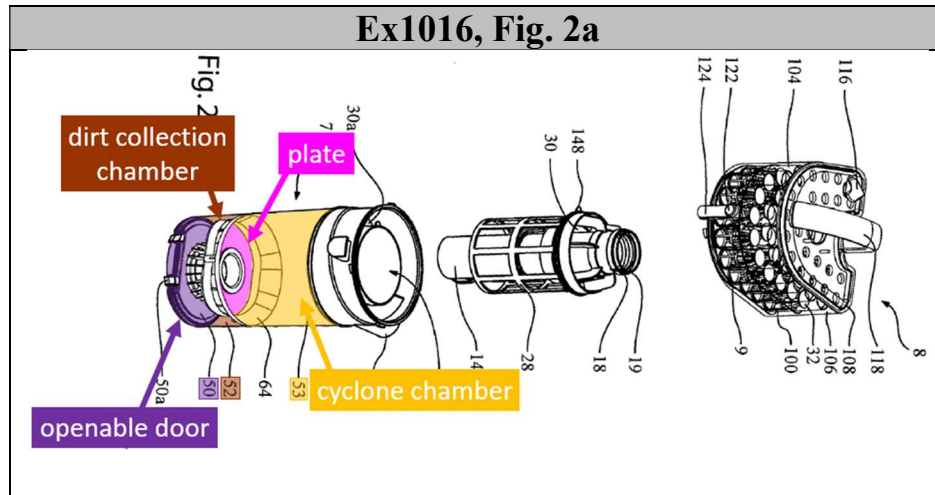
232. ***Second***, in my opinion a POSA would have understood that Butler and Jianan each provide motivations for this combination. While Butler discloses several cyclonic embodiments, Ex1005, 18:3-14, 22:14-25, 36:2-4, Butler explains that its vacuum “may alternatively comprise[] any known type of dirt separation and retention system,” and that such “variations will be apparent to those of ordinary skill in the art in view of the present disclosure and with routine experimentation with the invention.” *Id.*, 8:26-27, 19:1-3. In my opinion, a POSA would have therefore looked for “known type[s] of dirt separation and retention system[s]” to supplement Butler’s teachings, including a cyclone unit with a **cyclone chamber** and an **independent dirt-collection chamber**, as Jianan teaches, and in my opinion as a POSA would have known existed for 50+ years before the ’983 Patent, as shown in the annotated figures below:



233. In my opinion, a POSA would have understood cyclone units with this exterior dirt-collection chamber had certain benefits, including: (1) improved separation, because large dust particles no longer interfere with the cyclonic airflow, (2) improved suction, because less dust accumulates in the filter, and (3) reduced recurring pre-filter cleaning and replacement, because less debris reaches the pre-motor filter. Jianan itself teaches two benefits to this design: (1) because “the cyclone system is designed to collect dust 39 in an independent dust collection chamber 9,” “most of the dust ... separated through the cyclone” will remain in the “dust collection chamber,” and “users will not have to clean the filter as often,” and (2) because “only a small amount of dust (mainly very fine dust) will ... enter the filter,” “users ... will experience constant suction power” and

“improvement[s]” in “the efficiency of the cyclone.” Ex1015, 5, 10.

234. **Third**, in my opinion a POSA would have understood these benefits could be achieved by implementing Jianan’s independent dust-collection chamber teachings in various ways, as shown in the figures above. Each configuration provides additional benefits for different uses that, in my opinion, would have further motivated a POSA to modify Butler. In my opinion, a POSA would have understood implementing a horizontal “wall” is beneficial for cleaning vertical surfaces, and a vertical “wall” is beneficial for cleaning horizontal surfaces (both Butler’s stated objectives, Ex1005, 7:2-5), because, when so oriented during those use-cases, gravity causes the dust to collect in the correspondingly oriented independent dust-collection chamber. Implementing a vertical “wall” would also make it easier and more hygienic to empty the dust-collection chamber, because it would be provided adjacent to Butler’s openable front door. Ex1005, 18:26-30, 21:8-23. Furthermore, vacuum cleaners with this configuration were well-known in the art, which in my opinion would have further motivated a POSA and provided a reasonable expectation of success, including as shown in US2007/0209335, as shown in the annotated figure below:



235. In my opinion, a POSA also would have understood that implementing a horizontal “wall” and an enlarged dust-collection chamber enables longer periods of operation because the vacuum can hold more dust.
236. **Fourth**, in my opinion a POSA would have understood that this combination would have involved a simple substitution of known elements to obtain predictable results. Butler teaches a cyclone unit with an integrated dirt-collection chamber/cyclone chamber. Ex1005, Fig. 5. Jianan teaches a cyclone unit with a cyclone chamber separated from a dirt-collection chamber by a wall. Ex1015, Figs. 5-6. In my opinion, a POSA therefore would have understood the simple substitution of an integrated dirt-collection chamber for a separated one would achieve the predictable result of more efficient cyclonic air filtration and reduced pre-filter maintenance.

237. In my opinion, a POSA also would have been motivated to make the combination because Butler and Jianan are directed to hand vacuums having a similar orientation of cyclone unit relative to the overall vacuum configuration, as shown above.

c. A POSA Would Have Had A Reasonable Expectation of Success Combining the Teachings of Butler And Jianan

238. In my opinion, a POSA would have reasonably expected success for the reasons stated above. Ex1015, 10; Ex1005, claim 11. Further, as explained above, in my opinion a POSA would have understood that Butler and Jianan are very similar, including because they are both hand vacuums having similar orientations and removable cyclonic-separation units with openable doors for emptying, which, in my opinion, would have further given a POSA a reasonable expectation of success. Ex1005, 18:26-30, 21:8-15, claim 11, Fig. 5; Ex1015, Abstract, 4, claim 3, Figs. 3, 5-6.

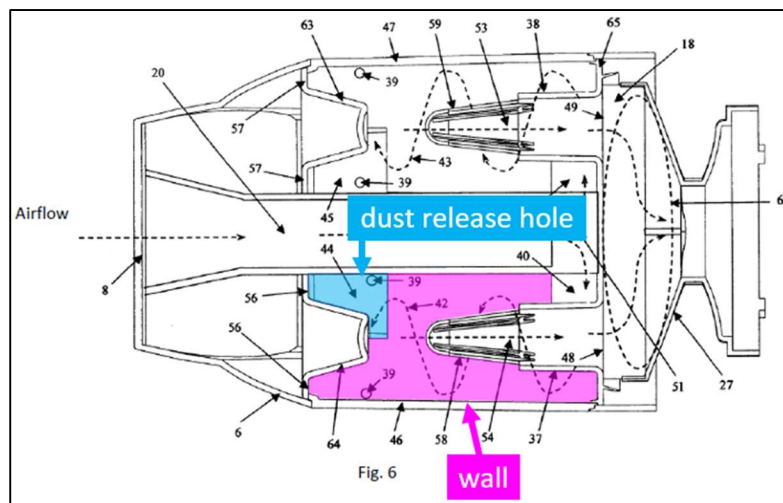
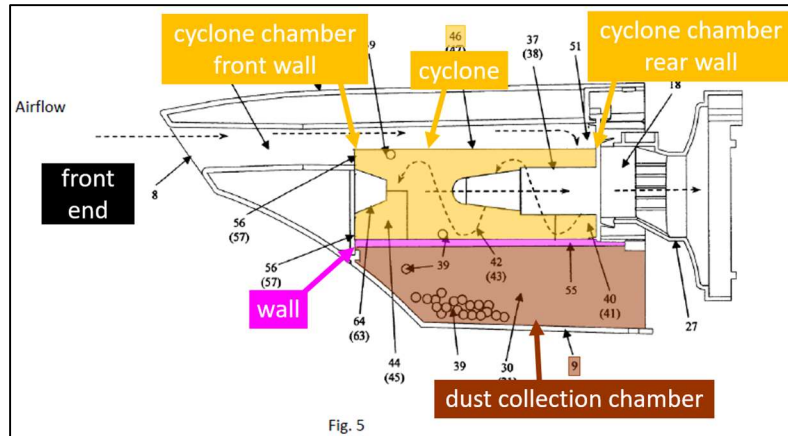
**2. Butler in combination with Jianan Renders Obvious Claims
[3]/[16]**

Reference Number	Claim Limitation
[3]	“The surface cleaning apparatus of claim 1 wherein the cyclone chamber has a sidewall extending between front and rear walls of the cyclone chamber and, when the hand vacuum cleaner is positioned with the front end of the hand vacuum cleaner in front of the rear end of the hand vacuum cleaner, the cyclone axis of rotation positioned horizontally, and the dirty air inlet faces forwardly, the sidewall extends generally horizontally and a dirt outlet is provided in a lower portion of the sidewall and is in communication with a dirt collection chamber that is exterior to the cyclone chamber.”
[16]	“The surface cleaning apparatus of claim 12 wherein the cyclone chamber has a sidewall extending between front and rear walls of the cyclone chamber and, when the hand vacuum cleaner is positioned with the front end of the hand vacuum cleaner in front of the rear end of the hand vacuum cleaner, the cyclone axis of rotation is positioned horizontally, and the dirty air inlet faces forwardly, the sidewall extends generally horizontally and a dirt outlet is provided in a lower portion of the sidewall and is in communication with a dirt collection chamber that is exterior to the cyclone chamber.”

239. In my opinion, Butler in combination with Jianan renders obvious the surface cleaning apparatus of claim 1 wherein the cyclone chamber has a sidewall extending between front and rear walls of the cyclone chamber and, when the hand vacuum cleaner is positioned with the front end of the hand vacuum cleaner in front of the rear end of the hand vacuum cleaner, the cyclone axis of rotation positioned horizontally, and the dirty air inlet faces forwardly, the sidewall extends generally horizontally and a dirt

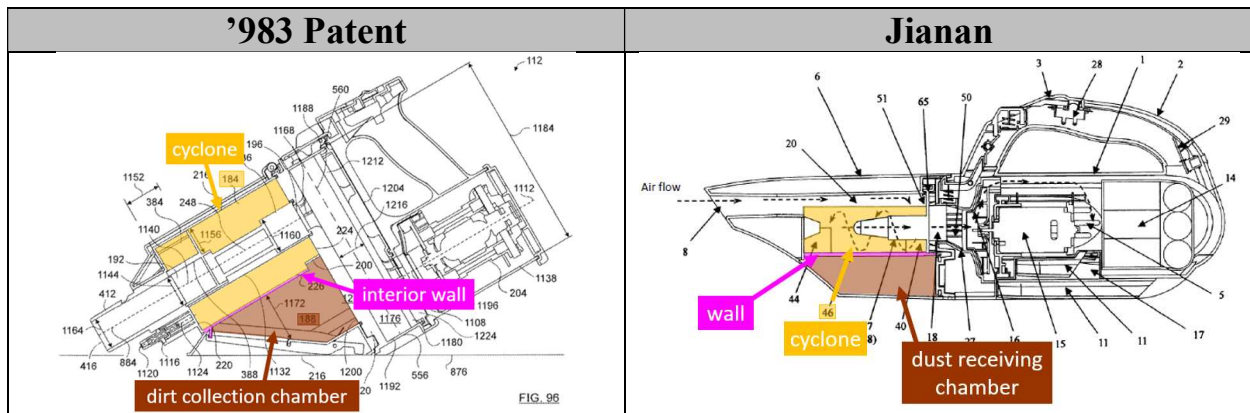
- outlet is provided in a lower portion of the sidewall and is in communication with a dirt collection chamber that is exterior to the cyclone chamber. (Claim 3).
240. In my opinion, Butler in combination with Jianan renders obvious the surface cleaning apparatus of claim 12 wherein the cyclone chamber has a sidewall extending between front and rear walls of the cyclone chamber and, when the hand vacuum cleaner is positioned with the front end of the hand vacuum cleaner in front of the rear end of the hand vacuum cleaner, the cyclone axis of rotation is positioned horizontally, and the dirty air inlet faces forwardly, the sidewall extends generally horizontally and a dirt outlet is provided in a lower portion of the sidewall and is in communication with a dirty collection chamber that is exterior to the cyclone chamber. (Claim 16).
241. The Butler-Jianan combination teaches and renders obvious claims [1]/[12] for the same reasons Butler does. Ground 1, [1]/[12].
242. First, in my opinion a POSA would have understood Butler teaches a hand vacuum cleaner comprising a cyclone chamber. Ground 1, [1a.2]/[12a.2].
243. In my opinion, a POSA would have understood Jianan teaches a sidewall extending between front and rear walls of a cyclone chamber that extends generally horizontally when the hand vacuum cleaner is positioned with its

front end in front of its rear end, the cyclone axis of rotation is positioned horizontally, and the dirty air inlet faces forwardly, and a dirt outlet is provided in a lower portion of the sidewall and is in communication with a dirt-collection chamber that is exterior to the cyclone chamber. Jianan's "wall 55" that separates "cyclone 46" (which in my opinion a POSA would have understood is positioned in a cyclone chamber) from "independent dust collection chamber 9," as shown in the annotated figures below:



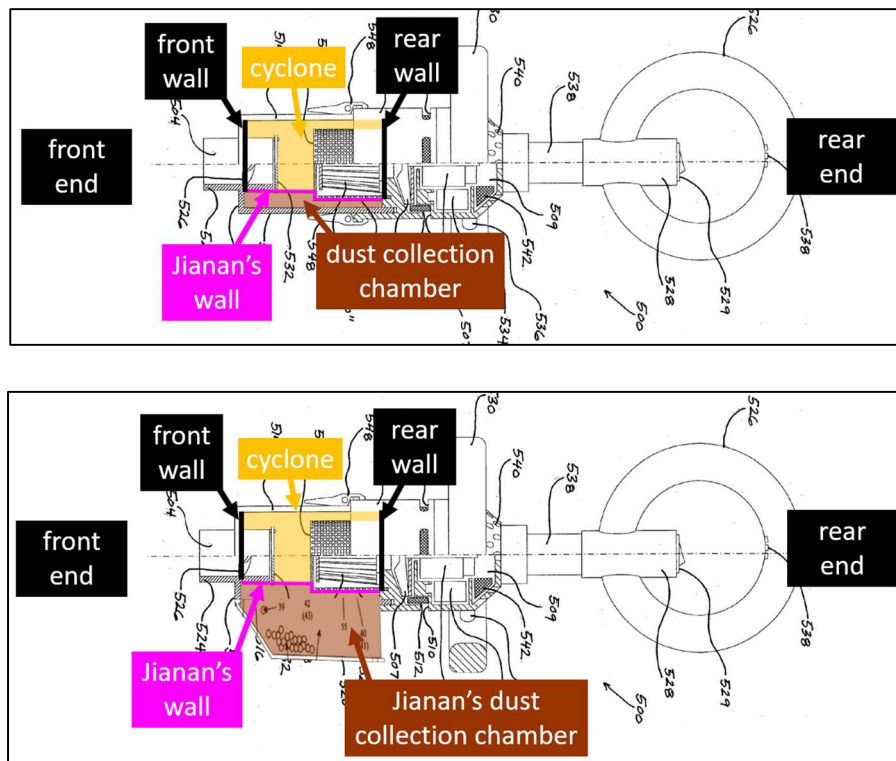
Ex1015, 9-10, Figs. 5-6.

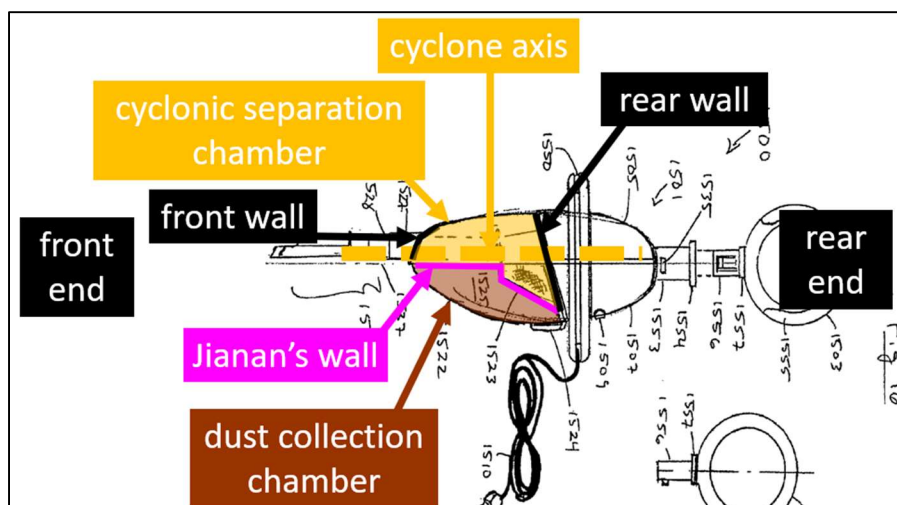
244. Jianan further teaches a “**dust collection chamber 9** is connected to the cyclone body via the **dust release hole**.” Ex1015, 9. “Dust particles escape into the hole cutout” and “most of the dust collects in [the] separate dust receiving chamber.” *Id.*, 4-5. Jianan also teaches that “[t]his invention uses an independent dust storage device located far away from the cyclone, and cooperates with an efficient cyclone system.” *Id.* at 10. Therefore, in my opinion a POSA would have understood “wall 55” is a sidewall extending between front and rear walls of the cyclone chamber, “independent dust collection chamber 9” is a dirt-collection chamber that is exterior to “cyclone 46” positioned in a cyclone chamber, and “dust release hole” is a dirt outlet provided in a lower portion of the side wall that is in communication with the dirt-collection chamber.
245. In my opinion, a POSA also would have understood “dust release hole” is provided at a lower portion of “wall 55” to facilitate “[d]ust particles escap[ing] into the hole cutout” with gravity. Ex1015, 4-5. Further, this is at least as much disclosure of these limitations as the ’983 Patent, as shown in the annotated figures below:



Ex1001, Fig. 96; Ex1015, Fig. 3; Ex1001, 12:41-42 (“As shown, a common interior wall 226 may divide cyclone chamber 184 from dirt collection chamber 188.”).

246. Therefore, the Butler-Jianan combination teaches this limitation, as shown in the modified figures below:





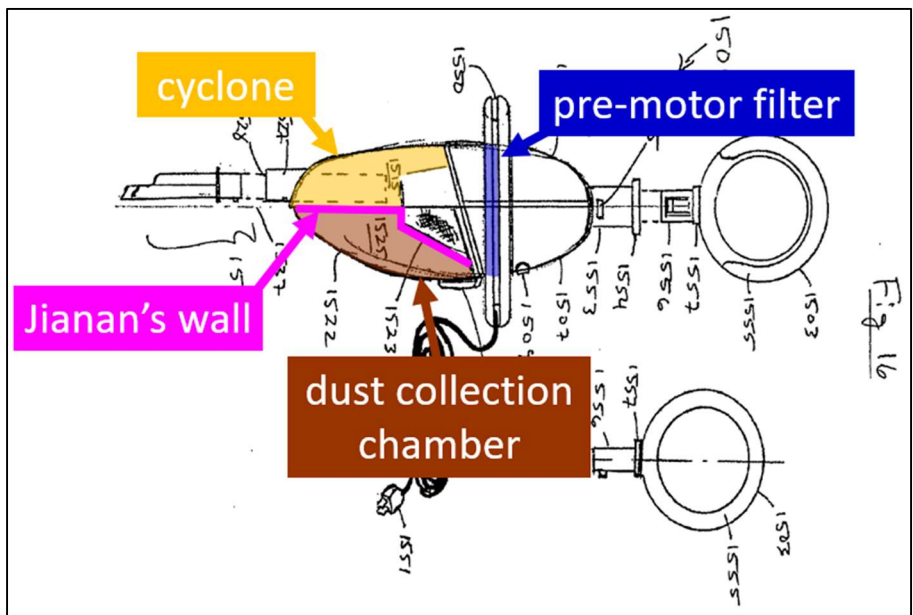
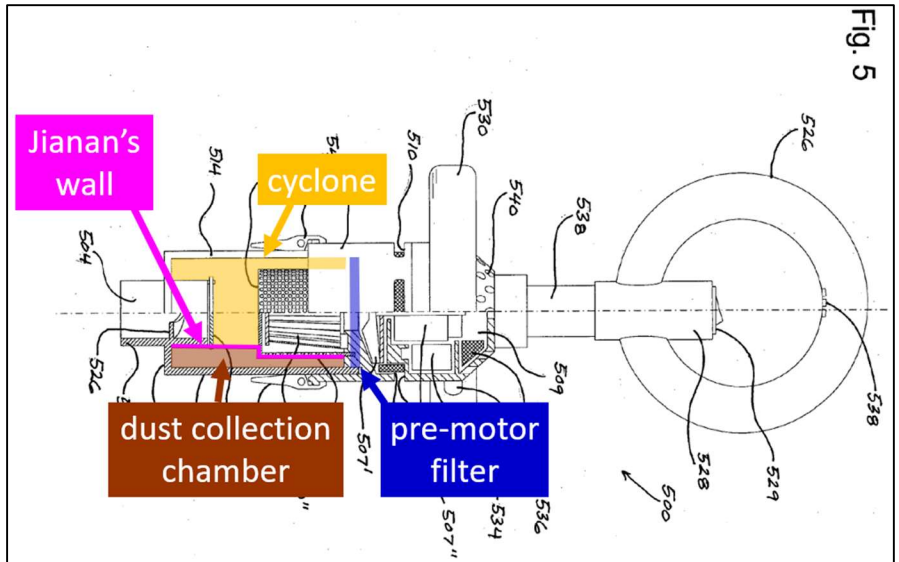
Ex1005, Figs. 5(modified), 16(modified); Ex1015, Fig. 5(modified); Ground 2, §1.

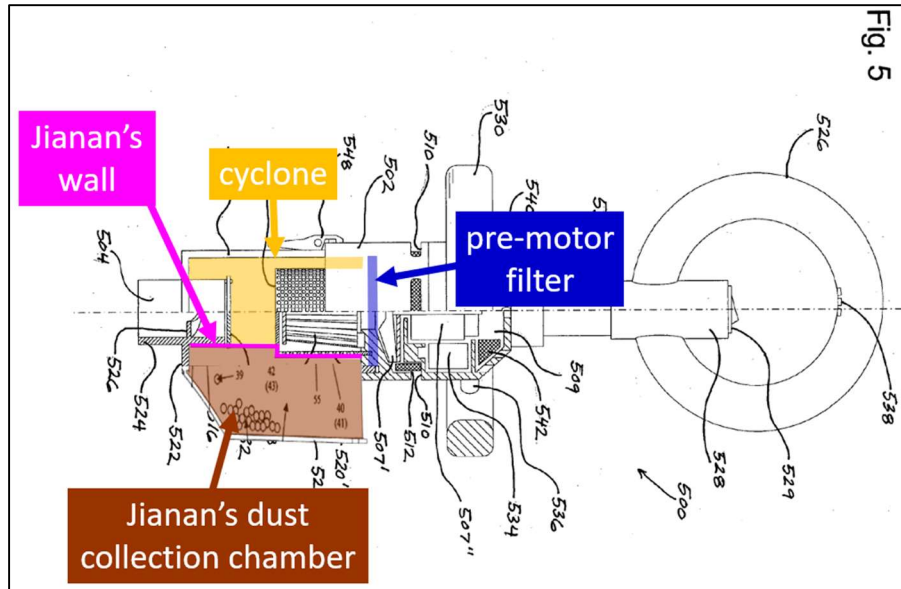
247. Further, in my opinion a POSA would have understood that if modifying Butler in view of Jianan moves the cyclone axis, it continues to extend in a forward/rearward direction, remains generally horizontal when oriented as shown in the modified figures above, and remains parallel to the suction motor axis and longitudinally extending conduit axis, meeting claims 1 and 12. Ground 1, [1]/[12].

3. Butler in combination with Jianan Renders Obvious Claims [10]/[21]

Reference Number	Claim Limitation
[10]	“The surface cleaning apparatus of claim 9 wherein the pre-motor filter has a height in a direction transverse to the cyclone axis and the height is larger than a diameter of the cyclone.”
[21]	“The surface cleaning apparatus of claim 20 wherein the pre-motor filter has a height in a direction transverse to the cyclone axis and the height is larger than a diameter of the cyclone.”

248. In my opinion, Butler in combination with Jianan renders obvious the surface cleaning apparatus of claim 9 wherein the pre-motor filter has a height in a direction transverse to the cyclone axis and the height is larger than a diameter of the cyclone. (Claim 10).
249. In my opinion, Butler in combination with Jianan renders obvious the surface cleaning apparatus of claim 20 wherein the pre-motor filter has a height in a direction transverse to the cyclone axis and the height is larger than a diameter of the cyclone. (Claim 21).
250. The Butler-Jianan combination teaches and renders obvious claims [9]/[20] for the same reasons Butler does. Ground 1, [9]/[20].
251. In my opinion, a POSA would have understood that, in the Butler-Jianan combination, the height of **pre-motor filter 1545** is larger than a diameter of the **cyclone**, which is contained in the cyclone chamber, as shown in the modified figures below:





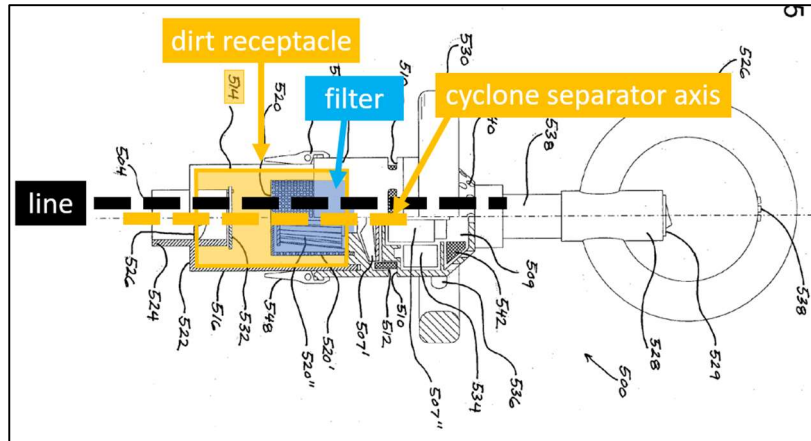
Ex1005, Figs. 5(modified), 16(modified); Ex1015, Fig. 5(modified).

4. Butler in combination with Jianan Renders Obvious Claims [11]/[22]

Reference Number	Claim Limitation
[11]	“The surface cleaning apparatus of claim 10 further comprising a dirt collection chamber that is exterior to the cyclone chamber and a line that is parallel to the cyclone axis extends through the dirt collection chamber and the pre-motor filter.”
[22]	“The surface cleaning apparatus of claim 21 further comprising a dirt collection chamber that is exterior to the cyclone chamber and a line that is parallel to the cyclone axis extends through the dirt collection chamber and the pre-motor filter.”

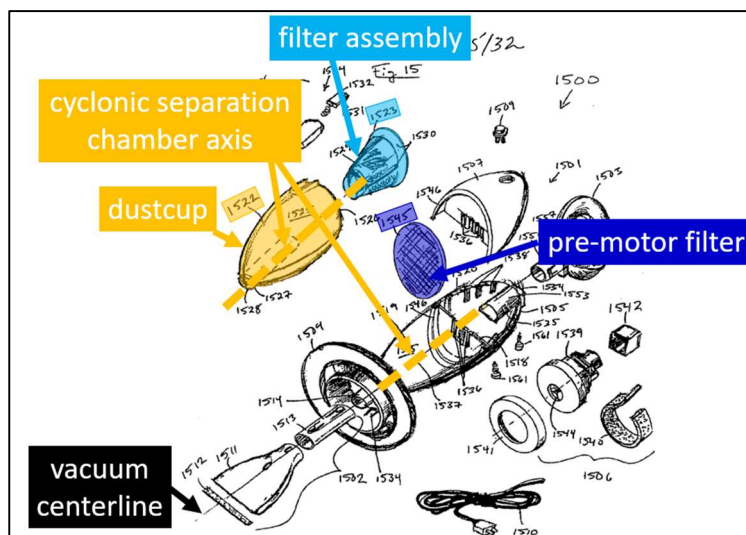
252. In my opinion, Butler in combination with Jianan renders obvious surface cleaning apparatus of claim 10 further comprising a dirt collection chamber that is exterior to the cyclone chamber and a line that is parallel to the cyclone axis extends through the dirt collection chamber and the pre-

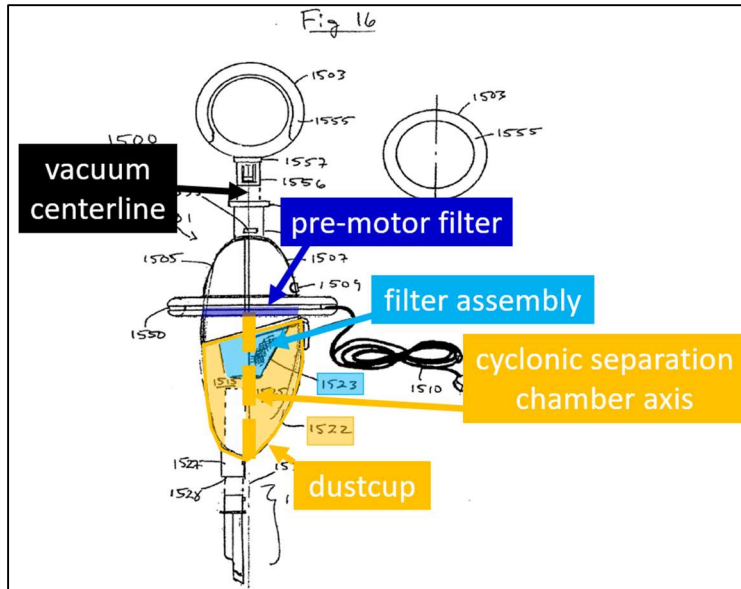
- motor filter. (Claim 11).
253. In my opinion, Butler in combination with Jianan renders obvious surface cleaning apparatus of claim 21 further comprising a dirt collection chamber that is exterior to the cyclone chamber and a line that is parallel to the cyclone axis extends through the dirt collection chamber and the pre-motor filter. (Claim 22).
254. The Butler-Jianan combination teaches and renders obvious claims [10]/[21] for the same reasons Butler does. Ground 1, [10]/[21].
255. First, in my opinion a POSA would have understood the Butler-Jianan combination teaches a dirt-collection chamber that is exterior to the cyclone chamber. Ground 2, [3]/[16].
256. In my opinion, a POSA further would have understood Butler to teach a **line** that is parallel to the cyclone axis (**cyclone separator axis**) extends through the dirt-collection chamber (“**dirt receptacle 514**”) and the pre-motor filter (“**filter 520**”), as shown in the annotated figure below:



Ex1005, Fig. 5.

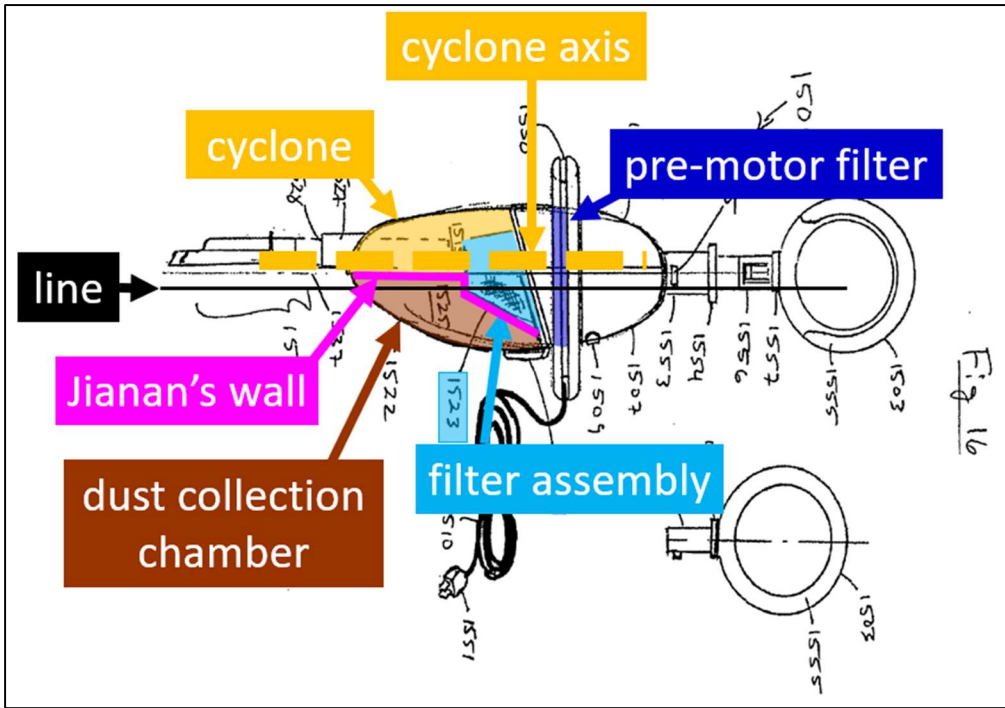
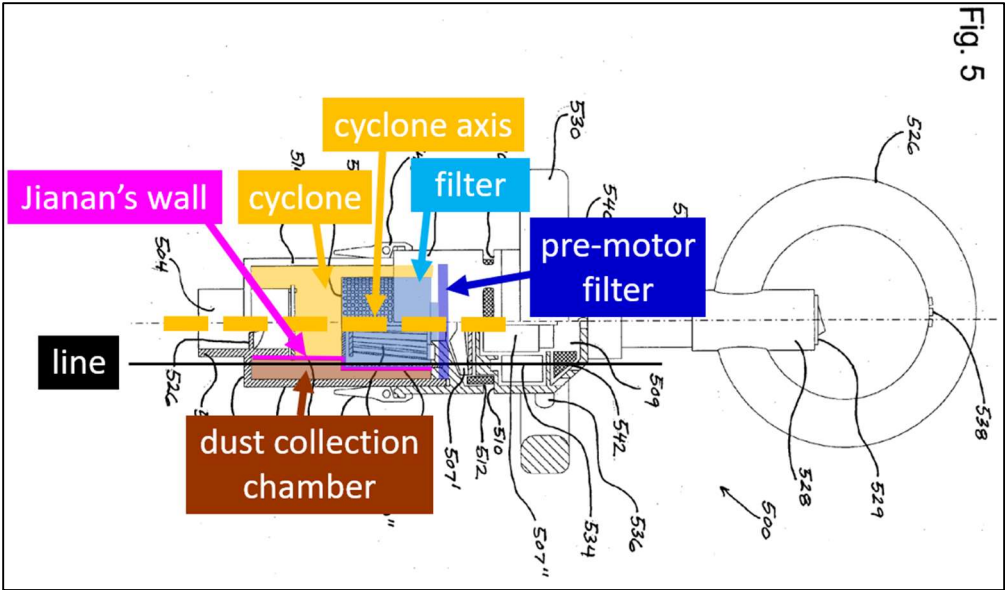
257. Likewise, in my opinion a POSA would have understood that a “**vacuum centerline 1537**” parallel to Butler’s **cyclonic separation chamber axis** extends through the “**dustcup 1522**” (dirt-collection chamber) and “**filter assembly 1523**” and “**pre-motor filter 1545**,” as shown in the annotated figures below:

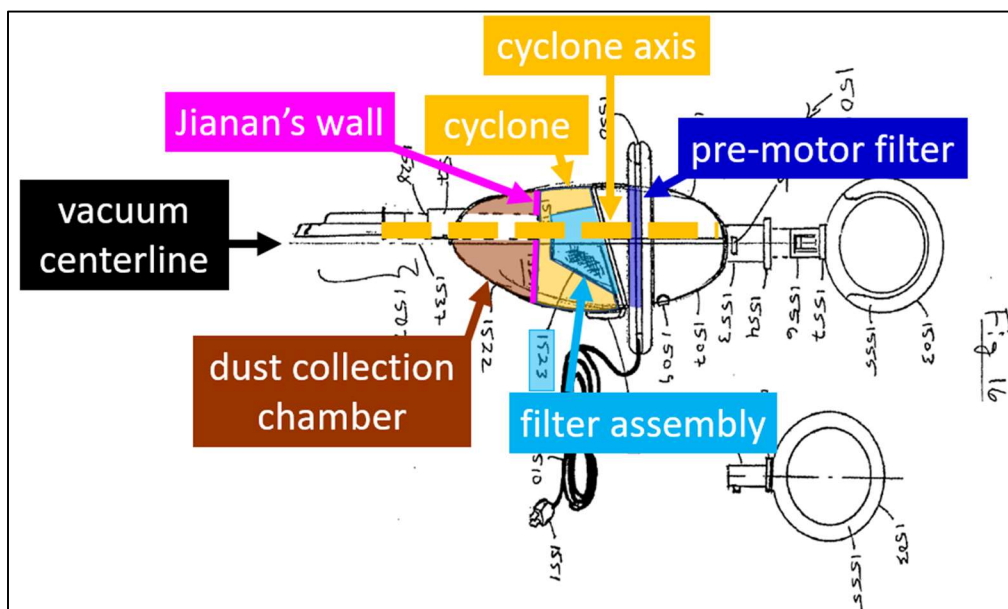
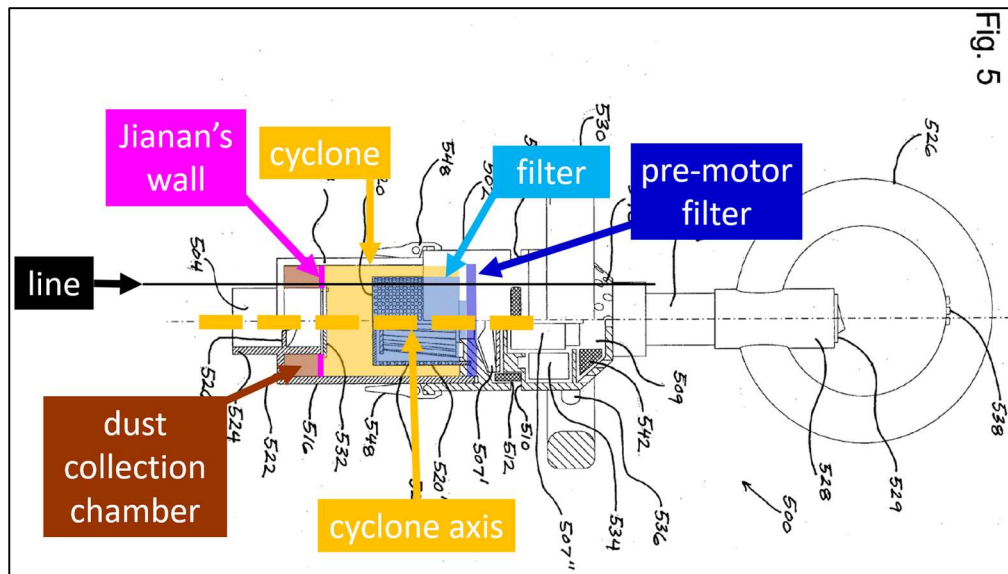


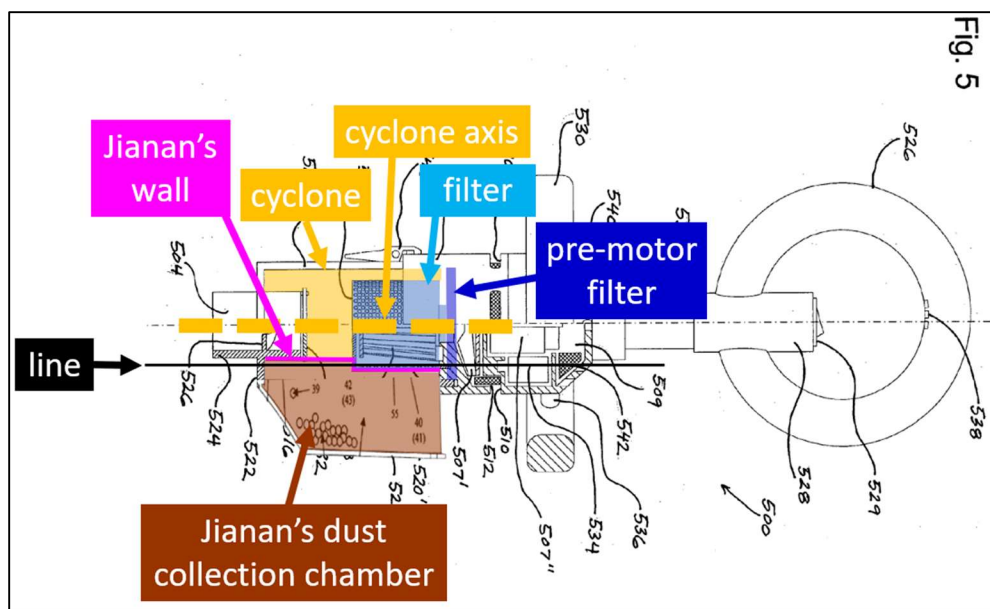


Ex1005, Figs. 15, 16.

258. In my opinion, a POSA further would have understood that this limitation is also met at least because Butler teaches that when its “dirt receptacle compris[ing] a cyclone separator” is modified in view of Jianan’s “independent **dust collection chamber**” teachings, as shown in the modified figures below:







Ex1005, Figs. 5(modified), 16(modified); Ex1015, Fig. 5(modified).

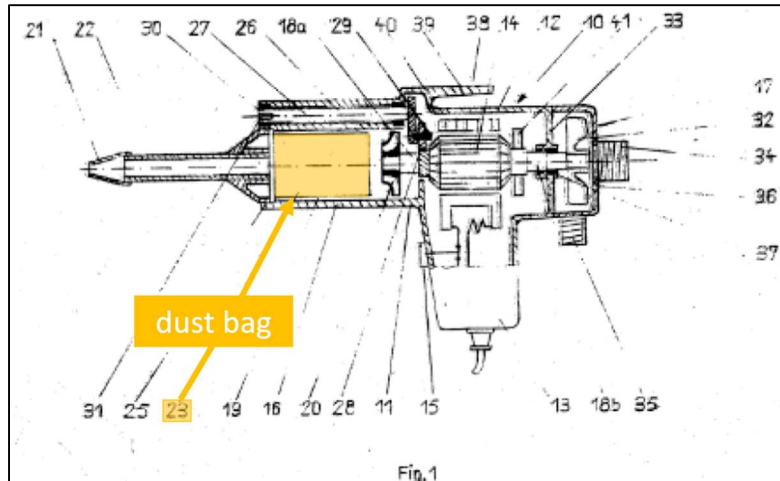
259. In my opinion, a POSA would have understood that the airflow in Butler's cyclone chamber would still be cyclonic when modified in view of Jinan. Butler teaches that a "helical ramp" at the cyclone chamber air entry "is sufficient to establish a cyclonic airflow pattern within the dirt receptacle."

Ex1005, 22:14-22.

C. Ground 3: Rebel in Combination With Martelliere Renders Obvious Claims 1-2, 4-10, 12-15, and 17-21

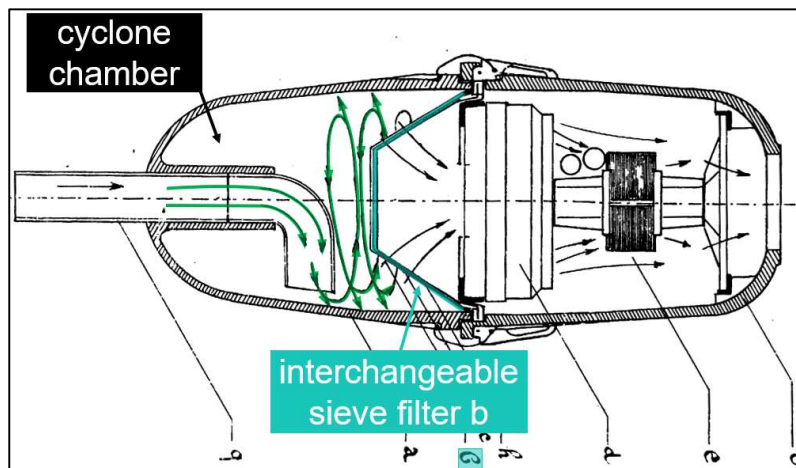
1. A POSA Would Have Been Motivated to Combine Rebel and Martelliere

260. Rebel teaches a compact "vacuum cleaner" with a "**dust bag 23**" to filter dust, as shown in the annotated figure below:



Ex1007, 4, Fig. 1.

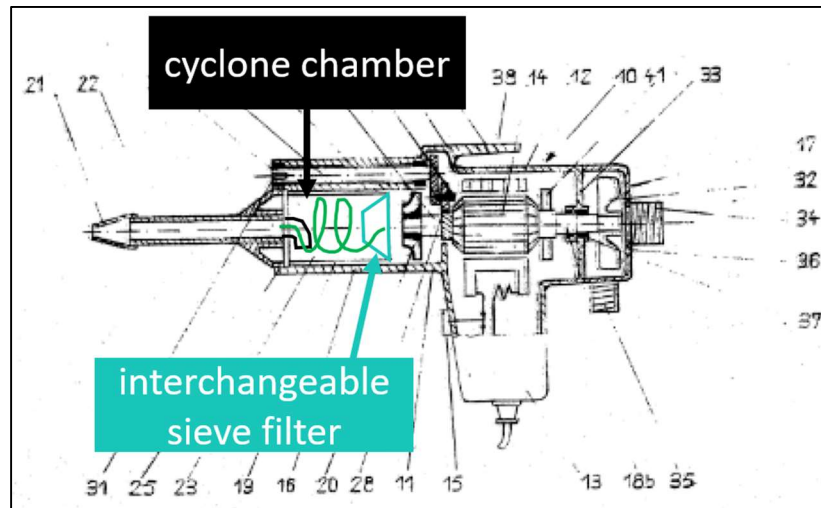
261. Martelliere teaches a compact vacuum cleaner with a “tangential[]” air inlet that creates a “Whirlwind” within a cyclone chamber to filter dust, which is then further filtered by a pre-motor filter, “**interchangeable sieve filter b,**” as shown in the annotated figure below:



Ex1020, 1, Fig. 1.

262. In my opinion, a POSA would have been motivated to combine Martelliere’s cyclonic-separation and pre-motor-filter teachings with

Rebel, as shown in the modified figure below:



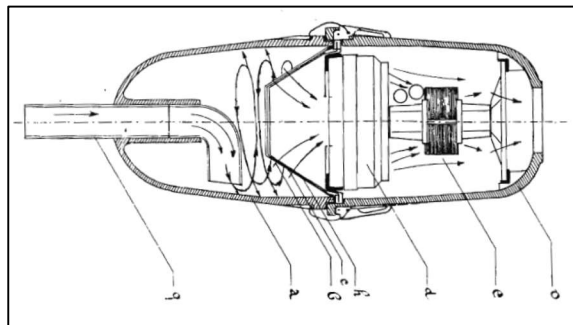
Ex1007, Fig. 1(modified); Ex1020, Fig. 1.

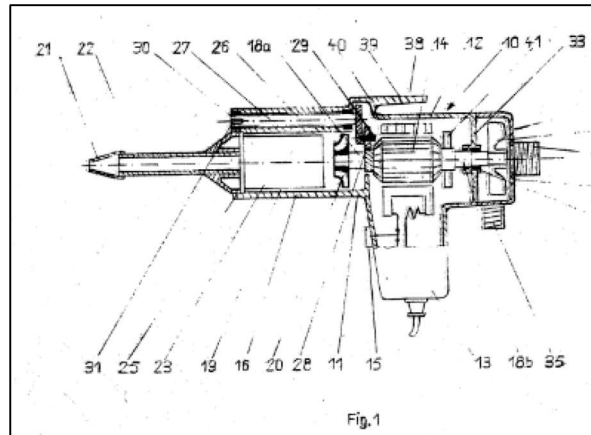
263. In my opinion, a POSA reading Rebel, including its teaching of a “dust bag” air-filtration unit that must “be removed from the housing” for emptying (Ex1007, 4), would have been motivated to incorporate Martelliere’s teachings of a tangential air inlet to generate a “Whirlwind” (*i.e.*, cyclonic filtration) and its “interchangeable sieve filter *b*” (Ex1020, 1, Fig. 1) as the air filtration unit for its many known benefits, including benefits Martelliere expressly teaches, and would have reasonably expected success.

264. As Martelliere teaches, “[b]y application of the ‘Whirlwind’ principle,” “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.” Ex1020, 1.

265. In my opinion, a POSA further would have understood that Martelliere and Rebel are analogous art at least because each teach vacuum cleaners with similar layouts.
266. In my opinion, a POSA would have been motivated to make this simple substitution of one known dust-separating element (dust bag chamber) for another (cyclone chamber with a filter) to obtain predictable results (dust separation). Both Rebel and Martelliere teach a dust-separation unit at the front of the vacuum cleaner with a centrally located air inlet having a similar form, factor, and orientation, as shown in the figures below:





Ex1020, Fig. 1; Ex1007, Fig. 1.

267. Additionally, in my opinion, a POSA would have also recognized these similarities and would have been further motivated to combine Rebel and Martelliere because of them.
268. In my opinion, a POSA would have also found it obvious to at least try this combination. There were a finite number of identified dust-separation solutions, including dust bags (as Rebel teaches) and cyclonic separators with a filter (as Martelliere teaches), and in my opinion a POSA would have been motivated to use cyclonic separation with a filter as taught by Martelliere to achieve its known benefits.
269. Furthermore, the Rebel-Martelliere combination would have at least been obvious to try at least because Martelliere explicitly teaches that its cyclonic filtration teachings “remedy [the] disadvantages” of “dust bag” filters. Ex1020, 1. Further, as explained in §VII.B, during prosecution of the '983 Patent, the Examiner found (and the Applicant did not dispute)

that it would have been obvious to substitute cyclonic-separation units for non-cyclonic separation units. Ex1004, 260-265, 276-281.

270. In my opinion, a POSA would have reasonably expected success at least because Rebel and Martelliere teach dust-separation units with similar layouts and in my opinion a POSA would have understood substituting Martelliere's cyclonic chamber and filter unit for Rebel's "dust bag" would have been a simple substitution of known filtering methods and a POSA would have reasonably expected success in making this simple substitution.

2. [1]/[12]

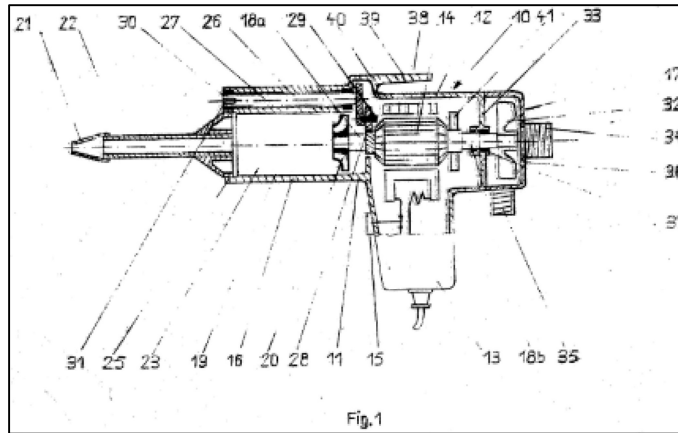
271. In my opinion, Rebel in combination with Martelliere renders claims 1 and 12 obvious.

a. [1pre]/[12pre]

Reference Number	Claim Limitation
[1pre]	"A surface cleaning apparatus comprising:"
[12pre]	"A surface cleaning apparatus comprising:"

272. In my opinion, to the extent the preambles are limiting, Rebel in combination with Martelliere renders obvious a surface cleaning apparatus.

273. Rebel teaches "a vacuum cleaner" that is a surface cleaning apparatus, as shown in the figure below:



Ex1007, Cover, 1, Fig. 1.

274. Martelliere similarly teaches a “vacuum cleaner” that is a surface cleaning apparatus. Ex1020, 1, Fig. 1.

275. In my opinion, a POSA therefore would have recognized that the Rebel-Martelliere combination is a vacuum cleaner that is a surface cleaning apparatus at least because Rebel is a surface cleaning apparatus and Martelliere is a surface cleaning apparatus and when combined Rebel-Martelliere is a surface cleaning apparatus.

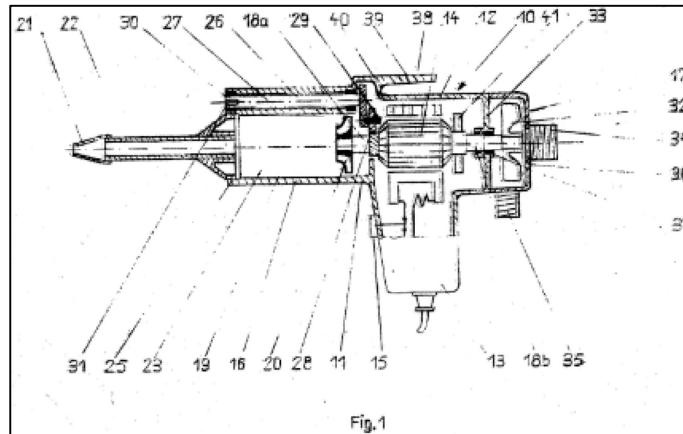
b. [1a.1]/[12a.1]

Reference Number	Claim Limitation
[1a.1]	“a hand vacuum cleaner having a front end having a dirty air inlet, a rear end, a clean air outlet, an upper end, a lower end,”
[12a.1]	“a hand vacuum cleaner having a front end having a dirty air inlet, a rear end, a clean air outlet, an upper end, a lower end,”

276. In my opinion, Rebel in combination with Martelliere renders obvious a hand vacuum cleaner having a front end having a dirty air inlet, a rear end,

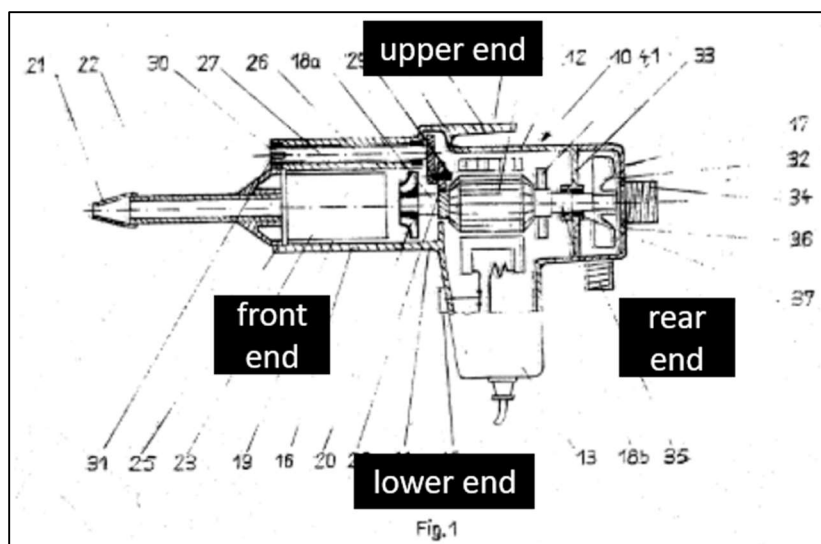
a clean air outlet, an upper end, a lower end.

277. Rebel teaches a “handheld vehicle care device” including “a vacuum cleaner” that is a hand vacuum cleaner, as shown in the figure below:



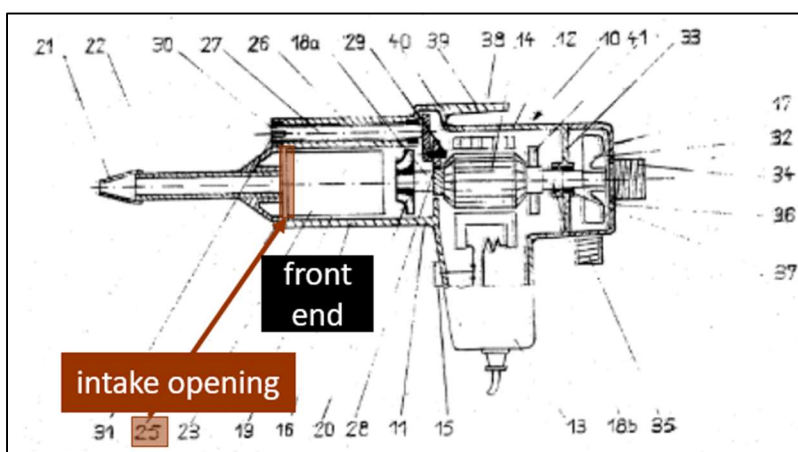
Ex1007, Cover, 1, Fig. 1.

278. In my opinion Martelliere teaches a hand vacuum cleaner because it teaches a compact-sized “vacuum cleaner” that is “held.” Ex1020, 1, Fig. 1.
279. In my opinion, a POSA therefore would have recognized that the Rebel-Martelliere combination is a hand vacuum cleaner at least because Rebel and Martelliere are hand vacuum cleaners and when combined they are a hand vacuum cleaner.
280. In my opinion, a POSA would have understood that Rebel’s hand vacuum cleaner is a three-dimensional object and it includes a **front end**, **rear end**, **upper end**, and **lower end**, as shown in the annotated figure below:



Ex1007, Fig. 1; *id.*, 4 (“The pistol-shaped housing 11 of the multipurpose device comprises ... a front part 16, and a rear part 17”).

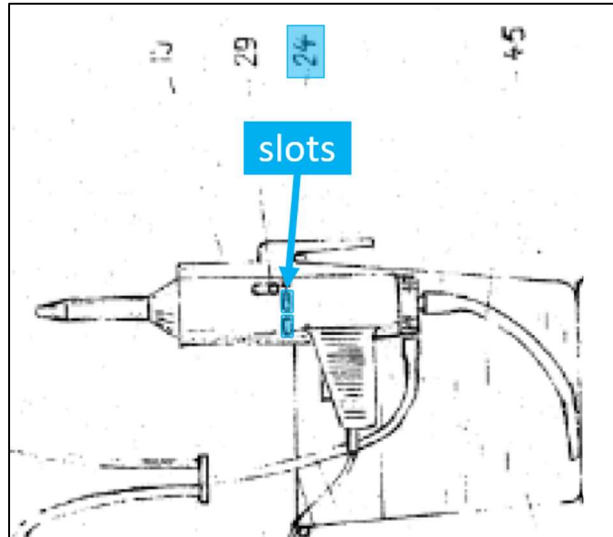
281. In my opinion, a POSA would have understood that the hand vacuum cleaner’s **front end** has a dirty air inlet (“**intake opening 25**”), as shown in the annotated figure below:



Ex1007, 6, Fig. 1.

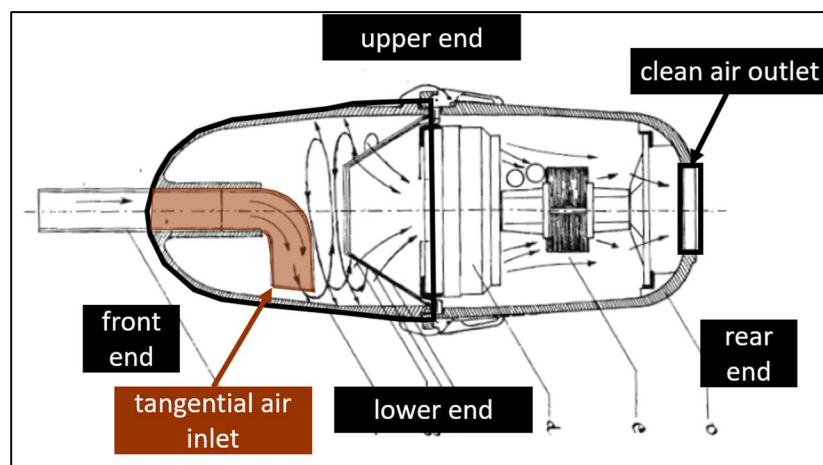
282. Rebel’s hand vacuum cleaner also includes “**slots 24**,” through which “the air escapes” after having been filtered by “dust bag 23,” which in my

opinion a POSA would have understood to be a clean air outlet, as shown in the annotated figure below:



Ex1007, 4, 8, Fig. 2.

283. In my opinion, a POSA similarly would have recognized that Martelliere teaches a three-dimensional hand vacuum cleaner having **front end**, **rear end**, **upper end** and **lower end**, as shown in the annotated figure below:

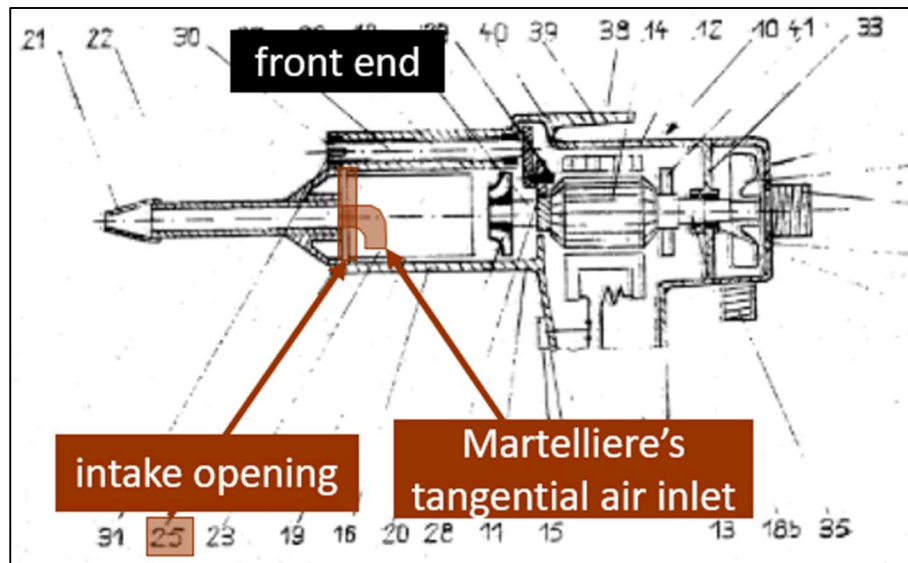


Ex1020, 1, Fig. 1.

284. In my opinion a POSA would have understood that the location in Martelliere where the air is “sucked **tangentially** to the interior wall of the transparent container” is a dirty air inlet at the front end. Ex1020, 1, Fig. 1.

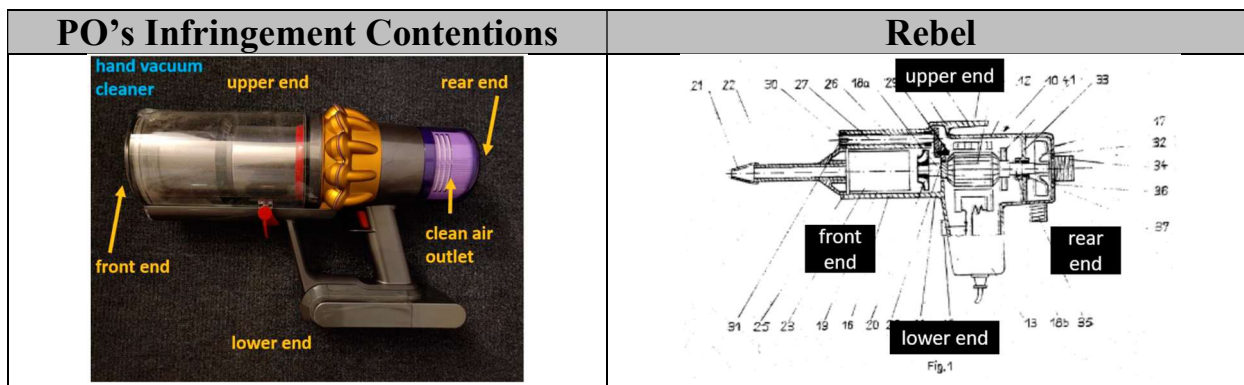
285. In my opinion, a POSA similarly would have understood that Martelliere has a clean air outlet at the location where the air exits.

286. In the Rebel-Martelliere combination, Rebel’s “**intake opening 25**” and Martelliere’s “**tangential[]**” **air inlet** individually and collectively are a dirty air inlet at the **front end**, as shown in the modified figure below:



Ex1007, Fig. 1(modified); Ex1020, Fig. 1.

287. This is at least as much disclosure of these limitations as PO accuses of infringement, as shown in the annotated figures below:



Ex1021 (Ex.28 to Complaint), 3(PO's annotations); Ex1007, Fig. 1.

c. [1a.2]/[12a.2]

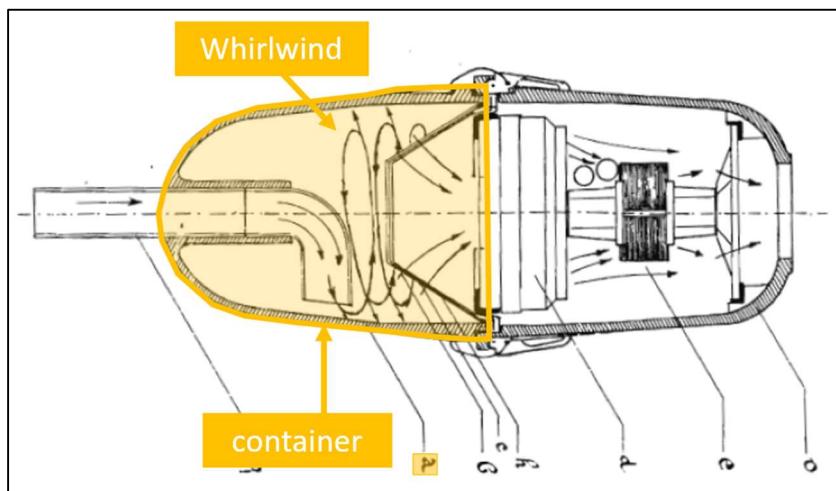
Reference Number	Claim Limitation
[1a.2]	"a cyclone unit comprising a cyclone chamber having a cyclone axis of rotation that extends in a forward/rearward direction, a suction motor and fan assembly having a suction motor axis of rotation and a pistol grip handle;"
[12a.2]	"a cyclone unit comprising a cyclone chamber having a cyclone axis of rotation that extends in a forward/rearward direction when the dirty air inlet faces forwardly, a suction motor and fan assembly having a suction motor axis of rotation and a pistol grip handle wherein the suction motor axis of rotation is generally parallel to the cyclone axis of rotation;"

288. In my opinion, Rebel in combination with Martelliere renders obvious a cyclone unit comprising a cyclone chamber having a cyclone axis of rotation that extends in a forward/rearward direction, a suction motor and fan assembly having a suction motor axis of rotation and a pistol grip handle. (Limitation [1a.2]).

289. In my opinion, Rebel in combination with Martelliere renders obvious a cyclone unit comprising a cyclone chamber having a cyclone axis of

rotation that extends in a forward/rearward direction when the dirty air inlet faces forwardly, a suction motor and fan assembly having a suction motor axis of rotation and a pistol grip handle wherein the suction motor axis of rotation is generally parallel to the cyclone axis of rotation. (Limitation [12a.2]).

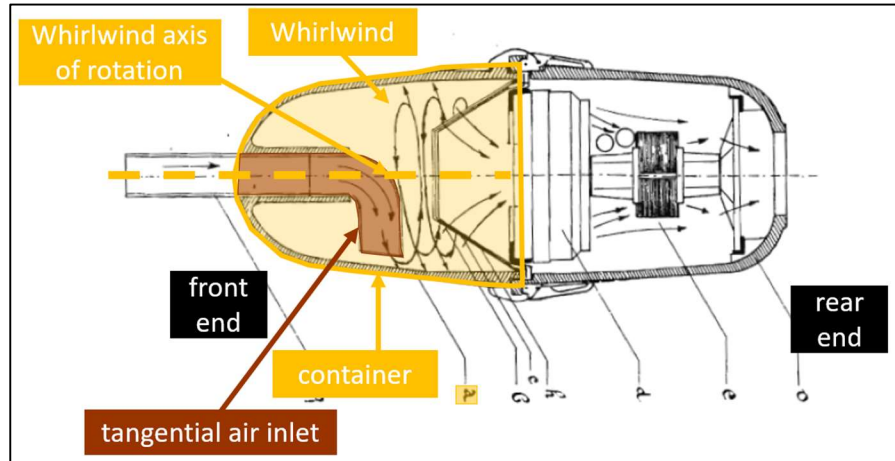
290. In my opinion, a POSA would have understood that Martelliere teaches a cyclone unit comprising a cyclone chamber at least because Martelliere teaches the “[a]pplication of the ‘Whirlwind’ principle,” which in my opinion a POSA would have understood is a cyclone, occurs in “container a,” as shown in the annotated figure below:



Ex1020, 1, Fig. 1.

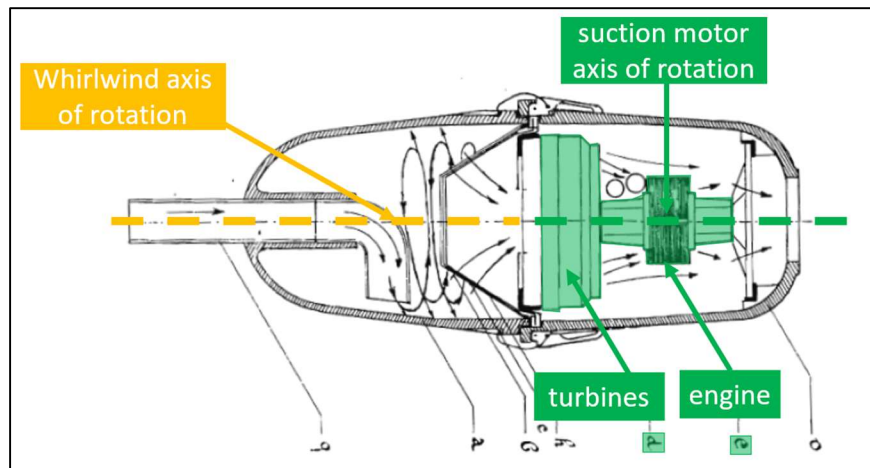
291. At least for the same reasons, in my opinion a POSA would have understood that Martelliere’s “container” is a cyclone unit comprising a cyclone chamber.

292. In my opinion, a POSA also would have understood that Martelliere's "container" has a cyclone axis of rotation that extends in a forward/rearward direction, including when the dirty air inlet faces forwardly, as shown in the annotated figure below:



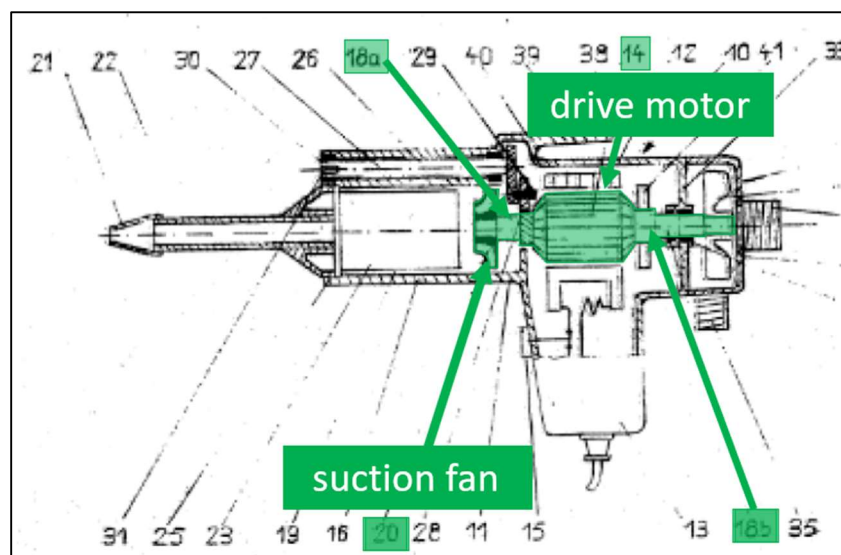
Ex1020, 1, Fig. 1.

293. Martelliere teaches a suction motor and fan assembly having a suction motor axis of rotation at least because Martelliere's vacuum cleaner is powered by "**turbines *d***" and "**engine *e***," which in my opinion a POSA would have understood is a suction motor and fan assembly having a **suction motor axis of rotation** that is generally parallel to the cyclone axis of rotation (**'Whirlwind' axis of rotation**), as shown in the annotated figure below:



Ex1020, 1, Fig. 1.

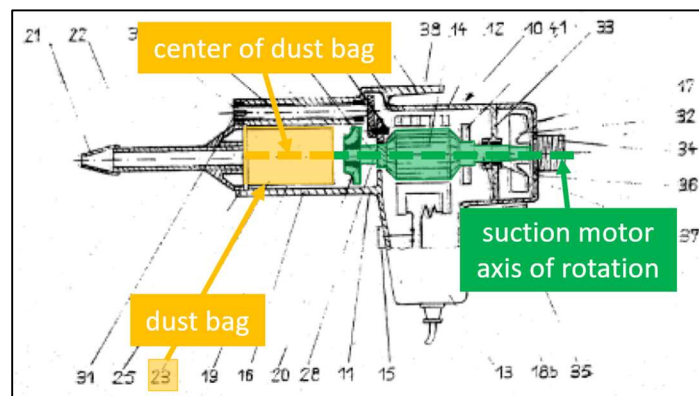
294. Rebel likewise teaches a suction motor and fan assembly having a suction motor axis of rotation at least because Rebel teaches a “**motor-driven** vacuum cleaner” in which the “**drive motor 14**” comprises “**shaft 18,**” which drives “**suction fan 20**” to “suck[] in the air and the dust,” as shown in the annotated figure below:



Ex1007, 1-2, 4-5; Fig. 1

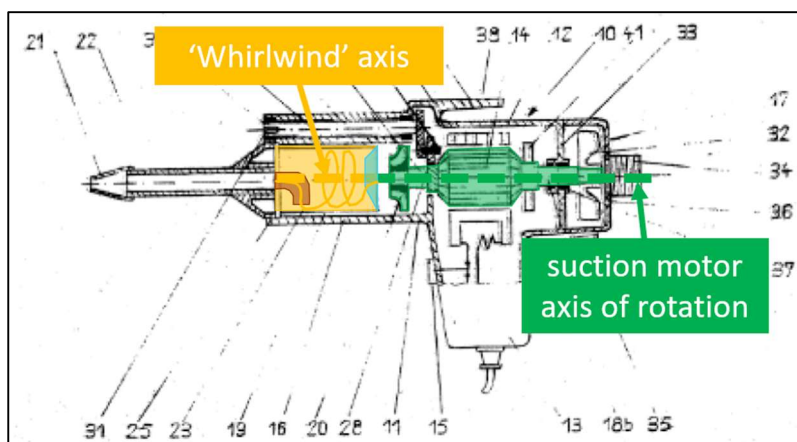
295. In my opinion, a POSA would have understood that Rebel has a “motor 14” including “shaft 18,” which it describes as “shaft 18 of the electric motor 14.” Ex1007, 5.

296. In my opinion, a POSA would have understood Rebel’s suction motor and fan assembly has a **suction motor axis of rotation** that is generally parallel to the center of “**dust bag 23**,” as shown in the annotated figure below:



Ex1007, Fig. 1.

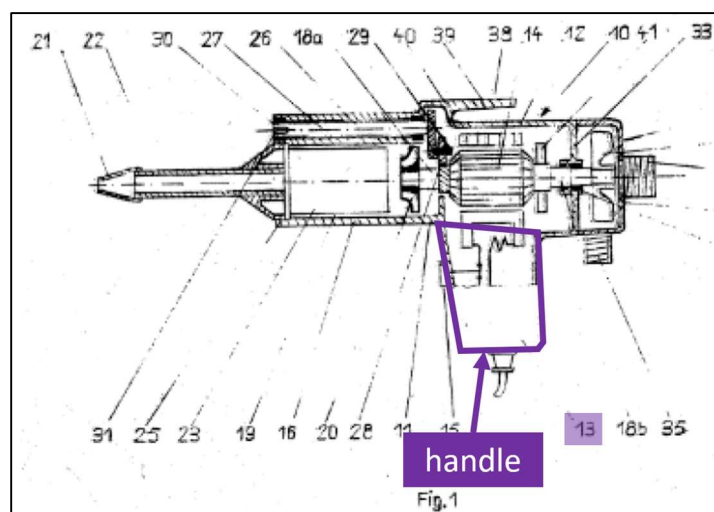
297. Therefore, in my opinion a POSA would have understood that in the Rebel-Martelliere combination the suction motor axis of rotation (Martelliere’s and/or Rebel’s) is generally parallel to the cyclone axis of rotation (Martelliere’s ‘**Whirlwind**’ axis of rotation), as shown in the modified figure below:



Ex1007, Fig. 1(modified); Ex1020, Fig. 1(modified).

298. Further, to the extent that PO argues these axes are co-axial, in my opinion a POSA would have understood co-axial axes are parallel for the same reasons explained in Ground 1, [1a.2]/[12a.2].

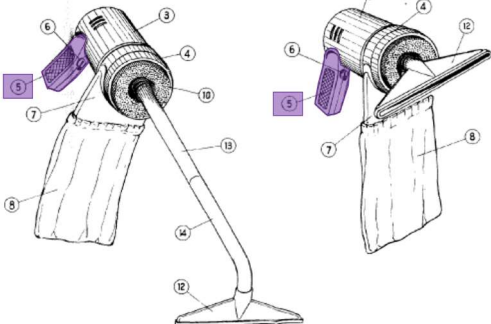
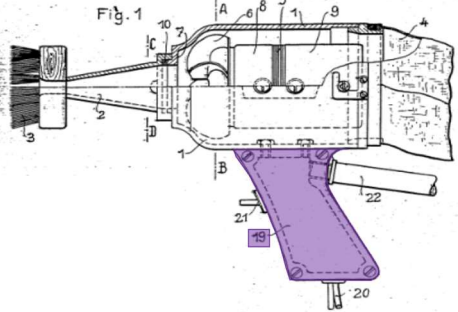
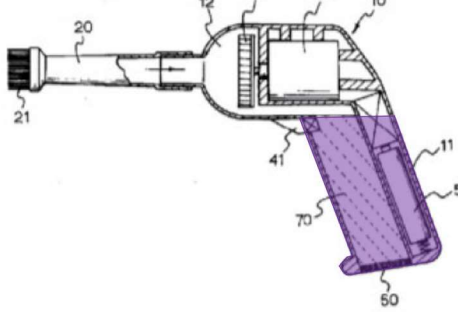
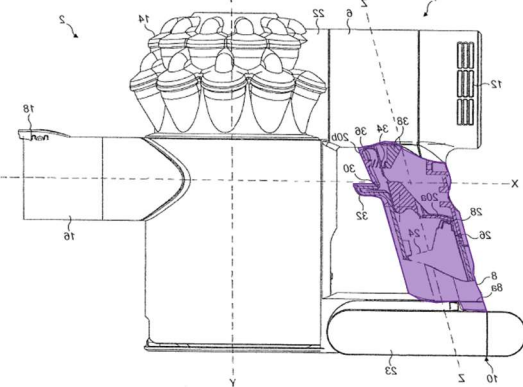
299. In my opinion, a POSA would have understood Rebel to teach a pistol-grip handle (“**handle 13**”), as shown in the annotated figure below:



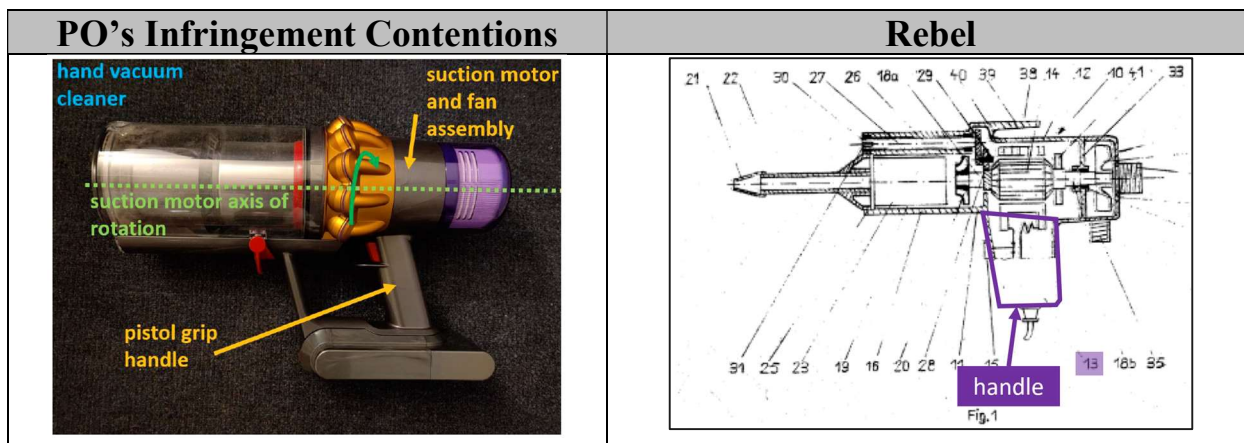
Ex1007, 4, Fig. 1.

300. In my opinion, a POSA would have understood Rebel’s “handle 13” is a

pistol-grip handle. Rebel describes the vacuum cleaner's housing as “pistol-shaped housing 11.” Ex1007, 4. Further, similar handles have been called “pistol-grip” handles for nearly 70 years, as shown in the annotated figures below:

Ex1028, pages 1, 3 (“pistol grip (5)”) (1954)	
	
Ex1011, Fig. 1 (“pistol-grip holder 19”) (1955)	Ex1030, Fig. 2 (“pistol style compact vacuum cleaner”) (1998)
	
Ex1017, Fig. 2 (“handle 8 is oriented in a pistol-grip formation”) (2013)	
	

301. Moreover, in my opinion a POSA would have understood Rebel to teach a pistol-grip handle at least to the same extent as PO accuses of infringement, as shown in the annotated figures below:



Ex1021 (Ex.28 to Complaint), 6(PO's annotations); Ex1007, Fig. 1.

302. Therefore, in my opinion a POSA would have understood Rebel's “**handle 13**” to be a pistol-grip handle.

d. [1b]/[12b]

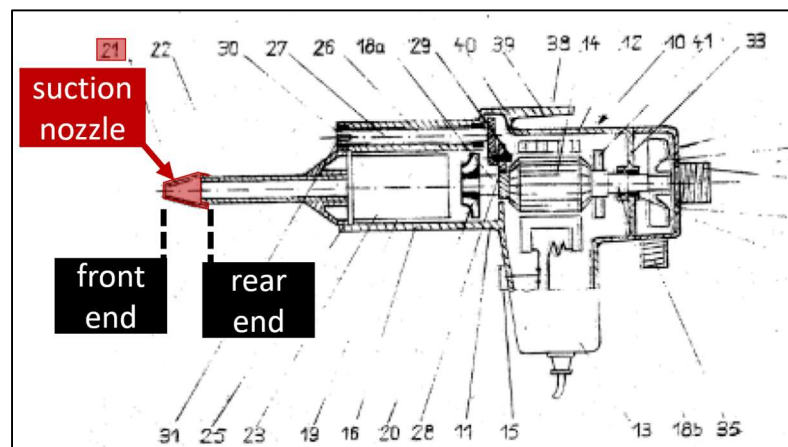
Reference Number	Claim Limitation
[1b]	“a surface cleaning head having a front end, a rear end, a dirty air inlet and a surface cleaning head air outlet; and,”
[12b]	“a surface cleaning head having a front end, a rear end, a dirty air inlet and a cleaning head air outlet; and”

303. In my opinion, Rebel in combination with Martelliere renders obvious a surface cleaning head having a front end, a rear end, a dirty air inlet and a surface cleaning head air outlet. (Limitation [1b]).

304. In my opinion, Rebel in combination with Martelliere renders obvious a surface cleaning head having a front end, a rear end, a dirty air inlet and a

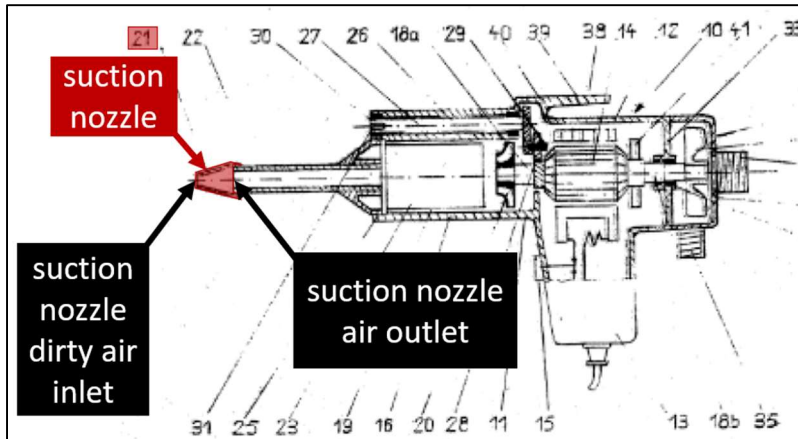
cleaning head air outlet. (Limitation [12b]).

305. Rebel teaches “**suction nozzle 21**” which “sucks in the air and the dust” and, in my opinion, a POSA would have understood it to be a three-dimensional surface cleaning head that has a **front end** and a **rear end** at least because the nozzle is three-dimensional and is designed to interact with the surface to be cleaned, as shown in the annotated figure below:



Ex1007, 4, Fig. 1.

306. In my opinion, a POSA further would have understood that “**suction nozzle 21**” has a **dirty air inlet** and a surface cleaning head air outlet (**suction nozzle air outlet**) at least because “the electric motor [] sucks in the air and the dust through the **suction nozzle 21**” and then into “the suction connection 22,” as shown in the annotated figure below:



Ex1007, 4, Fig. 1.

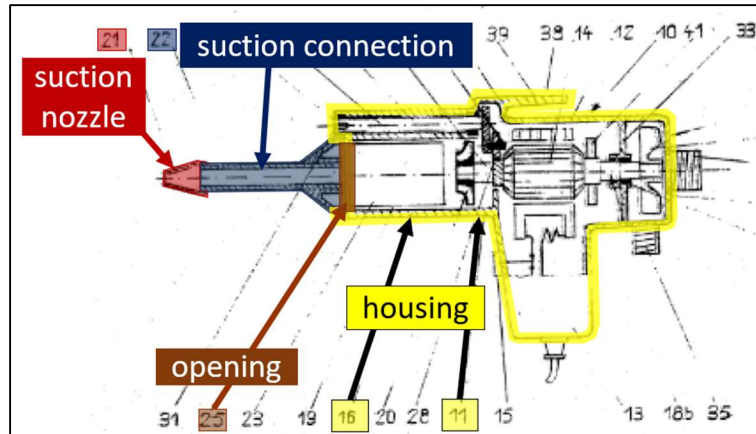
e. [1c.1]/[12c.1.i]

Reference Number	Claim Limitation
[1c.1]	“a rigid air flow conduit which, when mounted to the surface cleaning head and the hand vacuum cleaner, extends between the surface cleaning head air outlet and the dirty air inlet of the hand vacuum cleaner,”
[12c.1.i]	“a rigid air flow conduit which is mountable between the cleaning head air outlet and a hand vacuum cleaner air inlet,”

307. In my opinion, Rebel in combination with Martelliere renders obvious a rigid air flow conduit which, when mounted to the surface cleaning head and the hand vacuum cleaner, extends between the surface cleaning head air outlet and the dirty air inlet of the hand vacuum cleaner. (Limitation [1c.1]).

308. In my opinion, Rebel in combination with Martelliere renders obvious a rigid air flow conduit which is mountable between the cleaning head air outlet and a hand vacuum cleaner air inlet. (Limitation [12c.1.i]).

309. Rebel teaches a rigid air flow conduit (“**suction connection 22**”) which is mountable/mounted between the surface cleaning head air outlet (“[t]he **suction nozzle 21** is removably attached to the **suction connection 22**”) and the hand vacuum cleaner dirty air inlet (“**connection 22** ... is connected to the **front housing part 16**” at “**opening 25** for the **suction connection 22**” and “can be removed from the **housing 11**”) and extends between them, as shown in the annotated figure below:



Ex1007, 4, Fig. 1.

310. In my opinion, a POSA would have understood that the “suction connection 22” is rigid at least because it is depicted as a straight pipe rigidly supporting “suction nozzle 21.” Further, to the extent that PO argues that the “suction connection 22” is not rigid, in my opinion a POSA would have found that it would have been obvious to make “suction connection 22” rigid.

311. Also, Rebel depicts “suction connection 22” as straight and Rebel

describes the purpose of its “pistol-shaped” device is to be a “handheld vehicle care device” for, *e.g.*, cleaning tight spaces of a vehicle that would require “operat[ing] [the device] with one hand,” which, in my opinion, would have motivated a POSA to use a rigid tube as opposed to a flexible one that would require a second hand to guide. Ex1007, 1, 3-4. Further, in my opinion a POSA would have recognized that a rigid “suction connection 22” would better support “suction nozzle 21” as a rigid member, and it would have at least been obvious to try as there are a finite number of possibilities—namely, rigid or flexible. Ex1007, 5.

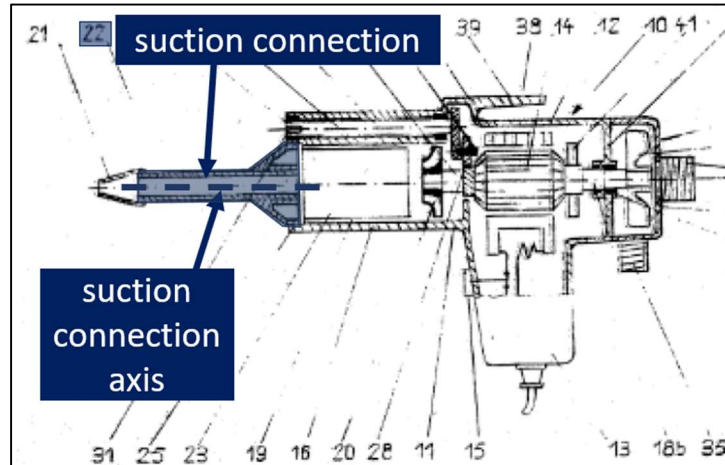
f. [12c.1.ii]

Reference Number	Claim Limitation
[12c.1.ii]	“the rigid air flow conduit having a longitudinally extending conduit axis, wherein, when the hand vacuum cleaner is mounted to the downstream end of the rigid air flow conduit, the handle is a driving handle for the surface cleaning apparatus and the longitudinally extending conduit axis of the rigid air flow conduit is parallel to the cyclone axis of rotation, and”

312. In my opinion, Rebel in combination with Martelliere renders obvious the rigid air flow conduit having a longitudinally extending conduit axis, wherein, when the hand vacuum cleaner is mounted to the downstream end of the rigid air flow conduit, the handle is a driving handle for the surface cleaning apparatus and the longitudinally extending conduit axis of the

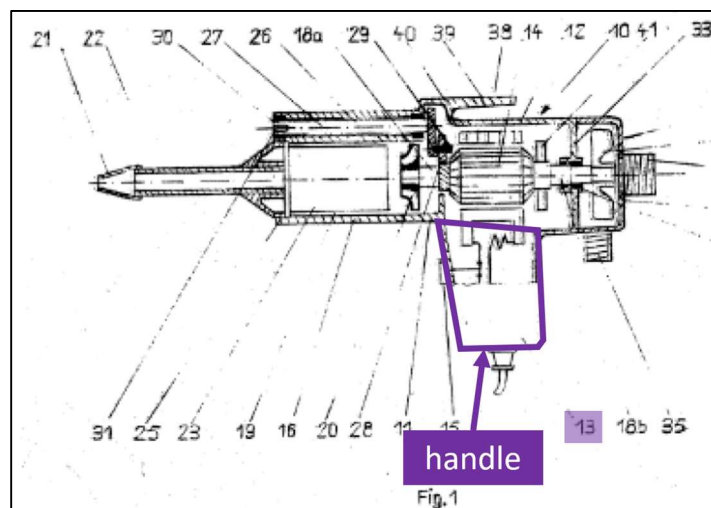
rigid air flow conduit is parallel to the cyclone axis of rotation.

313. Rebel teaches a rigid air flow conduit (“**suction connection 22**”) having a longitudinally extending conduit axis, as shown in the annotated figure below:



Ex1007, Fig. 1; Ground 3, [1c.1]/[12c.1.i].

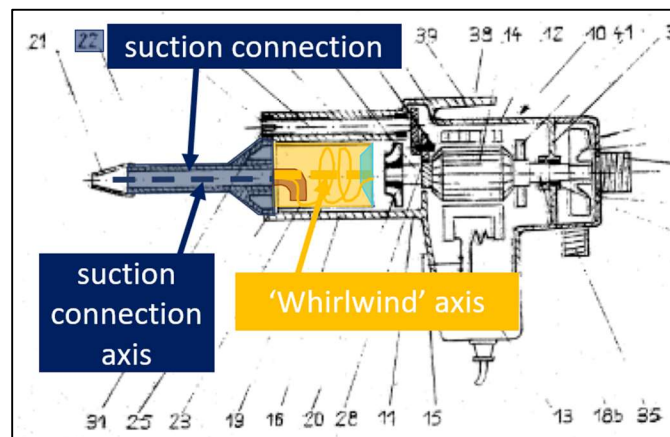
314. When Rebel’s hand vacuum cleaner is mounted to the downstream end of the rigid air flow conduit, the **handle** is a driving handle for the surface cleaning apparatus, as shown in the annotated figure below:



Ex1007, Fig. 1.

315. In my opinion, a POSA would have understood that Rebel's "handle" is a driving handle because it is a "means of holding the multipurpose device," is used to maneuver and operate the device, and because driving the handle drives the entire device. Ex1007, 3-4.

316. In the Rebel-Martelliere combination, the longitudinally extending conduit axis of the rigid air flow conduit is parallel to the cyclone axis of rotation (the "**Whirlwind**" axis of rotation) when the hand vacuum cleaner is mounted to the downstream end of the rigid air flow conduit, as shown in the modified figure below:



Ex1007, Fig. 1(modified); Ex1020, Fig. 1(modified); Ground 3, [1a.2]/[12a.2].

317. To the extent that PO argues these axes are co-axial, in my opinion a POSA would have understood they are also parallel for the same reasons explained in Ground 1, [1a.2]/[12a.2].

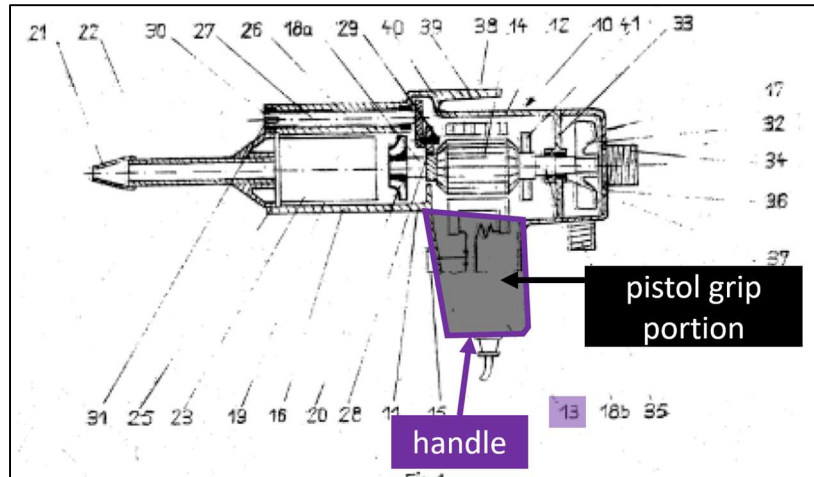
g. [1c.2]/[12c.2]

Reference Number	Claim Limitation
[1c.2]	“wherein the pistol grip handle has a pistol grip portion and an end that is mounted to an outer wall of the hand vacuum cleaner at a location rearward of the front end and forward of a rear end of the suction motor and”
[12c.2]	“wherein the pistol grip handle extends generally radially away from an outer wall of the hand vacuum cleaner at a location rearward of the front end and forward of a rear end of the suction motor.”

318. In my opinion, Rebel in combination with Martelliere renders obvious a hand vacuum cleaner wherein the pistol grip handle has a pistol grip portion and an end that is mounted to an outer wall of the hand vacuum cleaner at a location rearward of the front end and forward of a rear end of the suction motor. (Limitation [1c.2]).

319. In my opinion, Rebel in combination with Martelliere renders obvious a hand vacuum cleaner wherein the pistol grip handle extends generally radially away from an outer wall of the hand vacuum cleaner at a location rearward of the front end and forward of a rear end of the suction motor. (Limitation [12c.2]).

320. In my opinion, a POSA would have understood Rebel’s pistol grip handle (“**handle 13**” of “pistol-shaped housing 11”) has a **pistol grip portion**, as shown in the annotated figure below:



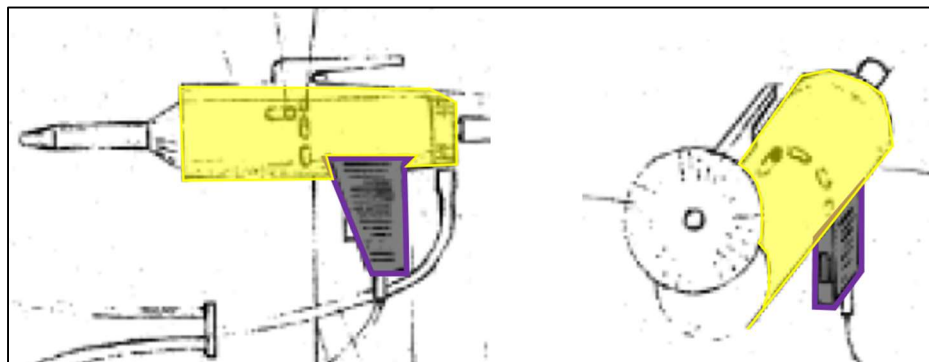
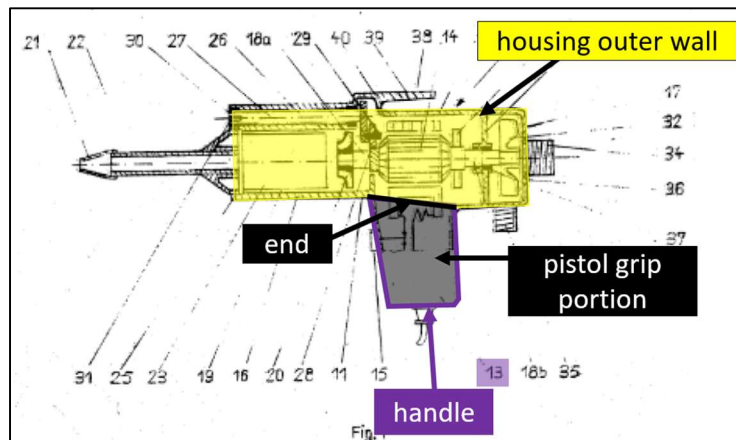
Ex1007, 4, Fig. 1.

321. To the extent that PO argues that a “pistol grip handle ha[ving] a pistol-grip portion” requires a feature that assists with gripping (e.g., a textured surface or contour), including as taught by Butler, in my opinion it would have been obvious to a POSA to modify Rebel to add such a feature to “handle 13” to improve the user’s ability to grip and manipulate the device, thus amplifying Rebel’s stated purpose of the “handle” as a “means of holding the multipurpose device,” consistent with the plain and ordinary meaning of “handle,” including when “operated with one hand.” Ex1007, 3.

322. In my opinion, a POSA would have reasonably expected success modifying Rebel because it would have involved simply adding a gripping surface (for example, knurling a rubber coating or dimples) to the handle, which was well-known in the art and had the known benefit of improving

grip. Ground 1, [1c.2]/[12c.2].

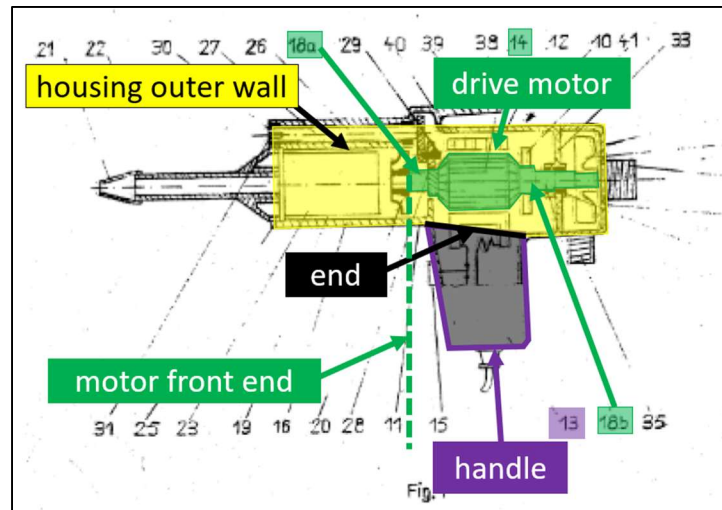
323. Rebel's pistol-grip handle ("**handle 13**") extends generally radially away from, and has an **end** that is mounted to, an outer wall of the hand vacuum cleaner ("**housing 11['s]**" **outer wall**), as shown in the annotated figures below:



Ex1007, Fig. 1; Ground 3, [1a.2]/[12a.2].

324. Rebel's "**handle 13**" also extends generally radially way from, and has an **end** that is mounted to, "housing 11['s]" outer wall at a location rearward of the front end and forward of a rear end of the suction motor ("**drive motor 14**" containing "**front output shaft 18a**" and "**rear output shaft**

18b,”), as shown in the annotated figure below:



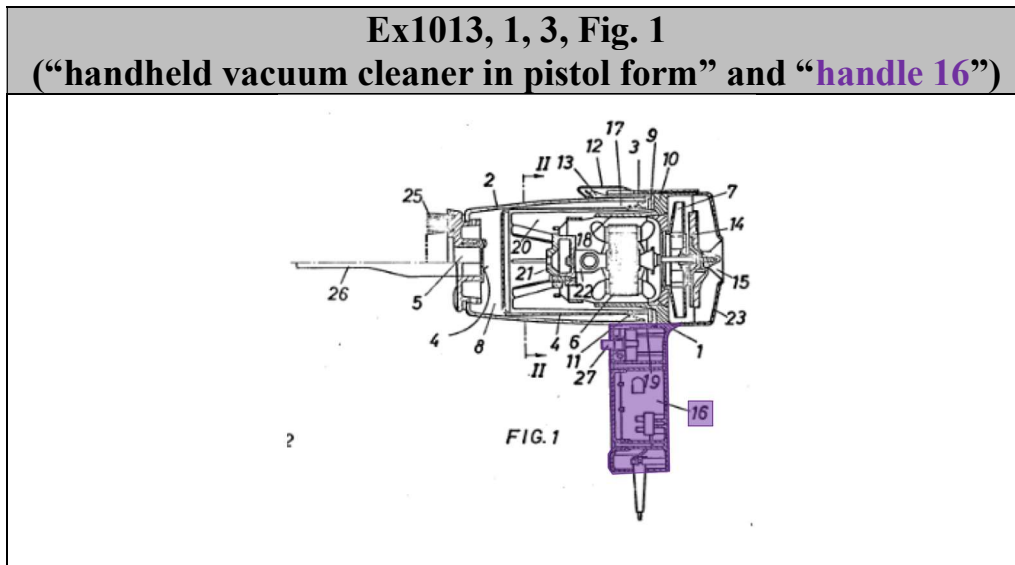
Ex1007, Fig. 1. In my opinion a POSA would have understood “**front output shaft 18a**” to extend at least as far forward as the rear end of suction fan 20.

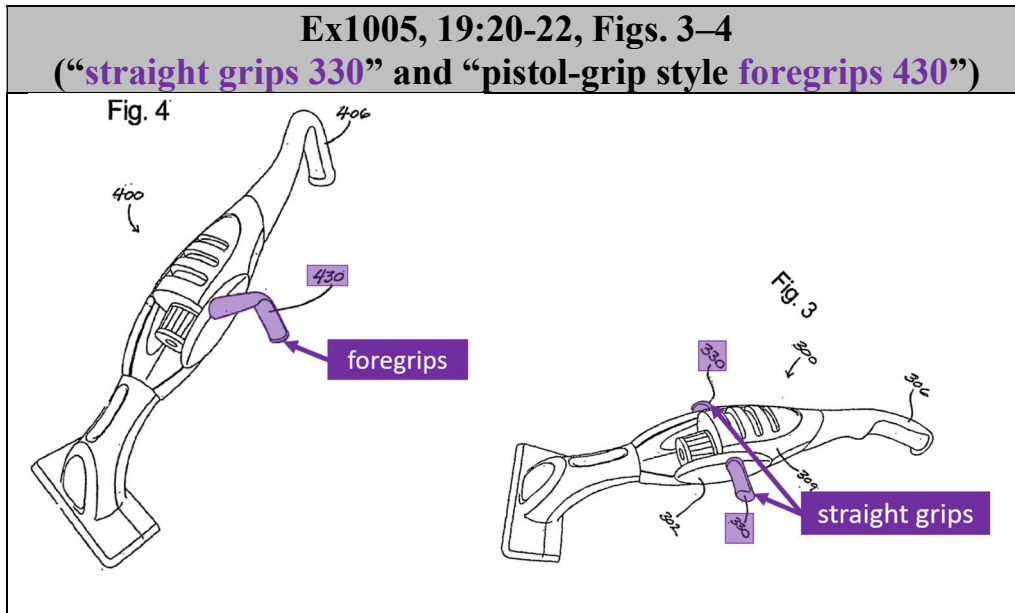
325. In my opinion, a POSA would have understood that “shaft 18” is part of “drive motor 14” at least because Rebel describes it as part “of” the motor, “the shaft 18 of the electric motor 14,” because in my opinion a POSA would have understood a motor shaft is needed to drive the “suction fan 20,” and because the ’983 Patent describes the “suction motor 204” as having a “motor axis 252 of suction motor 204,” which in my opinion a POSA would have understood is the axis of the rotating motor shaft. Ex1001, 13:38-46.

326. To the extent that PO argues that Rebel does not disclose this limitation, in my opinion a POSA would have found it obvious, based on Rebel’s teachings, to narrow Rebel’s handle to a more ergonomic size, which

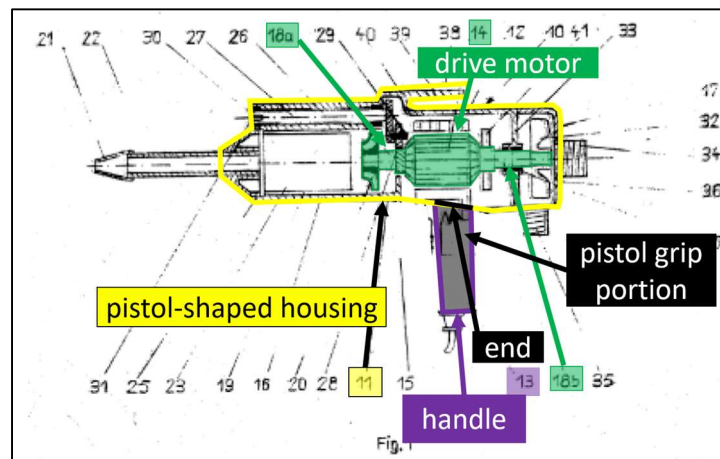
would improve its ability to be a “means of holding the multipurpose device,” as Rebel teaches. Ex1007, 3.

327. In my opinion, a POSA would have reasonably expected success in such a modification because it would have only involved slightly reducing the size of a well-known, simple component (the handle) and because thin pistol-grip handles were well known, as shown in the annotated figures below:





328. In my opinion, a POSA would have understood that, when Rebel’s handle is so modified, it also meets this limitation, as shown in the modified figure below:



Ex1007, Fig. 1(modified).

329. Further, in my opinion a POSA would have been motivated to modify Rebel to mount the handle at a location below the motor, including at a

location rearward of the front end and forward of a rear end of the suction motor, at least because it would locate the center of gravity of a heavy motor directly above the handle, thereby increasing ergonomics, reducing strain on the user, and improving the handle's ability to be a "means of holding the multipurpose device," as Rebel teaches. Ex1007, 3.

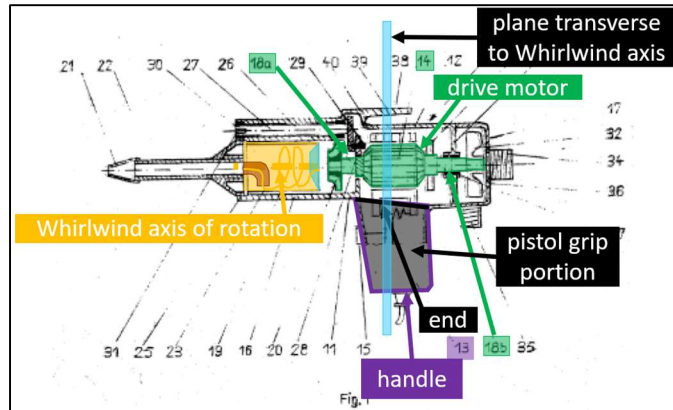
330. In my opinion, a POSA would have reasonably expected success in the above-described modification at least because it would have involved only slightly relocating the handle position and because these handles were well-known in the art, including as taught by Butler (Ground 1, [1c.2]/[12c.2]) and by Dyson146, which teaches that "[a]dvantageously, this motor may be positioned at or near the upper end of the pistol grip handle, so that the weight of the motor may be supported more comfortably on top of the user's hand." Ex1026, 4:19-21.
331. Dyson146 also teaches that "[t]he motor casing" may be "provided at the upper end of the pistol grip handle" such that "the weight of the motor inside the motor casing [] is comfortably support end on top of a user's hand during use of the cleaner," *id.*, 8:15-17, which further supports my opinion that a POSA would have found this modification obvious and would have reasonably expected success.

h. [1c.3]

Reference Number	Claim Limitation
[1c.3]	“wherein a plane that is transverse to the cyclone axis of rotation extends through the pistol grip portion and the hand vacuum cleaner at a location rearward of the front end and forward of a rear end of the suction motor,”

332. In my opinion, Rebel in combination with Martelliere renders obvious a hand vacuum cleaner wherein a plane that is transverse to the cyclone axis of rotation extends through the pistol grip portion and the hand vacuum cleaner at a location rearward of the front end and forward of a rear end of the suction motor.

333. In my opinion, a POSA would have recognized that Rebel in combination with Martelliere teaches a plane that is transverse to the cyclone axis of rotation extends through the pistol-grip portion and the hand vacuum cleaner at a location rearward of the front end and forward of a rear end of the suction motor at least for the same reasons that claims [1c.2]/[12c.2] are met, as shown in the modified figure below:



Ex1007, Fig. 1(modified); Ground 3, [1c.2]/[12c.2].

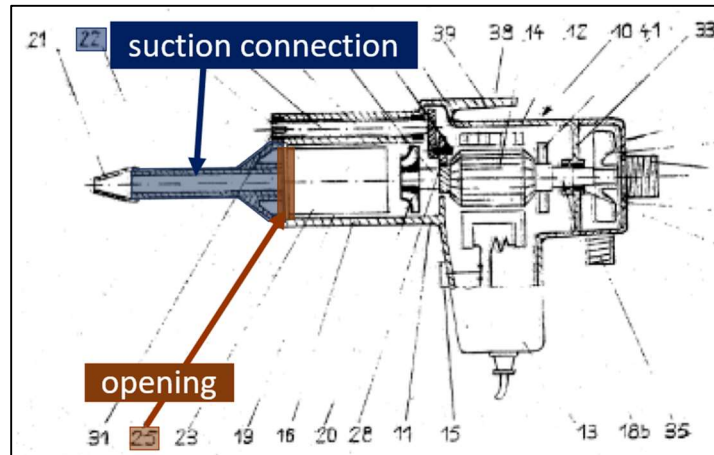
i. [1c.4]

Reference Number	Claim Limitation
[1c.4]	“wherein the dirty air inlet of the hand vacuum cleaner is removably drivingly mountable to a downstream end of the rigid air flow conduit whereby when the hand vacuum cleaner is mounted to the downstream end of the rigid air flow conduit, the pistol grip handle is a driving handle for the surface cleaning apparatus, and”

334. In my opinion, Rebel in combination with Martelliere renders obvious a hand vacuum cleaner wherein the dirty air inlet of the hand vacuum cleaner is removably drivingly mountable to a downstream end of the rigid air flow conduit whereby when the hand vacuum cleaner is mounted to the downstream end of the rigid air flow conduit, the pistol grip handle is a driving handle for the surface cleaning apparatus.

335. First, and as previously explained, in my opinion a POSA would have understood that Rebel teaches that the dirty air inlet of the hand vacuum

cleaner (“**opening 25**”) is removably drivingly mountable to a downstream end of the rigid air flow conduit (“**suction connection 22**”), as shown in the annotated figure below:



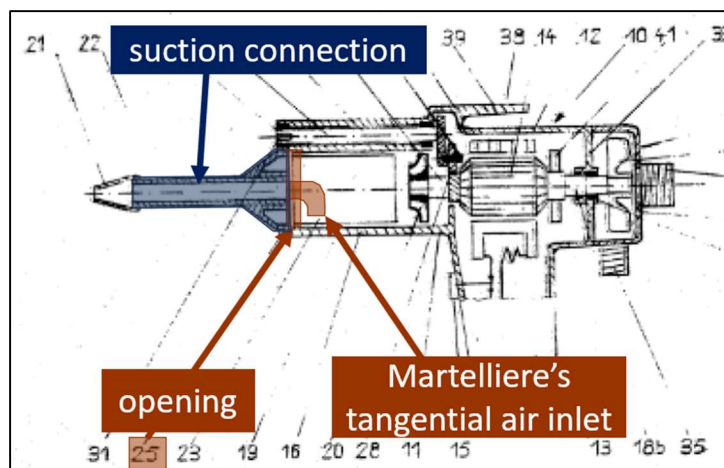
Ex1007, Fig. 1; Ground 3, [1a.1]/[12a.1], [1c.1]/[12c.1.i].

336. Next, in my opinion a POSA would have understood that the mounting between the “opening” and “suction connection” is removeable at least because the “suction connection” is “detachably attached” and can be “removed from” the housing: “dust bag 23 is detachably attached to the suction connection 22 and can be removed from the housing 11 together with said connection.” Ex1007, 4.

337. Further, in my opinion a POSA would have understood that Rebel’s dirty air inlet, “opening 25,” is drivingly mountable to a downstream end of “suction connection 22” and when the hand vacuum cleaner is mounted to the downstream end of “suction connection 22,” the pistol-grip handle

(“handle 13”) is a driving handle for the surface cleaning apparatus because movement of “handle 13” drives the entire device, including rigid “suction connection 22,” which, in turn, drives “suction nozzle 21” when so mounted. Ground 3, [1a.2]/[12a.2], [1c.1]/[12c.1.i], [12c.1.ii].

338. These features of “**opening 25**” would not change when Martelliere’s cyclonic-separator teachings, including its “**tangential[]**” **air inlet**, are incorporated with Rebel, as shown in the modified figure below:



Ex1007, Fig. 1(modified); Ex1020, Fig. 1(modified).

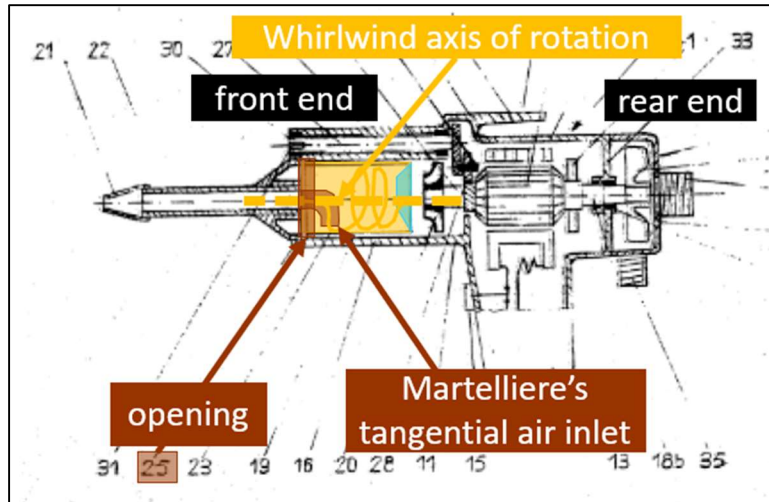
339. Therefore, in my opinion a POSA would have understood that Rebel’s “opening 25” and Martelliere’s “tangential[]” air inlet are individually and together a dirty air inlet of the hand vacuum cleaner.

j. [1c.5]

Reference Number	Claim Limitation
[1c.5]	“wherein when the hand vacuum cleaner is positioned with the front end of the hand vacuum cleaner in front of the rear end of the hand vacuum cleaner and the dirty air inlet faces forwardly, the cyclone axis of rotation is generally horizontal.”

340. In my opinion, Rebel in combination with Martelliere renders obvious a hand vacuum cleaner wherein when the hand vacuum cleaner is positioned with the front end of the hand vacuum cleaner in front of the rear end of the hand vacuum cleaner and the dirty air inlet faces forwardly, the cyclone axis of rotation is generally horizontal.

341. In my opinion, a POSA would have understood that the hand vacuum cleaner of the Rebel-Martelliere combination is positioned with the **front end** of the hand vacuum cleaner in front of the **rear end** of the hand vacuum cleaner and the dirty air inlet (“**opening 25**”/“**tangential[]**” **air inlet**) faces forwardly, the cyclone axis of rotation (“**Whirlwind**” **axis**) is generally horizontal, as shown in the modified figure below:



Ex1007, Fig. 1(modified); Ex1020, Fig. 1(modified).

12. Rebel in combination with Martelliere Renders Obvious Claims [2]/[14]

Reference Number	Claim Limitation
[2]	"The surface cleaning apparatus of claim 1 wherein the cyclone unit is removably mountable as part of the hand vacuum cleaner."
[14]	"The surface cleaning apparatus of claim 12 wherein the cyclone unit is removably mountable as part of the hand vacuum cleaner."

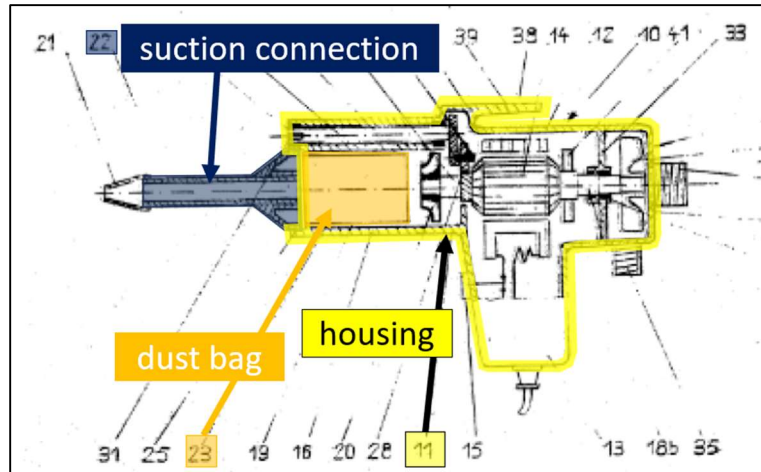
342. In my opinion, Rebel in combination with Martelliere renders obvious the surface cleaning apparatus of claim 1 wherein the cyclone unit is removably mountable as part of the hand vacuum cleaner. (Claim 2).

343. In my opinion, Rebel in combination with Martelliere renders obvious the surface cleaning apparatus of claim 12 wherein the cyclone unit is removably mountable as part of the hand vacuum cleaner. (Claim 14).

344. The Rebel-Martelliere combination teaches and renders obvious claims

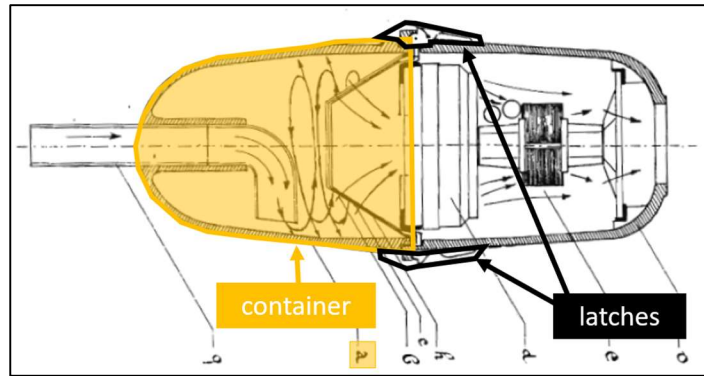
[1]/[12]. Ground 3, [1]/[12].

345. In my opinion, a POSA would have understood that Rebel teaches that the air-filtration unit is removably mountable as part of the hand vacuum cleaner at least because Rebel teaches that “**dust bag 23** is detachably attached to the **suction connection 22** and can be removed from the **housing 11** together with said **connection**,” as shown in the annotated figure below:



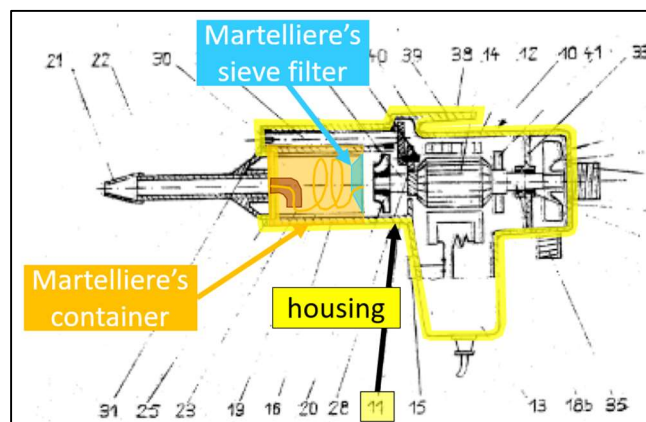
Ex1007, 4, Fig. 1.

346. In my opinion, a POSA would have understood that Martelliere teaches that the cyclone unit (“**container a**,” in which the “Whirlwind” cyclonic airflow occurs) is removably mountable as part of the hand vacuum cleaner at least because Martelliere teaches that “the **container** is very easily detachable” using latches, as shown in the annotated figure below:



Ex1020, 1, Fig. 1.

347. Therefore, in my opinion a POSA would have understood in the Rebel-Martelliere combination, the cyclone unit (Martelliere’s “very easily detachable” “**container**”) is removably mountable as part of the hand vacuum cleaner because both Rebel and Martelliere teach removable air filtration units and because the removably mountable cyclone unit allows a user to empty the collected dust, to clean the container, and to create access to the pre-motor filter (Martelliere’s “**sieve filter**”) for cleaning, maintenance, and replacement, as shown in the modified figure below:



Ex1007, Fig. 1(modified); Ex1020, Fig. 1(modified).

348. Further, in my opinion a POSA would have found it obvious to make the cyclone unit removably mountable for these reasons. In my opinion, a POSA would have found it at least been obvious to try, as one of a finite number of ways to empty the collected dust and create access to the pre-motor filter, including removing the cyclone unit and opening a door to the cyclone unit. In my opinion, a POSA further would have reasonably expected success because it would have been straightforward to make the cyclone unit removably mountable, including by using latches as Martelliere teaches, and/or by using other well-known mechanisms to “detach[]” the air-filtration unit, as Rebel teaches. Ex1020, 1, Fig. 1; Ex1007, 4, Fig. 1.

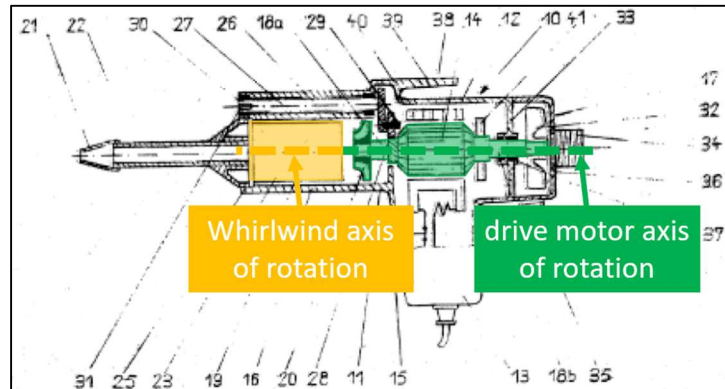
13. Rebel in combination with Martelliere Renders Obvious Claims [4]

Reference Number	Claim Limitation
[4]	“The surface cleaning apparatus of claim 1 wherein the cyclone axis of rotation is generally parallel to the suction motor axis of rotation.”

349. In my opinion, Rebel in combination with Martelliere renders obvious the surface cleaning apparatus of claim 1 wherein the cyclone axis of rotation is generally parallel to the suction motor axis of rotation.

350. The Rebel-Martelliere combination teaches and renders obvious claim [1]. Ground 3, [1].

351. In the Rebel-Martelliere combination, the cyclone axis of rotation (“Whirlwind” axis) is generally parallel to the suction motor axis of rotation, as shown in the modified figure below:



Ex1007, Fig. 1(modified); Ex1020, Fig. 1(modified).

352. To the extent that PO argues these axes are co-axial, in my opinion a POSA would have understood they are also parallel for the same reasons explained in Ground 1, [1a.2]/[12a.2].

14. Rebel in combination with Martelliere Renders Obvious Claims [5]

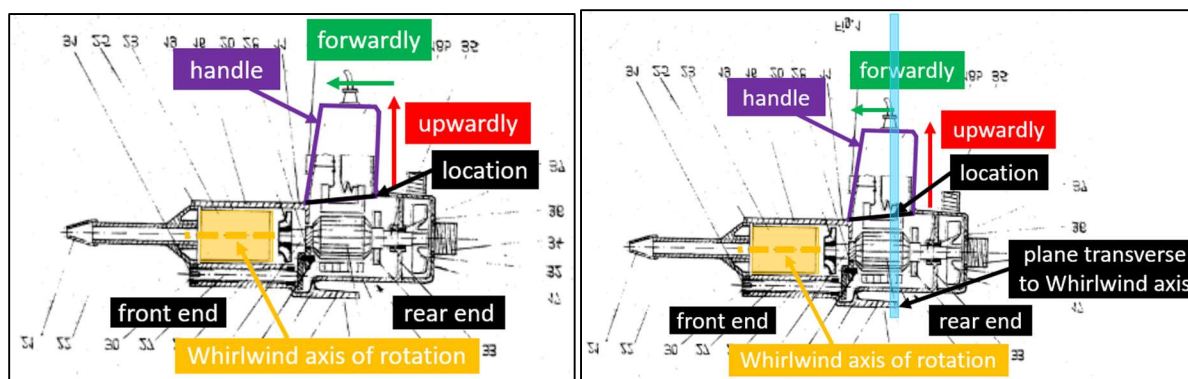
Reference Number	Claim Limitation
[5]	“The surface cleaning apparatus of claim 1 wherein, when the hand vacuum cleaner is positioned with the front end of the hand vacuum cleaner in front of the rear end of the hand vacuum cleaner the cyclone axis of rotation is positioned horizontally, the pistol grip handle extends upwardly and forwardly from the location.”

353. In my opinion, Rebel in combination with Martelliere renders obvious the surface cleaning apparatus of claim 1 wherein, when the hand vacuum

cleaner is positioned with the front end of the hand vacuum cleaner in front of the rear end of the hand vacuum cleaner the cyclone axis of rotation is positioned horizontally, the pistol grip handle extends upwardly and forwardly from the location.

354. The Rebel-Martelliere combination teaches and renders obvious claim [1].
Ground 3, [1].

355. In my opinion, a POSA would have understood that when the Rebel-Martelliere combination hand vacuum cleaner is positioned with the **front end** of the hand vacuum cleaner in front of the **rear end** of the hand vacuum cleaner, the cyclone axis of rotation (“**Whirlwind**” **axis**) is positioned horizontally and the pistol grip handle (“**handle 13**”) extends **upwardly** and **forwardly** from **the location**, regardless of whether “the location” refers to “a location” where the handle end is mounted (claim element [1c.2], left), or “a location” of the plane transverse to cyclone axis (claim element [1c.3], right), as shown in the modified figures below:



Ex1007, Fig. 1(modified); Ex1020, Fig. 1(modified).

356. In my opinion, a POSA would have understood one of the ways in which a user can “hold[] the multipurpose device” of Rebel-Martelliere vacuum is as depicted above, particularly when cleaning hard-to-reach areas, such as under a vehicle’s seat, as Rebel teaches. Ex1007, 1 (“Multipurpose device, in particular handheld vehicle care device”), 3.

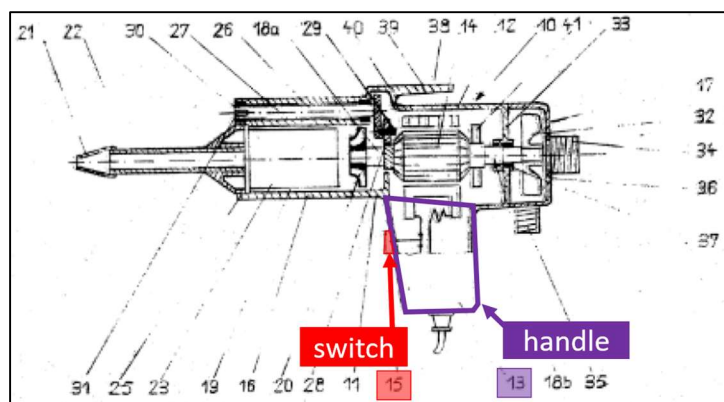
15. Rebel in combination with Martelliere Renders Obvious Claims [6]/[17]

Reference Number	Claim Limitation
[6]	“The surface cleaning apparatus of claim 1 wherein an enclosed finger grip area is provided on a forward side of the pistol grip handle.”
[17]	“The surface cleaning apparatus of claim 1 wherein an enclosed finger grip area is provided on a forward side of the pistol grip handle.”

357. In my opinion, Rebel in combination with Martelliere renders obvious the surface cleaning apparatus of claim 1 wherein an enclosed finger grip area is provided on a forward side of the pistol grip handle.

358. The Rebel-Martelliere combination teaches and renders obvious claim [1]. Ground 3, [1].

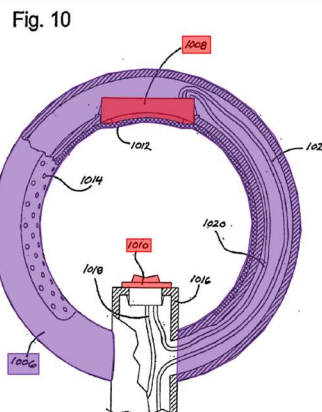
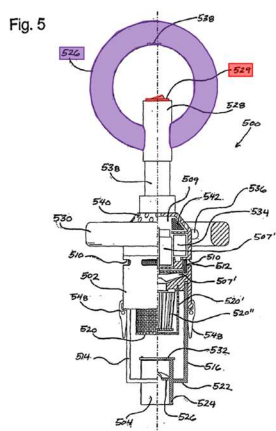
359. Rebel teaches that its “**handle 13** ... accommodates ... **switch 15**,” which “operate[s]” the “electric motor”, as shown in the annotated figure below:



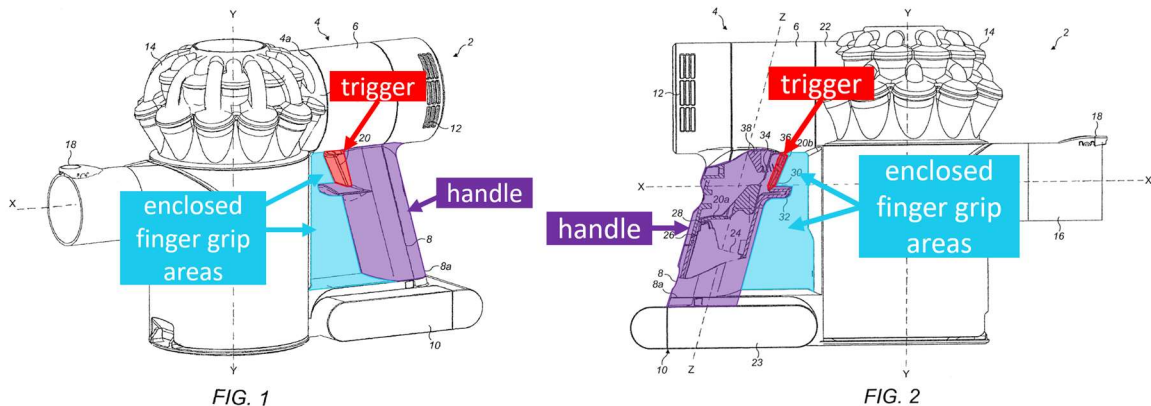
Ex1007, 4, 7, Fig. 1.

360. As explained for Ground 1, [6]/[17], in my opinion a POSA would have understood that handles having enclosed finger grip areas provided on a forward side of the pistol grip handle were well-known in the art as providing certain benefits, including protecting a user's fingers from injury and protecting accidental operation of a finger-operated trigger, as shown in the annotated figures below:

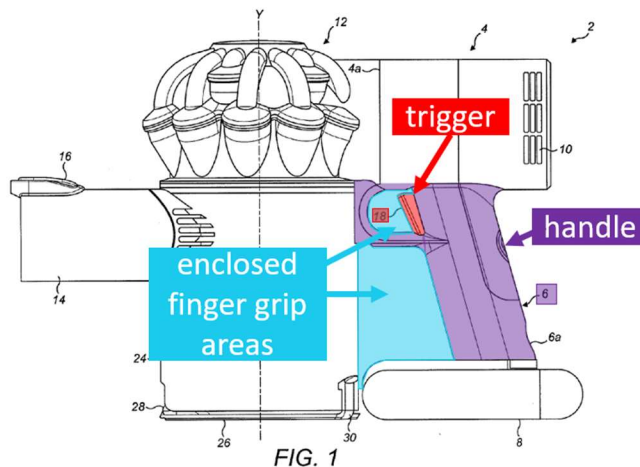
Ex1005, 11:18-19, Figs. 5, 10 (enclosed finger grip areas “shield[] the power switch ... from being accidentally activated”)



Ex1017, 7:31-8:4 Figs. 1-2 (enclosed finger grip areas “allow[] a user to grasp the handle without actuating the trigger”)



Ex1018, ¶27, Fig. 1 (enclosed finger grip areas prevent accidental operation of trigger 18)



See Ground 1, [6]/[17].

361. In my opinion, a POSA therefore would have been motivated to modify Rebel’s “handle 13” to include such an enclosed finger grip area to achieve these benefits. Further, in my opinion a POSA would have understood this modification involves simply adding a known element (an extension of “handle 13” enclosing the “switch 15” and/or the entire handle) to obtain

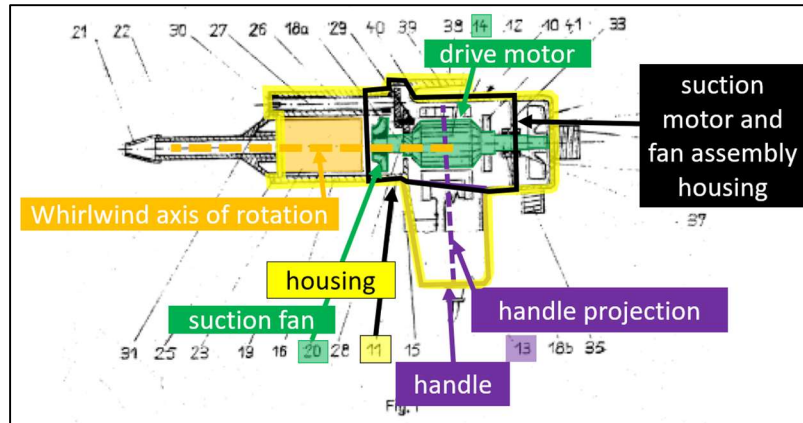
the predictable results of encasing and protecting the hand-grip portion of the handle and protecting the “switch” from accidental operation.

362. In my opinion, a POSA would have found this modification to have at least been obvious to try as one of a finite number of handle possibilities, including handles with exposed finger grip areas and handles with enclosed finger grip areas. In my opinion, a POSA would have reasonably expected success modifying Rebel’s handle as described for the reasons listed above and because it would have been a straightforward modification of the handle to include such an enclosure.

16. Rebel in combination with Martelliere Renders Obvious Claims [7]/[8]/[18]/[19]

Reference Number	Claim Limitation
[7]	“The surface cleaning apparatus of claim 1 wherein a projection of the pistol grip handle in a direction transverse to the cyclone axis of rotation intersects the suction motor and fan assembly.”
[8]	“The surface cleaning apparatus of claim 1 wherein a projection of the pistol grip handle in a direction transverse to the cyclone axis of rotation intersects a housing of the suction motor and fan assembly.”
[18]	“The surface cleaning apparatus of claim 1 wherein a projection of the pistol grip handle in a direction transverse to the cyclone axis of rotation intersects the suction motor and fan assembly.”
[19]	“The surface cleaning apparatus of claim 1 wherein a projection of the pistol grip handle in a direction transverse to the cyclone axis of rotation intersects a housing of the suction motor and fan assembly.”

363. In my opinion, Rebel in combination with Martelliere renders obvious the surface cleaning apparatus of claim 1 wherein a projection of the pistol grip handle in a direction transverse to the cyclone axis of rotation intersects the suction motor and fan assembly. (Claims 7, 18).
364. In my opinion, Rebel in combination with Martelliere renders obvious the surface cleaning apparatus of claim 1 wherein a projection of the pistol grip handle in a direction transverse to the cyclone axis of rotation intersects a housing of the suction motor and fan assembly. (Claims 8, 19).
365. The Rebel-Martelliere combination teaches and renders obvious claim [1]. Ground 3, [1].
366. In my opinion, a POSA would have understood that in the Rebel-Martelliere combination a projection of the pistol grip handle (“**handle 13**”) in a direction transverse to the cyclone axis of rotation (“**Whirlwind axis**”) intersects the suction motor and fan assembly (“**drive motor 14**,” which comprises “**shaft 18**,” and “**suction fan 20**”) and a housing of the suction motor and fan assembly (the **portion** of “**housing 11**” that houses “**motor 14**” and “**fan 20**”), as shown in the modified figure below:



Ex1007, Fig. 1(modified); Ex1020, Fig. 1(modified).

17. Rebel in combination with Martelliere Renders Obvious Claims [9]/[20]

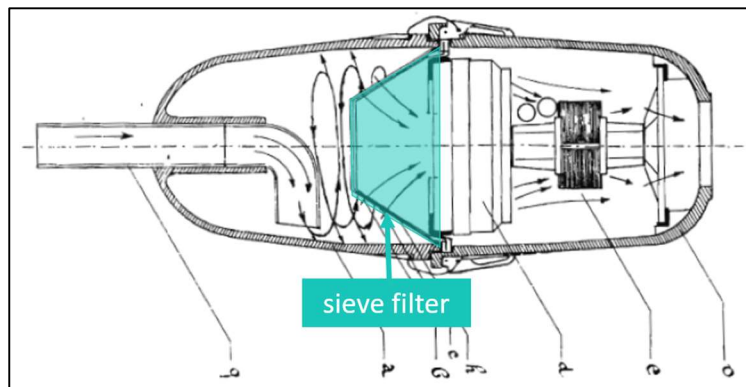
Reference Number	Claim Limitation
[9]	“The surface cleaning apparatus of claim 2 further comprising a pre-motor filter, wherein the pre-motor filter is accessible when the cyclone unit is removed.”
[20]	“The surface cleaning apparatus of claim 14 further comprising a pre-motor filter, wherein the pre-motor filter is accessible when the cyclone unit is removed.”

367. In my opinion, Rebel in combination with Martelliere renders obvious the surface cleaning apparatus of claim 2 further comprising a pre-motor filter, wherein the pre-motor filter is accessible when the cyclone unit is removed. (Claim 9).

368. In my opinion, Rebel in combination with Martelliere renders obvious the surface cleaning apparatus of claim 14 further comprising a pre-motor filter, wherein the pre-motor filter is accessible when the cyclone unit is removed. (Claim 20).

369. The Rebel-Martelliere combination teaches and renders obvious claims [2]/[14]. Ground 3, [2]/[14].

370. Martelliere teaches a pre-motor filter (“**interchangeable sieve filter b**”), wherein the pre-motor filter is accessible when the cyclone unit is removed, as shown in the annotated figure below:

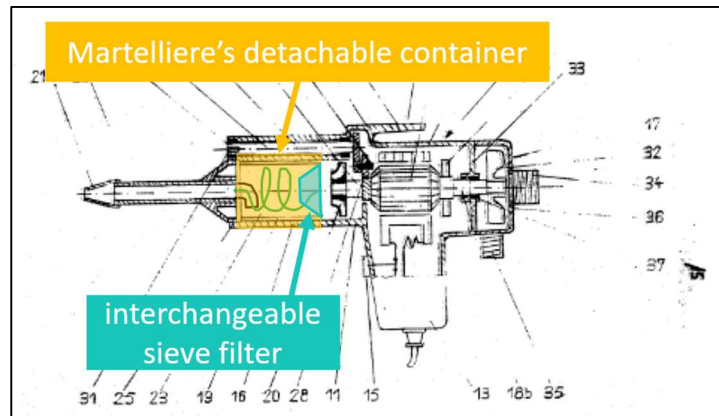


Ex1020, 1, Fig. 1.

371. In my opinion, a POSA would have understood “sieve filter” is a pre-motor filter at least because it “filter[s] ... the vacuumed dust” upstream of the suction motor. Ex1020, 1, Fig. 1. In my opinion, a POSA further would have understood “sieve filter” is accessible when the cyclone unit (“chamber a”), which surrounds “sieve filter,” is removed, because Martelliere teaches “sieve filter” is “interchangeable” and is “replaced at each emptying.” Ex1020, 1, Fig. 1.

372. This limitation remains met when Martelliere’s air-filtration unit teachings, including pre-motor-filter “**sieve filter**,” are incorporated into

Rebel, as shown in the modified figure below:



Ex1007, Fig. 1(modified); Ex1020, Fig. 1(modified); Ground 3 [2]/[14].

18. Rebel in combination with Martelliere Renders Obvious Claims [10]/[21]

Reference Number	Claim Limitation
[10]	“The surface cleaning apparatus of claim 9 wherein the pre-motor filter has a height in a direction transverse to the cyclone axis and the height is larger than a diameter of the cyclone.”
[21]	“The surface cleaning apparatus of claim 20 wherein the pre-motor filter has a height in a direction transverse to the cyclone axis and the height is larger than a diameter of the cyclone.”

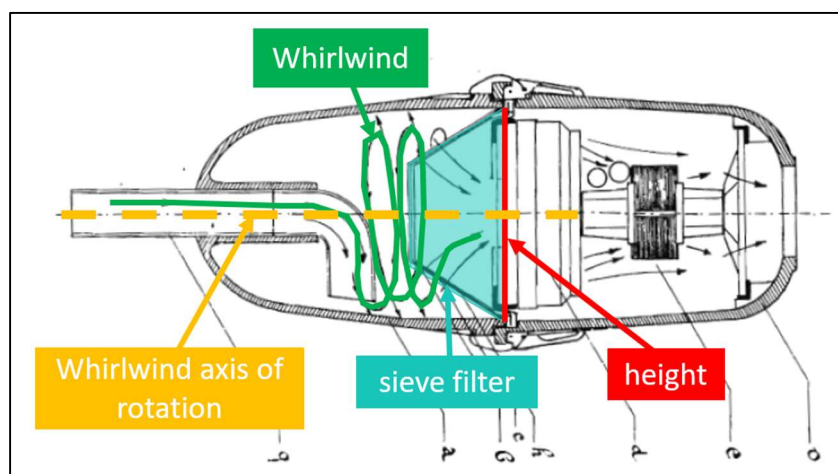
373. In my opinion, Rebel in combination with Martelliere renders obvious the surface cleaning apparatus of claim 9 wherein the pre-motor filter has a height in a direction transverse to the cyclone axis and the height is larger than a diameter of the cyclone. (Claim 10).

374. In my opinion, Rebel in combination with Martelliere renders obvious the surface cleaning apparatus of claim 20 wherein the pre-motor filter has a

height in a direction transverse to the cyclone axis and the height is larger than a diameter of the cyclone. (Claim 21).

375. The Rebel-Martelliere combination teaches and renders obvious claims [9]/[20]. Ground 3, [9]/[20].

376. In my opinion, a POSA would have understood that Martelliere's pre-motor filter ("sieve filter") has a **height** in a direction transverse to the cyclone axis ("Whirlwind" axis) and the height is larger than a diameter of the cyclone ("Whirlwind"), as shown in the annotated figure below:

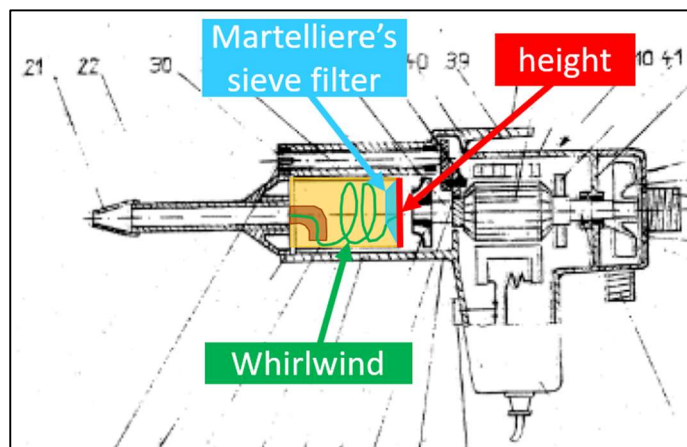


Ex1020, Fig. 1.

377. As shown above, in my opinion a POSA would have understood Martelliere teaches the pre-motor filter height in a direction transverse to the cyclone axis is larger than a diameter than of the cyclone because the "sieve filter" extends to the edges of Martelliere's "container," and therefore the height is larger or as large as the largest-diameter of the

cyclone, and because the “container” tapers towards the front, and thus the height is larger than a diameter of the cyclone at the tapered end.

378. In my opinion, a POSA further would have understood that the “sieve filter” in the Rebel-Martelliere combination has a height that is larger or as large as the largest-diameter of the cyclone, as shown in the modified figure below:

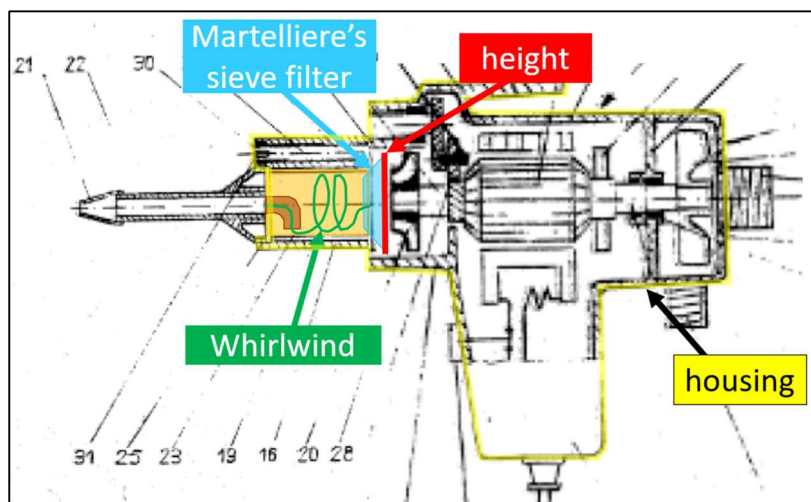


Ex1007, Fig. 1(modified); Ex1020, Fig. 1(modified).

379. Further, in the Rebel-Martelliere combination, in my opinion a POSA would have been motivated to increase the amount of pre-motor filtration by increasing the size of Martelliere’s “sieve filter,” which would also result in the pre-motor filter height being larger than a diameter of the cyclone. In my opinion, a POSA would have understood increasing filter size (surface area and volume) increases the amount of air filtration and allows the filter to filter more particles before becoming clogged. Indeed,

this was well known in the art. For example, Conrad570 discloses a “surface cleaning apparatus” and further teaches that “[a] pre-motor filter reduces the level of entrained dirt that will reach the HEPA filter. However, the filter will become clogged with use. Increasing the surface area of the upstream side of the pre-motor filter extends the lifetime of the pre-motor filter.” Ex1031, Abstract, ¶ 33.

380. In my opinion, a POSA further would have been motivated to increase the amount of pre-motor filtration to increase the overall amount of filtration during operation, to further protect the motor from being damaged by dirty air, and to decrease the resistance of airflow through the filter. In my opinion, a POSA would have understood Martelliere’s “sieve filter” and its height could be increased by simply enlarging certain portions of Rebel’s “housing 11,” as shown in the modified figure below:



Ex1007, Fig. 1(modified); Ex1020, Fig. 1(modified).

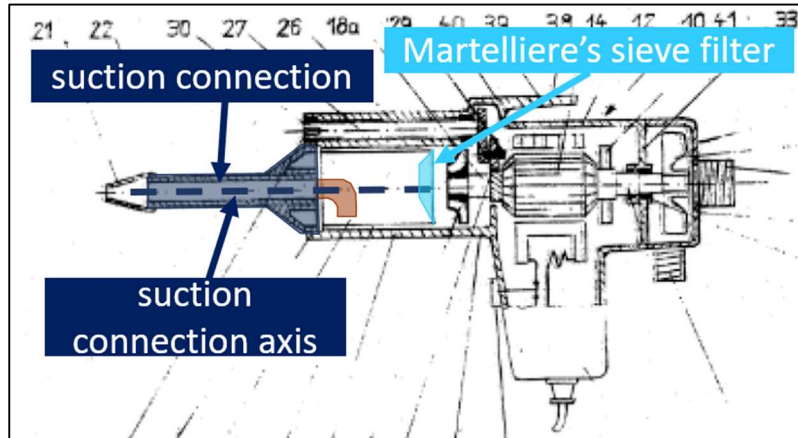
381. When so modified, the pre-motor “sieve filter” has a height larger than a diameter of the cyclone.
382. In my opinion, a POSA would have reasonably expected success because this modification would have involved only modestly enlarging Martelliere’s pre-motor filter and the rear portion of Rebel’s housing, which would have been straightforward.

19. Rebel in combination with Martelliere Renders Obvious Claims [13]

Reference Number	Claim Limitation
[13]	“The surface cleaning apparatus of claim 12 further comprising a pre-motor filter, wherein, when the hand vacuum cleaner is mounted to the downstream end of the rigid air flow conduit, a projection of the longitudinally extending conduit axis intersects the pre-motor filter.”

383. In my opinion, Rebel in combination with Martelliere renders obvious the surface cleaning apparatus of claim 12 further comprising a pre-motor filter, wherein, when the hand vacuum cleaner is mounted to the downstream end of the rigid air flow conduit, a projection of the longitudinally extending conduit axis intersects the pre-motor filter.
384. The Rebel-Martelliere combination teaches and renders obvious claim [12]. Ground 3, [12].
385. In my opinion a POSA would have understood that the Rebel-Martelliere combination teaches a pre-motor filter (“**sieve filter**”), wherein, when the

hand vacuum cleaner is mounted to the downstream end of the rigid air flow conduit (“**suction connection 22**”), a projection of the longitudinally extending conduit axis (**suction connection axis**) intersects the pre-motor filter, as shown in the modified figure below:



Ex1007, Fig. 1(modified); Ex1020, Fig. 1(modified).

20. Rebel in combination with Martelliere Renders Obvious Claims [15]

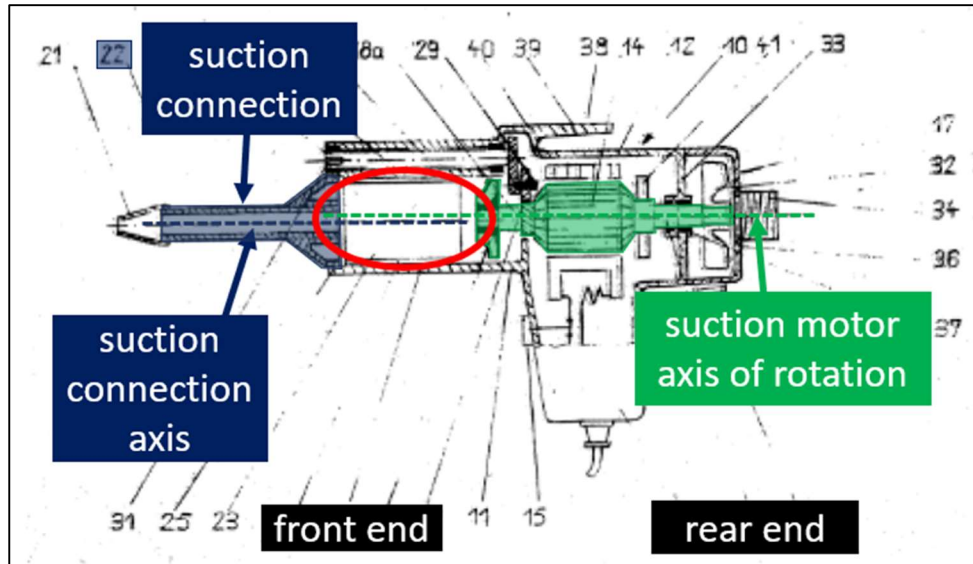
Reference Number	Claim Limitation
[15]	“The surface cleaning apparatus of claim 12 wherein, when the hand vacuum cleaner is mounted to the downstream end of the rigid air flow conduit and when the hand vacuum cleaner is positioned with the front end of the hand vacuum cleaner in front of the rear end of the hand vacuum cleaner, the suction motor axis of rotation is vertically spaced from the longitudinally extending conduit axis.”

386. In my opinion, Rebel in combination with Martelliere renders obvious the surface cleaning apparatus of claim 12 wherein, when the hand vacuum cleaner is mounted to the downstream end of the rigid air flow conduit and

when the hand vacuum cleaner is positioned with the front end of the hand vacuum cleaner in front of the rear end of the hand vacuum cleaner, the suction motor axis of rotation is vertically spaced from the longitudinally extending conduit axis.

387. The Rebel-Martelliere combination teaches and renders obvious claim [12]. Ground 3, [12].

388. In my opinion, a POSA would have understood that the Rebel teaches that the **suction motor axis of rotation** is **vertically spaced** from the longitudinally extending conduit axis (**suction connection axis**), as shown in the annotated figure below, when the hand vacuum cleaner is mounted to the downstream end of the rigid air flow conduit (“**suction connection 22**”) and when the hand vacuum cleaner is positioned with the **front end** of the hand vacuum cleaner in front of the **rear end** of the hand vacuum cleaner:



Ex1007, Fig. 1.

389. Furthermore, to the extent that PO argues the drive motor axis of rotation is not vertically spaced from the suction connection axis, in my opinion a POSA would have found it obvious to modify Rebel to vertically space these axes, even by a modest amount.
390. Rebel teaches “a handheld vehicle care device” that “comprises a motor-driven vacuum cleaner.” Ex1007, 1. In my opinion, a POSA would have understood raising or lowering Rebel’s “suction connection 22” would improve the utility of the device for certain uses, including cleaning hard-to-reach areas, e.g., under a vehicle seat, and in my opinion a POSA would have reasonably expected success, because it would have been a minor modification to the location of the suction connector.
391. In my opinion, a POSA would have also been motivated to raise or lower

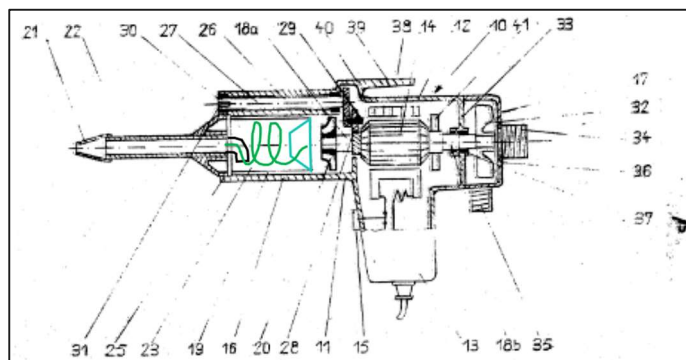
Rebel's motor/fan assembly to optimize airflow, cooling, and component packaging. Further, it would have at least been obvious to try moving the suction connector up/down relative to the drive motor, as there are a finite number of relative locations of these components and thus a finite number of relative positions of their axes, including co-axial and vertically offset.

D. Ground 4: Rebel In Combination With Martelliere and Jianan Renders Obvious Claims 3, 10-11, 16, and 21-22

1. A POSA Would Have Been Motivated To Combine Rebel, Martelliere, And Jianan

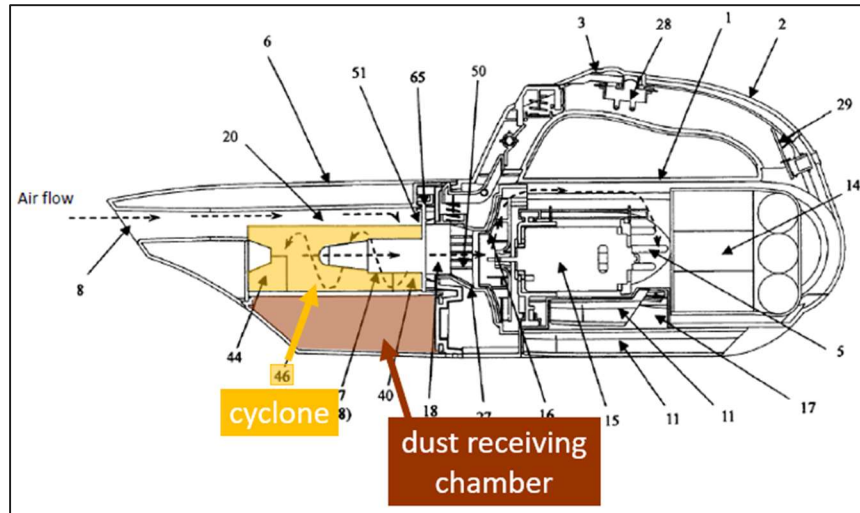
a. Scope and Content of the Rebel, Martelliere, And Jianan Prior Art References

392. The Rebel-Martelliere combination is a “[m]ultipurpose device” including a cyclonic “vacuum cleaner,” as shown in the modified figure below:



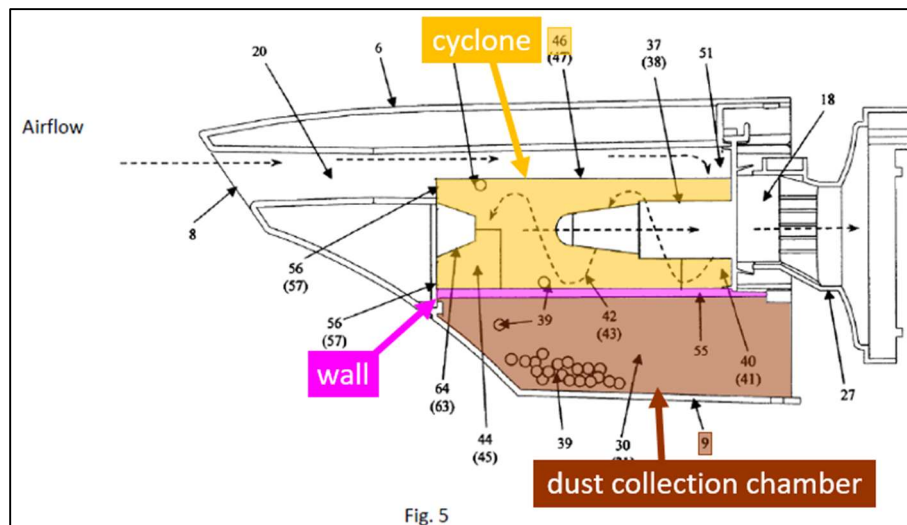
Ex1007, 1, Fig. 1(modified); Ex1020, 1, Fig. 1(modified); Ground 3, §1.

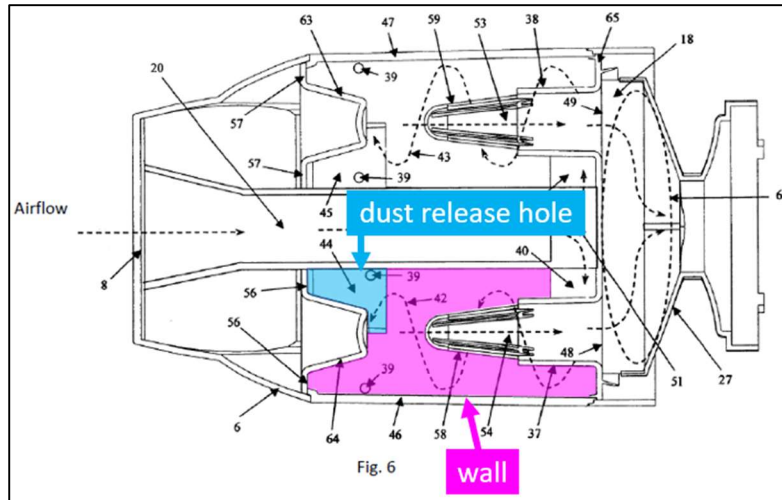
393. Jianan teaches a “handheld vacuum” with a “detachable dust cup” comprising “two parallel **cyclones** and separate **dust receiving chambers**,” as shown in the annotated figure below:



Ex1015, Abstract, 4, Fig. 3.

394. Jianan teaches a “**wall 55**” that separates “**cyclone 46**” and the “independent **dust collection chamber 9**,” as shown in the annotated figures below:



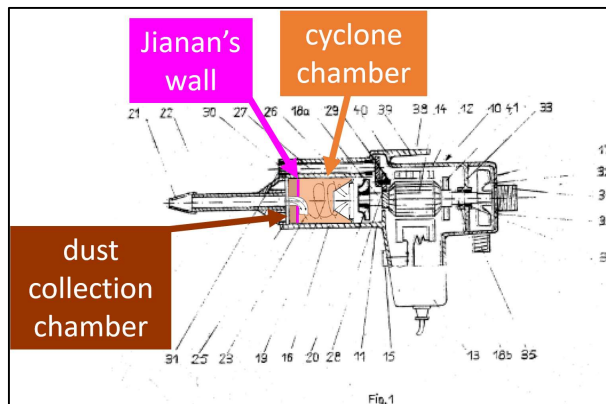
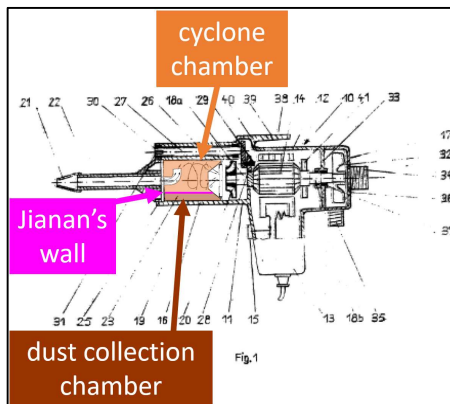
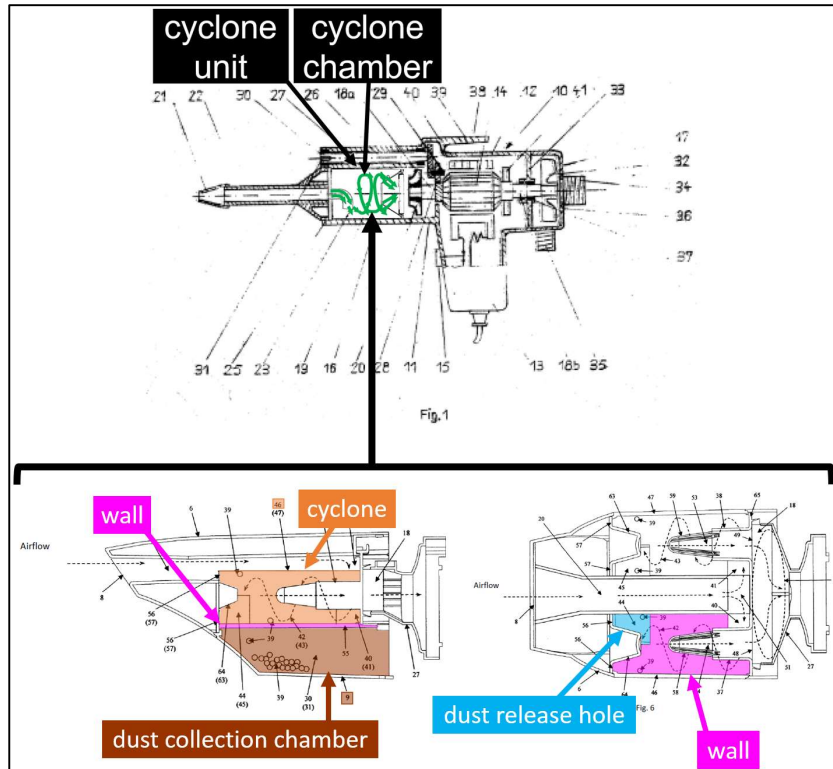


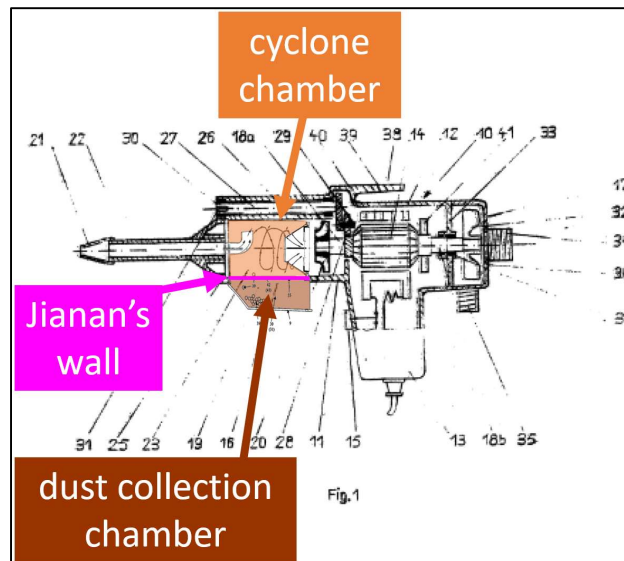
Ex1015, 9-10, Figs. 5-6.

395. Jianan further teaches a “**dust collection chamber 9** is connected to the cyclone body via the **dust release hole**.” Ex1015, 9.

b. A POSA Would Have Been Motivated to Combine the Teachings of Rebel, Martelliere, And Jianan

396. In my opinion, a POSA would have been motivated to incorporate Jianan’s teachings into the Rebel-Martelliere combination to achieve the benefits of Jianan’s independent dust-collection chamber in multiple ways, including by adding a horizontal or vertical “**wall**” with a “**dust release hole**” to the cyclone chamber, and by adding Jianan’s external dust-collection chamber, as shown in the modified figures below:





Ex1007, 4, Fig. 1(modified); Ex1020, Fig. 1(modified); Ex1015, Figs. 5-6(modified).

397. In my opinion, a POSA would have understood that Martelliere’s “tangential[]” air inlet would create cyclonic airflow whether pointed toward the upper or lower end of the cyclone chamber.

398. In my opinion, to accommodate the separate dirt-collection chamber when a horizontal wall is used, a POSA would have been motivated to point Martelliere’s “tangential[]” air inlet upwards.

399. For the same reasons as for Ground 2, §1.b, in my opinion a POSA would have been motivated to incorporate Jianan’s teachings into the Rebel-Martelliere combination as described. Jianan is analogous art to the Rebel-Martelliere combination at least because both teach a hand vacuum cleaner with a removable cyclonic-separation unit. Ground 3, [2]/[14]; Ex1015,

Abstract, 4, claim 3.

400. Furthermore, in my opinion a POSA would have recognized that these references provide motivations for this combination. Martelliere teaches it is beneficial to “prevent[] clogging” of the “filter screen” and to create “stable suction” by having “the [dust] materials [be] deposited in the bottom of the container, after having separated from the air, before it passes through the filter screen,” which, in my opinion, would have motivated a POSA to look for ways to further prevent clogging and improve suction stability, such as Jianan teaches. Ex1020, 1. In my opinion, a POSA would have understood cyclone units with an exterior dirt-collection chamber as Jianan teaches had certain benefits, including benefits Jianan expressly teaches. Ground 2, §1; Ex1015, 5, 10.
401. In my opinion, a POSA would have understood this combination to involve a simple substitution of known elements to obtain predictable results. The Rebel-Martelliere combination teaches a cyclone unit with an integrated dirt-collection chamber/cyclone chamber. Ex1020, Fig. 1. Jianan teaches a cyclone unit with a cyclone chamber separated from a dirt-collection chamber by a wall. Ex1015, Figs. 5-6. A POSA would understand that simply substituting an integrated dirt-collection chamber for a separated one would achieve the predictable result of more efficient cyclonic air

filtration and reduced pre-filter maintenance.

402. Further, as depicted in the modified figures above, the Rebel-Martelliere combination and Jianan are both hand vacuums having a similar orientation of cyclone unit relative to the overall vacuum configuration, which, in my opinion, would have further motivated a POSA to make the combination.

c. A POSA Would Have Had A Reasonable Expectation of Success Combining the Teachings of Rebel, Martelliere, And Jianan

403. In my opinion, a POSA would have reasonably expected success for the reasons stated above, including because the Rebel-Martelliere combination and Jianan are very similar, as they are both hand vacuums having similar configurations and removable cyclonic separating units, which in my opinion would have further given a POSA a reasonable expectation of success.

**2. Rebel In Combination With Martelliere and Jianan
Renders Obvious Claims [3]/[16]**

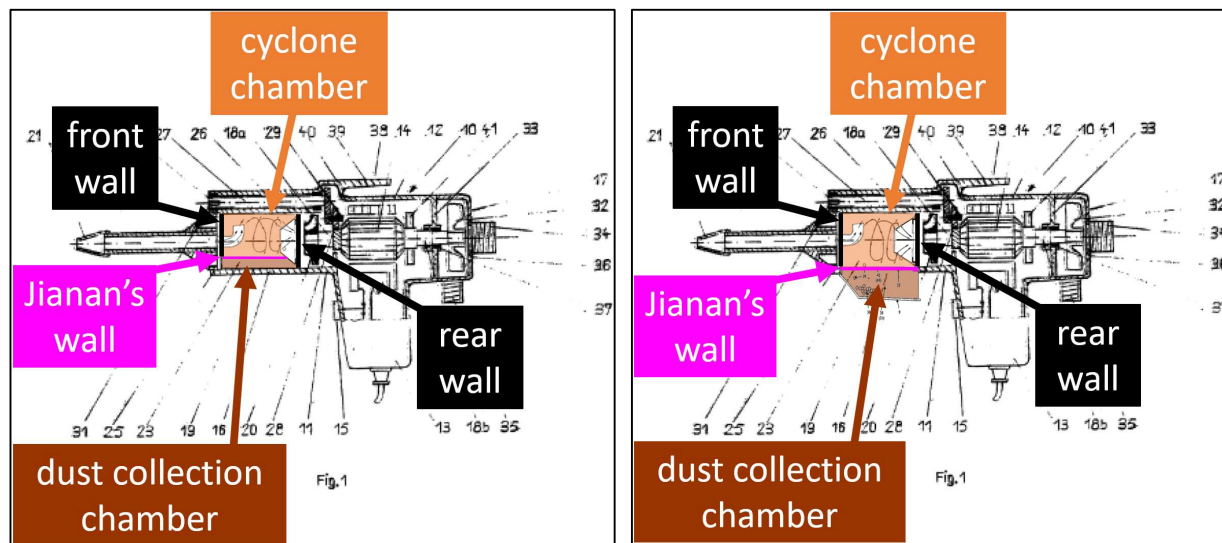
Reference Number	Claim Limitation
[3]	“The surface cleaning apparatus of claim 1 wherein the cyclone chamber has a sidewall extending between front and rear walls of the cyclone chamber and, when the hand vacuum cleaner is positioned with the front end of the hand vacuum cleaner in front of the rear end of the hand vacuum cleaner, the cyclone axis of rotation positioned horizontally, and the dirty air inlet faces forwardly, the sidewall extends generally horizontally and a dirt outlet is provided in a lower portion of the sidewall and is in communication with a dirt collection chamber that is exterior to the cyclone chamber.”
[16]	“The surface cleaning apparatus of claim 12 wherein the cyclone chamber has a sidewall extending between front and rear walls of the cyclone chamber and, when the hand vacuum cleaner is positioned with the front end of the hand vacuum cleaner in front of the rear end of the hand vacuum cleaner, the cyclone axis of rotation is positioned horizontally, and the dirty air inlet faces forwardly, the sidewall extends generally horizontally and a dirt outlet is provided in a lower portion of the sidewall and is in communication with a dirty collection chamber that is exterior to the cyclone chamber.”

404. In my opinion, Rebel in combination with Martelliere and Jianan renders obvious the surface cleaning apparatus of claim 1 wherein the cyclone chamber has a sidewall extending between front and rear walls of the cyclone chamber and, when the hand vacuum cleaner is positioned with the front end of the hand vacuum cleaner in front of the rear end of the hand vacuum cleaner, the cyclone axis of rotation positioned horizontally, and the dirty air inlet faces forwardly, the sidewall extends generally

- horizontally and a dirt outlet is provided in a lower portion of the sidewall and is in communication with a dirt collection chamber that is exterior to the cyclone chamber. (Claim 3).
405. In my opinion, Rebel in combination with Martelliere and Jianan renders obvious the surface cleaning apparatus of claim 12 wherein the cyclone chamber has a sidewall extending between front and rear walls of the cyclone chamber and, when the hand vacuum cleaner is positioned with the front end of the hand vacuum cleaner in front of the rear end of the hand vacuum cleaner, the cyclone axis of rotation is positioned horizontally, and the dirty air inlet faces forwardly, the sidewall extends generally horizontally and a dirt outlet is provided in a lower portion of the sidewall and is in communication with a dirty collection chamber that is exterior to the cyclone chamber. (Claim 16).
406. The Rebel-Martelliere-Jianan combination teaches and renders obvious claims [1]/[12] for the same reasons the Rebel-Martelliere combination does. Ground 3, [1]/[12].
407. First, the Rebel-Martelliere combination, and therefore the Rebel-Martelliere-Jianan combination, teaches a hand vacuum cleaner comprising a cyclone chamber. Ground 3, [1a.2]/[12a.2].
408. Next, Jianan teaches the additional limitations of these claims, as

previously explained. Ground 2, [3]/[16].

409. Therefore, in my opinion, the Rebel-Martelliere-Jianan combination teaches this limitation, as shown in the modified figures below:



Ex1007, 4, Fig. 1(modified); Ex1020, Fig. 1(modified); Ex1015, Fig. 5(modified).

410. In my opinion, if modifying the Rebel-Martelliere combination in view of Jianan moves the cyclone axis, a POSA would have recognized that the cyclone axis would continue to extend in a forward/rearward direction, would remain generally horizontal when oriented as shown above, and would remain parallel to the suction motor axis and longitudinally extending conduit axis such that claims 1 and 12 are met. Ground 3, [1]/[12].

**3. Rebel In Combination With Martelliere and Jianan
Renders Obvious Claims [10]/[21]**

Reference Number	Claim Limitation
[10]	“The surface cleaning apparatus of claim 9 wherein the pre-motor filter has a height in a direction transverse to the cyclone axis and the height is larger than a diameter of the cyclone.”
[21]	“The surface cleaning apparatus of claim 20 wherein the pre-motor filter has a height in a direction transverse to the cyclone axis and the height is larger than a diameter of the cyclone.”

411. In my opinion, Rebel in combination with Martelliere and Jianan renders obvious the surface cleaning apparatus of claim 9 wherein the pre-motor filter has a height in a direction transverse to the cyclone axis and the height is larger than a diameter of the cyclone. (Claim 10).
412. In my opinion, Rebel in combination with Martelliere and Jianan renders obvious the surface cleaning apparatus of claim 20 wherein the pre-motor filter has a height in a direction transverse to the cyclone axis and the height is larger than a diameter of the cyclone. (Claim 21).
413. The Rebel-Martelliere-Jianan combination teaches and renders obvious claims [9]/[20] for the same reasons the Rebel-Martelliere combination does. Ground 3, [9]/[20].
414. In my opinion a POSA would have understood that the Rebel-Martelliere combination teaches that the pre-motor filter has a height in a direction

transverse to the cyclone axis and the height is larger than a diameter of the cyclone. Ground 3, [10]/[21].

415. In my opinion, a POSA further would have understood that incorporating Jianan's teachings into the Rebel-Martelliere combination maintains or reduces the cyclone chamber height and therefore maintains or reduces the diameter of the cyclone but does not reduce the pre-motor filter height.

416. Therefore, in my opinion a POSA would have understood the Rebel-Martelliere-Jianan combination to teach this limitation.

4. Rebel In Combination With Martelliere and Jianan Renders Obvious Claims [11]/[22]

Reference Number	Claim Limitation
[11]	"The surface cleaning apparatus of claim 10 further comprising a dirt collection chamber that is exterior to the cyclone chamber and a line that is parallel to the cyclone axis extends through the dirt collection chamber and the pre-motor filter."
[22]	"The surface cleaning apparatus of claim 21 further comprising a dirt collection chamber that is exterior to the cyclone chamber and a line that is parallel to the cyclone axis extends through the dirt collection chamber and the pre-motor filter."

417. In my opinion, Rebel in combination with Martelliere and Jianan renders obvious surface cleaning apparatus of claim 10 further comprising a dirt collection chamber that is exterior to the cyclone chamber and a line that is parallel to the cyclone axis extends through the dirt collection chamber

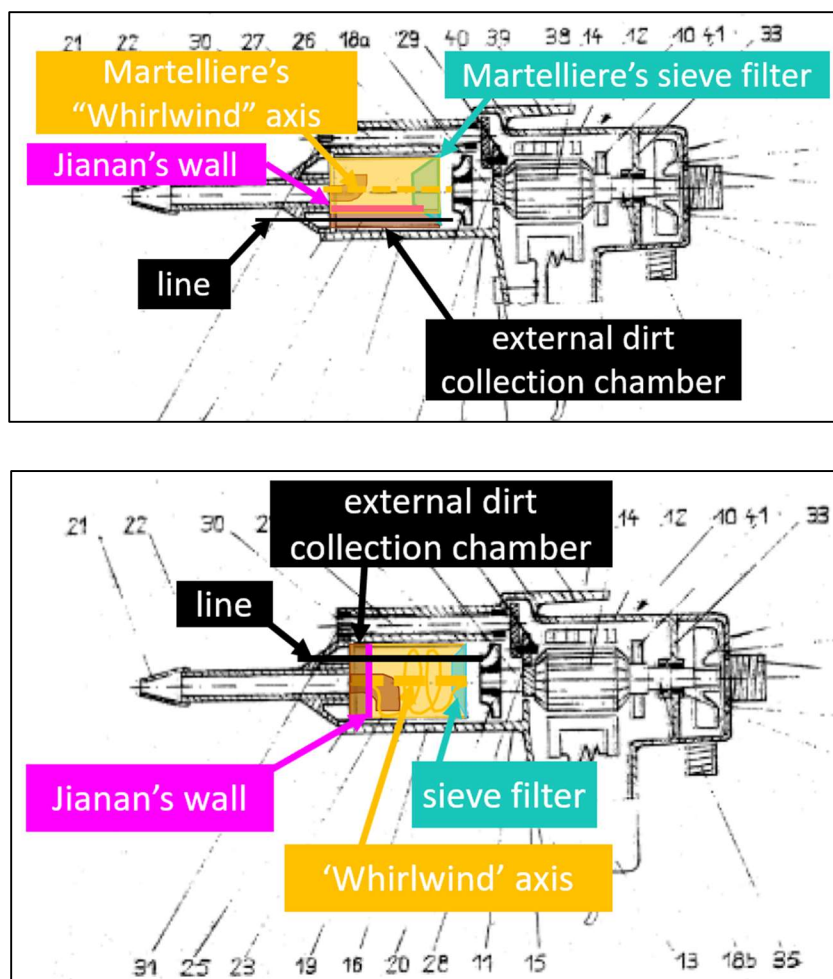
and the pre-motor filter. (Claim 11).

418. In my opinion, Rebel in combination with Martelliere and Jianan renders obvious surface cleaning apparatus of claim 21 further comprising a dirt collection chamber that is exterior to the cyclone chamber and a line that is parallel to the cyclone axis extends through the dirt collection chamber and the pre-motor filter. (Claim 22).

419. In my opinion, a POSA would have understood that the Rebel-Martelliere-Jianan combination teaches and renders obvious claims [10]/[21] for the same reasons the Rebel-Martelliere combination does. Ground 3, [10]/[21].

420. In my opinion a POSA would have understood that the Rebel-Martelliere-Jianan combination teaches a dirt-collection chamber that is exterior to the cyclone chamber. Ground 4, [3]/[16].

421. In my opinion, a POSA further would have understood that the Rebel-Martelliere-Jianan combination teaches a dirt-collection chamber that is exterior to the cyclone chamber and a **line** that is parallel to the cyclone axis (“**Whirlwind**” **axis**) extends through the **dirt-collection chamber** and the pre-motor filter (“**sieve filter**”), as shown in the modified figures below:



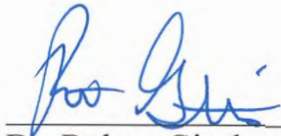
Ex1007, Fig. 1(modified); Ex1020, Fig. 1(modified); Ex1015, Fig. 5(modified).

XI. SECONDARY CONSIDERATIONS OF NON-OBVIOUSNESS

422. 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: 8/9/24