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. 8,607,407

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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 1-25 of U.S. Patent No. 8,607,407 (the "'407 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. 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:

   - U.S. Patent Publication No. 2007/0209335 to Conrad ("Conrad335," attached as Exhibit 1005)
   - U.K. Patent Publication No. GB283,179 to Inventia Patent-Verwertungs-Gesellschaft ("IPVG," attached as Exhibit 1006)
   - PCT Publication No. 2007/084543 to Butler et al. ("Butler," attached as Exhibit 1020)
   - French Patent No. 497,856 to Aktiebolaget Lux ("Lux," attached as Exhibit 1007)

- U.S. Patent No. 2,149,135 to Eriksson-Jons ("Eriksson-Jons," attached as Exhibit 1008)
- French Patent No. 1,094,603 to Martelliere ("Martelliere," attached as Exhibit 1009)
- Certified English translation of French Patent No. 1,094,603 to Martelliere ("Martelliere," attached as Exhibit 1010)
- Canadian Patent No. 161,428 to Robinson ("Robinson," Exhibit 1011)
- Chinese Patent Publication No. 101,061,932 to Jianan ("Jianan," Exhibit 1012)
- Certified English translation of Chinese Patent Publication No. 101,061,932 to Jianan ("Jianan," Exhibit 1013)
- U.S. Patent Publication No. 2006/0156508 to Khalil ("Khalil," Exhibit 1014)
- U.S. Patent Publication No. 2008/0040883 to Beskow ("Beskow," Exhibit 1015)
- International Publication No. WO 02/067753 to Vuijk ("Vuijk," Exhibit 1016)
- Swiss Patent No. CH203,675 to Peter ("Peter," Exhibit 1018)
- Certified English translation of Swiss Patent No. CH203,675 to Peter ("Peter," Exhibit 1019)

6. In my opinion, the Challenged Claims are invalid based on the following:

- Martelliere anticipates claims 23-24.
- Butler anticipates claims 23-24.
- The combination of IPVG and Conrad335 renders claims 1-25 obvious.

- The combination of IPVG and Martelliere renders claims 23-24 obvious.
- The combination of Jianan and Khalil renders claims 1-25 obvious.

II. BACKGROUND AND QUALIFICATIONS

7. I am a Licensed Professional Engineer in Illinois and Oklahoma, with over 20 years of experience in mechanical engineering. My experience in machinery and mechanisms spans numerous industries; I have worked directly designing mechanical systems and machinery, and I have consulted on the operation of machinery in various fields, including consumer products, commercial products, and industrial products.

8. I am employed by Fusion Engineering, LLC, where I have worked since November of 2020. Fusion is an engineering firm that provides multidisciplinary engineering consulting services.

9. I am currently the Director of Mechanical Engineering at Fusion. In this role, I am responsible for providing engineering consulting services in mechanical engineering, coordinating client outreach, coordinating marketing materials, and recruiting.

10. I am currently a Member of ASTM (American Society for Testing and Materials) and ASME (American Society of Mechanical Engineers) where I sit on several committees, including the Power Transmission Gearing Committee (ASME), which looks at transferring movement with belts and

gears. I am also on ASTM's F15 Consumer Product Committee, which handles matters such as consumer product safety guidelines. I am also a member of the ICPHSO (International Consumer Products Health & Safety Organization) group, and attend ICPHSO conferences, which cover health and safety issues relevant to consumer products.

11. I hold a Bachelor's, Master's, and Ph.D. degree in Mechanical Engineering. I have Minors in Physics (as an undergraduate) and Mechanics and Aeronautics (as a graduate student). I have taught courses in Physics, Mechanical Engineering, and Biomechanics across three universities.

12. I have been recognized as an expert in mechanical power transmission equipment, and I serve on the American Society of Mechanical Engineers (ASME) Power Transmission and Gearing Committee. I have also participated, by invitation, in the National Council of Examiners for Engineering and Surveying (NCEES) Mechanical Professional Activities and Knowledge Studies (PAKS) committee. This committee reviews and evaluates the problems and problem types that appear on the Mechanical Engineering Professional Engineering exam for licensure as a Professional Engineer.

13. For the past 30 years, I have been involved in the area of machine design

and applications of machine design. These machines and products have ranged from children's mattresses to garden hoses, pressure cookers, electronic tire/raft inflators, and industrial equipment including conveyors.

14. In approximately 1993-1994, I was a part of a team that developed and built a functioning autonomous, battery-powered vacuum cleaner. This design and development project involved analyzing the layout and inclusion of various vacuum-cleaner components, such as surface agitators, air filtration units, motors, fluid flow paths, batteries, and other electronic and mechanical components.

15. From 2003-2008, I was employed by the University of Wisconsin-Madison's Biomechanics laboratory in the Department of Kinesiology, where I was also a teaching assistant in biomechanics. While there, my research responsibilities included designing equipment with ergonomic handles for efficient use. While teaching biomechanics at the University of Wisconsin-Madison, I regularly instructed on the proper use of canes, crutches, and arm crutches in relationship to biomechanical principles, taking into consideration user ergonomics.

16. From 2008-2020, I was employed by Exponent, Inc., where I worked as a Senior Managing Engineer. At Exponent, I worked on various mechanical engineering projects that frequently related to consumer product design,

machinery design, product and machinery performance, and human interaction with consumer products and industrial equipment.

17. In approximately 2010-2013, I conducted an engineering analysis of vacuum cleaner products. In particular, I single-handedly developed tests to assess the dust-collection efficacy of various physical-media filters used in bagless, cyclonic vacuum cleaners. My work on this project included product tear-downs to analyze the efficacy and safety of these vacuum cleaners and their filters. I also developed a protocol for nationwide in-home testing of vacuum cleaner filtration system efficacy across climates, as well as a protocol for analyzing the materials collected by the vacuum cleaners and their filters. This analysis considered, among other things, the size of particulates that were collected by vacuum cleaner cyclones and filters.

18. In approximately 2010-2014, I conducted an analysis of collets—a pipe and tube connection device—under dynamic fluid pressurization conditions. After initial and traditional methods of testing the collets, which included X-Rays and geometric measurements, failed to identify the source of collet failure, I developed novel tests intended to mimic real-world conditions. These novel tests involved a hydro-static test and a dynamic test. The hydro-static test involved exposing the collets to

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

19. In approximately 2012-2017, I performed a wholistic safety and efficacy analysis of various consumer vacuum-sealer products. In particular, I conducted tear-down analyses, reviewed the vacuum-sealers' performance for safety and functionality considerations, analyzed the function and operation of vacuum pumps, analyzed fluid flow paths, and analyzed the operation of small valves. I further worked with an electrical engineer to review the safety of the products' internal electronics.

20. Since approximately 2013 to the present, I have used principles of biomechanics, as well as principles of physics, to analyze the effect on a user or nearby operator of pressure cookers that failed, ejecting hot liquid. This work involved analyses of, among other things, forces that are applied to pressure cookers, the physics involved in the operation of pressure cookers, and biomechanical principles.

21. In approximately 2013-2016, I used industry testing methods and developed and designed novel experiments and testing related to fluid flow

analysis for a consumer garden hose. The analysis involved testing the hose's strength, durability, environmental performance (temperature and UV exposure), and material selection in connection with user operation. I further designed computer-controlled pressurization and de-pressurization systems for these garden hoses. The system was initially powered pneumatically with compressed air driven through a manifold in conjunction with a tank of water. When scaled, the system involved two parallel pumps that pressurized two groups of manifolds using computer-controlled valves in series to pressurize and de-pressurize expandable garden hoses. Developing this system involved, among other things, selecting the appropriate fluid power components and optimizing fluid flow paths.

22. In approximately 2015, I applied my biomechanical background to the use of cane handles, which involved assessing the amount of force to be applied to the handle and developing a handle that could both support that amount of force reliably and house a battery for novel electronics that were embedded in the cane.

23. In approximately 2015-2017, I investigated various properties of a garden hose ball valve. I worked as a part of a team to investigate valve properties, including materials, geometry, and seal selection. We further investigated

fluid flow through the valve to ensure that the flow was optimized by analyzing valve shape with the Bernoulli equation.

24. In approximately 2016, I conducted an analysis of a cordless, handheld consumer leaf blower. In particular, I analyzed the functioning, operation, and failure of blower motors and fans in relation to the direction of fluid flow within a consumer leaf blower. This analysis concerned, among other things, consideration of fluid flow and mechanical design of leaf blowers, specifically regarding fan blade failure and its potential impact on the consumer-operator.

25. In approximately 2017-2018, I conducted an efficacy analysis of hand grips for ergonomic handheld hose nozzles. This analysis included a review of handheld nozzles in the marketplace that were advertised as ergonomic, as well as biomechanically modelling postures expected to be associated with the ergonomic handheld nozzles. To biomechanically model these handheld nozzles, I used a program called 3DSSPP, which models, among other things, human balance and effort levels. This program can be used calculate human joint torque based on operator input, which I used (and continue to use) to analyze the ergonomics of holding various handles, including handles for household consumer products.

26. I further used 3DSSPP to model biomechanics for use in household

consumer products and industrial products. For example, in my paper, *Analytical Model for Estimating Knee Loads During Ladder Climbing*, published in the 2013 edition of the ASME International Mechanical Engineering Congress Exposition, I discussed how force output at the hands based on arm posture influences the forces within the knee joint. At a high level, this involved analyzing the ergonomics of how posture influences likely force output of limbs, particularly in connection with household consumer products, specifically ladders.

27. In approximately 2018-2020, I analyzed the operation of computer-controlled blowers, manifolds, valves, and sensors in consumer air mattresses. In particular, the analysis concerned the ability to control and maintain constant air pressure within air mattresses at particular pressure set points. This analysis concerned, among other things, fluid dynamics, fluid flow, fluid path selection, and changes in pressure.

28. In 2021, I published a paper, *Characterization of the Release of Heated and Pressurized Water from a Pressure Cooker*, in the Journal of Burns. In this paper, I analyzed and described how fluid is ejected from a pressure cooker as a result of a flash boil event. In this analysis, I considered the operation of an exemplary household pressure cooker, analyzing fluid dynamics resulting from the trade-off between volume of liquid and

pressure on fluid dynamics and its effect on consumer-users.

29. I have provided my full background in the curriculum vitae that is attached as Exhibit 1003.

III. DOCUMENTS AND MATERIALS CONSIDERED

30. In forming the opinions expressed in this Declaration, I relied upon my education, training, knowledge, and experience in the relevant field of the art, as well as information pertaining to the documents described below.

31. In preparing this Declaration, I have reviewed the ’407 patent and its file history, as well as the Martelliere, Butler, IPVG, Conrad335, Jianan, and Khalil prior art references on which my opinions are based. Other references and documents that I have reviewed are mentioned below. These references and documents reflect the state of the relevant art at the time of the alleged invention and the background knowledge of a POSA.

32. I have also reviewed the Patent Owner (“PO”)’s infringement contentions served in the related litigation, *SharkNinja Operating LLC v. Dyson, Inc.*, No. 1:23-cv-12372 (D. Mass.) (the “Litigation”).

IV. LEGAL PRINCIPLES

33. Dyson’s counsel has informed me of certain legal standards. I have applied these understandings in my analysis as detailed below. I am not an attorney and offer no legal opinions.

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

35. I have been informed and understand that the level of ordinary skill in the art may be determined by considering such factors as the education level of those working in the field, the sophistication of the technology, the types of problems encountered in the art, the prior art solutions to those problems, and the speed at which innovations are made. I have been informed and understand that not all of these factors need be considered and that one or more of these factors may control.

36. I have been informed and understand that an obviousness analysis is based on several factors, including the scope and content of the prior art, what differences, if any, existed between the alleged invention and the prior art, and the level of ordinary skill in the pertinent art at the time of the alleged invention.

37. I have been informed and understand that to determine whether a claim is obvious, it is appropriate to consider, among other factors:

(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

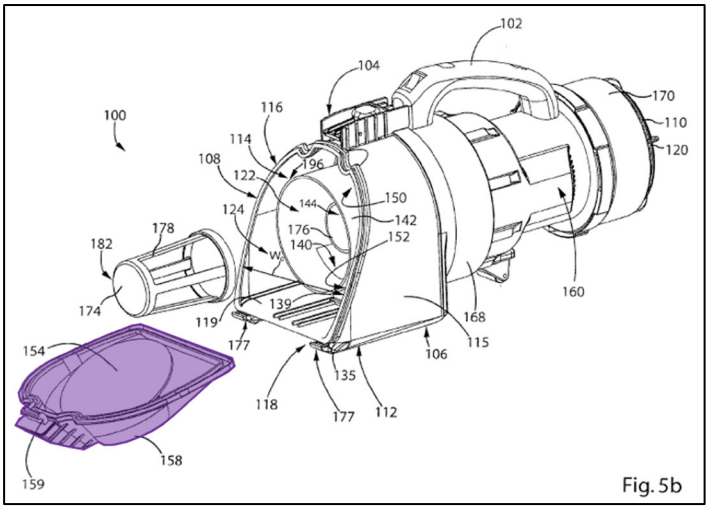
41. In my opinion, a Person of Ordinary Skill in the Art ("POSA") in the

subject matter of the '407 patent would have had a bachelor's degree in mechanical engineering or a similar field and 2-3 years of experience in machine design, including machines that include fluid dynamics or fluid paths, such as vacuum cleaners. Additional education could offset less experience and vice versa, and a POSA could have also obtained similar knowledge and experience through other means.

42. I have been a POSA since at least 2003. The opinions I am offering are from the perspective of a POSA at the time of the alleged invention. For the purposes of my opinions below, I have been asked to assume that the relevant time frame is the relevant priority date for the Challenged Claims.

VI. TECHNOLOGY BACKGROUND

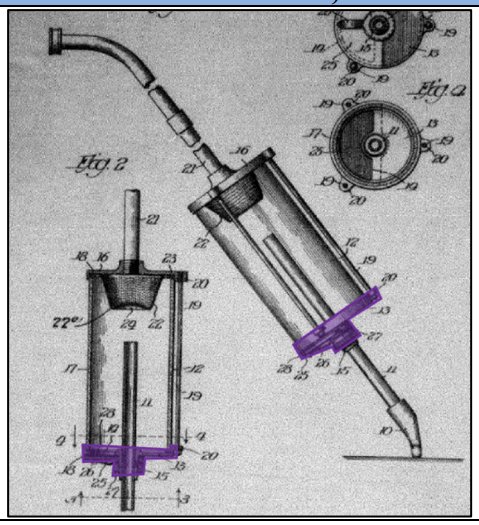
43. The Challenged Claims are directed to hand vacuum cleaners having an openable door located at the front. *See* Ex1001, Claims. The '407 patent depicts the openable door located at the front of the vacuum cleaner in Figure 5b, shown below:



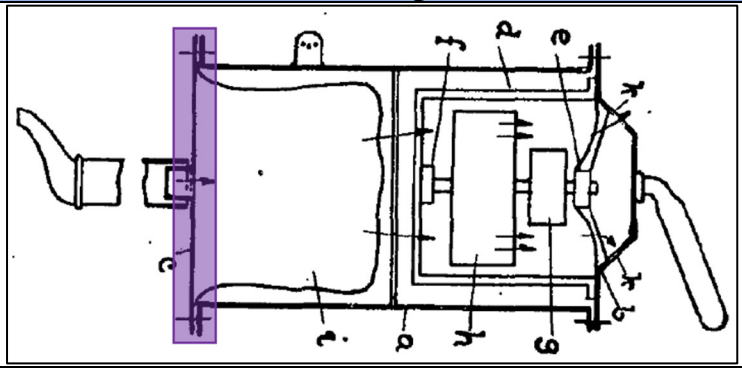
Ex1001, Fig. 5b.

44. In my opinion, vacuum cleaners with openable front doors are not new. I have seen several examples of such vacuum cleaners from as early as 1915:

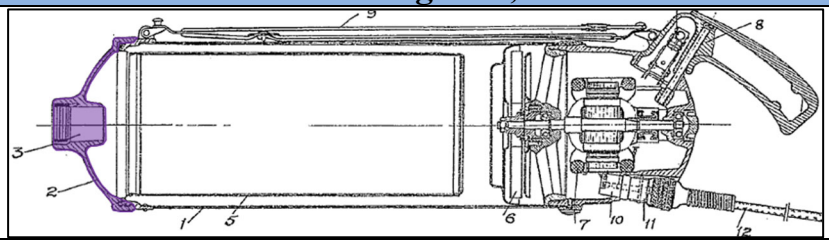
Ex1011: March 3, 1915



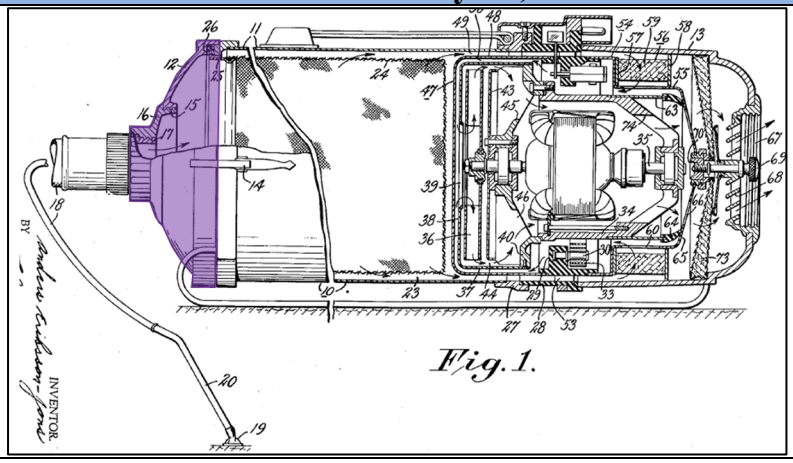
Ex1007: April 5, 1919



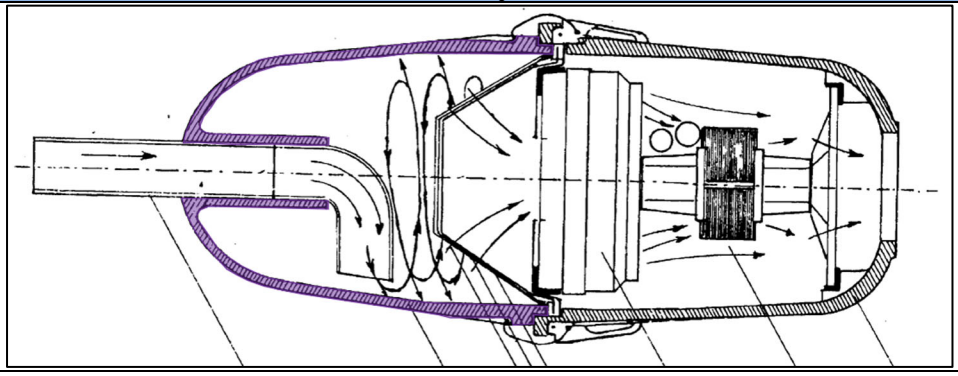
Ex1006: August 9, 1928



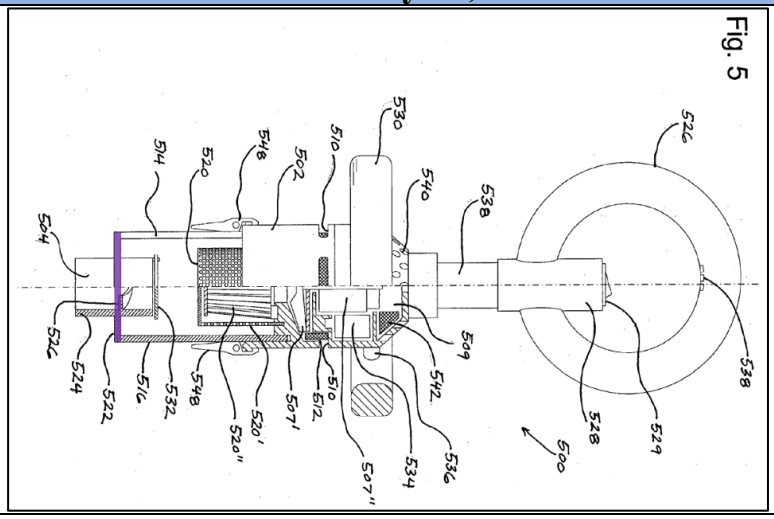
Ex1008: February 28, 1939



Ex1009: May 23, 1955



Ex1020: July 26, 2007



45. I have also reviewed the file history of the '407 Patent. None of the references I rely upon in forming my invalidity opinions appear to have been before the United States Patent and Trademark Office.

46. In my opinion, as set forth in more detail below, these undisclosed references invalidate every claim of the '407 Patent.

VII. BACKGROUND OF THE '407 PATENT

47. The '407 Patent is titled "Configuration of a Hand Vacuum Cleaner."

Ex1001, Title. The '407 Patent states that it issued on December 17, 2013 from U.S. Patent Application No. 12/720,484, filed on March 9, 2010. Ex1001, Cover. The '407 Patent claims priority to a foreign patent application, CA2658019, filed March 11, 2009..

A. Summary of the '407 Patent's Specification

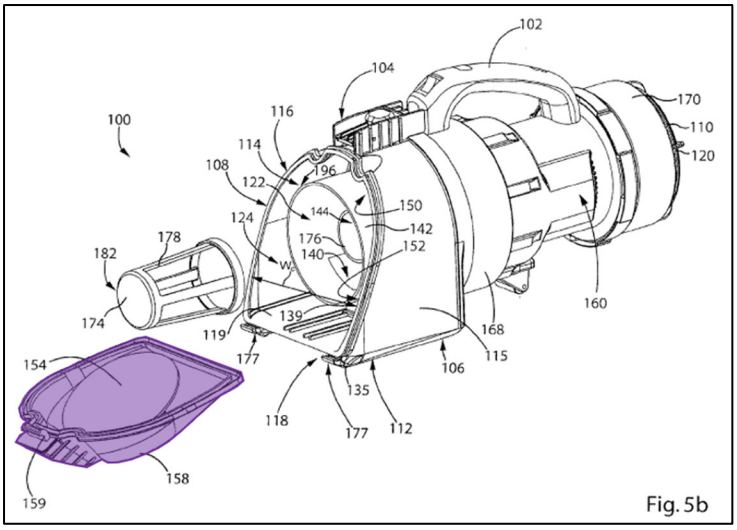
48. The '407 patent states that it "relates to cyclonic hand vacuum cleaners having an openable door." Ex1001, 1:14-16.

49. The '407 patent's specification states that it "locate[s]" its "openable and preferably, … removably mounted" **door** "towards the front of the hand vacuum cleaner":

> According to one broad aspect, a hand vacuum cleaner is provided which has a door that is located towards the front of the hand vacuum cleaner and is openable and, preferable, is removable [sic] mounted. According to such a design, when a user wants to empty the vacuum cleaner, the user may open the door and then pour dirt out of, e.g., a dirt chamber.

Ex1001, 1:50-55.

50. An annotated image of the '407 Patent's openable, removable door is shown below:



Ex1001, Fig. 5b.

51. The ’407 Patent identifies what it states are benefits to this design. According the ’407 Patent, an openable door located at the front of the vacuum cleaner allows the user of the vacuum cleaner to empty the vacuum cleaner with “no impediment to the door being opened,” and without “the dirt leaving the vacuum cleaner … contact[ing] any portion of the vacuum cleaner when it is poured, e.g., into a garbage can”:

> According to such a design, when a user wants to empty the vacuum cleaner, the user may open the door and then pour dirt out of, e.g., a dirt chamber. As the door is at the front of the vacuum cleaner, there is no impediment to the door being opened, [sic] Further, when the vacuum cleaner is inclined or inverted to empty the vacuum cleaner, no portion of the vacuum cleaner need be in front of the door. Accordingly, the dirt leaving the vacuum cleaner will not contact any portion of the vacuum cleaner when it is poured, e.g., into a garbage can.

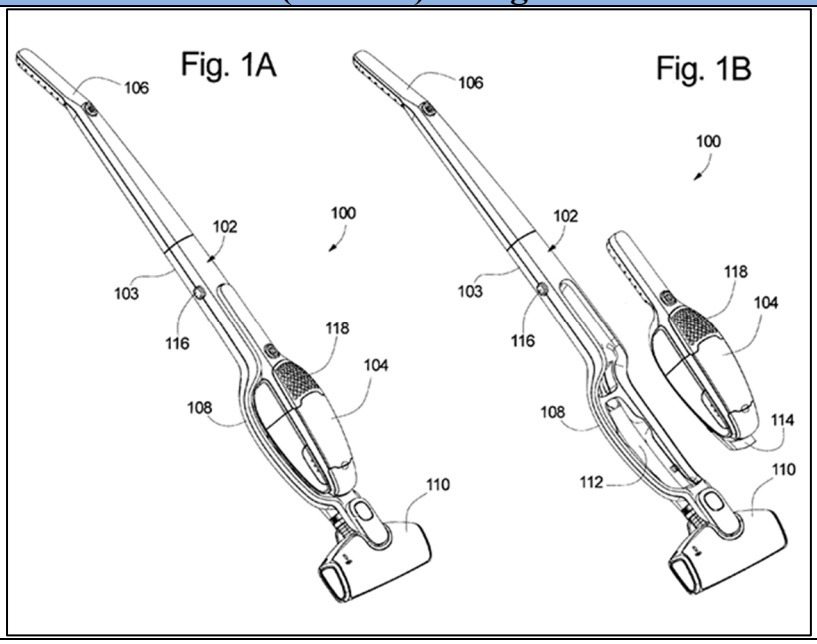
Ex1001, 1:53-62.

B. Prosecution History of the ’407 Patent

52. I have reviewed the prosecution history of the ’407 Patent. The following is my understanding:

53. During prosecution of the application that issued at the ’407 Patent, the Examiner rejected pending claims over U.S. Patent Application Publication No. 2008/0040883 to Beskow (“Beskow”), alone or in combination with U.S. Patent Application Publication No. 2008/0190080 to Oh (“Oh”). Ex1004, 116-19. I show Beskow’s Figures 1A and 1B below:

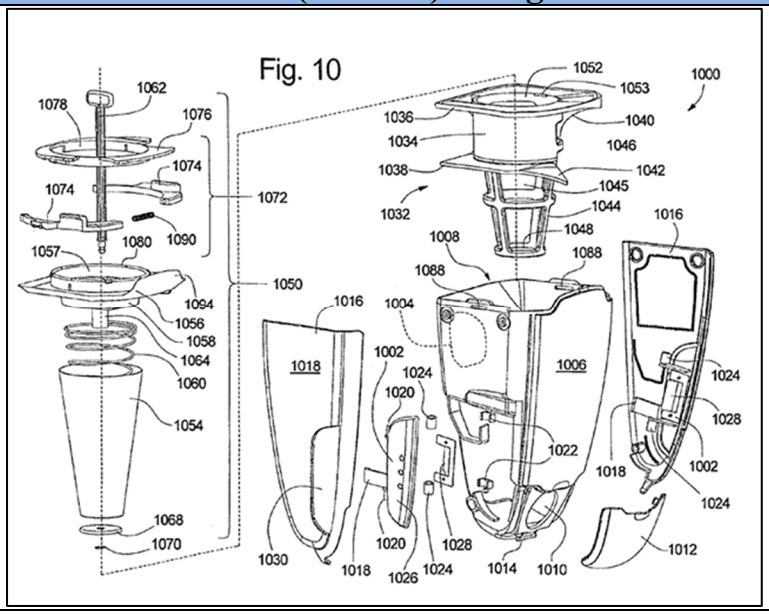
Ex1015 (Beskow) at Figs. 1A-1B



54. In response to the Examiner’s rejection, the Applicant argued that Beskow

teaches an "openable removable door 1012 [that] is positioned on a ***sidewall*** of unit 1006 and ***not on the front wall*** thereof," and amended the claims to require the front door be at the "front wall," among other limitations. Ex1004, 138-45 (quote at 143), 163-2.[1] Beskow's Figure 10, which shows the positioning of Beskow's "openable removable door 1012" is shown below:

Ex1015 (Beskow) at Fig. 10



55. In response to the Applicant's argument, the Examiner stated that "Beskow et al does not disclose the door positioned at the front wall of the front end." Ex1004, 150-54 (quote at 152). The Examiner found that the prior art of record failed to teach or render obvious "the front wall comprising

[1] All emphasis added unless otherwise noted.

the openable door," in combination with the other elements of the independent claims, and allowed the claims. *Id.*, 217-220 (quote at 218).

C. Priority Date of the Challenged Claims

56. For the purposes of my analysis, I have been instructed to apply and have applied a priority date of March 11, 2009, for the Challenged Claims.

VIII. BACKGROUND OF THE PRIOR ART

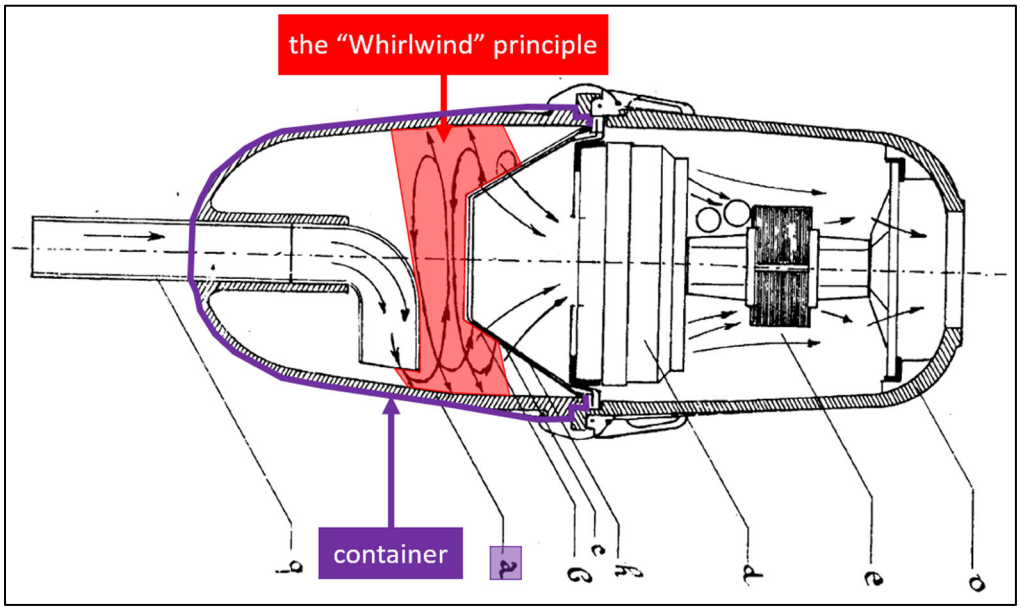
A. Martelliere[2]

57. Martelliere is titled "Improved dust vacuums." Ex1010, Cover. It describes a "broom type vacuum cleaner model, where the device is held vertically or slightly inclined" and that "app[lies] the 'Whirlwind' principle" to separate dust from air. Ex1010, 1. Martelliere is a French patent that was filed on December 16, 1953, was issued on December 8, 1954, and published on May 23, 1955. Ex1010, Cover.

58. Martelliere teaches vacuums that use cyclonic separation, which Martelliere describes as using "the 'Whirlwind' principle" to separate dust from air using "tangential[]" airflow. *Id.* at 1, Fig. 1. Martelliere's vacuum cleaner has a dust-collection "**container a**" that "receives the dust," is

[2] Ex1010 is a certified English translation of Ex1009, which was originally published in French. Citations to Ex1010 are to the page, as the English translation does not include column or line numbers.

"transparent," "easy to handle, without giving off dust" and "very easily detachable," as shown in the annotated image below:

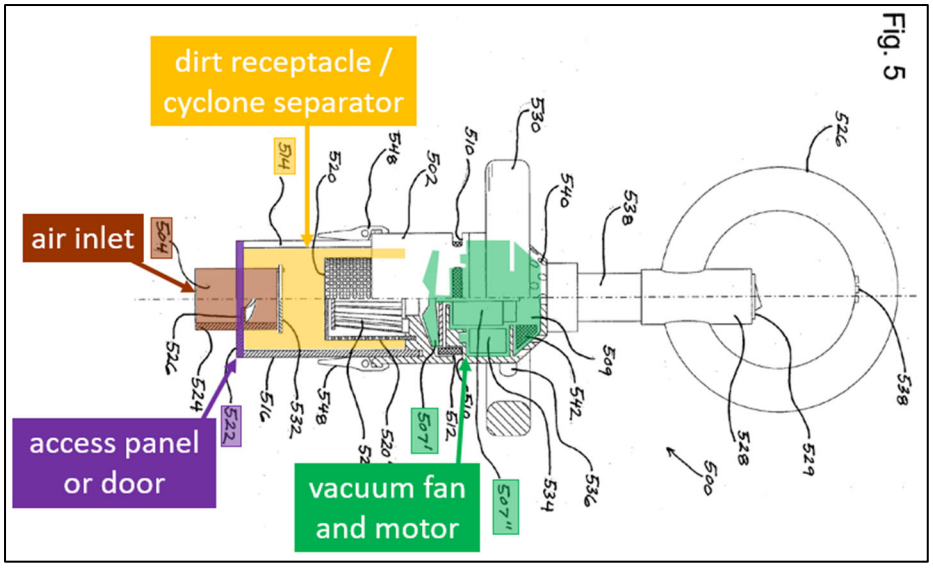


Ex1010, 1, Fig. 1.

B. Butler

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

60. Butler teaches a vacuum with an "**air inlet**," a "**dirt receptacle** compris[ing] a **cyclone separator**" that is "covered by an **access panel or door**" to "facilitate the chamber's emptying," and a "**vacuum fan and a motor**":

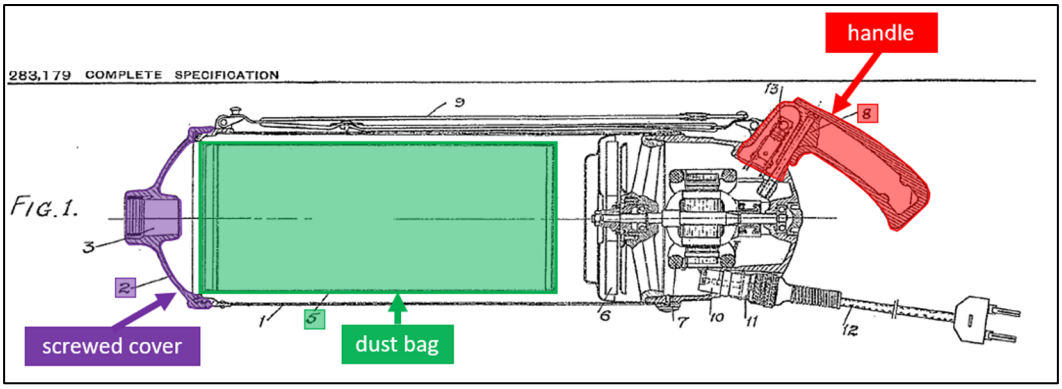


Ex1020, 3:20-25, 18:26-30, Claim 11, Fig. 5.

C. IPVG

61. IPVG is titled "Improvements in Dust Suction Apparatus." Ex1006, Title. It describes a "portable dust suction apparatus of the enclosed dust bag type." Ex1006, 1:10-12, 1:22-33. IPVG is a U.K. patent publication that was filed in Germany on January 6, 1927, was filed in the U.K. on January 5, 1928, and published on August 9, 1928. Ex1006, Cover.

62. IPVG describes a portable dust suction apparatus of the enclosed dust bag type and "comprises a casing containing a motor driven fan and a **dust bag [5] or like member through which the air stream passes**," a "**screwed cover 2** formed with a suction opening 3 for attaching a suction pipe 4," and a "**handle [8]** by which the apparatus may be readily lifted during operation," as shown in the annotated image below:

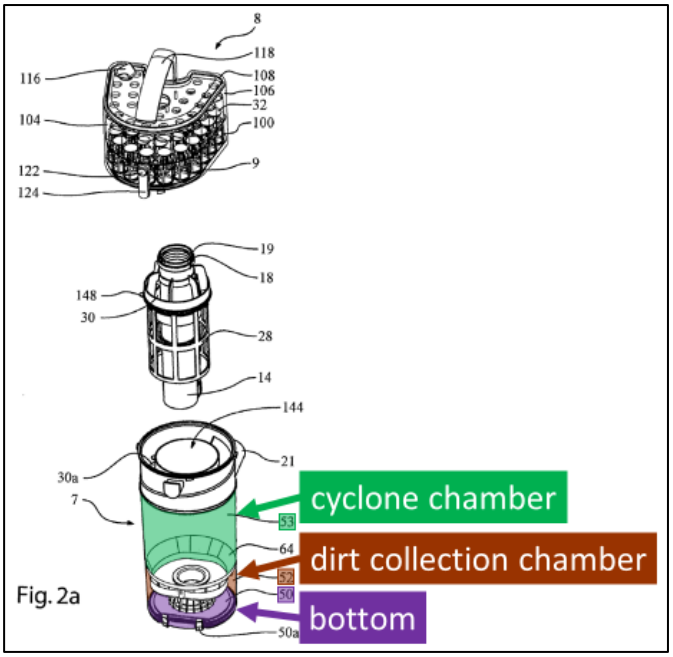


Ex1006 at 1:10-12, 1:22-33, Fig. 1.

D. Conrad335

63. Conrad335 is titled "Vacuum Cleaner with a Moveable Divider Plate." Ex1005 at Title. It describes "a cyclonic surface cleaning apparatus, such as a vacuum cleaner." Ex1005 ¶ 1. Conrad335 is a U.S. patent publication that was filed on March 8, 2007, and published on September 13, 2007. Ex1005, Cover.

64. Conrad335's "surface cleaning apparatus comprises … a cyclone separator having … a **cyclone chamber** and a **dirt collection chamber**," and "the **dirt collection chamber** has a **bottom** that is openable," as shown in the annotated image below:



Ex1005 at Abstract, ¶23, Fig. 2a.

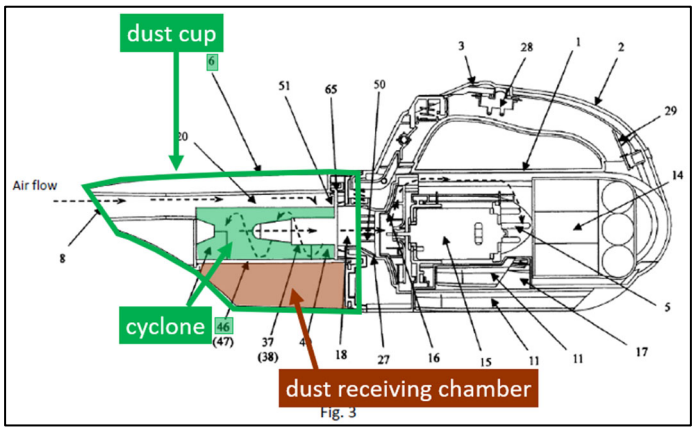
65. Conrad335 explains that the "first cyclonic cleaning stage 7 compris[es] a single cyclone," a "dirt collection region 52" with "a bottom opening door 50 … pivoted open about … pivot hinges 50a," and an "air inlet 21 that is located on the top of the cyclone separator." *Id.* ¶¶ 274, 283, 339. "[S]piral ramp 25 … create[s] cyclonic circulation 23 in cyclone separator 20," causing "a portion of the particles … to be disentrained from the fluid flow stream and accumulate within the lower region," which Conrad335 calls the "dirt collection chamber." *Id.* at Abstract, ¶¶ 283, 284, Fig. 3. Conrad335 explains that "any or all of the embodiments may be used individually or in combination or sub-combinations," and that the "cyclonic embodiments … may be used in conjunction with a fan or other

moving means to create a … hand vacuum." *Id.* ¶ 375, 376.

E. Jianan[3]

66. Jianan is titled "Cyclone Handheld Vacuum Cleaner." Ex1013, Title. Jianan teaches "a rechargeable handheld vacuum cleaner using a parallel cyclone as a separation device." Ex1013, 3. Jianan is a Chinese patent publication that was filed on April 28, 2006 and published on October 31, 2007. Ex1013, Cover.

67. Jianan teaches a "handheld vacuum cleaner" with a "detachable **dust cup**" that comprises "two parallel **cyclones** and separate **dust receiving chambers**," as shown in the annotated image below:



Ex1013, Abstract, 4, Fig. 3.

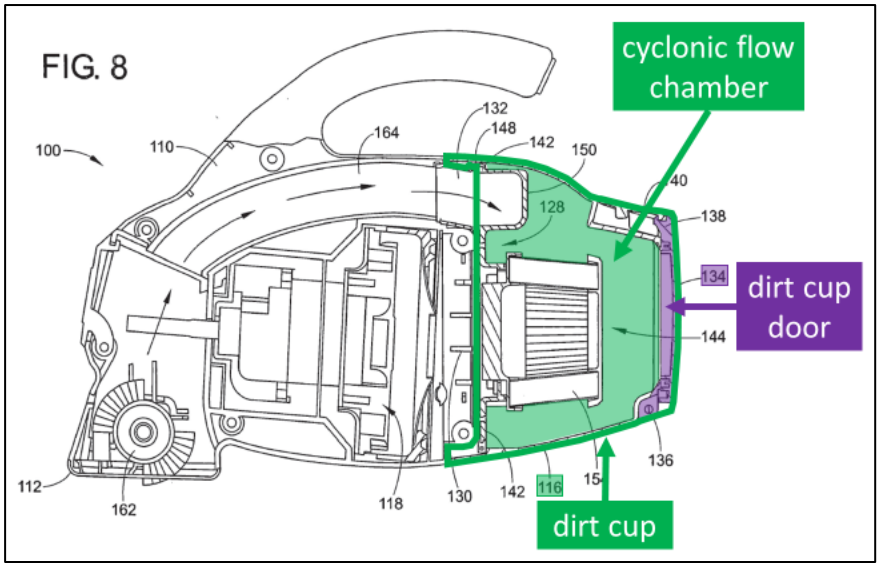
[3] Ex1013 is a certified English translation of Ex1012, which was originally published in Chinese. Citations to Ex1013 are to the page, as the English translation does not include column or line numbers.

68. Jianan explains that the "dust collection chamber has at least one opening for emptying dirt," i.e., an "opening and closing device such as a door or the like," "making cleaning the dust collection chamber 9 a more convenient and hygienic process" for the user of the vacuum cleaner. *Id*., 10, claim 3.

F. Khalil

69. Khalil is titled "Vacuum Cleaner with Cyclonic Separating Dirt Cup and Dirt Cup Door." Ex1014, Title. Khalil describes "a hand-held cyclonic vacuum cleaner" that has a "detachably mounted" "dirt cup." Ex1014 ¶¶ 7, 12. Khalil is a U.S. patent publication that was filed on October 13, 2005 and issued on July 20, 2006. Ex1014, Cover.

70. Khalil teaches a "hand-held vacuum cleaner," which "includes a **dirt cup**" that is "detachable from the housing," a "**dirt cup door**," and a "**cyclonic flow chamber**," as shown in the annotated image below:



Ex1014 at Abstract, Fig. 8.

71. Khalil teaches that the "volumetric space between the filter support plate 142 and the dirt cup door 134 defines a cyclonic flow chamber," and further teaches that the "dirt cup door 134 … pivot[s] downward about the hinge 136" to "provid[e] a convenient method of emptying the dirt cup 116." *Id.*, ¶¶ 27, 29.

IX. CLAIM CONSTRUCTION

72. I am unaware of any claim construction determinations related to the '407 patent.

73. 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: '407 PATENT

74. In my opinion, the Challenged Claims of the ’407 patent are invalid based on the following references and combinations: claims 23-24 are anticipated by Martelliere; claims 23-24 are anticipated by Butler; claims 1-25 are rendered obvious by the combination of IPVG and Conrad335; claims 23-24 are rendered obvious by the combination of Martelliere and IPVG; and claims 1-25 are rendered obvious by the combination of Jianan and Khalil.

75. 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 March 11, 2009 for the Challenged Claims of the ’407 patent, as discussed above. I have also considered the level of ordinary skill in the pertinent art.

76. 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 ’407 patent.

A. Ground 1: Martelliere Anticipates Claims 23-24

1. Martelliere Anticipates Claims 23 and 24

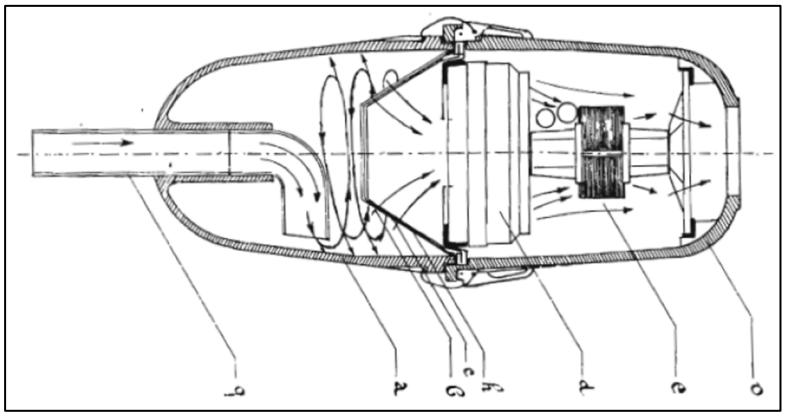
77. In my opinion, Martelliere anticipates claims 23 and 24 because, as I

explain below, Martelliere teaches each and every limitation of these claims, as they are arranged in the claims.

a. [23pre]/[24pre]

Reference Number	Claim Limitation
[23pre]	"A hand vacuum cleaner comprising:"
[24pre]	"A hand vacuum cleaner comprising:"

78. To the extent the preambles are limiting, in my opinion, Martelliere teaches a hand vacuum cleaner. Martelliere is titled "Improved dust vacuums." Ex1010, Title. Within its specification, Martelleire teaches a "broom type vacuum cleaner model, where the device is held vertically or slightly inclined" and that "app[lies] the 'Whirlwind' principle" to separate dust from air, as shown in Martelliere Figure 1, which I have shown below:



Ex1010, 1, Fig. 1.

79. In my opinion, a POSA would have understood that Martelliere's vacuum cleaner is a cyclonic hand vacuum cleaner. Specifically, in my opinion, a

POSA would have known that when Martelliere teaches an air filtration unit that applies the Whirlwind principle, Martelliere is teaching a cyclonic air filtration unit. Martelliere teaches that its Whirlwind principle air filtration uses a tangential air inlet to create cyclonic airflow that separates dust from air, *see* Ex1010, 1, Fig. 1, which is what happens in cyclonic air filtration units in vacuum cleaners.

80. Further, in my opinion, a POSA would have understood that Martelliere's vacuum cleaner is a hand vacuum cleaner. Martelliere describes its vacuum cleaner as a "broom type vacuum cleaner model" that is "held vertically or slightly inclined" by the user. Ex1010, 1. A POSA would understand that Martelliere is a hand vacuum cleaner because it depicts a compact vacuum cleaner that is held by the user, including in a "broom type" configuration.

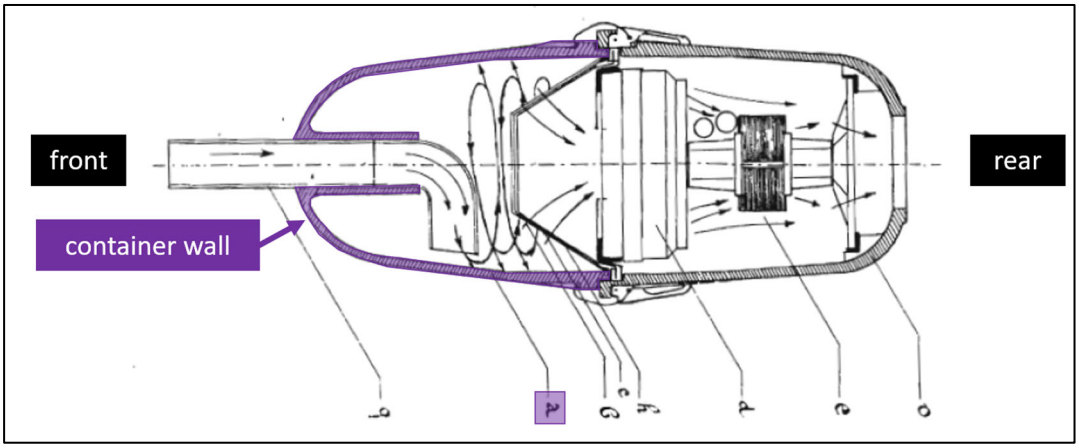
b. [23a]/[24a]

Reference Number	Claim Limitation
[23a]	"a) a front end having a front wall and a rear end;"
[24a]	"a) a front end having a front wall and a rear end;"

81. In my opinion, Martelliere teaches a front end having a front wall and a rear end.

82. Martelliere teaches that its "**container a**" has a "**wall**," as I have shown in

the annotated image below:



Ex1010, 1, Fig. 1.

83. In my opinion, a POSA would have understood that Marelliere's **container wall** is a front wall because it is a wall that is located at the front of the cleaner. Further, in my opinion, a POSA would have understood that Marelliere's **container wall** is positioned at the **front end** of Martelliere's cleaner. Marelliere's **container wall** is at the end through which air enters the cleaner and Marelliere's **container wall** is opposite the end of the cleaner though which air exits the cleaner. In my opinion, a POSA would understand that the end through which air enters Martelliere's cleaner is its **front end** and the end through which air exits Martelliere's cleaner is its **rear end**, as I have depicted above.

84. As further support that Martelliere's cleaner has a **rear end** as I depicted in the annotated image above, Martelliere describes the air flow path as

coming in through a "tangential[]" air inlet and past "sieve filter *b*" and "engine *e*," before exiting the vacuum cleaner. Ex1010, 1. Where air exits Martelliere's cleaner is at the cleaner **rear end**.

c. [23b]/[24b]/[23e]/[24e]

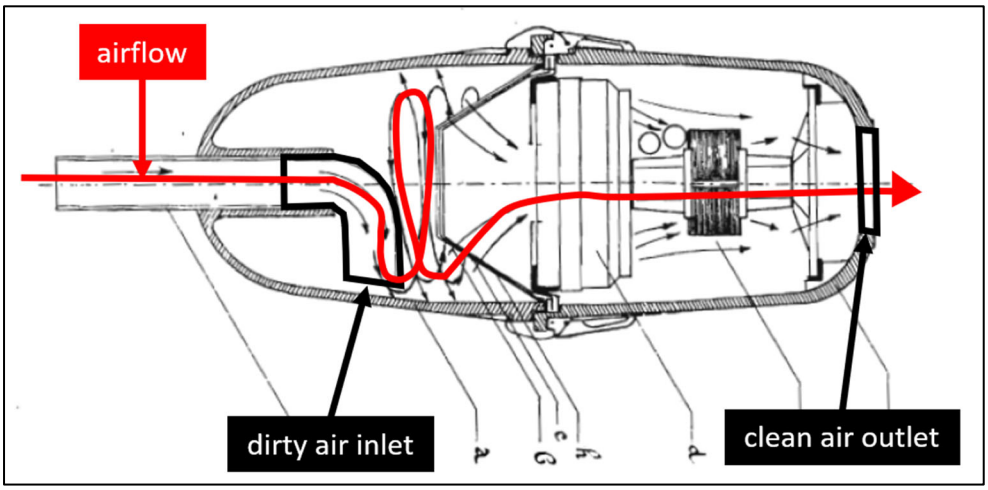
Reference Number	Claim Limitation
[23b]	"b) an air flow passage extending from a dirty air inlet to a clean air outlet;"
[24b]	"b) an air flow passage extending from a dirty air inlet to a clean air outlet;"
[23e]	"e) a suction motor positioned in the air flow passage"
[24e]	"e) a suction motor positioned in the air flow passage"

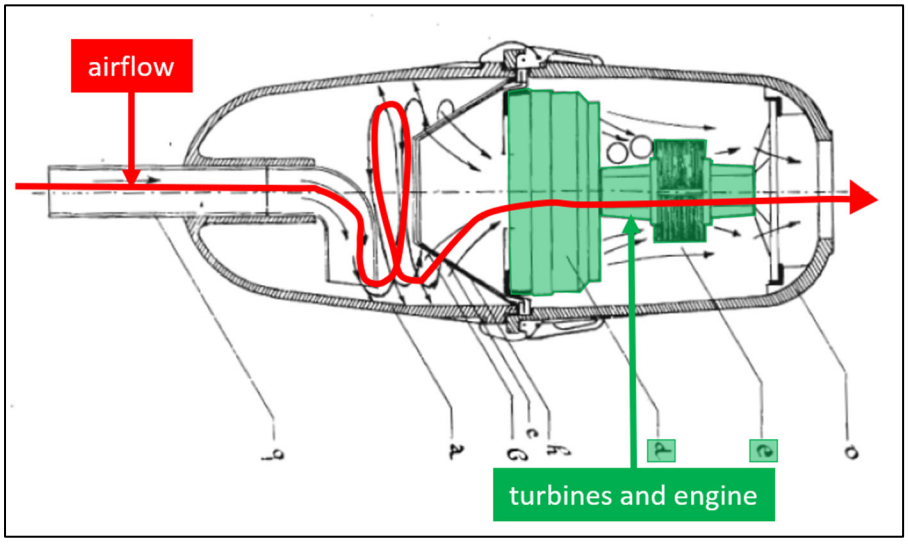
85. In my opinion, Martelliere teaches an air flow passage extending from a dirty air inlet to a clean air outlet.

86. In my opinion, Martelliere teaches a suction motor positioned in the air flow passage.

87. Martelliere describes the airflow through its cleaner. First, "**air** [is] sucked tangentially to the interior wall of the transparent container" (through what a POSA would have understood is a **dirty air inlet**). Ex1010, 1. Then, the **air** is treated (or cleaned) by application of what Martelliere calls "the 'Whirlwind' principle," which Martelliere explains "separate[s]" dust from air, "before it passes through the filter screen," which a POSA would have understood also treats (or cleans) the air. *Id.* Then, "perfectly

filtered, the **air** can then pass through the **turbines *d*** and into the **engine *e*** which is energetically cooled." *Id.* Finally, the **air** flows out of the vacuum cleaner (through what, in my opinion, a POSA would have understood is a **clean air outlet**). I have depicted this in the annotated images below:





Ex1010, 1, Fig. 1.

88. For all these reasons, in my opinion, Martelliere teaches an **air flow**

passage extending from a **dirty air inlet** to a **clean air outlet**.

89. Further, in my opinion, a POSA would have understood that Martelliere's "**engine *e***" (either individually or together with "**turbines *d***") is a suction motor positioned in the air flow passage. For example, it is a machine that provides power to create suction. Also, the air flow in Martelliere "pass[es] through" it. Ex1010, 1.

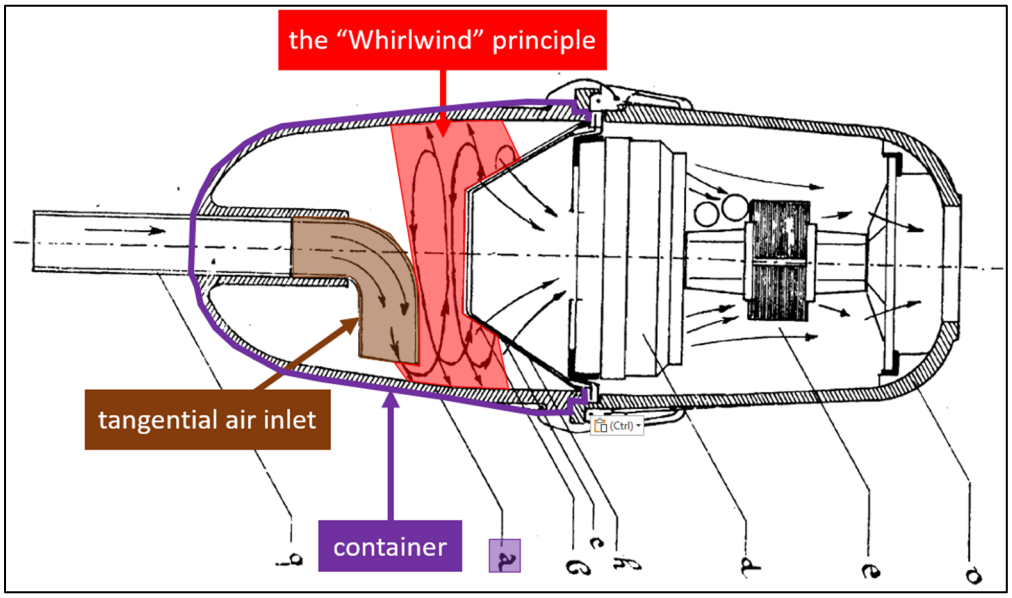
d. [23c]/[24c]

Reference Number	Claim Limitation
[23c]	"c) a first cyclone unit positioned in the air flow passage, the first cyclone unit comprising at least one cyclone and at least one dirt collection chamber;"
[24c]	"c) a first cyclone unit positioned in the air flow passage, the first cyclone unit comprising at least one cyclone and at least one dirt collection chamber;"

90. In my opinion, Martelliere teaches a first cyclone unit positioned in the air flow passage, the first cyclone unit comprising at least one cyclone and at least one dirt collection chamber.

91. In my opinion, Martelliere teaches a first cyclone unit positioned in the air flow passage. Martelliere teaches that, in the vacuum cleaner, air enters "**container a**" through a "**tangential[]**" **air inlet**, which, as explained above, a POSA would have understood creates cyclonic airflow (Martelliere calls this "**the 'Whirlwind' principle**") to treat dirty air and

deposits the dirt "in the bottom of the container, after having separated from the air." Ex1010, 1. I have shown this in the annotated image below:



Ex1010, 1, Fig. 1.

92. As I explained above, in my opinion, a POSA would have understood that Martelliere's teaching of "**the 'Whirlwind' principle**" created using "air sucked **tangentially** to the [**container's**] interior wall" teaches cyclonic air filtration (as is depicted in the annotated image above), because it uses centrifugal air filtration to separate dust from air. Accordingly, in my opinion, a POSA would have understood that Martelliere's "**container**" (in which "**the 'Whirlwind' principle**" is applied to separate dust from air and in which the separated dirt is collected), is a first cyclone unit positioned in the air flow passage.

93. It is also my opinion that a POSA would have understood that Martelliere's

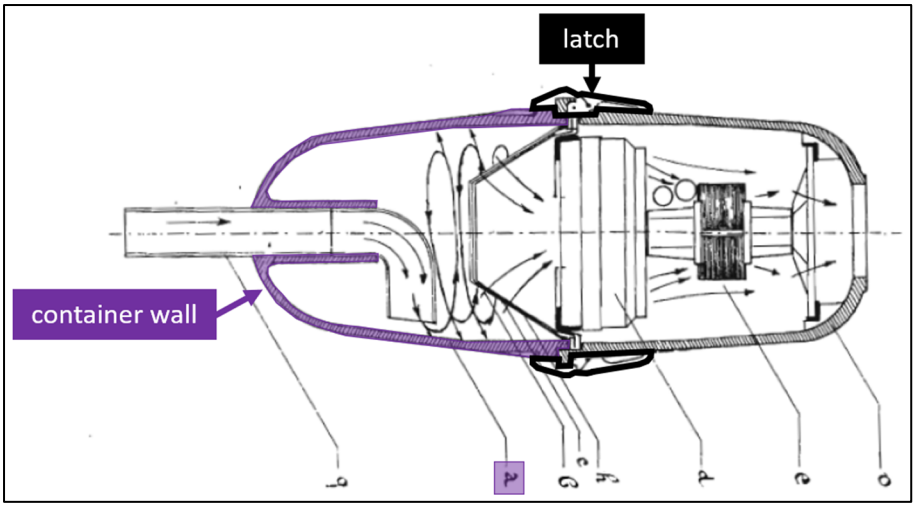
"**container**" (in which "**the 'Whirlwind' principle**" is applied and the separated dirt is collected) is a first cyclone unit positioned in the air flow passage, the first cyclone unit comprising at least one cyclone and at least one dirt collection chamber. As I depicted above, and as Martelliere describes, Martelliere's "**container**" comprises at least one cyclone (using the Whirlwind principle) and it collects the separated dust and dirt. Ex1010, 1. So, it is a first cyclone unit comprising at least one cyclone and at least one dirt collection chamber.

e. [23d]/[24d]

Reference Number	Claim Limitation
[23d]	"d) the dirt collection chamber having an openable door, the front wall comprising the openable door; and,"
[24d]	"d) the dirt collection chamber having an openable door, the front wall comprising the openable door; and,"

94. In my opinion, Martelliere teaches the dirt collection chamber having an openable door, the front wall comprising the openable door.

95. Martelliere teaches that its vacuum cleaner "**container [a]** is very easily detachable." Ex1010 at 1. Also, Martelliere depicts what, in my opinion, a POSA would have understood are **latches**, as I have shown in the annotated image below:



Ex1010 at 1, Fig. 1.

96. A POSA would have understood these to be **latches** for several reasons, including because they look like latches and Martelliere describes them as serving the same function as latches, including by securing and "detach[ing]" the "**container**" "**wall**" by latching onto it and then by releasing from it.

97. In my opinion, a POSA would have understood that, when Maretlliere's **latches** are released, Martelliere's "**container**" can be detached as described.

98. It is also my opinion that a POSA would have understood that Martelliere's "**container**" is pivotable. For example, a user could unlatch one of Martelliere's two **latches**, which would allow Martelliere's "**container**" to pivot open about the other **latch**—at least to some degree—so as to create an opening between the container wall and the rear of the vacuum cleaner.

99. It is also my opinion that a POSA would have understood that the detachable and pivotable front "**wall**" of Martellier's vacuum cleaner "**container a**" is an openable door. For example, it is a detachable wall that, when attached, covers an end of the container and, when detached, an end of the container opens, including by pivoting open. So, in my opinion, Martelliere teaches that the dirt collection chamber has an openable door, the front wall comprising the openable door. For additional explanation, *see* Ground 1, Limitations [23a]/[24a], [23c]/[24c].

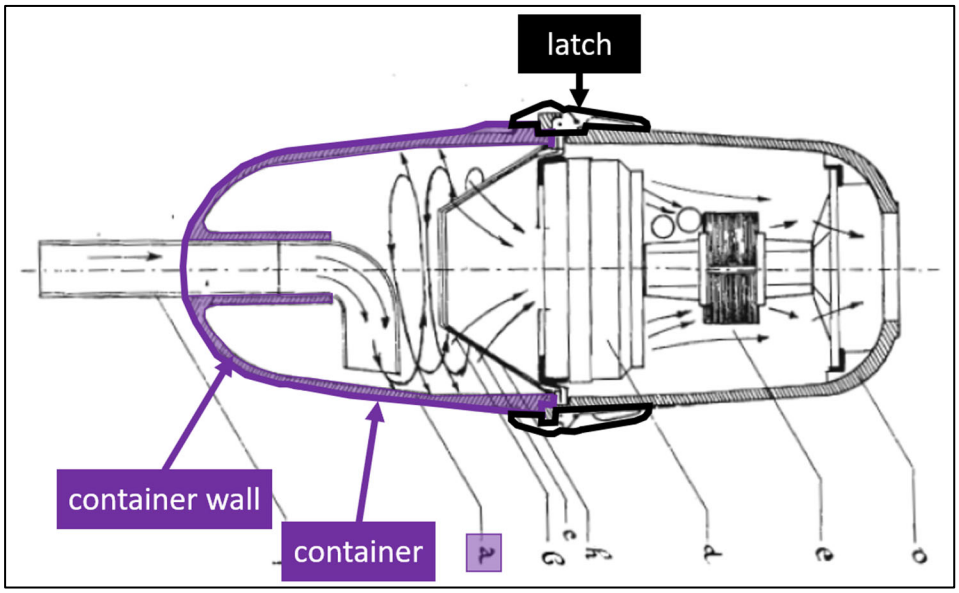
f. [23f]

Reference Number	Claim Limitation
[23f]	"wherein the door is openable when the dirt collection chamber is mounted to the hand vacuum cleaner."

100. In my opinion, Martelliere teaches that the door is openable when the dirt collection chamber is mounted to the hand vacuum cleaner.

101. In my opinion, a POSA would have understood that the "**wall**" to Martelliere's "**container a**" (which, in my opinion, is the openable door) is pivotable—at least to some degree when one of Martelliere's two latches are released—such that so as to create an opening between the container wall and the rear of the vacuum cleaner, and "detachable" (which, in my opinion, is openable) when Martelliere's "**container a**" (which, in my

opinion, is the dirt collection chamber) is mounted to Martelliere's "broom type vacuum cleaner" (which, in my opinion, is the hand vacuum cleaner). Ex1010, 1, Fig. 1. For example, a POSA would have understood that a user of Martelliere's vacuum cleaner could unlatch one of Martelliere's two **latches** and "very easily detachable **container [a]**" would still remain mounted to Martelliere's "broom type vacuum cleaner" because the other **latch** would remain engaged. I have shown an annotated image of these various components below:



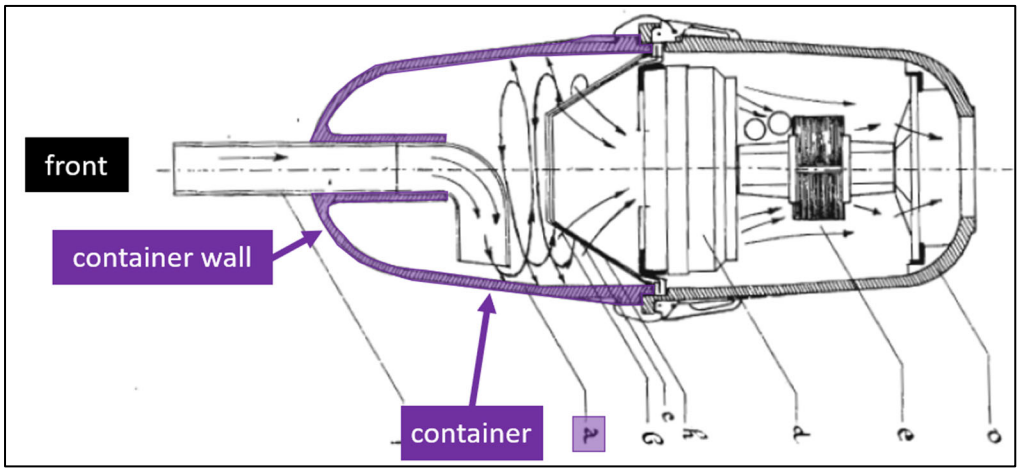
Ex1010 at 1, Fig. 1.

g. [24f]

Reference Number	Claim Limitation
[24f]	"wherein the openable door covers an end of the dirt collection chamber."

102. In my opinion, Martelliere teaches that the openable door covers an end of the dirt collection chamber.

103. Martelliere teaches that its "very easily detachable **container [a]**" "**wall**" (which, in my opinion, is the openable door) covers an end of "**container a**" (which, in my opinion, is the dirt collection chamber). Ex1010, 1. To clarify, Martelliere teaches that its **container wall** covers what a POSA would understand is the **front end** of Martellier's **container**, as shown in the annotated image below:



Ex1010 at 1, Fig. 1. For additional explanation, *see* Ground 1, Limitations [23a]/[24].

B. Ground 2: Butler Anticipates Claims 23-24

1. Butler Anticipates Claims 23 and 24

104. In my opinion, Butler anticipates claims 23 and 24 because, as I explain below, Butler teaches each and every limitation of these claims, as they are

arranged in the claims.

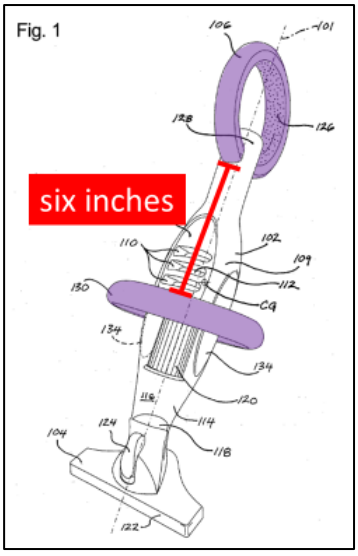
a. [23pre]/[24pre]

Reference Number	Claim Limitation
[23pre]	"A hand vacuum cleaner comprising:"
[24pre]	"A hand vacuum cleaner comprising:"

105. In my opinion, to the extent the preambles are limiting, Butler teaches a hand vacuum cleaner.

106. Butler teaches a "stair cleaning vacuum cleaner." Ex1020, Title. A POSA reading Butler would understand that Butler's vacuum cleaner is designed to be used by hand. A POSA would therefore understand that Butler's vacuum cleaner is a hand vacuum cleaner, particularly given the context of Butler's other teachings.

107. For example, Butler teaches that its vacuum cleaner includes a "**rear grip**" and "one or more **foregrips**," which a POSA would understand are to be gripped by a user's hand during use, as is the case with a hand vacuum cleaner. Ex1020, 15:5-6, 26:1-10. Butler also teaches that its vacuum cleaner comes in a range of "compact" sizes. *Id.* One of those "compact" sizes is so small that the distance between the foregrip and the rear grip is only **six inches**, and the vacuum cleaner's overall length is only eighteen inches, as shown in the annotated image below:



Ex1020, 15:5-6, 26:1-10, Fig. 1.

108. Butler's teaching of "compact" sizes is yet another reason why a POSA would understand that Butler's vacuum cleaner is a hand vacuum cleaner.

109. Further, Butler teaches that its "compact" and "maneuver[able]" design is "adapted for cleaning … stairwells and other confined spaces." Ex1020, Abstract, 1:2-3, 26:1-5, 27:12-29. A POSA would understand this further supports that Butler teaching a hand vacuum cleaner. Butler also teaches that its vacuum cleaner can use telescoping handgrip members and extension tubes to reach the floor. *Id.* These extension members would commonly be used in hand vacuum cleaners. Moreover, Butler's vacuum cleaner is designed to have an optimal "center of gravity" and to "remov[e] excess weight." Ex1020, 13:1-19, 15:12-18. A POSA would understand that these considerations (center of gravity position, and weight) are

considerations that are crucial to hand vacuum cleaners in particular. For example, a hand vacuum cleaner that had a sub-optimal center of gravity could disadvantageously create strain on a user's hand and wrist during use. A hand vacuum cleaner that was excessively heavy would be fatiguing for a user. Similarly, a hand vacuum cleaner that has a sub-optimal center of gravity, i.e., one that is unfavorably far from the hand, can also have the same effect on a user as an excessively heavy vacuum.

b. [23a]/[24a]

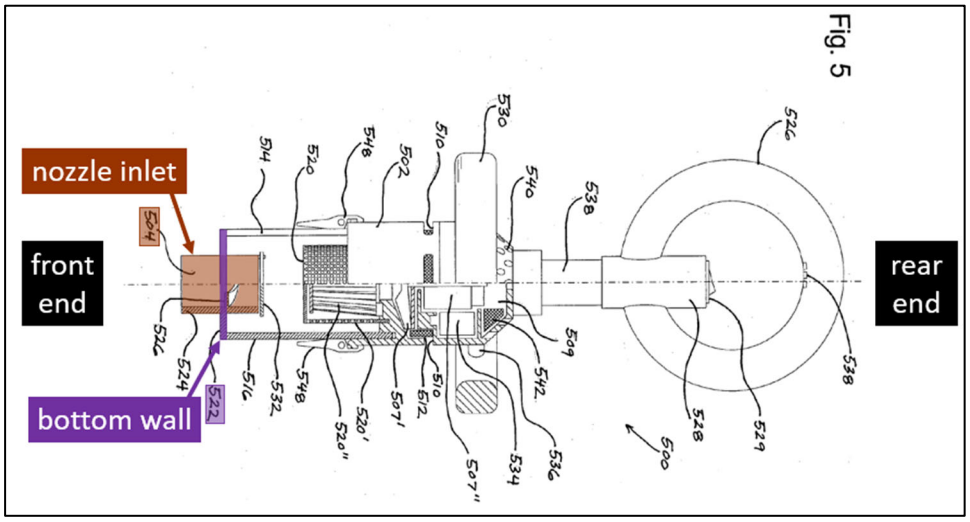
Reference Number	Claim Limitation
[23a]	"a) a front end having a front wall and a rear end;"
[24a]	"a) a front end having a front wall and a rear end;"

110. In my opinion, Butler teaches a front end having a front wall and a rear end.

111. In my opinion, a POSA reading Butler would understand that Butler's vacuum has a front wall: "**bottom wall 522**." Though Butler calls it the "bottom wall," in my opinion a POSA would understand that, in use, "**wall 522**" is at the front of Butler's cleaner, closest to the surface to be cleaned, and is therefore a front wall.

112. In my opinion, a POSA would also understand that Butler's front wall ("**bottom wall 522**") is located at the **front end** (which is the end where

air enters Butler's cleaner, via "**nozzle inlet 504**"), as shown in the annotated image below:



Ex1020, 21:19-23, 22:5-6; Fig. 5.

113. A POSA would additionally understand that Butler's **front end** is at the opposite end of Butler's **rear end**, which is the end opposite where air enters Butler's cleaner. Further, Butler's **front end**, as depicted above, is the forward-most part of the vacuum relative to the user.

114. Another reason why a POSA would understand that the **front and rear ends** of Butler's vacuum are oriented as shown above, and that Butler's "**bottom wall 522**" is a front wall located at Butler's **front end**, is because this orientation follows the flow of air through Butler's cleaner, and because "**bottom wall 522**" is at the end opposite Butler's "rear grip 506," i.e., the **front end**.

115. Further, at least when Butler's vacuum is oriented for "vertical cleaning"

and "cleaning vertical surfaces," the "**bottom wall 522**" is at Butler's **front end**:

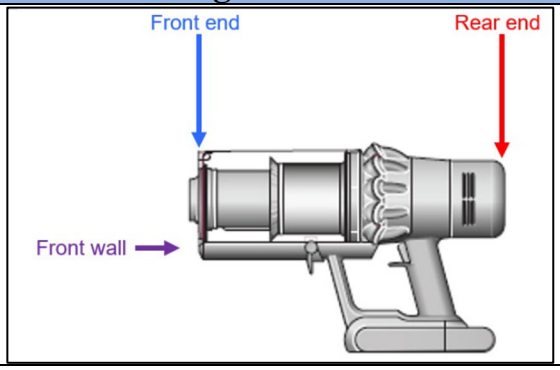
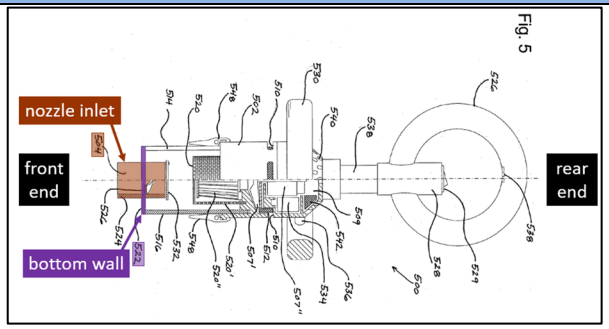
> The user also may wish to hold the foregrip 130 with both hands on both sides of the housing 102 during either horizontal or vertical cleaning, depending on the distance to the surface being cleaned and other factors.

Ex1020,13:31-14:3.

> In the embodiment of Figure 10, the power trigger 1008 is mounted in the rear grip 1006 at approximately the end of the vacuum cleaner. In this position, it may be activated by simply squeezing the rear grip 1006, regardless of whether the vacuum cleaner is positioned for cleaning horizontal surfaces or rotated 180 degrees for cleaning vertical surfaces.

Ex1020, 29:1-5.

116. I have reviewed PO's infringement contentions in the related litigation. In my opinion, the above disclosure is at least as much disclosure of these limitations as PO has accused of infringement in the related litigation:

PO's Infringement Contentions	Butler
	

Ex1017, 3–4, 11 (PO's annotations); Ex1020, Fig. 5.

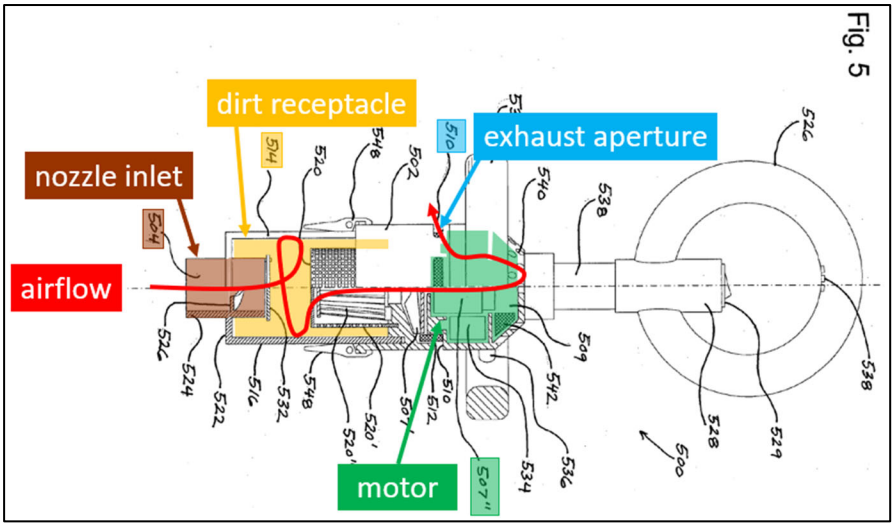
c. [23b]/[24b]/[23e]/[24e]

Reference Number	Claim Limitation
[23b]	"b) an air flow passage extending from a dirty air inlet to a clean air outlet;"
[24b]	"b) an air flow passage extending from a dirty air inlet to a clean air outlet;"
[23e]	"e) a suction motor positioned in the air flow passage"
[24e]	"e) a suction motor positioned in the air flow passage"

117. In my opinion, Butler teaches an air flow passage extending from a dirty air inlet to a clean air outlet.

118. In my opinion, Butler teaches a suction motor positioned in the air flow passage.

119. Butler teaches that dirty air enters through "**nozzle inlet 504**," after which, the dirty air is cleaned by "a cyclonic airflow pattern within the **dirt receptacle 514**," which separates the dirt/dust from the air, and after that, the air, which Butler calls the "working **airflow**," "cool[s] the **motor 507**'" (by flowing past it) and then, finally exits via "**exhaust apertures 510**" as shown in the annotated image below:



Ex1020, 20:14-26, 22:5-6, 22:20-22, Fig. 5.

120. Given Butler's teachings, in my opinion, a POSA would understand that Butler's "**nozzle inlet 504**" is a dirty air inlet, at least because it is an inlet for dirty air to enter Butler's cleaner. A POSA would also understand that Butler's "**exhaust apertures 510**" are clean air outlets, at least because they are outlets through which air that has been cleaned by Butler's vacuum cleaner exits the vacuum cleaner. Also, in my opinion, a POSA would understand that Butler's "**airflow**" passage extends between them, as that is what Butler describes and depicts.

121. Further, in my opinion, a POSA would have understood that Butler's "**motor 507''**" is a suction motor, because it is the motor used to create the suction in Butler's vacuum cleaner.

122. In my opinion, a POSA would have understood that Butler's suction motor is positioned in the air flow passage because Butler teaches "cool[ing]" the

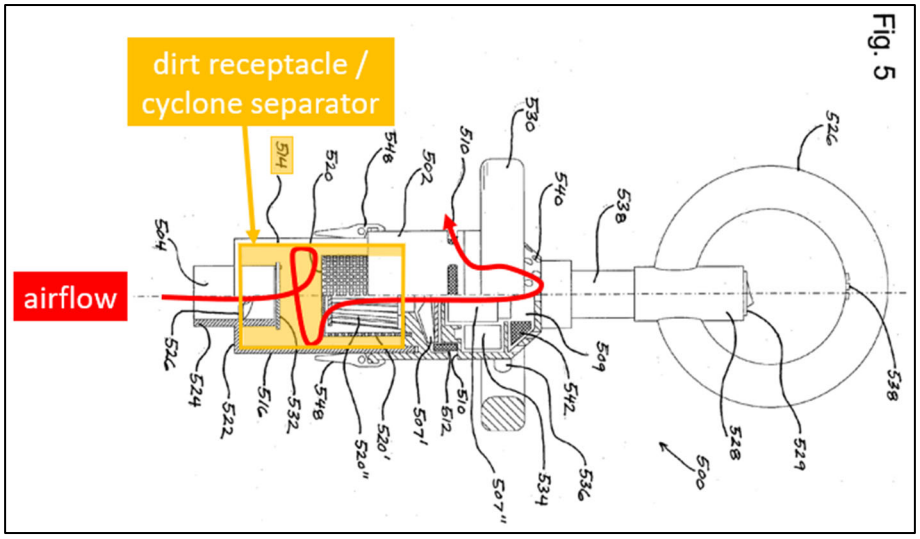
motor using "the working airflow." Ex1020, 20:14-16. A POSA would have understood that this is accomplished when Butler's motor is positioned in the air flow passage.

d. [23c]/[24c]

Reference Number	Claim Limitation
[23c]	"c) a first cyclone unit positioned in the air flow passage, the first cyclone unit comprising at least one cyclone and at least one dirt collection chamber;"
[24c]	"c) a first cyclone unit positioned in the air flow passage, the first cyclone unit comprising at least one cyclone and at least one dirt collection chamber;"

123. In my opinion, Butler teaches a first cyclone unit positioned in the air flow passage, the first cyclone unit comprising at least one cyclone and at least one dirt collection chamber.

124. Butler teaches that its "**dirt receptacle** compris[ing] a **cyclone separator**" is positioned in the air flow passage as shown in the annotated image below:



Ex1020, Claim 11, Fig. 5.

125. Butler also discusses the airflow path, and in particular, the cyclonic airflow creation, at Ex1020, 22:14-22.

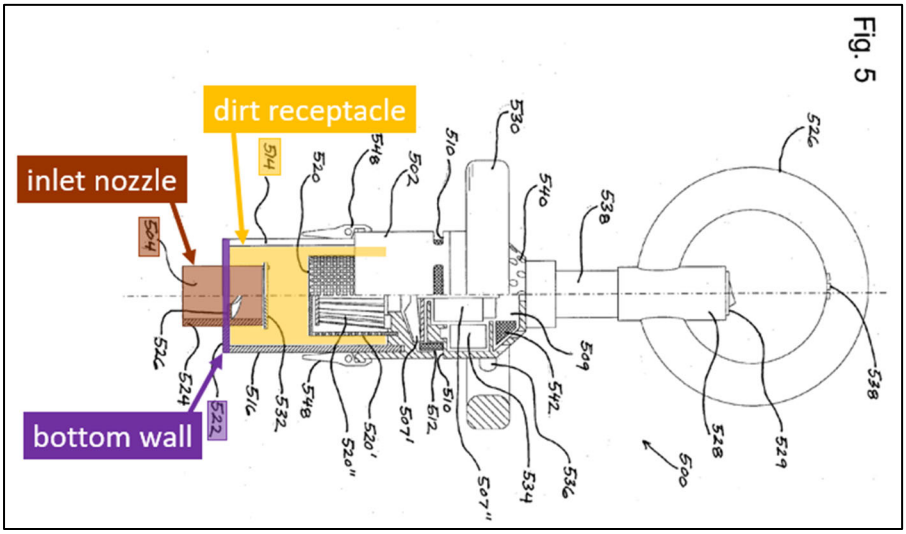
126. In my opinion, POSA would understand that Butler's "**dirt receptacle** compris[ing] a **cyclone separator**" is a first cyclone unit comprising a cyclone and a dirt collection chamber at least because it is the unit in which cyclonic airflow separates dirt from air (i.e., the "cyclone separator") and it is also the unit in which the separated dirt is collected (i.e., the "dirt receptacle").

e. [23d]/[24d]

Reference Number	Claim Limitation
[23d]	"d) the dirt collection chamber having an openable door, the front wall comprising the openable door; and,"
[24d]	"d) the dirt collection chamber having an openable door, the front wall comprising the openable door; and,"

127. In my opinion, Butler teaches the dirt collection chamber having an openable door, the front wall comprising the openable door.

128. Butler teaches that the dirt collection chamber (the "dirt receptacle 214") "may be covered by an access panel or door" in order to "facilitate the chamber's emptying," and Butler further teaches that the "bottom end" of "**dirt receptacle 514**" (which Butler also calls the "**bottom wall 522**") is "removable from the device, along with the **inlet nozzle 504**" as shown in the annotated image below:



Ex1020, 18:26-30, 21:19-21, Fig. 5.

129. As I explained above for Limitations [23a]/[24a], in my opinion a POSA would understand that Butler's "**bottom wall 522**" is a front wall. *See* Ground 2, Limitations [23a]/[24a].

130. In my opinion, a POSA would understand that the "removable" front wall (Butler's "**bottom wall 522**") of Butler's "**dirt receptacle 514**" is an openable door, at least because a POSA would understand that a removable front wall is an openable door. Further, as explained for Ground 2, Limitations [23a]/[24a], [23c]/[24c], Butler teaches a front end having a front wall and further teaches a first cyclone unit positioned in the air flow passage, the first cyclone unit comprising at least one cyclone and at least one dirt collection chamber. *See* Ground 2, Limitations [23a]/[24a], [23c]/[24c].

f. [23f]

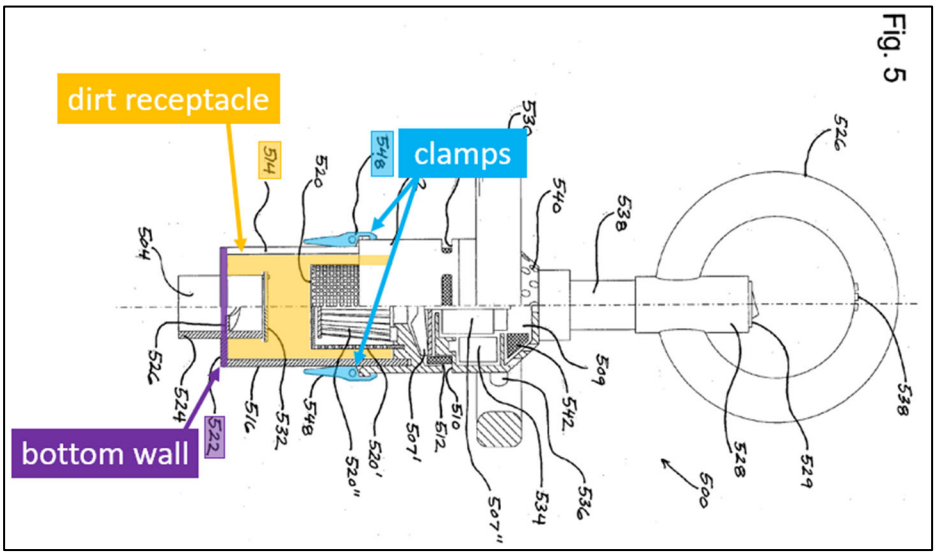
Reference Number	Claim Limitation
[23f]	"wherein the door is openable when the dirt collection chamber is mounted to the hand vacuum cleaner."

131. In my opinion, Butler teaches that the door is openable when the dirt collection chamber is mounted to the hand vacuum cleaner.

132. As explained for Limitations [23d]/[24d], Butler teaches an openable door ("**bottom wall 522**") to Butler's dirt collection chamber ("**dirt receptacle 514**"). *See* Ground 2, Limitation [23d]/[24d].

133. In my opinion, a POSA would understand that a user can remove or open Butler's "**bottom wall 522**" (the openable door) while Butler's "**dirt**

receptacle 514" (the dirt collection chamber) is "permanently attached to the housing 502" (i.e., mounted to the hand vacuum cleaner), for example, by "clamps 548," which "hold the dirt receptacle 514 and housing 502 together," as shown in the annotated image below:



Ex1020, 21:13-15, 21:19-23, Fig. 5.

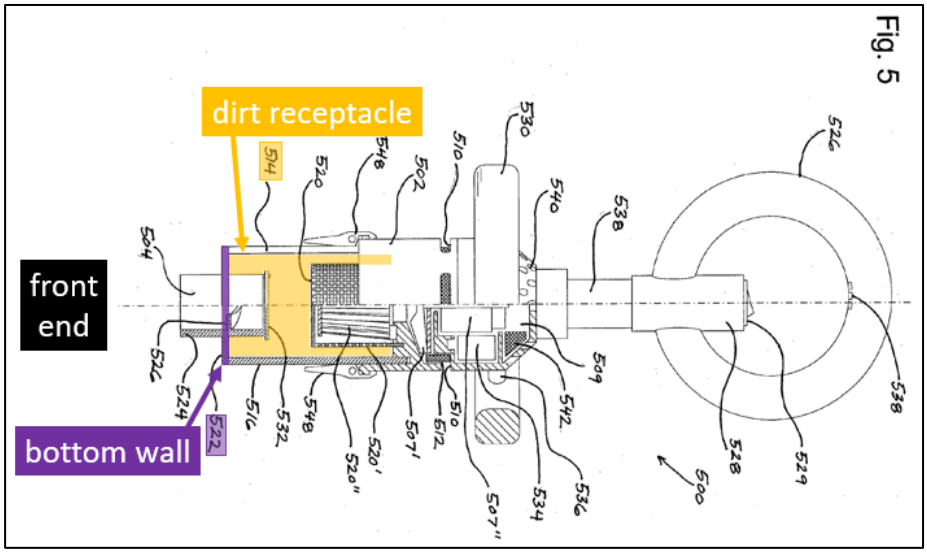
g. [24f]

Reference Number	Claim Limitation
[24f]	"wherein the openable door covers an end of the dirt collection chamber."

134. In my opinion, Butler teaches that the openable door covers an end of the dirt collection chamber.

135. Butler teaches (and depicts) that its "bottom wall 522" (the openable door) covers the front end of Butler's "dirt receptacle 514" (the dirt collection

chamber) as shown in the annotated image below:



Ex1020, 21:19-23, Fig. 5.

C. Ground 3: IPVG in Combination with Conrad335 Renders Claims 1-25 Obvious

136. In my opinion, the combined teachings of IPVG and Conrad335 render obvious each of the Challenged Claims (claims 1-25), as I explain below.

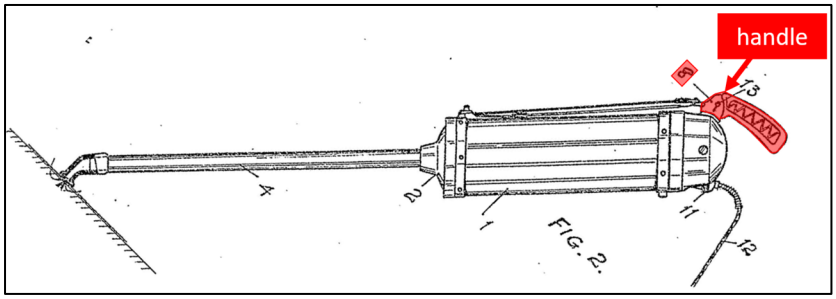
1. A POSA Would Have Been Motivated to Combine IPVG and Conrad335

a. IPVG and Conrad335

i. IPVG

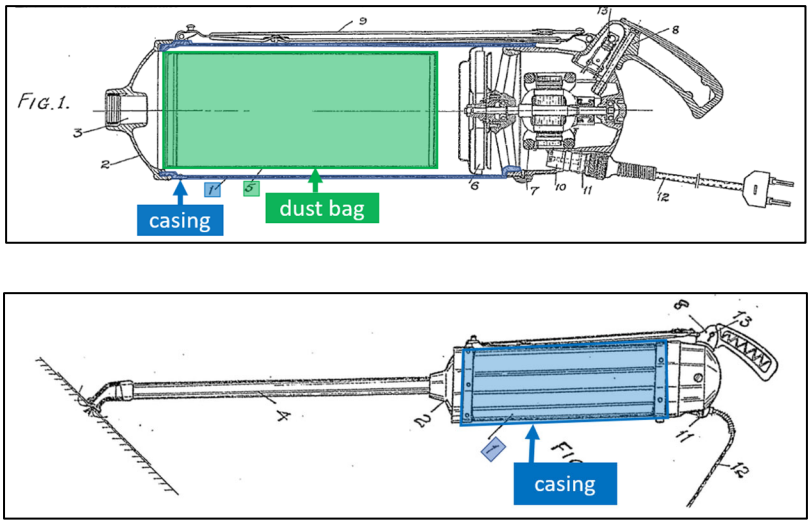
137. As noted briefly above in the Background of the Prior Art section, IPVG teaches a hand/stick vacuum cleaner from 1928. Ex1006. IPVG teaches that its hand/stick vacuum cleaner has "a **handle [8]** by which the apparatus may be readily lifted during operation," as I have shown in the

annotated image below:



Ex1006, 1:22-33, Fig. 2.

138. IPVG teaches that its hand/stick vacuum cleaner uses a "**dust bag or like member [5]**." Ex1006, 1:51-57. IPVG describes (and depicts) that its "**dust bag or like member [5]**" is stored in "**casing 1**," as I have shown in the annotated images below:

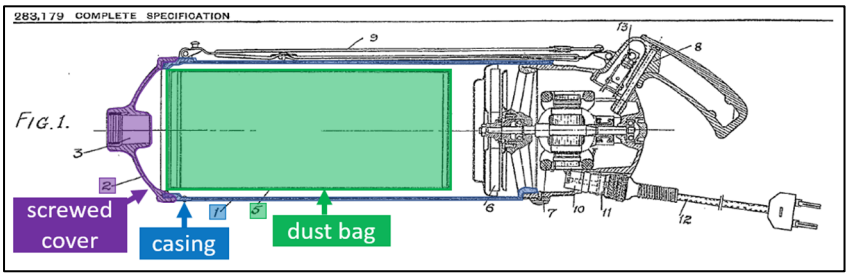


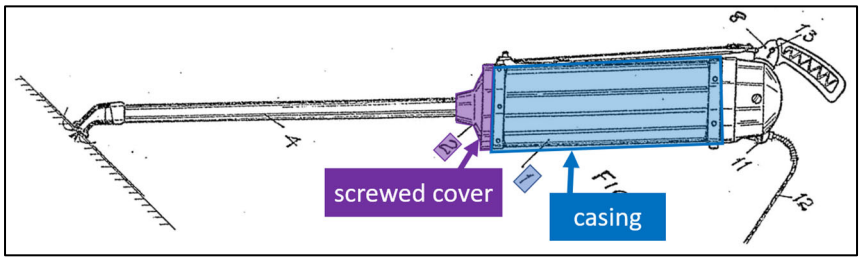
Ex1006, 1:51-57, 2:9-20, Figs. 1-2.

139. IPVG teaches, and in my opinion, a POSA would have understood (including because this was common and well known), that its "**dust bag or like member [5]**" filters dust from air and collects the filtered dust.

Ex1006, 1:51-57. Indeed, that is the primary purpose of dust bags.

140. IPVG teaches that a user empties IPVG's hand/stick vacuum cleaner by unscrewing and removing "**screwed cover 2**" (which IPVG teaches "close[s]" "**casing 1** … at the front end") and by removing "**dust bag 5**," as I have shown in the annotated images below:

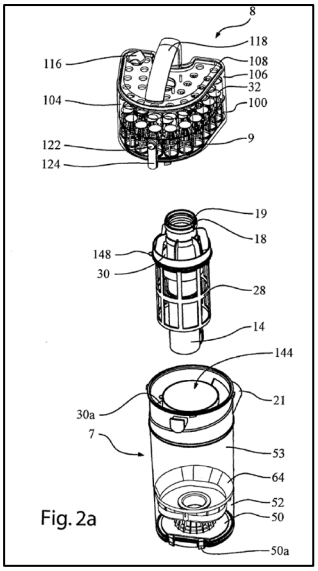




Ex1006, 1:51-57, Figs. 1-2.

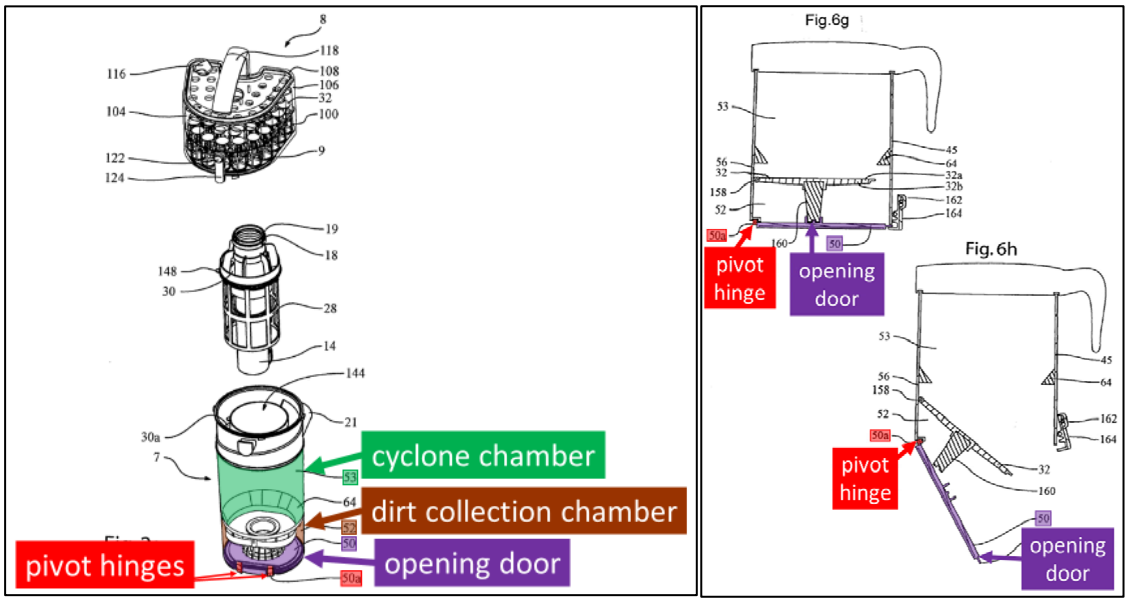
ii. Conrad335

141. As I noted briefly above in the Background of the Prior Art section, Conrad335 teaches a "cyclone separator" that Conrad335 explains "may be used … to create" different types or formats of vacuum cleaners, including "an upright vacuum cleaner," "a stick vacuum cleaner," or "a hand vacuum," as shown in, for example, Conrad335 Figure 2a, shown below:



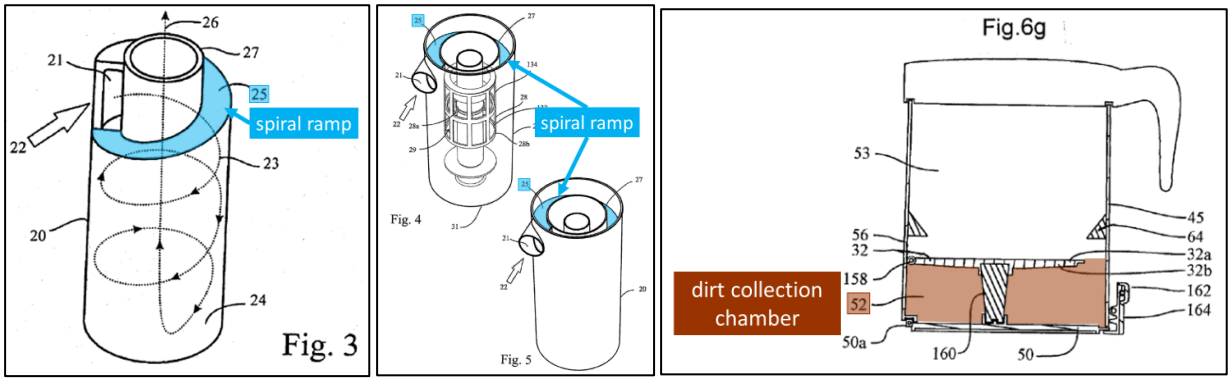
Ex1005 at Abstract, ¶376, Fig. 2a.

142. Conrad335 teaches that its "cyclone separator" has "a **cyclone chamber [53]** and a **dirt collection chamber [52]**," that is sealed by "**opening door 50**," which is "pivoted open about, e.g., **pivot hinges 50a**" for emptying the collected dirt and dust, as I have shown in the annotated images below:



Ex1005, Abstract, ¶¶23, 339, Figs. 2a, 6g-6h.

143. Conrad335 describes how air flows through its cyclonic separator. Conrad335 teaches that "**spiral ramp 25** … create[s] cyclonic circulation 23 in cyclone separator 20," causing "a portion of the particles … to be disentrained from the fluid flow stream and accumulate within the lower region," which Conrad335 calls the "**dirt collection chamber [52]**," as I have shown in the annotated images below:



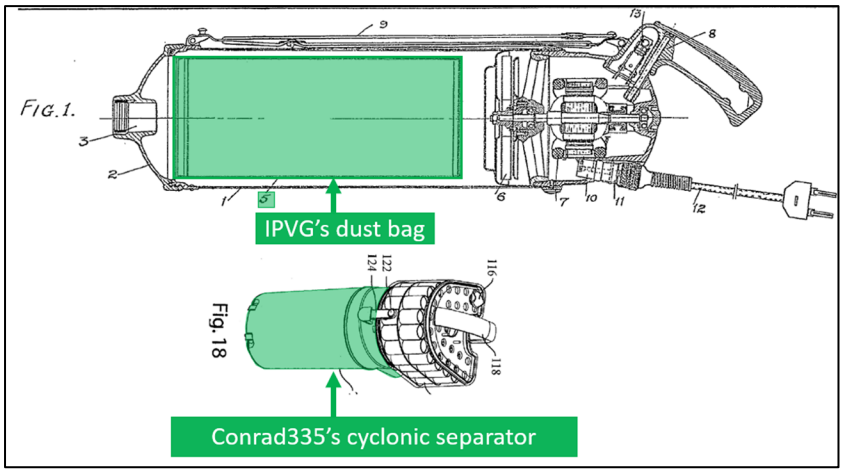
Ex1005 at Abstract, ¶¶283, 284, Figs. 3-6g.

b. A POSA Would Have Been Motivated to Combine the Teachings of IPVG and Conrad335

144. In my opinion, a POSA would have been motivated to combine the teachings of IPVG and Conrad335. For example, a POSA who was reading IPVG at the time of the '407 Patent's alleged invention (which, as mentioned above, I have assumed for the purposes of this analysis to be March 11, 2009) would have been motivated to create a vacuum cleaner that used IPVG's beneficial teachings—including IPVG's user-friendly hand/stick vacuum cleaner design—but improved it to also enjoy the

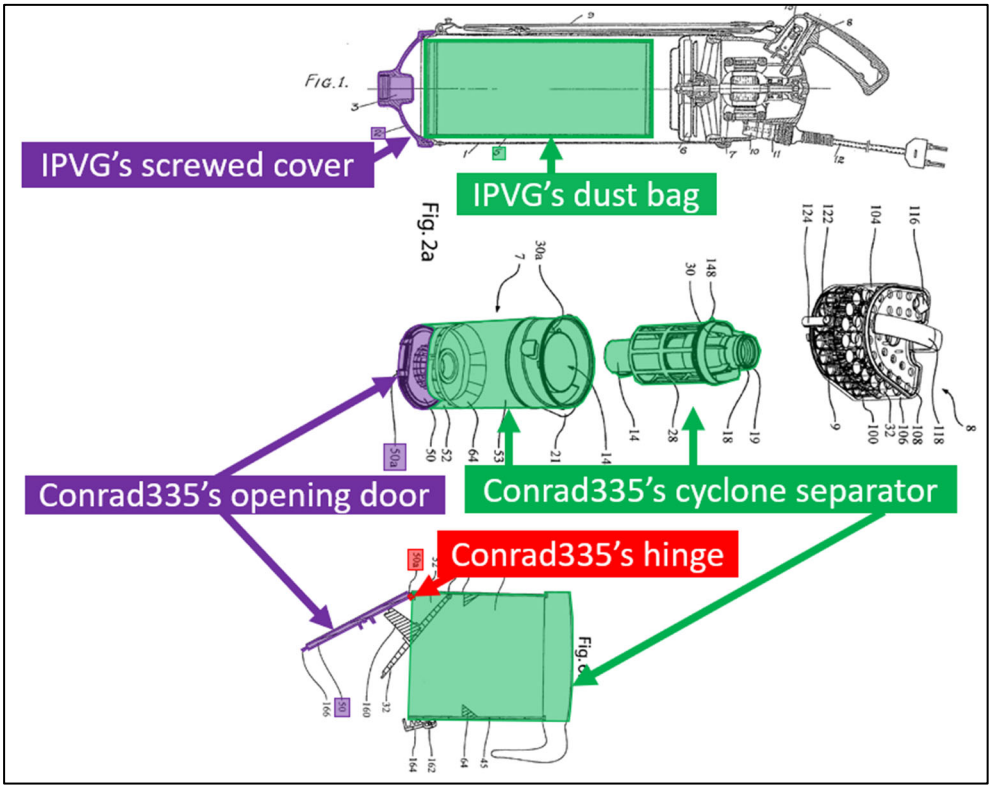
benefits of Conrad335's cyclonic-separation air filtration system and its hinged door. These benefits (described in further detail below) include bagless air filtration and quicker bin emptying. It is also my opinion that a POSA reading Conrad335 at the time of the '407 Patent's alleged invention would have been motivated to incorporate Conrad335's cyclonic separation unit into a hand vacuum cleaner, such as IPVG's hand vacuum cleaner. This is particularly supported by Conrad335's teaching that "[its] cyclonic embodiments … may be used in conjunction with … a hand vacuum." Ex1005 ¶376. I describe the specific combinations and modifications in detail below.

145. First, in my opinion, a POSA would modify IPVG's dust separation unit (IPVG's "**dust bag or like member [5]**") so that it used a dust-filtration unit that is cyclonic, such as Conrad335's "**cyclone separator**." I have shown these components in the annotated images below:



Ex1006 at Fig. 1; Ex1005 at Fig. 18.

146. Second, in my opinion, a POSA would have modified IPVG's screwed-open door (IPVG's "**screwed cover 2**") to be a pivot-open door, such as Conrad335's "**opening door 50**" (which Conrad335 teaches is "pivoted open about, e.g., **pivot hinges 50a**"). Ex1005, Abstract, ¶¶23, 339. It is also my opinion that a POSA would have known that Conrad335's "**opening door 50**" could be aligned with IPVG's "**screwed cover 2**" when these teachings are combined, as I have shown in the annotated images below:



Ex1006 at Fig. 1; Ex1005 at Figs. 2a, 6h.

147. In my opinion, there are several reasons why a POSA would have been motivated to combine the teachings of IPVG and Conrad335 as described above and elsewhere in this declaration.

148. First, in my opinion, a POSA would have been motivated to combine these teachings because IPVG and Conrad335 have many similarities and are therefore analogous. For example, IPVG teaches a "portable dust suction apparatus" that uses an air-filtration unit (IPVG's "dust bag or like member [5]") contained within a cylindrical chamber (IPVG's "casing 1") that is sealed at one end by an openable door ("casing 1 [is] closed at the front end by a screwed cover 2"). Ex1006, 1:10-12, 1:51-57, 2:9-20. Similarly, Conrad335 teaches a "portable vacuum cleaner" that uses an air-filtration unit (a "cyclone separator") that is sealed at one end by an openable door ("opening door 50"). Ex1005, Abstract, ¶¶ 23, 84, 339.

149. Second, in my opinion, a POSA would have been motivated to combine these teachings because Conrad335 and IPVG each provide explicit motivations for this combination. Put differently, Conrad335 and IPVG each suggest to a POSA reading them that this combination should be made. For example, Conrad335 teaches that its cyclonic separator teachings "may be used … to create … a stick vacuum cleaner" or "a hand vacuum." Ex1005 ¶376. In my opinion, this would motivate a POSA to

look to hand/stick vacuum cleaner references that could use Conrad335's cyclonic-filtration teachings—including IPVG's hand/stick vacuum cleaner. Also, IPVG describes its air-filtration unit as "a dust bag or like member through which the air stream passes." Ex1006, 1:22-33, claim 1. In my opinion, a POSA reading this teaching by IPVG would have been motivated to look for "like members" that may offer advantages over a dust bag. In my opinion, a POSA would have understood that one such "like member" is a cyclonic air-filtration unit as taught by Conrad335.

150. In my opinion, a POSA would have known that cyclonic air filtration had several benefits compared to dust-bag air filtration. One such benefit that a POSA would have known is that a user does not need to replace the dust bag. By eliminating the need to purchase and replace dust bags, a user can reduce recurring costs associated with operating the vacuum cleaner. Another benefit that a POSA would have known is that dust-bag cleaners are more susceptible to loss of suction as they get full compared to cyclonic cleaners. Dust bags have pores through which air flows that get clogged with dust and dirt, reducing suction. This is not typically a concern with cyclonic cleaners. Yet another benefit that a POSA would have known is that cyclonic cleaners can be (and typically are) transparent to let the user see how full the container is, and therefore provide visual feedback to let

the user know when it is preferable to empty the container. This is not typically associated with a dust bag, which are typically made of an opaque filtration material.

151. In my opinion, these advantages have been understood in the art since well before the time of the '407 Patent. For example, Martelliere in French Patent No. 1,094,603 recognized these advantages nearly seventy years ago, back in 1955. Ex1010. As Martelliere explains, "[b]y application of the 'Whirlwind' principle," (which, in my opinion, a POSA would have understood is cyclonic air filtration at least because of how Martelliere describes it as separating dust from air using cyclonic airflow), "the materials are deposited in the bottom of the container, after having separated from the air, before it passes through the filter screen." Ex1010, 1. Martelliere teaches that this has several advantages over dust bag filtration, including because it "prevent[s] clogging" and it creates "stable suction." Ex1010, 1. Martelliere also explains that another advantage of using a transparent cyclonic chamber is that "the user is able, when stopped, to see where the filling of the container is" and the user "can therefore better judge when it must be emptied." Ex1010, 1.

152. As another example of these advantages being well understood in the art is Vuijk. Ex1016. In 2002, Vuijk explained that "so-called bagless

vacuum cleaners," or "cyclonic" cleaners, "are becoming increasingly popular" because of these well-known advantages. Ex1016, 1:5-10. For example, Vuijk explains that these cyclonic cleaners "avoid[ed] the use of a filter bag as the primary form of separation" and, as a result, they "maintain a consistently high level of suction, even as the collecting chamber fills with dirt." Ex1016, 1:5-10.

153. Conrad335 itself is another example of these benefits being well understood. Conrad335 teaches that "[c]yclonic vacuum cleaners are known in the art" and explains that they have several advantages. Ex1005 ¶¶112, 382. For example, Conrad335 teaches that one "advantage" of Conrad335's cyclonic filtration unit design is that its chamber is transparent, which is beneficial because, "when the dirt collection bin is full, a user … will have a visual signal to empty the cyclonic stage." Ex1005 ¶¶2, 112.

154. Third, in my opinion, a POSA would have been motivated to combine these teachings because a POSA would have understood that Conrad335's hinged "opening door 50" had several advantages over IPVG's "screwed cover 2." In my opinion, a POSA would have understood that one of these advantages is ease of opening for cleaner emptying. For example, while IPVG's emptying process involves a user unscrewing "screwed cover 2,"

removing "dust bag 5," and then carrying the dirty, full dust bag to the garbage can (which a POSA would have understood is time-consuming and can result in the user getting dirty), in my opinion, a POSA would have understood that a user may empty a cleaner having Conrad335's "opening door 50" by holding the cleaner over a trash can or garbage can and then by pivoting the door open "such as by pushing [a] button," which is what Conrad335 teaches. Ex1006, 1; Ex1005 ¶339. As compared to IPVG's "screwed cover 2," in my opinion, a POSA would have understood that Conrad335's "opening door 50" beneficially allows a user to empty dirt more quickly, more conveniently, and more hygienically, and with little to no unwanted dust spillage.

155. Fourth, in my opinion, a POSA would have been motivated to combine these teachings because this combination would have involved a simple substitution of known elements for others to obtain predictable results. IPVG teaches a vacuum cleaner that has a dust separation unit with a door that covers one end of the dust separation unit and IPVG teaches that that door opens with a screw. Ex1006, Fig. 1. Conrad335 teaches a dust separation unit with door that covers one end of the dust separation unit and Conrad335 teaches that that door opens with a hinge. Ex1005, Fig. 2a. In my opinion, each of these components was a well-known element. A

POSA would have understood that the simple substitution of these dust separation units and openable doors would achieve predictable results. These predictable results include filtering air and allowing one end of the dust separation unit to be opened to empty the collected dirt and dust. Also, as depicted above, in my opinion, IPVG and Conrad335—which are each directed to hand/stick vacuum cleaners—each depicts a vacuum cleaner that has a similar size, shape, and orientation of a separation unit relative to the door. Ex1006, Fig. 1; Ex1005, Figs. 2a, 6h.

156. Fifth, in my opinion, a POSA would have been motivated to combine these teachings because it would have at least been obvious to try this combination. In my opinion, a POSA would have understood that there are a finite number of known, identified solutions for dust separation in vacuum cleaners. These solutions include using a dust bag (as IPVG teaches) and using one or more cyclonic separators (as Conrad335 teaches). Also, in my opinion, a POSA would have understood that there are a finite number of known, identified solutions for openable doors for dirt collection chambers. These solutions include a screwed door (as IPVG teaches) and a hinged door (as Conrad335 teaches). As a result, in my opinion, it would have been obvious to try to achieve these known benefits that I described above.

c. A POSA Would Have Had a Reasonable Expectation of Success Combining the Teachings of IPVG and Conrad335

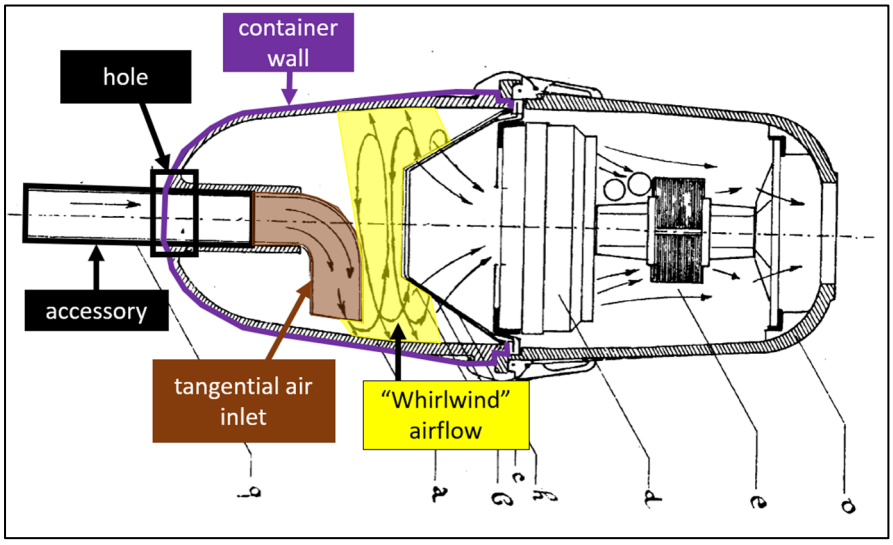
157. In my opinion, a POSA would have had a reasonable expectation of success substituting IPVG's "dust bag or like member [5]" with Conrad335's "cyclone separator" teachings and substituting IPVG's openable door for Conrad335's openable-door teachings. In my opinion, a POSA would have understood that IPVG's separation unit and Conrad335's separation unit could be used interchangeably. Also, in my opinion, a POSA would have understood that IPVG's openable door and Conrad335's openable door could be used interchangeably.

158. In my opinion, a POSA would have further expected success for the reasons I discussed above regarding a POSA's motivation to combine. This includes because such modification involves a simple substitution of known elements that perform similar functions in similar ways, and because of the express motivations taught by Conrad335 and by IPVG to perform such substitution.

159. Also, in my opinion, a POSA would have had a reasonable expectation of success incorporating Conrad335's cyclonic-separation teachings into IPVG. In my opinion, it was well known in the art that front-located air inlets (such as IPVG's air inlet) create cyclonic airflow separation by using

a tangential opening. For example, Conrad335 teaches (and a POSA would have known) that "a spiral or tangential inlet" can create cyclonic airflow. Ex1005 ¶224.

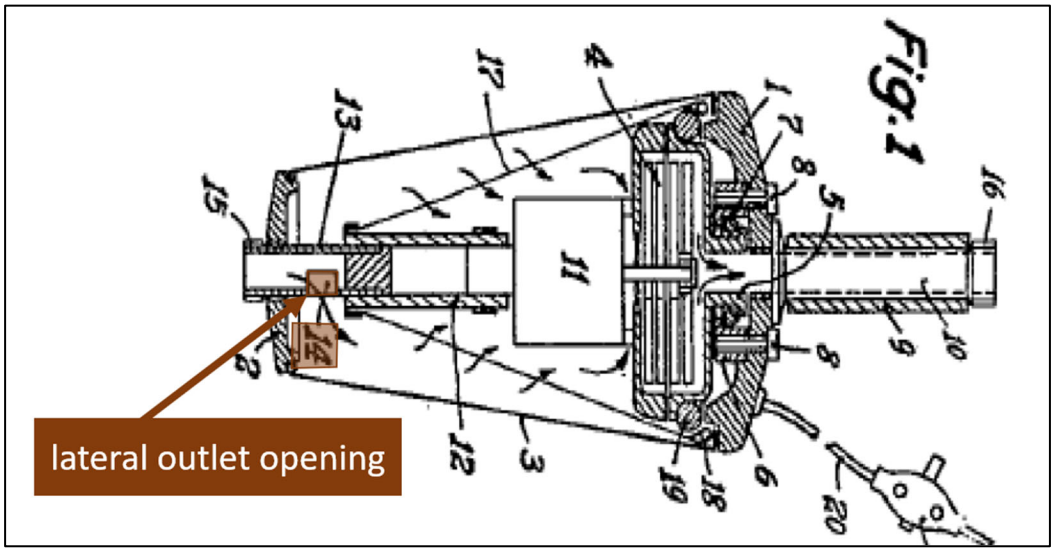
160. Also, front-located tangential air inlets have been used for cyclonic vacuum cleaners since well before the time of the '407 Patent's alleged invention. One example is Martelliere. In 1955, Martelliere taught a "**tangential[]**" **air inlet** and a removable **accessory** attached to the "**tangential[]**" **air inlet** through a **hole** in the "detachable" front "**wall of the … container**" that created "the 'Whirlwind' principle," which, in my opinion, a POSA would understand is cyclonic airflow as shown in the annotated image below:



Ex1010, 1, Fig. 1.

161. Another example is Peter. In 1938, Peter disclosed a hand vacuum cleaner

with a front-mounted accessory and an air inlet that contained "**lateral outlet opening 14**" that, in my opinion, a POSA would have understood created cyclonic airflow:



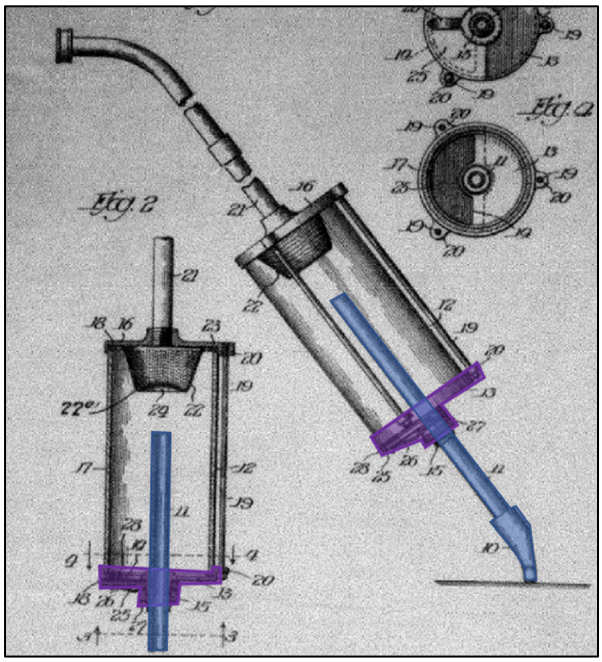
Ex1019, 2, Fig. 1.[4]

162. In my opinion, a POSA would have understood that the same tangential air inlet configuration would create cyclonic airflow in the combined teachings of IPVG and Conrad335 by incorporating a tangential cyclone air inlet, such as Conrad335's "inlet 21." Ex1005 ¶283. In my opinion, a POSA would have also understood that such a pipe would connect IPVG's

[4] Ex1019 is a certified English translation of Ex1018, originally published in German. Citations to Ex1019 are by page, as the English translation does not include column or line numbers.

air inlet with Conrad335's tangential "inlet 21."

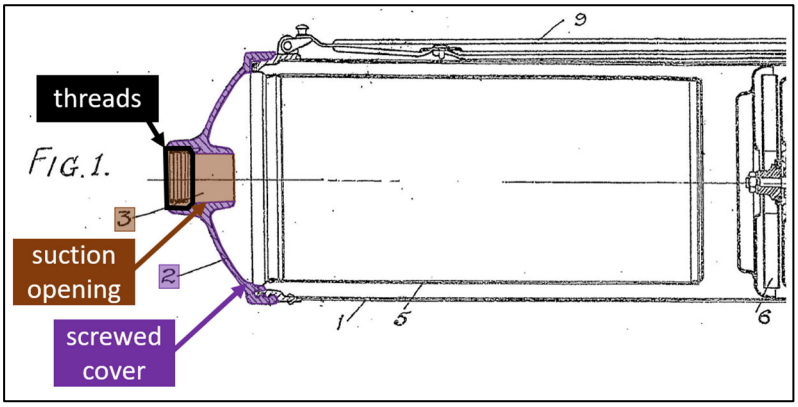
163. Also, in my opinion, **accessories** that project through **openable front doors** in vacuum cleaners have existed in the art for more than one hundred years. For example, the annotated image below is from a reference that was published in 1915:

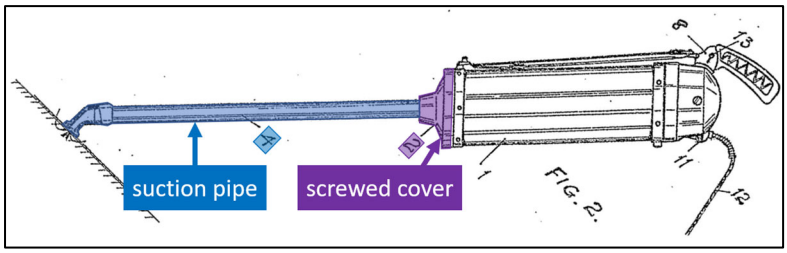


Ex1011, Figs. 1-2.

164. Also, Conrad335 teaches that its cyclone-separator teachings "may be used … with … a stick" vacuum or a "hand vacuum." Ex1005 ¶376. In my opinion, front-mounted accessories were common for these types of vacuum cleaners. In my opinion, a POSA would have understood as well that front-mounted accessories for the combined teachings of Conrad335 and IPVG would be detachable because this functionality would allow

Conrad335's door to pivot open once the accessory was detached, including as IPVG teaches. As an example, IPVG teaches a **threaded** "**suction opening 3**" to which a "**suction pipe 4**" that has mating threads corresponding to the "**suction opening 3**"'s threads can be attached for cleaning use and detached to allow a user to remove "**screwed cover 2**" for emptying the cleaner, as shown in the annotated images below:

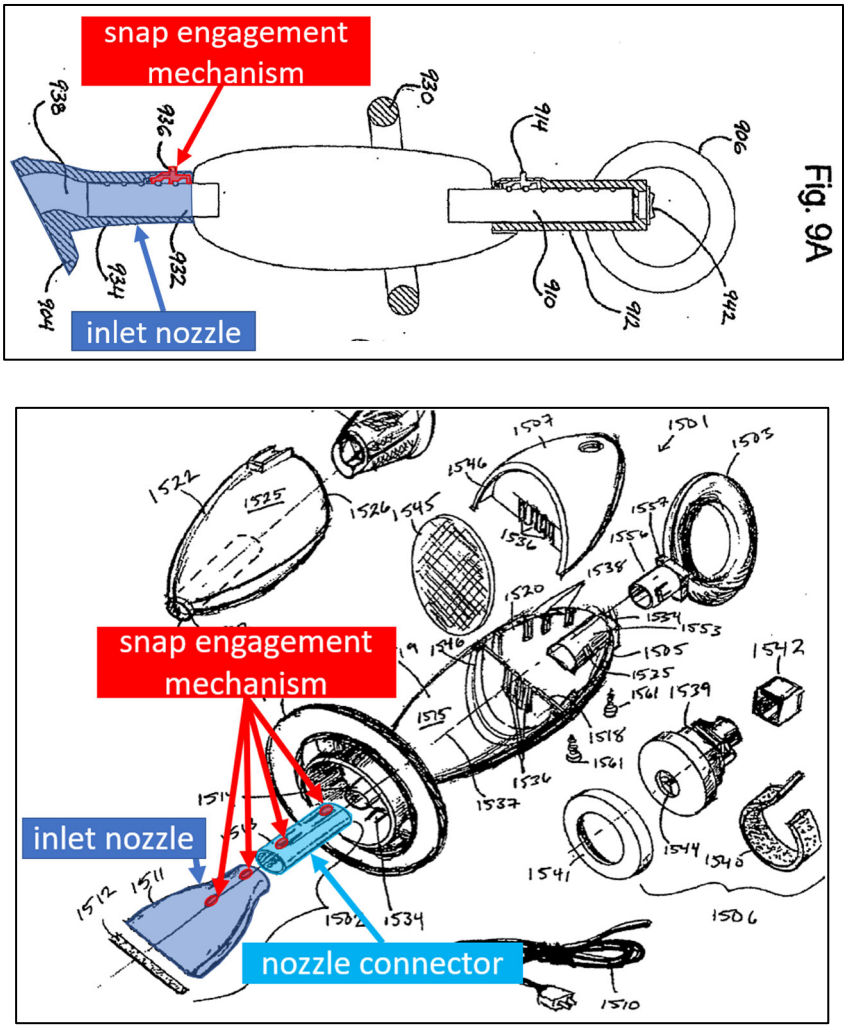




Ex1006, 1:51-57, Figs. 1-2.

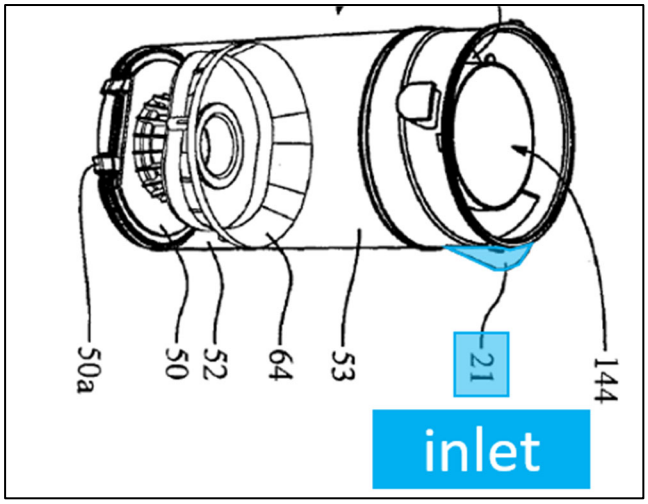
165. Further, PCT Publication No. 2007/084543 to Butler ("Butler") teaches a hand vacuum cleaner that has removably connectable accessories. Ex1012. Butler teaches that these accessories include an "inlet nozzle" and/or "nozzle connector," and they are removably "attached to the housing … by snap engagement" for easy attachment and removal, as

shown in the annotated images below:



Ex1012, 27:12, 34:28-30, 35:8-11, Figs. 9A, 15; *see also id.*, 10:28-11:2, 37:16-18, 38:25-39:1.

166. Also, in my opinion, a POSA would have understood that IPVG's accessory (IPVG's "suction pipe 4") could alternatively attach to a cyclone air inlet that is positioned on the outside of the cyclonic dirt separation unit, such as Conrad335's "**inlet 21**," which is shown in the annotated image below:



Ex1005, Fig. 2a.

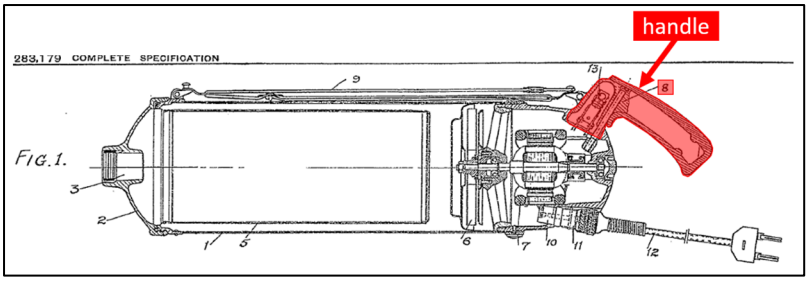
2. The Combined Teachings of IPVG and Conrad335 Render Obvious Claims 1, 23, 24, and 25

a. [1pre]/[23pre]/[24pre]/[25pre]

Reference Number	Claim Limitation
[1pre]	"A hand vacuum cleaner comprising:"
[23pre]	"A hand vacuum cleaner comprising:"
[24pre]	"A hand vacuum cleaner comprising:"
[25pre]	"A hand vacuum cleaner comprising:"

167. To the extent the preambles are limiting, in my opinion, IPVG teaches a hand vacuum cleaner.

168. IPVG teaches a "portable dust suction apparatus" that has "a **handle [8]** which is rigidly secured to the casing," and which IPVG teaches the operator holds "during manipulation of the apparatus," as shown in the annotated image below:



Ex1006 at 1:10-21.

169. Based on IPVG's teachings, in my opinion, a POSA would have understood that IPVG's portable dust suction apparatus is a hand vacuum cleaner.

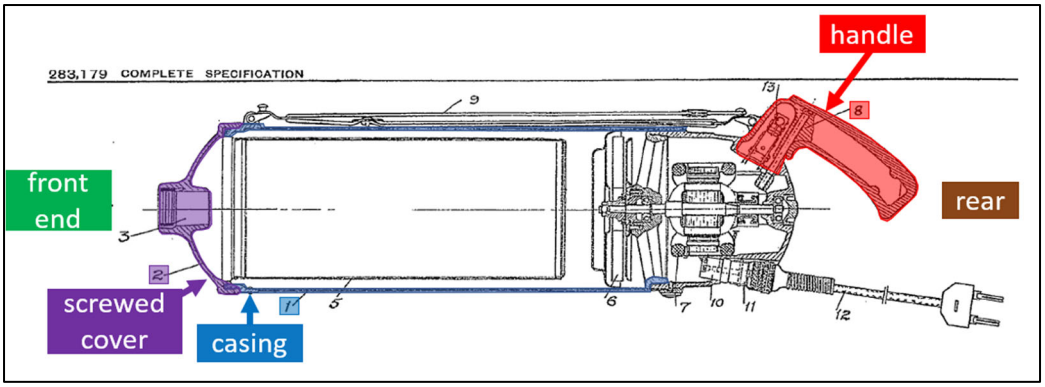
170. Also, Conrad335 teaches "a cyclonic surface cleaning apparatus" that Conrad335 teaches "may be used in conjunction with a fan or other air moving means to create a… hand vacuum." Ex1005, ¶¶ 1, 376.

b. [1a]/[23a]/[24a]/[25a]

Reference Number	Claim Limitation
[1a]	"a) a front end having a front wall and a rear end;"
[23a]	"a) a front end having a front wall and a rear end;"
[24a]	"a) a front end having a front wall and a rear end;"
[25a]	"a) a front end having a front wall and a rear end;"

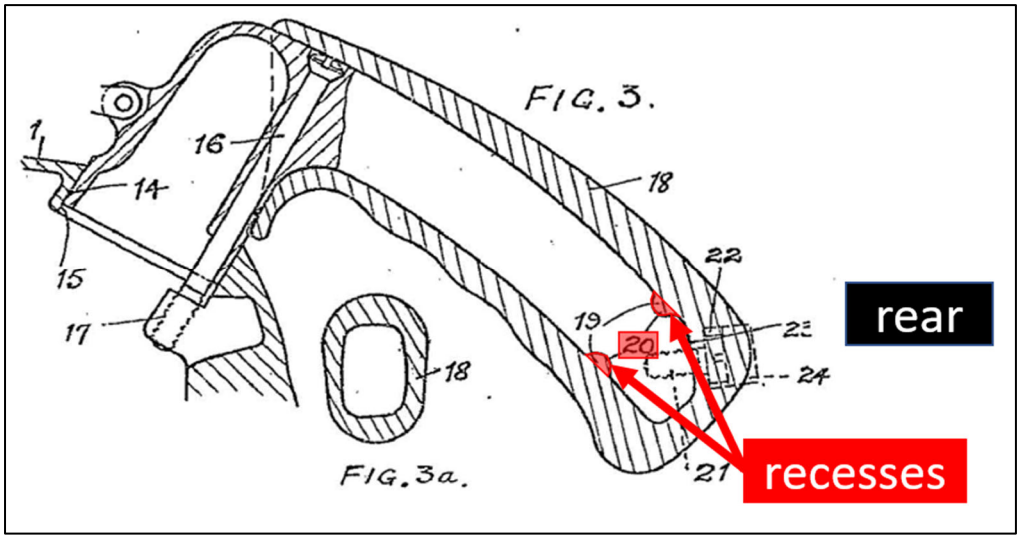
171. In my opinion, IPVG teaches and the combination of IPVG and Conrad 335 teaches a front end having a front wall and a rear end.

172. IPVG teaches a "portable dust suction apparatus" that IPVG teaches includes "**casing 1** closed at the **front end** by a **screwed cover 2**" and a "**handle 8**" located at the "**rear**," as shown in the annotated image below:



Ex1006 at 1:10-12, 1:51-57, 1:92-2:2, claim 3, Fig. 1.

173. IPVG also teaches that "**recesses 20**" are "preferably located at the rear end of the handle" and IPVG depicts those "**recesses 20**" at being positioned at the far-right-hand side of the handle in IPVG Figure 3, which, in my opinion, a POSA would have understood further supports the above identification of the front and the rear ends of IPVG's vacuum cleaner:

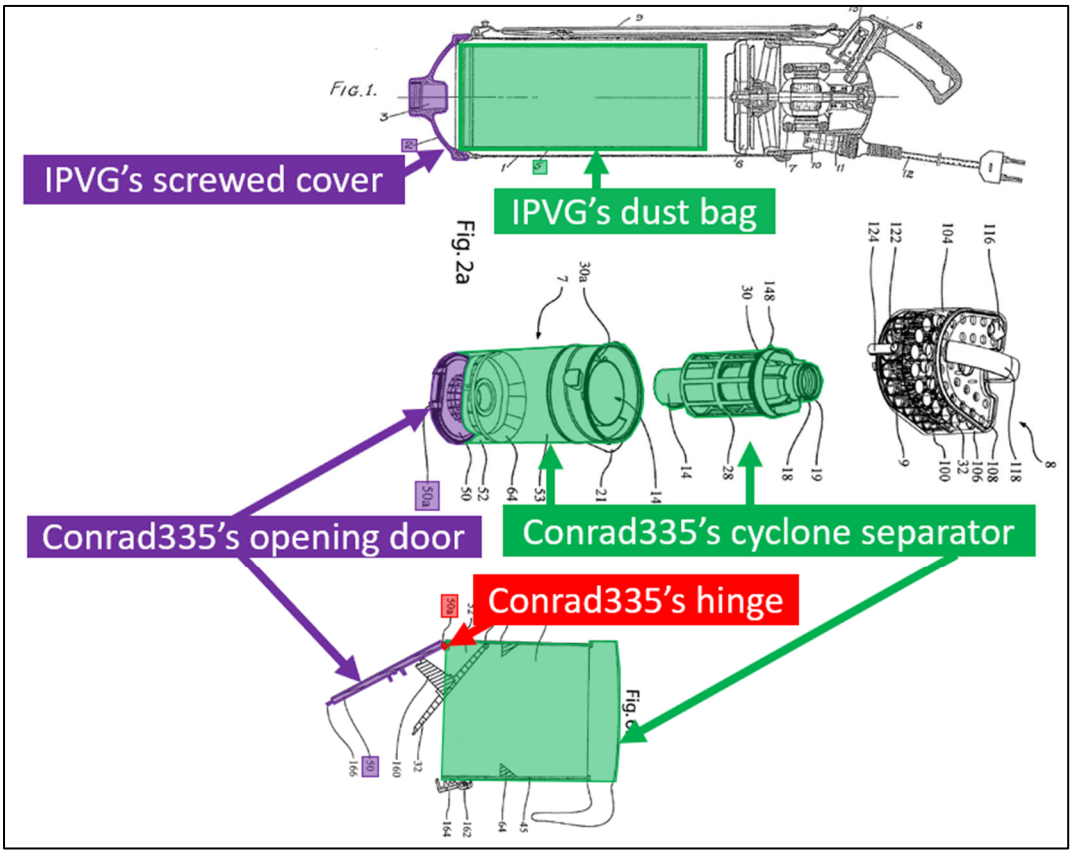


Ex1006 at 1:97-101, Fig. 3.

174. In my opinion, a POSA would have understood that IPVG's "**screwed**

cover 2" is a front wall at least because it is a cover sealing the "**front end**" of IPVG's "casing 1" and because it is located at the opposite end of IPVG's vacuum cleaner from the "**rear**."

175. As explained, in my opinion, a POSA would have been motivated to modify IPVG's "screwed cover 2" with Conrad335's "opening door 50" teachings and a POSA would have had a reasonable expectation of success doing so. *See* Ground 3, §1. When so combined, Conrad's "opening door 50" is the front wall, as shown in the annotated images below:



Ex1006 at Fig. 1; Ex1005 at Figs. 2a, 6h.

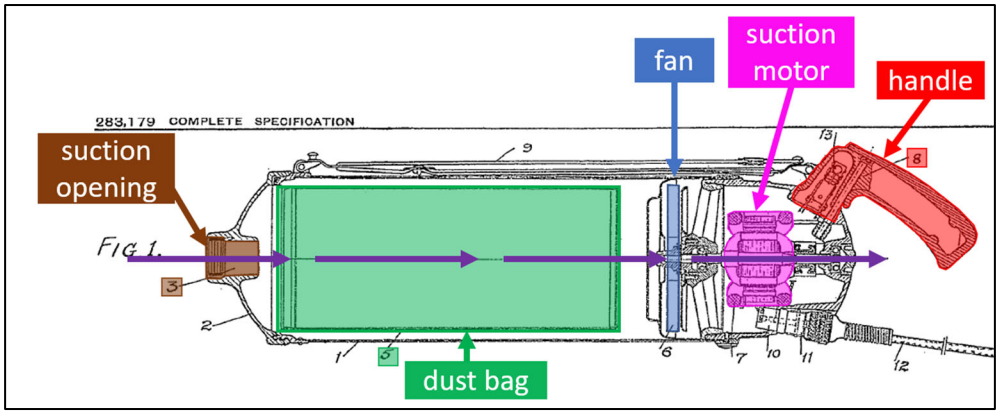
c. [1b]/[23b]/[24b]/[25b]/[1e]/[23e]/[24e]/[25e]

Reference Number	Claim Limitation
[1b]	"b) an air flow passage extending from a dirty air inlet to a clean air outlet;"
[23b]	"b) an air flow passage extending from a dirty air inlet to a clean air outlet;"
[24b]	"b) an air flow passage extending from a dirty air inlet to a clean air outlet;"
[25b]	"b) an air flow passage extending from a dirty air inlet to a clean air outlet;"
[1e]	"e) a suction motor positioned in the air flow passage."
[23e]	"e) a suction motor positioned in the air flow passage"
[24e]	"e) a suction motor positioned in the air flow passage"
[25e]	"e) a suction motor positioned in the air flow passage"

176. In my opinion, IPVG teaches and the combination of IPVG and Conrad335 teaches an air flow passage extending from a dirty air inlet to a clean air outlet.

177. In my opinion, IPVG teaches and the combination of IPVG and Conrad335 teaches a suction motor positioned in the air flow passage.

178. IPVG teaches that, in its vacuum cleaner, **air flows** in through "**suction opening 3**," through "**dust bag 5**, and a **fan 6** driven by an **electric motor 7**," and out "the exhaust or blowing end of the casing," which is on the end where "**handle 8**" "is mounted," as shown in the annotated image below:



Ex006 at 1:51-62, Fig. 1.

179. In my opinion, a POSA would have understood that IPVG's "**suction opening 3**" is a dirty air inlet at least because it is an inlet for dirty air. In my opinion, a POSA would also understand that IPVG's "exhaust or blowing end of the casing" is a clean air outlet at least because it is an outlet for air that has been cleaned.

180. Also, in my opinion, Conrad335 teaches an air flow passage extending from a dirty air inlet to a clean air outlet. Conrad335 teaches that its "vacuum cleaner 1 has a ground engaging head 2 having a dirty air inlet (not shown) which is in airflow communication with the first stage cyclone inlet 10." Ex1005 ¶274. Conrad335 further teaches that "[t]he air travels through first cyclonic cleaning stage 7," "exits upwardly via first stage cyclone outlet 27," "enter[s] second stage cyclones 9," and "travels downwardly via conduit 14 into the ground engaging head to a fluid flow motor that is preferably a suction motor 15 prior to exiting vacuum cleaner

1." *Id*. In my opinion, Conrad335's cyclonic separation cleans the air before it exits the vacuum cleaner.

181. In my opinion, a POSA would have understood that Conrad335's "dirty air inlet" is a dirty air inlet at least because it is an inlet for dirty air. In my opinion, a POSA would also understand that the post-motor portion of Conrad335's vacuum cleaner where already-treated air "exit[s]" the vacuum cleaner is a clean air outlet at least because it is an outlet for air that has been cleaned.

182. Further, in IPVG, "**fan 6** driven by an **electric motor 7**" is in the air flow passage, as shown in the annotated image above. IPVG's "handle 8" is mounted to the "exhaust or blowing end of the casing" and IPVG's "**motor 7**" is between the "exhaust or blowing end" and "suction opening 3." Ex1006, 1:51-62. In my opinion, IPVG's "**motor 7**" individually or together with "**fan 6**" is a suction motor positioned in the airflow passage.

183. In my opinion, the combination of IPVG and Conrad335 also teaches these limitations. In Conrad335, air enters the cleaner through "a dirty air inlet," is treated, then "the treated air … travels … to a fluid flow motor that is preferably a suction motor 15 prior to exiting vacuum cleaner 1." Ex1005 ¶274.

184. As explained, in my opinion, a POSA would have been motivated to

combine the teachings of IPVG and Conrad335, *see* Ground 3, §1, and a POSA would have been motivated to use an airflow passage from a dirty air inlet to a clean air outlet and including a suction motor for improved motor efficiency and reliability (by cooling the motor using the airflow) and for improved suction.

185. As explained, in my opinion, a POSA would have been motivated to replace IPVG's "dust bag 5" with Conrad335's cyclone separator teachings and a POSA would have had a reasonable expectation of success doing so. *See* Ground 3, §1. In my opinion, the combined teachings likewise meet these limitations because the air flows from a dirty air inlet, such as IPVG's "suction opening 3" (when modified to create cyclonic airflow), through a suction motor, to a clean air outlet, such as IPVG's "exhaust."

d. [1c]/[23c]/[24c]/[25c]

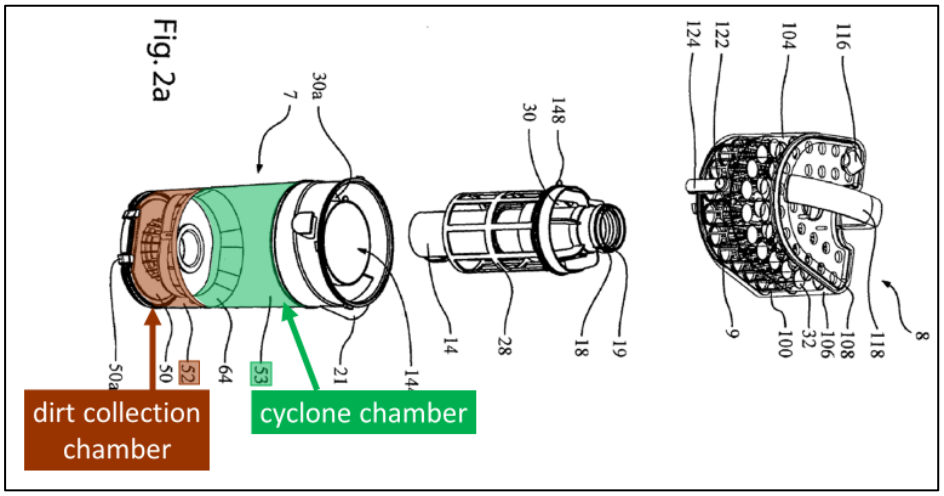
Reference Number	Claim Limitation
[1c]	"c) a first cyclone unit positioned in the air flow passage, the first cyclone unit comprising at least one cyclone and at least one dirt collection chamber external to the cyclone chamber;"
[23c]	"c) a first cyclone unit positioned in the air flow passage, the first cyclone unit comprising at least one cyclone and at least one dirt collection chamber;"
[24c]	"c) a first cyclone unit positioned in the air flow passage, the first cyclone unit comprising at least one cyclone and at least one dirt collection chamber;"
[25c]	"c) a first cyclone unit positioned in the air flow passage, the first cyclone unit comprising at least one cyclone and at least one dirt collection chamber;"

186. In my opinion, IPVG in combination with Conrad335 teaches a first cyclone unit positioned in the air flow passage, the first cyclone unit comprising at least one cyclone and at least one dirt collection chamber.

187. IPVG teaches a "dust bag or like member [5]" "through which the suction air stream passes." Ex1006, 1:51-57, claim 1. In my opinion, a POSA would have understood that IPVG's "dust bag or like member [5]" is an air filtration and dirt collection unit that is positioned in the air flow passage. *Id.*

188. In my opinion, Conrad335 teaches a first cyclone unit positioned in the air flow passage, the first cyclone unit comprising at least one cyclone and at least one dirt collection chamber. Conrad335 teaches that "cyclone separator 20" includes "a cyclonic region or cyclone chamber 53 and a dirt

collection region or chamber [52],” as shown in the annotated image below:



Ex1005 ¶318, Fig. 2a.

189. In my opinion, a POSA would have understood that Conrad335’s “cyclone separator 20” is a first cyclone unit. In my opinion, a POSA would have understood that Conrad335’s “cyclone chamber 53” contains at least one cyclone. In my opinion, a POSA would have understood that Conrad335’s “dirt collection region or chamber [52]” is a dirt collection chamber.

190. As further support, Conrad335 provides the following description of the construction and operation of its cyclone units, including the operation of the fluid flow:

> In accordance with another aspect, which may be used individually or with any other aspect, a cyclone separator 20 may have air inlet 21 that is located on the top of the separator 20, see for example FIGS. 3, 3 a and 3 b. The inlet 21 may be round,

oval, square, rectangular, ellipsoid or any other shape in transverse section to the direction of flow, but a rectangular shape, as exemplified in the Figures, is preferred. The particle laden fluid represented by arrow 22 enters into the air inlet 21 and is directed by the spiral ramp 25 that defines inlet 21 so as to create cyclonic circulation 23 in cyclone separator 20. The spiral ramp 25 can be configured to occupy an arc of from 10° to 360° of the perimeter of the circumference of the cyclone separator 20 as seen from above. Preferably, the spiral ramp 25 extends through an arc from 15 to 360° and, more preferably from 25° to 270° and, most preferably from 25° to 90°. In the embodiment of FIG. 3 a, air or fluid inlet 21 extends through an arc of 90° and in the embodiment of FIG. 3 b, air inlet extends through an arc of 270°. The spiral ramp 25 may be configured in either a clockwise or counterclockwise direction. As exemplified in the drawings, at least a portion of, and preferably all of, inlet 21 is positioned exterior to the cyclone chamber, which chamber is located inside cyclone separator 20. For example, the inlet may be on the outer surface of cyclone separator 20 but is preferably positioned at the top of cyclone separator 20.

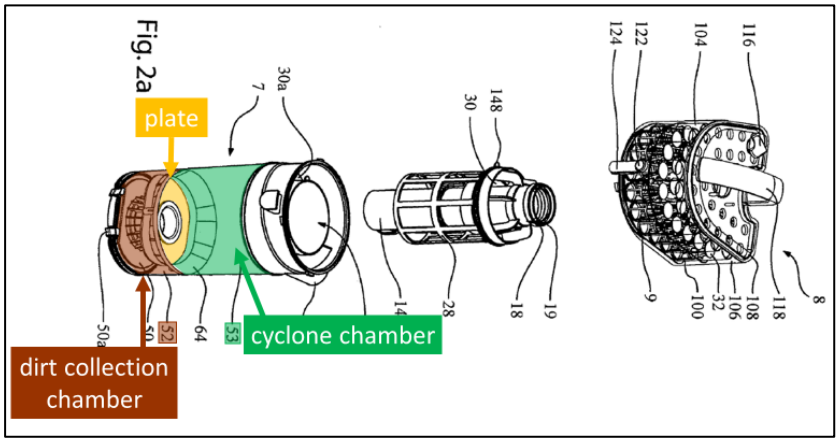
Cyclonic circulation 23 in cyclone separator 20 causes at least a portion of the particles 24 within the particle laden fluid stream 22 to be disentrained from the fluid flow stream and accumulate within the lower region of the cyclone separator 20. The fluid stream 26, which exits the cyclone separator 20 through the fluid outlet 27 that is located adjacent to the inlet 21, has a

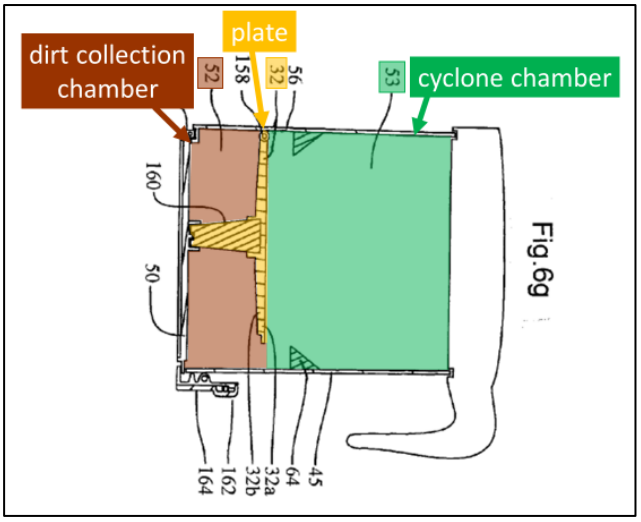
Dyson Ex1002
Page 90

reduced concentration of the particles 24 than particle laden fluid stream 22. It is understood that this construction can be applied to a single cyclone or a plurality of cyclones in parallel. In another embodiment, it will be appreciated that outlet 27 may be provided in the bottom of cyclone separator 20 or any other location known in the art.

Ex1005 ¶¶ 283-84.

191. With respect to Limitation [1c], in my opinion, Conrad335 teaches the at least one dirt collection chamber is external to the cyclone chamber. Conrad335 teaches that a "**plate 32** … is included in a cyclone separator 20 to divide the interior of a cyclone separator 20 into a cyclonic region or **cyclone chamber 53** and a **dirt collection region or chamber**," as shown in the annotated images below:





Ex1005 ¶ 318, Figs. 2a, 6g.

192. In my opinion, a POSA would have understood that Conrad335's "dirt collection region or chamber [52]" is external to the cyclone chamber at least because they are separated by Conrad335's "plate 32."

193. Accordingly, a POSA would have been motivated to modify IPVG's "dust bag 5" with Conrad335's cyclone separator teachings and a POSA would have had a reasonable expectation of success doing so. *See* Ground 3, §1.

e. [1d]/[23d]/[24d]/[25d]

Reference Number	Claim Limitation
[1d]	"d) the cyclone and the dirt collection chamber having an openable door, the front wall comprising the openable door, whereby, when the door is in an open position, both the cyclone and the dirt collection chamber are opened; and,"
[23d]	"d) the dirt collection chamber having an openable door, the front wall comprising the openable door; and,"
[24d]	"d) the dirt collection chamber having an openable door, the front wall comprising the openable door; and,"
[25d]	"d) the dirt collection chamber having an openable door, the front wall comprising the openable door; and,"

194. In my opinion, IPVG in combination with Conrad335 teaches the cyclone and the dirt collection chamber having an openable door, the front wall comprising the openable door, whereby, when the door is in an open position, both the cyclone and the dirt collection chamber are opened (Limitation (1[d])).

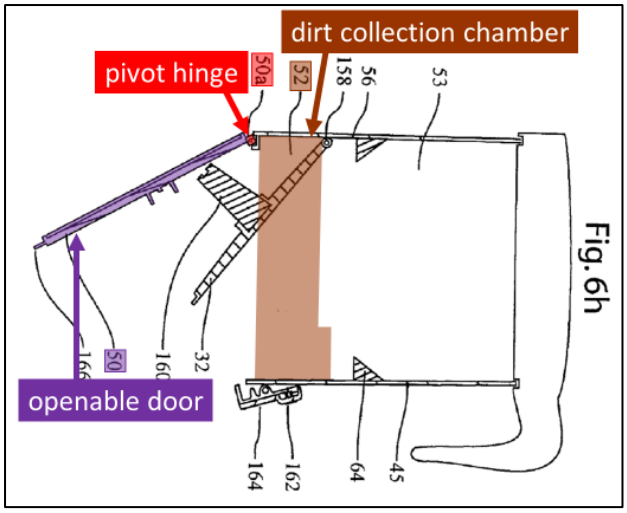
195. In my opinion, IPVG in combination with Conrad335 teaches the dirt collection chamber having an openable door, the front wall comprising the openable door (Limitations [23d]/[24d]/[25d]).

196. In my opinion, IPVG teaches the dirt collection chamber having an openable door, the front wall comprising the openable door, in Limitations [23d]/[24d]/[25d]. *See* Ground 3, Limitation [1a]. In my opinion, a POSA would have understood that IPVG's "screwed cover 2" is a front wall comprising an openable door at least because IPVG's "screwed cover 2"

"close[s] … the front end" of IPVG's "chamber 1" and because IPVG's "screwed cover 2" is removable by removing the screws (in other words, is openable) for a user to empty IPVG's dust bag.

197. Regarding Limitation [1d], in my opinion, IPVG also teaches that its dust separation unit, "dust bag or like member [5]," has an openable door, whereby, when the door is in an open position, "dust bag or like member [5]," which is both a dust separation unit and a dirt collection chamber, are opened. Ex1006, 1:51-57, Fig. 1.

198. In my opinion, Conrad335 teaches that the cyclone and the dirt collection chamber have an openable door, the front wall comprising the openable door, whereby, when the door is in an open position, both the cyclone and the dirt collection chamber are opened. For example, Conrad335 teaches that "**openable door [50]**" can be "pivoted open about, e.g. **pivot hinges 50a**," and Conrad335 depicts the "**dirt collection chamber 52**" in an opened position when "**openable door [50]**" is pivoted to an open position, as shown in the annotated image below:

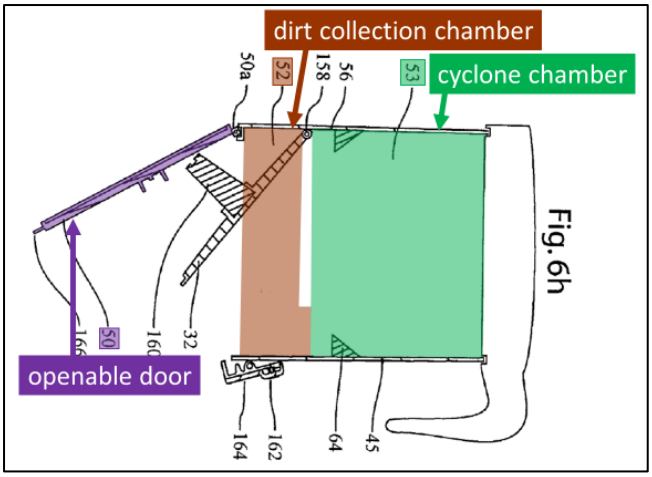


Ex1005 ¶¶147, 338-39, Fig. 6h.

199. Conrad335 teaches that "the dirt collection chamber has a bottom that is openable," and Conrad335 teaches that when "[c]yclonic cleaning stage 7" is full, it "may then be emptied, e.g., by opening a bottom pivoting door 50." Ex1005 ¶¶ 23, 350.

200. As I explained for Limitations [1a]/[23a]/[24a]/[25a], when Conrad335's teachings of its "cyclone separator 20" are incorporated into IPVG's hand/stick vacuum cleaner, in my opinion, Conrad335's "openable door [50]" is a front wall comprising the openable door. *See* Ground 3, Limitations [1a]/[23a]/[24a]/[25a].

201. Regarding Limitation [1d], Conrad teaches that its "**openable door [50]**" is an openable door to both Conrad335's "**dirt collection chamber 52**" and Conrad335's "**cyclone chamber 53**," as shown in the annotated image below:



Ex1005 ¶¶147, 338-39, Fig. 6h.

202. Additionally, Conrad335 teaches that its cyclonic separator design "permit[s] dirt … in the cyclone chamber and the dirt collection chamber to be removed concurrently." Ex1005, claim 13.

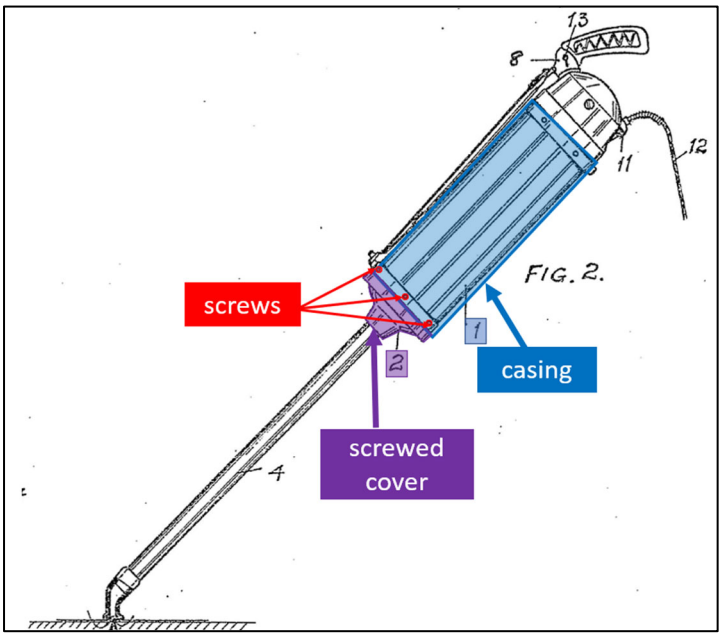
203. As explained, in my opinion, a POSA would have been motivated to modify IPVG's "dust bag 5" with Conrad335's cyclone separator teachings and a POSA would have had a reasonable expectation of success doing so. *See* Ground 3, §1.

f. [23f]

Reference Number	Claim Limitation
[23f]	"wherein the door is openable when the dirt collection chamber is mounted to the hand vacuum cleaner."

204. In my opinion, IPVG teaches and the combination of IPVG and Conrad 335 teaches that the door is openable when the dirt collection chamber is mounted to the hand vacuum cleaner.

205. IPVG's openable door, "screwed cover 2," is opened by removing the screws, which can be performed when "casing 1," in which IPVG's "dust bag 5" is housed, is mounted to the rest of the hand vacuum cleaner, as shown in the annotated image below:



Ex1006 at Fig. 2.

206. In my opinion, IPVG's "casing 1," individually, or together with IPVG's "dust bag 5," is a dirt collection chamber. *See* Ground 3, Limitations [23c], [23d].

207. As explained, in my opinion, a POSA would have been motivated to modify IPVG's "screwed cover 2" with Conrad335's openable door teachings and would have had a reasonable expectation of success doing so. *See* Ground 3, §1. In my opinion, the combined teachings likewise

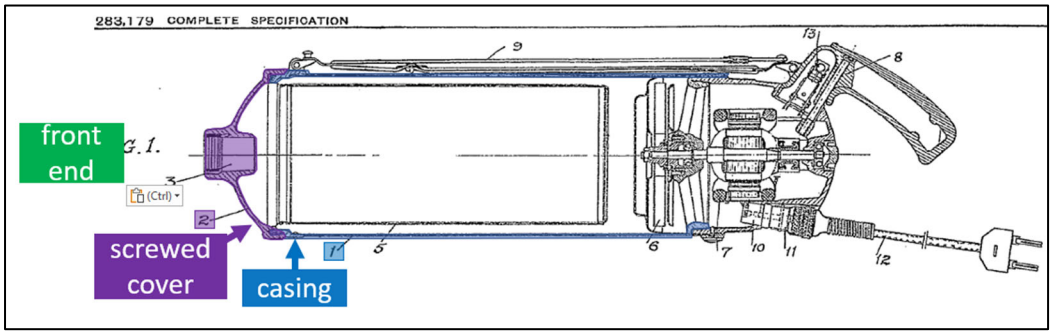
meet these limitations because Conrad335's "opening door 50," when substituted for IPVG's "screwed cover 2," would still be openable when the dirt separation unit was mounted to IPVG's hand vacuum cleaner, as it would not be blocked from pivoting open when no accessory was attached.

g. [24f]

Reference Number	Claim Limitation
[24f]	"wherein the openable door covers an end of the dirt collection chamber."

208. In my opinion, IPVG teaches that the openable door covers an end of the dirt collection chamber.

209. In IPVG, "the apparatus comprises a **casing 1** closed at the **front end** by a **screwed cover 2,**" as shown in the annotated image below:

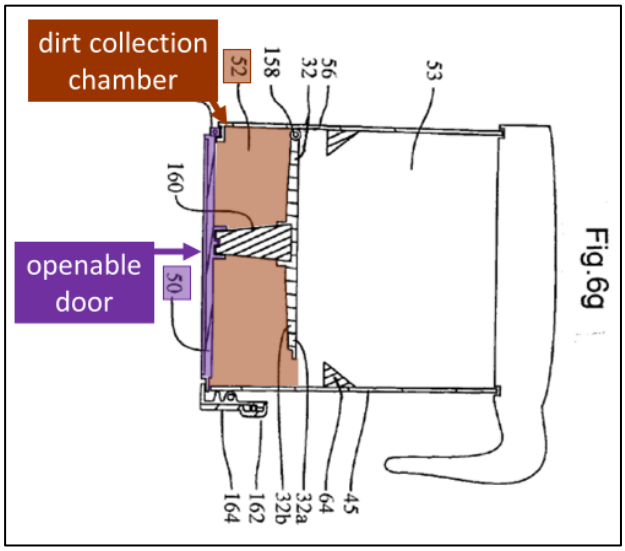


Ex1006 at 1:51-57, Fig. 1.

210. In my opinion, IPVG's "**screwed cover 2**" is an openable door, and it covers an end of IPVG's "**casing 1**," which individually, or together with IPVG's "dust bag 5," is a dirt collection chamber. *See* Ground 3,

Limitations [24c], [24d].

211. Likewise, Conrad's "**openable door [50]**" covers an end of the "**dirt collection chamber 52**," as shown in the annotated image below:



Ex1005 at Fig. 6g.

212. Further, Conrad335 explains that "[i]n another embodiment, the **dirt collection chamber** has a **bottom** that is openable." Ex1005 ¶23.

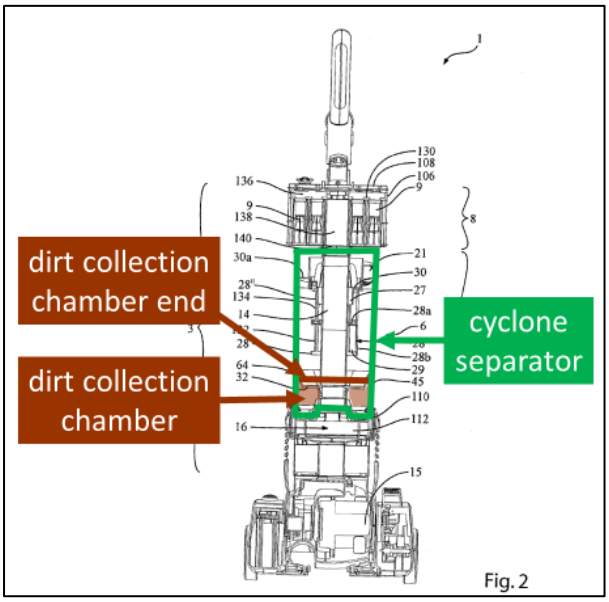
213. As explained, in my opinion, a POSA would have been motivated to modify IPVG's "screwed cover 2" with Conrad335's openable door teachings and to modify IPVG's "dust bag 5" with Conrad335's cyclone separator teachings and would have had a reasonable expectation of success doing so. *See* Ground 3, §1. In my opinion, the combined teachings likewise meet these limitations because Conrad335's "opening door 50" would cover an end of IPVG's dirt collection chamber.

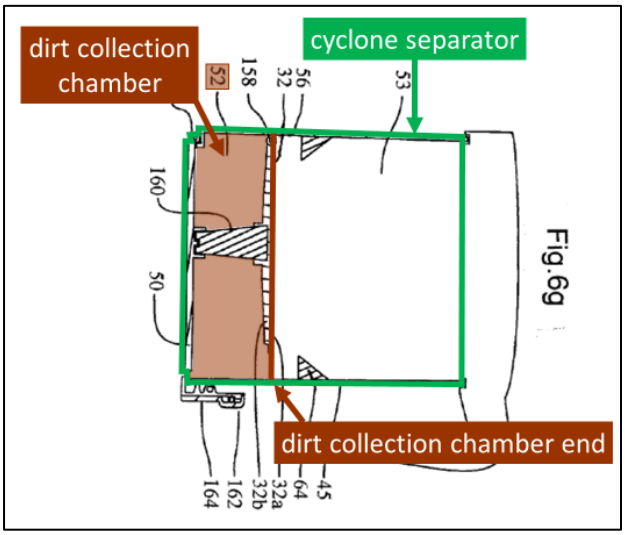
h. [25f]

Reference Number	Claim Limitation
[25f]	"wherein the dirt collection chamber has a rear end and the rear end is non-removably mounted to the first cyclone unit."

214. In my opinion, IPVG in combination with Conrad335 renders obvious the dirt collection chamber having a rear end and the rear end is non-removably mounted to the first cyclone unit.

215. Conrad335's "**dirt collection chamber 52**" has an **end** that is non-removably mounted to Conrad335's "**cyclone separator 20**," as shown in the annotated images below:





Ex1005 at Figs. 2, 6g.

216. In my opinion, a POSA would have understood that the end of Conrad335's "dirt collection chamber 52" is non-removably mounted to

Conrad335's "cyclone separator 20" (which is a first cyclone unit, *see* Ground 3, Limitation [25c]), including because Conrad335 explains that "[e]ach cyclone and associated dirt collection chamber is ***integrally molded*** from transparent plastic." Ex1005 ¶134.

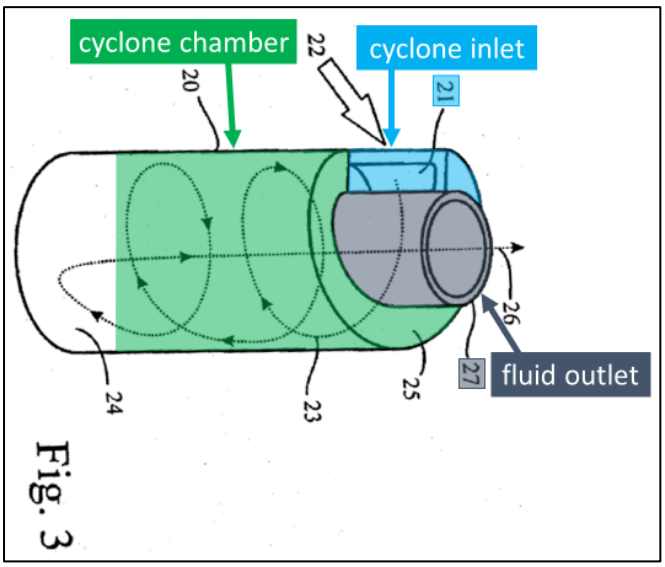
217. As explained, in my opinion, a POSA would have been motivated to modify IPVG's "dust bag 5" with Conrad335's cyclone separator teachings and would have had a reasonable expectation of success doing so. *See* Ground 3, §1. In my opinion, the combined teachings meet these limitations because Conrad335's dirt collection chamber end would remain non-removably mounted to the first cyclone.

3. The Combined Teachings of IPVG and Conrad335 Render Obvious Claim 2

Reference Number	Claim Limitation
[2]	"The hand vacuum cleaner of claim 1 wherein the at least one cyclone has a cyclone front end, a cyclone rear end, a cyclone air inlet and a cyclone air outlet and the cyclone front end is at the front end of the hand vacuum cleaner."

218. In my opinion, IPVG in combination with Conrad335 renders obvious the hand vacuum cleaner of claim 1 wherein the at least one cyclone has a cyclone front end, a cyclone rear end, a cyclone air inlet and a cyclone air outlet and the cyclone front end is at the front end of the hand vacuum cleaner.

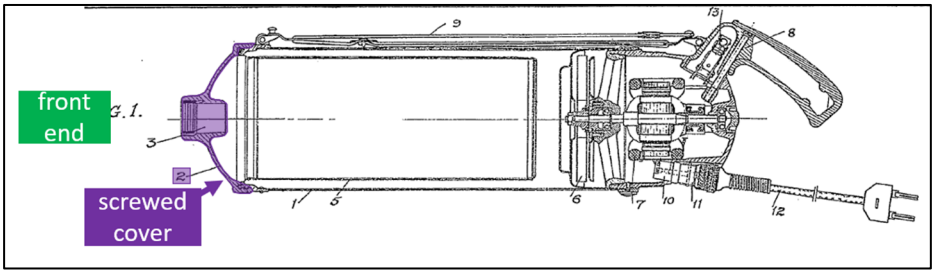
219. In my opinion, Conrad335 teaches that the at least one cyclone has a cyclone front end, a cyclone rear end, a cyclone air inlet and a cyclone air outlet. Conrad335's "**cyclone chamber 53**" includes a first cyclone. *See* Ground 3, Limitation [1c]. Conrad335's "**cyclone chamber 53**" has "**cyclone inlet 21**," which, in my opinion, is a cyclone air inlet, and "**fluid outlet 27**," which, in my opinion, is a cyclone air outlet, as shown in the annotated image below:

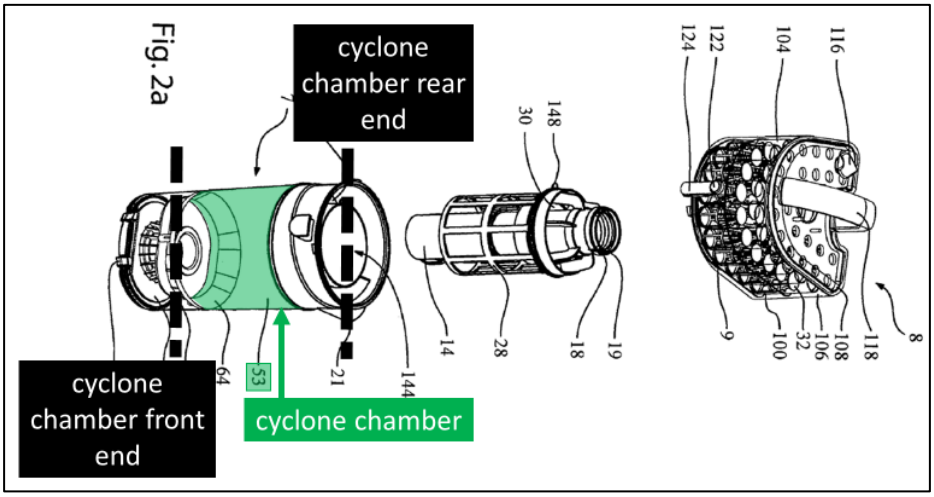


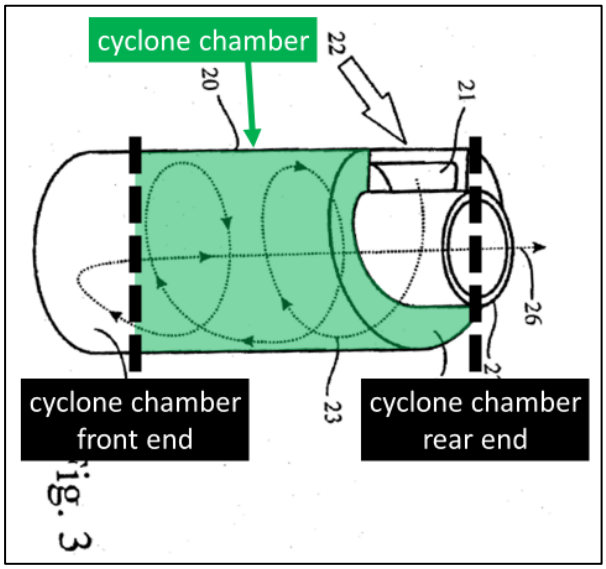
Ex1005 ¶¶284, 324, Fig. 3.

220. In my opinion, when Conrad335's "cyclone separator 20," including "**cyclone chamber 53**," is incorporated into IPVG's vacuum cleaner, Conrad335's "**cyclone chamber 53**" would have its front end at IPVG's "front end" (in other words, near "**screwed cover 2**"), which is at the front end of the vacuum cleaner, and would have its rear end at the opposite end,

as shown in the annotated images below:







Ex1006 at Fig. 1; Ex1005 at Figs. 2a, 3.

221. As explained, in my opinion, a POSA would have been motivated to

modify IPVG's "dust bag 5" with Conrad335's cyclone separator teachings and would have had a reasonable expectation of success doing so. *See* Ground 3, §1. In my opinion, the combined teachings meet these limitations because they would incorporate Conrad335's cyclone separator.

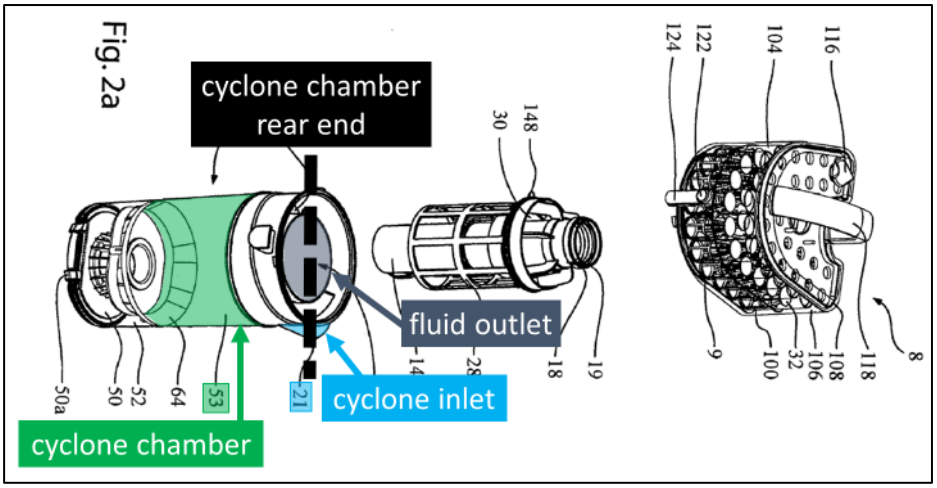
4. The Combined Teachings of IPVG and Conrad335 Render Obvious Claims 3 and 4

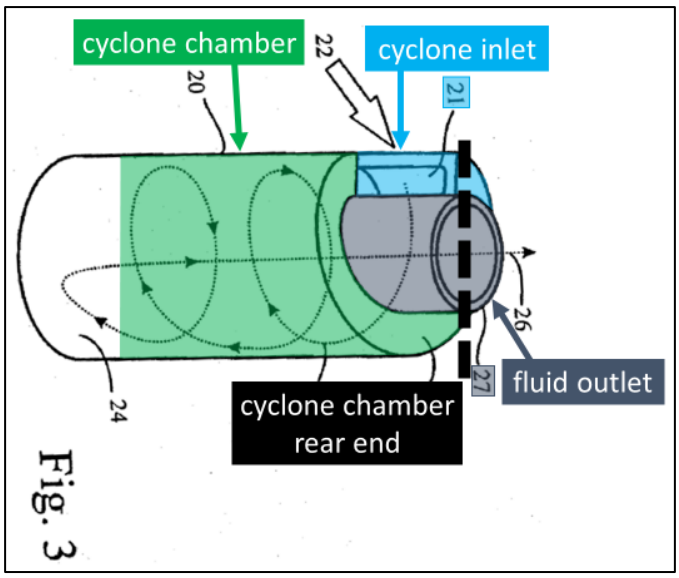
Reference Number	Claim Limitation
[3]	"The hand vacuum cleaner of claim 2 wherein the cyclone air inlet and the cyclone air outlet are at the same end."
[4]	"The hand vacuum cleaner of claim 3 wherein the cyclone air inlet and the cyclone air outlet are at the cyclone rear end."

222. In my opinion, IPVG in combination with Conrad335 renders obvious the hand vacuum cleaner of claim 2 wherein the cyclone air inlet and the cyclone air outlet are at the same end (Claim 3).

223. In my opinion, IPVG in combination with Conrad335 renders obvious the hand vacuum cleaner of claim 3 wherein the cyclone air inlet and the cyclone air outlet are at the cyclone rear end (Claim 4).

224. In my opinion, Conrad335's "**cyclone inlet 21**" and "**fluid outlet 27**" are at the same end—namely, the "**cyclone chamber 53**" **rear end**, as shown in the annotated images below:





Ex1005 at Figs. 2a, 3.

225. As explained, in my opinion a POSA would have been motivated to modify IPVG's "dust bag 5" with Conrad335's cyclone separator teachings and would have had a reasonable expectation of success doing so. *See* Ground 3, §1. In my opinion, the combined teachings meet these limitations because a POSA would route air from IPVG's floor tool, "suction pipe 4," to Conrad335's "cyclone inlet 21," either through the center of

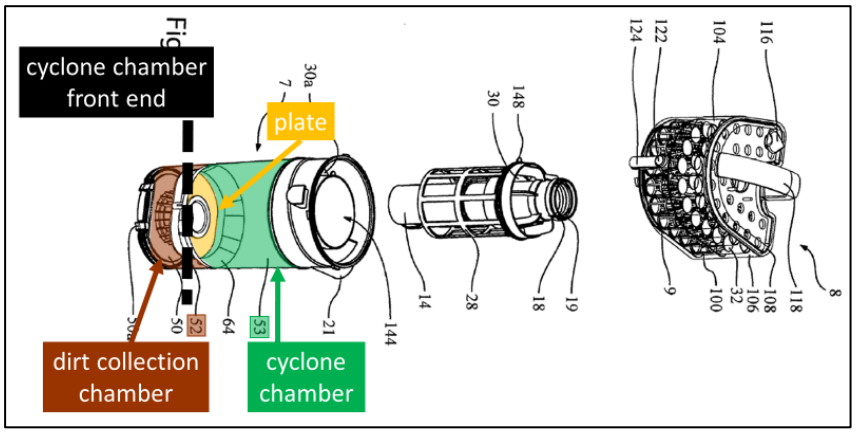
Conrad335's cyclone separator, or along its side. *See* Ground 3, §1.

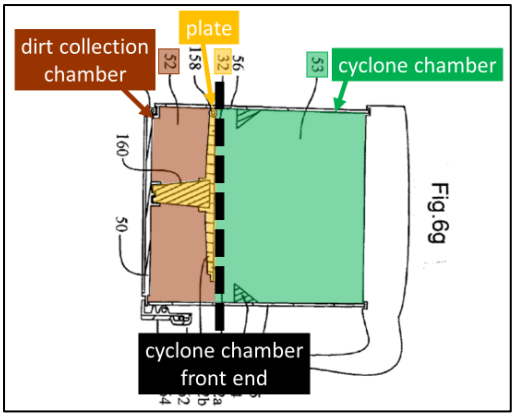
5. The Combined Teachings of IPVG and Conrad335 Render Obvious Claim 5

Reference Number	Claim Limitation
[5]	"The hand vacuum cleaner of claim 1 wherein the cyclone front end has a dirt outlet and a separation plate is mounted in facing relation to the dirt outlet."

226. In my opinion, IPVG in combination with Conrad335 renders obvious the hand vacuum cleaner of claim 1 wherein the cyclone front end has a dirt outlet and a separation plate is mounted in facing relation to the dirt outlet.

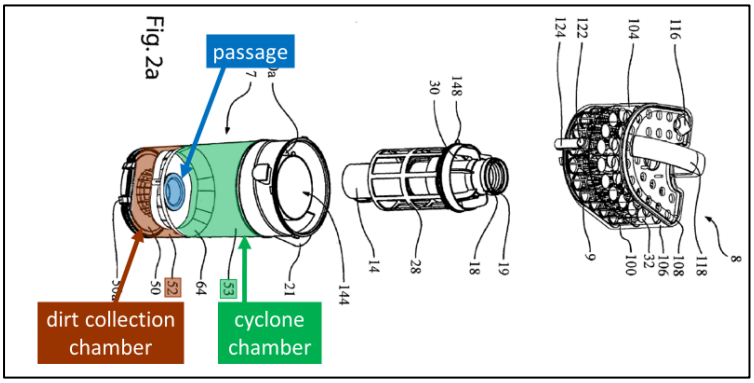
227. In my opinion, Conrad335 teaches that the cyclone front end has a dirt outlet. When Conrad335's "cyclone separator 20" is incorporated with IPVG', the **front end** of Conrad335's "**cyclone chamber 53**" is the cyclone front end, and "**plate 32**" containing a "passage" is located at that **front end**:

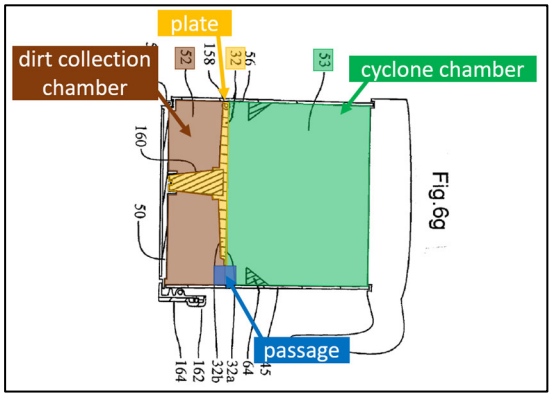




Ex1005 ¶318, Figs. 2a, 6g.

228. Conrad335 teaches that this "**passage**" "connect[s] the **cyclone chamber 53** in communication with the **dirt collection chamber 52**," and may be located at a radial center of the separation plate or near a perimeter:

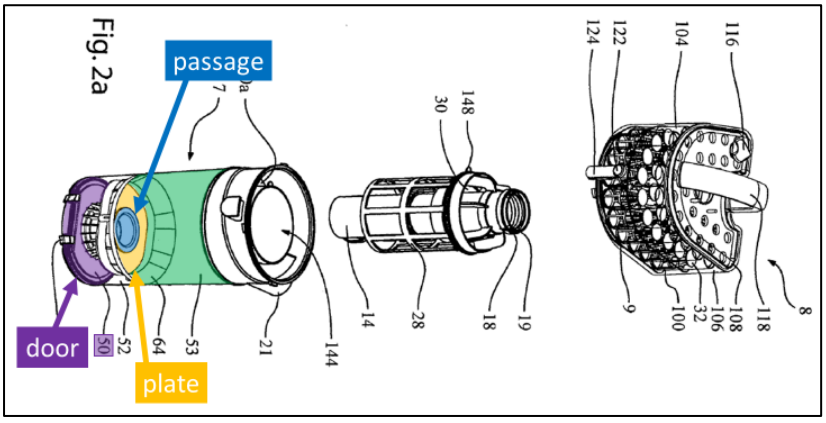


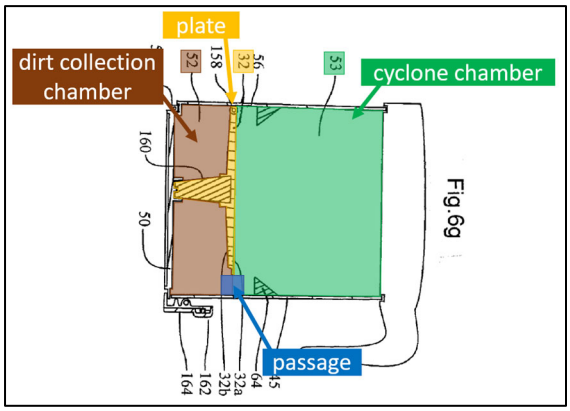


Ex1005 ¶324, Figs. 2a, 6g; *see also id.* ¶¶325, 327, Fig. 7b.

229. In my opinion, Conrad335's "passage that connects the cyclone chamber and the dirt collection chamber" is a cyclone dirt outlet.

230. In my opinion, Conrad335 teaches a separation plate that is mounted in facing relation to the dirt outlet. Conrad335 teaches that "**[p]late 32**" is mounted in facing relation to the dirt outlet, as the plate faces the "**passage**" where dirt exits:





Ex1005 ¶339, Figs. 2a, 6g; *see also id.* ¶¶325, 327, Fig. 7b.

231. In my opinion, a POSA would have been motivated to modify IPVG's "screwed cover 2" with Conrad335's openable-door teachings, including "plate 32," and would have had a reasonable expectation of success. *See*

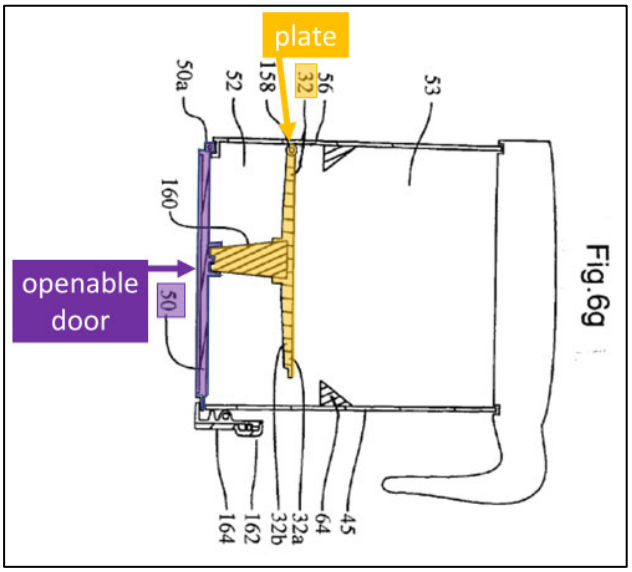
Ground 3, §1.

6. The Combined Teachings of IPVG and Conrad335 Render Obvious Claim 6

Reference Number	Claim Limitation
[6]	"The hand vacuum cleaner of claim 5 wherein the separation plate is mounted to the door."

232. In my opinion, IPVG in combination with Conrad335 renders obvious the hand vacuum cleaner of claim 5 wherein the separation plate is mounted to the door.

233. As explained for Claim 5, Conrad335 teaches that its "**plate 32**" is mounted to "**openable door [50]**," as shown in the annotated image below:



Ex1005, Fig. 6g.

234. Conrad335 also teaches that "in one embodiment, the plate 32 may be secured to the bottom 31 of a cyclone casing," (Conrad335's bottom door

50). *Id*. ¶322.

235. As explained, in my opinion, a POSA would have been motivated to modify IPVG's "screwed cover 2" with Conrad335's openable door teachings, including "plate 32," and would have had a reasonable expectation of success doing so. *See* Ground 3, §1.

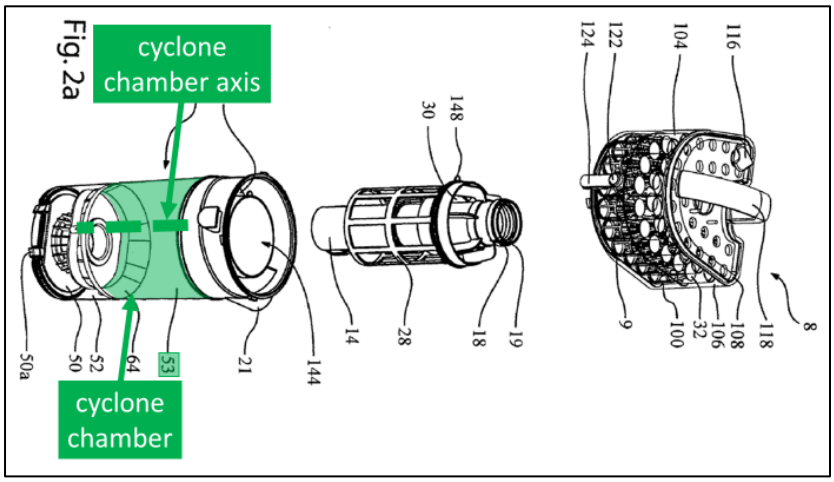
7. The Combined Teachings of IPVG and Conrad335 Render Obvious Claim 7

Reference Number	Claim Limitation
[7]	"The hand vacuum cleaner of claim 1 wherein the at least one cyclone has a cyclone axis extending longitudinally through the at least one cyclone, the hand vacuum cleaner has an axis extending from the front end to the rear end and the cyclone axis is generally parallel to the axis of the hand vacuum cleaner."

236. In my opinion, IPVG in combination with Conrad335 renders obvious the hand vacuum cleaner of claim 1 wherein the at least one cyclone has a cyclone axis extending longitudinally through the at least one cyclone, the hand vacuum cleaner has an axis extending from the front end to the rear end and the cyclone axis is generally parallel to the axis of the hand vacuum cleaner.

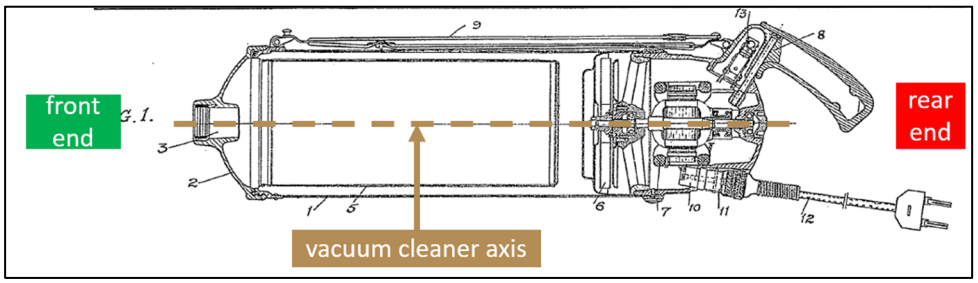
237. In my opinion, IPVG in combination with Conrad335 renders obvious the at least one cyclone having a cyclone axis extending longitudinally through the at least one cyclone. As explained, in my opinion, when Conrad335's teachings are incorporated into IPVG's vacuum cleaner, Conrad335's

"openable door [50]" would align with and replace IPVG's "screwed cover 2." *See* Ground 3, Limitation [1a]. When so combined, in my opinion, Conrad335's "**cyclone chamber 53**" is at least one cyclone having a cyclone axis extending longitudinally through it, as shown in the annotated image below:



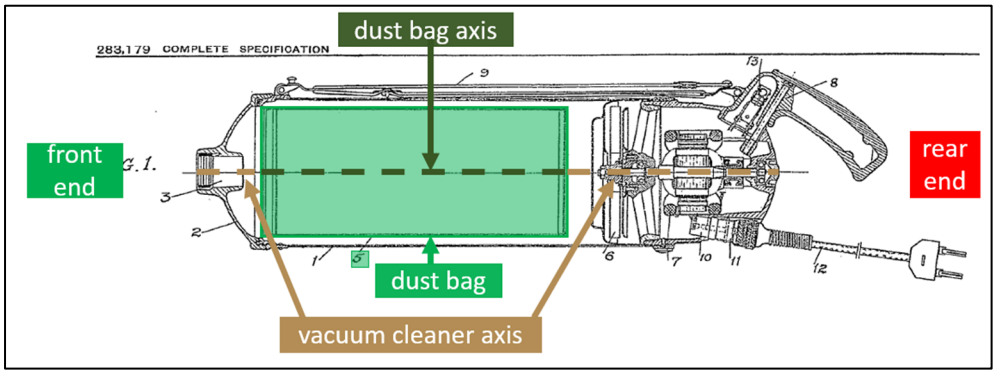
Ex1005 at Fig. 2a.

238. In my opinion, IPVG teaches the hand vacuum cleaner having an axis extending from the front end to the rear end, as shown in the annotated image below:



Ex1006 at Fig. 1.

239. In my opinion, this axis is generally parallel to the axis of IPVG's "dust bag 5," as shown in the annotated image below:



Ex1006 at Fig. 1.

240. To the extent these axes are co-axial, in my opinion, a POSA would have understood that co-axial axes are generally parallel because they extend in the same direction and maintain the same (zero) distance between them.

241. In my opinion, in the combined teachings of IPVG and Conrad335, when Conrad335's teachings are incorporated into IPVG's vacuum cleaner, Conrad335's "openable door [50]" would align with and replace IPVG's "screwed cover 2" and Conrad335's "cyclone separator 20" teachings would replace IPVG's "dust bag 5." *See* Ground 3, §1. When so combined, in my opinion, Conrad335's "cyclone chamber 53" axis is generally parallel to IPVG's vacuum cleaner axis.

242. As explained, in my opinion, a POSA would have been motivated to modify IPVG's "screwed cover 2" and "dust bag 5" with Conrad335's

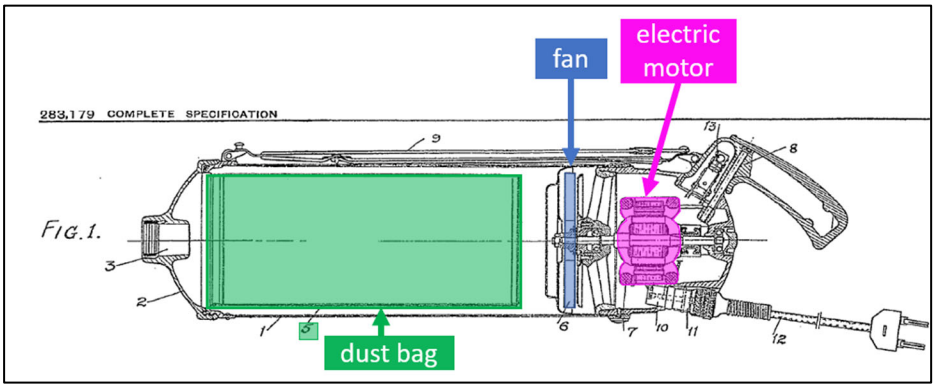
openable door and cyclone separator teachings and would have had a reasonable expectation of success doing so. *See* Ground 3, §1.

8. The Combined Teachings of IPVG and Conrad335 Render Obvious Claim 8

Reference Number	Claim Limitation
[8]	"The hand vacuum cleaner of claim 1 wherein the first cyclone unit is positioned forward of the suction motor."

243. In my opinion, IPVG in combination with Conrad335 renders obvious the hand vacuum cleaner of claim 1 wherein the first cyclone unit is positioned forward of the suction motor.

244. IPVG's "**dust bag 5**" is positioned forward of its "**fan 6**" and "**electric motor 7**," as shown in the annotated image below:



Ex1006 at Fig. 1.

245. As explained, in my opinion, a POSA would have been motivated to modify IPVG's "dust bag 5" with Conrad335's "cyclone separator 20" teachings, oriented by lining up and replacing IPVG's "screwed cover 2"

with Conrad335's "openable door [50]" and would have had a reasonable expectation of success. *See* Ground 3, §1. When Conrad335's cyclonic separator and opening door are substituted for IPVG's dust bag and screwed cover, in my opinion, Conrad335's "cyclone chamber 53" is a first cyclone unit that is positioned forward of IPVG's "electric motor 7" (which, in my opinion, is a suction motor, *see* Ground 3, Limitation [1e]). *See* Ground 3, Limitation [1c].

9. The Combined Teachings of IPVG and Conrad335 Render Obvious Claim 9

Reference Number	Claim Limitation
[9]	"The hand vacuum cleaner of claim 1 wherein the door is removable."

246. In my opinion, IPVG in combination with Conrad335 renders obvious the hand vacuum cleaner of claim 1 wherein the door is removable.

247. In my opinion, IPVG's "screwed cover 2" is an openable door. *See* Ground 3, Limitation [1d]. Further, in my opinion, IPVG's "screwed cover 2" is removable at least because it can be removed by removing the screws.

248. Further, Conrad335 teaches that "the particles captured in the cyclone separator 20" can be "easily removed by … removing the floor 50," which is Conrad335's "openable door [50]." Ex1005 ¶343.

249. As explained, in my opinion, a POSA would have been motivated to

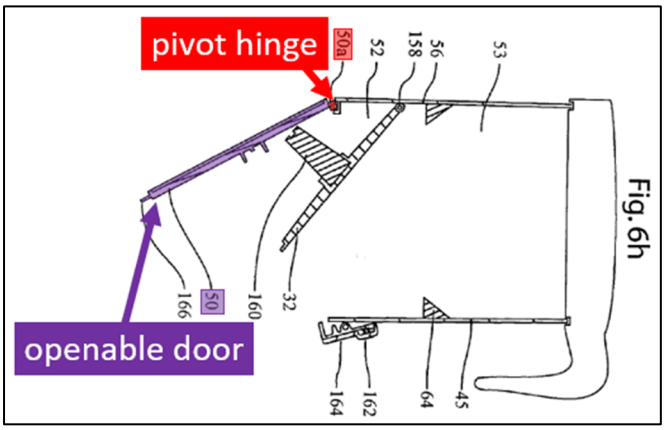
modify IPVG's "screwed cover 2" with Conrad335's "openable door [50]" and would have had a reasonable expectation of success. *See* Ground 3, §1. The combined teachings meet this limitation.

10. The Combined Teachings of IPVG and Conrad335 Render Obvious Claim 10

Reference Number	Claim Limitation
[10]	"The hand vacuum cleaner of claim 1 wherein the door is pivotally mounted to the hand vacuum cleaner."

250. In my opinion, IPVG in combination with Conrad335 renders obvious the hand vacuum cleaner of claim 1 wherein the door is pivotally mounted to the hand vacuum cleaner.

251. In Conrad335, "**openable door [50]**" can be "pivoted open about, e.g. **pivot hinges 50a**," as shown in the annotated image below:



Ex1005 ¶¶147, 339, Fig. 6.

252. Also, Conrad335 teaches that "the floor 50 is removable or moveable (e.g. pivotally mounted such as by **pivot hinge 50a** …)." Ex1005 ¶338.

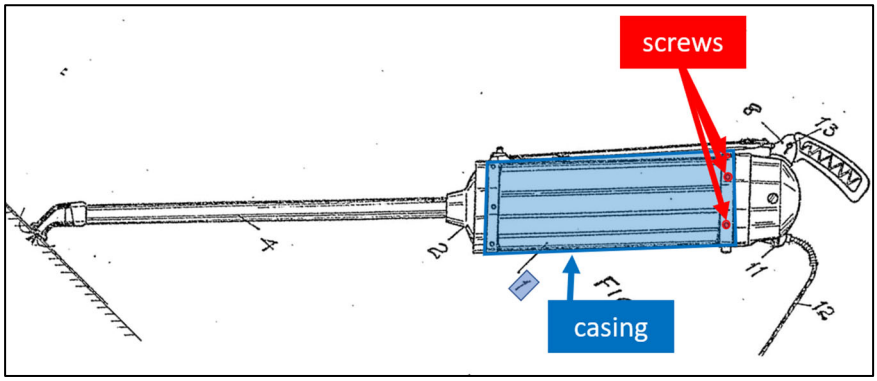
253. As explained, in my opinion, a POSA would have been motivated to modify IPVG's "screwed cover 2" with Conrad335's openable door teachings, and would have had a reasonable expectation of success doing so. *See* Ground 3, §1.

11. The Combined Teachings of IPVG and Conrad335 Render Obvious Claim 11

Reference Number	Claim Limitation
[11]	"The hand vacuum cleaner of claim 1 wherein the dirt collection chamber is removable from the hand vacuum cleaner."

254. In my opinion, IPVG in combination with Conrad335 renders obvious the hand vacuum cleaner of claim 1 wherein the dirt collection chamber is removable from the hand vacuum cleaner.

255. IPVG's "**casing 1**," in which "dust bag 5" is stored, can be removed from the rest of the vacuum cleaner by removing the **screws**, as shown in the annotated image below:

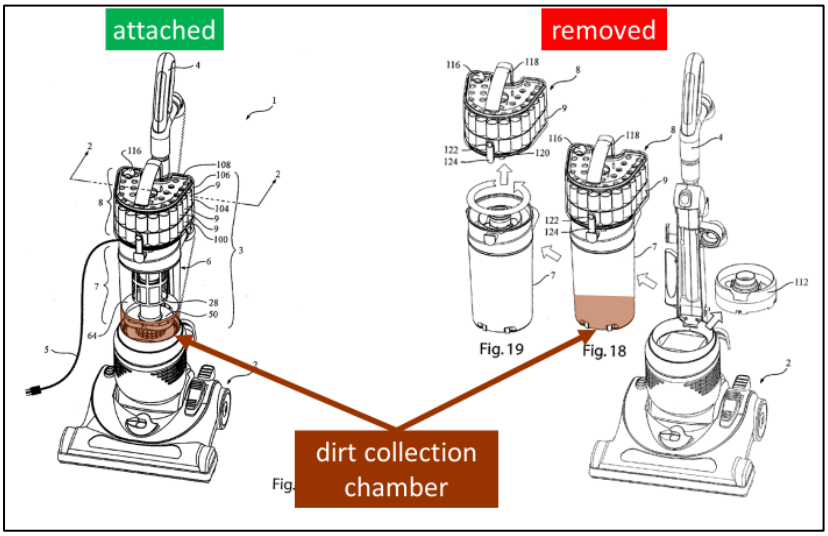


Ex1006 at Fig. 2.

256. Further, IPVG describes the use of "screws" in other contexts as well, including the context of the handle. Ex1006 at 1:70-2:3.

257. In my opinion, IPVG's "**casing 1**," together with "dust bag 5" are a removable a dirt collection chamber.

258. Likewise, Conrad335 teaches that the "first and second cyclonic stages 7, 8," including their "dirt collection chamber," "may be removed at the same time" "so they may be transported to a garbage can or the like for emptying." Ex1005 ¶¶177, 350. Conrad335 depicts the **dirt collection chamber** as being removable from the vacuum cleaner main body, as shown in the annotated image below:



Ex1005 at Figs. 1, 18, 19.

259. In my opinion, a POSA would have understood that this limitation is met when Conrad335's teachings are incorporated with IPVG's, either by

using IPVG's screws or by using Conrad335's cyclonic separator connection-and-release mechanism, which a POSA would have been motivated to do and would have had a reasonable expectation of success doing. *See* Ground 3, §1.

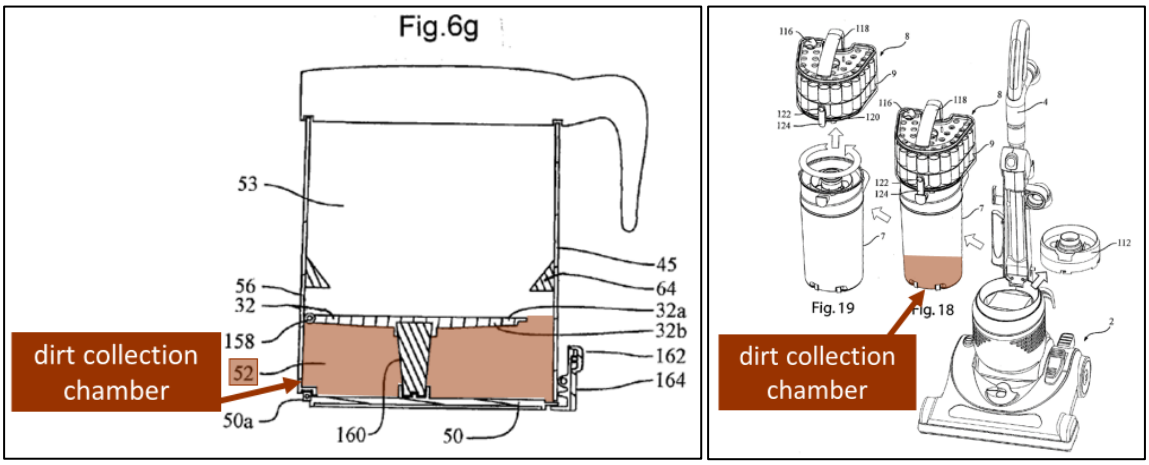
12. The Combined Teachings of IPVG and Conrad335 Render Obvious Claim 12

Reference Number	Claim Limitation
[12]	"The hand vacuum cleaner of claim 1 wherein the dirt collection chamber is removable from the surface cleaning apparatus as a sealed unit for emptying."

260. In my opinion, IPVG in combination with Conrad335 renders obvious the hand vacuum cleaner of claim 1 wherein the dirt collection chamber is removable from the surface cleaning apparatus as a sealed unit for emptying.

261. In my opinion, IPVG teaches a dirt collection chamber that is removable from the hand vacuum cleaner. *See* Ground 3, Claim 11. In my opinion, IPVG also teaches that the dirt collection chamber is removable as a sealed unit for emptying. For example, when IPVG's "casing 1" is unscrewed at the rear, IPVG teaches that it is still "closed at the front end by a screwed cover 2." Ex1006, 1:51-57, Fig. 2. Also, IPVG uses a "dust bag 5," which, in my opinion, a POSA would have understood is removed from IPVG as a sealed unit for emptying. Ex1006, 1:51-57, Fig. 2.

262. Conrad335's dirt collection chamber is also removable from the hand vacuum. *See* Ground 3, Claim 11. In my opinion, when Conrad335's dirt collection chamber is removed, it is a sealed unit, as shown in the annotated images below:



Ex1005 at Figs. 6g, 18.

263. Also, Conrad335 teaches that the "first cleaning stage comprises a cyclonic cleaning unit that is sealed when removed from the surface cleaning apparatus other than fluid flow passages leading to and from the cyclones." Ex1005 ¶186. In my opinion, a POSA would have understood that this limitation is met when Conrad335's teachings are incorporated with IPVG's, which, in my opinion, a POSA would have been motivated to do and would have had a reasonable expectation of success doing. *See* Ground 3, §1.

13. The Combined Teachings of IPVG and Conrad335 Render Obvious Claim 13

Reference Number	Claim Limitation
[13]	"The hand vacuum cleaner of claim 12 wherein the first cyclone unit is sealed when removed from the hand vacuum cleaner other than fluid flow passages leading to and from the first cyclone unit."

264. In my opinion, IPVG in combination with Conrad335 renders obvious the hand vacuum cleaner of claim 12 wherein the first cyclone unit is sealed when removed from the hand vacuum cleaner other than fluid flow passages leading to and from the first cyclone unit.

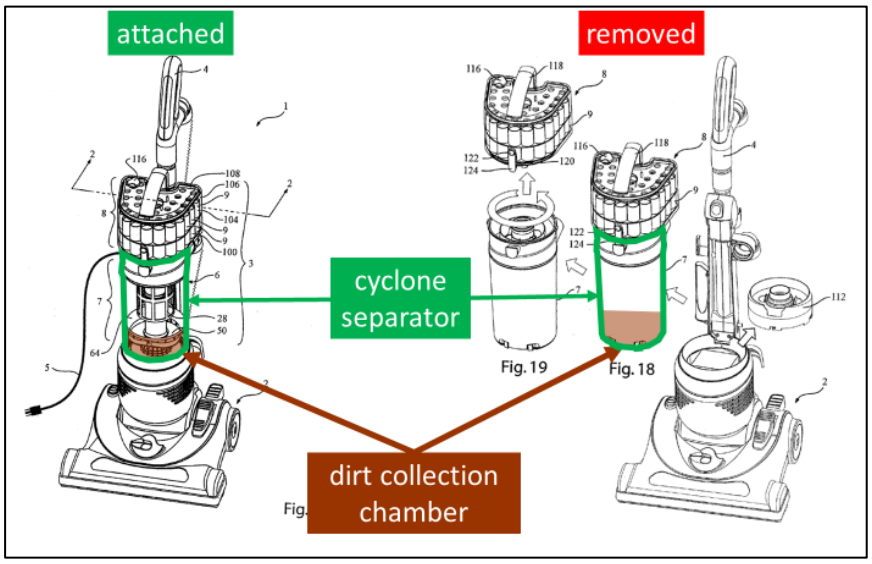
265. Conrad335 teaches that the "first cleaning stage comprises a cyclonic cleaning unit that is sealed when removed from the surface cleaning apparatus other than fluid flow passages leading to and from the cyclones." Ex1005 ¶186. In my opinion, a POSA would have understood that this limitation is met when Conrad335's teachings are incorporated with IPVG's, which, in my opinion, a POSA would have been motivated to do and would have had a reasonable expectation of success doing. *See* Ground 3, §1.

14. The Combined Teachings of IPVG and Conrad335 Render Obvious Claim 14

Reference Number	Claim Limitation
[14]	"The hand vacuum cleaner of claim 1 wherein the dirt collection chamber is removable from the hand vacuum cleaner with the first cyclone unit."

266. In my opinion, IPVG in combination with Conrad335 renders obvious the hand vacuum cleaner of claim 1 wherein the dirt collection chamber is removable from the hand vacuum cleaner with the first cyclone unit.

267. Conrad335's "**dirt collection chamber 52**" is removable from the hand vacuum with its "**cyclone separator**," as shown in the annotated image below:



Ex1005 at Figs. 1, 18, 19.

268. In my opinion, a POSA would have understood this limitation is met when Conrad335's teachings are incorporated with IPVG's, which, in my

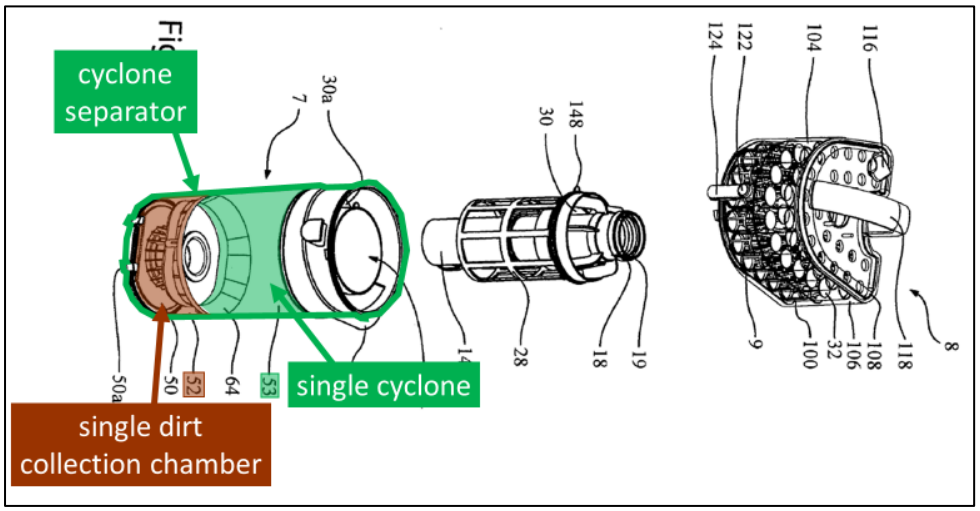
opinion, a POSA would have been motivated to do and would have had a reasonable expectation of success doing. *See* Ground 3, §1.

15. The Combined Teachings of IPVG and Conrad335 Render Obvious Claim 15

Reference Number	Claim Limitation
[15]	"The hand vacuum cleaner of claim 1 wherein the first cyclone unit has a single cyclone and a single dirt collection chamber."

269. In my opinion, IPVG in combination with Conrad335 renders obvious the hand vacuum cleaner of claim 1 wherein the first cyclone unit has a single cyclone and a single dirt collection chamber.

270. Conrad335 teaches that its "**cyclone separator 20**" has a **single cyclone** and a **single dirt collection chamber**, as shown in the annotated image below:



Ex1005, Fig. 2a.

271. Also, as explained for Limitation [1c], in my opinion, Conrad335 teaches

a first cyclone unit positioned in the air flow passage, the first cyclone comprising at least one cyclone and at least one dirt collection chamber external to the cyclone chamber. *See* Ground 1, Limitation [1c].

272. Also, Conrad335 teaches that "[m]ain casing 3 has a cyclonic cleaning unit 6 comprising a first cyclonic cleaning stage 7 comprising a single cyclone." Ex1005 ¶274.

273. As explained, in my opinion, a POSA would have been motivated to modify IPVG's "dust bag 5" with Conrad335's "cyclone separator 20" teachings and would have had a reasonable expectation of success doing so. *See* Ground 3, §1.

16. The Combined Teachings of IPVG and Conrad335 Render Obvious Claim 16

Reference Number	Claim Limitation
[16]	"The hand vacuum cleaner of claim 15 wherein the single dirt collection chamber is positioned exterior to the single cyclone."

274. In my opinion, IPVG in combination with Conrad335 renders obvious the hand vacuum cleaner of claim 15 wherein the single dirt collection chamber is positioned exterior to the single cyclone for the same reasons as I explained for Limitation [1c]. *See* Ground 3, Limitation [1c].

275. Also, as I explained for Claim 15, in my opinion, Conrad335 teaches that the first cyclone unit has a single cyclone and a single dirt collection

chamber. *See* Ground 3, Claim 15.

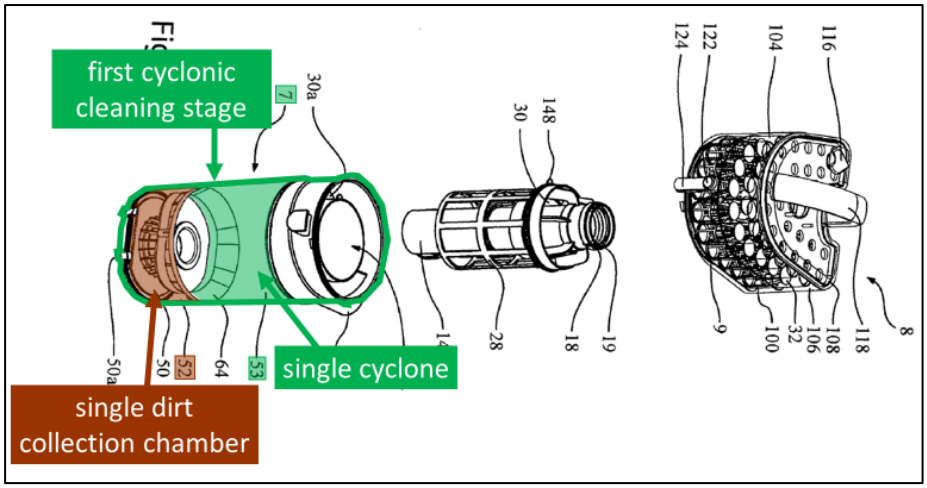
17. The Combined Teachings of IPVG and Conrad335 Render Obvious Claims 17 and 18

Reference Number	Claim Limitation
[17]	"The hand vacuum cleaner of claim 16 wherein the single cyclone and the single dirt collection chamber comprise a one-piece assembly."
[18]	""The hand vacuum cleaner of claim 17 wherein the single cyclone and the single dirt collection chamber are integrally formed."

276. In my opinion, IPVG in combination with Conrad335 renders obvious the hand vacuum cleaner of claim 16 wherein the single cyclone and the single dirt collection chamber comprise a one-piece assembly.

277. In my opinion, IPVG in combination with Conrad335 renders obvious the hand vacuum cleaner of claim 17 wherein the single cyclone and the single dirt collection chamber are integrally formed.

278. Conrad335 teaches that its "**first cyclonic cleaning stage 7**" is a single cyclone and single dirt collection chamber comprising a one-piece assembly that is integrally formed, as shown in the annotated image below:



Ex1005 at Fig. 2a.

279. Also, Conrad335 teaches that "[e]ach cyclone and associated dirt collection chamber is integrally molded from transparent plastic." *See* Ex1005 ¶134.

280. Further, as I explained for Limitation [25f], in my opinion, in the combined teachings of IPVG and Conrad335, the dirt collection chamber has a rear end and the rear end is non-removably mounted to the first cyclone unit. *See* Ground 3, Limitation [25f].

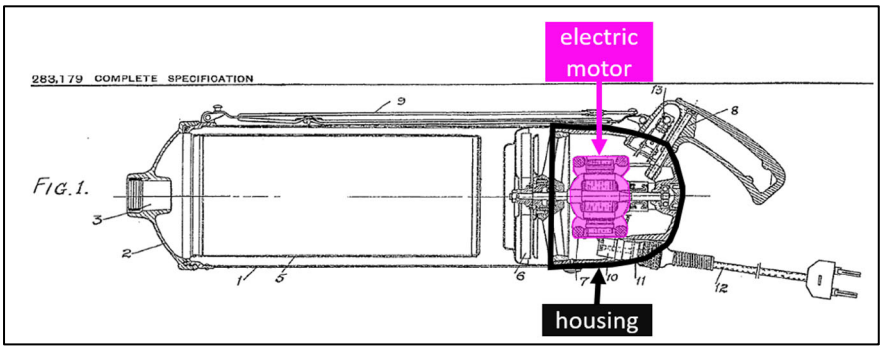
281. As explained, in my opinion, a POSA would have been motivated to modify IPVG's "dust bag 5" with Conrad335's "cyclone separator 20" teachings and would have had a reasonable expectation of success doing so. *See* Ground 3, §1.

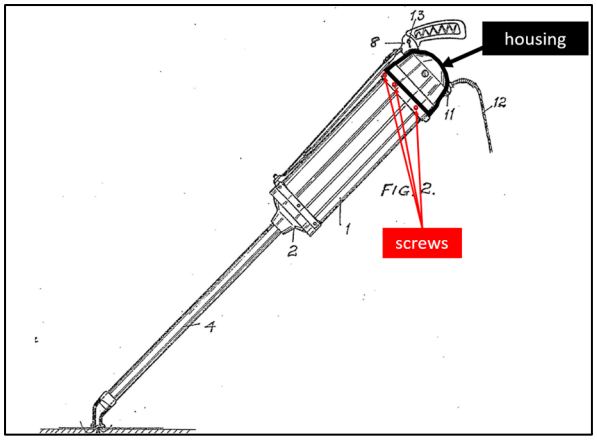
18. The Combined Teachings of IPVG and Conrad335 Render Obvious Claim 19

Reference Number	Claim Limitation
[19]	"The hand vacuum cleaner of claim 1 wherein the hand vacuum cleaner further comprises a suction motor housing, the suction motor is positioned in the suction motor housing and the first cyclone unit is removably mounted to the suction motor housing."

282. In my opinion, IPVG in combination with Conrad335 renders obvious the hand vacuum cleaner of claim 1 wherein the hand vacuum cleaner further comprises a suction motor housing, the suction motor is positioned in the suction motor housing and the first cyclone unit is removably mounted to the suction motor housing.

283. IPVG teaches an "**electric motor 7**," which IPVG depicts as being housed in a **housing** that is removably mounted by "**screws**," as shown in the annotated images below:



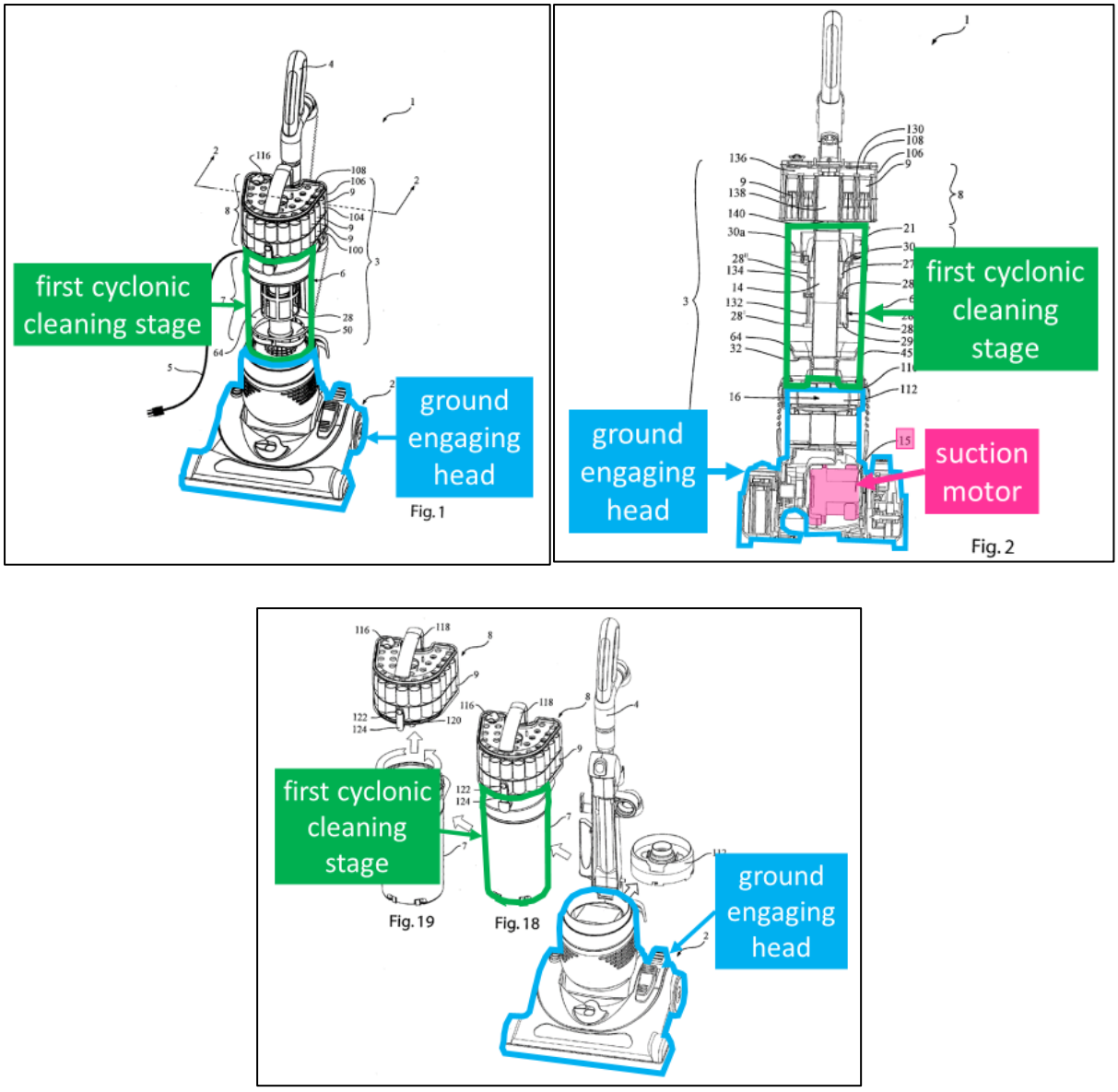


Ex1005 at 1:51-57, Figs. 1-2.

284. Also, IPVG teaches that "[t]he screw 16 screws into a lug 17 formed on the casing 1," which describes the use of screws in other contexts as well. Ex1005 at 1:77-79.

285. In my opinion, a POSA would have understood the housing identified above surrounds, houses, and supports IPVG's "**electric motor 7**" and therefore that IPVG's dirt separation unit is removably mounted to the suction motor housing.

286. Also, Conrad335 teaches that "**first cyclonic cleaning stage 7**" is removably mounted to "**ground engaging head 2**," which, in my opinion, a POSA would have understood is a suction motor housing at least because "**ground engaging head 2**" surrounds, houses, and supports Conrad335's "**suction motor 15**," as shown in the annotated images below:



Ex1005¶274, Figs. 1-2, 18-19.

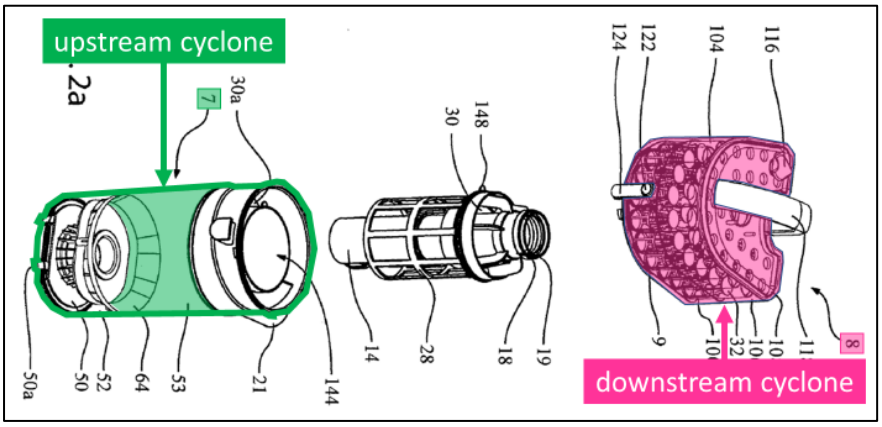
287. In my opinion, a POSA would have understood this limitation is met when Conrad335's teachings are incorporated with IPVG's, which, in my opinion, a POSA would have been motivated to do and would have had a reasonable expectation of success doing. *See* Ground 3, §1.

19. The Combined Teachings of IPVG and Conrad335 Render Obvious Claim 20

Reference Number	Claim Limitation
[20]	"The hand vacuum cleaner of claim 1 further comprising a second cyclone unit downstream from the first cyclone unit."

288. In my opinion, IPVG in combination with Conrad335 renders obvious the hand vacuum cleaner of claim 1 further comprising a second cyclone unit downstream from the first cyclone unit.

289. Conrad335 teaches that "the outlet from an **upstream cyclone** is connected in fluid communication with the inlet to a **downstream cyclone**," as shown in the annotated image below:



Ex1005 ¶62, Fig. 2a.

290. Also, Conrad335 teaches a "first cyclonic cleaning stage 7 comprising a single cyclone and a second cyclonic cleaning stage 8 comprising a plurality of cyclones 9 in parallel." Ex1005 ¶274. In my opinion, Conrad335 teaches that its "second cyclonic cleaning stage 8," which

Conrad335 teaches is its "downstream cyclone," is a second cyclone unit downstream from the first cyclone unit.

291. As explained, in my opinion, a POSA would have been motivated to modify IPVG's "dust bag 5" with Conrad335's "cyclonic separator 20," including Conrad335's "second cyclonic cleaning stage 8," and would have had a reasonable expectation of success. *See* Ground 3, §1.

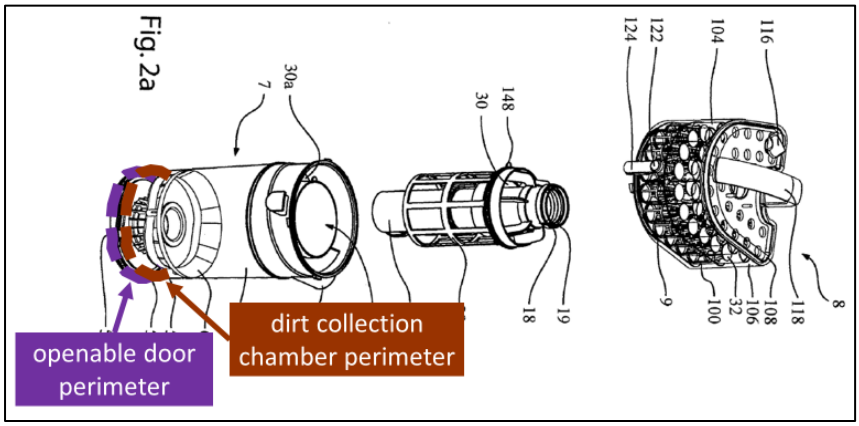
20. The Combined Teachings of IPVG and Conrad335 Render Obvious Claim 21

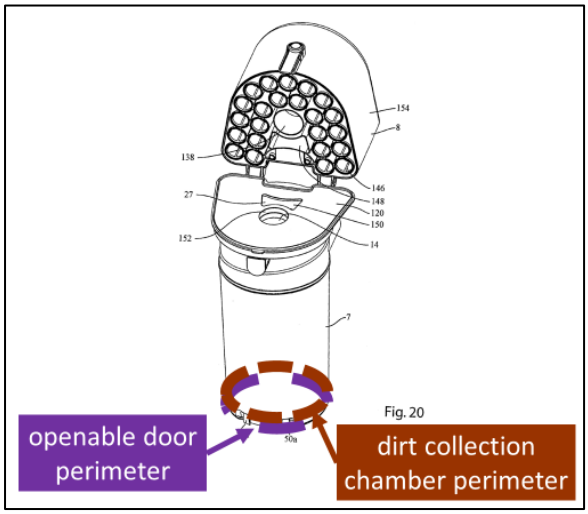
Reference Number	Claim Limitation
[21]	"The hand vacuum cleaner of claim 1 wherein the at least one cyclone has a cyclone axis extending longitudinally through the at least one cyclone and the dirt collection chamber has a perimeter at the front end and the openable door has a perimeter that is generally the same as the perimeter of the dirt collection chamber."

292. In my opinion, IPVG in combination with Conrad335 renders obvious the hand vacuum cleaner of claim 1 wherein the at least one cyclone has a cyclone axis extending longitudinally through the at least one cyclone and the dirt collection chamber has a perimeter at the front end and the openable door has a perimeter that is generally the same as the perimeter of the dirt collection chamber.

293. In my opinion, Conrad335 teaches the at least one cyclone has a cyclone axis extending longitudinally through the at least one cyclone. *See* Ground 3, Claim 7.

294. In my opinion, Conrad335 teaches that its "**dirt collection chamber 53**" has a perimeter that is generally the same as the perimeter of Conrad335's "**openable door [50]**," as shown in the annotated images below:





Ex1005 at Figs. 2a, 20.

295. As explained, in my opinion, a POSA would have been motivated to modify IPVG's "screwed cover 2" and "dust bag 5" with Conrad335's "openable door [50]" and "cyclone separator 20" teachings, including by lining up Conrad335's "openable door [50]" with IPVG's "screwed cover

2," and would have had a reasonable expectation of success. *See* Ground 3, §1. When so modified, in my opinion, Conrad335's "dirt collection chamber 53" perimeter is at the front end.

21. The Combined Teachings of IPVG and Conrad335 Render Obvious Claim 22

Reference Number	Claim Limitation
[22]	"The hand vacuum cleaner of claim 1 wherein the front wall is the openable door."

296. In my opinion, IPVG in combination with Conrad335 renders obvious the hand vacuum cleaner of claim 1 wherein the front wall is the openable door.

297. For the reasons I explained for Limitation [1d], in my opinion, IPVG's "screwed cover 2" and Conrad335's "openable door [50]" are each a front wall that is the openable door, and in my opinion, their combined teachings meet this limitation. *See* Ground 3, Limitation [1a].

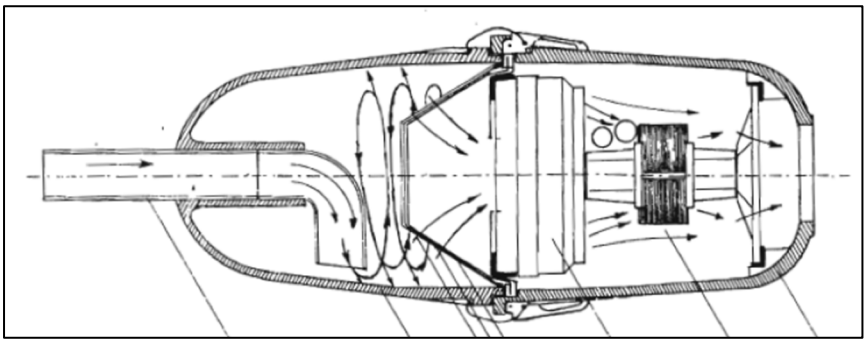
D. Ground 4: Martelliere in Combination with IPVG Renders Claims 23-24 Obvious

298. As I explained in Ground 1, in my opinion, Martelliere anticipates claims 23-24. To the extent Martelliere does not explicitly teach any limitation of those claims, however, it is also my opinion that the combined teachings of Martelliere and IPVG render claims 23 and 24 obvious, as I explain below.

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

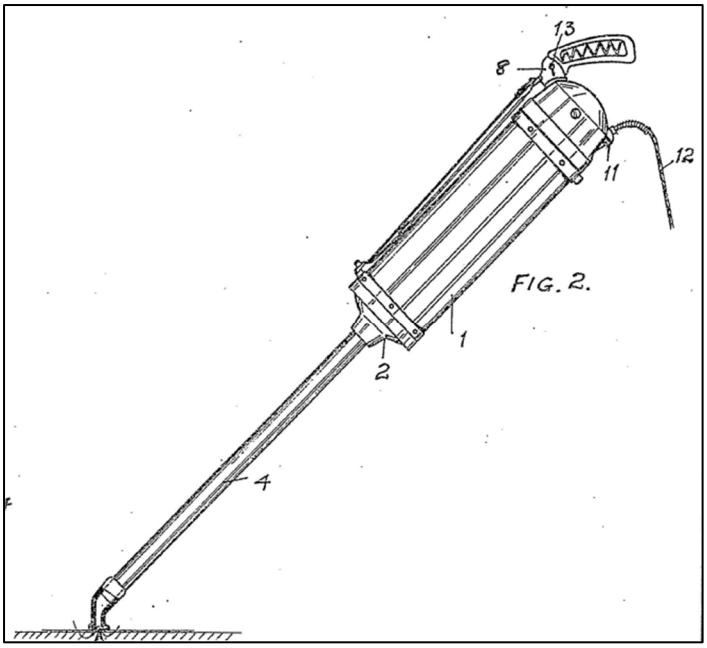
a. The Scope and the Content of the Martelliere and IPVG Prior Art References

299. Martelliere teaches a "broom type vacuum cleaner model, where the device is held vertically or slightly inclined" that uses "the 'Whirlwind' principle" and a "sieve filter *b*" to filter dust from air, as shown in Martelliere's Figure 1, shown below:



Ex1010 at 1, Fig. 1.

300. IPVG teaches a hand/stick vacuum cleaner from 1928, as shown in IPVG Figure 2, shown below:



Ex1006 at Fig. 2.

301. For additional discussion of IPVG's teachings, *see* Ground 3.

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

302. In my opinion, to the extent a POSA had any uncertainty as to how to implement Martelliere's cyclonic cleaner as a "broom type vacuum cleaner model, where the device is held vertically or slightly inclined" as Martelliere teaches, a POSA would have looked to IPVG for additional implementation details. Ex1010, 1. IPVG provides implementation details regarding the various structures of a hand-stick vacuum cleaner, including its "casing," its openable "cover," its "suction opening 3 for attaching a suction pipe 4," its "fan 6 driven by an electric motor 7," and its "handle 8" that is "attached to the casing," as well as a "sling 9 which

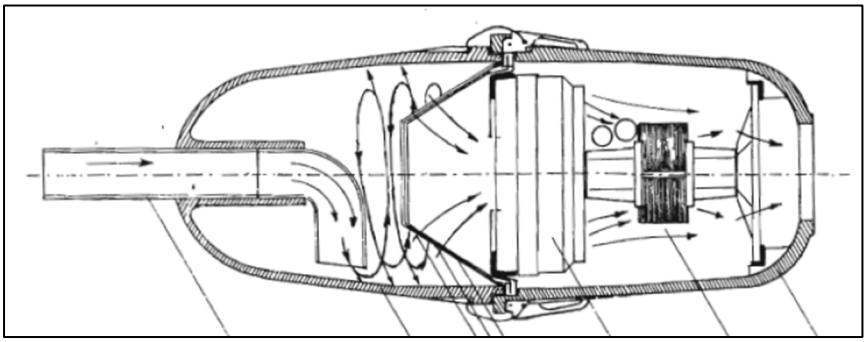
may be used to support the body of the apparatus." Ex1006, 1:51-2:3.

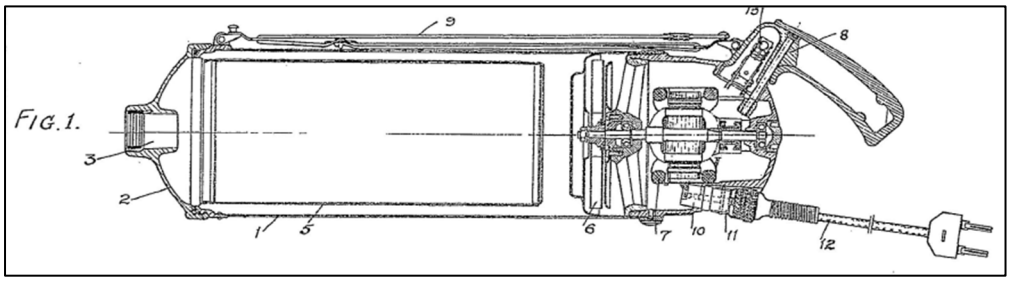
303. Also, in my opinion, a POSA reading IPVG—including its teaching that a "dust bag ***or like member*** through which the air stream passes" may be used as an air-filtration unit (Ex1006, 1:22-33)—would have been motivated to incorporate Martelliere's teachings of "the 'Whirlwind' principle" (which, in my opinion, a POSA would understand is cyclonic filtration) as one such "like member" for its many known advantages. In my opinion, these known advantages include advantages that Martelliere explicitly teaches, and in my opinion, a POSA would have had a reasonable expectation of success doing so. *See* Ground 3, §1; Ex1010, 1.

304. In my opinion, Martelliere and IPVG are analogous art because they each teach vacuum cleaners with very similar configurations and layouts. Like Martelliere, which teaches a vacuum cleaner that is "held vertically or slightly inclined" by the user and has an accessory that is centrally mounted to the front of the vacuum cleaner through an openable door ("detachable container [a]" "wall"), Ex1010, 1, Fig. 1, IPVG teaches a vacuum cleaner that a user "hold[s]" at various angles during operation, including slightly inclined, and has an accessory ("suction pipe 4") that is centrally mounted to the front of the vacuum cleaner through an openable door ("screwed cover 2 formed with a suction opening 3 for attaching a

suction pipe 4"), Ex1006, 1:32-41, 1:51-57, Fig. 2.

305. In my opinion, this combination would have involved a simple substitution of known elements for others to obtain predictable results. IPVG teaches a cleaner having a dust separation unit with a door covering one end that opens with a screw. Ex1006, Fig. 1. Martelliere likewise teaches a separation unit with door covering one end that opens with a latch. Ex1010, Fig. 1. In my opinion, a POSA would have understood that the simple substitution of these separation units would achieve the predictable results of filtering air. Also, as depicted below, in my opinion, Martelliere and IPVG depict a cleaner having a similar size, shape, and orientation, as shown in Martelliere Figure 1 and IPVG Figure 1, shown below:





Ex1010 at Fig. 1; Ex1006 at Fig. 1.

306. I provide additional explanation on a POSA's motivation to incorporate a cyclonic air filtration unit with IPVG's teachings in Ground 3. *See* Ground 3, §1.b.

307. In my opinion, this combination would have involved applying a known technique to a known device ready for improvement to yield predictable results. As I explained above, in my opinion, a POSA would have understood that this combination would achieve several benefits that were well known in the art, including the benefits of cyclonic filtration (*see* Ground 3, §1.b) and the benefits of a portable, user-holdable vacuum cleaner.

308. In my opinion, it would have been obvious to try this combination. In my opinion, a POSA would have understood there are a finite number of identified dust-separation solutions. These include a dust bag (as IPVG teaches) and a cyclonic separator (as Martelliere teaches).

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

309. In my opinion, a POSA would have had a reasonable expectation of success implementing Martelliere's cyclonic vacuum cleaner using IPVG's hand-stick cleaner teachings. Martelliere teaches that its cyclonic filtration unit can be used with a "broom type vacuum cleaner model," such

as IPVG's hand-stick cleaner. Ex1010, 1. IPVG teaches that its dust separation unit can be "a dust bag or like member," such as Martelliere's cyclonic-filtration unit. Ex1006, 1:22-33, claim 1. As I explained above, in my opinion, IPVG and Martelliere share many similarities. In my opinion, this combination would have involved a simple substitution of one known element (a cyclonic separator) for another known element (a dust bag) to obtain the predictable result of filtering air in a hand-stick cleaner and with the benefits of cyclonic separation.

310. I provide additional explanation on a POSA's reasonable expectation of success implanting cyclonic air filtration unit teachings with IPVG's teachings in Ground 3. *See* Ground 3, §1.c.

2. The Combined Teachings of Martelliere and IPVG Render Obvious a Hand Vacuum Cleaner (Limitations [23pre]/[24pre])

311. In my opinion, Martelliere teaches a hand vacuum cleaner. *See* Ground 1, Limitations [23pre]/[24pre]. Also, in my opinion, IPVG teaches a hand vacuum cleaner. *See* Ground 3, Limitations [1pre]/[23pre]/[24pre]/[25pre]. As I explained, in my opinion, a POSA would have been motivated to combine Martelliere and IPVG and would have had a reasonable expectation of success doing so. *See* Ground 4, §1. In my opinion, the combined teachings of Martelliere and IPVG meet these

limitations because IPVG's hand vacuum cleaner would still be a hand vacuum cleaner after its dust bag is replaced with Martelliere's cyclonic air-filtration unit.

3. The Combined Teachings of Martelliere and IPVG Render Obvious the Door Limitations (Limitations [23d]/[24d]/[23f])

312. In my opinion, IPVG teaches that its dirt-collection chamber has an openable door, and IPVG teaches that its front wall comprises the openable door. *See* Ground 3, Limitations [1a]/[1d]. In my opinion, IPVG also teaches that its openable door is openable when its dirt-collection chamber is mounted to the hand vacuum cleaner. *See* Ground 3, Limitation [23f]. In my opinion, a POSA would have been motivated to combine the teachings of Martelliere and IPVG and would have had a reasonable expectation of success. *See* Ground 4, §1. In my opinion, the combined teachings meet these limitations at least because a POSA would understand that substituting Martelliere's cyclonic air-filtration teachings would not affect IPVG's door. *See* Ground 4, §1; Ex1006, Fig. 2; Ex1010, Fig. 1.

313. Also, in my opinion, it would have been obvious to modify IPVG's door to include a latch system that would allow the door to pivot at least to some degree. In my opinion, a POSA would have at least found this modification obvious to try. A POSA would have understood that a latch

was one of a finite number of commonly known ways to open a door, and, in my opinion, Martelliere teaches such a latch. *See* Ground 1, Limitation [23d]. In my opinion, a POSA would have understood that substituting IPVG's screws for a latch would allow for fast, convenient, and hygienic dust emptying. For example, a user could hold IPVG's vacuum cleaner directly over a trashcan and then release the openable door, which, in my opinion, a POSA would have understood to be preferred over having to remove each screw on IPVG's "screwed cover 2," during which dirt could spill. In my opinion, a POSA would have had a reasonable expectation of success because it would have involved the simple substitution of well-known parts, and because Martelliere already teaches such a mechanism.

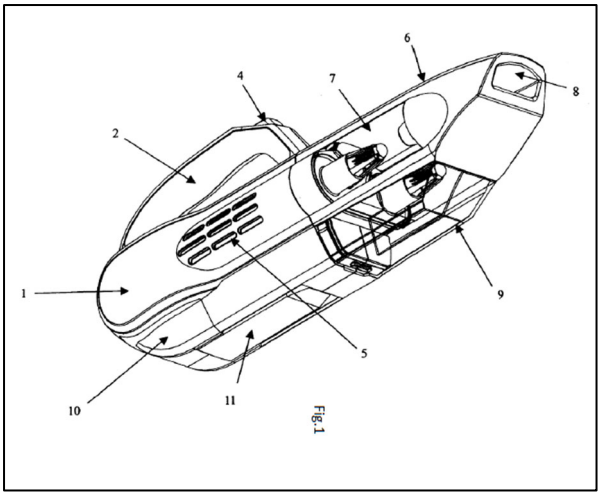
E. Ground 5: Jianan in Combination with Khalil Renders Claims 1-25 Obvious

314. In my opinion, the combined teachings of Jianan and Khalil render obvious each of the Challenged Claims (claims 1-25), as I explain below.

1. A POSA Would Have Been Motivated to Combine Jianan and Khalil

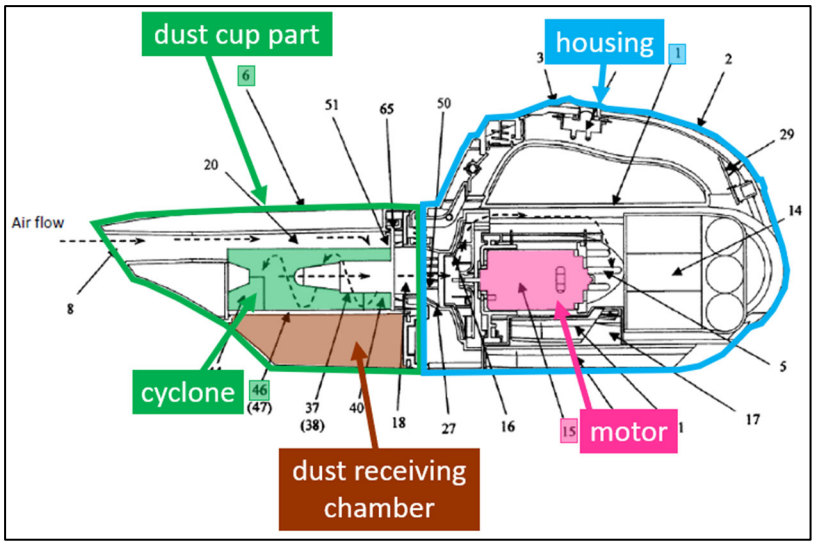
a. Jianan and Khalil

315. Jianan teaches an "improved handheld vacuum cleaner" with an "efficient cyclone effect, a clean and convenient dust removal process, and constant suction performance," as shown in Jianan Figure 1, shown below:



Ex1013 at 4, Fig. 1.

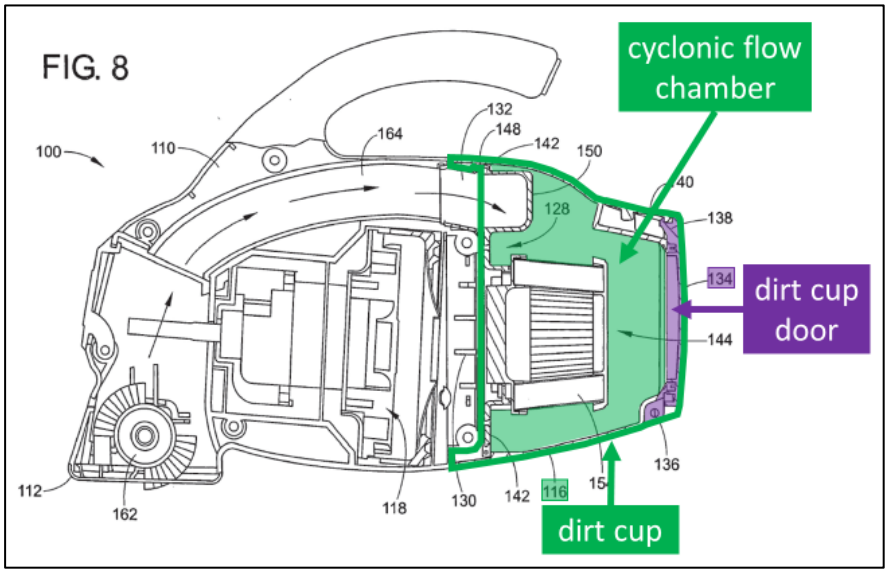
316. Jianan's vacuum "includes a **housing** and a **dust cup part**." Ex1013 at 4. Jianan teaches that its housing includes a "**motor**, which is connected to the impeller," and the dust cup part comprising a "cyclone body of a cylindrical geometry with two parallel **cyclones** and separate **dust receiving chambers**," as shown in the annotated image below:



Ex1013 at 4, Fig. 3.

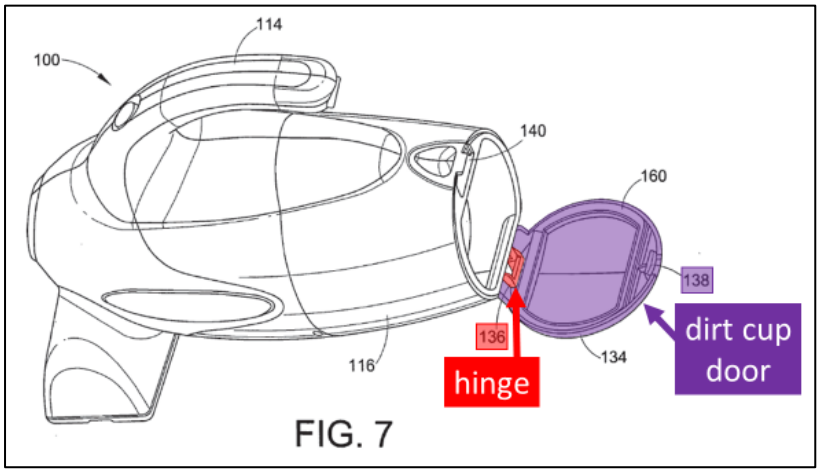
317. To empty Jianan's dust collection chamber, Jianan teaches that the user may "simply separate the dust cup 6 from the main housing 1" and discharge dirt through "dust collection chamber opening 35," or use "an opening and closing device" "that replaces the dust collection chamber opening 35," such as a "movable door on the dust collection chamber 9." Ex1013, 10, claim 3. Jianan does not provide additional implementation details for its dust collection chamber's "movable door." *Id.*

318. Khalil teaches a "hand-held vacuum cleaner," which "includes a **dirt cup [116]**" that is "detachable from the housing," a "**dirt cup door [134]**," and a "**cyclonic flow chamber**," which is "the volumetric space between the filter support plate 142 and the dirt cup door 134," as shown in the annotated image below:



Ex1014 at Abstract, ¶29, Fig. 8.

319. Khalil teaches that the "**dirt cup door 134** … pivot[s] downward about the **hinge 136**" to "provid[e] a convenient method of emptying the dirt cup 116," as shown in the annotated image below:



Ex1014 ¶¶27, 29, Fig. 7.

b. A POSA Would Have Been Motivated to Combine the Teachings of Jianan and Khalil

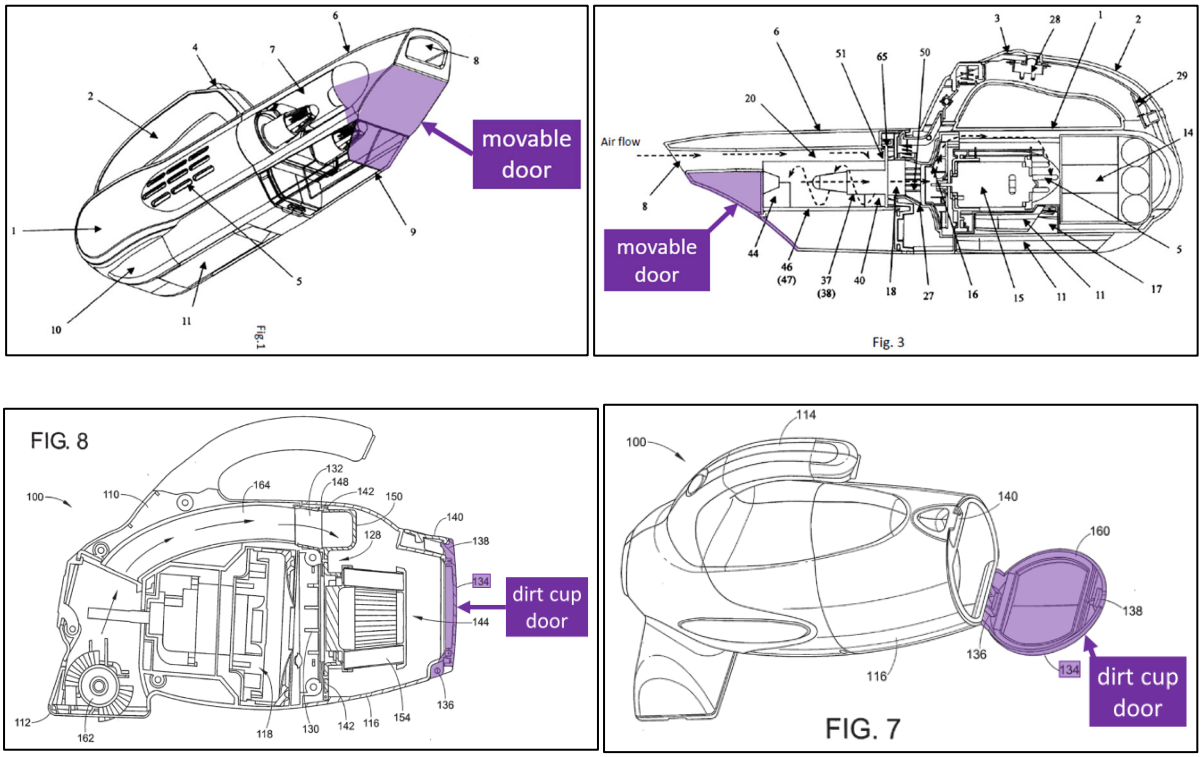
320. In my opinion, a POSA would have been motivated to combine the teachings of Jianan and Khalil. Jianan teaches "a clean and convenient dust removal process," involving a "movable door on the dust collection chamber 9," but does not teach implementation details for that movable dust collection chamber door. Ex1013, 4, 10. In my opinion, a POSA reading Jianan at the time of the '407Patent's alleged invention would have been motivated to look to references that teach implementation details for movable doors on dust collection chambers in hand vacuums to enable Jianan's stated goal of providing "a clean and convenient dust removal

process." Ex1013, 4. In my opinion, Khalil is one such reference. For example, Khalil provides implementation details on a "dirt cup door" that pivot[s] downward about the hinge 136" to solve the same problem as Jianan, which is to "provid[e] a convenient method of emptying the dirt cup 116" for a "cyclonic flow chamber" in a hand vacuum. Ex1014 ¶¶27, 29, Fig. 7. In my opinion, because both Jianan and Khalil explicitly teach that they are directed to solving the same problem ("convenient" dust removal processes in handvacs, Ex1013, 4; Ex1014 ¶27) would further motivate a POSA to combine their teachings and it would give a POSA a reasonable expectation of success.

321. In my opinion, Khalil and Jianan are analogous art. Like Jianan, Khalil teaches a "hand-held vacuum cleaner" with a "dirt cup" that is "detachable from the housing," a "cyclonic flow chamber," and a "dirt cup door" that "provides a convenient method of emptying the dirt cup." Ex1014, Abstract, ¶27, Figs. 7-8. Also, Khalil and Jianan each teach concepts that in my opinion were well known to POSAs at the time of the '407Patent's alleged invention. Ex1013, cover; Ex1014, cover.

322. In my opinion, to implement Jianan's teaching of a "movable door on the dust collection chamber 9," a POSA would have substituted Khalil's detailed dirt cup door teachings, including its hinged door-opening

mechanism, for the front wall of Jianan's hand vacuum cleaner, as shown in the annotated images below:



Compare Ex1013, 10, claim 3, Figs. 1, 3 *with* Ex1014 ¶¶27, 33, Figs. 8, 7.

323. In my opinion, a POSA would have found Khalil's pivotable-door teachings at least obvious to try, as a hinge was one of the most commonly known ways to open a door, and also because a hinge was one of a finite number of identified, predictable solutions for implementing a "movable door" as Jianan teaches, including screwing the door on or sliding it into place. Also, pivotable, hinged doors were well known in the art for predictably and easily opening a door. In my opinion, a POSA would have understood that a pivotable, hinged door, as Khalil teaches, would have

allowed for fast, convenient, and clean dust emptying because a user could simply hold Jianan's vacuum cleaner over a garbage can and release the openable door to empty the collected dirt, rather than having to remove the entire dirt collection chamber and carry it over to a garbage can, which risks spilling dirt on the user or the floor.

c. A POSA Would Have Had a Reasonable Expectation of Success Combining the Teachings of Jianan and Khalil

324. In my opinion, a POSA would have had a reasonable expectation of success incorporating Khalil's openable door and unlocking mechanism teachings into Jianan's vacuum cleaner because it would have involved the simple substitution of well-known parts described above, and because of the many similarities between Khalil's teachings and Jianan's teachings. As I explained above, both Jianan's "dust cup part" and Khalil's "dirt cup" have an end with a "dust collection chamber opening," *see* Ex1013, 10; Ex1014 ¶¶27, 33, and both Jianan's "movable door" and Khalil's "dirt cup door" cover the opening and enable "clean and convenient dust removal," *see* Ex1013, 4, 10; Ex1014 ¶¶27, 33.

2. The Combined Teachings of Jianan and Khalil Render Obvious Claims 1, 23, 24, and 25

a. [1pre]/[23pre]/[24pre]/[25pre]

Reference Number	Claim Limitation
[1pre]	"A hand vacuum cleaner comprising:"
[23pre]	"A hand vacuum cleaner comprising:"
[24pre]	"A hand vacuum cleaner comprising:"
[25pre]	"A hand vacuum cleaner comprising:"

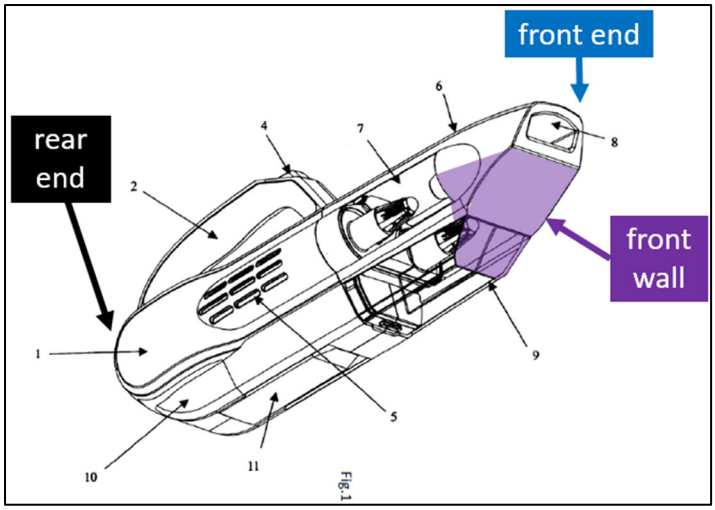
325. To the extent the preambles are limiting, in my opinion, Jianan teaches a hand vacuum cleaner.

326. Jianan teaches a "handheld vacuum cleaner." Ex1013, Abstract.

b. [1a]/[23a]/[24a]/[25a]

Reference Number	Claim Limitation
[1a]	"a) a front end having a front wall and a rear end;"
[23a]	"a) a front end having a front wall and a rear end;"
[24a]	"a) a front end having a front wall and a rear end;"
[25a]	"a) a front end having a front wall and a rear end;"

327. In my opinion, Jianan teaches a front end having a front wall and a rear end. Jianan teaches a **front wall** positioned underneath an "air inlet channel opening 8 located at the **front end** of the dust cup 6," opposite the **rear end**, as shown in the annotated image below:



Ex1013 at 7, Fig. 1.

328. In my opinion, Jianan's front wall is positioned at the vacuum cleaner's front end, which is opposite its rear end, as identified the above figure.

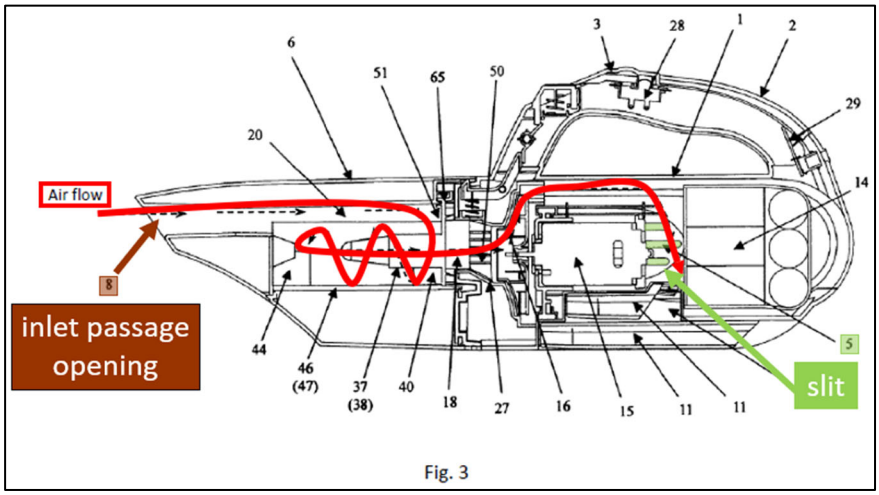
c. [1b]/[23b]/[24b]/[25b]

Reference Number	Claim Limitation
[1b]	"b) an air flow passage extending from a dirty air inlet to a clean air outlet;"
[23b]	"b) an air flow passage extending from a dirty air inlet to a clean air outlet;"
[24b]	"b) an air flow passage extending from a dirty air inlet to a clean air outlet;"
[25b]	"b) an air flow passage extending from a dirty air inlet to a clean air outlet;"

329. In my opinion, Jianan teaches an air flow passage extending from a dirty air inlet to a clean air outlet.

330. Jianan teaches that **air flows** into "**inlet passage opening 8**," "through the air inlet passage 20 into the cyclone 46," "into the main housing 1," past

the "motor 15 and battery pack 14," where the air "helps to cool the components," and is finally "discharged from the housing through **slit 5**," as shown in the annotated image below:



Ex1013 at 8, Fig. 3.

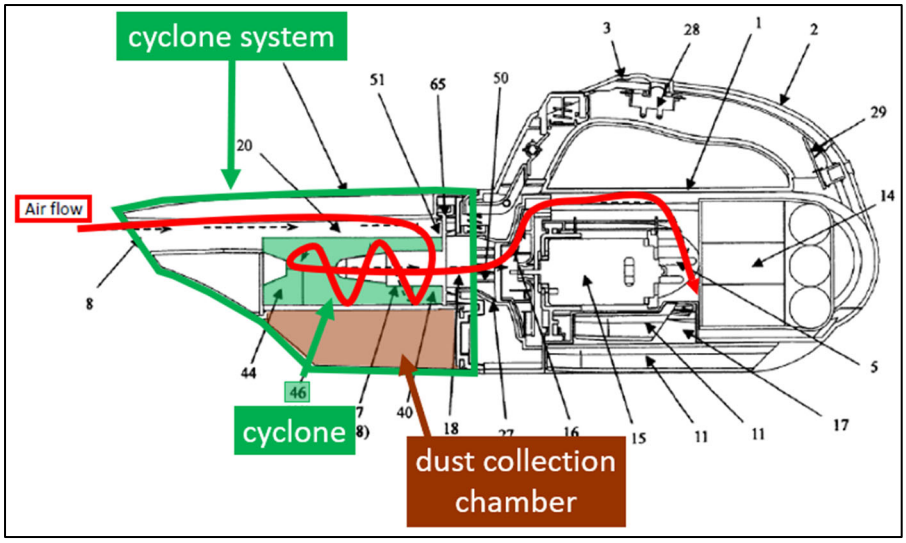
331. In my opinion, a POSA would have understood that Jianan's "inlet passage opening 8" is a dirty air inlet. In my opinion, a POSA would have understood that Jianan's "slit 5" is a clean air outlet. And, in my opinion, a POSA would have understood that an air flow passage extends between Jianan's dirty air inlet and its clean air outlet.

d. [1c]/[23c]/[24c]/[25c]

Reference Number	Claim Limitation
[1c]	"c) a first cyclone unit positioned in the air flow passage, the first cyclone unit comprising at least one cyclone and at least one dirt collection chamber external to the cyclone chamber;"
[23c]	"c) a first cyclone unit positioned in the air flow passage, the first cyclone unit comprising at least one cyclone and at least one dirt collection chamber;"
[24c]	"c) a first cyclone unit positioned in the air flow passage, the first cyclone unit comprising at least one cyclone and at least one dirt collection chamber;"
[25c]	"c) a first cyclone unit positioned in the air flow passage, the first cyclone unit comprising at least one cyclone and at least one dirt collection chamber;"

332. In my opinion, Jianan teaches a first cyclone unit positioned in the air flow passage, the first cyclone unit comprising at least one cyclone and at least one dirt collection chamber external to the cyclone chamber.

333. Jianan teaches a "**cyclone system**" with a "**cyclone 46**" that is "designed to collect dust 39 in an **independent dust collection chamber 9**" and is positioned in the **air flow passage**, as shown in the annotated image below:



Ex1013 at 10, Fig. 3.

334. Jianan teaches that, "[s]ince most of the dust collects in a separate dust receiving chamber, there is no need to clean the filter after each use." Ex1013, 5. In my opinion, Jianan's "cyclone system" is a first cyclone unit positioned in the air flow passage, as depicted above, and Jianan's "dust collection chamber 9" is a dirt collection chamber external to the cyclone chamber.

335. Also, Khalil teaches that "when the filter assembly 128 is inserted into the dirt cup 116, the volumetric space between the filter support plate 142 and the dirt cup door 134 defines a cyclonic flow chamber." Ex1014 ¶29. Khalil teaches that "[h]eavier than air particles are separated from the airflow due to the centrifugal forces generated by the cyclonic flow of the air," and "[t]hese particles accumulate in or near the bottom and rear

portions of the dirt cup 116." *Id*. ¶34. In my opinion, Khalil's "cyclonic flow chamber," which is positioned within "dirt cup 116," comprises a cyclone and a dirt collection chamber, and Khalil's hand vacuum "dirt cup 116" includes a first cyclone unit.

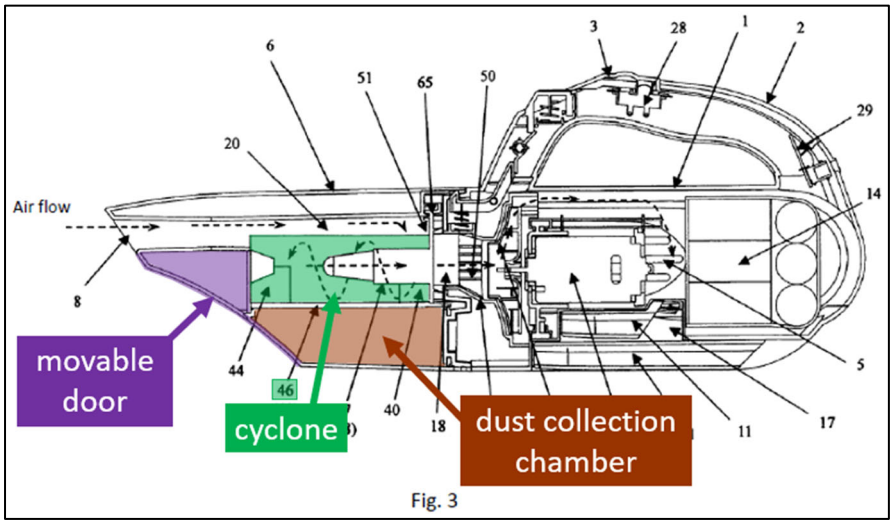
e. [1d]/[23d]/[24d]/[25d]

Reference Number	Claim Limitation
[1d]	"d) the cyclone and the dirt collection chamber having an openable door, the front wall comprising the openable door, whereby, when the door is in an open position, both the cyclone and the dirt collection chamber are opened; and,"
[23d]	"d) the dirt collection chamber having an openable door, the front wall comprising the openable door; and,"
[24d]	"d) the dirt collection chamber having an openable door, the front wall comprising the openable door; and,"
[25d]	"d) the dirt collection chamber having an openable door, the front wall comprising the openable door; and,"

336. In my opinion, Jianan in combination with Kalil renders obvious the cyclone and the dirt collection chamber having an openable door, the front wall comprising the openable door, whereby, when the door is in an open position, both the cyclone and the dirt collection chamber are opened.

337. Jianan teaches a "handheld vacuum cleaner … wherein the dust collection chamber has at least one opening for emptying dirt." Ex1013, claim 2. In an exemplary embodiment Jianan teaches that its "dust collection chamber 9" has a "dust collection chamber opening 35" that "provides a clean and fast dust removal process." *Id*., 10. Additionally, Jianan teaches an

"alternative device in which the dust chamber" opening can be replaced with "an opening and closing device such as a" "**movable door** on the **dust collection chamber 9**," as shown in the annotated image below:



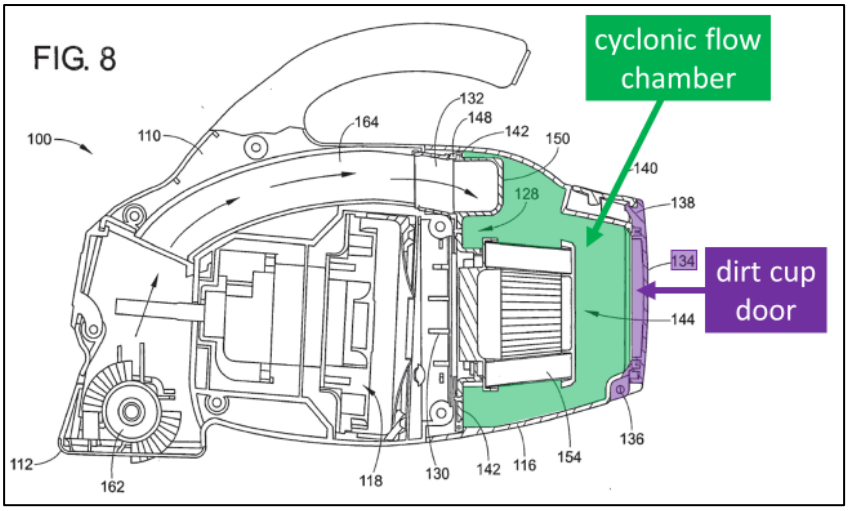
Ex1013 at 10, claim 3, Fig. 3.

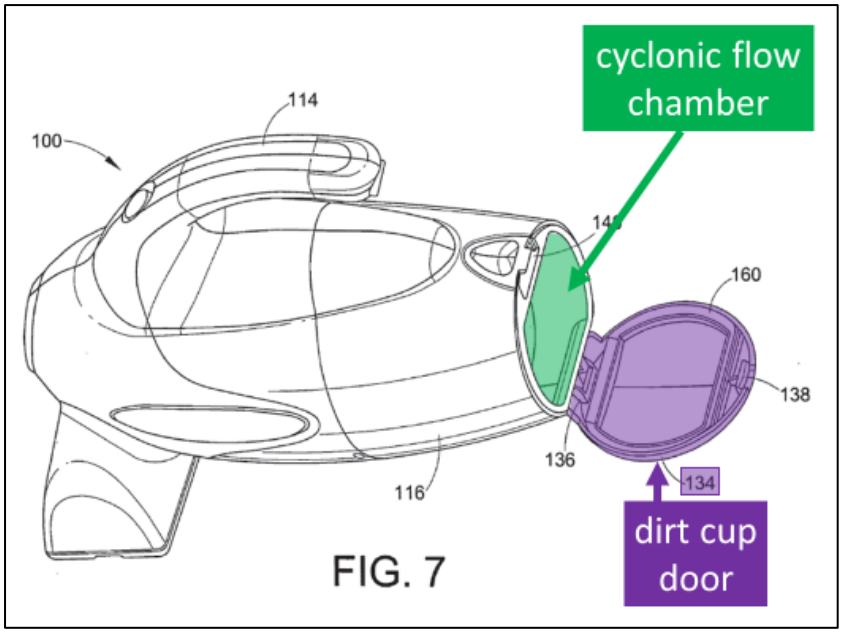
338. In my opinion, a POSA would have understood that one of a finite number of openable door placements on the dirt collection chamber is below the air inlet channel opening 8. Thus, in my opinion, it would have been obvious for Jianan's **front wall to comprise the openable door**.

339. Also, in my opinion, a POSA would have understood that Jianan's openable door would open both the **cyclone** and the **dust collection chamber**, as is depicted above. Jianan teaches that its stated purpose is to provide a "clean and fast dust removal process." Ex1013, 10. Jianan teaches that although "most of the dust collects in a separate dust receiving chamber," some will accumulate in the cyclone and thus the cyclone will

need to be emptied. *Id*., 5. In my opinion, a POSA would have understood that fibrous materials, including hair and string, frequently wrap themselves around the conical cyclone filters. When this happens, a user may need to manually pull out the fibrous materials. Because of this, in my opinion, a POSA would have understood that to meet Jianan's objective of "clean and fast dust removal," the openable door would cover (and when it was opened, it would expose) both the cyclone and the dirt collection chamber. In my opinion, this would allow for convenient cleaning and dust removal.

340. Because Jianan does not provide details on how to implement its openable-door embodiment, in my opinion, a POSA would have turned to Khalil because Khalil provides those details. Further, in my opinion, a POSA would have a reasonable expectation of success incorporating Khalil's teachings. Khalil teaches a "**dirt cup door 134**" covering an end of the hand vacuum cleaner, wherein the "volumetric space between the filter support plate 142 and the **dirt cup door 134** defines a **cyclonic flow chamber**," as shown in the annotated images below:





Ex1014 ¶29, Figs. 7-8.

341. Khalil teaches that its **cyclonic flow chamber** comprises a cyclone and a dirt collection chamber, which are both opened "when the latch 140 is depressed, the catch 138 is released and a spring biasing element that may be located within the hinge 136 urges the **dirt cup door 134** open." Ex1014 ¶33.

342. As I explained, in my opinion, a POSA would have been motivated to implement Jianan's "movable door" teachings using Khalil's dirt cup door 134 teachings and a POSA would have had a reasonable expectation of success doing so. *See* Ground 5, §1. In my opinion, in the combined teachings of Jianan and Khalil, the cyclone and the dirt collection chamber have an openable door, the front wall comprising the openable door, whereby, when the door is in an open position, both the cyclone and the dirt collection chamber are opened.

f. [1e]/[23e]/[24e]/[25e]

Reference Number	Claim Limitation
[1e]	"e) a suction motor positioned in the air flow passage."
[23e]	"e) a suction motor positioned in the air flow passage"
[24e]	"e) a suction motor positioned in the air flow passage"
[25e]	"e) a suction motor positioned in the air flow passage"

343. In my opinion, Jianan alone or in combination with Khalil teaches a suction motor positioned in the air flow passage.

344. In my opinion, Jianan teaches a suction motor positioned in the air flow passage. Jianan teaches that "[w]ithin the main housing 1, the wall surrounding the motor 15 and battery pack 14 forms a long air path to guide clean air, which helps to cool the components and reduce noise." Ex1013, 8. In my opinion, a POSA would have understood that Jianan's "motor 15" is a suction motor. In my opinion, a POSA would have also understood

that the "components" cooled by the air include "motor 15" and thus that "motor 15" is a suction motor positioned in the air flow passage.

345. Alternatively, to the extent it is argued that Jianan's motor is not in the air flow passage, it is my opinion that a POSA would have been motivated by Jianan's disclosures to modify Jianan to place the suction motor in the air flow passage. I have reviewed prior art references that demonstrate that suction motors have been positioned in the airflow passage to cool the motor for over eighty years. *See* Ex1008, 1:32-38, Fig. 2 ("it is desirable to pass the air through the fan motor for the purpose of cooling"). So, in my opinion, positioning Jianan's suction motor in the airflow passage would have been obvious to try, it would have been easy to implement using nearly century old teachings, and it would have yielded the predictable result of "cool[ing] [a] component[]," in this case, "motor 11," with "clean air," which is one of Jianan's stated objectives. Ex1013, 8. In my opinion, a POSA would have reasonably expected success modifying Jianan, if necessary, because of Jianan's express teachings of using airflow to cool components, because of the prior art's teachings of using airflow to cool motors, and because of the location of Jianan's air outlet, "slit[s] 5" that surround the motor. *See* Ground 5, Limitation [1b].

346. Also, Khalil teaches that the "airflow exits the dirt cup 116 via the collar

152 a" and "[a]s the air flow passes through the suction fan and motor assembly 118," it "cools the motor and exits the vacuum cleaner through the exhaust ports 131." Ex1014 ¶34.

347. In my opinion, to the extent that Jianan's motor is not positioned in the air flow passage, a POSA would have been motivated to combine Khalil's air flow teachings with Jianan to obtain the benefits taught by Khalil of "cool[ing] the motor." Further, in my opinion, a POSA would have reasonably expected success for the same reasons discussed above. In my opinion, in the combined teachings of Jianan and Khalil, the suction motor is positioned in the air flow passage.

g. [23f]

Reference Number	Claim Limitation
[23f]	"wherein the door is openable when the dirt collection chamber is mounted to the hand vacuum cleaner."

348. In my opinion, Jianan in combination with Khalil teaches that the door is openable when the dirt collection chamber is mounted to the hand vacuum cleaner for the same reasons as discussed for Limitation [1d]. *See* Ground 5, Limitation [1d].

h. [24f]

Reference Number	Claim Limitation
[24f]	"wherein the openable door covers an end of the dirt collection chamber."

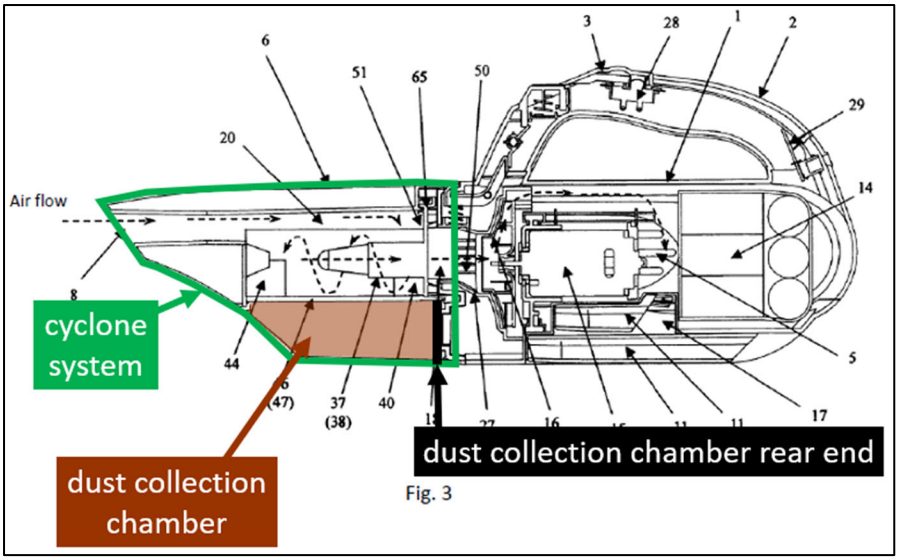
349. In my opinion, Jianan in combination with Khalil teaches the openable door covering an end of the dirt collection chamber. *See* Ground 5, Limitation [1d].

i. [25f]

Reference Number	Claim Limitation
[25f]	"wherein the dirt collection chamber has a rear end and the rear end is non-removably mounted to the first cyclone unit."

350. In my opinion, Jianan teaches the dirt collection chamber having a rear end and the rear end is non-removably mounted to the first cyclone unit.

351. Jianan teaches that the "main components of the dust cup part, dust cup, and cyclone body are permanently bonded together," as shown in the annotated image below:



Ex1013 at 4, Fig. 3.

352. Jianan's "permanently bonded" "main components of the dust cup part, dust cup, and cyclone body" include the dust collection chamber, and, in my opinion, the dust collection chamber has a rear end non-removably mounted to the first cyclone unit.

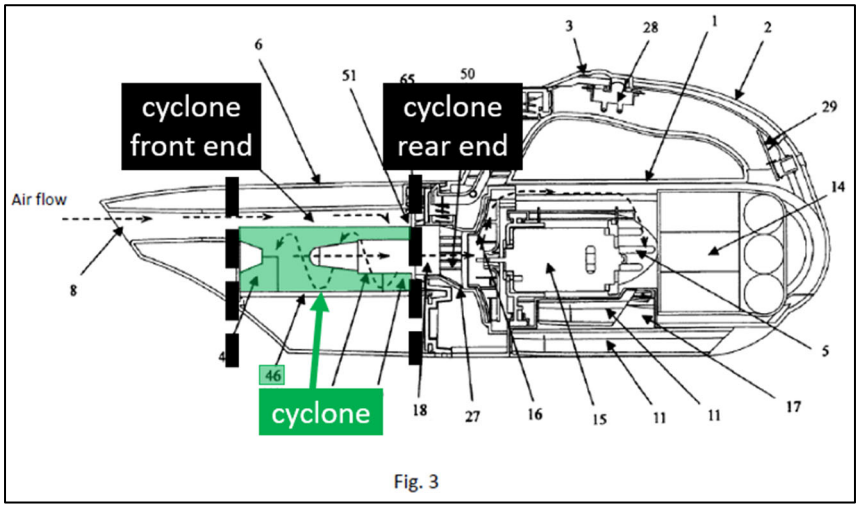
3. The Combined Teachings of Jianan and Khalil Render Obvious Claim 2

Reference Number	Claim Limitation
[2]	"The hand vacuum cleaner of claim 1 wherein the at least one cyclone has a cyclone front end, a cyclone rear end, a cyclone air inlet and a cyclone air outlet and the cyclone front end is at the front end of the hand vacuum cleaner."

353. In my opinion, Jianan in combination Khalil teaches the hand vacuum cleaner of claim 1 wherein the at least one cyclone has a cyclone front end, a cyclone rear end, a cyclone air inlet and a cyclone air outlet and the

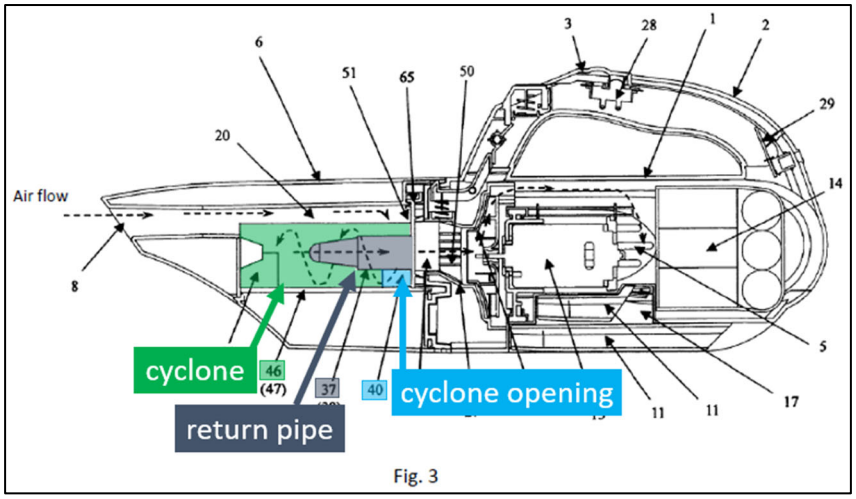
cyclone front end is at the front end of the hand vacuum cleaner.

354. In my opinion, Jianan teaches that the at least one cyclone has a cyclone front end, a cyclone rear end a cyclone air inlet and a cyclone air outlet. Jianan teaches that its "**cyclone 46**" has a **front end** at the front end of the vacuum cleaner, and a **rear end** at the opposite end, as shown in the annotated image below:



Ex1013 at Fig. 3.

355. Also, Jianan teaches that its "**cyclone 46**" has "**cyclone opening 40**," which, in my opinion, a POSA would have understood is a cyclone air inlet, and "**return pipe 37**," which, in my opinion, a POSA would have understood is a cyclone air outlet, as shown in the annotated image below:



Ex1013 at 9, Fig. 3.

356. Jianan teaches that "dust-laden air … enter[s] the cyclone 46 … through the **cyclone opening 40**" and is "cleaned by cyclone separation," after which the air exits the cyclone by "enter[ing] the **return pipe 37**." Ex1013, 9.

4. The Combined Teachings of Jianan and Khalil Render Obvious Claims 3 and 4

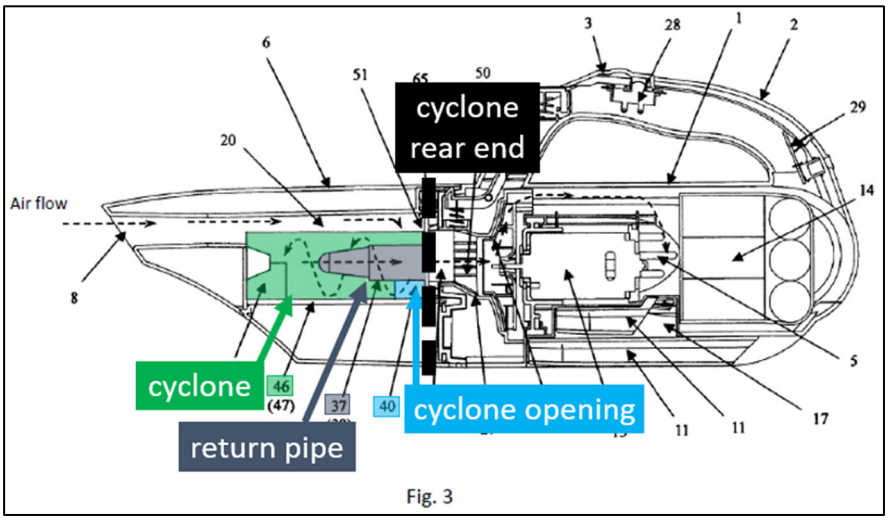
Reference Number	Claim Limitation
[3]	"The hand vacuum cleaner of claim 2 wherein the cyclone air inlet and the cyclone air outlet are at the same end."
[4]	"The hand vacuum cleaner of claim 3 wherein the cyclone air inlet and the cyclone air outlet are at the cyclone rear end."

357. In my opinion, Jianan in combination with Khalil teaches the hand vacuum cleaner of claim 2 wherein the cyclone air inlet and the cyclone air outlet are at the same end.

358. In my opinion, Jianan in combination with Khalil teaches the hand vacuum

cleaner of claim 3 wherein the cyclone air inlet and the cyclone air outlet are at the cyclone rear end.

359. In my opinion, Jianan's "**cyclone opening 40**" and "**return pipe 37**" are at the same end—namely, the "**cyclone 46**" **rear end**, as shown in the annotated image below:



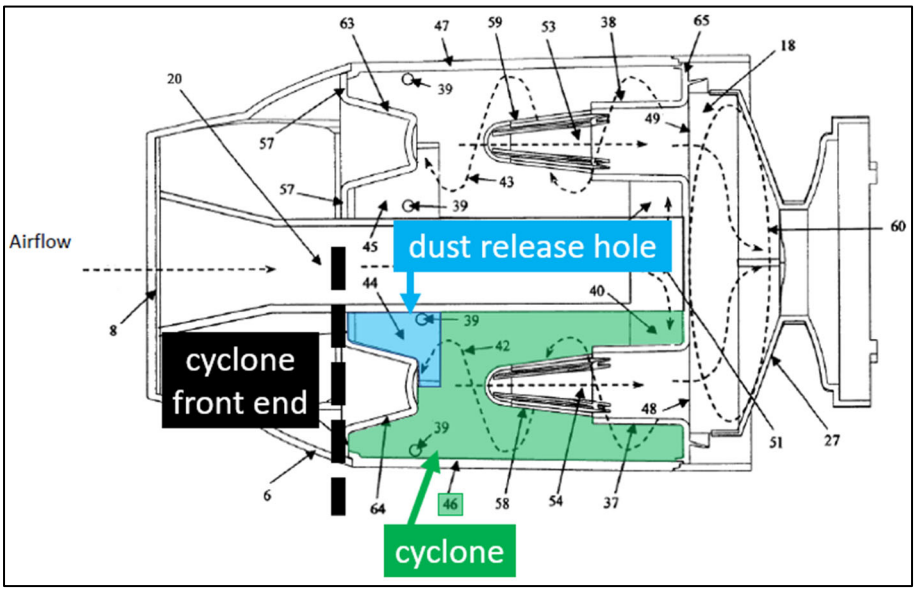
Ex1013 at Fig. 3.

5. The Combined Teachings of Jianan and Khalil Render Obvious Claim 5

Reference Number	Claim Limitation
[5]	"The hand vacuum cleaner of claim 1 wherein the cyclone front end has a dirt outlet and a separation plate is mounted in facing relation to the dirt outlet."

360. In my opinion, Jianan in combination with Khalil teaches the hand vacuum cleaner of claim 1 wherein the cyclone front end has a dirt outlet and a separation plate is mounted in facing relation to the dirt outlet.

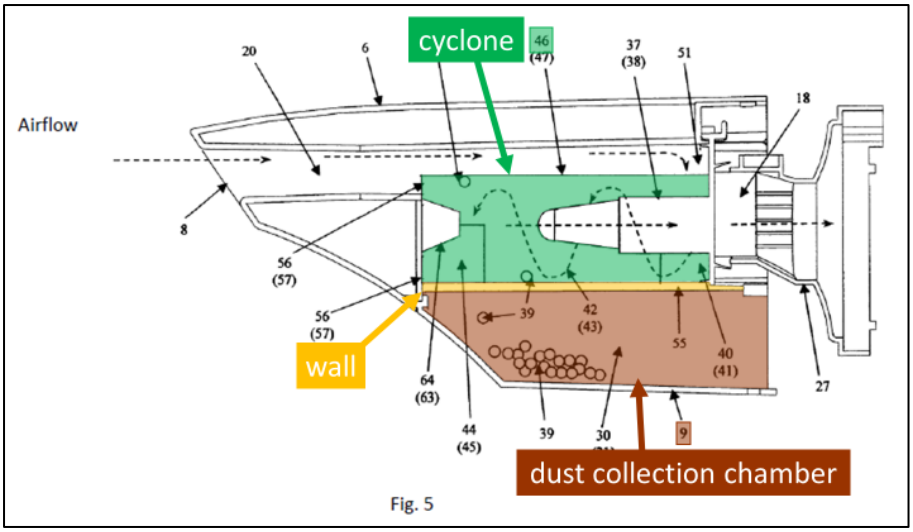
361. In my opinion, Jianan teaches a cyclone front end. *See* Ground 5, Claim 2. In my opinion, Jianan also teaches that the cyclone front end has a dirt outlet. For example, Jianan teaches a "**dust release hole**" at the **front end** of "**cyclone 46**," as shown in the annotated image below:



Ex1013 at 9, Fig. 6.

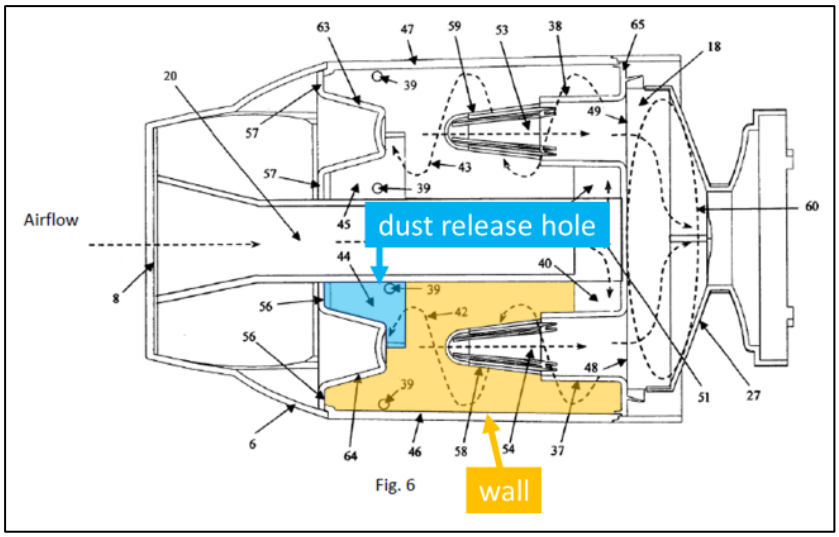
362. Jianan teaches that "dust collection chamber 9 is connected to the cyclone body via the **dust release hole**," and that "[d]uring normal operation," "dust 39 escapes" "cyclone 46" "through the action of inertia." *Id.*, 9. Thus, in my opinion, Jianan's "**dust release hole**" is a dirt outlet.

363. In my opinion, Jianan teaches a separation plate mounted in facing relation to the dirt outlet. For example, Jianan teaches that "**wall 55**" separates "**cyclone 46**" and the "independent **dust collection chamber 9**," as shown in the annotated image below:



Ex1013 at 9-10, Fig. 5.

364. Jianan teaches that, "[a]s a result, most of the dust … separated through the cyclone" remains in the "dust collection chamber 9," and "users will not have to clean the filter as often." Ex1013, 10. Jianan also teaches that its "**wall 55**" is mounted in facing relation to the "**dust release hole**," as shown in the annotated image below:



Ex1013 at 9, Fig. 6.

365. In my opinion, Jianan's "**wall 55**" is a separation plate mounted in facing relation to the dirt outlet.

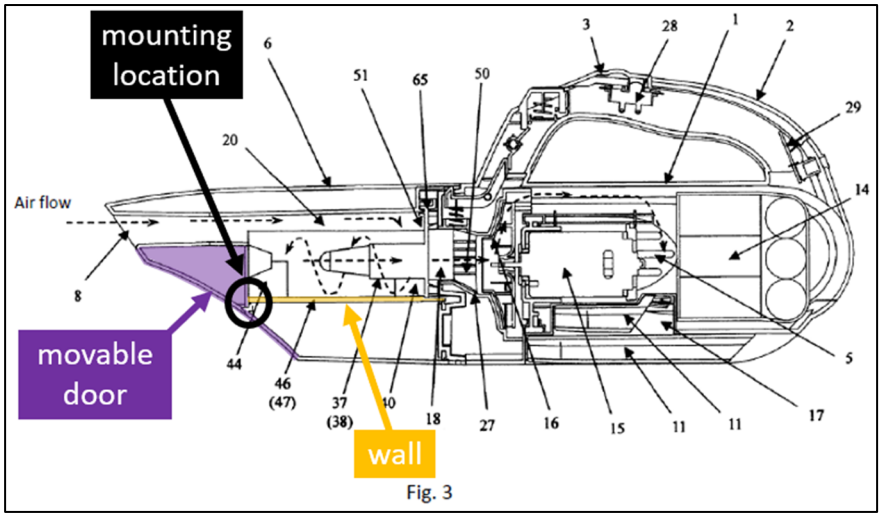
6. The Combined Teachings of Jianan and Khalil Render Obvious Claim 6

Reference Number	Claim Limitation
[6]	"The hand vacuum cleaner of claim 5 wherein the separation plate is mounted to the door."

366. In my opinion, Jianan in combination with Khalil renders obvious the hand vacuum cleaner of claim 5 wherein the separation plate is mounted to the door.

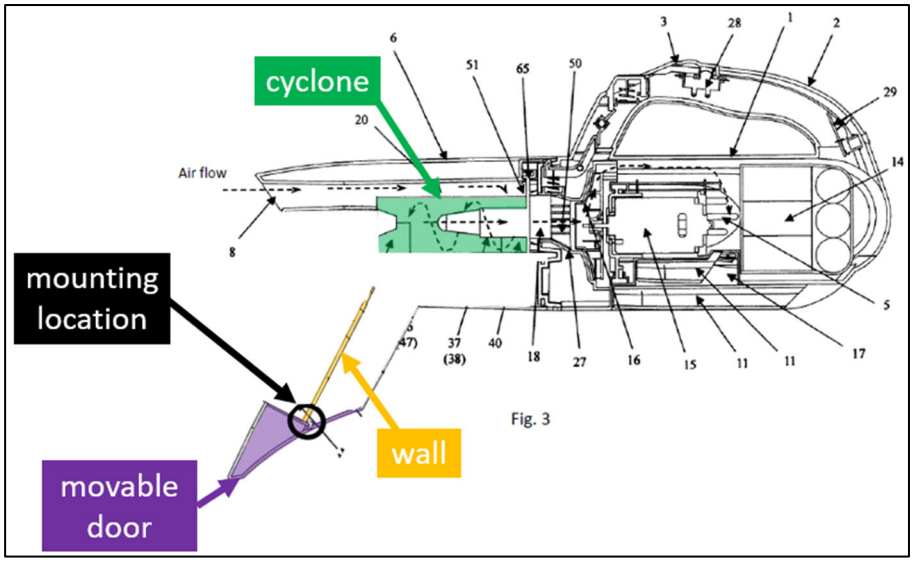
367. In my opinion, Jianan teaches a separation plate. *See* Ground 5, Claim 5. In my opinion, Jianan in combination with Khalil teaches an openable door. *See* Ground 5, Limitation [1d].

368. In my opinion, in the combined teachings of Jianan and Khalil, the separation plate is mounted to the door. For example, Jianan teaches that its "**wall 55**" is mounted to the "**movable door**," as shown in the annotated image below:



Ex1013 at 9-10, Fig. 3.

369. As I explained for Limitation [1d], in my opinion, a POSA would have understood that Jianan's "cyclone 46" must be cleaned by hand and thus a POSA would have been motivated to have the openable door open the cyclone to increase access to the cyclone. *See* Ground 5, Limitation [1d]. For the same reasons, in my opinion, it would have been obvious to mount "**wall 55**" to Jianan's "**moveable door**," such that when the door pivots open, the "**wall 55**" slides out for more convenient cleaning of the **cyclone 46**, as shown in the annotated image below:



Ex1013 at Fig. 3 (modified).

370. In my opinion, a POSA would have understood that there are a finite number of places to mount "**wall 55**" and one of them is on the "**movable door**," which a POSA would understand would predictably increase access to "**cyclone 46**" and would, in my opinion, meet Jianan's objective of "clean and fast dust removal." Ex1013, 10.

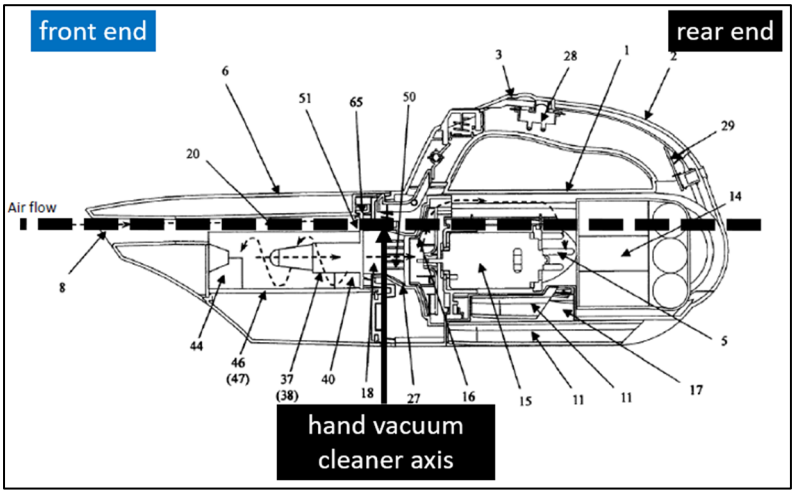
371. As I explained, in my opinion, a POSA would have been motivated to implement Jianan's "movable door" teachings using Khalil's dirt cup door 134 teachings and a POSA would have had a reasonable expectation of success doing so. *See* Ground 5, §1. In my opinion, in the combined teachings of Jianan and Khalil, the separation plate is mounted to the door.

7. The Combined Teachings of Jianan and Khalil Render Obvious Claim 7

Reference Number	Claim Limitation
[7]	"The hand vacuum cleaner of claim 1 wherein the at least one cyclone has a cyclone axis extending longitudinally through the at least one cyclone, the hand vacuum cleaner has an axis extending from the front end to the rear end and the cyclone axis is generally parallel to the axis of the hand vacuum cleaner."

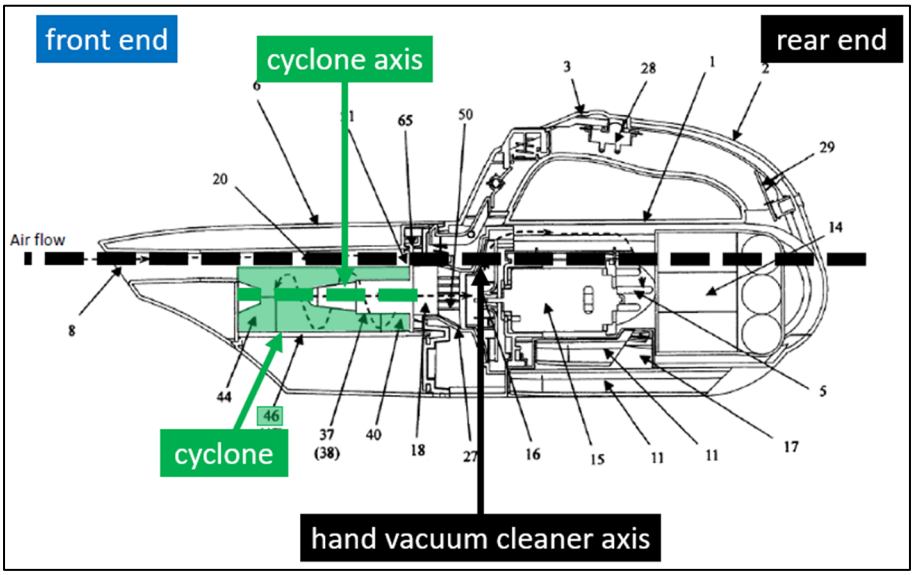
372. In my opinion, Jianan in combination with Khalil teaches the hand vacuum cleaner of claim 1 wherein the at least one cyclone has a cyclone axis extending longitudinally through the at least one cyclone, the hand vacuum cleaner has an axis extending from the front end to the rear end and the cyclone axis is generally parallel to the axis of the hand vacuum cleaner.

373. In my opinion, Jianan teaches the hand vacuum cleaner having an **axis** extending from the **front end** to the **rear end**, as shown in the annotated image below:



Ex1013 at Fig. 3.

374. In my opinion, this axis is generally parallel to Jianan's "**cyclone 46**" **axis**, as shown in the annotated image below:



Ex1013 at Fig. 3.

8. The Combined Teachings of Jianan and Khalil Render Obvious Claim 8

Reference Number	Claim Limitation
[8]	"The hand vacuum cleaner of claim 1 wherein the first cyclone unit is positioned forward of the suction motor."

375. Jianan in combination with Khalil teaches the hand vacuum cleaner of claim 1 wherein the first cyclone unit is positioned forward of the suction motor.

376. Jianan teaches that its "**cyclone system**" is positioned forward of "**motor 15**":

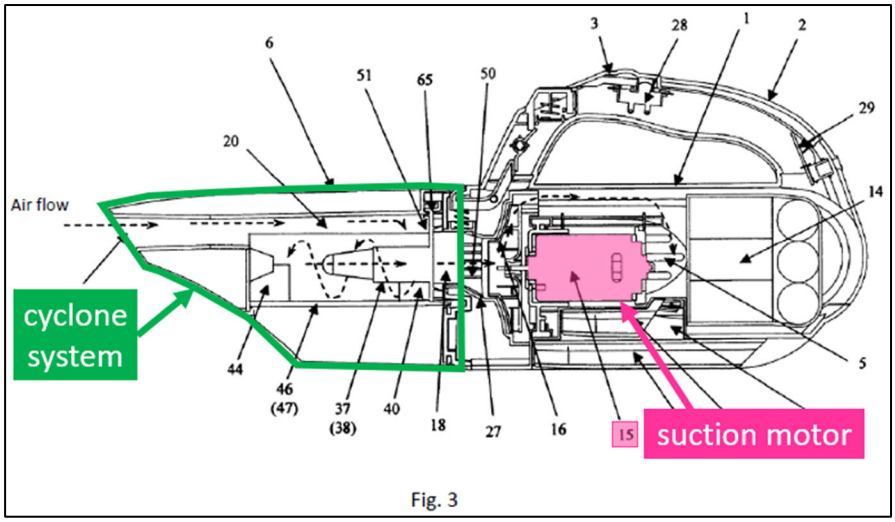


Fig. 3

Ex1013 at Fig. 3.

377. As I explained, in my opinion, Jianan's "**cyclone system**" is a first cyclone unit. *See* Ground 5, Limitation [1c]. Thus, in my opinion, a POSA would have understood that Jianan's "**cyclone system**" is a first cyclone unit that is positioned forward of Jianan's "**motor 15**" (which, in my opinion, is a suction motor, *see* Ground 5, Limitation [1e]).

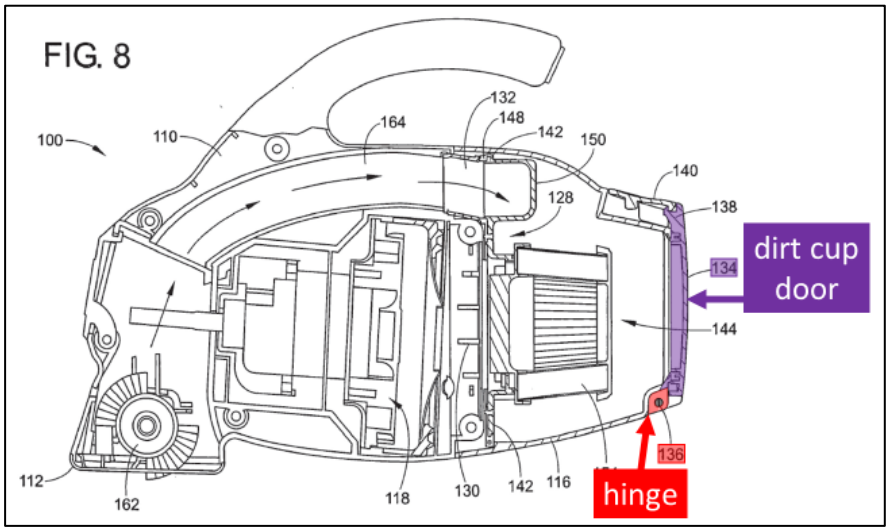
9. The Combined Teachings of Jianan and Khalil Render Obvious Claim 9

Reference Number	Claim Limitation
[9]	"The hand vacuum cleaner of claim 1 wherein the door is removable."

378. Jianan in combination with Khalil teaches the hand vacuum cleaner of claim 1 wherein the door is removable.

379. In my opinion, Khalil teaches and renders obvious the door is removable. For example, Khalil teaches that its "**dirt cup door 134**" is pivotally

mounted to the hand vacuum cleaner by "**hinge 136**," as shown in the annotated image below:



Ex1014 ¶34, Fig. 8.

380. In my opinion, a POSA would have understood that Khalil's "**hinge 136**" is secured to the hand vacuum by a removable screw or pin, at least because it appears that Khalil depicts a removable screw or pin in the center of Khalil's "**hinge 136**," as shown above. *See* Ex1014 at Fig. 8. In my opinion, a POSA would also have understood that when the screw or pin is removed, the dirt cup door is removable from the hand vacuum cleaner.

381. Alternatively, in my opinion, it would have been obvious to a POSA to include a screw or pin that removably attaches the hinge, and therefore attaches the door, to the hand vacuum cleaner. In my opinion, this would allow for more convenient cleaning of the dirt collection chamber and the

cyclone chamber. In my opinion, the use of a screw or a pin was a well-known technique to predictably attach a hinge to a vacuum cleaner. Also, in my opinion, this would have been obvious to try because there were a finite number of solutions for doing so.

382. As I explained, in my opinion, a POSA would have been motivated to implement Jianan's "movable door" teachings using Khalil's dirt cup door 134 teachings and a POSA would have had a reasonable expectation of success doing so. *See* Ground 5, §1. In my opinion, in the combined teachings of Jianan and Khalil, the door is removable.

10. The Combined Teachings of Jianan and Khalil Render Obvious Claim 10

Reference Number	Claim Limitation
[10]	"The hand vacuum cleaner of claim 1 wherein the door is pivotally mounted to the hand vacuum cleaner."

383. Jianan in combination with Khalil teaches the hand vacuum cleaner of claim 1 wherein the door is pivotally mounted to the hand vacuum cleaner.

384. Khalil teaches that "[b]y depressing the latch 140, the catch 138 on the **dirt cup door 134** is released and the **dirt cup door 134** will pivot downward about the **hinge 136**":

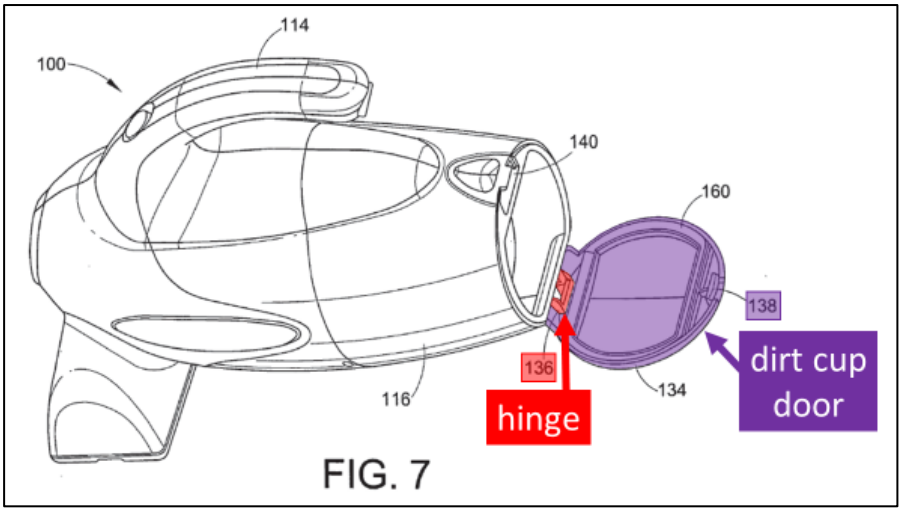


FIG. 7

Ex1014 ¶27, Fig. 7.

385. Khalil teaches that its "**dirt cup door 134**" is pivotably mounted to the hand vacuum cleaner.

386. As I explained, in my opinion, a POSA would have been motivated to implement Jianan's "movable door" teachings using Khalil's dirt cup door 134 teachings and a POSA would have had a reasonable expectation of success doing so. *See* Ground 5, §1. In my opinion, in the combined teachings of Jianan and Khalil, the door is pivotally mounted to the hand vacuum cleaner.

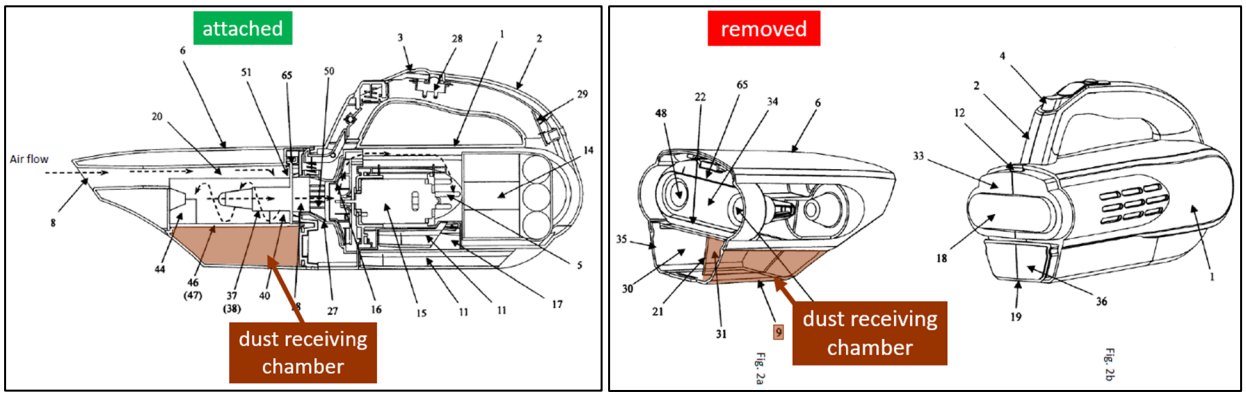
11. The Combined Teachings of Jianan and Khalil Render Obvious Claim 11

Reference Number	Claim Limitation
[11]	"The hand vacuum cleaner of claim 1 wherein the dirt collection chamber is removable from the hand vacuum cleaner."

387. In my opinion, Jianan in combination with Khalil teaches the hand vacuum

cleaner of claim 1 wherein the dirt collection chamber is removable from the hand vacuum cleaner.

388. Jianan teaches that its "dust cup 6" includes "two cyclones and separate **dust receiving chambers**," and can be "separated from the main housing 1," as shown in the annotated images below:



Ex1013 at 7, Figs. 3, 2a-2b.

389. In my opinion, a POSA would have understood that Jianan's "dust receiving chambers" are dirt collection chambers that are removable from the hand vacuum cleaner.

12. The Combined Teachings of Jianan and Khalil Render Obvious Claim 12

Reference Number	Claim Limitation
[12]	"The hand vacuum cleaner of claim 1 wherein the dirt collection chamber is removable from the surface cleaning apparatus as a sealed unit for emptying."

390. In my opinion, Jianan in combination with Khalil renders obvious the hand vacuum cleaner of claim 1 wherein the dirt collection chamber is

removable from the surface cleaning apparatus as a sealed unit for emptying.

391. In my opinion, Jianan's dirt collection chamber is removable from the hand vacuum. *See* Ground 5, Claim 11.

392. To the extent Jianan's dirt collection chamber is not removable as a sealed unit for emptying, it is my opinion that this would have been obvious to implement when Jianan's teachings are combined with Khalil's openable door teachings. In my opinion, a POSA would have been motivated to seal Jianan's "dust collection chamber opening 35" when using a front door with Jianan's cleaner because a POSA would have understood that sealing the dust collection chamber opening would prevent dirt from falling out of the back of the dirt collection chamber. As a result, in my opinion, such a seal would provide a "clean and convenient dust removal process" that does not "soil the user's hands," both of which are Jianan's stated purposes. Ex1013, 3-4. Also, in my opinion, it would have been obvious to try sealing Jianan's "dirt collection chamber opening 35." For example, the dirt collection chamber's rear opening would no longer be needed because dirt can be removed through the front door. Also, a POSA would have been motivated to implement such a seal using known techniques (in particular, a rear wall), and in my opinion, it would have yielded the

predictable result of preventing accidental dirt spillage.

393. As I explained, in my opinion, a POSA would have been motivated to implement Jianan's "movable door" teachings using Khalil's dirt cup door 134 teachings and a POSA would have had a reasonable expectation of success doing so. *See* Ground 5, §1. In my opinion, in the combined teachings of Jianan and Khalil, the dirt collection chamber is removable from the surface cleaning apparatus as a sealed unit for emptying.

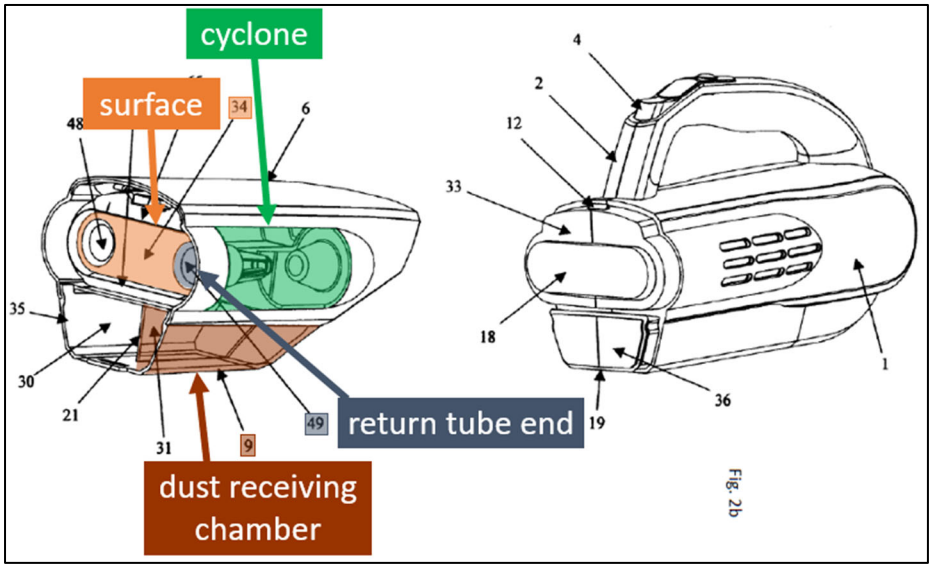
13. The Combined Teachings of Jianan and Khalil Render Obvious Claim 13

Reference Number	Claim Limitation
[13]	"The hand vacuum cleaner of claim 12 wherein the first cyclone unit is sealed when removed from the hand vacuum cleaner other than fluid flow passages leading to and from the first cyclone unit."

394. In my opinion, Jianan in combination with Khalil renders obvious the hand vacuum cleaner of claim 12 wherein the first cyclone unit is sealed when removed from the hand vacuum cleaner other than fluid flow passages leading to and from the first cyclone unit.

395. In my opinion, Jianan teaches a first cyclone unit comprising a cyclone and a dirt collection chamber. *See* Ground 5, Limitation [1c]. As I explained for Claim 12, in my opinion, Jianan in combination with Khalil renders obvious the dirt collection chamber is sealed when removed. *See* Ground 5, Claim 12. Also, Jianan teaches that "**cyclone 46**" is also sealed when

removed, as shown in the annotated image below:



Ex0113 at Figs. 2a-2b.

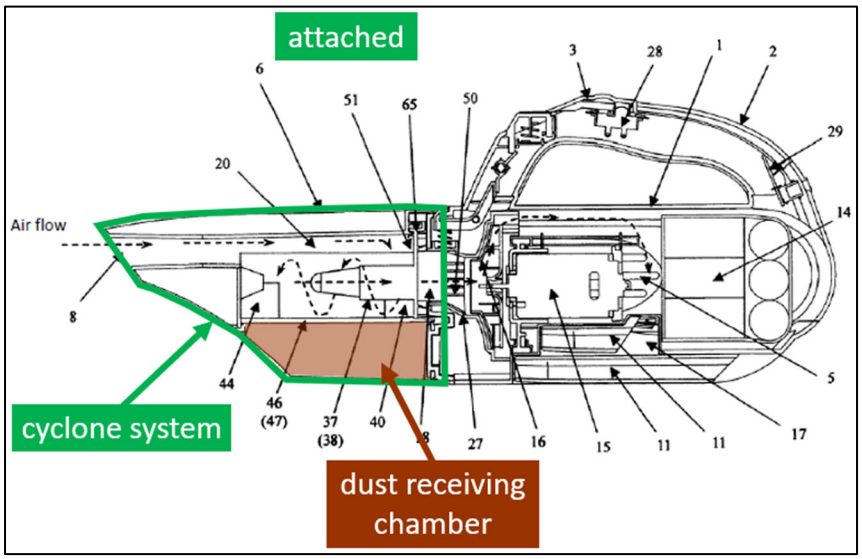
396. Jianan teaches that its "separator top 65 has a … **return tube end 49**" and a "**surface 34**" that is located at the rear of "**cyclone 46**," as is depicted above. Ex1013, 7. Jianan teaches that "[a]ir leaves the cyclones 46 and 47 through return tube ends 48 and 49 respectively." Ex1013, 10. In my opinion, a POSA would have understood that Jianan's "**return tube end 49**" is a fluid flow passage at least because air passes through it. Thus, in my opinion, a POSA would have understood that Jianan's "**cyclone 46**" is sealed when removed. Therefore, in my opinion, a POSA would have understood that, in Jianan, the first cyclone unit is sealed when removed from the hand vacuum cleaner other than fluid flow passages leading to and from the first cyclone unit.

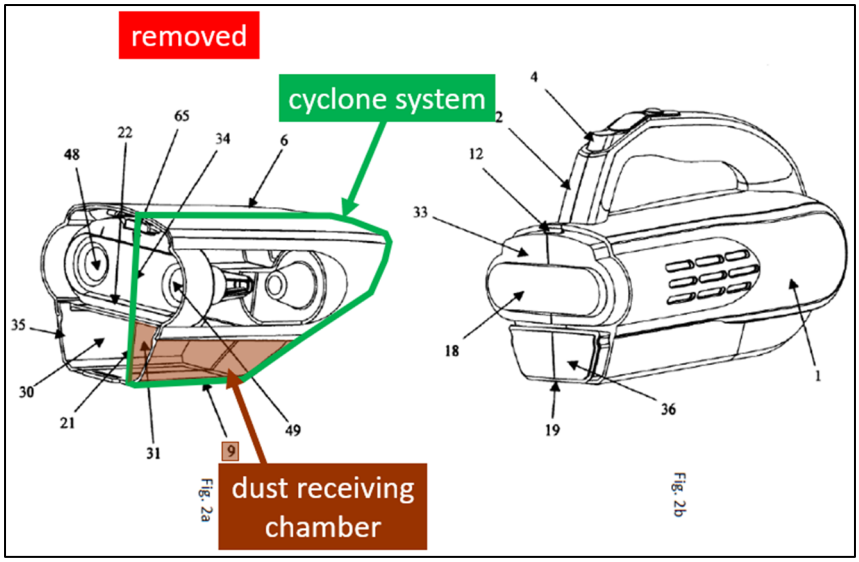
14. The Combined Teachings of Jianan and Khalil Render Obvious Claim 14

Reference Number	Claim Limitation
[14]	"The hand vacuum cleaner of claim 1 wherein the dirt collection chamber is removable from the hand vacuum cleaner with the first cyclone unit."

397. In my opinion, Jianan in combination with Khalil renders obvious the hand vacuum cleaner of claim 1 wherein the dirt collection chamber is removable from the hand vacuum cleaner with the first cyclone unit.

398. Jianan teaches that its "**dust receiving chamber**" is removable from the hand vacuum with its "**cyclone system**," as shown in the annotated images below:





Ex1013 at Figs. 3, 2a-2b.[5]

399. As I explained for Limitation [1c], in my opinion, Jianan's "cyclone system" is a first cyclone unit, and a POSA would have understood that Jianan teaches the dirt collection chamber is removable from the hand vacuum cleaner with the first cyclone unit. *See* Ground 5, Limitation [1c].

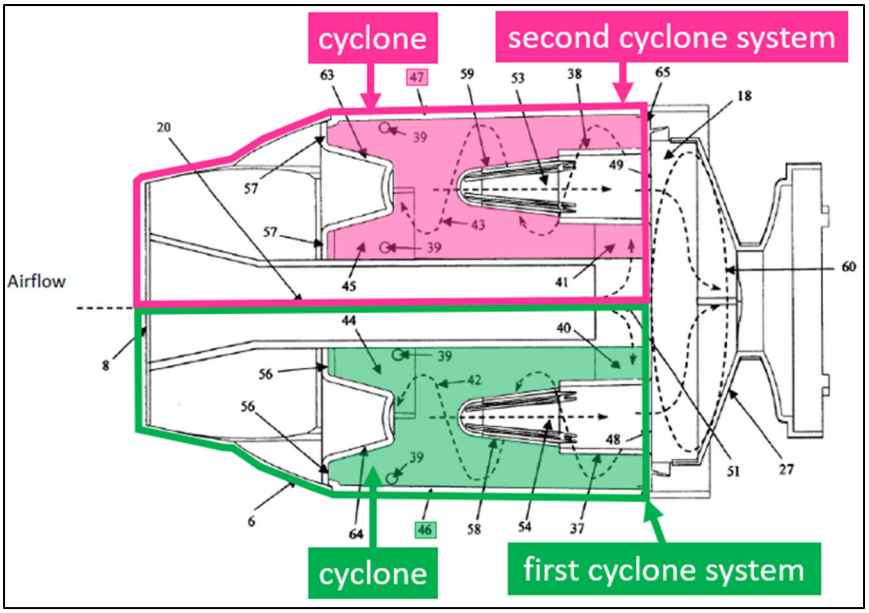
[5] For clarity, while these annotations to Jianan Figure 3 identify the left-most side of Jianan's dual-cyclone chamber as the first cyclone unit and dirt collection chamber, for Figure 2a, I annotate the right-most side of Jianan's dual-cyclone chamber, which is separate from Jianan's first cyclone unit and dirt collection chamber, for illustrative purposes in this declaration only, as it more clearly depicts Jianan's teachings.

15. The Combined Teachings of Jianan and Khalil Render Obvious Claim 15

Reference Number	Claim Limitation
[15]	"The hand vacuum cleaner of claim 1 wherein the first cyclone unit has a single cyclone and a single dirt collection chamber."

400. In my opinion, Jianan in combination with Khalil teaches the hand vacuum cleaner of claim 1 wherein the first cyclone unit has a single cyclone and a single dirt collection chamber.

401. In my opinion, Jianan teaches the first cyclone unit has a single cyclone and a single dirt collection chamber. For example, Jianan teaches that its "dust cup part includes two parallel cyclones"—specifically, "**cyclone 46**" and "**cyclone 47**," and "two dust collection chambers." Ex1013, Abstract. In my opinion, a POSA would understand that each cyclone and its respective dust collection chamber constitute a **first** and **second** "cyclone system," as shown in the annotated images below:



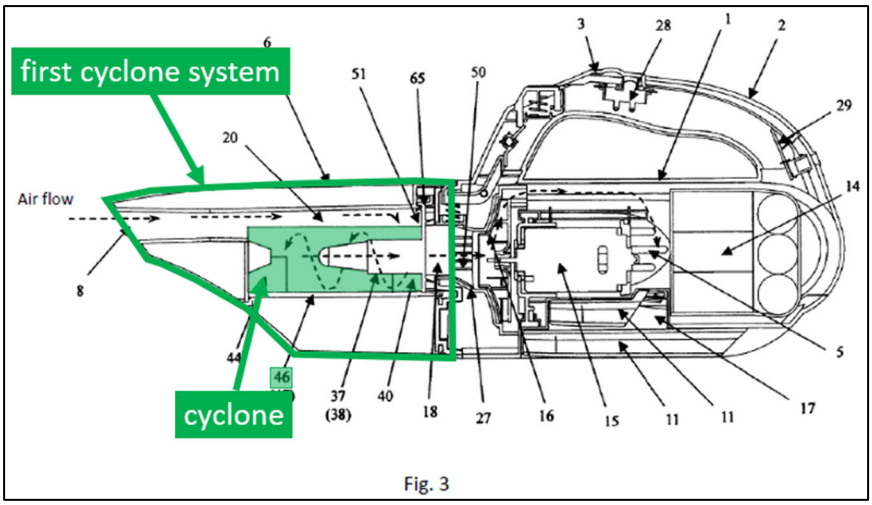


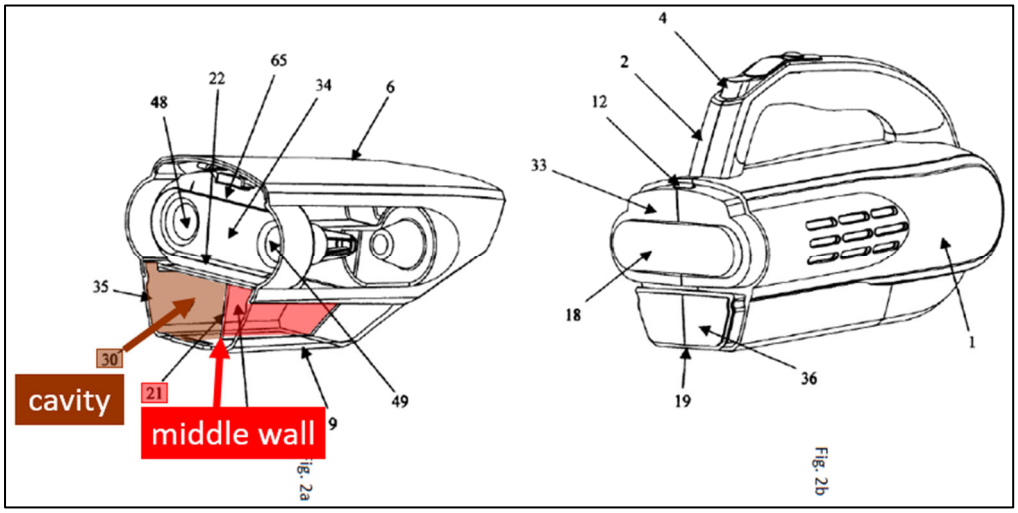
Fig. 3

Ex1013 at Abstract, 8, Figs. 6, 3.

402. As shown above, Jianan's first and second cyclones are positioned in two separate cyclone systems that a POSA would understand remove particles from the air separately. Ex1013, Figs. 6, 3. Jianan teaches that air "flows through the air inlet channel 20 to the T-shaped double bifurcation 51, where the air flow is divided into two streams" and "enter[s] the cyclone

46 and cyclone 47 through the cyclone opening 40 and the cyclone 41, respectively." Ex1013, 9. Jianan also teaches that "dust laden air flows tangentially onto the inner surfaces of the cyclones … and forms vortices 43 and 42 within the respective cyclones, respectively," prior to exiting the separate cyclones through the "return pipe 37 and the return pipe 38." *Id.*, 8-9. In my opinion, Jianan's first "cyclone system" is the first cyclone unit, and Jianan's "cyclone 46" is the single cyclone in the first cyclone unit.

403. Jianan also teaches that "dust chamber 9 includes a … **middle wall 21**," which "divides the cavity … into two parts, forming a **cavity 30** and a cavity 31," as shown in the annotated images below:



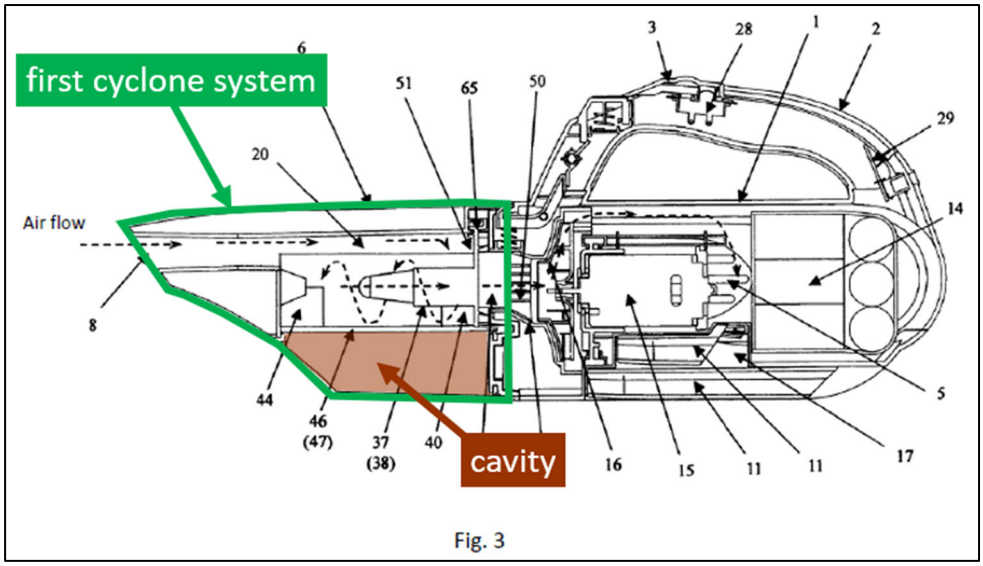


Fig. 3

Ex1013 at 7, Figs. 2a, 2b, 3.

404. In my opinion, Jianan's "**cavity 30**" is the single dirt collection chamber in the first cyclone unit. Thus, in my opinion, Jianan teaches that the first cyclone unit has a single cyclone and a single dirt collection chamber.

405. In addition, Khalil teaches that "[w]hen the filter assembly 128 is inserted into the dirt cup 116, the volumetric space between the filter support plate 142 and the dirt cup door 134 defines a cyclonic flow chamber," which, in my opinion, a POSA would have understood comprises a single cyclone and a single dirt collection chamber. Ex1014 ¶29.

406. Also, as I explained for Limitation [1c], in my opinion, Jianan and Khalil each teach a first cyclone unit positioned in the air flow passage, the first cyclone unit comprising at least one cyclone and at least one dirt collection chamber external to the cyclone chamber. *See* Ground 5, Limitation [1c].

16. The Combined Teachings of Jianan and Khalil Render Obvious Claim 16

Reference Number	Claim Limitation
[16]	"The hand vacuum cleaner of claim 15 wherein the single dirt collection chamber is positioned exterior to the single cyclone."

407. In my opinion, Jianan in combination with Khalil teaches the hand vacuum cleaner of claim 15 wherein the single dirt collection chamber is positioned exterior to the single cyclone.

408. For the same reasons that I explained for Limitation [1c], in my opinion, Jianan's single dirt collection chamber is positioned exterior to the single cyclone. *See* Ground 5, Limitation [1c].

17. The Combined Teachings of Jianan and Khalil Render Obvious Claims 17 and 18

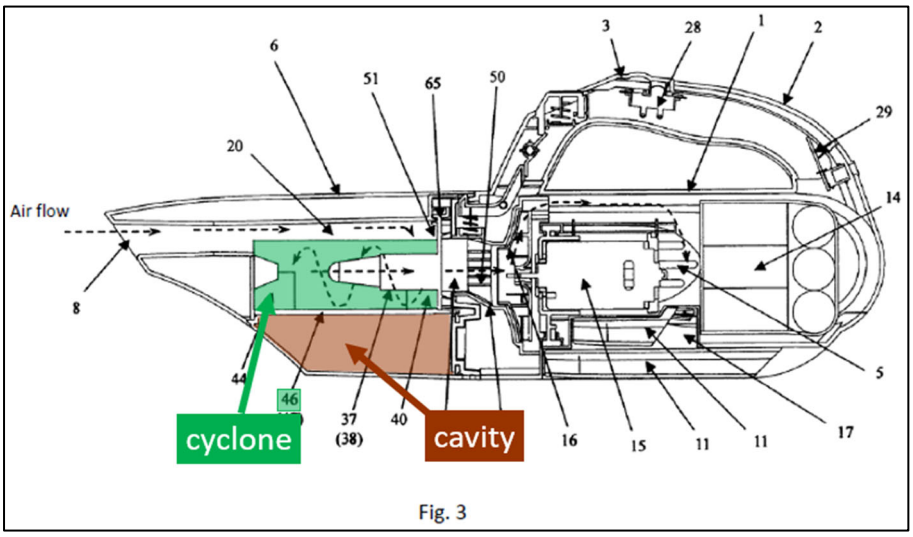
Reference Number	Claim Limitation
[17]	"The hand vacuum cleaner of claim 16 wherein the single cyclone and the single dirt collection chamber comprise a one-piece assembly."
[18]	"The hand vacuum cleaner of claim 17 wherein the single cyclone and the single dirt collection chamber are integrally formed."

409. In my opinion, Jianan in combination with Khalil teaches the hand vacuum cleaner of claim 16 wherein the single cyclone and the single dirt collection chamber comprise a one-piece assembly.

410. In my opinion, Jianan in combination with Khalil teaches the hand vacuum cleaner of claim 17 wherein the single cyclone and the single dirt collection

chamber are integrally formed.

411. In my opinion, Jianan teaches that "**cyclone 46**" and "**cavity 30**" comprise a one-piece assembly and are integrally formed, as shown in the annotated image below:



Ex1013 at Fig. 3.

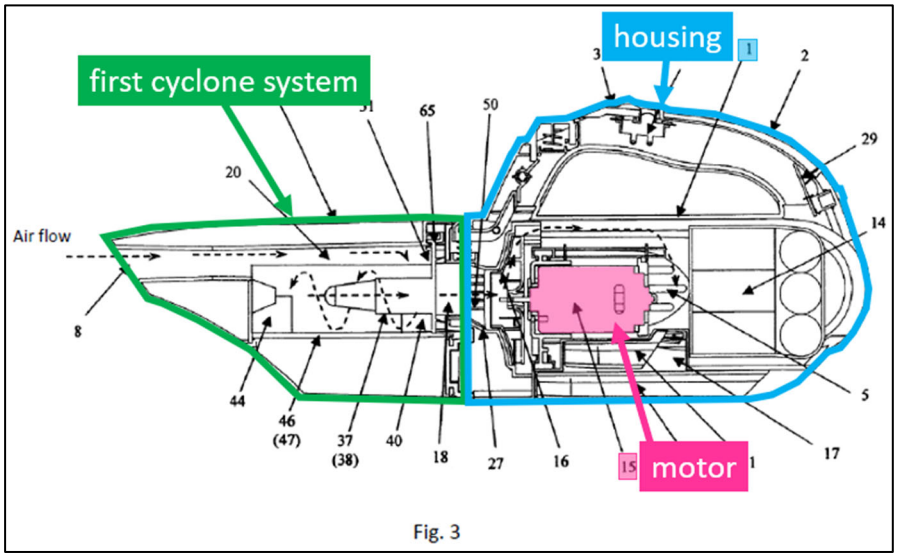
412. Also, Jianan teaches that the "main components of the dust cup part, dust cup, and cyclone body are permanently bonded together." Ex1013 at 4. In my opinion, this teaching further supports that Jianan teaches that the single cyclone and the single dirt collection chamber comprise a one-piece assembly.

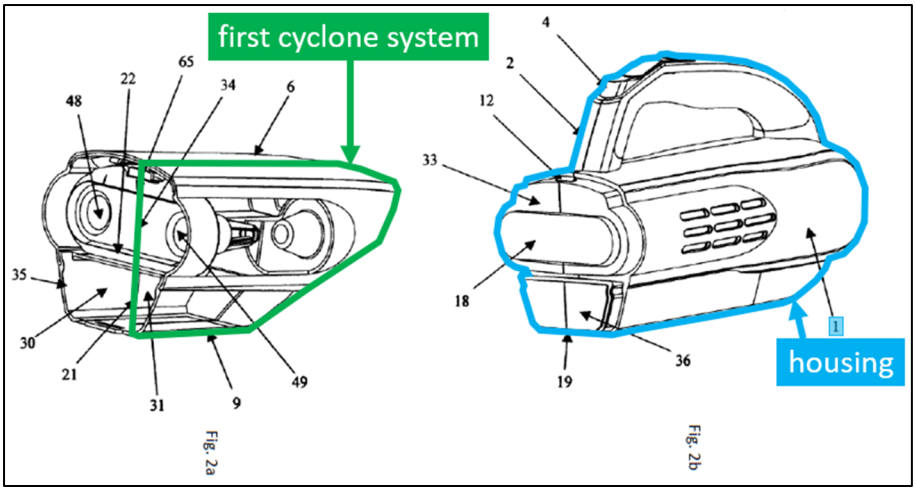
18. The Combined Teachings of Jianan and Khalil Render Obvious Claim 19

Reference Number	Claim Limitation
[19]	"The hand vacuum cleaner of claim 1 wherein the hand vacuum cleaner further comprises a suction motor housing, the suction motor is positioned in the suction motor housing and the first cyclone unit is removably mounted to the suction motor housing."

413. In my opinion, Jianan in combination with Khalil teaches the hand vacuum cleaner of claim 1 wherein the hand vacuum cleaner further comprises a suction motor housing, the suction motor is positioned in the suction motor housing and the first cyclone unit is removably mounted to the suction motor housing.

414. Jianan teaches that "[w]ithin the main **housing 1** is a battery pack 14 and **motor 15**," as shown in the annotated images below:





Ex1013 at 8, Figs. 3, 2a-2b.

415. As is depicted above, the first "cyclone system" can be "separated from the main housing 1." *Id.*, 7. In my opinion, Jianan's "main housing 1" is the suction motor housing because it houses the suction motor, and Jianan's "motor 15" is the suction motor.

19. The Combined Teachings of Jianan and Khalil Render Obvious Claim 20

Reference Number	Claim Limitation
[20]	"The hand vacuum cleaner of claim 1 further comprising a second cyclone unit downstream from the first cyclone unit."

416. In my opinion, Jianan in combination with Khalil renders obvious the hand vacuum cleaner of claim 1 further comprising a second cyclone unit downstream from the first cyclone unit.

417. Jianan teaches first and second cyclone units arranged in parallel with each unit comprising a single cyclone and a single dirt collection chamber. *See*

Ground 5, Claim 15.

418. To the extent Jianan does not disclose the second cyclone unit downstream from the first cyclone unit, it is my opinion that a POSA would have found this arrangement obvious. In my opinion, a POSA would have been motivated to rearrange Jianan's first and second cyclone units to be in series. Alternatively, in my opinion, a POSA would have been motivated to place a second set of parallel cyclone units downstream of Jianan's first set. A POSA would have understood that these modifications would further Jianan's stated purpose of an "efficient cyclone effect … and constant suction performance," and in my opinion a POSA would have had a reasonable expectation of success in doing so. Ex1013, 4. For example, Jianan teaches that vacuum cleaners "using multiple cyclones can separate finer dust from the air," and Jianan notes that the concept of "two cyclones arranged in series" has been disclosed in a "large number of patents," which, in my opinion, would have motivated a POSA to incorporate one. Ex1013, 3. In my opinion, a POSA would have understood that incorporating an in-series multi-cyclone-unit orientation into Jianan's hand vacuum would have involved the simple substitution of one well-known cyclone orientation for another, or, alternatively, the downstream addition of another set of parallel cyclone units, to achieve the predictable

result of fine dust separation. Further, in my opinion, a POSA would have found this obvious to try because there are only a finite number of multi-cyclone orientations to use—namely, two: parallel and in series. When so modified, Jianan's cleaner includes a second cyclone unit downstream from the first cyclone unit. In my opinion, a POSA would have had a reasonable expectation of success making this modification because in-series multi-cyclonic arrangements were well known in the art, as Jianan recognizes. Also, in my opinion, a POSA would have had a reasonable expectation of success making this modification because Jianan already teaches a multi-cyclone arrangement.

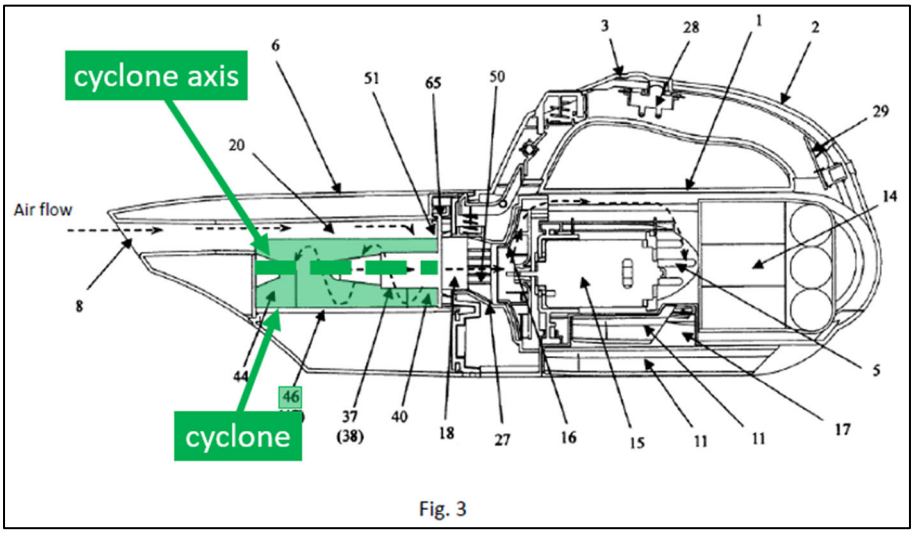
20. The Combined Teachings of Jianan and Khalil Render Obvious Claim 21

Reference Number	Claim Limitation
[21]	"The hand vacuum cleaner of claim 1 wherein the at least one cyclone has a cyclone axis extending longitudinally through the at least one cyclone and the dirt collection chamber has a perimeter at the front end and the openable door has a perimeter that is generally the same as the perimeter of the dirt collection chamber."

419. In my opinion, Jianan in combination with Khalil teaches the hand vacuum cleaner of claim 1 wherein the at least one cyclone has a cyclone axis extending longitudinally through the at least one cyclone and the dirt collection chamber has a perimeter at the front end and the openable door has a perimeter that is generally the same as the perimeter of the dirt

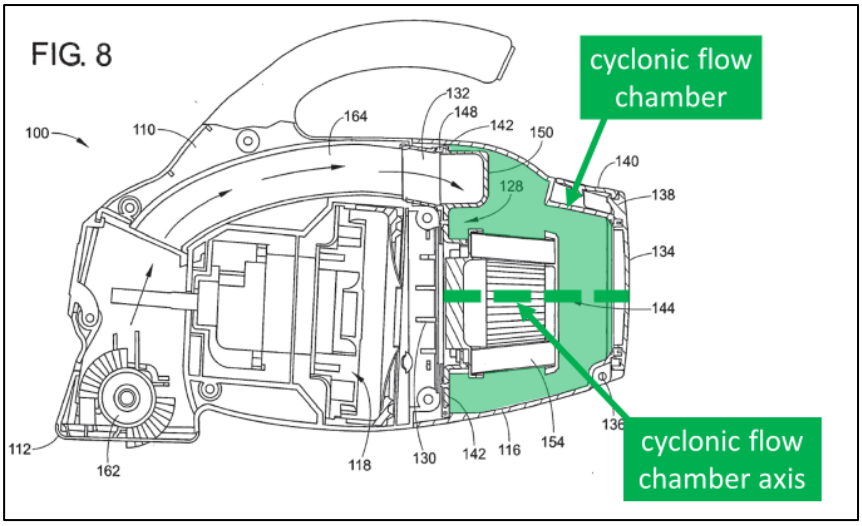
collection chamber.

420. Jianan teaches that its "**cyclone 46**" has a longitudinally extending "**cyclone**" **axis**, as shown in the annotated image below:



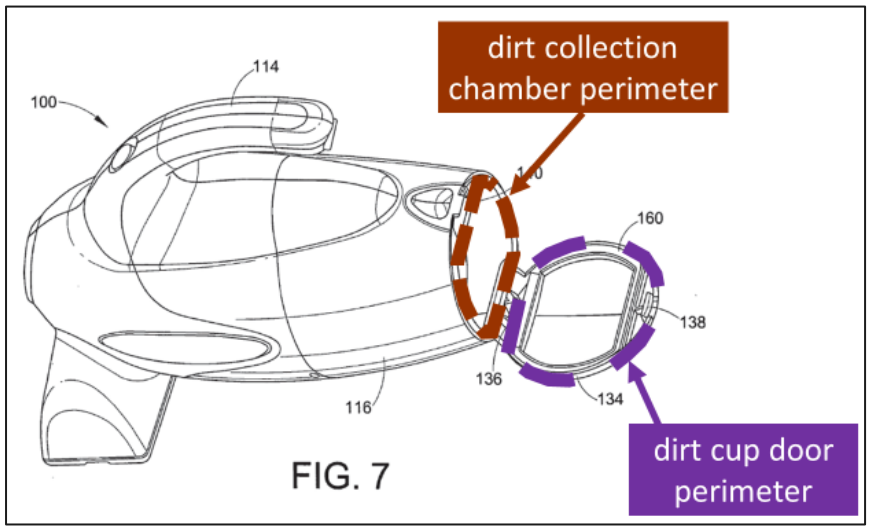
Ex1013 at Fig. 3.

421. Also, Khalil teaches that its "**cyclonic flow chamber**" has a longitudinally extending "**cyclonic flow chamber**" **axis**, as shown in the annotated image below:



Ex1014 at Fig. 8.

422. Khalil also teaches that the "cyclonic flow chamber" **dirt collection chamber** has a perimeter that is generally the same as the perimeter of Khalil's "**dirt cup door 134**," as shown in the annotated image below:



Ex1014 at Fig. 7.

423. As I explained, in my opinion, a POSA would have been motivated to implement Jianan's "movable door" teachings using Khalil's dirt cup door 134 teachings and a POSA would have had a reasonable expectation of success doing so. *See* Ground 5, §1. When so combined, in my opinion, Khalil's "dirt cup door 138" perimeter is at the front end and is generally the same as dirt collection chamber's perimeter.

21. The Combined Teachings of Jianan and Khalil Render Obvious Claim 22

Reference Number	Claim Limitation
[22]	"The hand vacuum cleaner of claim 1 wherein the front wall is the openable door."

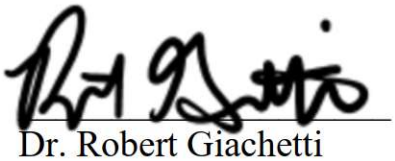
424. In my opinion, Jianan in combination with Khalil teaches the hand vacuum cleaner of claim 1 wherein the front wall is the openable door.

425. For the same reasons as I explained in Limitation [1d], in my opinion, Jianan in combination with Khalil renders obvious that the front wall is the openable door. *See* Ground 5, Limitation [1d].

XI. SECONDARY CONSIDERATIONS OF NON-OBVIOUSNESS

426. 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 well-known configurations and features. 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: March 4, 2024