

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

DYSON TECHNOLOGY LIMITED AND DYSON, INC.,

Petitioners,

v.

OMACHRON INTELLECTUAL PROPERTY INC.,

Patent Owner.

DECLARATION OF ROBERT GIACHETTI

REGARDING

U.S. Patent No. 11,910,984

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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 1-18 of U.S. Patent No. 11,910,984 (the “’984 Patent”) in this petition for *inter partes* review (“IPR”). I refer to these as the “Challenged Claims.”
3. I have been asked to consider whether certain references invalidate the Challenged Claims.
4. I am a salaried employee of Fusion Engineering, LLC. Fusion Engineering is being compensated for my time in connection with this matter at the consulting rate of \$410 per hour. My compensation is not affected by the content of my opinions, testimony, or the outcome of this matter.
5. The prior art references on which my opinions are based are:
 - U.S. Patent Publication No. US 2017/0079489 (“Dimbylow,” attached as exhibit 1005)
 - U.S. Patent No. 8,021,453 (“Howes,” attached as exhibit 1006)
 - U.K. Patent Publication No. GB283,179 (“IPVG,” attached as exhibit 1007)
 - U.S. Patent No. 7,175,682 (“Nakai,” attached as exhibit 1008)
 - PCT Publication No. 2013/117901 (“Sunderland,” attached as exhibit 1017)
6. In my opinion, the Challenged Claims are invalid based on the following:
 - The combination of Dimbylow and Howes renders claims 1-18 obvious.

- The combination of IPVG and Nakai renders claims 1-18 obvious.
- The combination of IPVG, Nakai, and Sunderland renders claims 1-18 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 holistic safety and efficacy analysis of various consumer vacuum-sealer products. In particular, I conducted tear-down analyses, reviewed the vacuum-sealers' performance for safety and functionality considerations, analyzed the function and operation of vacuum pumps, analyzed fluid flow paths, and analyzed the operation of small valves. I further worked with an electrical engineer to review the safety of the products' internal electronics.
 20. Since approximately 2013 to the present, I have used principles of biomechanics, as well as principles of physics, to analyze the effect on a user or nearby operator of pressure cookers that failed, ejecting hot liquid. This work involved analyses of, among other things, forces that are applied to pressure cookers, the physics involved in the operation of pressure cookers, and biomechanical principles.
 21. In approximately 2013-2016, I used industry testing methods and developed and designed novel experiments and testing related to fluid flow

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

22. In approximately 2015, I applied my biomechanical background to the use of cane handles, which involved assessing the amount of force to be applied to the handle and developing a handle that could both support that amount of force reliably and house a battery for novel electronics that were embedded in the cane.
23. In approximately 2015-2017, I investigated various properties of a garden hose ball valve. I worked as a part of a team to investigate valve properties, including materials, geometry, and seal selection. We further investigated

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

24. In approximately 2016, I conducted an analysis of a cordless, handheld consumer leaf blower. In particular, I analyzed the functioning, operation, and failure of blower motors and fans in relation to the direction of fluid flow within a consumer leaf blower. This analysis concerned, among other things, consideration of fluid flow and mechanical design of leaf blowers, specifically regarding fan blade failure and its potential impact on the consumer-operator.
25. In approximately 2017-2018, I conducted an efficacy analysis of hand grips for ergonomic handheld hose nozzles. This analysis included a review of handheld nozzles in the marketplace that were advertised as ergonomic, as well as biomechanically modelling postures expected to be associated with the ergonomic handheld nozzles. To biomechanically model these handheld nozzles, I used a program called 3DSSPP, which models, among other things, human balance and effort levels. This program can be used calculate human joint torque based on operator input, which I used (and continue to use) to analyze the ergonomics of holding various handles, including handles for household consumer products.
26. I further used 3DSSPP to model biomechanics for use in household

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

27. In approximately 2018-2020, I analyzed the operation of computer-controlled blowers, manifolds, valves, and sensors in consumer air mattresses. In particular, the analysis concerned the ability to control and maintain constant air pressure within air mattresses at particular pressure set points. This analysis concerned, among other things, fluid dynamics, fluid flow, fluid path selection, and changes in pressure.
28. In 2021, I published a paper, *Characterization of the Release of Heated and Pressurized Water from a Pressure Cooker*, in the Journal of Burns. In this paper, I analyzed and described how fluid is ejected from a pressure cooker as a result of a flash boil event. In this analysis, I considered the operation of an exemplary household pressure cooker, analyzing fluid dynamics resulting from the trade-off between volume of liquid and

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

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

III. DOCUMENTS AND MATERIALS CONSIDERED

30. In forming the opinions expressed in this Declaration, I relied upon my education, training, knowledge, and experience in the relevant field of the art, as well as information pertaining to the documents described below.
31. In preparing this Declaration, I have considered the materials referenced herein, including the '984 patent and its file history, the Dimbylow, Howes, IPVG, Nakai, and Sunderland prior art references on which my opinions are based, and other documents listed in the Exhibit List of the Petition. These references and documents reflect the state of the relevant art at the time of the alleged invention and the background knowledge of a POSA.
32. I have also reviewed the Patent Owner ("PO")'s infringement contentions served in the related litigation, *Certain Surface Cleaning Devices and Components Thereof*, Dkt. No. 337-TA-1404 (the "ITC Litigation").

IV. LEGAL PRINCIPLES

33. Dyson's counsel has informed me of certain legal standards. I have applied these understandings in my analysis as detailed below. I am not an attorney

and offer no legal opinions.

34. I have been informed and understand that a patent claim is invalid if it is obvious, and that obviousness requires that the claim be obvious from the perspective of a person of ordinary skill in the relevant art at the time of the alleged invention. I have been informed and understand that a claim may be obvious in view of a single prior art reference, or may be obvious in view of a combination of two or more prior art references.
35. I have been informed and understand that the level of ordinary skill in the art may be determined by considering such factors as the education level of those working in the field, the sophistication of the technology, the types of problems encountered in the art, the prior art solutions to those problems, and the speed at which innovations are made. I have been informed and understand that not all of these factors need be considered and that one or more of these factors may control.
36. I have been informed and understand that an obviousness analysis is based on several factors, including the scope and content of the prior art, what differences, if any, existed between the alleged invention and the prior art, and the level of ordinary skill in the pertinent art at the time of the alleged invention.
37. I have been informed and understand that to determine whether a claim is

obvious, it is appropriate to consider, among other factors:

(1) whether the teachings of the prior art references disclose known concepts combined in familiar ways, and when combined, would yield predictable results; (2) whether a person of ordinary skill in the art could implement a predictable variation, and would see the benefit of doing so; (3) whether the claimed elements represent one of a limited number of known design choices, and would have a reasonable expectation of success by those skilled in the art; (4) whether a person of ordinary skill would have recognized a reason to combine known elements in the manner described in the claim; (5) whether there is some teaching or suggestion in the prior art to make the modification or combination of elements claimed in the patent; and (6) whether the innovation applies a known technique that had been used to improve a similar device or method in a similar way.

38. I further have been informed and understand that while it may be helpful to identify a reason for this combination, common sense should guide and no rigid requirement of finding a teaching, suggestion, or motivation to combine is required.

39. I further have been informed and understand that certain factors called secondary considerations may be considered in evaluating the obviousness of a claim. I understand that such secondary considerations include,

among other things, commercial success of the alleged invention, skepticism of those having ordinary skill in the art at the time of the alleged invention, unexpected results of the alleged invention, any long-felt but unsolved need in the art that was satisfied by the alleged invention, the failure of others to make the alleged invention, praise of the alleged invention by those having ordinary skill in the art, and copying of the alleged invention by others in the field. I have been informed and understand that there must be a nexus—a connection—between any such secondary considerations and the alleged invention. I also have been informed and understand that contemporaneous and independent invention by others is a secondary consideration tending to show obviousness.

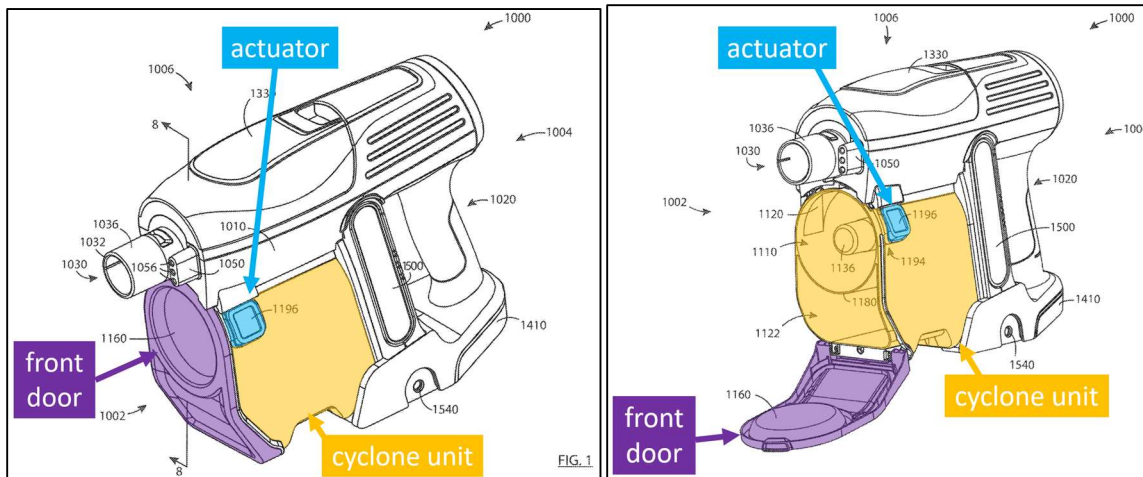
40. I have been informed and understand that a prior art reference may expressly or inherently describe a limitation of a claim. I have been informed and understand that if the prior art necessarily includes or functions in accordance with a claim's limitation, then the prior art inherently discloses that limitation. I have been informed and understand that to establish inherency, the evidence must make clear that the missing descriptive matter is necessarily present in the item of prior art and that it would be so recognized by persons of ordinary skill in the art.

V. PERSON OF ORDINARY SKILL IN THE ART

41. In my opinion, a Person of Ordinary Skill in the Art (“POSA”) in the subject matter of the ’984 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.

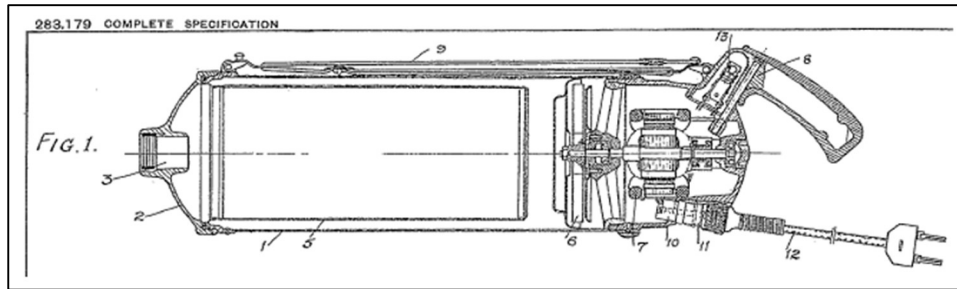
VI. TECHNOLOGY BACKGROUND

43. The Challenged Claims are directed to hand vacuum cleaners that use a cyclone unit to treat the air, where the cyclone unit includes an openable front door with “[a] lock [that] secures the front door in the closed position.” *See* Ex. 1001, Abstract, Fig. 1.
44. The ’984 Patent explains that, to open the “**cyclone unit**,” “a user may unlock the assembly door lock” “by depressing the **actuator**,” as shown in the annotated images below:



Id., 23:16-19, Figs. 1, 6.

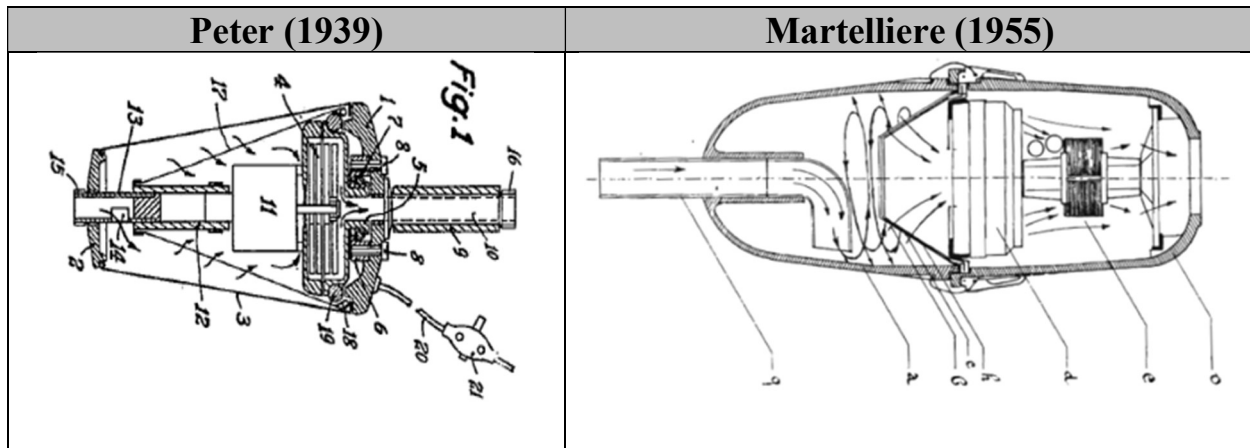
45. In my opinion, this feature was well-known, as were the '984 Patent's claims' remaining elements, which concern commonly used features, including suction motors, cyclone units, battery packs, and pistol grip handles.
46. For over a century, vacuum cleaners have been using the features described in the '984 Patent, such as a suction motor that draws dirty air into a dirty air inlet, filtration processes that clean the air, and dirty air outlets that exhaust the cleaned air. Many early vacuum cleaners, such as the vacuum cleaner described in U.K Patent Publication No. GB283,179 to Inventia Patent-Verwertungs-Gesellschaft ("IPVG"), used disposable dust bags to separate dust from the air, as shown in the figure below:



Ex1007, Fig. 1; *see also id.*, 1:22-33 (“According to the present invention the apparatus comprises a casing containing a motor driven fan and a dust bag or like member through which the suction air stream passes and provided with a handle by which the apparatus may be readily lifted during operation, the handle being formed at its end to be connected to the casing with a conical portion fitting in a conical bore of the casing and secured therein by a longitudinally acting screw arranged eccentrically of the bore.”).

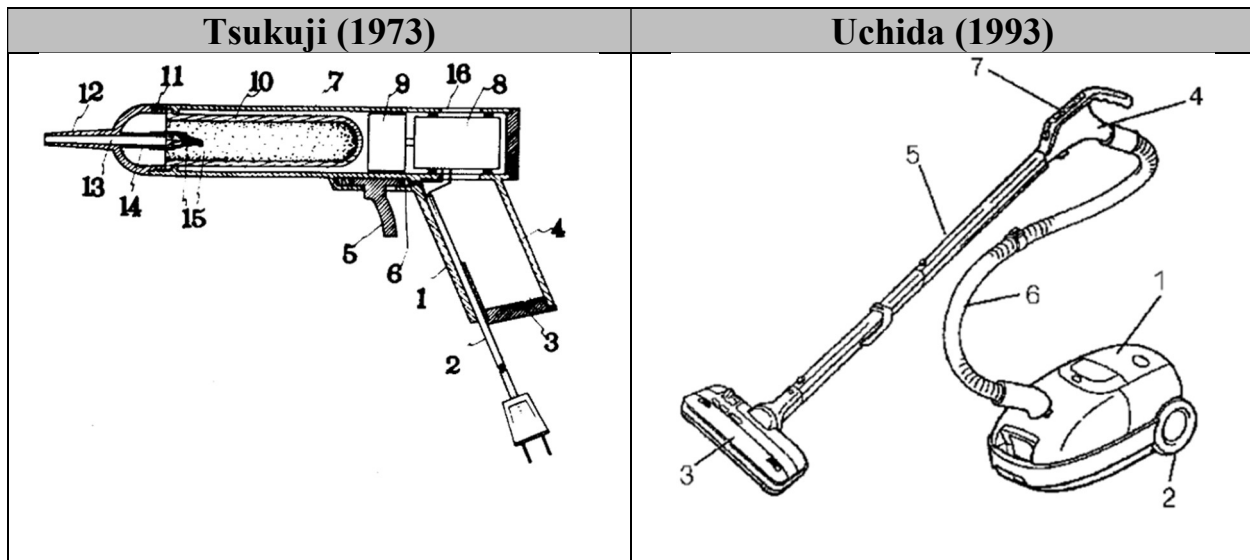
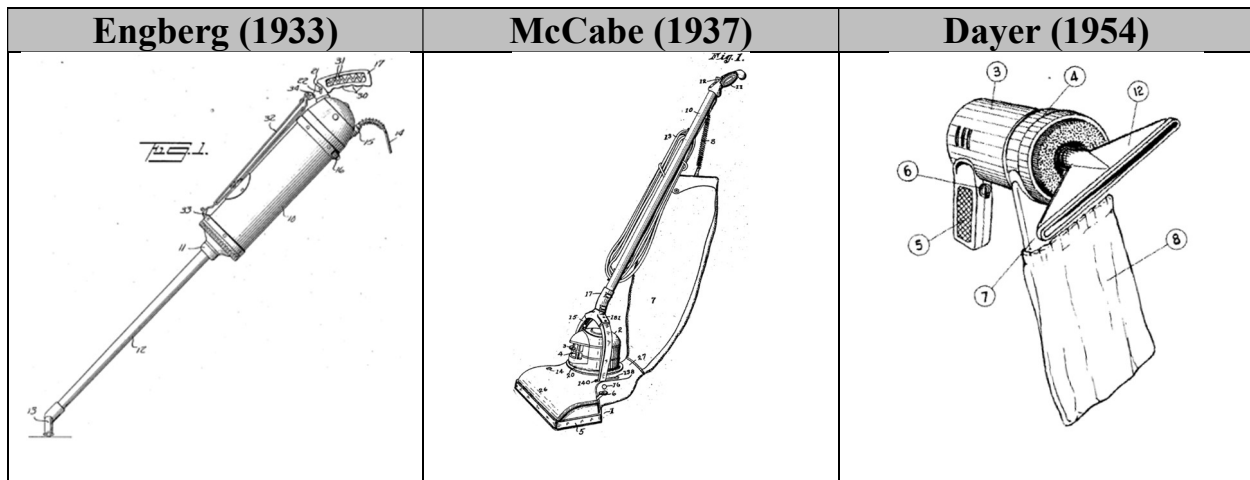
47. Those skilled in the art recognized that this dust-bag method is costly (dust bags must be replaced), loses effectiveness during use (dust-bag cleaners lose suction as they fill), and prevents the user from seeing how full the bag, leaving a user to guess as to when to empty or replace it. However, those skilled in the art also recognized, more than 80 years ago, that vacuum cleaners that use cyclonic separation units—which use cyclonic airflow to separate heavier-than-air dust particles from the dirty air—have certain benefits over dust bag filtration units, as was taught by Swiss Patent No. CH203,675 to Peter in 1939, and French Patent No. 1,094,603 to

Martelliere in 1955, as shown in the figures below:



Ex1015, Fig. 1; Ex1012, 1, Fig. 1.

48. Further, vacuum cleaners having features that assist with maneuverability and usability, such as a pistol grip handle, have also been known in the art for nearly a century, including as taught by U.S. Patent No. 1,908,834 to Engberg et al. in 1933, U.S. Patent No. 2,099,172 to McCabe et al. in 1937, Spanish Patent No. ES43816 to Dayer in 1954, Japanese Patent Publication No. JPS48107459U to Tsukuji in 1973, and Japanese Patent Publication No JPH0580451U to Uchida et al. in 1993, as shown in the figures below:



Ex1019, Fig. 1; *see also id.* 1:53-54 (“Handle 17 has the general form of a pistol grip.”); Ex1020, Fig. 1; Ex1022, Fig. 1; Ex1023, Fig. 1; *see also* Ex1023 ¶6 (“4 is a gun-type handle connected to the suction unit 3 via an extension tube 5 at the front and the suction port of the main unit 1 via a flexible hose 6 at the rear.”); Ex1025, page 3.

49. This style of handle allows the user to maneuver the vacuum more ergonomically and can reduce stress on the user’s wrist while cleaning.

Ex1017, 6:11-12.

50. Battery powered vacuum cleaners are also common. Electric vacuum cleaners were originally designed with power cords for plugging into wall outlets. As was well known in the art, substituting this power source for a battery pack allows the user to move freely around the area to be cleaned.

Ex1017, 1:6-7, 1:15-16, 1:19-22, 7:13-14.

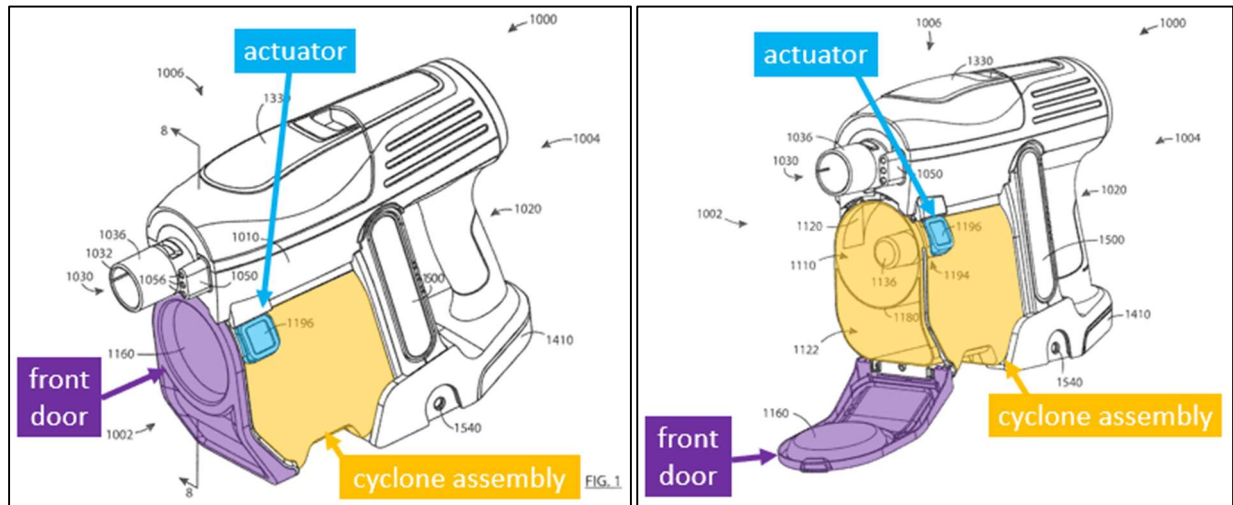
VII. BACKGROUND OF THE '984 PATENT

51. The '984 Patent is titled "Handheld Surface Cleaning Apparatus." Ex. 1001, Title. The '984 Patent states that it issued on February 27, 2024, from U.S. Patent Application No. 18/376,975, filed on October 5, 2023. *Id.*, Cover. The '984 Patent states that it is a continuation of application No. 18/346,834, filed on July 4, 2023, which in turn claims to be a continuation of application No. 17/342,299, filed on June 8, 2021, which in turn claims to be a continuation of application No. 16/900,465, filed on June 12, 2020, which in turn claims to be a continuation of application No. 15/642,781, filed on July 6, 2017. *Id.*

A. Summary of the '984 Patent's Specification

52. The '984 Patent states that it relates to cyclonic "hand vacuums" having "an openable front door" that is "secured in the closed position" by an "assembly door lock." Ex1001, 1:21-24, 22:52-56, 23:13-23.

53. The '984 Patent's specification explains that the "assembly door lock" for the "**openable front door**" includes an "**actuator**" "provided on the **cyclone assembly** ... or on any other portion of the hand vacuum," as shown in the annotated images below:



Ex. 1001, 23:16-23, Figs. 1, 6.

54. The '984 Patent's claimed hand vacuums also include features such as "a dirty air inlet provided at the front end," "a clear air outlet provided at the rear end," "a suction motor positioned in the air flow passage," "a cyclone unit positioned ... upstream from the suction motor," "a battery pack," and "a pistol grip handle." *Id.*, Claims. In my opinion, these are a mix of well-known, interchangeable features and configurations.
55. I have reviewed the '984 Patent's specification, and the combination of these claimed elements does not purport to provide any technical benefit or solve any purported problem.

B. Prosecution History of the '984 Patent

56. I have reviewed the prosecution history of the '984 Patent. The following is my understanding:
57. During prosecution, the Examiner allowed the '984 Patent's claims without any rejections that were based on prior art anticipating and/or rendering obvious the pending claims. Ex1004. In the Examiner's Reasons for Allowance, the Examiner stated that the prior art of record during prosecution failed to teach "the lock feature" that is recited in Limitations [1d]/[10e]—specifically, "a lock securing the front door in the closed position, the lock comprising an actuator." *Id.*, 375.
58. However, in my opinion, this feature (as well as the other limitations that are recited in the '984 Patent's claims) was well-known at the time and was disclosed in prior art that was not before the Examiner.
59. While Dimbylow, Howes, Sunderland, and Nakai were before the United States Patent and Trademark Office during the prosecution of the '984 Patent's parent applications, IPVG was not. Nor were any of the prior art combinations presented herein considered by the Examiner during the prosecution of the application that issued as the '984 Patent or its parent applications.

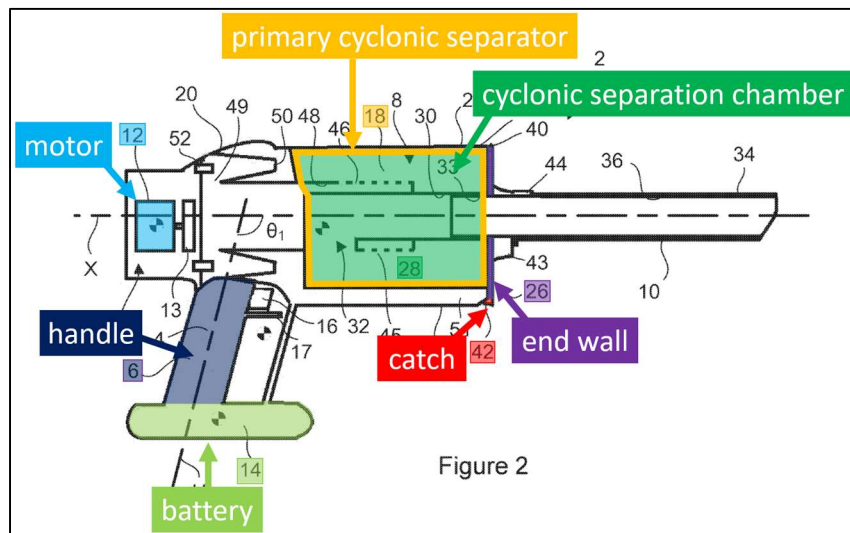
C. Priority Date of the Challenged Claims

60. For the purposes of my analysis, I have been instructed to apply and have applied a priority date of July 6, 2017, for the Challenged Claims.

VIII. BACKGROUND OF THE PRIOR ART

A. Dimbylow

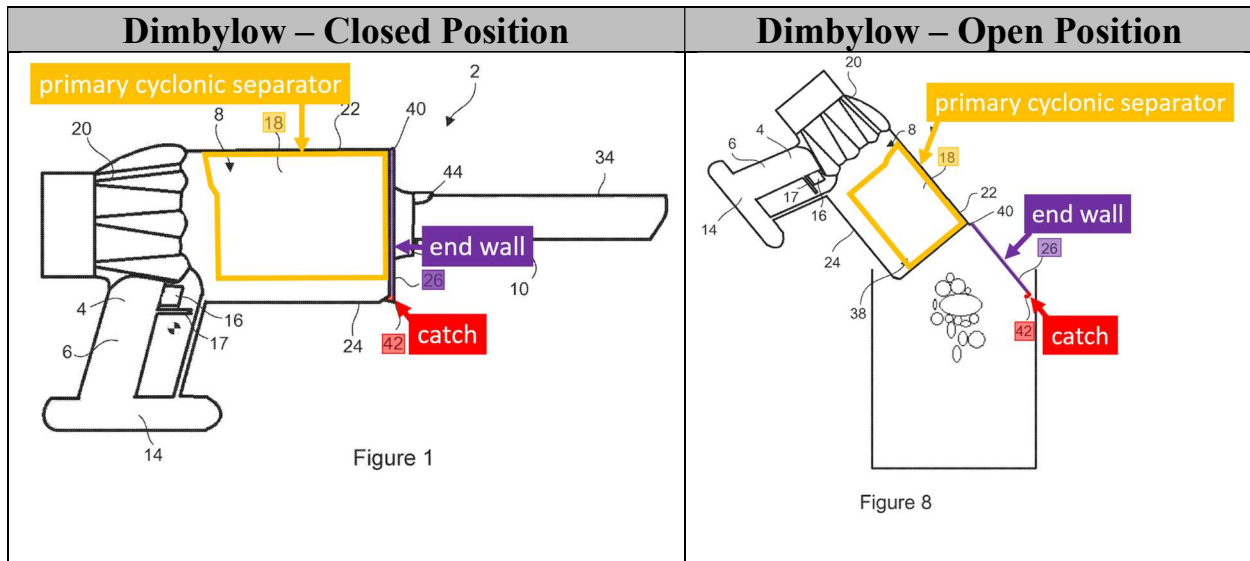
61. Dimbylow is a Dyson patent publication from 2017. Ex. 1005, Cover. Dimbylow teaches a “handheld vacuum cleaner.” *Id.* ¶8. Dimbylow’s handheld vacuum cleaner has a “primary cyclonic separator 18” with a “cyclonic separation chamber 28,” “handle 6,” “battery 14,” “motor 12,” and an “end wall 26,” which “is held in a closed position by a user-operable catch 42,” as shown in the annotated image below:



Id. ¶¶31-33, 37, 48, Fig. 2.

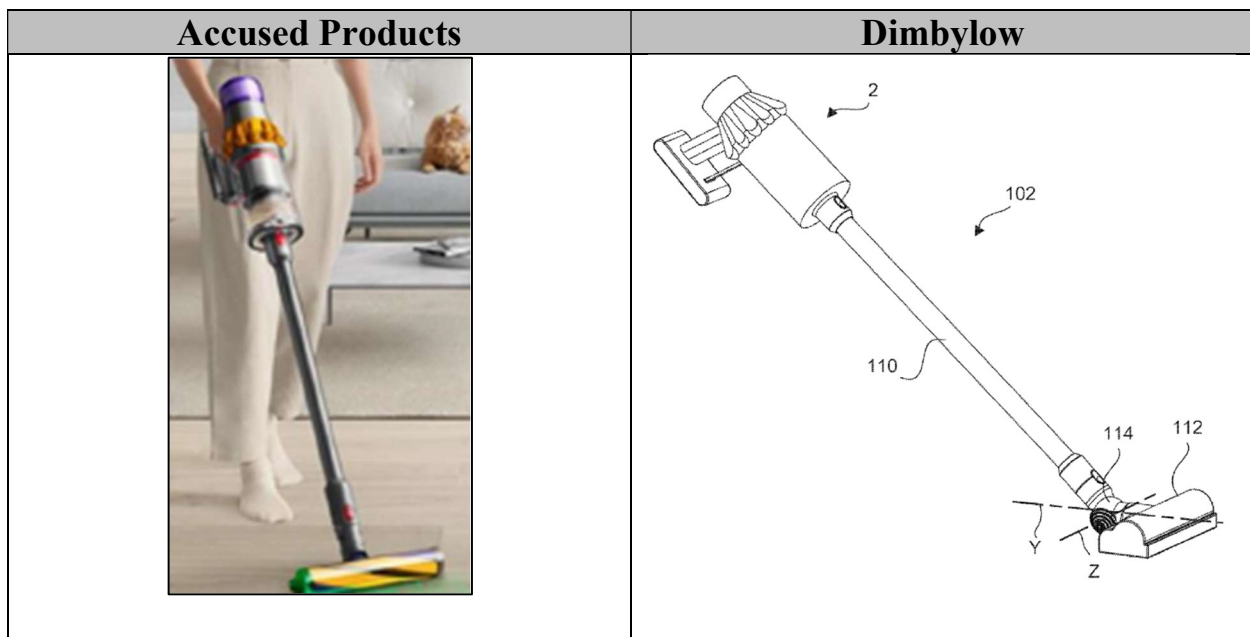
62. To open “primary cyclonic separator 18,” “the user” “release[s]” “catch 42” “and the end wall 26 [is] pivoted from its closed position into its open

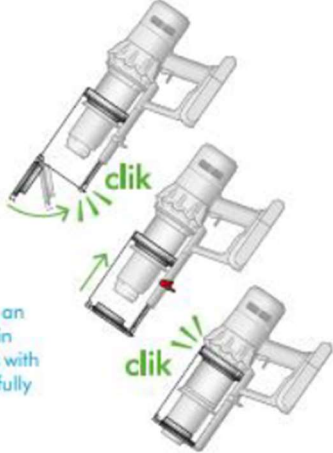
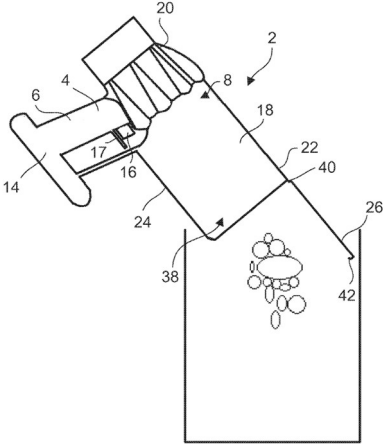
position,” as shown in the annotated images below:



Ex1005 ¶48, Figs. 1, 8.

63. In the co-pending ITC Litigation, PO accuses products that resemble Dimbylow’s configuration of infringing claims 1-18 of the ’984 Patent, as shown in the images below:

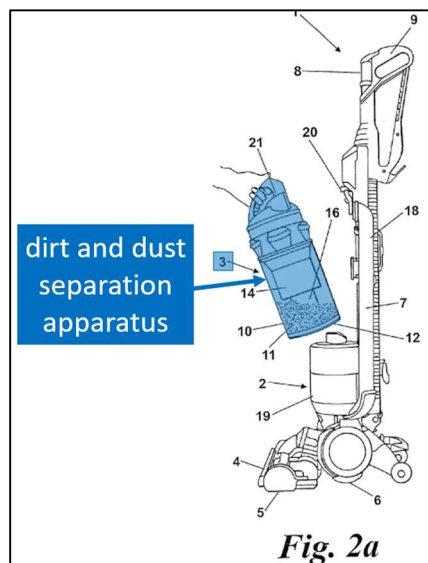


Accused Products	Dimbylow
 The bin lid closing with an audible click and the bin being pushed upwards with another click once it is fully in place.	

Ex1005, Figs. 6, 8; Ex1018, 1, 10.

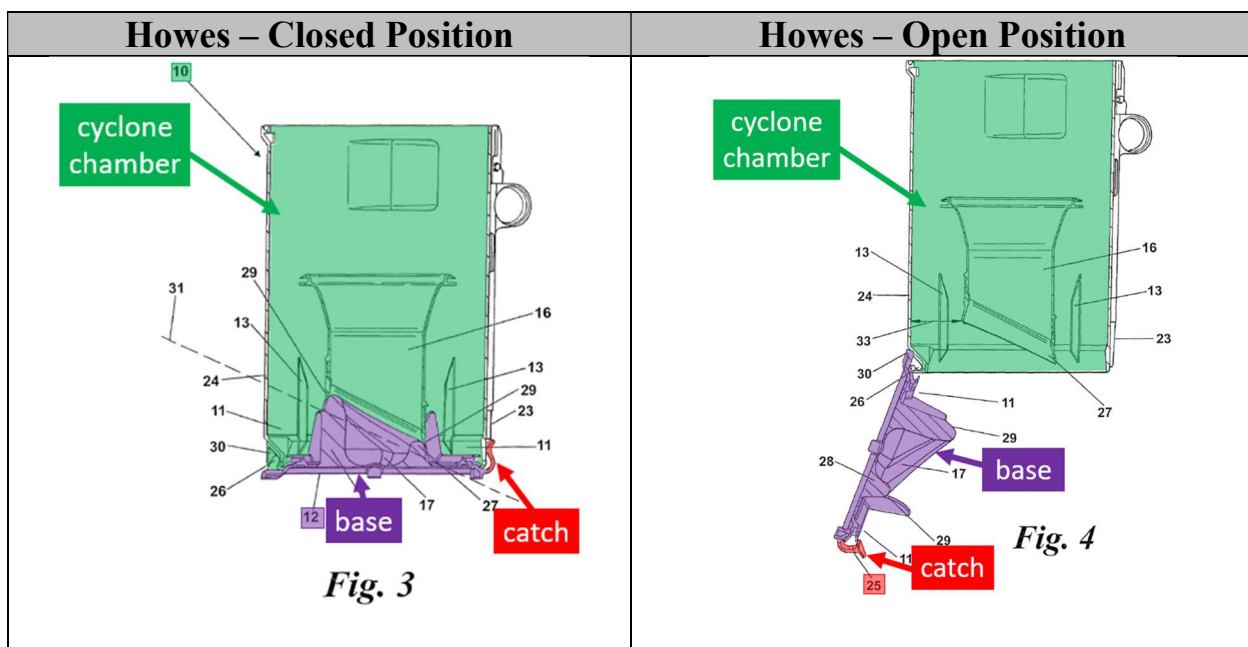
B. Howes

64. Howes is a Dyson patent from 2011. Ex. 1006, Cover. Howes teaches a detachable “**dirt and dust separation apparatus 3**” for a multi-cyclonic vacuum cleaner, as shown in the annotated image below:



Id., 3:3-5, Fig. 2a.

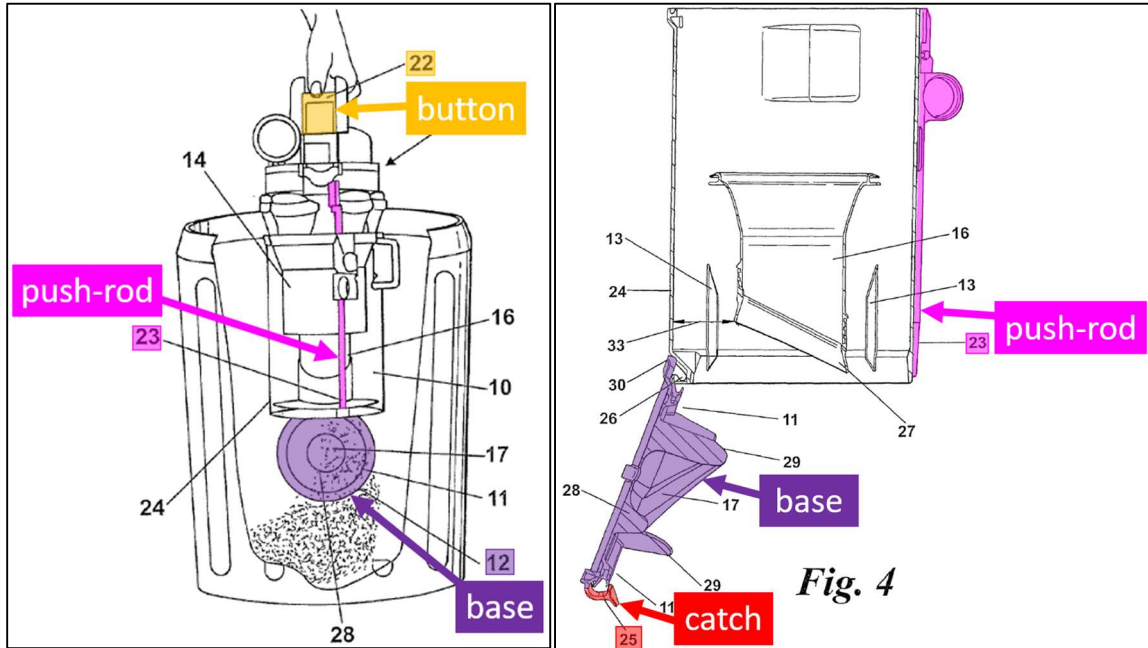
65. Like Dimbylow, Howes’s dirt collection chamber for its multi-cyclonic cleaner has a pivot-open door (“**base 12**”) that is held in place by a “**catch**” that is released to empty the dirt. *Id.*, 4:8-13. Howes’s “**base 12** ... attache[s] to the **cyclone chamber 10** by means of a **hinge 26** to allow pivotal movement of the **base 12** between the open and closed positions,” as shown in the annotated images below:



Id., 4:11-13, Figs. 3-4.

66. While, in my opinion, Howes and Dimbylow both use an identical (or nearly identical) “**catch**” to secure and to open the chamber door, Howes differs from Dimbylow in that it teaches a more convenient and hygienic method of releasing the catch and open the door. According to the method taught by Howes, “the user presses the **button 22**,” such that the “**push-**

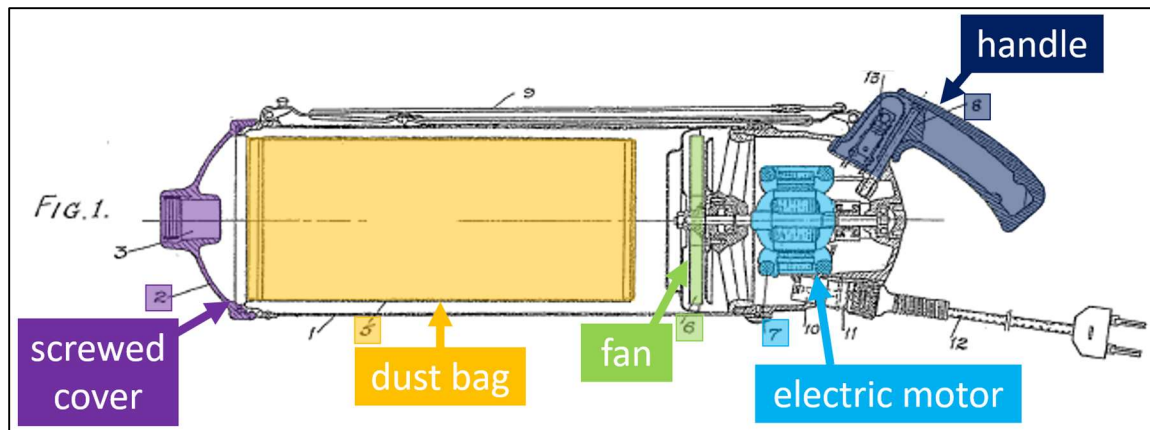
rod 23 is urged against [the] catch 25” and the “base 12 ... move[s] into the open position,” as shown in the annotated images below:



Id., 4:2-10, Figs. 2b, 4.

B. IPVG

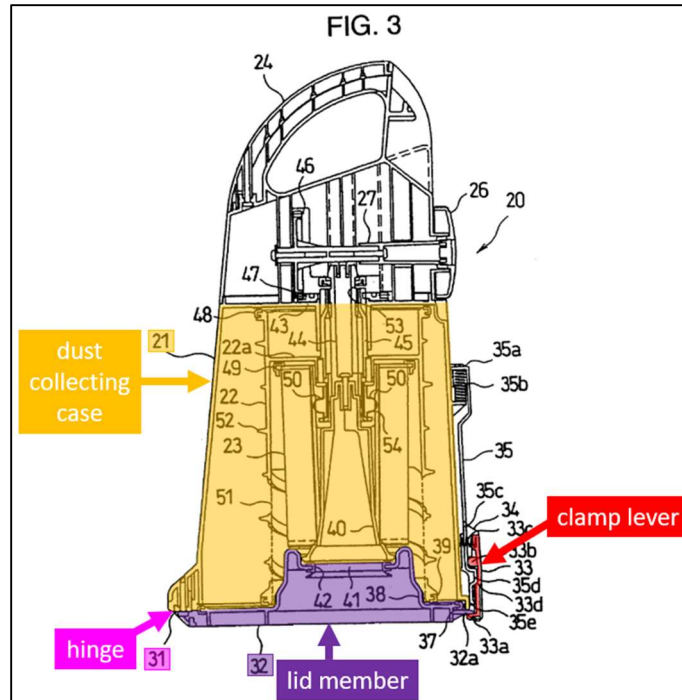
67. IPVG is a U.K. publication from 1928. Ex. 1007, Cover. IPVG teaches a “portable dust suction apparatus” with “a dust bag [5] or like member,” “screwed cover 2,” “handle [8],” and “a fan 6 driven by an electric motor 7,” as shown in the annotated image below:



Id., 1:10-12, 1:22-33, 1:51-62, Fig. 1.

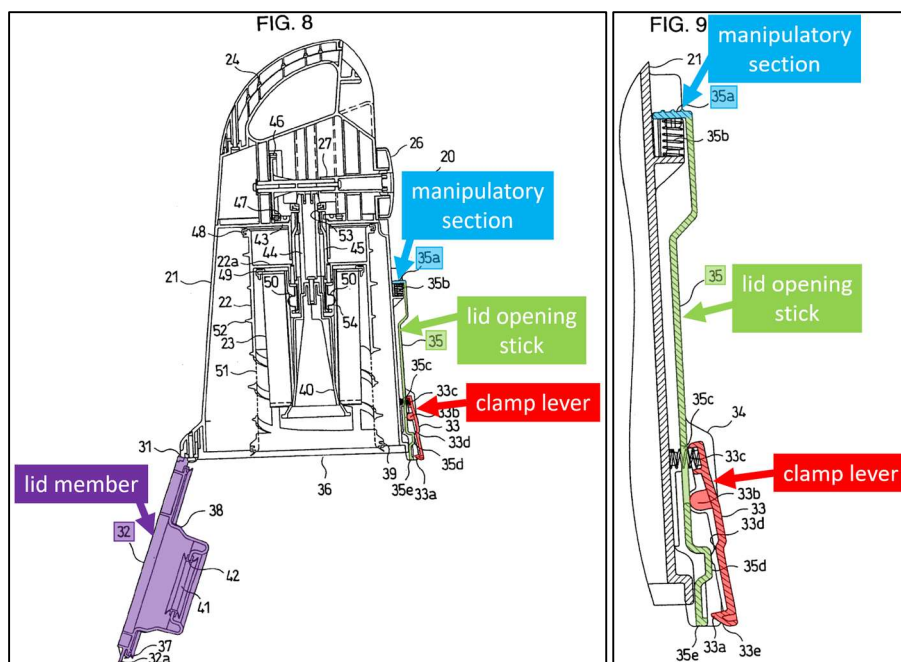
C. Nakai

68. Nakai is a U.S. patent from 2007. Ex. 1008, Cover. Nakai's vacuum cleaner comprises a “**dust collecting case 21**,” where “dust sucked together with the air from the upper suction port is forcibly whirled downward, causing the dust to be accumulated and compacted on the bottom of the **lid member 32**,” as shown in the annotated image below:



Id., Abstract, 6:24-29, Fig. 3.

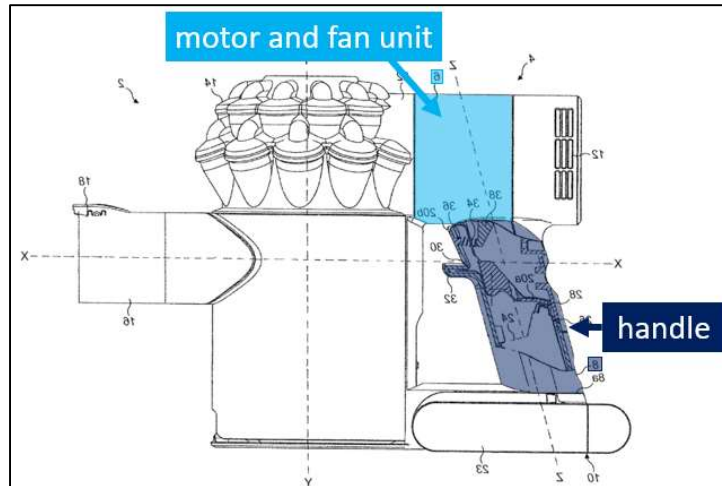
69. Nakai's "**lid member 32**" is "rotatably mounted on the bottom of the **dust collecting case 21** ... via a **hinge 31**," and is "locked by hooking up the clamp hook 33a formed on the lower end of the **clamp lever 33**." *Id.*, 4:27-34, Fig. 3.
70. To open "**lid member 32**," the "**manipulatory section 35a** of the **lid opening stick 35** is forced down," "thereby rotating the **clamp lever 33** away from the ... **lid member 32**," as shown in the annotated images below:



Id., 7:11-24, Figs. 8-9.

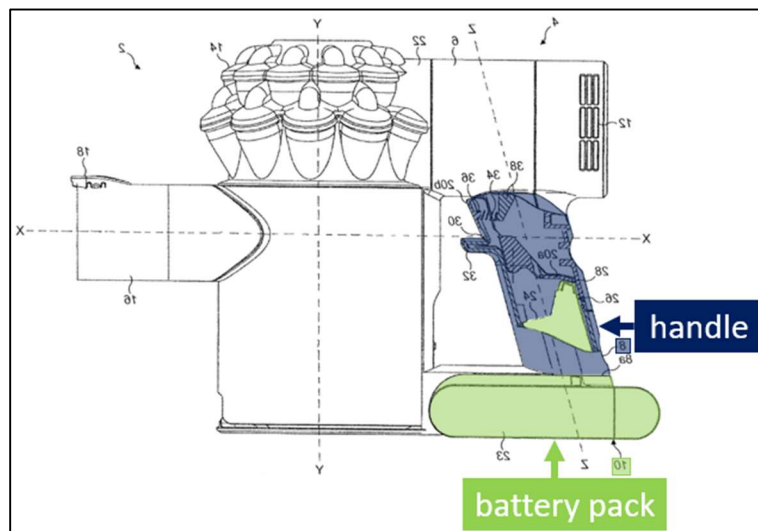
D. Sunderland

71. Sunderland is a Dyson PCT publication from 2013. Ex1017, Cover. Sunderland teaches “a battery pack suitable for use in a battery-powered appliance such as a handheld vacuum cleaner.” *Id.*, 1:6-7. Sunderland’s “**motor and fan unit 6** is located above” a “**handle 8** [that] is oriented in a pistol-grip formation,” as shown in the annotated image below:



Id., 5:17-18, 6:11-12, Fig. 2.

72. Sunderland’s “handheld cleaning appliance includes a **removable battery pack [10]** ... that is receivable in a dock opening in the end of [the] **handle [8]**” “so that the **battery pack 10** may be docked onto the vacuum cleaner 2,” as shown in the annotated image below:



Id., 1:19-22, 7:13-14, Fig. 2.

IX. CLAIM CONSTRUCTION

73. I am unaware of any claim construction determinations related to the '984 Patent.
74. 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: '984 PATENT

75. In my opinion, the Challenged Claims of the '984 Patent are invalid based on the following references and combinations: claims 1-18 are rendered obvious by the combination of Dimbylow and Howes; claims 1-18 are rendered obvious by the combination of IPVG and Nakai; and claims 1-18 are rendered obvious by the combination of IPVG, Nakai, and Sunderland; and it would have been obvious to a POSA to combine the teachings of these references.
76. 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 July 6, 2017, for the Challenged Claims of the '984 Patent, as discussed above.

I have also considered the level of ordinary skill in the pertinent art.

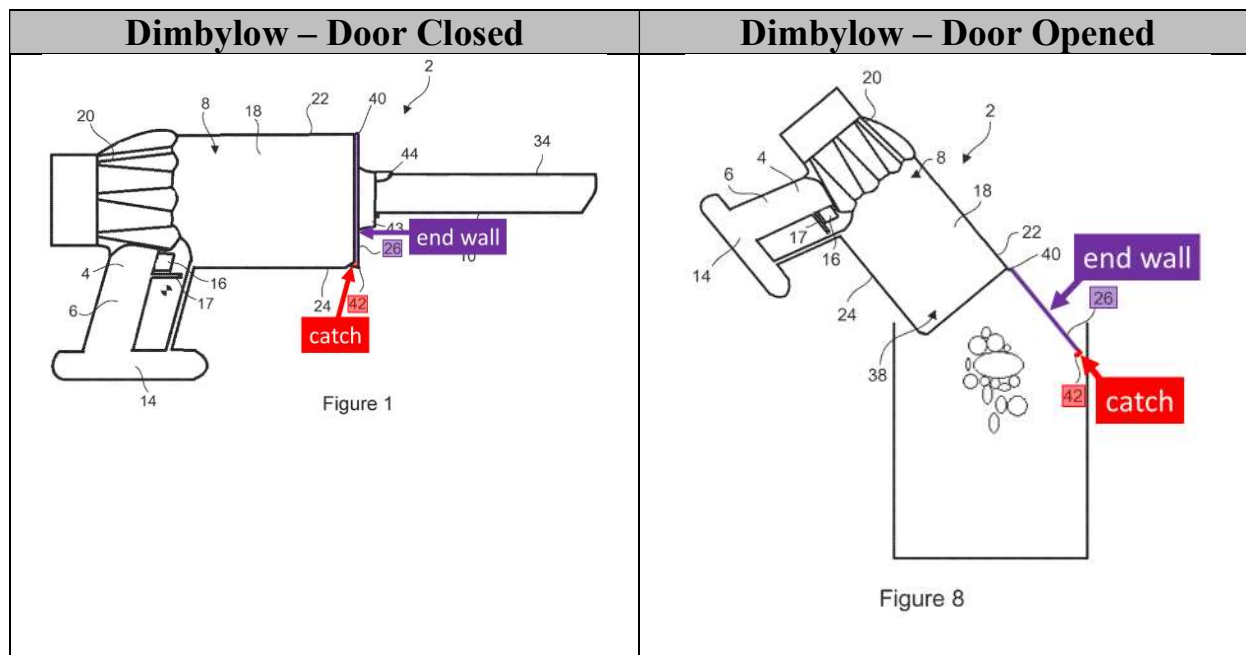
77. I describe in detail below the scope and content of the prior art, as well as any differences between the alleged invention and the prior art, on an element-by-element basis for each Challenged Claim of the '984 Patent.

A. Ground 1: Dimbylow in Combination with Howes Renders Obvious Claims 1-18

1. A POSA Would Have Combined Dimbylow and Howes

a. Scope and Content of the Dimbylow and Howes Prior Art References

78. As noted briefly above in the Background of the Prior Art section, Dimbylow is a Dyson patent publication from 2017 that teaches “[a] handheld vacuum cleaner.” Ex. 1005, Abstract. Dimbylow teaches that a user can empty its vacuum cleaner by “point[ing] the vacuum cleaner 2 towards a suitable receptacle ... into which the dirt is to be emptied,” and “releas[ing]” “[t]he **catch 42**” (which, when engaged, holds a pivotable “**end wall 26**” closed), allowing “**end wall 26** [to be] pivoted from its closed position into its open position” as shown in the annotated images below:



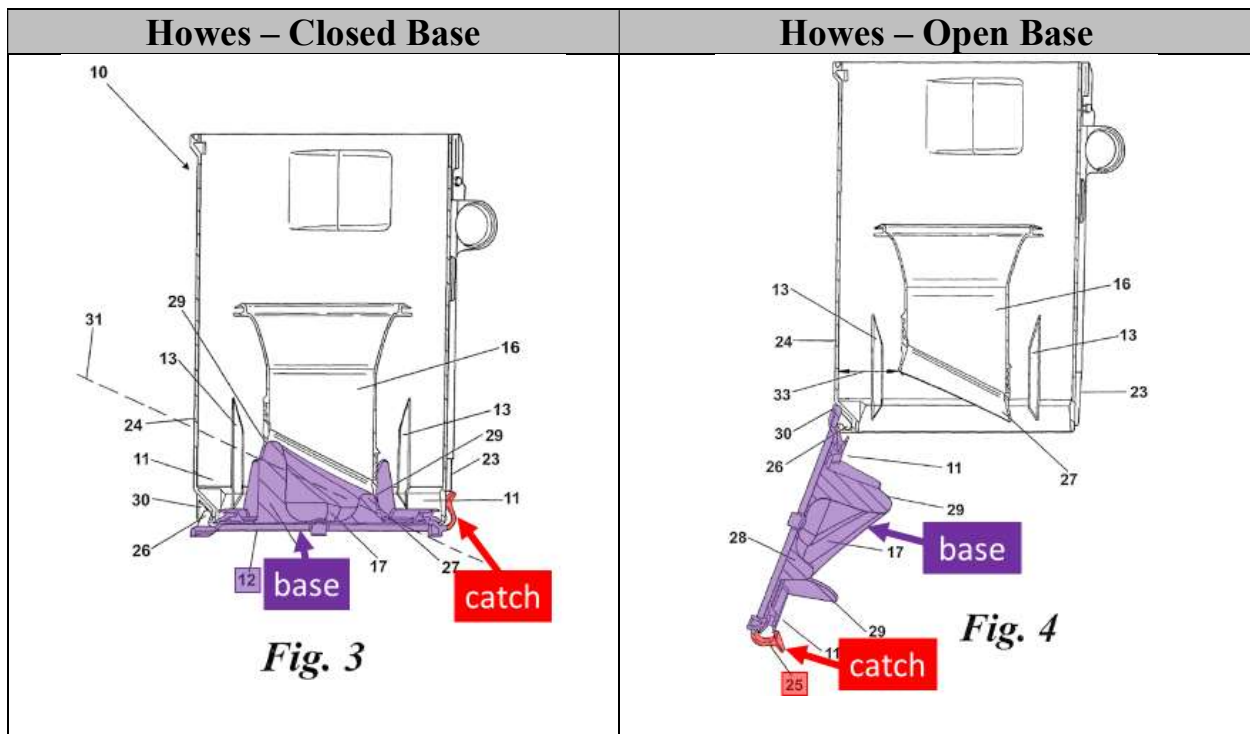
Ex. 1005, Abstract, ¶¶37, 48, Figs. 1, 8.

79. Dimbylow teaches that there are two benefits to this dust-emptying design.

In my opinion, a POSA would have readily recognized and understood these to be benefits of Dimbylow’s design. First, Dimbylow teaches that its dust-emptying design is “very intuitive and ergonomic,” because, “[s]ince the cyclonic separating unit 8 is pointed away from the user, there is no need for the user to adopt a different grip or posture from that which is adopted during normal cleaning.” Ex. 1005 ¶48. Second, Dimbylow teaches that because “dirt exits the dirt collector 38/fine dust collector 51 from the end of the cyclonic separating unit 8 which is furthest from the handle 6 ..., there is less risk that dirt will spill ... onto a user during emptying.” *Id.* However, while Dimbylow describes releasing its “**catch**

42” to empty the cleaner, Dimbylow does not specify the method by which “[t]he **catch 42** is ... released by the user.” *Id.*; *see also id.* ¶37 (describing the “user-operable **catch 42**”).

80. As described briefly above in the background of the prior art section, Howes is a Dyson patent from 2011. Ex. 1006. Howes teaches “a separating unit” for a “bagless vacuum cleaner” that “separate[s] dirt and dust by way of cyclonic, centrifugal or inertial separation” and that has a “**base**” that “is movable between a closed position and an open position” as shown in the annotated images below:

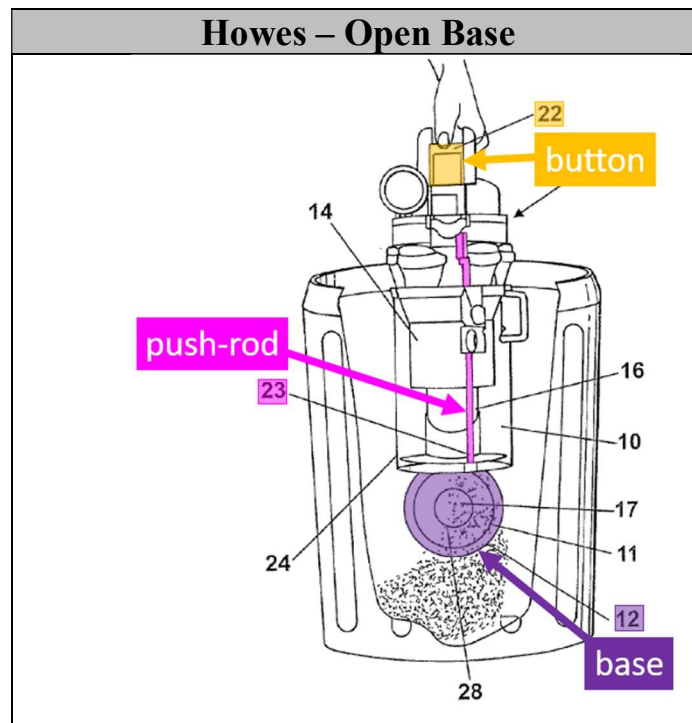


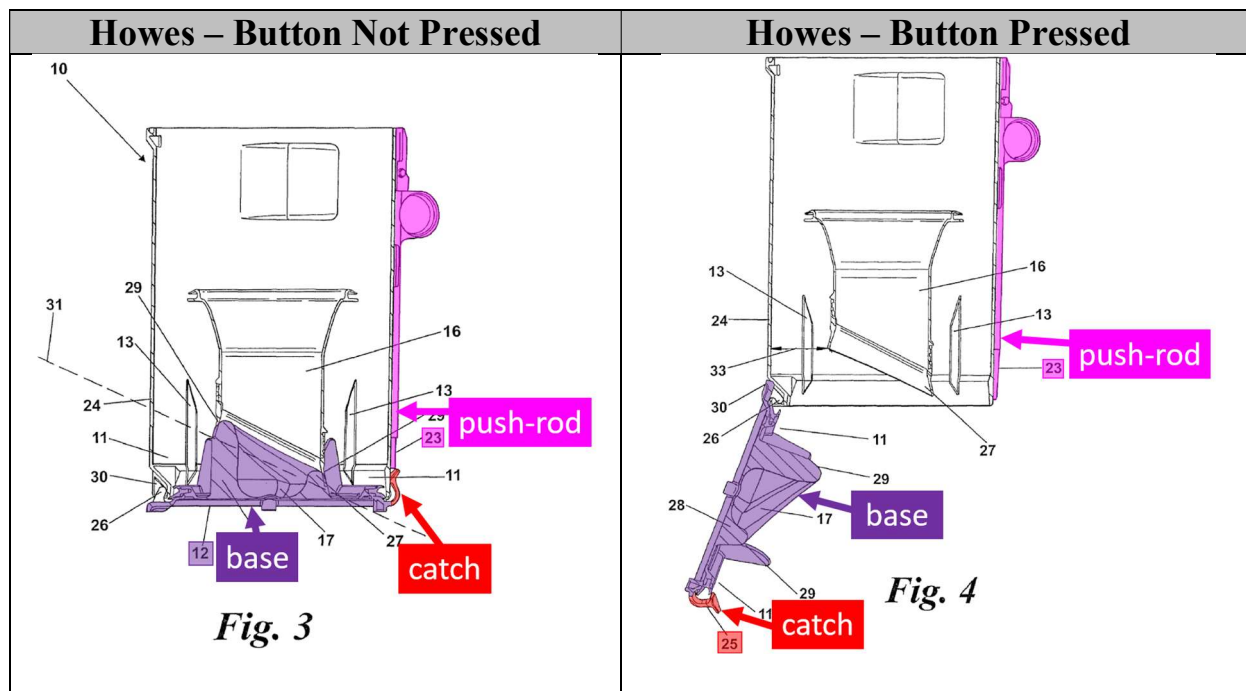
Ex. 1006, Abstract, 2:36-39, Figs. 3-4.

81. As shown above, Howes’s “**base 12**” is held in the “closed position” by

“catch 25.” Ex. 1006, 4:6-10, Figs. 3-4.

82. Howes further teaches a convenient and hygienic method of releasing the catch to open the base to empty the separating unit: “to empty the separator unit 3, the user presses the button 22” that is “linked to” a “push-rod 23.” Ex. 1006, 4:2-4, Fig. 2b. Howes explains that “[w]hen the user depresses the button 22, the push-rod 23 is urged against a catch 25 on the base 12,” and “[t]he force exerted by the push-rod 23 overcomes any resistance of the base 12 to move into the open position,” as shown in the annotated images below:





Ex. 1006, 4:4-10, Figs. 2b-4.

b. A POSA Would Have Been Motivated to Combine the Teachings of Dimbylow and Howes

83. Having reviewed the teachings of both Dimbylow and Howes, in my opinion, a POSA would have been motivated to implement Howes’s base “actuator mechanism” teachings (which include Howes’s “**button 22**” and “**push-rod 23**”) as the method by which Dimbylow’s “**catch 42** is ... released by the user,” including because this would achieve Dimbylow’s stated goal of “intuitive and ergonomic” dust emptying that reduces the “risk that dirt will spill ... onto a user during emptying.” Ex. 1006, 4:1-10; Ex. 1005 ¶48. In particular, it is my opinion that a POSA would have been motivated to incorporate a button and a push-rod (as Howes teaches)

collection chamber door) that teach mechanisms to release a similar component (a catch) to accomplish a similar goal (hygienic and convenient bin emptying). Howes is such a reference.

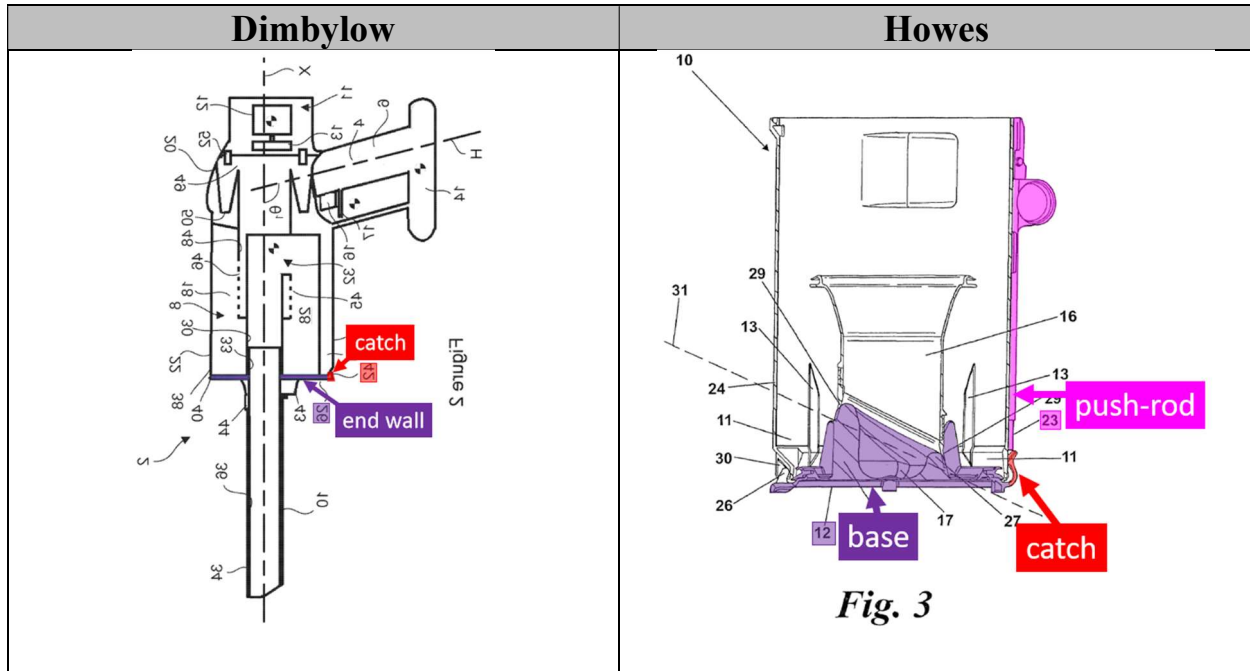
85. In my opinion, a POSA would have understood that Howes's teachings about its "actuator mechanism" would further the purpose described in Dimbylow of providing "intuitive and ergonomic" dust emptying. Ex. 1005 ¶48. This is because the simple act of pushing a button (Howes's "push-button 22," *see* Ex1006, 4:1-2) with a finger on one hand while continuing to hold the cleaner's handle with the other hand is, in my opinion, an intuitive and ergonomic method of emptying the collected dust, and a POSA would have understood this. A POSA would have also understood that a user could operate Howes's "actuator mechanism" with Dimbylow's cleaner while still achieving Dimbylow's teaching of "no[t] need[ing] ... the user to adopt a different grip or posture from that which is adopted during normal cleaning." Ex. 1005 ¶48. Further, in my opinion, simply pushing a button, particularly one that is located near the handle, is more "intuitive and ergonomic" for a user than having to manually release Dimbylow's "catch 42," which Dimbylow teaches is located at a position "which is furthest from the handle 6." *Id.* ¶48.

86. In my opinion, a POSA would have understood that Howes's "actuator

mechanism” teachings would also further another of Dimbylow’s stated purposes—specifically, providing a process to empty the collected dirt and dust that reduces the “risk that dirt will spill ... onto a user during emptying.” Ex. 1005 ¶48. This is because, during emptying, the user would not need to place his or her hand in front of or near the openable door of the dirt collection chamber, which, when opened, releases the collected dirt. Instead, a user would push a button located closer to the handle near the opposite end of the collection chamber from the openable door. In my opinion, a POSA would have understood that this has certain benefits over a user manually releasing Dimbylow’s “catch 42.” In my opinion, one of these known benefits is that a user would not need to place his or her hand near the area where dust is emptied, which, in my opinion, reduces the risk that dirt will spill onto a user during emptying.

87. In my opinion, a POSA reading Dimbylow would have been motivated to look to Howes to implement Dimbylow’s catch-release functionality. I have several reasons for this opinion. For example, Dimbylow and Howes are analogous art, as explained above. Both Dimbylow and Howes are Dyson patents that are related to bagless, cyclonic vacuum cleaners having separation units with pivotable doors held in place by a releasable, user-operable catch. Ex. 1005, Abstract, ¶¶37, 48, Figs. 1, 8; Ex. 1006,

Abstract, 2:36-39, 4:1-10, Figs. 2b-4. These patents therefore share many similarities, including as shown in the annotated images below:



Ex. 1005, Fig. 2; Ex. 1006, Fig. 3.

88. Also, in my opinion, a POSA would have understood that this combination would have involved a simple substitution of known elements—in particular, Howes’s button linked to a push-rod—to obtain the predictable result of opening a pivotable door by releasing a catch. This would have further motivated a POSA in my opinion.

89. As further support for my opinion, this combination would have involved applying a known technique (Howes’s button-actuated push-rod) to a known device ready for improvement (Dimbylow’s manually operated catch) to yield predictable results (using the push-rod to exert a force

against the catch sufficient to release the catch and overcome any resistance of the openable door). *See* Ex. 1006, 4:1-10. This would have further motivated a POSA in my opinion.

90. In my opinion, a POSA would have found this combination at least obvious to try. This is my opinion because a POSA would have understood that there are a finite number of ways to release Dimbylow's user-operable catch. Howes's manual push-rod allows a manual actuator to be located in a user-friendly location for releasing Dimbylow's catch.

c. A POSA Would Have Had A Reasonable Expectation of Success Combining the Teachings of Dimbylow and Howes

91. In my opinion, a POSA would have had a reasonable expectation of success implementing Howes's "actuator mechanism" teachings as the method of releasing Dimbylow's "user-operable catch 42," for the reasons that I discussed above. Ex. 1006, 4:1-10; Ex. 1005 ¶37. Also, as I explained above, the Dimbylow and Howes references are very similar, including because they are both Dyson patents related to bagless, cyclonic vacuum cleaners having separation units with pivotable doors held in place by a releasable, user-operable catch. In my opinion, these similarities would have further given a POSA a reasonable expectation of success. Ex. 1005, Abstract, ¶¶37, 48, Figs. 1, 8; Ex. 1006, Abstract, 2:36-39, 4:1-10,

Figs. 2b-4. Also, in my opinion, implementing Howes’s “actuator mechanism” teachings with Dimbylow would have only involved incorporating a few basic, well-known components—specifically, a button that is linked to a push-rod. Accordingly, in my opinion, a POSA would have had a reasonable expectation of success combining the teachings of Dimbylow and Howes as described.

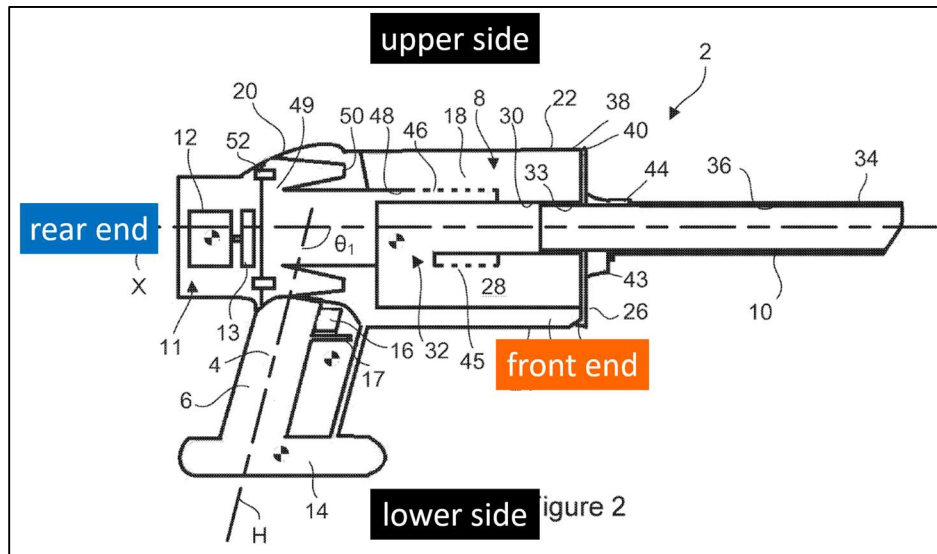
2. [1]/[10]

a. [1pre]/[10pre]

Reference Number	Claim Limitation
[1pre]	“A hand vacuum cleaner having a front end, a rear end, an upper side and a lower side, the hand vacuum cleaner comprising:”
[10pre]	“A hand vacuum cleaner having a front end, a rear end, an upper side and a lower side, the hand vacuum cleaner comprising:”

92. In my opinion, Dimbylow teaches a hand vacuum cleaner having a front end, a rear end, an upper side and a lower side.
93. Dimbylow teaches a “handheld vacuum cleaner ... for cleaning confined spaces” and other “hard-to-reach surfaces.” Ex1005 ¶¶8, 43, Figs. 1, 6. In my opinion, a POSA would have recognized and understood that this is a hand vacuum cleaner.
94. A POSA would have understood that Dimbylow’s hand vacuum cleaner has a “**front**” **end** opposite a “**rear**” **end**, and an **upper side** opposite a

lower side, as shown in the annotated image below:



Ex1005 ¶¶41-42, Fig. 2; *see also id.*, Fig. 3.

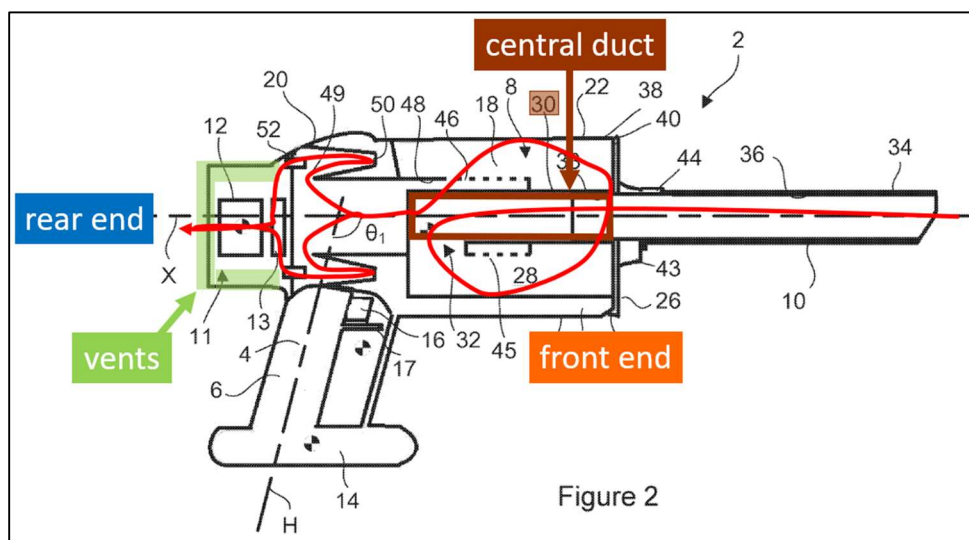
b. [1a]/[10a]

Reference Number	Claim Limitation
[1a]	“(a) an air flow passage extending from a dirty air inlet provided at the front end to a clear air outlet provided at the rear end;”
[10a]	“(a) an air flow passage extending from a dirty air inlet provided at the front end to a clear air outlet provided at the rear end;”

95. In my opinion, Dimbylow teaches an air flow passage extending from a dirty air inlet provided at the front end to a clear air outlet provided at the rear end.

96. A POSA would have understood that Dimbylow teaches an air flow passage extending from a dirty air inlet provided at the front end to a clear air outlet provided at the rear end. In Dimbylow, “[d]irty **air** is drawn by

the suction generator 11 through the inlet duct 30, 36” (which includes the “**central duct 30**” at the “**front end**”), “into the [primary] cyclonic separation chamber 28,” then through the “secondary cyclones 20,” whereafter the “cleaned air exits ... through the suction generator 11,” “comprising a motor 12,” and “out of **vents** (not shown) at the **rear end**” of the main body,” as shown in the annotated image below:



Ex1005 ¶¶31, 35, 42, Fig. 2.

97. Dimbylow’s “central duct 30” has an upstream portion (where the **air** enters the central duct) and a downstream portion (where the air exits the central duct). In my opinion, a POSA would have understood that the upstream portion of Dimbylow’s “central duct 30” is a dirty air inlet, at least because it is the inlet for dirty air to enter into Dimbylow’s cleaner. Further, in my opinion, a POSA would have understood that Dimbylow’s

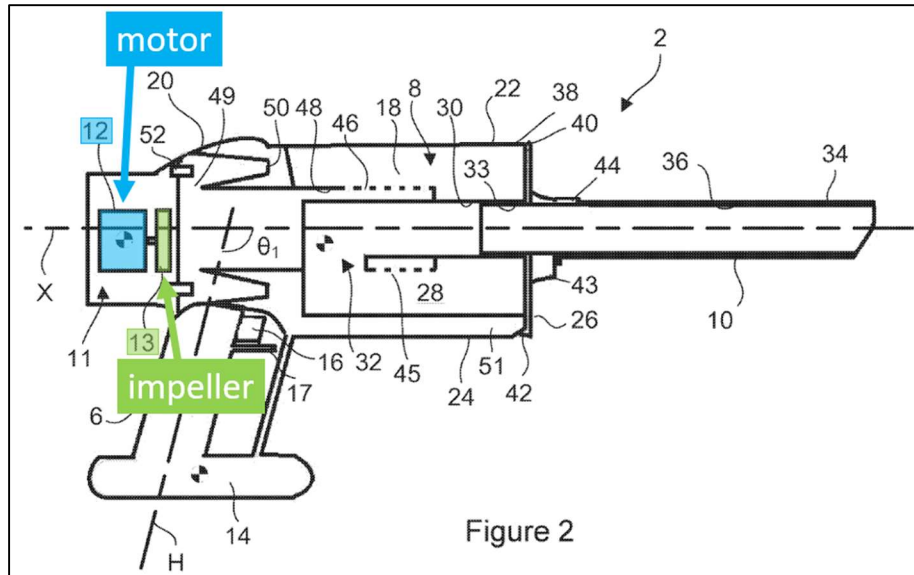
“vents” are unobstructed, clear air outlets exhausting air that is both clean¹ and “clear”; and an air flow path extends between them.

c. [1b]/[10b]/[10d]

Reference Number	Claim Limitation
[1b]	“(b) a vacuum cleaner body comprising a suction motor positioned in the air flow passage, a front end, a rear end and a handle;”
[10b]	“(b) a vacuum cleaner body comprising a suction motor positioned in the air flow passage, a front end, a rear end and a handle;”
[10d]	(d) a pistol grip handle; and,

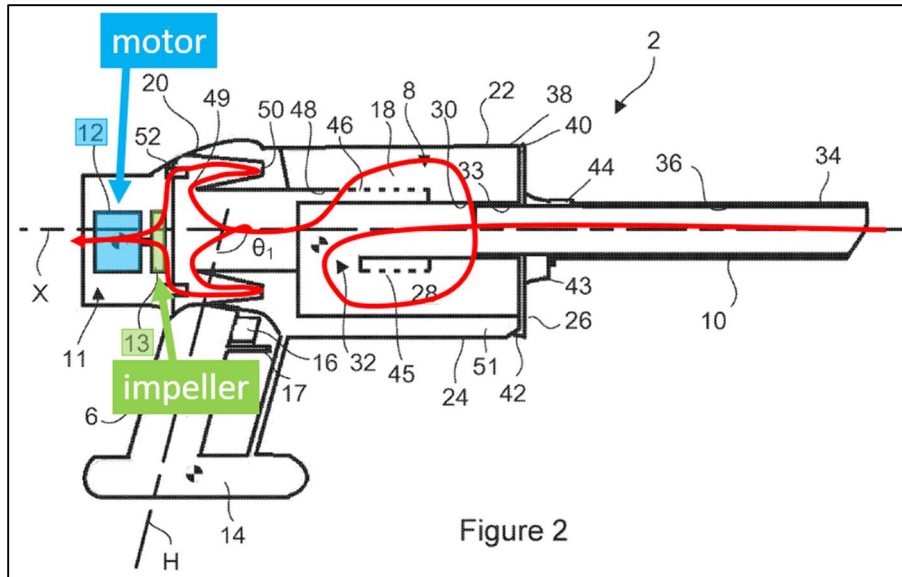
98. In my opinion, Dimbylow teaches a vacuum cleaner body comprising a suction motor positioned in the air flow passage, a front end, a rear end and a handle (Limitations [1b]/[10b]).
99. In my opinion, Dimbylow teaches a pistol grip handle (Limitation [10d]).
100. A POSA would have understood that Dimbylow’s cleaner has a body comprising a suction motor. Dimbylow’s “handheld vacuum cleaner” has a “main body ... compris[ing] a suction generator 11 comprising a **motor 12** and **impeller 13**,” as shown in the annotated image below:

¹ The specification refers to a “clean air outlet” while the claims recite a “clear air outlet.” *Compare* Ex1001, 16:51-56 *with id*, claim 1.



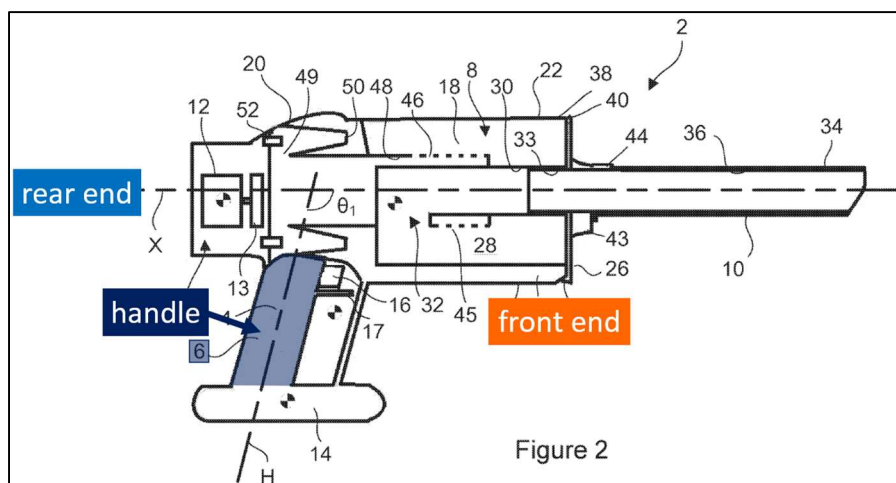
Ex1005 ¶31, Fig. 2.

101. In my opinion, a POSA would have understood that Dimbylow’s “motor 12,” individually or together with “impeller 13,” is a suction motor, at least because it is a motor that creates suction.
102. Also, in my opinion, Dimbylow’s suction motor is positioned in the air flow passage. In Dimbylow, “cleaned **air** exits ... through the suction generator 11” “comprising a **motor 12** and **impeller 13**” “and out of vents (not shown) at the rear of the main body,” as shown in the annotated image below:



Ex1005, ¶¶31, 42, Fig. 2. For additional explanation, *see* Ground 1, Limitations [1a]/[10a].

103. A POSA would have understood that Dimbylow’s vacuum cleaner body comprises a front end, a rear end, and a handle. Dimbylow’s “main body” has a “**front**” **end** opposite a “**rear**” **end**, and “an elongate **handle 6**,” as shown in the annotated image below:



Ex1005 ¶¶30, 41-42, Fig. 2.

104. Regarding Limitation [10d], a POSA would have understood that Dimbylow teaches a pistol grip handle. Dimbylow explains that “**handle 6** is in a pistol grip configuration.” Ex1005 ¶31, Fig. 2.

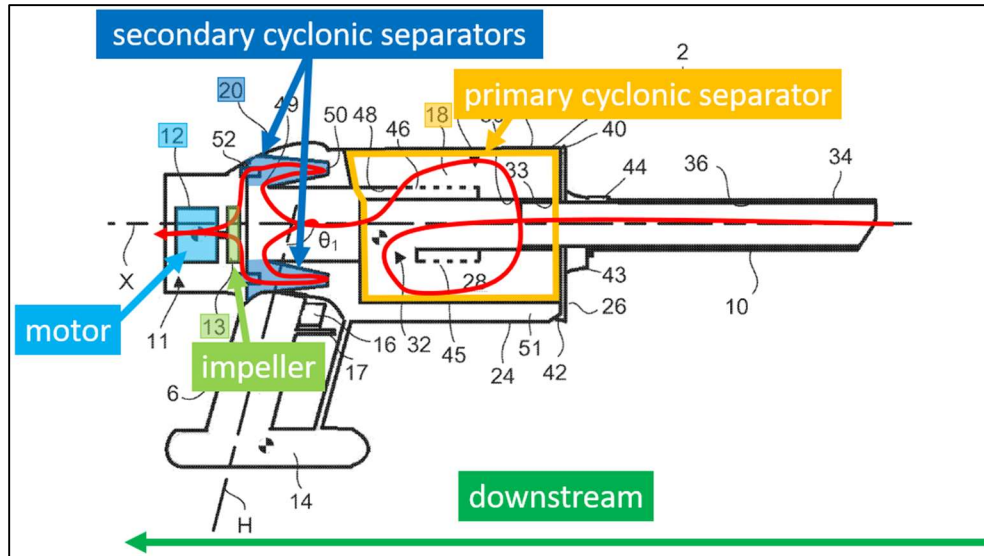
d. [1c]/[10c]

Reference Number	Claim Limitation
[1c]	“(c) a cyclone unit positioned in the air flow passage upstream from the suction motor, the cyclone unit comprising a cyclone having a front end, a rear end, a cyclone axis of rotation extending between the front and rear ends of the cyclone, the cyclone unit further comprising an axially extending cyclone unit wall which extends to a front end of the cyclone unit, the front end of the cyclone unit comprising a front door that is moveable between a closed position and an open position; and,”
[10c]	“(c) a cyclone unit positioned in the air flow passage upstream from the suction motor, the cyclone unit comprising a cyclone having a front end, a rear end, a cyclone axis of rotation extending between the front and rear ends of the cyclone, the cyclone unit further comprising an axially extending cyclone unit wall which extends to a front end of the cyclone unit, the front end of the cyclone unit comprising a front door that is moveable between a closed position and an open position; and,”

105. In my opinion, Dimbylow teaches a cyclone unit positioned in the air flow passage upstream from the suction motor, the cyclone unit comprising a cyclone having a front end, a rear end, a cyclone axis of rotation extending between the front and rear ends of the cyclone, the cyclone unit further comprising an axially extending cyclone unit wall which extends to a front

end of the cyclone unit, the front end of the cyclone unit comprising a front door that is moveable between a closed position and an open position.

106. In my opinion, Dimbylow teaches a cyclone unit positioned in the air flow passage upstream from the suction motor. Dimbylow's "cyclonic separating unit 8 comprises a **primary cyclonic separator 18** and a plurality of **secondary cyclonic separators 20** positioned **downstream** of the **primary cyclonic separator**," as shown in the annotated image below:

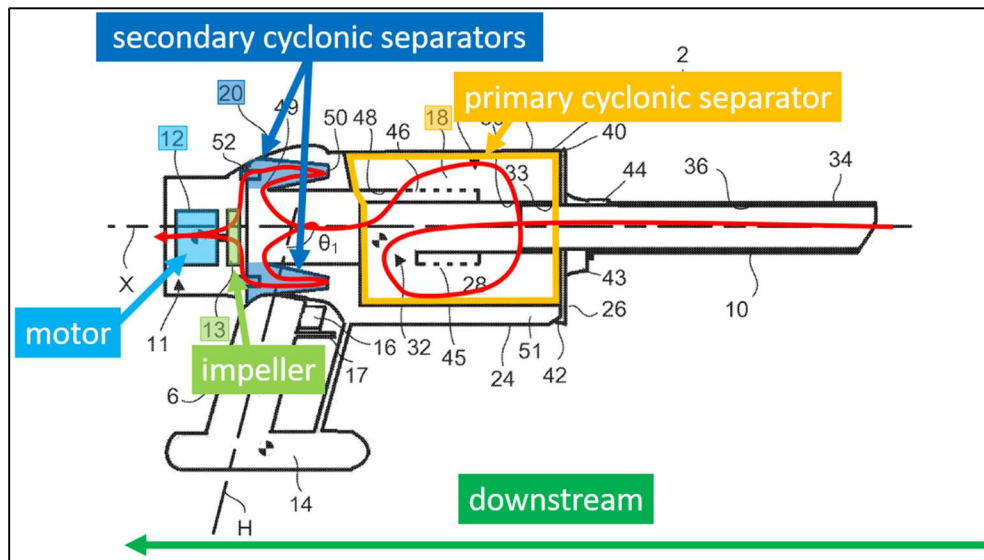


Ex1005 ¶32, Fig. 2.

107. In my opinion, a POSA would have understood that Dimbylow's "primary cyclonic separator 18" is a cyclone unit positioned in the air flow passage, at least because it uses cyclonic airflow to separate dirt from air. For additional explanation, *see* Ground 1, Limitations [1a]/[10a].
108. Also, in my opinion, Dimbylow's "**primary cyclonic separator 18**" is

positioned upstream from “**motor 12**” and “**impeller 13**.” Ex1005, Fig. 2.

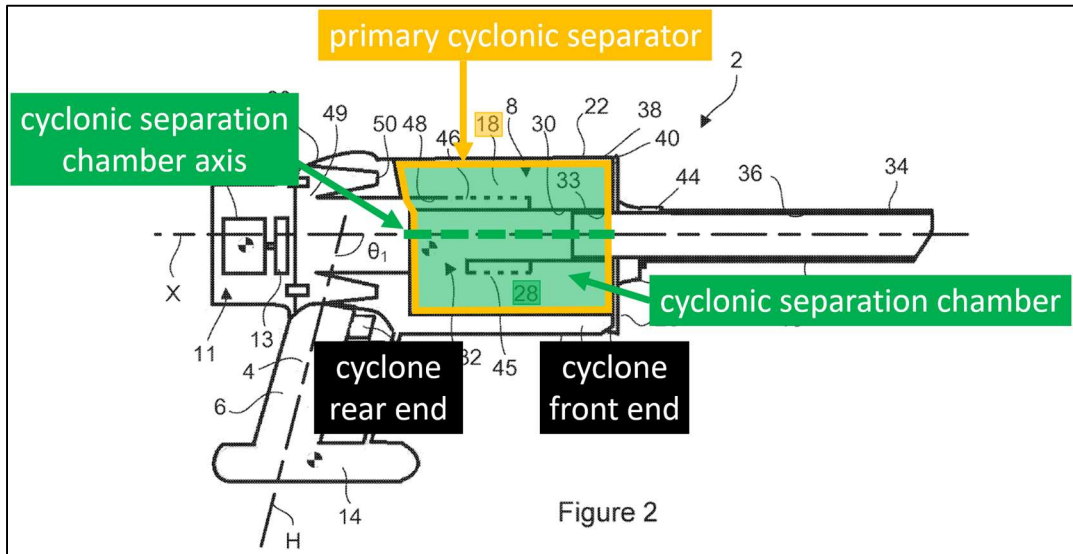
Dimbylow states that its “plurality of **secondary cyclonic separators 20**” are “positioned **downstream** of the **primary cyclonic separator**,” and illustrates that its “**motor 12**” and “**impeller 13**” are further downstream from Dimbylow’s “**primary cyclonic separator 18**”:



Ex1005 ¶32, Fig. 2. A POSA would have understood that Dimbylow’s “**primary cyclonic separator 18**” is thus positioned upstream from “**motor 12**” and “**impeller 13**.”

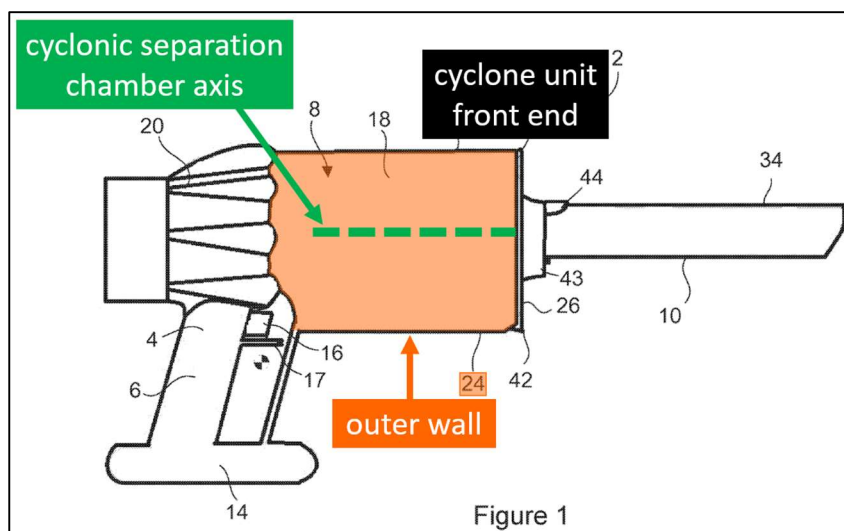
109. In my opinion, Dimbylow teaches the cyclone unit comprising a cyclone having a front end, a rear end, and a cyclone axis of rotation extending between the front and rear ends of the cyclone. Dimbylow’s “**primary cyclonic separator 18**” has a “**cyclonic separation chamber 28**,” which, when Dimbylow’s cleaner is activated, in my opinion a POSA would have

understood comprises a cyclone, with a **front end** and a **rear end**, as shown in the annotated image below:



Ex1005 ¶33; Fig. 2.

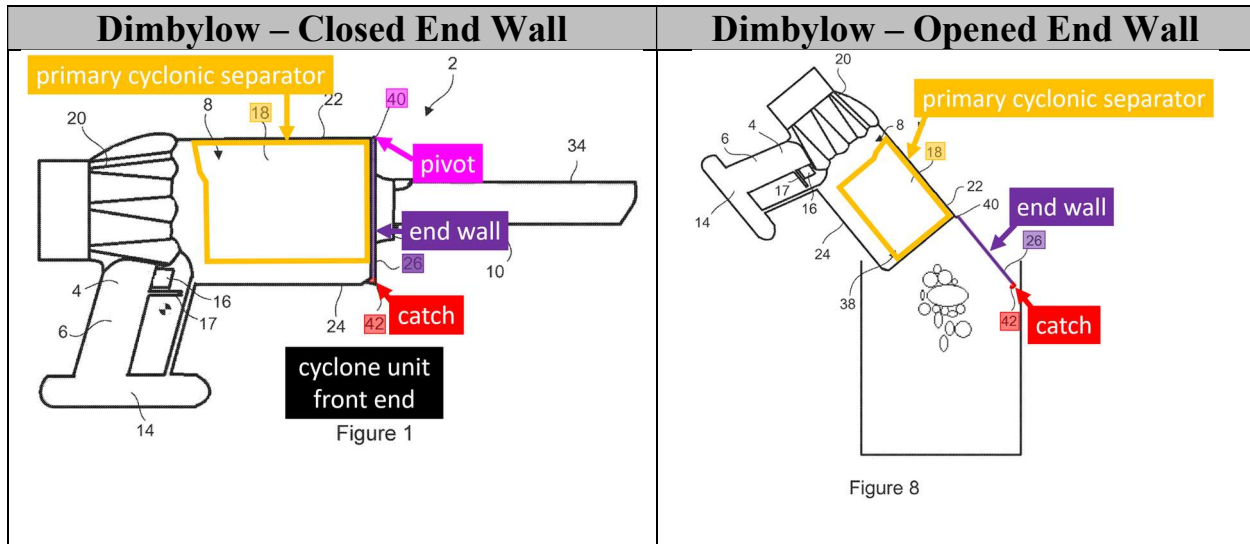
110. Further, in my opinion, Dimbylow teaches an “**axis of the cyclonic separation chamber 28**,” which a POSA would have understood is a cyclone axis of rotation that extends between the front and rear ends of the cyclone, as I show above. Ex1005 ¶33.
111. In my opinion, Dimbylow teaches the cyclone unit further comprising an axially extending cyclone unit wall which extends to a front end of the cyclone unit. Dimbylow’s “primary cyclonic separator 18 comprises a separator body 22 in the form of a bin having a cylindrical **outer wall 24**” that extends to an “end,” i.e., a **cyclone unit front end**, as shown in the annotated image below:



Ex1005 ¶33, 37, Fig. 1.

112. In my opinion, a POSA would have understood that Dimbylow’s “**outer wall 24**” is an axially extending cyclone unit wall. This is my opinion at least because Dimbylow’s “**outer wall 24**” extends along the same direction as the “**axis of the cyclonic separation chamber 28.**” Ex1005 ¶33.

113. Also, in my opinion, Dimbylow teaches the front end of the cyclone unit comprising a front door that is moveable between a closed position and an open position. The front “end” of Dimbylow’s “**primary cyclonic separator 18**” comprises an “**end wall 26** [that] is connected to the cylindrical outer wall 24 by a **pivot 40** and is held in a closed position by a user-operable **catch 42,**” as shown in the annotated images below:



Ex1005 ¶¶36-37, Figs. 1, 8.

114. Dimbylow explains that to open “**end wall 26**,” the “user points the vacuum cleaner 2 towards a suitable receptacle,” “release[s]” “**catch 42**,” and the “**end wall 26** [is] pivoted from its closed position into its open position.” Ex1005 ¶48. A POSA would have understood that Dimbylow’s “end wall 26” is a front door at the front end of the cyclone unit.

e. [1d]/[10e]

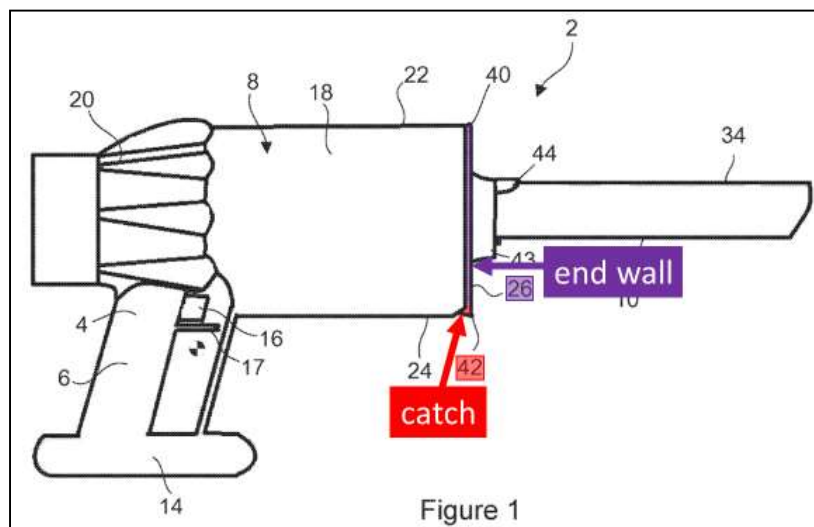
Reference Number	Claim Limitation
[1d]	“(d) a lock securing the front door in the closed position, the lock comprising an actuator, wherein the actuator is spaced towards the rear end of the cyclone.”
[10e]	“(e) a lock securing the front door in the closed position, the lock comprising an actuator, wherein the actuator is located at an elevation of an upper end of the pistol grip handle and forward of the pistol grip handle.”

115. In my opinion, the combined teachings of Dimbylow and Howes render

obvious a lock securing the front door in the closed position, the lock comprising an actuator, wherein the actuator is spaced towards the rear end of the cyclone (Limitation [1d]).

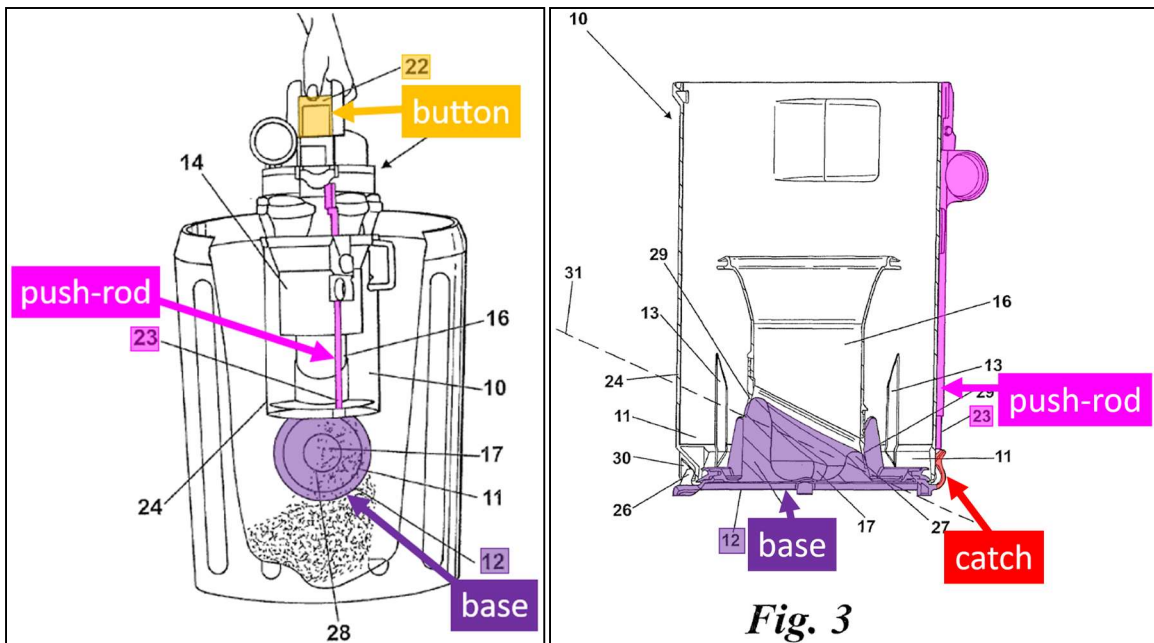
116. In my opinion, the combined teachings of Dimbylow and Howes render obvious a lock securing the front door in the closed position, the lock comprising an actuator, wherein the actuator is located at an elevation of an upper end of the pistol grip handle and forward of the pistol grip handle (Limitation [10e]).

117. In my opinion, Dimbylow teaches a lock securing the front door in the closed position. Dimbylow's “**end wall 26** is connected to the cylindrical outer wall 24 by a pivot 40 and is held in a closed position by a user-operable **catch 42**,” as shown in the annotated image below:



Ex1005 ¶37, Fig. 1.

118. In my opinion, a POSA would have understood that Dimbylow’s “user-operable catch 42” is a lock because, when engaged, it secures the front door in a closed position.
119. Also, in my opinion, Howes teaches a lock securing the openable door in the closed position, the lock comprising an actuator. Howes teaches “[a]n actuator mechanism in the form of a **push-button 22**” “linked to on[e] end of a **push-rod 23**,” and the “other end of the push-rod 23 is adjacent the **base 12**,” which is pivotable and, when closed, is held in place by a “**catch 25**,” as shown in the annotated images below:

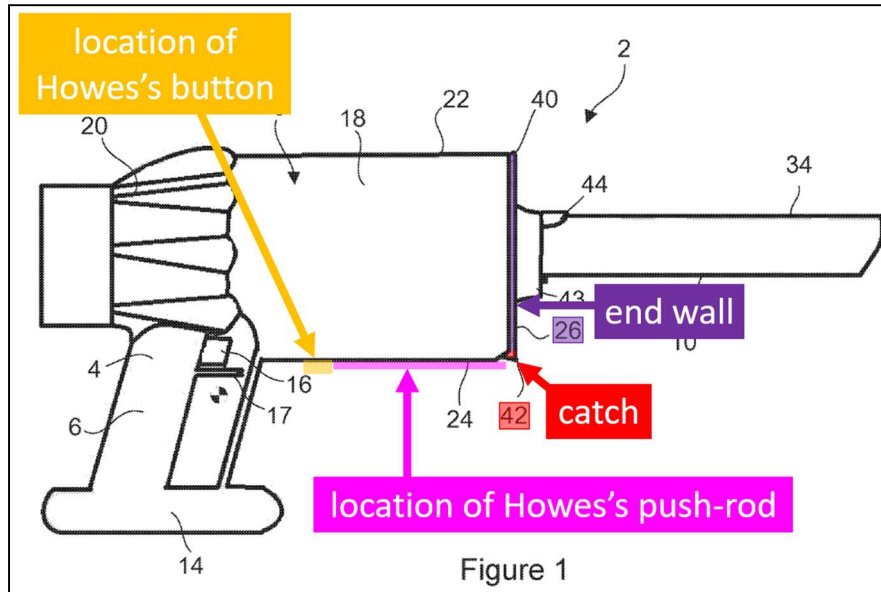


Ex1006, 4:1-10, Figs. 2b-3.

120. In my opinion, a POSA would have understood that Howes’s base 12 actuator mechanism, including “push button 22,” “push-rod 23,” and

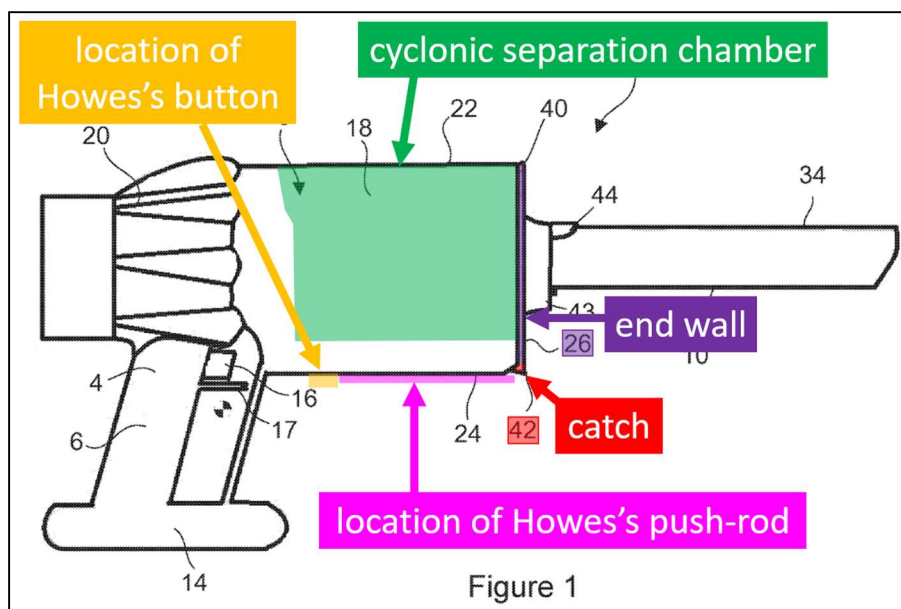
“catch 25,” together are a lock securing the openable door in the closed position. Also, in my opinion, a POSA would have understood that Howes’s “actuator mechanism” comprises an actuator (“button 22”) because pushing (actuating) the button (the actuator) releases the door. As Howes explains, “to empty the separator unit 3, the user presses the button 22,” which causes “base 12 to move into the open position.” Ex1006, 4:2-10.

121. As I explained above, in my opinion a POSA would have been motivated to combine Dimbylow and Howes to include an “actuator mechanism,” as taught by Howes, to Dimbylow’s hand vacuum. Ground 1, §1. Because Dimbylow does not expressly disclose how to open its catch, in my opinion a POSA would have looked to references such as Howes for teachings on how to open Dimbylow’s catch to provide “intuitive and ergonomic” dust emptying that reduces the “risk that dirt will spill ... onto a user during emptying,” as taught by Dimbylow. *Id.*; Ex1005 ¶48. In my opinion, a POSA would have had a reasonable expectation that this combination would be successful. Ground 1, §1. Also, in my opinion, a POSA would have been motivated to implement Howes’s actuator mechanism on Dimbylow’s hand vacuum as shown in the annotated image below:



Ex1005, Fig. 1(modified); Ex1006, 4:1-10.

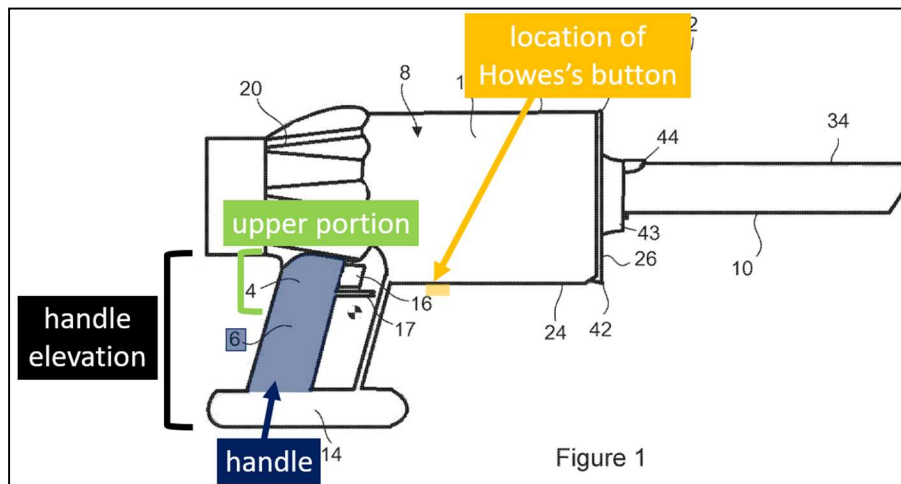
122. Thus, in my opinion, the combination of Dimbylow and Howes renders obvious a lock securing the front door in the closed position, the lock comprising an actuator.
123. Regarding Limitation [1d], in my opinion, the combination of Dimbylow and Howes renders obvious the actuator is spaced towards the rear end of the cyclone. In my opinion, in their combined teachings, Howes's "actuator mechanism" (including "button 22" and "push-rod 23") releases Dimbylow's "end wall 26" (by releasing Dimbylow's "catch 42"), as shown in the annotated image below:



Ex1005, Fig. 1(modified); Ex1006, 4:1-10.

124. In my opinion, a POSA reading Dimbylow and Howes would have found it obvious to locate Howes's actuator in the convenient location identified above—spaced towards the rear end of the cyclone (i.e., the end closer to the hand vacuum cleaner rear end)—and would have had a reasonable expectation of success doing so, including because Howes's cyclone, when oriented as shown in Dimbylow, likewise has its actuator at the rear of the cyclone. Ground 1, §1.
125. Regarding Limitation [10e], in my opinion, the combination of Dimbylow and Howes renders obvious locating the actuator at an elevation of an upper end of the pistol grip handle and forward of the pistol grip handle. In my opinion, a POSA reading Dimbylow and Howes would have found it obvious to conveniently locate the “**button 22**” (actuator) at an **elevation**

of an “upper portion” (upper end) of Dimbylow’s “handle 6,” and forward of “handle 6,” including because there are a finite number of locations to use and this location is within easy reach while a user is holding the vacuum cleaner, as shown in the annotated image below:



Ex1005 ¶31, Fig. 1(modified); Ex1006, 4:1-10.

126. In my opinion, a POSA would have understood that, in the combined teachings of Dimbylow and Howes, the actuator is forward of Dimbylow’s “handle 6,” including because Dimbylow teaches “[a] trigger guard 17 extends forwardly from the handle below the trigger 16.” Ex1005 ¶31.

3. [2]

Reference Number	Claim Limitation
[2]	“The hand vacuum cleaner of claim 1 further comprising a pistol grip handle wherein the actuator is located at an elevation of an upper end of the pistol grip handle and forward of the pistol grip handle.”

127. In my opinion, the combined teachings of Dimbylow and Howes render

obvious the hand vacuum cleaner of claim 1 further comprising a pistol grip handle wherein the actuator is located at an elevation of an upper end of the pistol grip handle and forward of the pistol grip handle.

128. In my opinion, Dimbylow in combination with Howes renders this claim obvious for the same reasons discussed for Limitations [1d]/[10d]/[10e].
Ground 1, Limitations [1d]/[10d]/[10e].

4. [3]/[13]

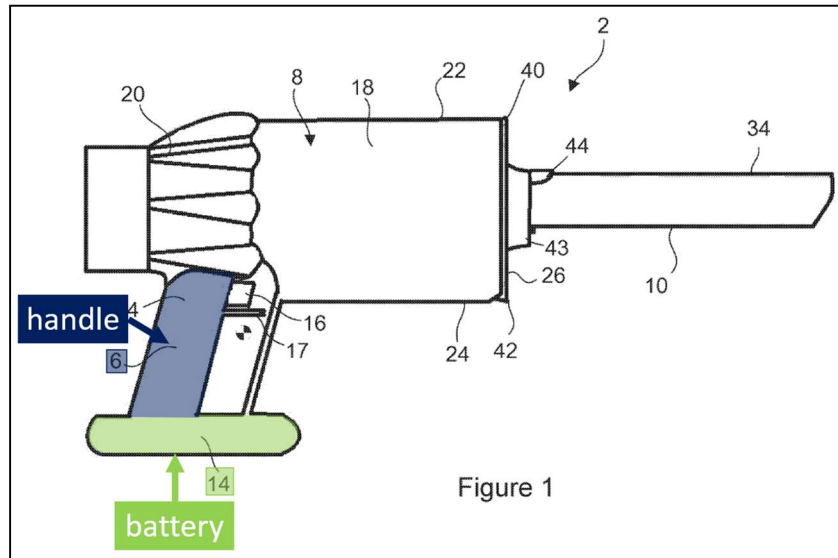
Reference Number	Claim Limitation
[3]	“The hand vacuum cleaner of claim 2 further comprising a battery pack wherein the actuator is axially located adjacent a forward end of the battery pack.”
[13]	“The hand vacuum cleaner of claim 10 further comprising a battery pack wherein the actuator is axially located adjacent a forward end of the battery pack.”

129. In my opinion, the combined teachings of Dimbylow and Howes renders obvious the hand vacuum cleaner of claim 2 further comprising a battery pack wherein the actuator is axially located adjacent a forward end of the battery pack.

130. In my opinion, the combined teachings of Dimbylow and Howes renders obvious the hand vacuum cleaner of claim 10 further comprising a battery pack wherein the actuator is axially located adjacent a forward end of the battery pack.

131. In my opinion, Dimbylow teaches a hand vacuum cleaner comprising a

battery pack. Dimbylow's "**battery 14** [is] located directly below the **handle 6**," as shown in the annotated image below:



Ex1005 ¶31, Fig. 1.

132. In my opinion, a POSA would have understood that Dimbylow's "**battery 14**" is a battery pack.

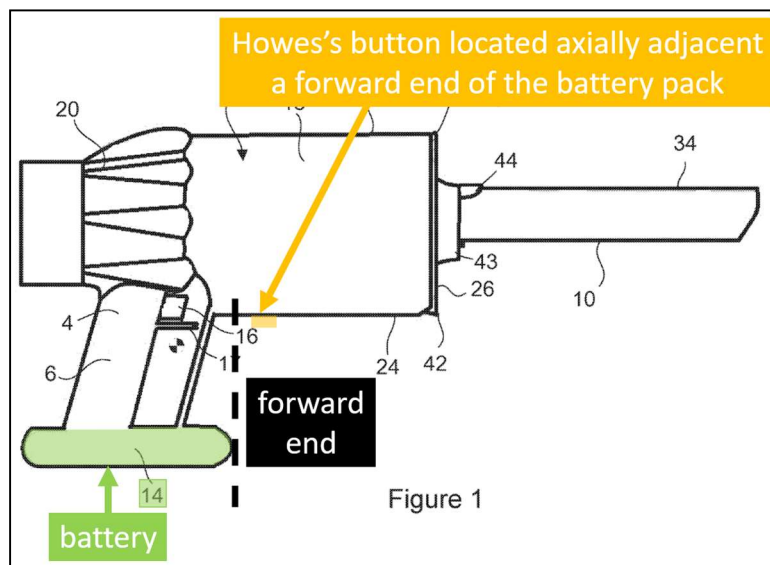
133. To the extent PO argues Dimbylow's "**battery 14**" is not a battery pack, in my opinion, a POSA would have been motivated by Dimbylow's disclosures to modify Dimbylow to include a battery pack. The '984 Patent explains that the "battery pack" can "include[] one ... battery cell[]," such as Dimbylow's "battery 14." Ex1001, 6:35-41. In my opinion, while a POSA would have understood that Dimbylow's "battery 14" is a battery pack (as opposed to, for example, a battery that is exposed to the air), a POSA also would have found encasing Dimbylow's "battery

14” in a pack to be obvious to try, easy to implement, and would have yielded the predictable result of protecting the user from the battery while still meeting Dimbylow’s other “battery 14” objectives, including “form[ing] a base of the vacuum cleaner.” Ex1005 ¶40. Also, in my opinion, a POSA would have reasonably expected success based on Dimbylow’s teachings of a “battery 14” and because batteries and battery packs perform the same function (powering the cleaner) in the same way (providing electricity). In my opinion, a POSA would also have reasonably expected success because battery packs were well-known in the art for powering cordless vacuum cleaners.

134. For example, Sunderland, a 2013 Dyson patent publication, teaches “a handheld cleaning appliance [that] includes a removable battery pack [10] which is generally slab-like in form with an upstanding pillar that is receivable in a dock opening in the end of a handle of the vacuum cleaner” “so that the battery pack 10 may be docked onto the vacuum cleaner 2.” Ex1017, 1:19-22, 7:13-14.

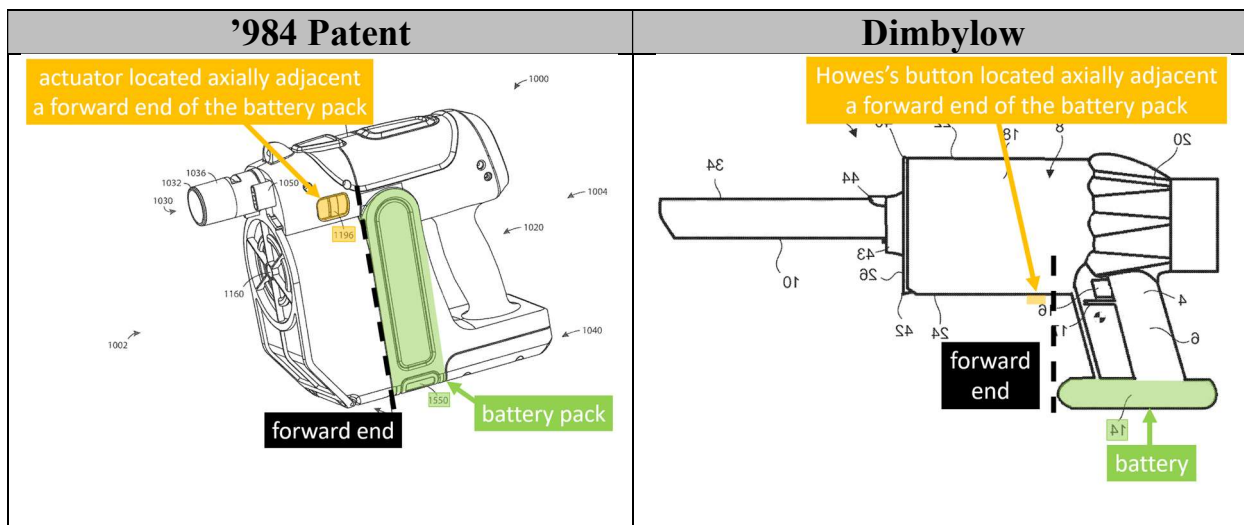
135. In my opinion, the combination of Dimbylow and Howes renders obvious wherein the actuator is axially located adjacent a forward end of the battery pack. In my opinion, a POSA would have understood that the right-most end of Dimbylow’s battery pack in the figure below (the end closest to the

front end of Dimbylow's cleaner) is a forward end, including because Dimbylow teaches "[a] trigger guard 17 extends forwardly from the handle below the trigger 16." Ex1005 ¶31. Also, in my opinion, a POSA reading Dimbylow and Howes would have found it obvious to locate the "button 22" (actuator) axially adjacent to that **forward end** of Dimbylow's "battery 14" (battery pack), as shown in the annotated image below:



Ex1005 ¶31, Fig. 1(modified); Ex1006, 4:1-10; Ground 1, §1, Limitations [1d]/[10e].

136. Further, this is at least as much disclosure of these limitations as the '984 Patent:



Ex1001, Fig. 46; Ex1005, Fig. 1(modified).

5. [4]/[14]

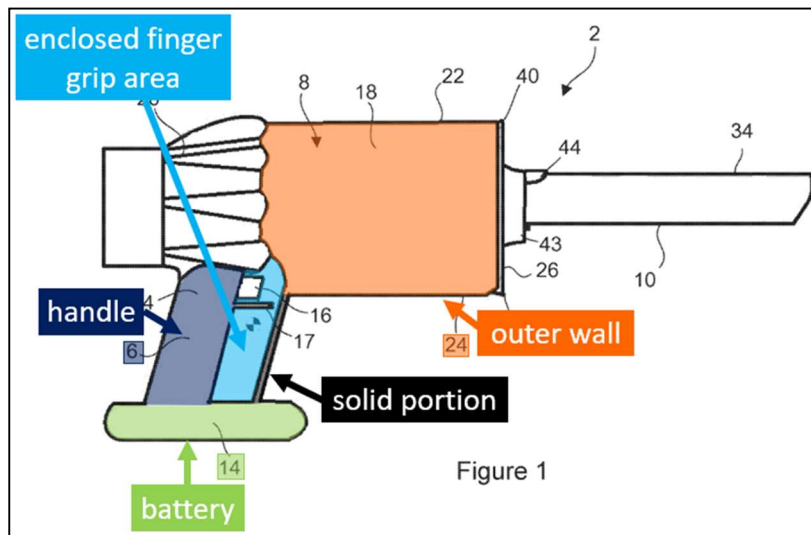
Reference Number	Claim Limitation
[4]	“The hand vacuum cleaner of claim 3 further comprising an enclosed finger grip area.”
[14]	“The hand vacuum cleaner of claim 13 further comprising an enclosed finger grip area.”

137. In my opinion, the combined teachings of Dimbylow and Howes render obvious the hand vacuum cleaner of claim 3 and Dimbylow teaches an enclosed finger grip area.

138. In my opinion, the combined teachings of Dimbylow and Howes render obvious the hand vacuum cleaner of claim 13 and Dimbylow teaches an enclosed finger grip area.

139. A POSA would have understood that Dimbylow teaches the hand vacuum cleaner further comprising an enclosed finger grip area. Dimbylow

illustrates that its “handheld vacuum cleaner” comprises an **enclosed finger grip area**, as Dimbylow illustrates an open area bordered on all sides by “**outer wall 24**,” “**handle 6**,” “**battery 14**,” and a **solid portion** extending from “**outer wall 24**” to “**battery 14**”:



Ex1005, Fig. 1.

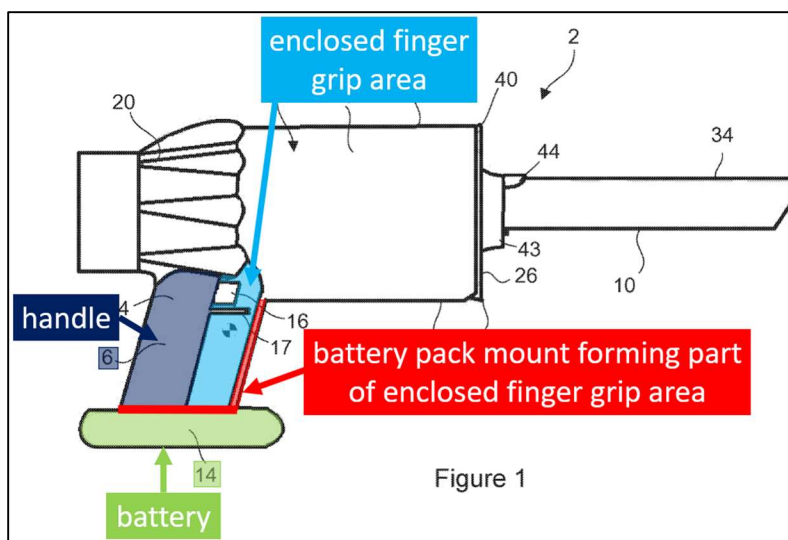
140. A POSA would have understood that when the user grabs Dimbylow’s “**handle 6**,” their fingers wrap into Dimbylow’s **enclosed finger grip area**.

6. [5]/[15]

Reference Number	Claim Limitation
[5]	“The hand vacuum cleaner of claim 4 wherein a battery pack mount forms part of the enclosed finger grip area.”
[15]	“The hand vacuum cleaner of claim 14 wherein a battery pack mount forms part of the enclosed finger grip area.”

141. In my opinion, the combined teachings of Dimbylow and Howes renders

- obvious the hand vacuum cleaner of claim 4 and Dimbylow teaches a battery pack mount forms part of the enclosed finger grip area.
142. In my opinion, the combined teachings of Dimbylow and Howes renders obvious the hand vacuum cleaner of claim 14 and Dimbylow teaches a battery pack mount forms part of the enclosed finger grip area.
143. As I explained above, in my opinion Dimbylow teaches an enclosed finger grip area, where the bottom boundary of the enclosed finger grip area is illustrated as “**battery 14**.” Ground 1, Claims 4/14.
144. Dimbylow teaches that its “**battery**” is mounted “directly below the **handle 6**.” Ex1005 ¶31, Fig. 1. In my opinion, a POSA would have understood that Dimbylow’s “**battery 14**” includes a **battery pack mount** (including the solid portion identified for claims 4/14) that holds the battery in place, and that the **battery pack mount** forms part of the **enclosed finger grip area**, as shown in the annotated image below:



Ex1005 ¶31, Fig. 1. For additional explanation, *see* Ground 1, Claims 3/13, 4/14.

7. [6]/[11]

Reference Number	Claim Limitation
[6]	“The hand vacuum cleaner of claim 2 wherein a pistol grip axis extends through the pistol grip handle from a lower end of the pistol grip handle to an upper end of the pistol grip handle and the pistol grip axis intersects the suction motor.”
[11]	“The hand vacuum cleaner of claim 10 wherein a pistol grip axis extends through the pistol grip handle from a lower end of the pistol grip handle to the upper end of the pistol grip handle and the pistol grip axis intersects the suction motor.”

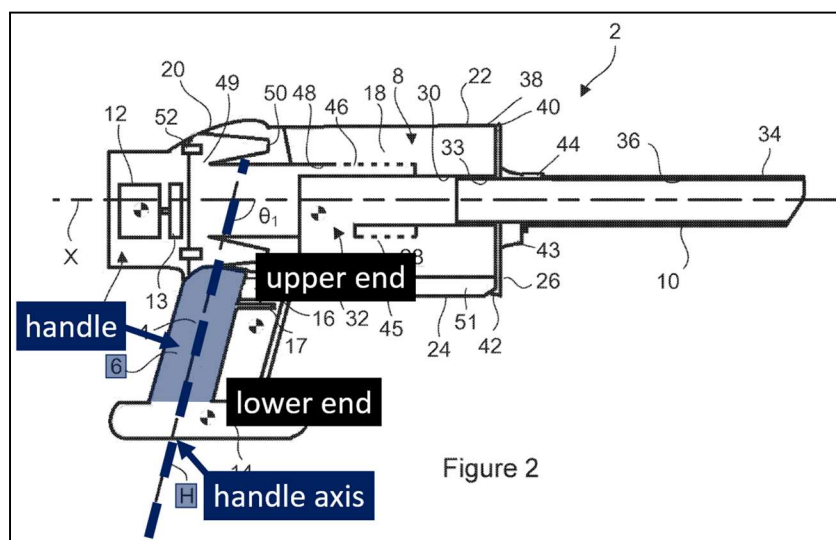
145. In my opinion, the combined teachings of Dimbylow and Howes render obvious the hand vacuum cleaner of claim 2 and Dimbylow teaches and renders obvious a pistol grip axis extends through the pistol grip handle from a lower end of the pistol grip handle to an upper end of the pistol grip handle and the pistol grip axis intersects the suction motor.

146. In my opinion, the combined teachings of Dimbylow and Howes render

obvious the hand vacuum cleaner of claim 10 and Dimbylow teaches and renders obvious a pistol grip axis extends through the pistol grip handle from a lower end of the pistol grip handle to an upper end of the pistol grip handle and the pistol grip axis intersects the suction motor.

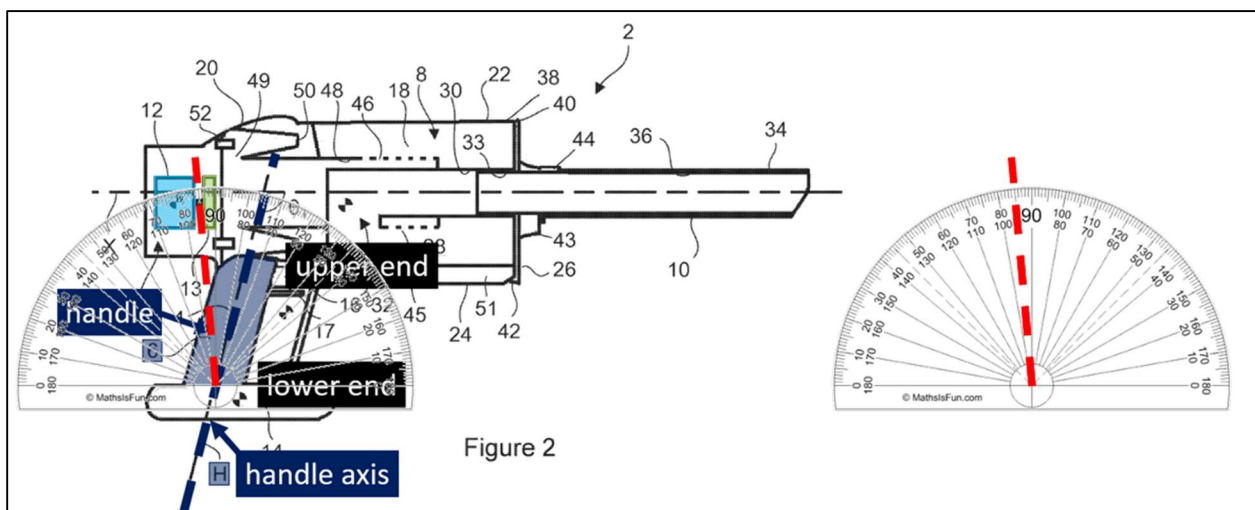
147. As I explained for Limitations [1b]/[10b]/[10d], in my opinion, Dimbylow teaches a pistol grip handle and a suction motor. Ground 1, Limitations [1b]/[10b]/[10d].

148. Also, in my opinion, Dimbylow teaches a pistol grip axis extends through the pistol grip handle from a lower end of the pistol grip handle to an upper end of the pistol grip handle. Dimbylow's "**handle axis H** extend[s] through the **handle 6**" from a **lower end** to an/the **upper end**, as shown in the annotated image below:



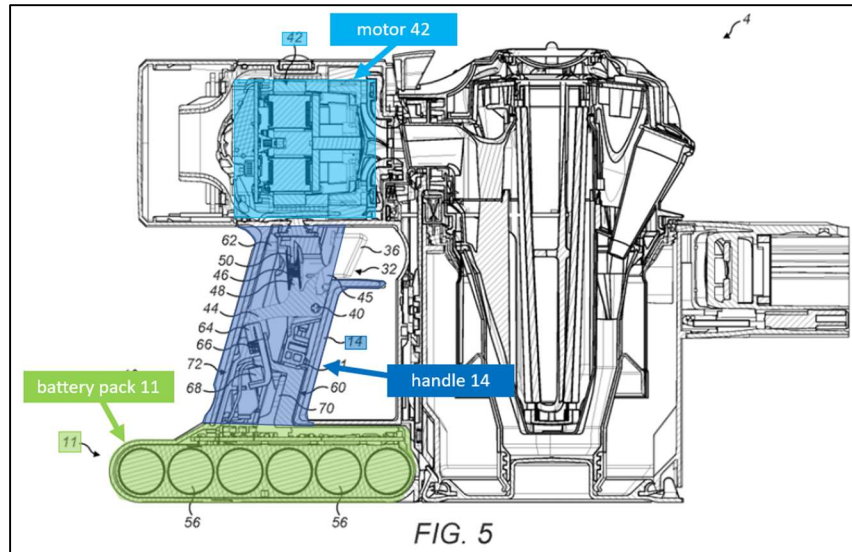
Ex1005 ¶31, Fig. 2.

149. Further, in my opinion, Dimbylow teaches the pistol grip axis intersects the suction motor. Dimbylow teaches the “suction generator 11 compris[es] a motor 12 and impeller 13 ... located **above** and towards the rear of the handle 6.” Ex1005 ¶31 (emphasis added). Dimbylow explains that “[t]he handle 6 is arranged at an angle θ_1 with respect to the longitudinal axis X of the cyclonic separating unit 8 such that the handle 6 is in a pistol grip configuration.” *Id.* Dimbylow discloses that “[t]he cyclonic separating unit may be inclined with respect to the handle to form an angle of not less than 85 degrees and not greater than 140 degrees between the handle and the longitudinal axis of the cyclonic separating unit.” *Id.* ¶13. This range includes angles, including an **85-degree angle**, depicted below, that result in Dimbylow’s “**handle axis H**” intersecting Dimbylow’s “**motor 12 and impeller 13** ... located above ... the handle,” as shown in the annotated image below:



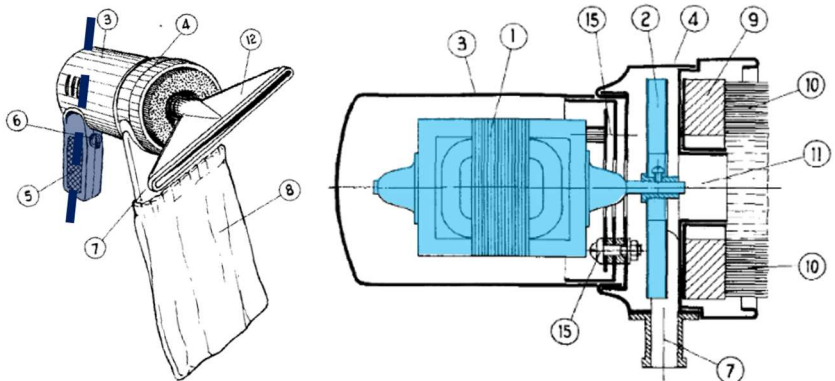
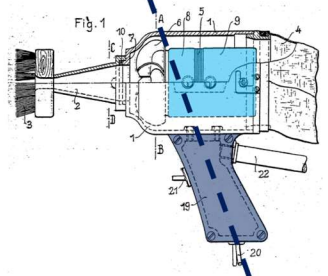
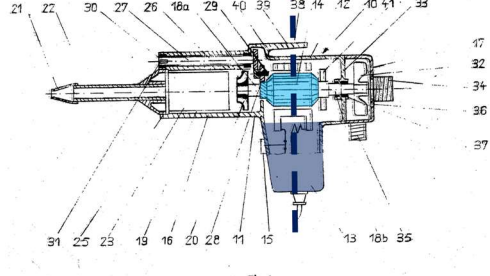
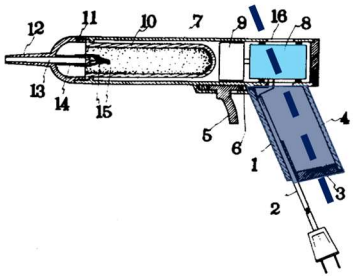
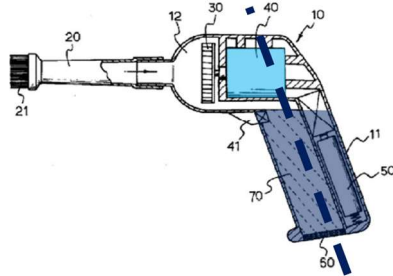
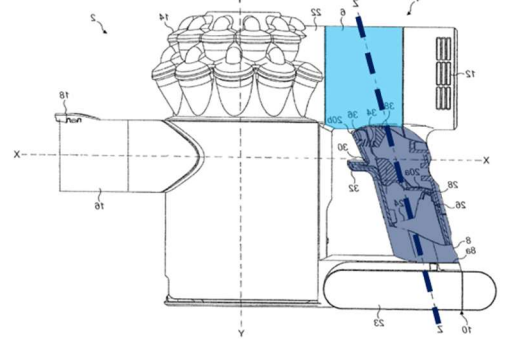
Ex1005 ¶31, Fig. 2.

150. Alternatively, to the extent PO argues that Dimbylow's hand vacuum cleaner does not disclose a pistol grip axis that intersects the suction motor, in my opinion, a POSA would have been motivated by Dimbylow's disclosures to modify Dimbylow such that the pistol grip axis intersects the suction motor. In my opinion, a POSA would have understood that locating heavy components, such as the battery and the suction motor, at opposite ends of the handle can advantageously improve weight balance and useability, as was known in the art. As one example, another Dyson patent, US10743733, filed six months before the '984Patent's earliest-claimed priority date, teaches this: "The battery pack 11 and the motor and fan [42] ... being positioned on the opposite ends of the handle 14 provides ... particularly ergonomic weight balance," as shown in the annotated image below:



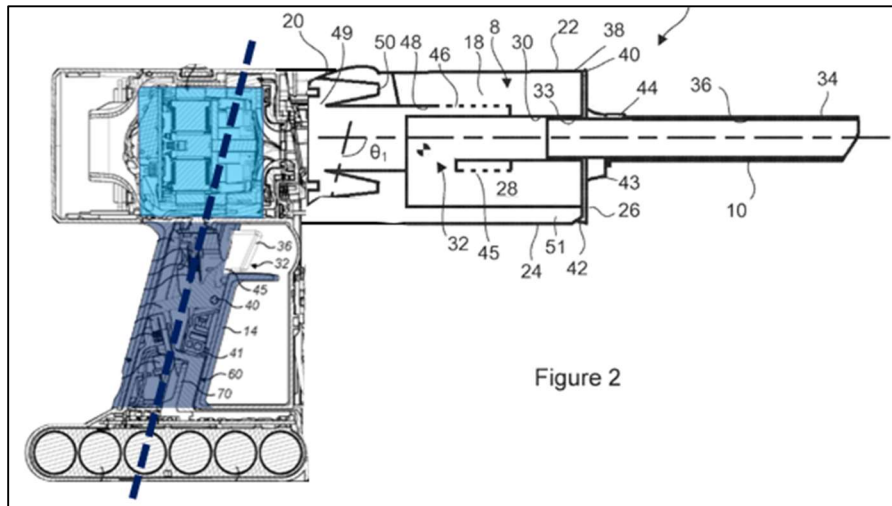
Ex1027, 8:28-32, 10:59-62, Fig. 5.

151. Thus, in my opinion, a POSA would have been motivated to achieve this improved weigh balance by placing Dimbylow's handle directly underneath the suction motor.
152. Further, hand vacuum cleaners having **pistol grip handles** positioned directly underneath the **suction motor** with **axes** that intersect the **suction motor** have existed for nearly 70 years, as shown in the annotated images below:

Ex1025, page 3 (1954)	
	
Ex1029, Fig. 1 (1955)	Ex1033, Fig. 1 (1971)
	
Ex1022, Fig. 1 (1973)	Ex1031, Fig. 2 (1998)
	
Ex1017, Fig. 2 (2013)	
	

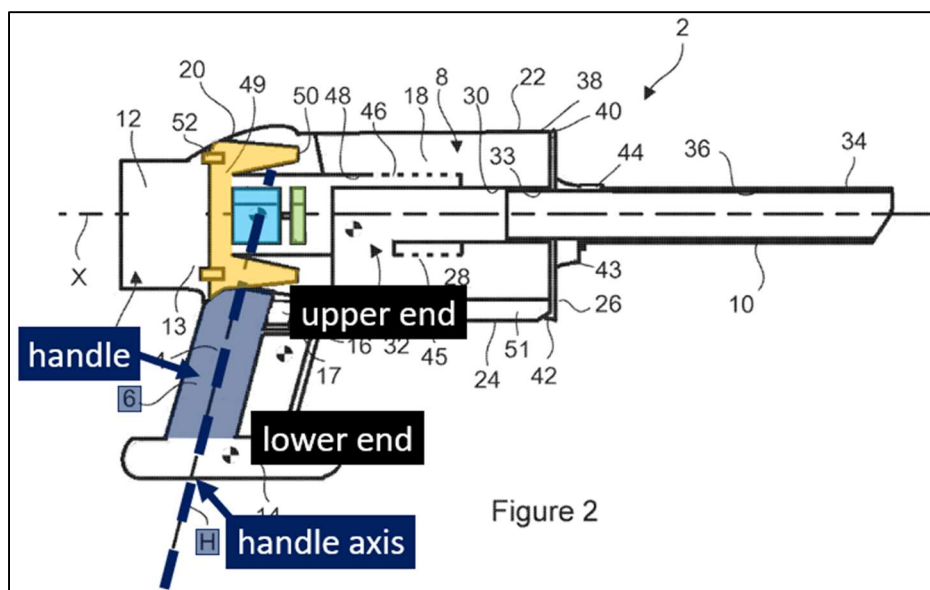
153. In my opinion, a POSA would have reasonably expected success modifying Dimbylow as described because it would have involved a

straightforward relocation of Dimbylow's existing handle and/or motor, and because Dimbylow itself teaches that many handle angles (and thus many handle-body junctions) are possible. When so modified, the **pistol grip-axis** intersects the **suction motor**, as shown in the annotated image below:



Ex1005, Fig. 2(modified); Ex1027, Fig. 5(modified)

154. Further, Dimbylow depicts and teaches that the “**secondary cyclonic separators 20** are arranged in a circular array,” creating a central space into which a POSA would have understood Dimbylow’s **motor 12** and **impeller 13** could be located, as shown in the annotated image below:



Ex1005 ¶32, Fig. 2(modified).

155. In my opinion, a POSA would have been motivated to modify Dimbylow as depicted above to make Dimbylow more compact and therefore more versatile, usable, and easier to store, and would have reasonably expected success doing so because it would involve a straightforward relocation of Dimbylow's existing components.

156. Thus, in my opinion, positioning Dimbylow's pistol grip such that the axis intersects the suction motor would have been at least obvious to try, particularly given Dimbylow's teaching that different handle angles could be used; it would have been easy to implement, including by using nearly 70-year-old teachings; and it would have yielded the predictable result of a "wieldable handheld vacuum" that "can be manipulated easily in order to clean hard-to-reach surfaces," which is one of Dimbylow's stated

objectives. Ex1005 ¶¶8, 13, 43. Further, in my opinion, a POSA would have reasonably expected success based on Dimbylow's teachings of arranging the suction motor above the pistol grip handle to increase maneuverability and balance:

The main body 4 further comprises a suction generator 11 comprising a motor 12 and impeller 13 which are located above and towards the rear of the handle 6, and a battery 14 located directly below the handle 6. An actuator in the form of a finger-operated trigger 16 is provided at an upper portion of the handle 6. A trigger guard 17 extends forwardly from the handle below the trigger 16. The handle 6 is arranged at an angle θ_1 with respect to the longitudinal axis X of the cyclonic separating unit 8 such that the handle 6 is in a pistol grip configuration. In the embodiment shown, a handle axis H is arranged at 110 degrees with respect to the longitudinal axis X of the cyclonic separating unit 8. The angle θ_1 is the included angle between the longitudinal axis X extending forward of the handle 6 and the portion of the handle axis H extending through the handle 6.

Id., ¶31.

The cyclonic separating unit 8, suction generator 11 and battery 14 are expected to be the heaviest components of the vacuum cleaner 2. The separator 8 has a centre of gravity which is forward of the trigger guard 17 and so generates a clockwise moment about the trigger 16 and the trigger guard 17 (as viewed in FIG. 2). The battery 14 has a centre of gravity which is

rearward of the trigger guard 17. The battery 14 therefore exerts an anticlockwise moment about the trigger 16 and the trigger guard 17. The suction generator 11 also has a centre of gravity which is rearward of the trigger guard 17. The cyclonic separating unit 8, suction generator 11 and battery 14 are positioned such that the net moment of all of the components of the vacuum cleaner 2 about an axis that extends perpendicularly with respect to the handle 6 and the longitudinal axis X of the cyclonic separating unit 8 and which passes through a region immediately below the trigger guard 17 is zero. The centre of gravity of the vacuum cleaner 2 is therefore located within the region below the trigger guard 17 such that when the trigger 16 is released by a user, the handheld vacuum cleaner 2 is balanced about a point below the trigger guard 17 and so can be supported easily by the rest of the user's fingers on the handle 6 and the upper finger against the trigger guard 17 without tipping forwards or backwards. Furthermore, the vacuum cleaner 2 can be supported on the battery 14, which forms a base of the vacuum cleaner 2, without toppling over.

Id., ¶40. A POSA further would have reasonably expected success based on the prior art's teachings of positioning the pistol grip handle below the suction motor. Ex1017, 5:17-18, 6:11-12, Fig. 2; Ex1022, Fig. 1; Ex1025, page 3.

8. [7]/[12]

Reference Number	Claim Limitation
[7]	“The hand vacuum cleaner of claim 6 wherein the pistol grip axis and the cyclone axis of rotation intersect within the hand vacuum cleaner.”
[12]	“The hand vacuum cleaner of claim 11 wherein the pistol grip axis and the cyclone axis of rotation intersect within the hand vacuum cleaner.”

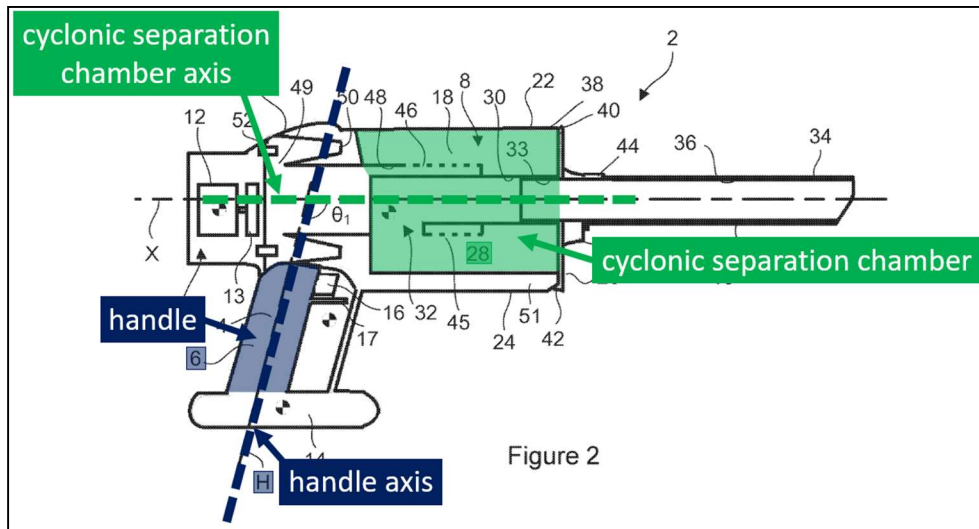
157. In my opinion, the combined teachings of Dimbylow and Howes render obvious the hand vacuum cleaner of claim 6 and Dimbylow teaches the pistol grip axis and the cyclone axis of rotation intersect within the hand vacuum cleaner.

158. In my opinion, the combined teachings of Dimbylow and Howes render obvious the hand vacuum cleaner of claim 11 and Dimbylow teaches the pistol grip axis and the cyclone axis of rotation intersect within the hand vacuum cleaner.

159. As I explained above, in my opinion, Dimbylow teaches a pistol grip handle with a pistol grip axis, and a cyclone axis of rotation. Ground 1, Limitations [1c]/[10c], Claims 6/11.

160. Also, in my opinion, Dimbylow teaches that the pistol grip axis and the cyclone axis of rotation intersect within the hand vacuum cleaner. Dimbylow illustrates that its “**handle axis H**” and “**axis of the cyclonic separation chamber 28**” intersect within Dimbylow’s “handheld vacuum

cleaner,” as shown in the annotated image below:



Ex1005 ¶¶31, 33, Fig. 2.

161. Further, Dimbylow discloses that “[t]he cyclonic separating unit may be inclined with respect to the handle to form an angle of not less than 85 degrees and not greater than 140 degrees between the handle and the longitudinal axis of the cyclonic separating unit.” Ex1005 ¶13. In my opinion, a POSA would have understood that those configuration angles would result in the pistol grip axis and the cyclone axis of rotation intersecting within the hand vacuum cleaner, including when modified as described in claims 6/11. For additional explanation, *see* Ground 1, Claims 6/11.

9. [8]/[17]

Reference Number	Claim Limitation
[8]	“The hand vacuum cleaner of claim 1 wherein the front door has a door first end which is rotatably mounted to a front end of the cyclone unit wall and an opposed securable end and the lock further comprises a latch that is located at an elevation of the opposed securable end.”
[17]	“The hand vacuum cleaner of claim 10 wherein the front door has a door first end which is rotatably mounted to a front end of the cyclone unit wall and an opposed securable end and the lock further comprises a latch that is located at an elevation of the opposed securable end.”

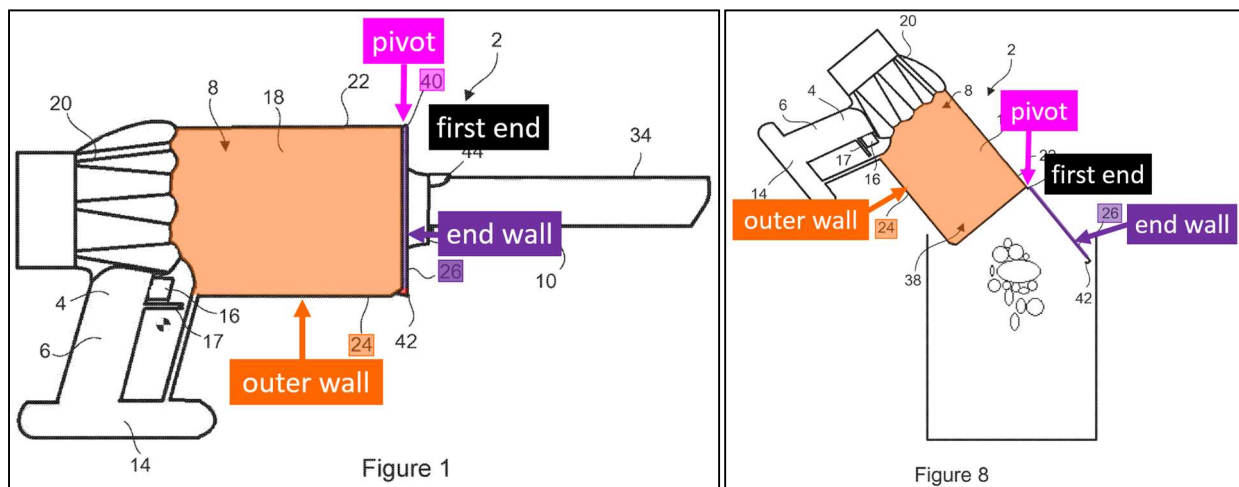
162. In my opinion, the combined teachings of Dimbylow and Howes render obvious the hand vacuum cleaner of claim 1 and Dimbylow teaches the front door has a door first end which is rotatably mounted to a front end of the cyclone unit wall and an opposed securable end and the lock further comprises a latch that is located at an elevation of the opposed securable end.

163. In my opinion, the combined teachings of Dimbylow and Howes render obvious the hand vacuum cleaner of claim 10 and Dimbylow teaches the front door has a door first end which is rotatably mounted to a front end of the cyclone unit wall and an opposed securable end and the lock further comprises a latch that is located at an elevation of the opposed securable end.

164. As I explained for Limitations [1c]/[10c], in my opinion, Dimbylow

teaches a front door and a cyclone unit wall with a front end. Ground 1, Limitations [1c]/[10c].

165. Further, in my opinion, Dimbylow’s front door has a door first end which is rotatably mounted to a front end of the cyclone unit wall. The **first end** of Dimbylow’s “**end wall 26** is connected to the cylindrical **outer wall 24** by a **pivot 40**,” as shown in the annotated images below:

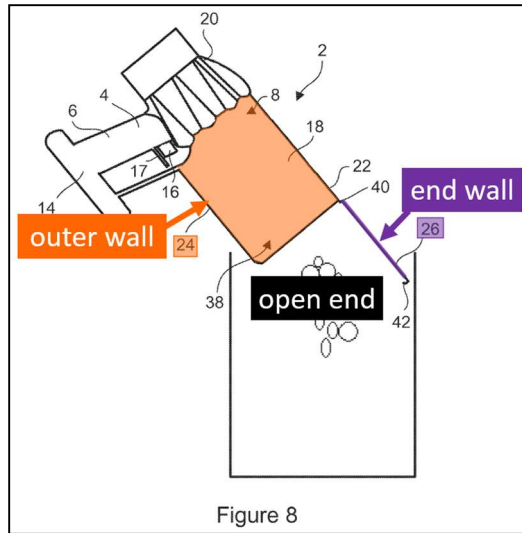


Ex1005 ¶37, Figs. 1, 8; *see also id.* ¶37 (“The end wall 26 can be moved from the closed position ... to an open position ... by releasing the catch 42 and pivoting the end wall 26 away from the end of the cylindrical outer wall 24.”).

166. As I explained for Limitations [1d]/[10e], in my opinion, Dimbylow teaches a door lock, and the combination of Dimbylow and Howes teaches a door lock. Ground 1, Limitations [1d]/[10e].

167. Further, in my opinion, Dimbylow teaches an opposed securable end and the lock further comprises a latch that is located at an elevation of the

169. In my opinion, the combined teachings of Dimbylow and Howes render obvious the hand vacuum cleaner of claim 1 and Dimbylow teaches the cyclone unit wall terminates at an open end, the open end is closed by the front door, wherein all of the open end is opened when the front door is in the open position.
170. In my opinion, the combined teachings of Dimbylow and Howes render obvious the hand vacuum cleaner of claim 10 and Dimbylow teaches the cyclone unit wall terminates at an open end, the open end is closed by the front door, wherein all of the open end is opened when the front door is in the open position.
171. As I explained for Limitations [1c]/[10c], in my opinion, Dimbylow teaches the cyclone unit wall terminates at an open end, and the open end is closed by a front door. Ground 1, Limitations [1c]/[10c].
172. Also, in my opinion, Dimbylow further teaches wherein all of the open end is opened when the front door is in the open position. When Dimbylow's "end wall 26 [is] pivoted from its closed position into its open position," all of "outer wall 24"'s open "end" is opened, as shown in the annotated image below:



Ex1005 ¶¶33, 48, Fig. 8.

11. [16]

Reference Number	Claim Limitation
[16]	“The hand vacuum cleaner of claim 14 wherein the actuator is spaced towards the rear end of the cyclone.”

173. In my opinion, the combined teachings of Dimbylow and Howes render obvious the hand vacuum cleaner of claim 14 wherein the actuator is spaced towards the rear end of the cyclone.

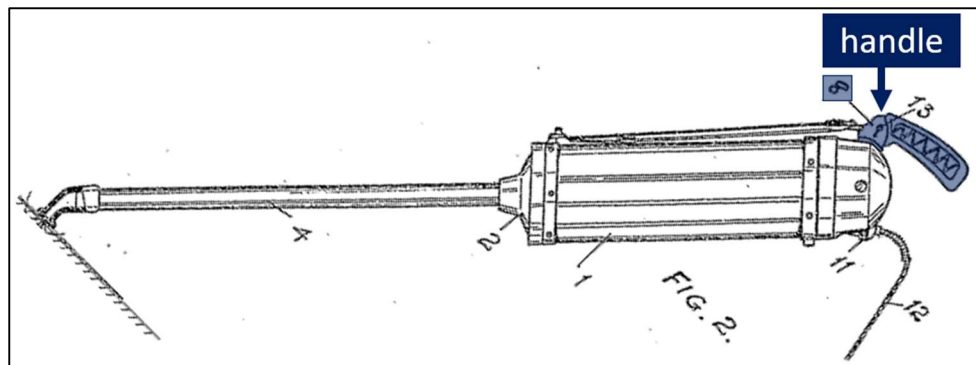
174. In my opinion, Dimbylow in combination with Howes renders this claim obvious for the same reasons discussed for Limitation [1d]. Ground 1, Limitation [1d].

B. Ground 2: IPVG in Combination with Nakai Renders Obvious Claims 1-18

1. A POSA Would Have Combined IPVG and Nakai

a. Scope and Content of the IPVG and Nakai Prior Art References

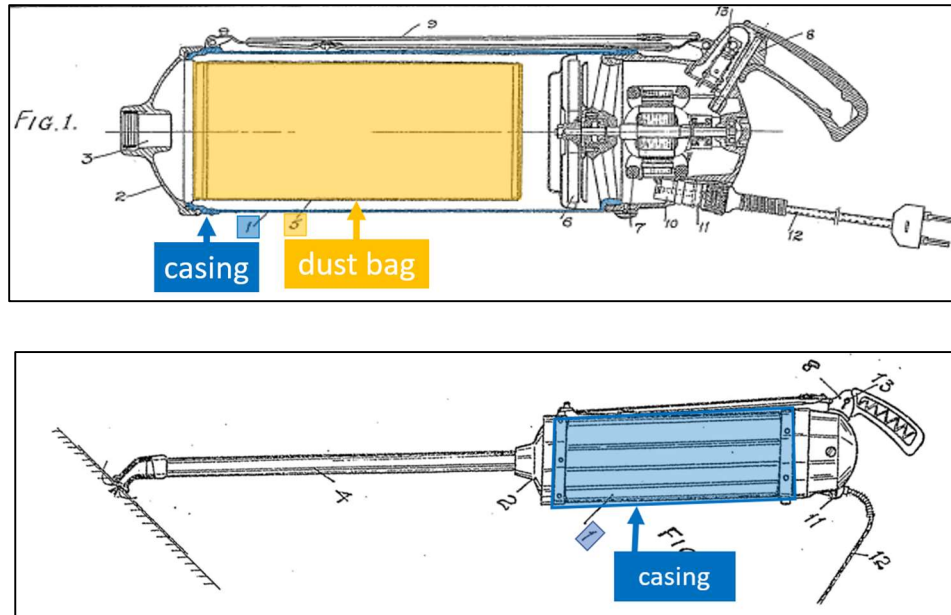
175. As noted briefly above in the Background of the Prior Art section, IPVG teaches a “portable dust suction apparatus” from 1928. Ex1007, 1:10-33. IPVG’s “portable dust suction apparatus” has “a **handle [8]**,” as shown in the annotated image below:



Ex1007, 1:22-33, Fig. 2.

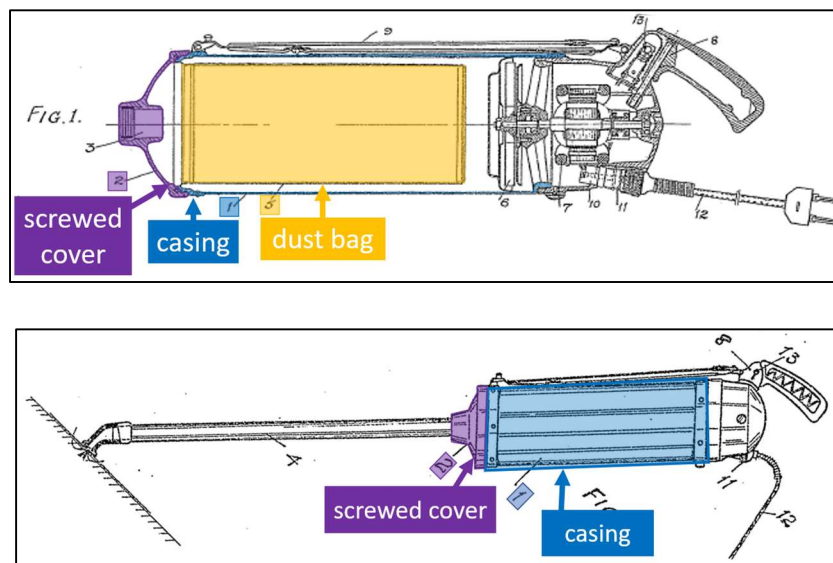
176. In my opinion, a POSA would have understood that a “portable dust suction apparatus” having a handle and a configuration as illustrated in the figure above is a hand vacuum.

177. IPVG’s vacuum uses “**dust bag or like member [5]**,” stored in “**casing 1**,” to filter dust, as shown in the annotated images below:



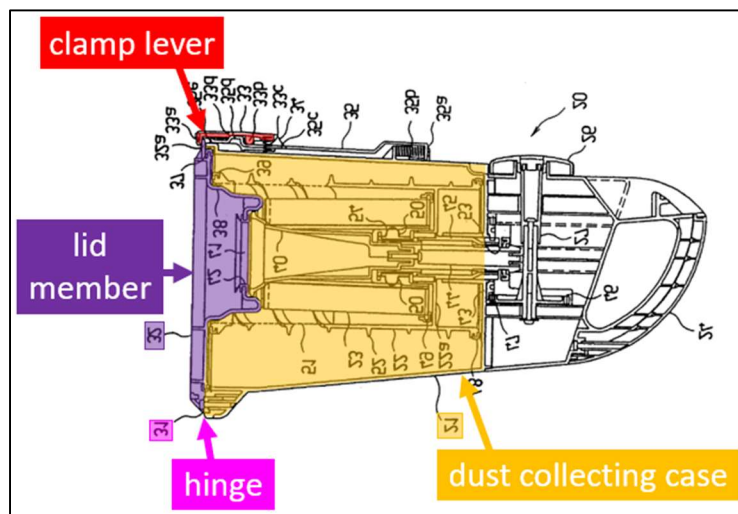
Ex1007, 1:51-57, 2:9-20, Figs. 1-2.

178. IPVG teaches that its vacuum is emptied by removing “**screwed cover 2**” (which “close[s]” “**casing 1** ... at the front end”) and removing “**dust bag 5**,” as shown in the annotated images below:



Ex1007, 1:51-57, Figs. 1-2.

179. As described briefly above in the background of the prior art section, Nakai is a patent from 2007. Ex1007. Nakai teaches a cyclonic “vacuum cleaner” with a “**dust collecting case 21**,” wherein “dust sucked together with the air from the upper suction port is forcibly whirled downward, causing the dust to be accumulated and compacted on the bottom of the **lid member 32**,” as shown in the annotated image below:



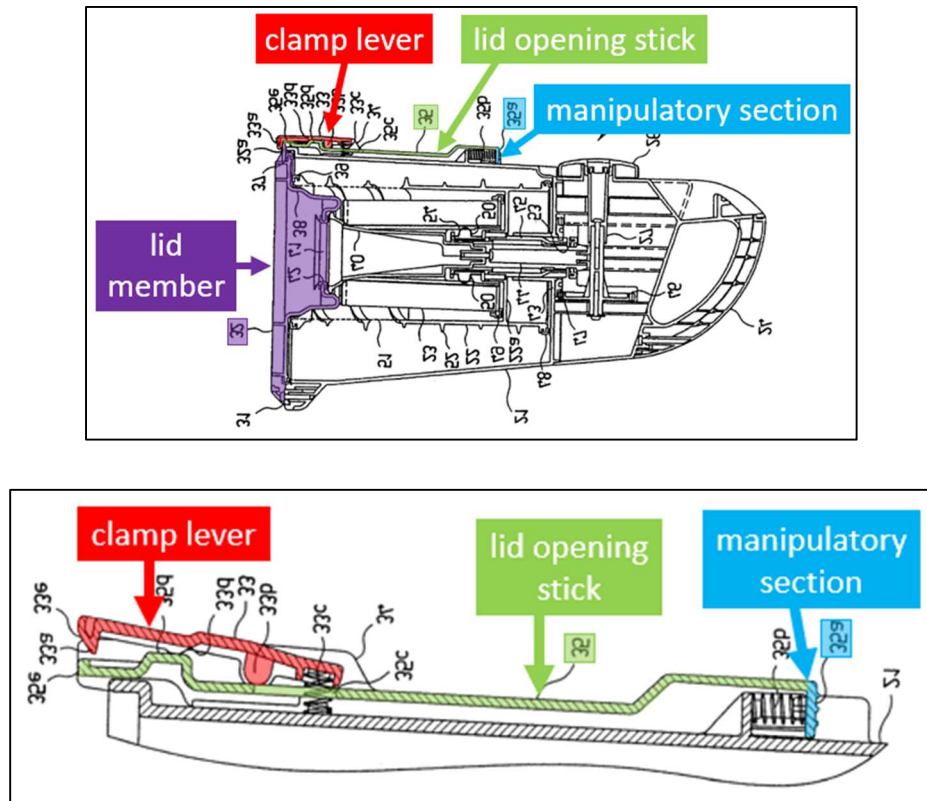
Ex1008, Abstract, 6:24-29, Fig. 3.

180. As shown above, “**lid member 32**” is “rotatably mounted on the bottom of the **dust collecting case 21**... via a **hinge 31**,” and is “locked by hooking up the clamp hook 33a formed on the lower end of the **clamp lever 33**.”

Ex1008, 4:27-34, Fig. 3.

181. Nakai explains that to open “**lid member 32**,” the “**manipulative section 35a** of the **lid opening stick 35** is forced down,” “thereby rotating the **clamp lever 33** away from the ... **lid member 32**,” as shown in the

annotated images below:



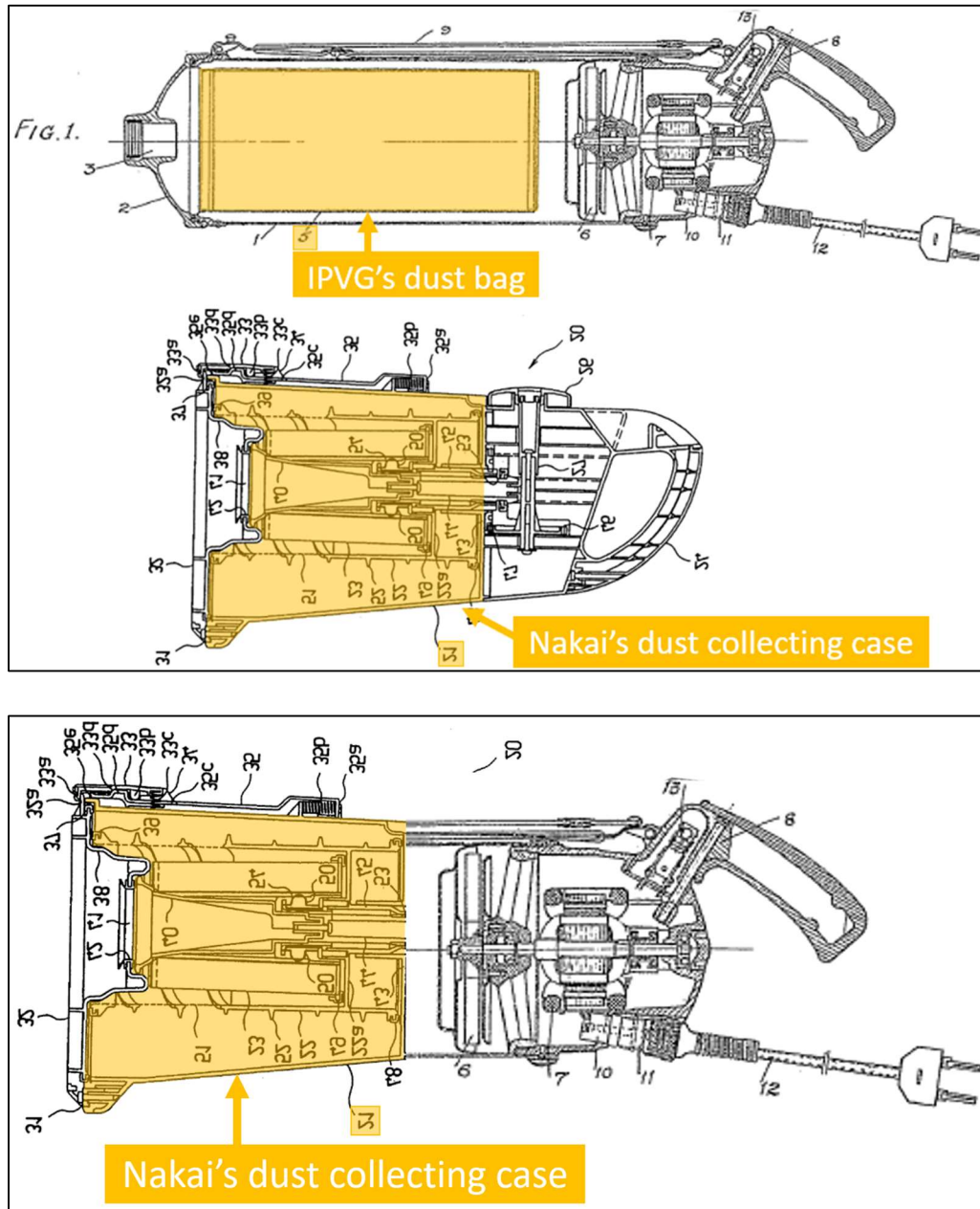
Ex1008, 7:11-24, Figs. 3, 9.

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

182. Having reviewed the teachings of both IPVG and Nakai, in my opinion, a POSA would have been motivated to modify IPVG to achieve the benefits of Nakai's cyclonic-separation system, hinged lid member, and lid opening mechanism.

183. In my opinion, a POSA would have been motivated to modify IPVG's dust-separation unit ("dust bag 5") to use a cyclonic-filtration unit, such as Nakai's "dust collecting case 21," which uses "a whirlpool motion"

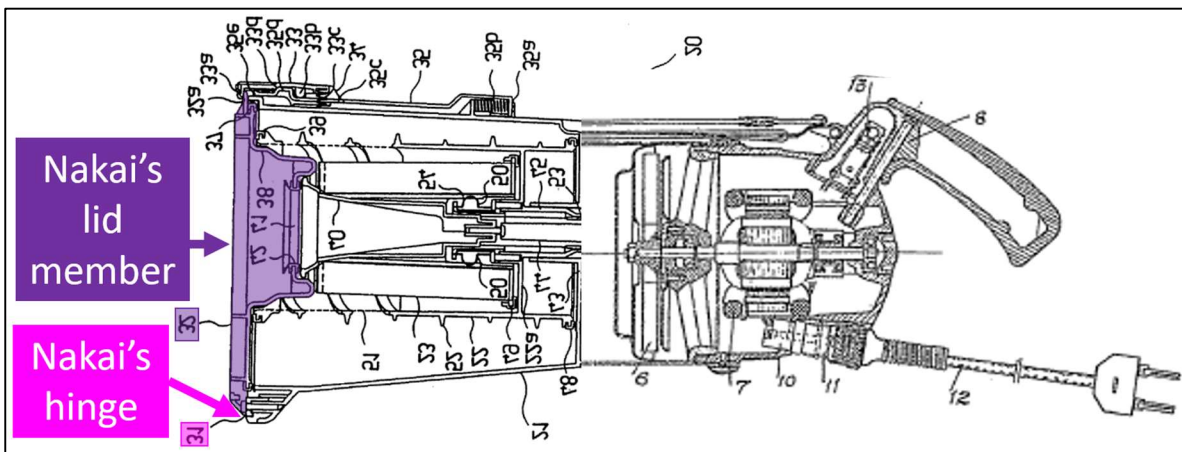
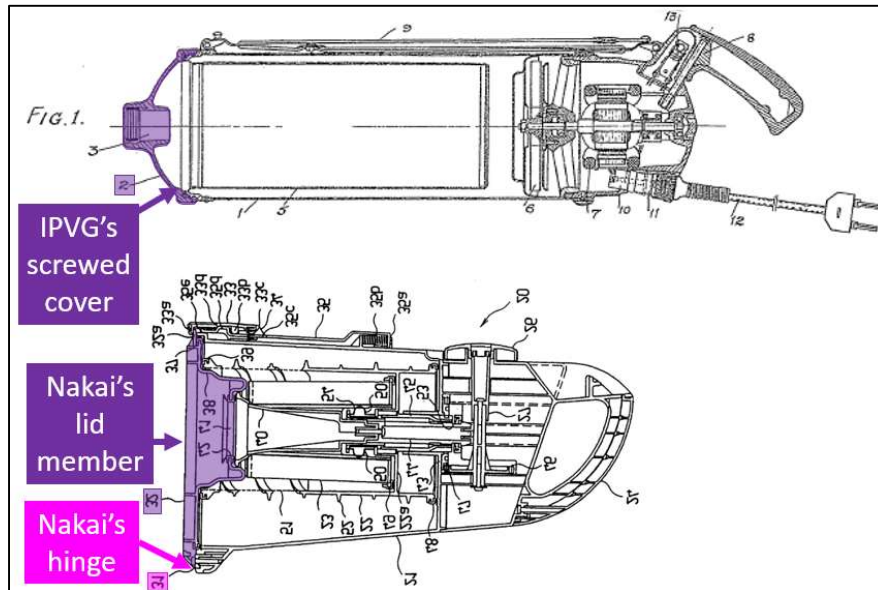
(which, in my opinion, a POSA would have understood is cyclonic air filtration) to separate dust from air, as shown in the annotated images below:



Ex1007, Fig. 1(modified); Ex1008, 4:22-26, Fig. 3(modified).

184. Also, in my opinion, a POSA would have been motivated to modify

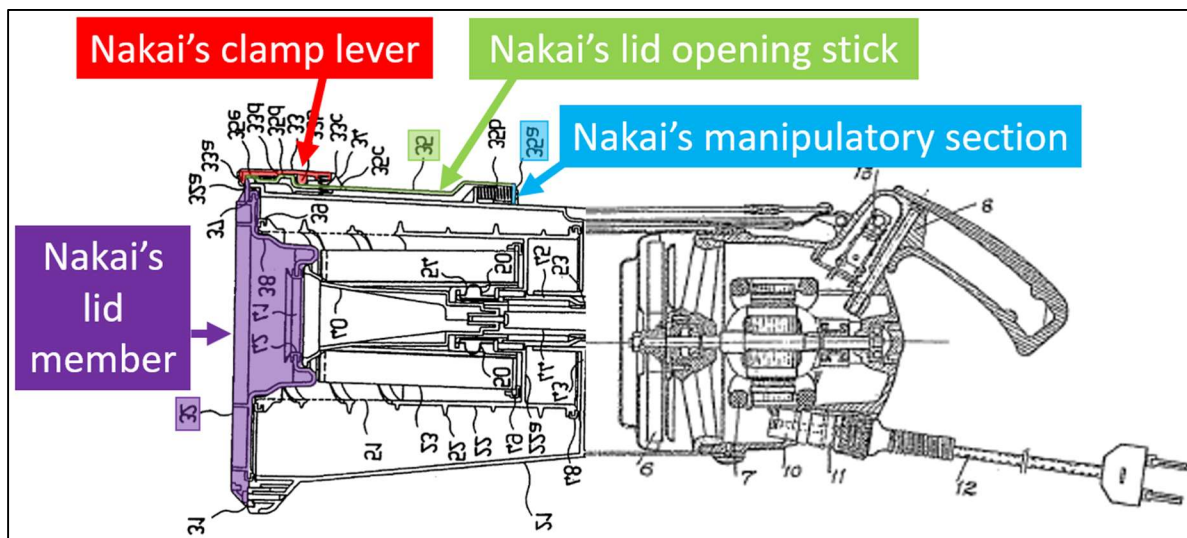
IPVG's screwed-open door ("screwed cover 2") to use a pivot-open door, such as Nakai's "lid member 32" with "hinge 31," as shown in the annotated images below:



Ex1007, Fig. 1(modified); Ex1008, Fig. 3(modified).

185. In my opinion, when making this modification, a POSA would have also been motivated to modify IPVG to include Nakai's "lid opening mechanism," including "manipulatory section 35a" "lid opening stick

35,” and “**clamp lever 33**,” as shown in the annotated image below:



Ex1007, Fig. 1(modified); Ex1008, 7:11-24, Fig. 3(modified).

186. In my opinion, a POSA would have been motivated to combine IPVG and Nakai as described for multiple reasons. First, in my opinion, IPVG and Nakai are analogous art. Like IPVG, which teaches a vacuum cleaner with an air-filtration unit (“dust bag or like member [5]”) contained within a cylindrical chamber (“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”), Ex1007, 1:10-12, 1:51-57, 2:9-20, Nakai teaches a vacuum cleaner with an air-filtration unit (“dust collecting case 21,” which uses “a whirlpool motion” to separate dust from air) that is sealed at one end by an openable door (“lid member 32”), Ex1008, 4:22-26, 6:24-29; 7:11-24.

187. Second, in my opinion, Nakai and IPVG each provide motivations for this

combination. IPVG teaches that its air-filtration unit is “a dust bag or like member through which the suction air stream passes.” Ex1007, 1:22-33, claim 1. In my opinion, a POSA would have looked for “like members” for filtering air, including a cyclonic air-filtration unit. Also, in my opinion, a POSA would have understood that cyclonic filtration had certain benefits over dust-bag filtration, including: (1) no bag needs to be replaced, reducing recurring costs; (2) unlike cyclonic cleaners, dust-bag cleaners lose suction as they fill; and (3) cyclonic cleaners give the user a visual indication of how full the container is and when to empty. In my opinion, these benefits were well-known in the art at the time the ’984 Patent’s earliest priority application was filed. For example, in 1955, a French patent taught that “[b]y application of the ‘Whirlwind’ principle,” i.e., cyclonic filtration, “the materials are deposited in the bottom of the container, after having separated from the air, before it passes through the filter screen,” which “prevent[s] clogging” and creates “stable suction,” and by using a transparent cyclonic chamber, “the user is able, when stopped, to see where the filling of the container is” and “can therefore

better judge when it must be emptied.” Ex1012, 1.² And a 2002 PCT Publication explained that “so-called bagless vacuum cleaners,” or “cyclonic” cleaners, “are becoming increasingly popular” because they “avoid[ed] the use of a filter bag as the primary form of separation” and thus “maintain a consistently high level of suction, even as the collecting chamber fills with dirt.” Ex1013, 1:5-10. Nakai itself teaches that “conventional cyclone type separators” are known in the art, and that its cyclonic air filtration system (in my opinion, “**dust collecting case 21**”) offers a further improvement to those conventional cyclone type separators because its whirlpool motion is so strong that its “dust” “compression rate is larger several fold,” which enables the “dust collecting unit” to “collec[t] a large amount of dust per unit volume.” Ex1008, 6:24-35. Nakai further notes that its cyclonic air filtration “provides an economic advantage” in that “it can be used semipermanently without any replacement of disposable paper bag,” and “the usability of the dust collection unit is greatly improved to that of a disposable type unit.” Ex1008, 7:53-59.

188. Third, in my opinion, a POSA would have known that Nakai’s hinged “lid

² Citations for this reference are by page, as the English translation does not include column or line numbers.

member 32” and “lid opening mechanism” had certain benefits over IPVG’s “screwed cover 2,” including ease of opening for cleaner emptying, and would have been motivated to incorporate Nakai’s hinged-door and door-opening mechanism into IPVG. Unlike IPVG’s emptying process, which involves a user unscrewing “screwed cover 2,” removing “dust bag 5,” and carrying the dirty dust bag to the trashcan, in my opinion, a POSA would have understood that a cleaner having Nakai’s “lid member 32” may be emptied by simply “push[ing]” “manipulatory section 35a” “down.” Ex1008, 7:6-24. By contrast to IPVG’s “screwed cover 2,” in my opinion, a POSA would have understood that Nakai’s “lid member 32” can empty dirt more quickly and “easily,” “thereby permitting the user to avoid laborious and unsanitary operations of opening the lid member 32.” Ex1008, 7:25-32.

189. Fourth, in my opinion, this combination would have involved a simple substitution of certain known elements for other known elements to obtain predictable results. IPVG teaches a cleaner having a dust-separation unit (using a bag) with a door covering one end that opens with a screw. Ex1007, Fig. 1. Nakai teaches a dust-separation unit (using cyclonic action) with a door covering one end that opens with a hinge. Ex1008, Figs. 3, 8. In my opinion, a POSA would have understood that the simple,

straightforward substitution of these styles of dust-separation units and openable doors would achieve the predictable results of filtering air and permitting one end of the dust-separation unit to be opened for emptying. Further, as depicted above, IPVG and Nakai are directed to vacuums having a similar orientation of separation unit relative to the openable door. Ex1007, Fig. 1; Ex1008, Figs. 3, 8.

190. Fifth, in my opinion, it would have been at least obvious for a POSA to try this combination. In my opinion, a POSA would have understood that there are a finite number of identified dust separation solutions, including dust bags (as IPVG teaches) and cyclonic dust collecting cases (as Nakai teaches). And, in my opinion, a POSA would have understood that there are a finite number of identified openable-door solutions, including screwed-open doors (as IPVG teaches) and actuated, hinged-open doors (as Nakai teaches), and it would have been obvious to try to achieve the known benefits described above.

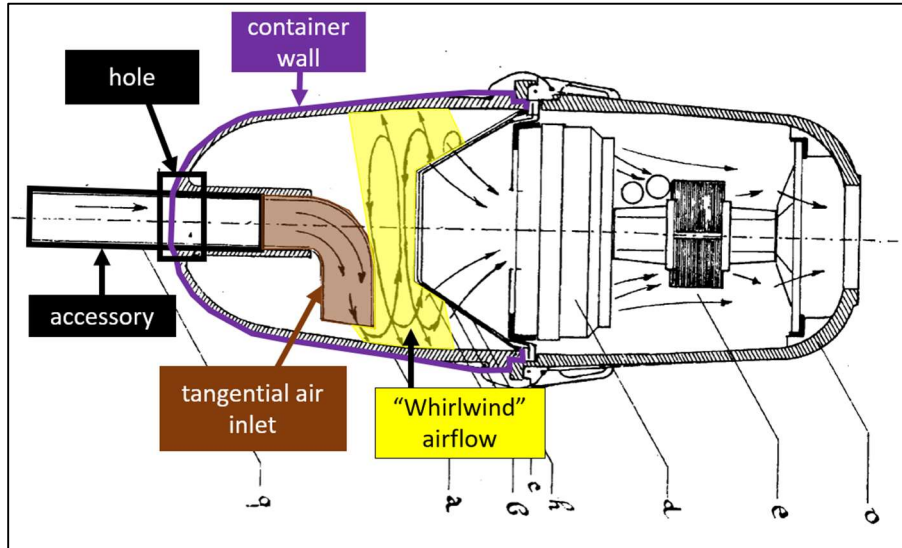
**c. A POSA Would Have Had A Reasonable Expectation
of Success Combining the Teachings of IPVG and
Nakai**

191. In my opinion, a POSA would have reasonably expected success combining IPVG's and Nakai's teachings as described. In my opinion, a POSA would have understood that these two types of dust-separation units

could be used interchangeably. And, in my opinion, a POSA would have understood that these two openable doors and their locking and opening mechanisms could also be used interchangeably. Also, in my opinion, a POSA would have further expected success for the reasons stated above, including because such modification involves a straightforward substitution of known elements that perform similar functions in similar ways, and because of the express motivations found in Nakai and IPVG to perform such substitutions.

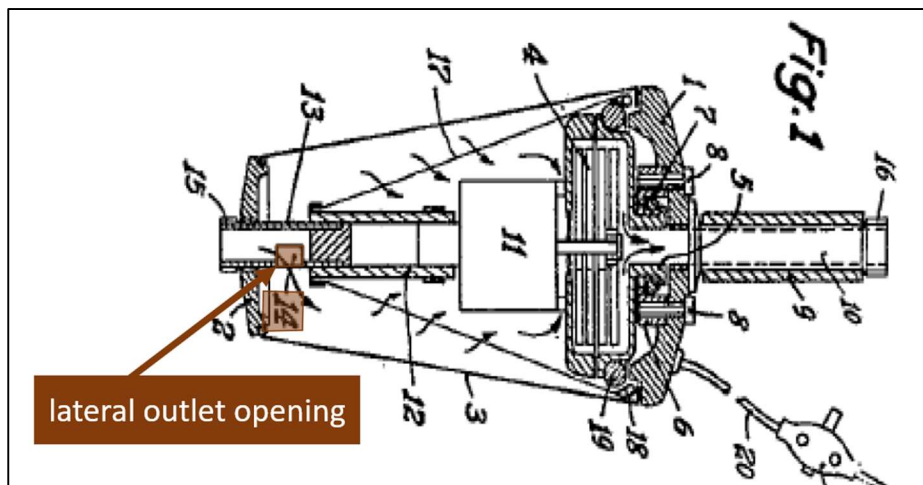
192. Further, in my opinion, a POSA would have reasonably expected success incorporating Nakai's cyclonic dust collecting case teachings into IPVG's vacuum cleaner because it was well-known that front-located air inlets (such as IPVG's) can be used to create cyclonic separation by using a tangential opening. As Nakai explains, "[b]ecause the suction port of the dust collecting case 21 is offset from the center of the dust collecting case 21," i.e., tangential, "dust-containing air sucked from the suction port is set in a whirlpool motion inside the dust collecting case 21." Ex1008, 4:22-26. In my opinion, front-located tangential air inlets have been used for cyclonic cleaners since well before the '984 Patent. For example, a 1955 French patent taught a "**tangential[]**" **air inlet** and a removable **accessory** attached thereto through a **hole** in the "detachable" front "**wall of the ...**

container” that created cyclonic airflow (“the ‘Whirlwind’ principle”), as shown in the annotated image below:



Ex1012, 1, Fig. 1.

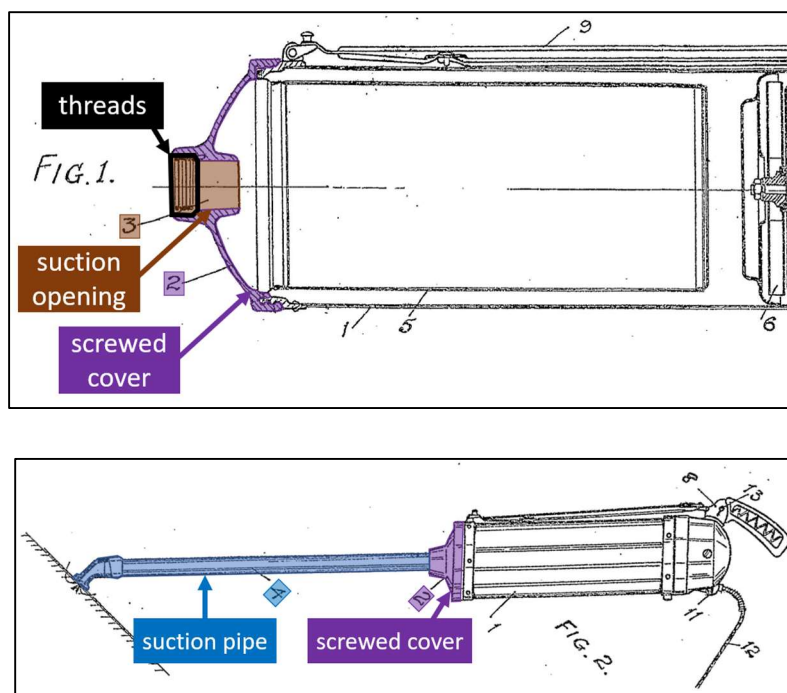
193. Similarly, a 1938 Swiss patent disclosed a cleaner with a front-mounted accessory and air inlet, which contained “**lateral outlet opening 14**” that, in my opinion, a POSA would have understood created cyclonic airflow, as shown in the annotated image below:



Ex1015, Fig. 1.³

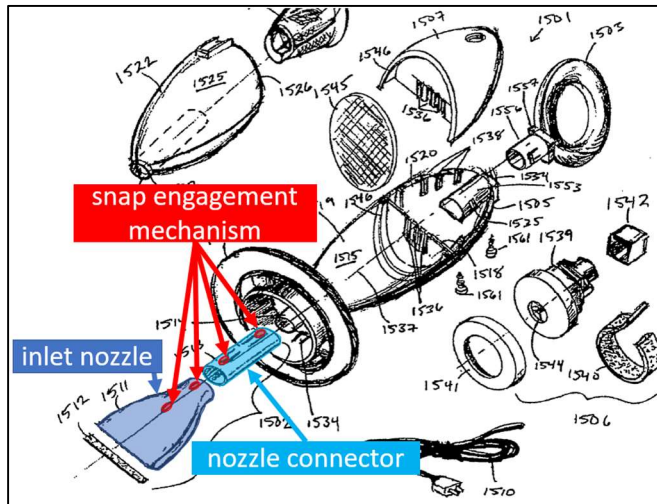
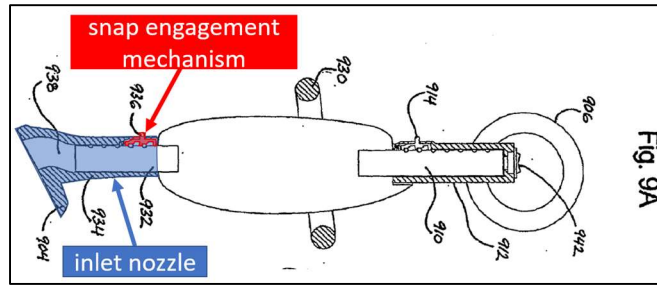
194. In my opinion, a POSA would have understood that the same configuration would create cyclonic airflow in the combined teachings of IPVG and Nakai by simply incorporating a tangential cyclone air inlet, such as Nakai's "suction port [30]" (Ex1008, 4:20-26), and a POSA further would have understood that such a pipe would connect IPVG's air inlet with Nakai's tangential "suction port [30]."
195. Finally, in my opinion, a POSA would have reasonably expected success incorporating Nakai's hinged lid and lid opening mechanism into IPVG's vacuum cleaner. IPVG teaches a **threaded "suction opening 3"** to which "a **suction pipe 4**" with corresponding mating threads can be attached for use and detached to allow "**screwed cover 2**" to be removed for emptying the cleaner, as shown in the annotated images below:

³ Citations for this reference are by page, as the English translation does not include column or line numbers.



Ex1007, 1:51-57, Figs. 1-2.

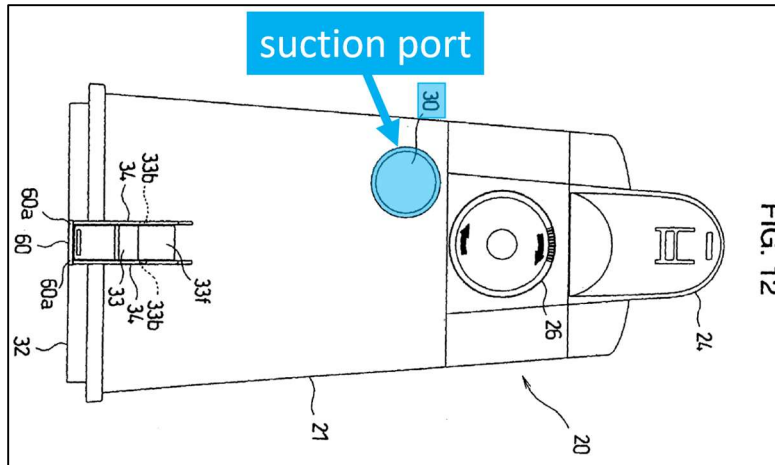
196. Nakai teaches that its “whirlpool motion” “dust collecting case 21” can be used with any type of “electric vacuum cleaner,” including hand vacuums, for which, in my opinion, front-mounted accessories were common. Ex1008, 4:16-26. For example, a 2007 PCT Publication teaches a cyclonic hand vacuum with removable accessories such as an “inlet nozzle” and/or “nozzle connector,” that are removably “attached to the housing ... by snap engagement” for easy attachment and removal, as shown in the annotated images below:



Ex1016, 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.

197. In my opinion, a POSA would have understood that front-mounted accessories could be detachable, as IPVG teaches, to allow Nakai's door to pivot open.

198. Also, in my opinion, a POSA would have further understood that IPVG's "suction pipe 4" could alternatively attach to a cyclone air inlet positioned on the outside of the dirt separation unit, such as Nakai's "suction port 30," which is shown in the annotated image below:



Ex1008, Fig. 12.

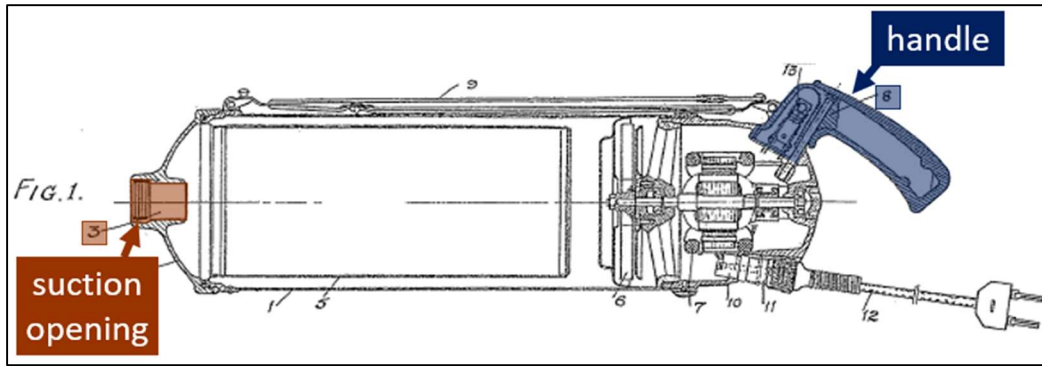
2. [1]/[10]

a. [1pre]/[10pre]

Reference Number	Claim Limitation
[1pre]	“A hand vacuum cleaner having a front end, a rear end, an upper side and a lower side, the hand vacuum cleaner comprising:”
[10pre]	“A hand vacuum cleaner having a front end, a rear end, an upper side and a lower side, the hand vacuum cleaner comprising:”

199. In my opinion, IPVG teaches a hand vacuum cleaner having a front end, a rear end, an upper side and a lower side.

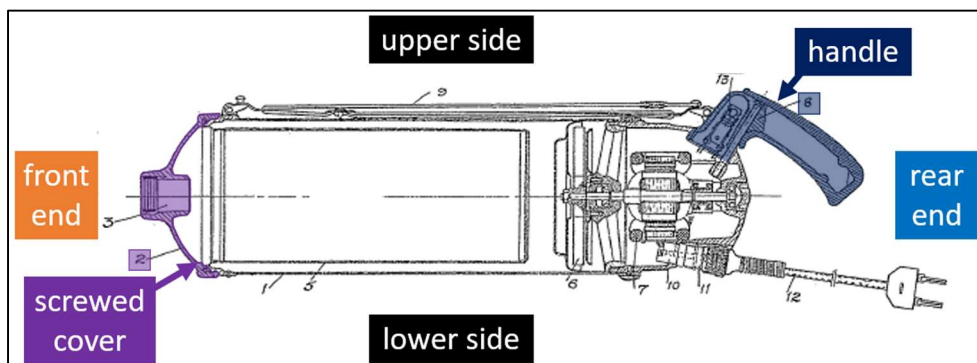
200. In my opinion, IPVG teaches a hand vacuum cleaner. IPVG teaches a “portable dust suction apparatus” that “may be readily lifted” by a “**handle [8]**” that the operator holds with a single hand “during manipulation of the apparatus,” as shown in the annotated image below:



Ex1007, 1:10-33, claims 1-2, Fig. 1.

201. Further, in my opinion, IPVG’s “**handle [8]**” and “**suction opening 3**” (dirty air inlet) are rigidly coupled and maintain a constant orientation relative to each other “during manipulation of the apparatus.” Ex1007, 1:13-21, 51-62, Fig. 1. In my opinion, a POSA would have understood that this is a hand vacuum cleaner.

202. Also, a POSA would have understood that IPVG’s hand vacuum cleaner has a “casing 1 closed at the **front end** by a **screwed cover 2**,” a “**handle 8**” located at the “**rear**” end, and an **upper side** opposite a **lower side**, as shown in the annotated image below:



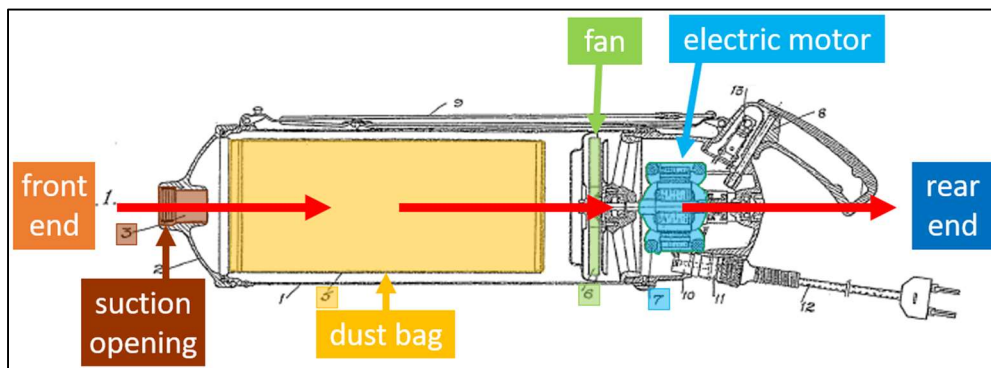
Ex1007, 1:10-12, 1:51-57, 1:92-2:2, Fig. 1; *see also id.*, Fig. 3.

b. [1a]/[10a]

Reference Number	Claim Limitation
[1a]	“(a) an air flow passage extending from a dirty air inlet provided at the front end to a clear air outlet provided at the rear end;”
[10a]	“(a) an air flow passage extending from a dirty air inlet provided at the front end to a clear air outlet provided at the rear end;”

203. In my opinion, IPVG, and the combined teachings of IPVG and Nakai, teaches an air flow passage extending from a dirty air inlet provided at the front end to a clear air outlet provided at the rear end.

204. A POSA would have understood that IPVG teaches an air flow passage extending from a dirty air inlet provided at the front end, to a clear air outlet provided at the rear end. In IPVG, **air flows** in “**suction opening 3**,” located at the “**front end**,” 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 at the “**rear**” **end**, as shown in the annotated image below:



Ex1007, 1:51-62, 1:92-2:2, Fig. 1. For additional explanation, *see* Ground 2, Limitations [1pre]/[10pre].

205. In my opinion, a POSA would have understood that IPVG's "suction opening 3" is a dirty air inlet, IPVG's "exhaust or blowing end of the casing" is an unobstructed, clear air outlet exhausting clean and clear air, and an air flow passage extends between them. Further, IPVG's "handle" is mounted to the "exhaust or blowing end of the casing," i.e., the rear end, and IPVG's "fan" and "motor" are between the "exhaust or blowing end" and the "suction opening." Ex1007, 1:51-62.

206. Likewise, a POSA would have understood that Nakai teaches an air flow passage extending from a dirty air inlet to a clear air outlet. Nakai's cleaner has a "suction port" and undergoes cyclonic separation that cleans the air such that "only clean filtered air is passed down to the electric fan and exhausted from the outlet 58" "formed in the lower front end of the main body 1." Ex1008, 6:9-15, 36-40, Fig. 1.

207. Indeed, Nakai explains "the air filtered by said dust collection unit and removed of dust thereby, is discharged from said dust collecting case, led to an electric fan, and then discharged to the atmosphere via an exhaust filter and through the exhaust opening of said cleaner body." Ex1008, claim 10.

208. As I explained above, a POSA would have been motivated to combine the teachings of IPVG and Nakai and would have reasonably expected success. Ground 2 §1. In my opinion, the combined teachings likewise meet these limitations because the air flows from a dirty air inlet located at the front end, such as IPVG’s “suction opening 3” (when modified to create cyclonic airflow), to a clear air outlet at the rear end, such as IPVG’s “exhaust.”

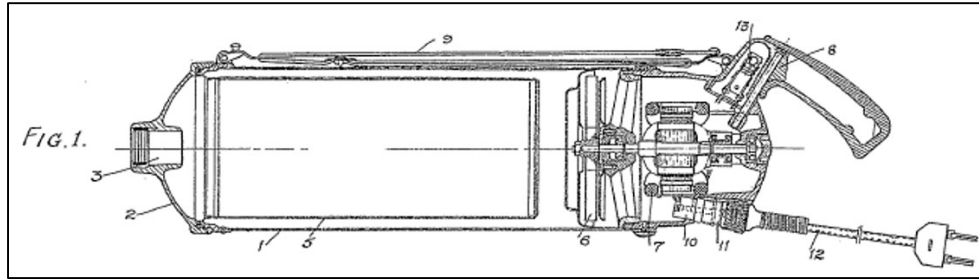
c. [1b]/[10b]/[10d]

Reference Number	Claim Limitation
[1b]	“(b) a vacuum cleaner body comprising a suction motor positioned in the air flow passage, a front end, a rear end and a handle;”
[10b]	“(b) a vacuum cleaner body comprising a suction motor positioned in the air flow passage, a front end, a rear end and a handle;”
[10d]	(d) a pistol grip handle; and,

209. In my opinion, IPVG, and the combined teachings of IPVG and Nakai, teaches a vacuum cleaner body comprising a suction motor positioned in the air flow passage, a front end, a rear end and a handle (Limitations [1b]/[10b]).

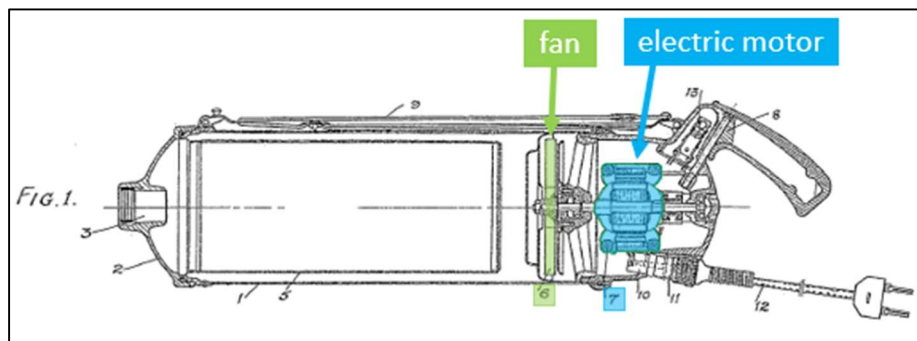
210. In my opinion, IPVG teaches a pistol grip handle (Limitation [10d]).

211. A POSA would have understood that IPVG’s vacuum cleaner has a vacuum cleaner body, as depicted in the figure below:



Ex1007, Fig. 1.

212. In my opinion, IPVG's vacuum cleaner body comprises a suction motor. IPVG's “fan 6” and “electric motor 7” are positioned in IPVG's vacuum cleaner body, as shown in the annotated image below:



Ex1007, 1:51-62, Fig. 1.

213. In my opinion, a POSA would have understood that IPVG's “electric motor,” individually or together with its “fan,” is a suction motor.
214. Likewise, in my opinion, Nakai teaches a vacuum cleaner body comprising a suction motor. Nakai's “electric fan” is positioned in “main body 1.”

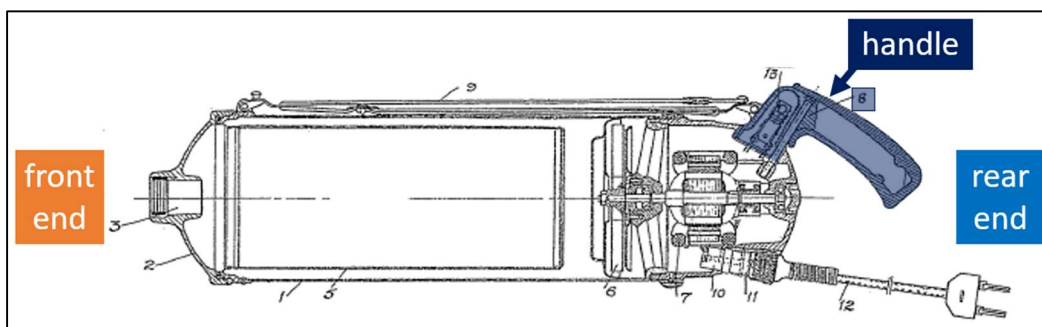
Ex1008, 6:9-15, Fig. 1.

215. As explained for Limitations [1a]/[10a], in my opinion, IPVG's and Nakai's suction motors are positioned in the air flow passage. Ground 2,

Limitations [1a]/[10a].

216. Also, in my opinion, a POSA would have been motivated to combine the teachings of IPVG and Nakai and would have reasonably expected success, Ground 2, §1, and would have been motivated to use a suction motor positioned in the air flow passage for improved motor efficiency and reliability (by cooling the motor using the airflow) and for improved suction. 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.”

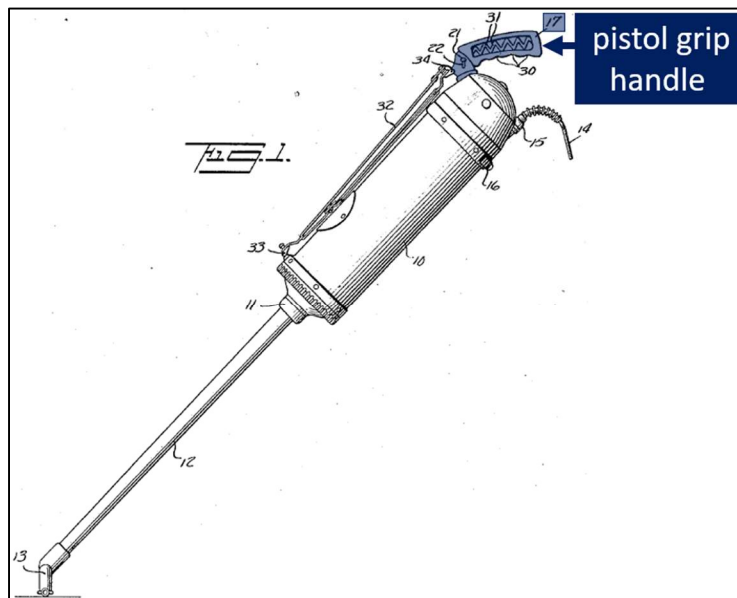
217. A POSA would have understood that IPVG’s cleaner body has a “**front end**,” and a “**handle 8**” located at the “**rear end**,” as shown in the annotated image below:



Ex1007, 1:51-62, 1:92-2:2, Fig. 1.

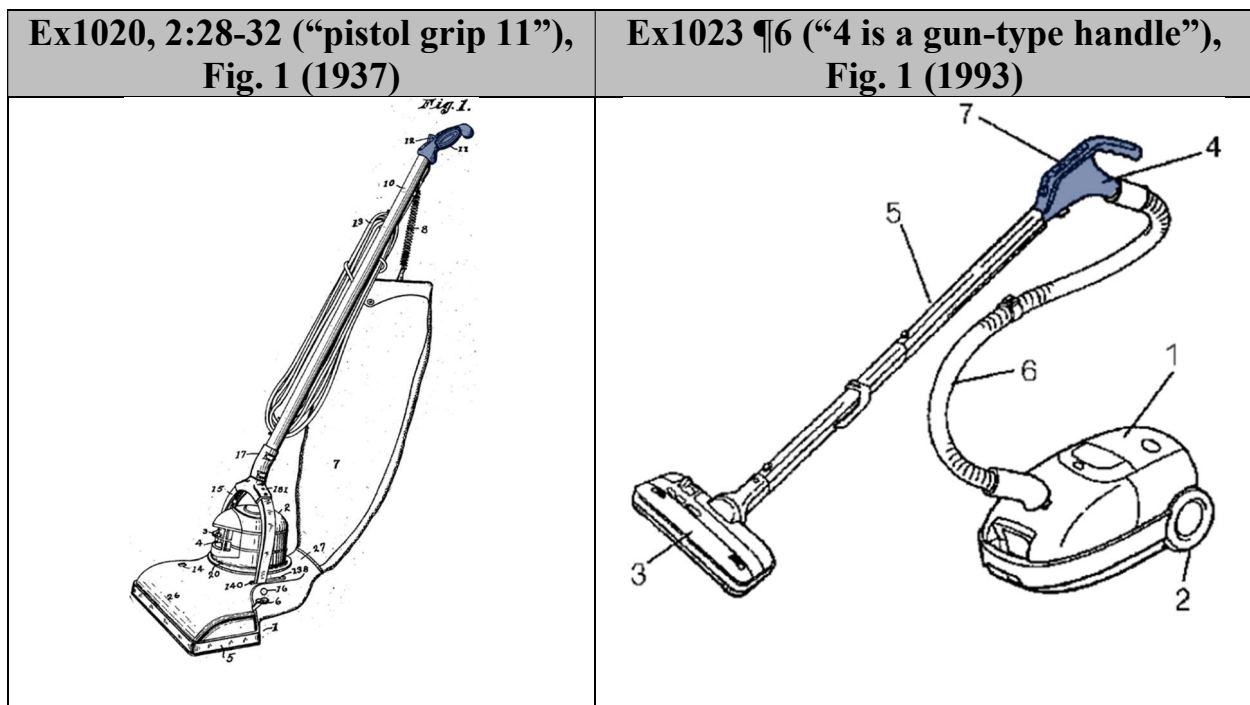
218. Regarding Limitation [10d], in my opinion, IPVG teaches a pistol grip handle. In my opinion, a POSA would have understood that IPVG’s

“handle 8” is a pistol grip handle. Ex1007, 1:57-62. For example, in 1933, U.S. Patent No. 1,908,834 to Engberg et al. (“Engberg”) disclosed a vacuum nearly identical to IPVG with a “[h]andle 17 hav[ing] the general form of a pistol grip,” as shown in the annotated image below:



Ex1019, 1:53-54, Fig. 1.

219. Likewise, a POSA would have understood that various types of **pistol grip vacuum handles** exist in the art, as shown in the annotated images below:



220. Further, a POSA would have understood that pistols with handles like IPVG’s have existed for centuries, as shown in the image below:



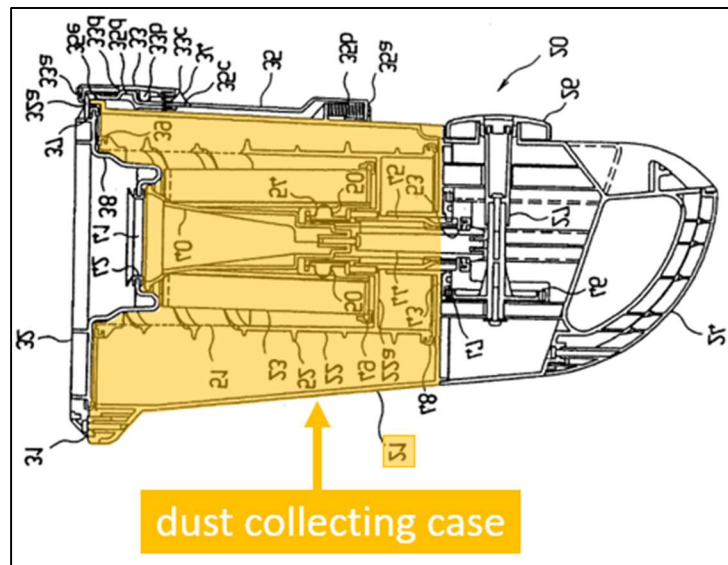
221. Thus, in my opinion, a POSA would have understood that IPVG’s “handle 8” is a pistol grip handle.

d. [1c]/[10c]

Reference Number	Claim Limitation
[1c]	“(c) a cyclone unit positioned in the air flow passage upstream from the suction motor, the cyclone unit comprising a cyclone having a front end, a rear end, a cyclone axis of rotation extending between the front and rear ends of the cyclone, the cyclone unit further comprising an axially extending cyclone unit wall which extends to a front end of the cyclone unit, the front end of the cyclone unit comprising a front door that is moveable between a closed position and an open position; and,”
[10c]	“(c) a cyclone unit positioned in the air flow passage upstream from the suction motor, the cyclone unit comprising a cyclone having a front end, a rear end, a cyclone axis of rotation extending between the front and rear ends of the cyclone, the cyclone unit further comprising an axially extending cyclone unit wall which extends to a front end of the cyclone unit, the front end of the cyclone unit comprising a front door that is moveable between a closed position and an open position; and,”

222. In my opinion, the combined teachings of IPVG and Nakai teaches a cyclone unit positioned in the air flow passage upstream from the suction motor, the cyclone unit comprising a cyclone having a front end, a rear end, a cyclone axis of rotation extending between the front and rear ends of the cyclone, the cyclone unit further comprising an axially extending cyclone unit wall which extends to a front end of the cyclone unit, the front end of the cyclone unit comprising a front door that is moveable between a closed position and an open position.

223. IPVG teaches a “dust bag 5” “through which the suction air stream passes,” which, in my opinion, is an air-filtration unit positioned in the airflow passage upstream from the suction motor. Ex1007, 1:51-57, claim 1. For additional explanation *see* Ground 2, Limitations [1b]/[10b].
224. Also, in my opinion, Nakai teaches a cyclone unit positioned in the air flow passage upstream from the suction motor. Nakai’s “**dust collecting case 21**,” which uses “a whirlpool motion” (in my opinion, cyclonic separation) to separate dust from air, is located upstream of Nakai’s “electric fan,” as shown in the annotated image below:



Ex1008, 4:22-26, Fig. 3. For additional explanation *see* Ground 2, Limitations [1b]/[10b]/[10d].

225. Nakai explains that “dust sucked together with the air from the upper suction port is forcibly whirled downward, causing the dust to be

accumulated and compacted on the bottom ... of the **dust collecting case 21.**” Ex1008, 6:24-29. In my opinion, a POSA would have understood that Nakai’s “dust collecting case 21” is a cyclone unit.

226. Nakai further describes its cyclonic “dust collecting case 21”:

The dust collecting case 21 is provided with a suction port (not shown), which, when mounted on the main body 1, communicates to an opening of a suction cylinder 12 via a packing or a seal. The suction cylinder is mounted on the back of the main body 1, offset to one side of the back. (This suction port is shown in the second embodiment by a reference numeral 30.) Because the suction port of the dust collecting case 21 is offset from the center of the dust collecting case 21, dust-containing air sucked from the suction port is set in a whirlpool motion inside the dust collecting case 21.

Ex1008, 4:16-26.

Because the meshed filter 51 is provided in the lower section of the dust collecting case 21, dust sucked in together with the air from a suction port (not shown) provided at an upper section of the dust collecting case 21 is forced to whirl downward at a high speed, and compacted on the bottom of the dust collecting case 21.

Id., 5:52-57.

In the upright vacuum cleaner of the invention as described above, dust on the floor is scratched by the rotary brush 5 of the

suction unit 2 and enters the dust collecting case 21 through the hose 10 and the suction cylinder 12 positioned offset from the center of back of the main body 1. The dust is whirled downward along the inner wall of the dust collecting case 21. Larger pieces of dust accumulate on the bottom of the dust collecting case 21.

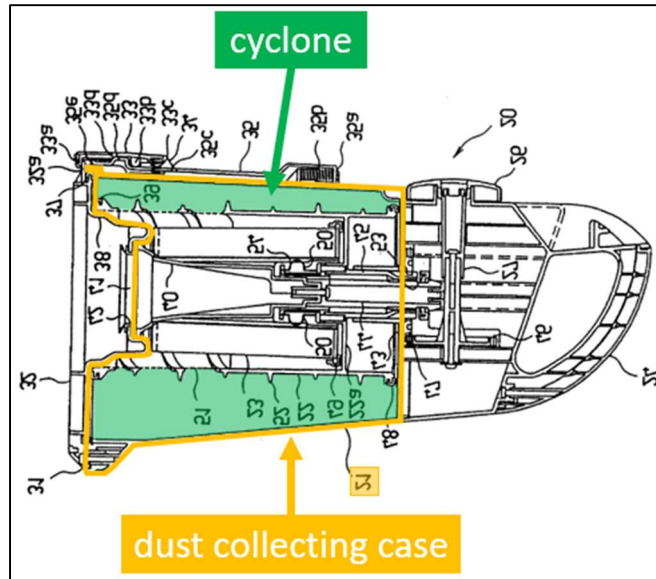
Since the mesh 51 of the pre-filter 22 is located in the lower section of the dust collecting case 21, dust sucked together with the air from the upper suction port is forcibly whirled downward, causing the dust to be accumulated and compacted on the bottom of the lid member 32 of the dust collecting case 21, as previously described. This compaction effect is significant especially when dust is cotton refuse. The compression rate is larger several fold, as compared with a conventional cyclone type separator. Because of such large compaction rate, the dust collection unit of the invention is capable of collecting a large amount of dust per unit volume.

Id., 6:16-35.

The upright electric vacuum cleaner according to any one of claims 5 through 7, wherein dust sucked together with air into said suction unit flows into said dust collecting case and whirls in said dust collecting case.

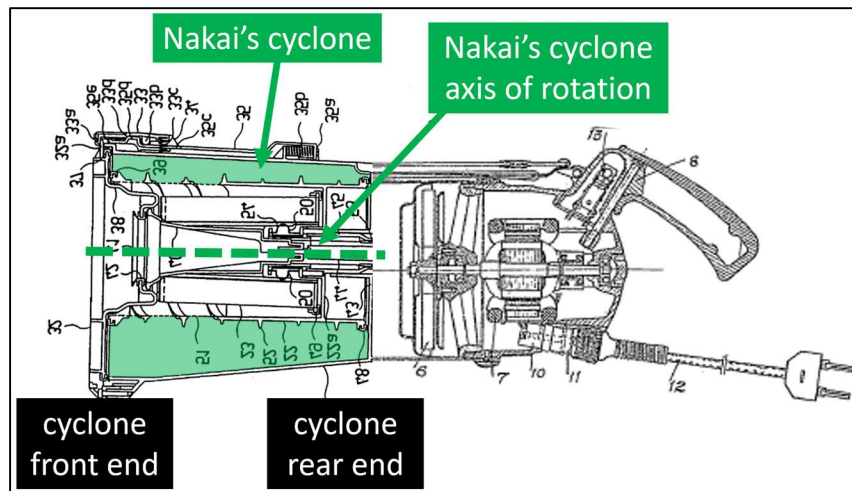
Id., claim 9.

227. In my opinion, Nakai's "**dust collecting case 21**" comprises a **cyclone** that separates dust from air by "whirl[ing]," as shown in the annotated image below:



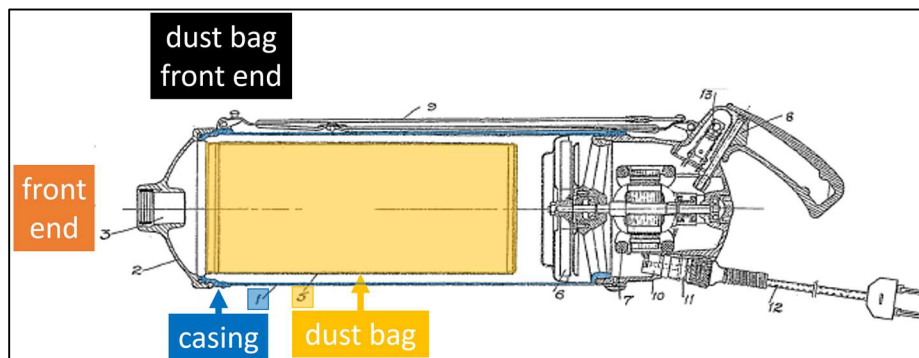
Ex1008, 6:16-35, Fig. 3.

228. In my opinion, a POSA would have been motivated to combine IPVG and Nakai and would have reasonably expected success. Ground 2, §1. In my opinion, when Nakai’s “dust collecting case 21” (cyclone unit) comprising a **cyclone** is incorporated into IPVG’s cleaner, Nakai’s **cyclone** has its **front end** at IPVG’s “front end,” its **rear end** at the opposite end, and a **cyclone axis of rotation** extends between the front and rear ends, as shown in the annotated image below:



Ex1007, Fig. 1 (modified); Ex1008, Fig. 3 (modified).

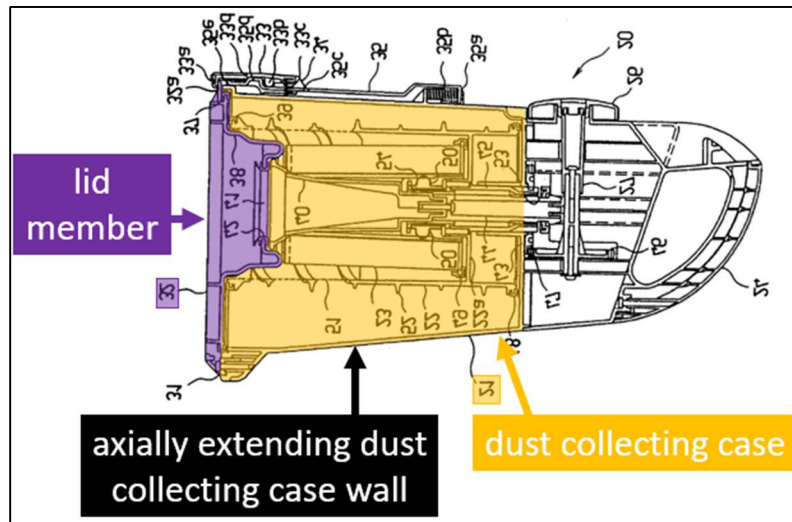
229. Further, in my opinion, IPVG's "**dust bag 5**" has an axially extending wall ("**casing 1**") that extends to the **front end** of "**dust bag 5**," which is located at the "**front end**" of IPVG's cleaner, as shown in the annotated image below:



Ex1007, Fig. 1.

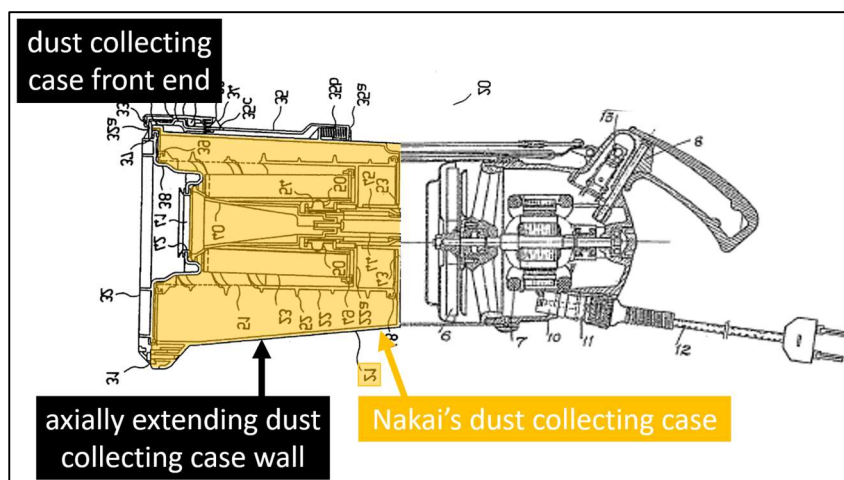
230. Also, in my opinion, Nakai's "**dust collecting case 21**" (in my opinion, a cyclone unit) has an **axially extending wall** which extends to "**dust collecting case 21**"'s "**lid member 32**," as shown in the annotated image

below:



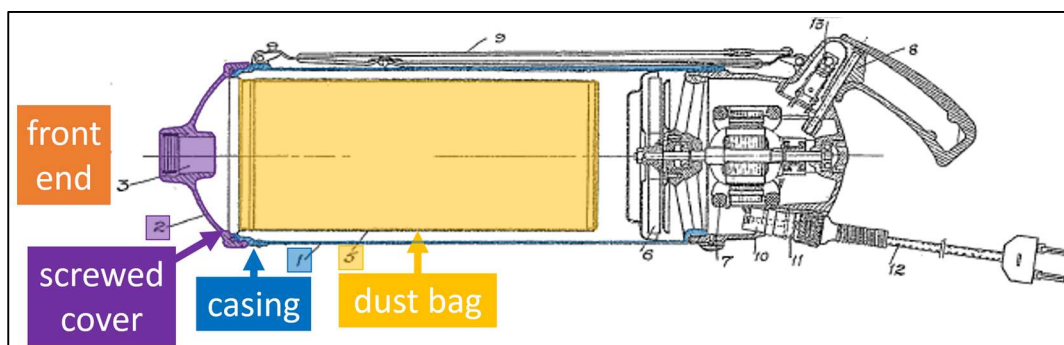
Ex1008, Fig. 3.

231. In my opinion, a POSA would have been motivated to combine IPVG and Nakai and would have reasonably expected success. Ground 2, §1. In my opinion, when Nakai’s “**dust collecting case 21**” is incorporated into IPVG’s cleaner, Nakai’s “**dust collecting case 21**” comprises an **axially extending dust collecting case wall** which extends to the **front end** of the “**dust collecting case 21**,” which is at the “front end” of IPVG’s cleaner, as shown in the annotated image below:



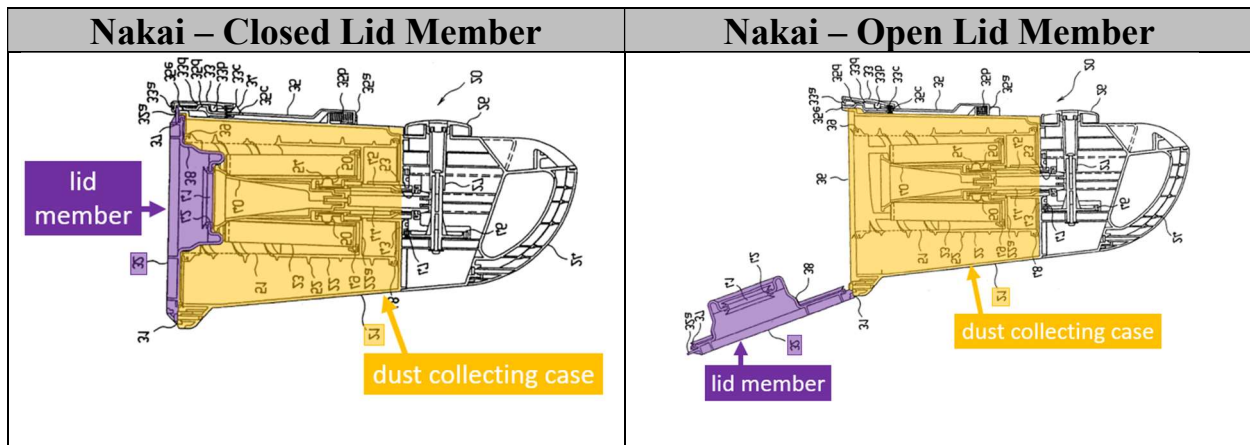
Ex1007, Fig. 1 (modified); Ex1008, Fig. 3 (modified).

232. Further, in my opinion, IPVG teaches the front end of the air filtration unit comprises a front door that is moveable between a closed position and an open position. In my opinion, a POSA would have understood IPVG's "screwed cover 2" is a front door at the front end of IPVG's "dust bag 5" because it "close[s]" "casing 1 ... at the front end" and it is opened by removing the "screw[s]" to empty IPVG's "dust bag 5," as shown in the annotated image below:



Ex1007, 1:51-62, Fig. 1.

233. Likewise, in my opinion, Nakai teaches the end of the cyclone unit comprising a door that is moveable between a closed position and an open position. Nakai's “**dust collecting case 21**” comprises “**lid member 32**” “that can be opened” and “closed,” as shown in the annotated images below:



Ex1008, Abstract, Figs. 3, 8.

234. Nakai further explains details regarding its moveable door:

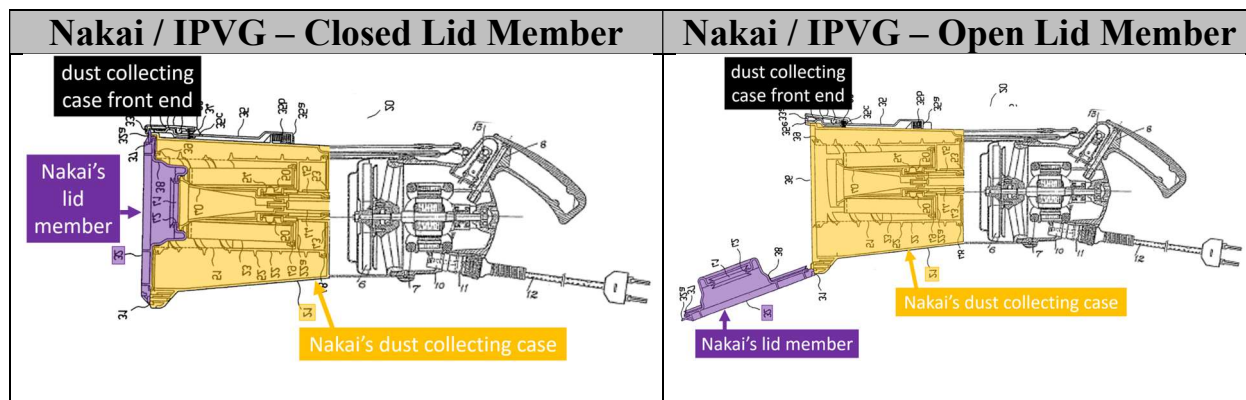
Rotatably mounted on the bottom of the dust collecting case 21 is a lid member 32 via a hinge 31 (or a fulcrum 31 for opening and closing the lid member). A clamp lever 33 is formed on the lower section of the dust collecting case 21. The closed lid member 32 can be locked by hooking up the clamp hook 33 a formed on the lower end of the clamp lever 33 on an extended peripheral portion 32 a of the lid member 32.

Ex1008, 4:27-34.

If the manipulatory section 35 a of the lid opening stick 35 is forced down as shown in FIGS. 6 and 7, the outward protrusion 35 d formed on the lower end of the lid opening stick 35 abuts against the inwardly inclined facet 33 d of the clamp lever 33, causing the inwardly inclined facet 33 d to recede outward, thereby rotating the clamp lever 33 away from the extended portion 32 a of the lid member 32 and disconnecting the clamp hook 33 a of the clamp lever 33 from the extended portion 32 a. If the manipulatory section 35 a is further forced down, the leading end 35 e of the stick 35 abuts on the extended portion 32 a and pushes it down, causing the lid member 32 to be forcibly opened as shown in FIG. 8. Now, the dust accumulated in the dust collecting case 21 can be removed from the dust collecting case 21.

Id., 7:11-24.

235. In my opinion, a POSA would have been motivated to combine IPVG and Nakai and would have reasonably expected success. In my opinion, when Nakai's openable door is incorporated into IPVG's vacuum cleaner, Nakai's "**dust collecting case 21**"'s **front end** (cyclone unit front end) comprises "**lid member 32**" (front door) "that can be opened" and "closed," as shown in the annotated images below:



Ex1007, Fig. 1(modified); Ex1008, Abstract, Figs. 3(modified), 8(modified).

e. [1d]/[10e]

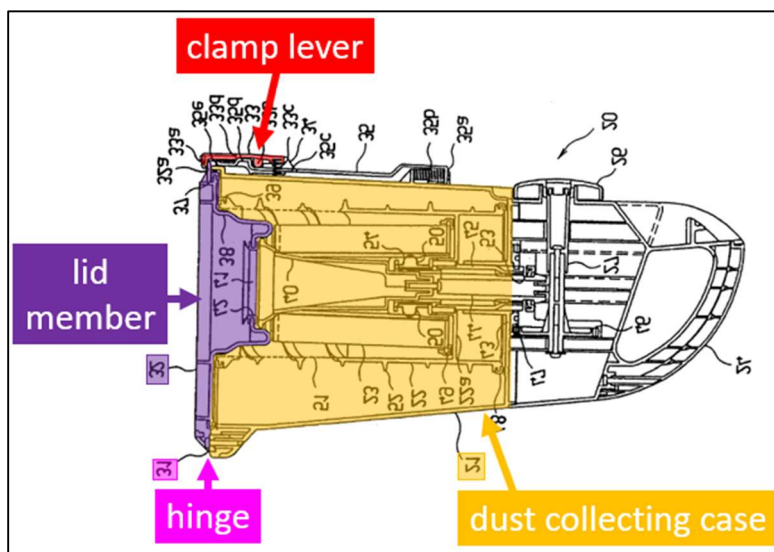
Reference Number	Claim Limitation
[1d]	“(d) a lock securing the front door in the closed position, the lock comprising an actuator, wherein the actuator is spaced towards the rear end of the cyclone.”
[10e]	“(e) a lock securing the front door in the closed position, the lock comprising an actuator, wherein the actuator is located at an elevation of an upper end of the pistol grip handle and forward of the pistol grip handle.”

236. In my opinion, the combined teachings of IPVG and Nakai render obvious a lock securing the front door in the closed position, the lock comprising an actuator, wherein the actuator is spaced towards the rear end of the cyclone (Limitation [1d]).

237. In my opinion, the combined teachings of IPVG and Nakai render obvious a lock securing the front door in the closed position, the lock comprising an actuator, wherein the actuator is located at an elevation of an upper end of the pistol grip handle and forward of the pistol grip handle (Limitation

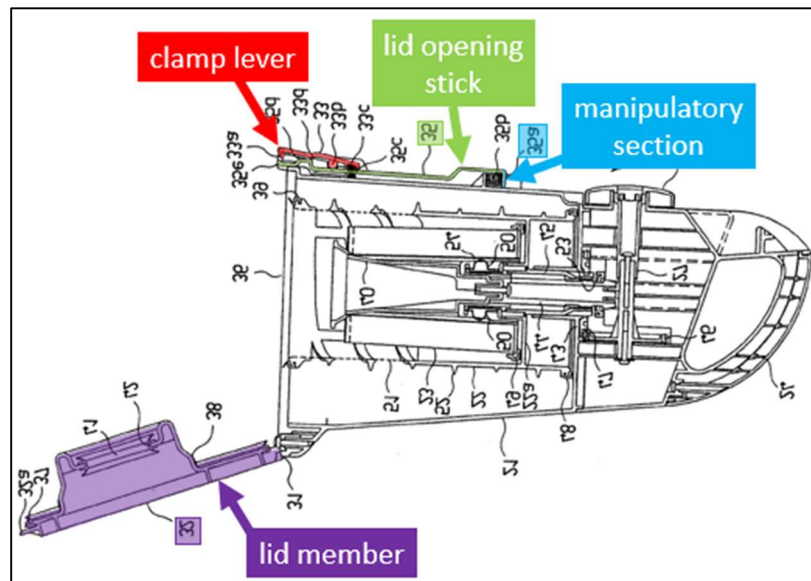
[10e]).

238. In my opinion, IPVG teaches a lock securing the front door in the closed position. As I explained for Limitations [1c]/[10c], IPVG's vacuum cleaner's "screwed cover 2" is held in the closed position by "screw[s]." Ground 2, Limitations [1c]/[10c]. In my opinion, a POSA would have understood that IPVG's "screw[s]" comprise a door lock, including because inserting the screws locks the "screwed cover 2" shut.
239. Likewise, in my opinion, Nakai teaches a lock securing the door in the closed position, the lock comprising an actuator. Nakai's "lid member 32" is "rotatably mounted on the bottom of the dust collecting case 21 ... via a hinge 31," and is "locked by hooking up the clamp hook 33a formed on the lower end of the clamp lever 33," as shown in the annotated image below:

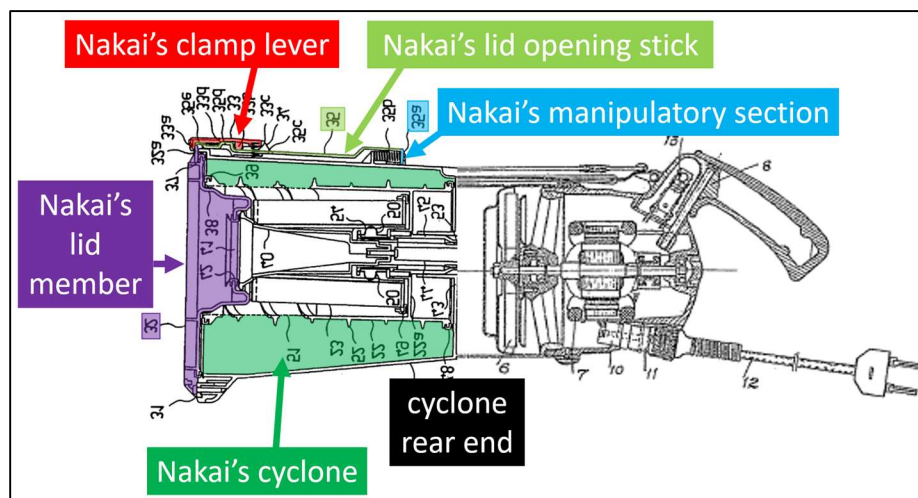


Ex1008, 4:27-34, Fig. 3.

240. Nakai teaches that to open “**lid member 32**,” the “**manipulatory section 35a** of the **lid opening stick 35** is forced down,” “thereby rotating the **clamp lever 33** away from the ... **lid member 32**,” as shown in the annotated images below:

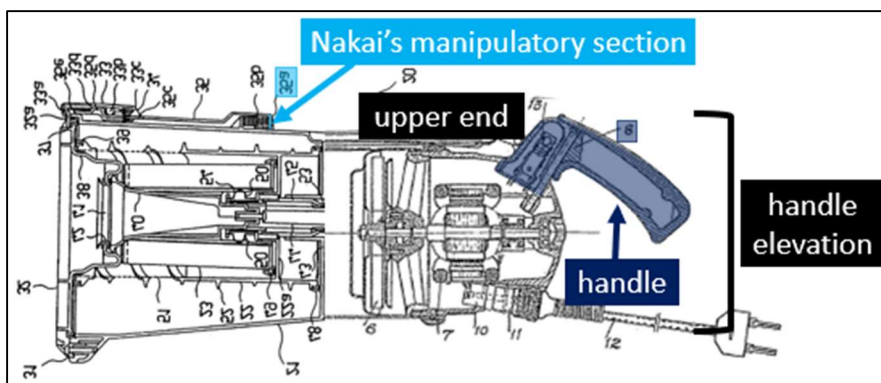


- 32” in the closed position. Ex1008, Abstract, 7:11-24.
242. Further, in my opinion, a POSA would have understood that Nakai’s “lid opening mechanism” comprises an actuator (“manipulatory section 35a”) because pushing the manipulatory section releases the door. As Nakai explains, “if manipulatory section 35a of the lid opening stick 35 is forced down,” the “lid member 32” is “forcibly opened.” Ex1008, 7:11-24.
243. Also, in my opinion, a POSA would have been motivated to combine IPVG and Nakai and would have had a reasonable expectation that this combination would be successful. Ground 2, §1. In my opinion, when Nakai’s “lid member 32” and “lid opening mechanism” (“clamp lever 33,” “manipulatory section 35a,” and “lid opening stick 35”) are incorporated into IPVG’s cleaner, Nakai’s “manipulatory section 35a” is spaced towards the rear end of Nakai’s cyclone, as shown in the annotated image below:



Ex1007, Fig. 1(modified); Ex1008, Fig. 3(modified).

244. Regarding Limitation [10d], in my opinion, when Nakai's door and door locking mechanism are incorporated into IPVG's cleaner, Nakai's "manipulatory section 35a" is also located at an **elevation** of an **upper end** of IPVG's "**handle 8**" (pistol grip handle) and forward of "**handle 8**," including because this location is within easy reach while the user is holding the vacuum, as shown in the annotated image below:



Ex1007, Fig. 1(modified); Ex1008, Fig. 3(modified).

3. [2]

Reference Number	Claim Limitation
[2]	"The hand vacuum cleaner of claim 1 further comprising a pistol grip handle wherein the actuator is located at an elevation of an upper end of the pistol grip handle and forward of the pistol grip handle."

245. In my opinion, the combined teachings of IPVG and Nakai render obvious the hand vacuum cleaner of claim 1 further comprising a pistol grip handle wherein the actuator is located at an elevation of an upper end of the pistol

grip handle and forward of the pistol grip handle.

246. In my opinion, IPVG in combination with Nakai renders this claim obvious for the same reasons discussed for Limitations [1d]/[10d]/[10e]. Ground 2, Limitations [1d]/[10d]/[10e].

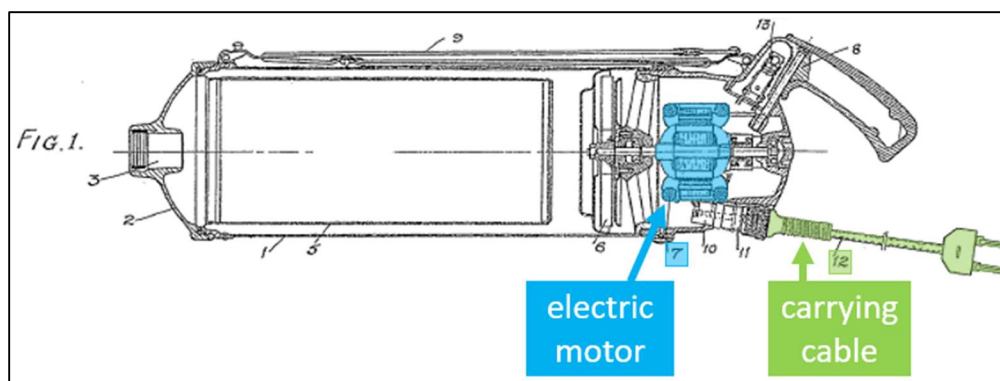
4. [3]/[13]

Reference Number	Claim Limitation
[3]	“The hand vacuum cleaner of claim 2 further comprising a battery pack wherein the actuator is axially located adjacent a forward end of the battery pack.”
[13]	“The hand vacuum cleaner of claim 10 further comprising a battery pack wherein the actuator is axially located adjacent a forward end of the battery pack.”

247. In my opinion, the combined teachings of IPVG and Nakai renders obvious the hand vacuum cleaner of claim 2 further comprising a battery pack wherein the actuator is axially located adjacent a forward end of the battery pack.

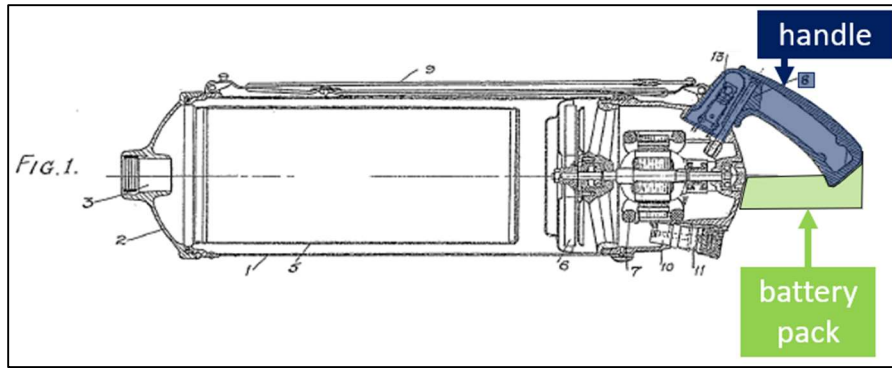
248. In my opinion, the combined teachings of IPVG and Nakai renders obvious the hand vacuum cleaner of claim 10 further comprising a battery pack wherein the actuator is axially located adjacent a forward end of the battery pack.

249. In my opinion, IPVG renders obvious a battery pack. IPVG teaches “a **current carrying cable 12**” that plugs into a wall to provide power to “**electric motor 7**,” as shown in the annotated image below:

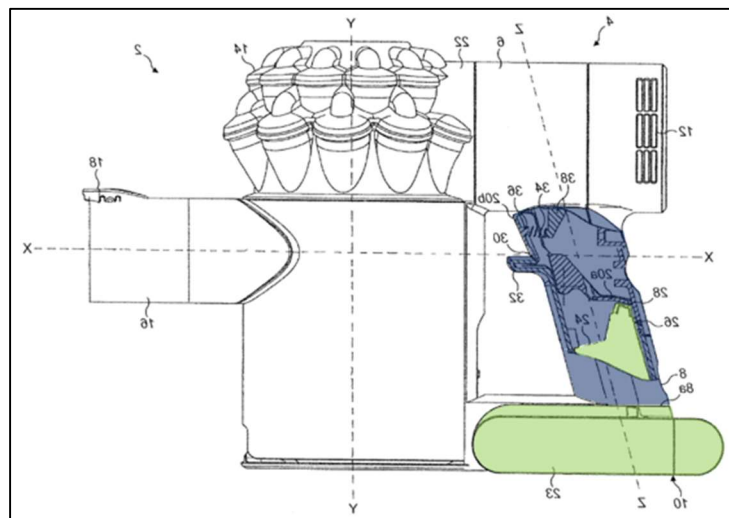


Ex1007, 1:51-57, 1:63-67, Fig. 1.

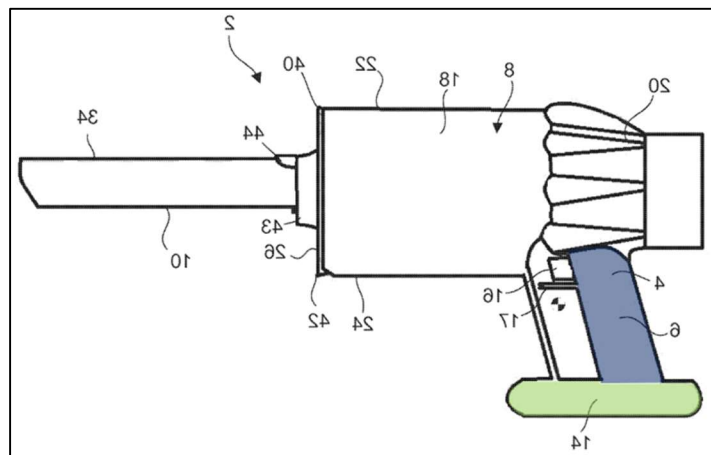
250. In my opinion, a POSA would have been motivated to modify IPVG to power “electric motor 7” with a battery pack rather than “carrying cable 12” for several reasons. IPVG teaches a “portable dust suction apparatus” that “may be readily lifted during operation.” Ex1007, 1:10-12, 1:22-33. In my opinion, a POSA would have therefore looked for alternative ways to power IPVG’s electric motor to increase “portab[ility]” and maneuverability, including through the use of a battery pack, which, in my opinion, was commonly known in the art. Ex1017, 1:6-7, 1:15-16 (“[I]n order to provide portability, it is common for handheld vacuum cleaners and stick-vacs to be cordless whereby power is supplied to such devices by way of a battery pack”). Further, in my opinion, a POSA would have been motivated to implement the **battery pack** at the base of IPVG’s pistol grip “**handle 8**,” as this location for a battery pack was commonly known in the art, as shown in the annotated images below:



Ex1007, Fig. 1(modified).



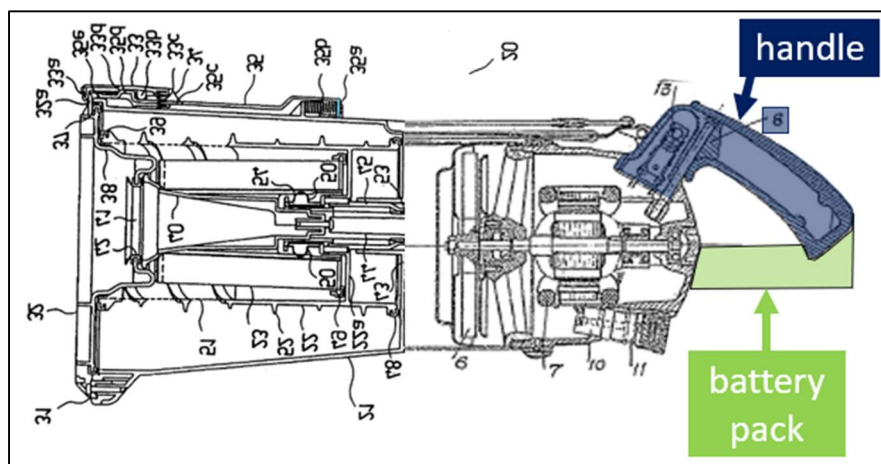
Ex1017, 5:18, Fig. 2.



Ex1005, ¶31, Fig. 1.

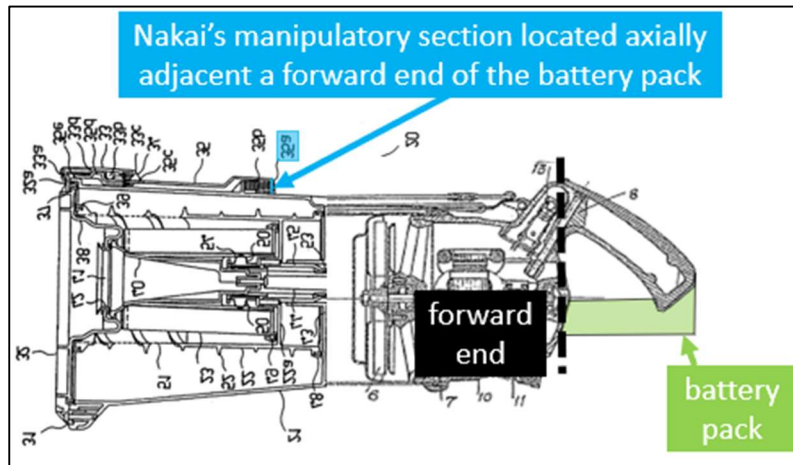
251. In my opinion, implementing a battery back into IPVG, as shown above, would have been obvious to try, easy to implement using known techniques, and would have yielded the predictable result of increased vacuum “portab[ility],” which is one of IPVG’s objectives. Ex1007, 1:10-12, 1:22-33, claim 1. And, in my opinion, a POSA would have further understood that this was one of a finite number of identified locations for the battery pack, and it would have been the most convenient location because it would place the center of gravity below IPVG’s pistol grip handle, thereby reducing strain on the user’s wrist.

252. In my opinion, a POSA would have been motivated to combine IPVG and Nakai and would have reasonably expected success. Ground 2, §1. Further, in my opinion, the combined teachings likewise meet these limitations, as shown in the annotated image below:



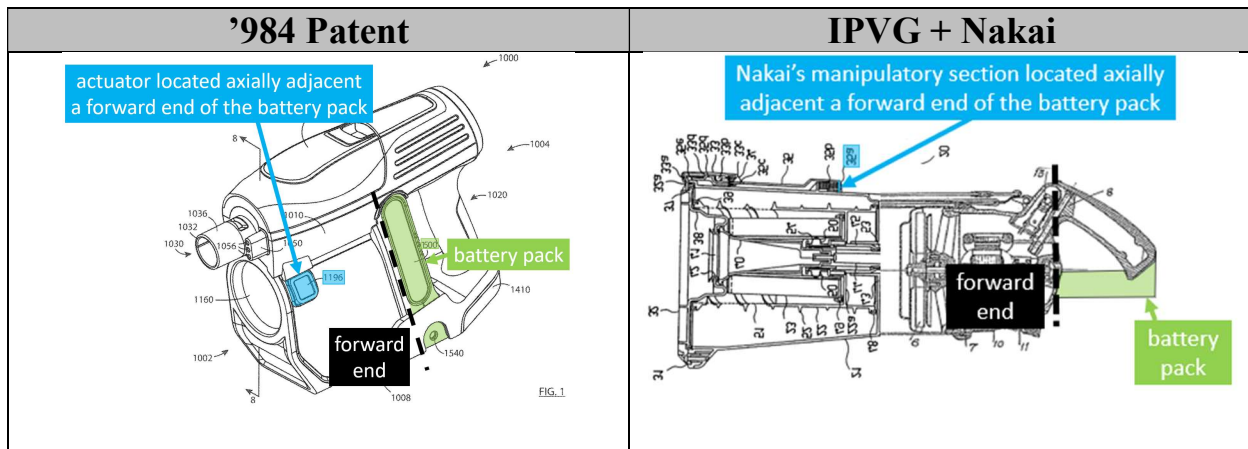
Ex1007, Fig. 1(modified); Ex1008, Fig. 3(modified).

253. In my opinion, when Nakai's door and door locking mechanism are incorporated into IPVG's cleaner, Nakai's "**manipulatory section 35a**" (in my opinion, an actuator) is axially located adjacent a **forward end** of the **battery pack**, as shown in the annotated image below:



Ex1007, Fig. 1(modified); Ex1008, Fig. 3(modified).

254. In my opinion, a POSA would have understood that the left-most end of IPVG's battery pack is the forward end, including because that is the end closest to IPVG's front end. Further, this is at least as much disclosure of these limitations as the '984 Patent, as shown in the annotated images below:



Ex1001, Fig. 1; Ex1007, Fig. 1(modified); Ex1008, Fig. 3(modified).

5. [4]/[14]

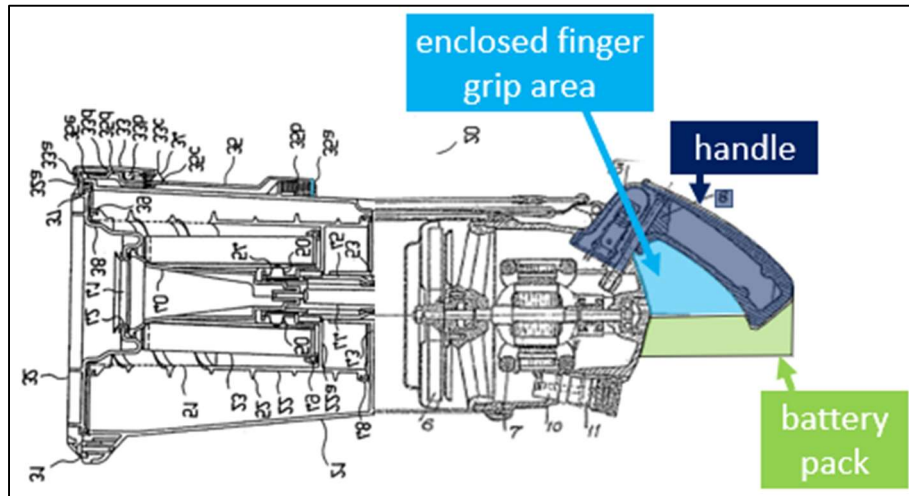
Reference Number	Claim Limitation
[4]	“The hand vacuum cleaner of claim 3 further comprising an enclosed finger grip area.”
[14]	“The hand vacuum cleaner of claim 13 further comprising an enclosed finger grip area.”

255. In my opinion, the combined teachings of IPVG and Nakai render obvious the hand vacuum cleaner of claim 3 further comprising an enclosed finger grip area.

256. In my opinion, the combined teachings of IPVG and Nakai render obvious the hand vacuum cleaner of claim 13 further comprising an enclosed finger grip area.

257. As I explained above, in my opinion, IPVG renders obvious a battery pack. Ground 2, Claims 3/13. Further, in my opinion, when the **battery pack** is mounted to IPVG's “**handle 8**” and the “exhaust or blowing end of the

casing,” the handvac comprises an **enclosed finger grip area**, as shown in the annotated image below:



Ex1007, 1:51-62, Fig. 1(modified); Ex1008, Fig. 3(modified).

258. In my opinion, when the user grabs IPVG’s **“handle 8,”** their fingers wrap into IPVG’s **enclosed finger grip area**.

6. [5]/[15]

Reference Number	Claim Limitation
[5]	“The hand vacuum cleaner of claim 4 wherein a battery pack mount forms part of the enclosed finger grip area.”
[15]	“The hand vacuum cleaner of claim 14 wherein a battery pack mount forms part of the enclosed finger grip area.”

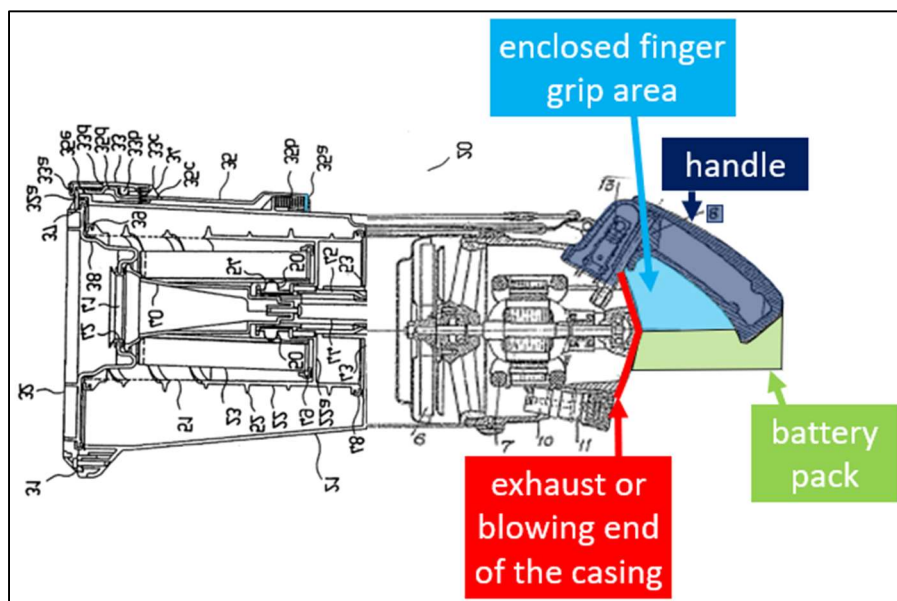
259. In my opinion, the combined teachings of IPVG and Nakai render obvious the hand vacuum cleaner of claim 4 wherein a battery pack mount forms part of the enclosed finger grip area.

260. In my opinion, the combined teachings of IPVG and Nakai render obvious

the hand vacuum cleaner of claim 14 wherein a battery pack mount forms part of the enclosed finger grip area.

261. As I explained above, in my opinion, IPVG renders obvious a battery pack and an enclosed finger grip area. Ground 2, Claims 3/13, 4/14.

262. Also, in my opinion, IPVG renders obvious a battery pack mount forms part of the enclosed finger grip area. In my opinion, a POSA would have understood that when a **battery pack** is implemented into IPVG's handvac, it is mounted to IPVG's "**handle 8**" and the "**exhaust or blowing end of the casing**." Ex1007, 1:51-62. As such, in my opinion, a POSA would have understood that both IPVG's "**handle 8**" and "**exhaust or blowing end of the casing**" are part of a battery pack mount, and both components form part of the **enclosed finger grip area**, as shown in the annotated image below:



Ex1007, Fig. 1(modified); Ex1008, Fig. 3(modified).

263. In my opinion, a POSA would have been motivated to combine IPVG and Nakai and would have reasonably expected success. Ground 2, §1. As shown above, in my opinion, the combined teachings meet these claims.

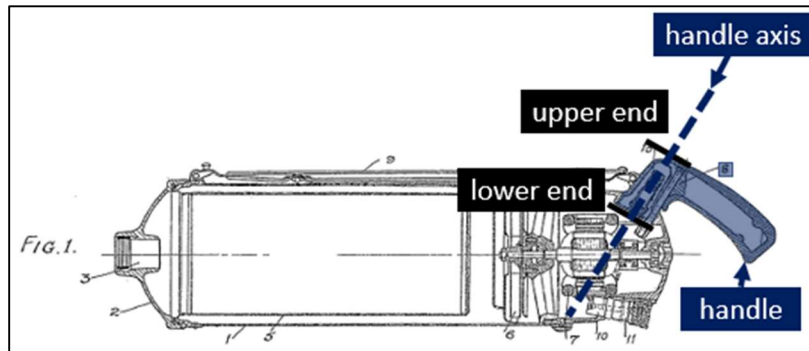
7. [6]/[11]

Reference Number	Claim Limitation
[6]	“The hand vacuum cleaner of claim 2 wherein a pistol grip axis extends through the pistol grip handle from a lower end of the pistol grip handle to an upper end of the pistol grip handle and the pistol grip axis intersects the suction motor.”
[11]	“The hand vacuum cleaner of claim 10 wherein a pistol grip axis extends through the pistol grip handle from a lower end of the pistol grip handle to the upper end of the pistol grip handle and the pistol grip axis intersects the suction motor.”

264. In my opinion, the combined teachings of IPVG and Nakai render obvious the hand vacuum cleaner of claim 2 and IPVG teaches a pistol grip axis extends through the pistol grip handle from a lower end of the pistol grip handle to an upper end of the pistol grip handle and the pistol grip axis intersects the suction motor.

265. In my opinion, the combined teachings of IPVG and Nakai render obvious the hand vacuum cleaner of claim 10 and IPVG teaches a pistol grip axis extends through the pistol grip handle from a lower end of the pistol grip handle to an upper end of the pistol grip handle and the pistol grip axis intersects the suction motor.

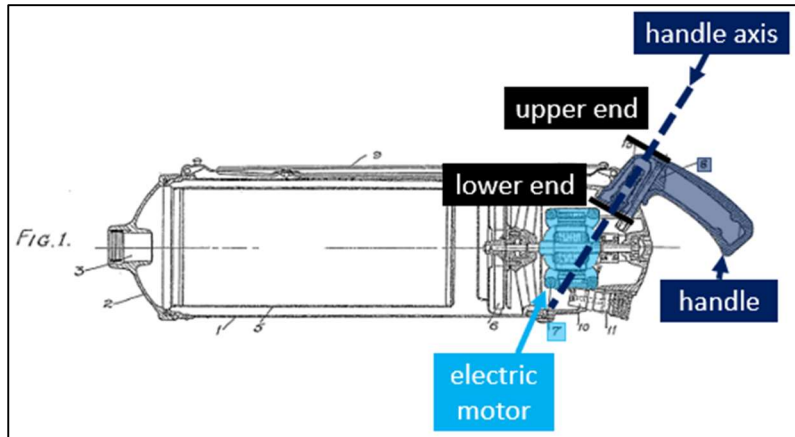
266. In my opinion, IPVG teaches a pistol grip axis extends through the pistol grip handle from a lower end of the pistol grip handle to an upper end of the pistol grip handle. IPVG's pistol grip "**handle 8**" has a **handle axis** that extends from a **lower end** to an/the **upper end**, as shown in the annotated image below:



Ex1007, Fig. 1.

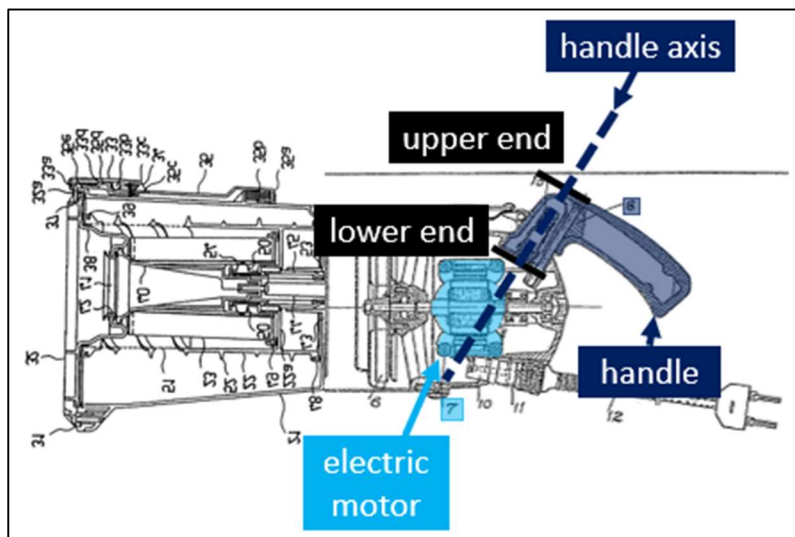
267. In my opinion, a POSA would have understood that IPVG's handle has an upper and lower end as depicted above.

268. In my opinion, IPVG teaches the pistol grip axis intersects the suction motor. IPVG's **handle axis** intersects "**electric motor 7**," as shown in the annotated image below:



Ex1007, Fig. 1.

269. In my opinion, a POSA would have been motivated to combine IPVG and Nakai and would have reasonably expected success. Ground 2, §1. Further, in my opinion, the combined teachings likewise meet these claims, as shown in the annotated image below:



Ex1007, Fig. 1(modified); Ex1008, Fig. 3(modified).

8. [7]/[12]

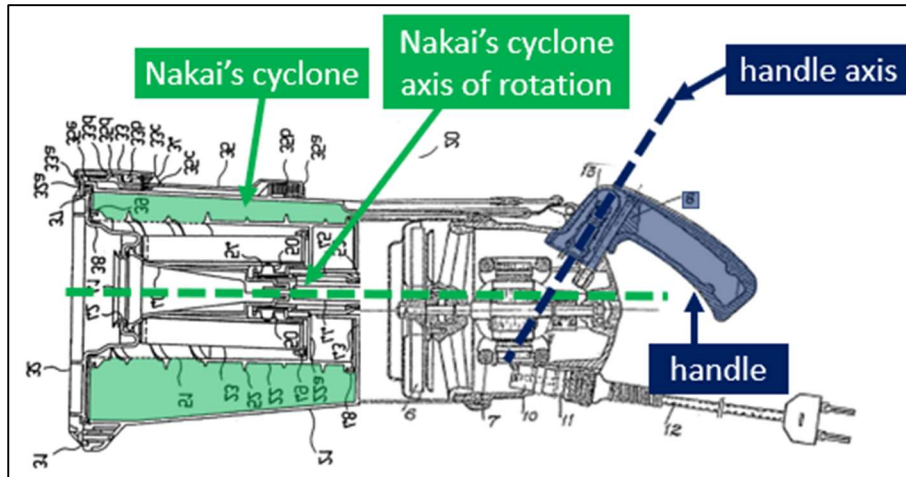
Reference Number	Claim Limitation
[7]	“The hand vacuum cleaner of claim 6 wherein the pistol grip axis and the cyclone axis of rotation intersect within the hand vacuum cleaner.”
[12]	“The hand vacuum cleaner of claim 11 wherein the pistol grip axis and the cyclone axis of rotation intersect within the hand vacuum cleaner.”

270. In my opinion, the combined teachings of IPVG and Nakai render obvious the hand vacuum cleaner of claim 6 wherein the pistol grip axis and the cyclone axis of rotation intersect within the hand vacuum cleaner.

271. In my opinion, the combined teachings of IPVG and Nakai render obvious the hand vacuum cleaner of claim 11 wherein the pistol grip axis and the cyclone axis of rotation intersect within the hand vacuum cleaner.

272. As I explained above, in my opinion, IPVG teaches a pistol grip axis, and Nakai teaches a cyclone axis of rotation. Ground 2, Limitations [1c]/[10c], Claims 6/11.

273. In my opinion, a POSA would have been motivated to combine IPVG and Nakai and would have reasonably expected success. Ground 2, §1. Further, in my opinion, when Nakai’s cyclonic separation teachings are incorporated into IPVG’s cleaner, the **handle axis** and the **cyclone axis of rotation** intersect within the handvac, as shown in the annotated image below:



Ex1007, Fig. 1(modified); Ex1008, Fig. 3(modified).

9. [8]/[17]

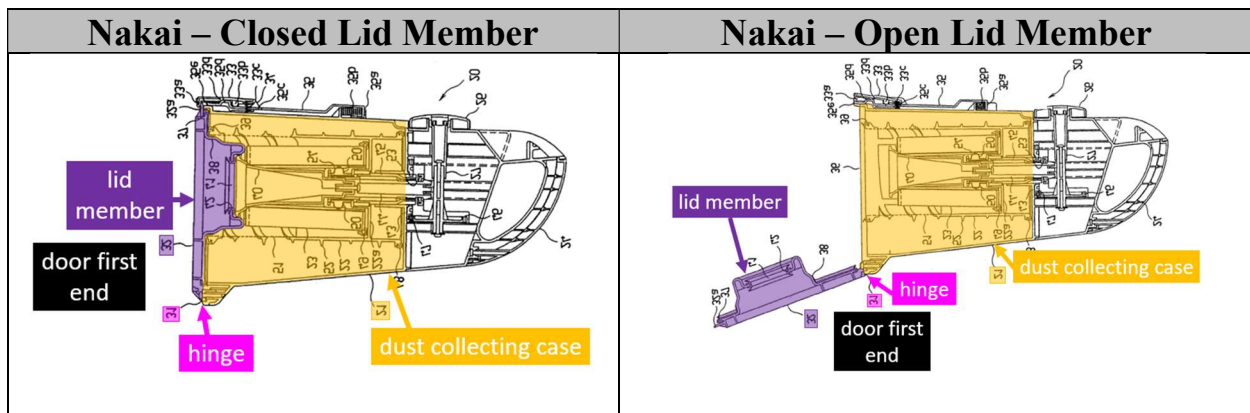
Reference Number	Claim Limitation
[8]	“The hand vacuum cleaner of claim 1 wherein the front door has a door first end which is rotatably mounted to a front end of the cyclone unit wall and an opposed securable end and the lock further comprises a latch that is located at an elevation of the opposed securable end.”
[17]	“The hand vacuum cleaner of claim 10 wherein the front door has a door first end which is rotatably mounted to a front end of the cyclone unit wall and an opposed securable end and the lock further comprises a latch that is located at an elevation of the opposed securable end.”

274. In my opinion, the combined teachings of IPVG and Nakai render obvious the hand vacuum cleaner of claim 1 wherein the front door has a door first end which is rotatably mounted to a front end of the cyclone unit wall and an opposed securable end and the lock further comprises a latch that is located at an elevation of the opposed securable end.

275. In my opinion, the combined teachings of IPVG and Nakai render obvious

the hand vacuum cleaner of claim 10 wherein the front door has a door first end which is rotatably mounted to a front end of the cyclone unit wall and an opposed securable end and the lock further comprises a latch that is located at an elevation of the opposed securable end.

276. In my opinion, Nakai teaches the door has a door first end which is rotatably mounted to an end of the cyclone unit wall. Nakai's "**lid member 32**" (in my opinion, a door) has a "**lid member 32**" first end which is [r]otatably mounted on the bottom of the **dust collecting case 21**" (in my opinion, a cyclone unit) wall "via a **hinge 31**," as shown in the annotated images below:

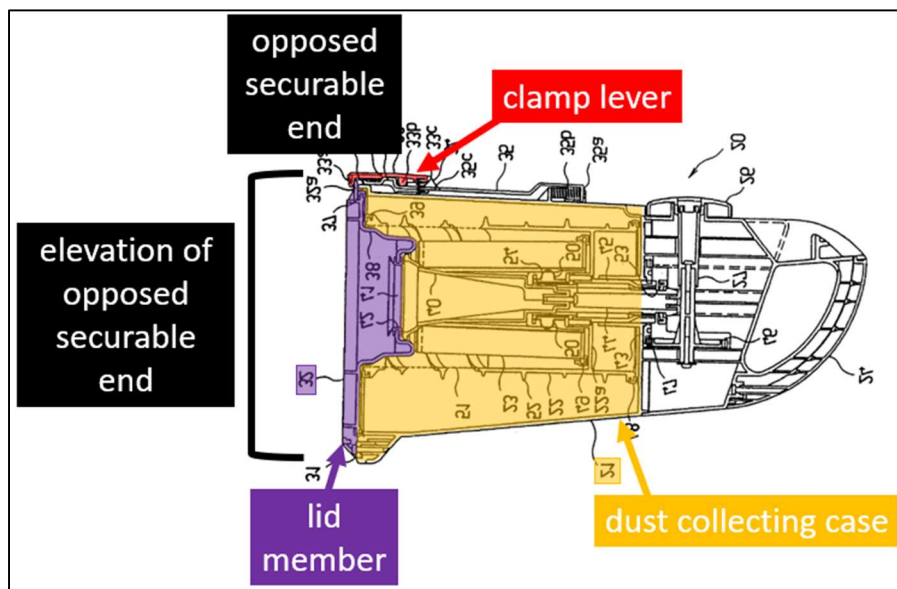


Ex1008, 4:27-34, Figs. 3, 8.

277. In my opinion, a POSA would have understood that the first end of Nakai's "**lid member 32**" is rotatably mounted to the wall of "**dust collecting case 21**" by the "**hinge 31**."

278. Further, in my opinion, Nakai teaches a door opposed securable end and

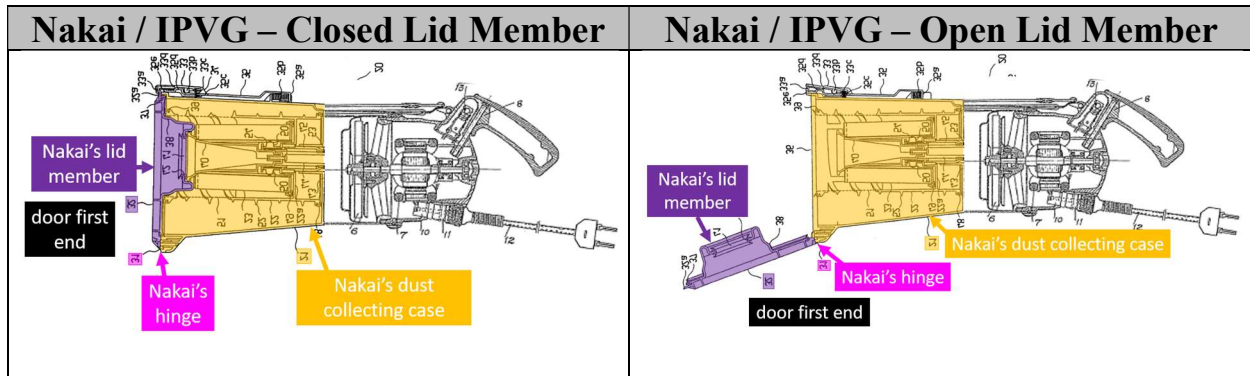
the lock further comprises a latch that is located at an elevation of the opposed securable end. Nakai's "**lid member 32**" has an **opposed securable end** and the "lid opening mechanism" (in my opinion, a lock) further comprises a "**clamp lever 33**" (in my opinion, a latch) that is located at an **elevation of the opposed securable end**, as shown in the annotated image below:



Ex1008, 7:11-24, Fig. 3.

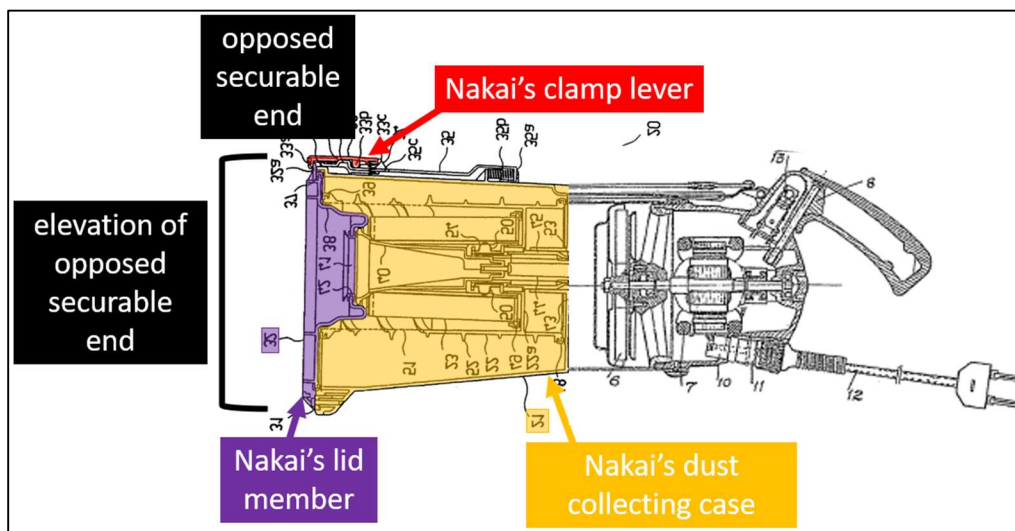
279. In my opinion, a POSA would have understood Nakai's "**clamp lever 33**" is a latch located at an **elevation of the opposed securable end** of the front door.
280. In my opinion, a POSA would have been motivated to combine IPVG and Nakai and would have reasonably expected success. Ground 2, §1. Further, in my opinion, when Nakai's "**lid member 32**" (including "**hinge**

31”) and “lid opening mechanism” (including “clamp lever 33”) teachings are incorporated into IPVG’s cleaner, the “lid member 32” has a door first end which is rotatably mounted to a front end of Nakai’s “dust collecting case 21”’s wall, as shown in the annotated images below:



Ex1007, Fig. 1(modified); Ex1008, Figs. 3(modified), 8(modified).

281. Likewise, in my opinion, “lid member 32” has an opposed securable end and the “lid opening mechanism” further comprises a “clamp lever 33” that is located at an elevation of the opposed securable end, as shown in the annotated image below:



Ex1007, Fig. 1(modified); Ex1008, Fig. 3(modified).

10. [9]/[18]

Reference Number	Claim Limitation
[9]	“The hand vacuum cleaner of claim 1 wherein the cyclone unit wall terminates at an open end, the open end is closed by the front door, wherein all of the open end is opened when the front door is in the open position.”
[18]	“The hand vacuum cleaner of claim 10 wherein the cyclone unit wall terminates at an open end, the open end is closed by the front door, wherein all of the open end is opened when the front door is in the open position.”

282. In my opinion, the combined teachings of IPVG and Nakai render obvious the hand vacuum cleaner of claim 1 wherein the cyclone unit wall terminates at an open end, the open end is closed by the front door, wherein all of the open end is opened when the front door is in the open position.

283. In my opinion, the combined teachings of IPVG and Nakai render obvious the hand vacuum cleaner of claim 10 wherein the cyclone unit wall terminates at an open end, the open end is closed by the front door, wherein all of the open end is opened when the front door is in the open position.

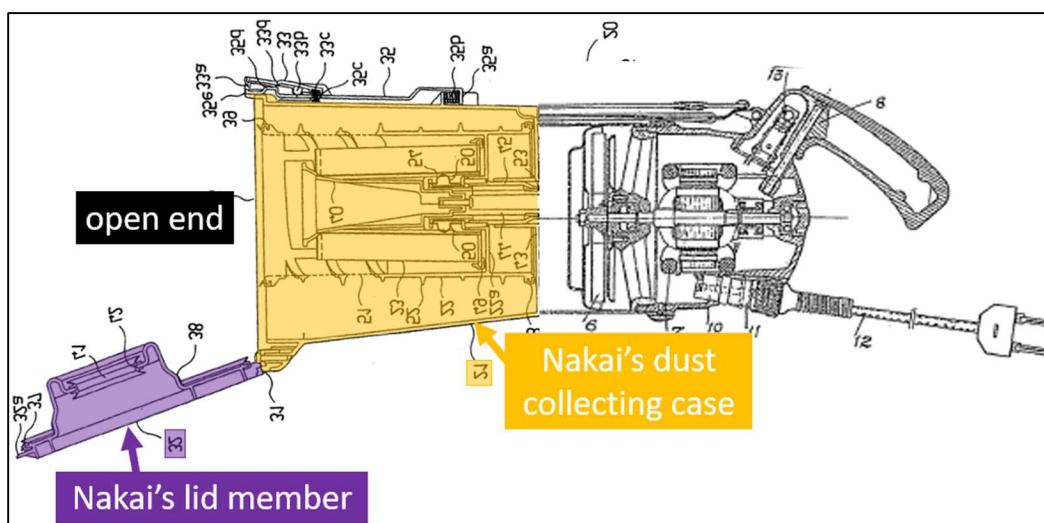
284. As I explained for Limitations [1c]/[10c], in my opinion, IPVG in combination with Nakai renders obvious the cyclone unit wall terminates at an open end, the open end is closed by the front door. Ground 2, Limitations [1c]/[10c].

285. Further, in my opinion, IPVG teaches wherein all of the open end is opened

when the front door is in the open position. IPVG's "screwed cover 2" "close[s] ... the front end" of IPVG's "chamber 1," and when it is opened (by removing the "screw[s]" to empty IPVG's "dust bag 5") all of the open end is opened. Ex1007, 1:51-62, Fig. 1.

286. In my opinion, Nakai also teaches wherein all of the open end is opened when the front door is in the open position. When Nakai's "lid member 32" is "opened to discharge the accumulated dust," all of the open end is "opened." Ex1008, Abstract; Fig. 8.

287. In my opinion, a POSA would have been motivated to combine IPVG and Nakai and would have reasonably expected success. Further, in my opinion, when Nakai's "lid member 32" and "dust collecting case 21" teachings are incorporated into IPVG's cleaner, all of the open end is "opened" when "lid member 32" is in the open position, as shown in the annotated image below:



Ex1007, Fig. 1(modified); Ex1008, Fig. 8(modified).

11. [16]

Reference Number	Claim Limitation
[16]	“The hand vacuum cleaner of claim 14 wherein the actuator is spaced towards the rear end of the cyclone.”

288. In my opinion, the combined teachings of IPVG and Nakai render obvious the hand vacuum cleaner of claim 14 wherein the actuator is spaced towards the rear end of the cyclone.

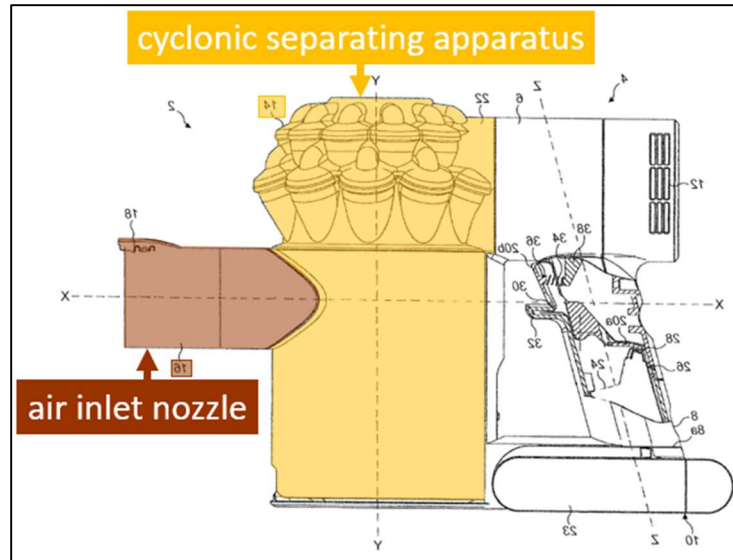
289. In my opinion, IPVG in combination with Nakai renders this claim obvious for the same reasons discussed for Limitation [1d]. Ground 2, Limitation [1d].

C. Ground 3: IPVG In Combination With Nakai and Sunderland Renders Obvious Claims 1-18

1. A POSA Would Have Combined IPVG, Nakai, and Sunderland

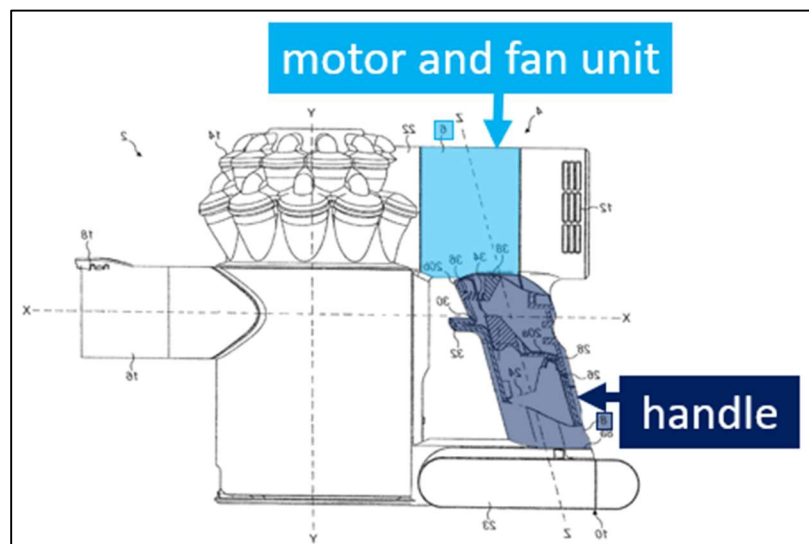
a. Scope and Content of the IPVG, Nakai, and Sunderland Prior Art References

290. As noted briefly in the Background of the Prior Art section, Sunderland is a Dyson PCT Publication from 2013. Ex1017. Sunderland teaches a “handheld vacuum cleaner” with a “**cyclonic separating apparatus**” and a “**air inlet nozzle 16**,” wherein “[a]n elongate extension tube or wand (not shown) may also be mounted to the **air inlet nozzle 16**,” as shown in the annotated image below:



Ex1017, 1:6-7, 5:22-24, 5:30-6:1, Fig. 2.

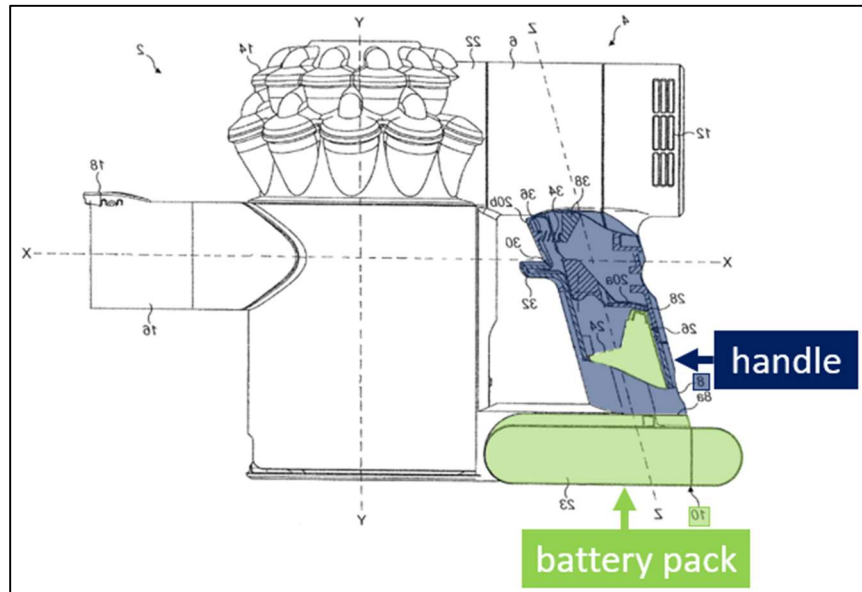
291. Sunderland’s “**motor and fan unit 6** is located above” a “**handle 8** [that] is oriented in a pistol-grip formation,” as shown in the annotated image below:



Ex1017, 5:17-18, 6:11-12, Fig. 2.

292. Further, Sunderland’s “handheld cleaning appliance includes a **removable**

battery pack [10] ... that is receivable in a dock opening in the end of [the] **handle [8]**” “so that the **battery pack 10** may be docked onto the vacuum cleaner 2,” as shown in the annotated image below:



Ex1017, 1:19-22, 7:13-14, Fig. 2.

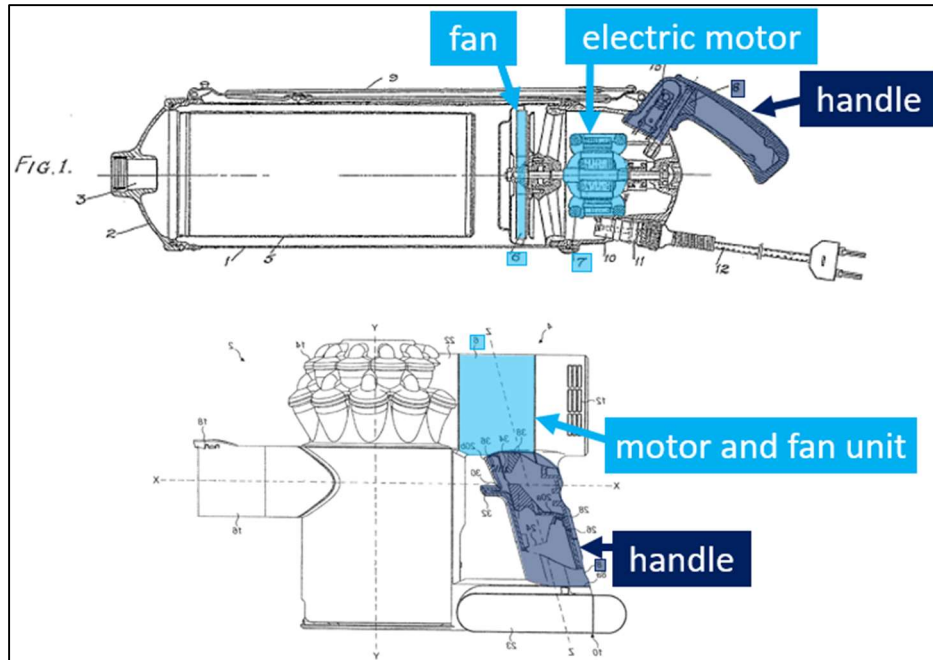
293. For discussion of IPVG’s and Nakai’s teachings, *see* Ground 2.

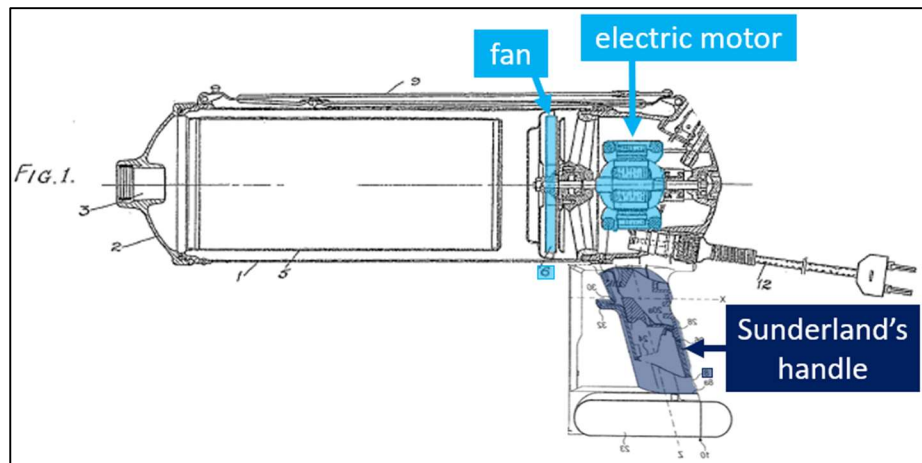
b. A POSA Would Have Been Motivated to Combine the Teachings of IPVG, Nakai, and Sunderland

294. As explained above, in my opinion, a POSA would have been motivated to combine IPVG and Nakai and would have had a reasonable expectation of success. Ground 2, §1. Further, in my opinion, a POSA reading IPVG would have been motivated to modify it to achieve the benefits of Sunderland’s handle and battery teachings, including better ergonomic handling, increased portability, and part longevity. Ex1007, 1:10-33; 1:51-

57. Specifically, in my opinion, a POSA would have been motivated to combine the teachings of IPVG and Nakai with Sunderland as follows:

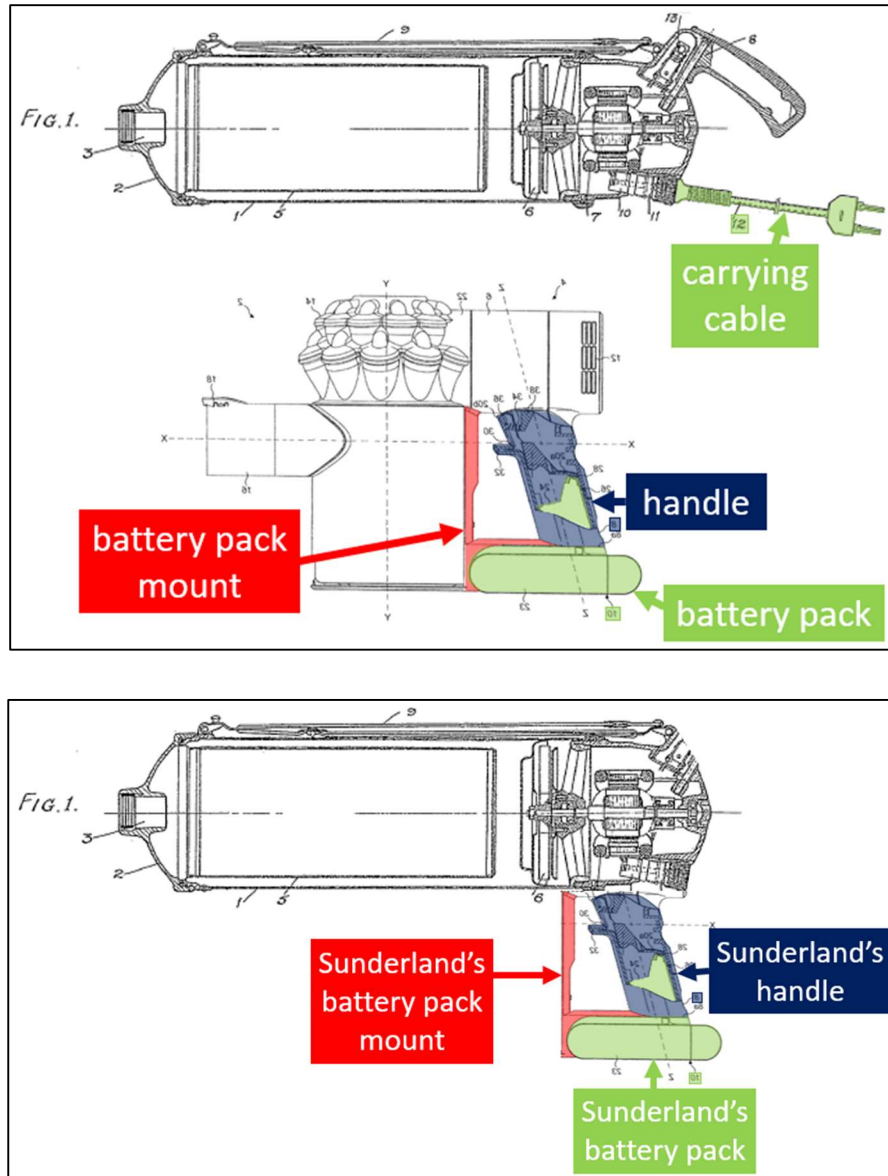
295. In my opinion, a POSA would have modified IPVG's pistol grip "**handle 8**" to use a pistol grip handle positioned below "**fan 6 driven by an electric motor 7**," such as Sunderland's "**handle 8** [that] is oriented in a pistol-grip formation" and positioned below "**motor and fan unit 6**," as shown in the annotated images below:





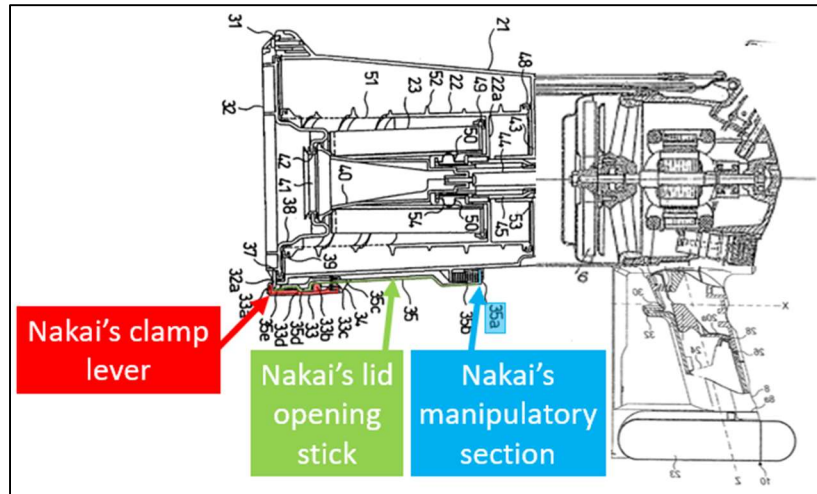
Ex1007, 1:51-62, Fig. 1(modified); Ex1017, 5:17-18, 6:11-12, Fig. 2(modified).

296. Further, in my opinion, a POSA would have modified IPVG's electrical wiring and power source, including “**carrying cable 12**” (which plugs into a wall outlet), to use a battery, such as Sunderland's “**removable battery pack [10]** ... that is receivable in a dock opening in the end of [the] **handle [8]**,” and Sunderland's **battery pack mount**, which provides structural support for Sunderland's “**removable battery pack [10]**”, as shown in the annotated images below:



Ex1007, 1:63-69, Fig. 1(modified); Ex1017, 1:19-22, 7:13-14, Fig. 2(modified).

297. In my opinion, a POSA would have understood that, when making these modifications, Nakai's cyclonic separating unit would be implemented with the door-actuation mechanism located on the lower side of IPVG's cleaner:



Ex1007, Fig. 1(modified); Ex1008, Fig. 3(modified); Ex1017, Fig. 2(modified).

298. In my opinion, locating the actuation mechanism as shown above would have been obvious to try, because a POSA would have understood that there were a finite number of identified actuation mechanism positions, including locating it on the lower side of IPVG's cleaner. Further, in my opinion, locating the actuator as shown has several benefits, including (1) easy user emptying, because simply pushing a manipulatory section located near the handle with one hand while continuing to hold the cleaner's handle with the other hand is a very intuitive and ergonomic method of emptying the collected dust, and (2) protecting against accidental bin-opening, since the manipulatory section is less likely to hit objects while the cleaner is in use. Also, in my opinion, a POSA would have reasonably expected success making this modification for the same reasons I mention above. Ground 2, §1.

299. In my opinion, a POSA would have been motivated to combine IPVG and Sunderland as described for several reasons. First, in my opinion, IPVG and Sunderland are analogous prior art references. Like IPVG, which teaches a “portable dust suction apparatus” with “a suction opening [] for attaching a suction pipe 4,” Ex1007, 1:10-12, 1:51-57, Fig. 2, Sunderland teaches “a handheld vacuum cleaner” with an “air inlet nozzle” upon which “an elongate extension tube or wand (not shown) may also be mounted,” Ex1017, 1:6-7, 5:30-6:2. Further, IPVG teaches a pistol grip “handle 8” located at the rear of the cleaner “by which the apparatus may be readily lifted during operation,” Ex1007, 1:22-33, 1:92-2:2, Fig. 1, and Sunderland teaches a “handle 8 [that] is oriented in a pistol-grip formation” and located at the rear of the cleaner, Ex1017, 5:17-18, 6:11-12, Fig. 2.
300. Second, in my opinion, IPVG and Sunderland each provide motivations for this combination. For example, Sunderland explains that its teachings are “suitable for use” in “handheld vacuum cleaner[s],” and that positioning “[t]he motor and fan unit 6 ... above” “pistol-grip” “handle 8” “reduces stress on a user’s wrist during cleaning.” Ex1017, 1:6-7, 5:17-18, 6:11-12. In my opinion, a POSA would have looked for hand/stick references that could use Sunderland’s handle teachings, including IPVG’s. Likewise, IPVG teaches that its cleaner is designed to be

- “portable” and “readily lifted during operation.” Ex1007, 1:10-12, 1:22-33. In my opinion, POSA would have looked for vacuum components that could increase maneuverability and ergonomics “during operation,” including a handle positioned below the suction motor and fan assembly. Also, in my opinion, a POSA would have understood that a handle positioned below the suction motor and fan assembly had certain benefits over one mounted rearward, including, (1) less strain on the user’s wrist, (2) reduced tension on the handle’s mount, thereby increasing part longevity and reducing recurring costs, and (3) closer location to the vacuum’s center of gravity, increasing vacuum maneuverability and ergonomics.
301. Third, in my opinion, a POSA would have understood that Sunderland’s “battery pack 10” (and battery pack mount) had certain benefits over IPVG’s “carrying cable 12,” and would have been motivated to incorporate Sunderland’s battery pack teachings into IPVG. Indeed, Sunderland explains that “in order to provide portability, it is common for handheld vacuum cleaners and stick-vacs to be cordless whereby power is supplied to such devices by way of a battery pack.” Ex1017, 1:6-7, 1:15-16. Unlike IPVG’s power source, which requires plugging “carrying cable 12” into a wall outlet, Sunderland’s “battery pack 10” “is receivable in a dock

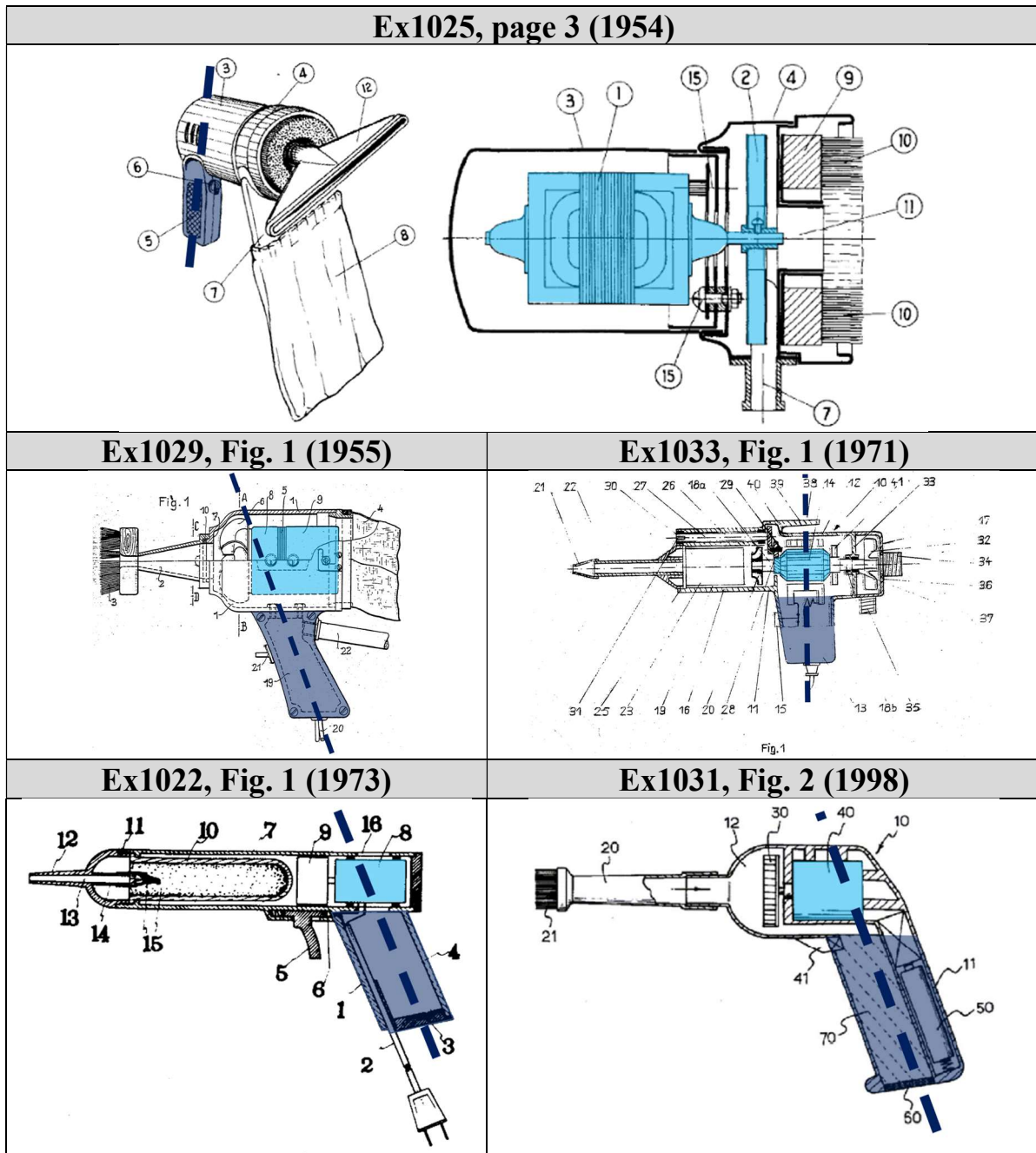
- opening in the end of [the] handle [8].” Ex1017, 1:19-22, 7:13-14. By contrast to IPVG’s “carrying cable 12,” in my opinion, a POSA would have understood that Sunderland’s “battery pack 10” enables the user to move unrestricted around the area to be cleaned.
302. Fourth, in my opinion, this combination would have involved a simple substitution of known elements for other known elements to obtain predictable results. IPVG teaches a cleaner with a pistol grip handle that is located above and rearward of the suction motor and fan assembly, and a power cord that plugs into the wall. Ex1007, Fig. 1. Sunderland teaches a pistol grip handle that is located below the suction motor and fan assembly, and a battery pack that is mountable to the pistol grip handle. Ex1017, Fig. 2. In my opinion, a POSA would have understood the simple substitution of these handles and power supply mechanisms would achieve the predictable results of increased vacuum maneuverability and ergonomics. Further, as explained above, in my opinion, IPVG and Sunderland are directed to hand/stick vacuums having a similar orientation of handle relative to the cylindrical vacuum cleaner housing. Ex1007, Fig. 1; Ex1017, Fig. 2.
303. Fifth, in my opinion, it would have been at least obvious to try this combination. In my opinion, a POSA would have understood that there

were a finite number of identified handle positions, including positioning the handle above and rearward of the suction motor, (as IPVG teaches), and positioning the handle below the suction motor (as Sunderland teaches). And, in my opinion, a POSA would have understood there were a finite number of identified suction motor power sources, including a power cord that plugs into the wall (as IPVG teaches), and a battery pack (as Sunderland teaches), and it would have been obvious to try to achieve the known benefits described above.

c. A POSA Would Have Had A Reasonable Expectation of Success Combining the Teachings of IPVG, Nakai, and Sunderland

304. In my opinion, a POSA would have reasonably expected success combining IPVG's and Sunderland's teachings as described. In my opinion, a POSA would have understood that these two handles could be used interchangeably, and these two suction motor power sources could be used interchangeably, and would have further expected success for the reasons stated above, including because such modification involves a simple substitution of known elements that perform similar functions in similar ways, and because of the express motivations found in IPVG and Sunderland to perform such substitution.
305. Further, in my opinion, a POSA would have reasonably expected success

incorporating Sunderland's handle teachings into IPVG because **pistol grip handles** positioned below the **suction motor** have existed for nearly 70 years, as shown in the annotated images below:



2. [1]/[2]/[8]/[9]/[10]/[17]/[18]

306. As I explained above, in my opinion, IPVG in combination with Nakai renders these claims obvious. Ground 2.

307. Likewise, in my opinion, these claims are obvious in view of the combination of IPVG, Nakai, and Sunderland for the same reasons discussed above. Ground 3, §1.

3. [3]/[13]

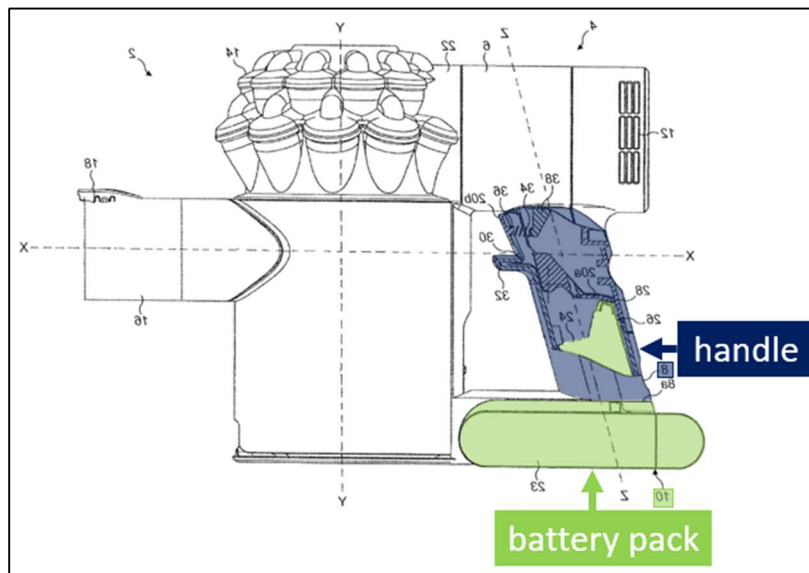
Reference Number	Claim Limitation
[3]	“The hand vacuum cleaner of claim 2 further comprising a battery pack wherein the actuator is axially located adjacent a forward end of the battery pack.”
[13]	“The hand vacuum cleaner of claim 10 further comprising a battery pack wherein the actuator is axially located adjacent a forward end of the battery pack.”

308. In my opinion, the combined teachings of IPVG, Nakai, and Sunderland renders obvious the hand vacuum cleaner of claim 2 further comprising a battery pack wherein the actuator is axially located adjacent a forward end of the battery pack.

309. In my opinion, the combined teachings of IPVG, Nakai, and Sunderland renders obvious the hand vacuum cleaner of claim 10 further comprising a battery pack wherein the actuator is axially located adjacent a forward end of the battery pack.

310. A POSA would have understood that Sunderland teaches a battery pack.

Sunderland's cleaner includes a “**removable battery pack [10]** ... that is receivable in a dock opening in the end of [the] **handle [8]**” “so that the **battery pack 10** may be docked onto the vacuum cleaner 2,” as shown in the annotated image below:



Ex1017, 1:19-22, 7:13-14, Fig. 2.

311. As I explained above, in my opinion, Nakai teaches an actuator. Ground 2, Limitations [1d]/[10e].

312. In my opinion, a POSA would have been motivated to combine IPVG, Nakai, and Sunderland and would have reasonably expected success. Ground 3, §1. Further, in my opinion, in the combined teachings, the vacuum cleaner comprises a “**battery pack 10**” wherein the “**manipulatory section 35a**” (actuator) is axially located adjacent a **forward end** of the “**battery pack 10**,” as shown in the annotated image

The drawing is a side-view cross-section of a vehicle chassis. At the rear (left), a large battery pack is shown in green, labeled 'Sunderland's battery pack' with a green arrow. Moving forward (right), a blue component labeled 'Sunderland's handle' is shown with a blue arrow. The main body of the vehicle is white with various mechanical parts and components labeled with numbers (e.g., 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100). A blue arrow points from the battery pack area towards the handle area, indicating the axial relationship between them.

313. Further, in my opinion, this is at least as much disclosure of these limitations as the '984 Patent, as shown in the annotated images below:

'984 Patent	IPVG + Nakai + Sunderland
actuator located axially adjacent a forward end of the battery pack battery pack forward end FIG. 1	

156

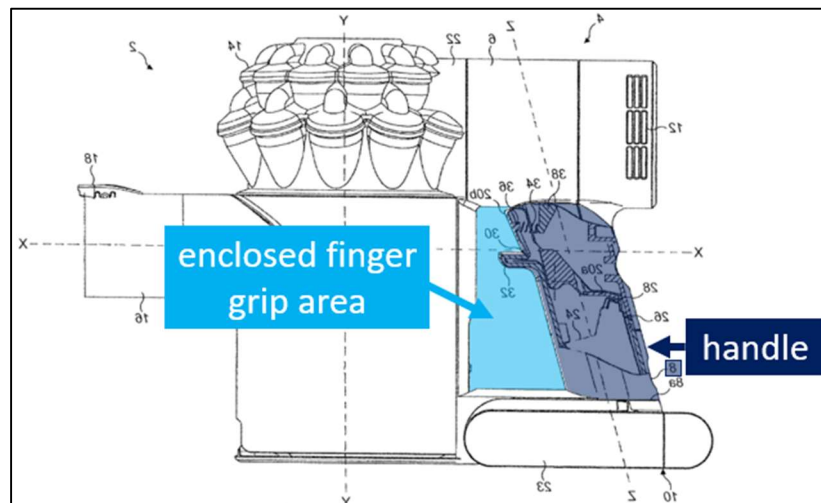
4. [4]/[14]

Reference Number	Claim Limitation
[4]	“The hand vacuum cleaner of claim 3 further comprising an enclosed finger grip area.”
[14]	“The hand vacuum cleaner of claim 13 further comprising an enclosed finger grip area.”

314. In my opinion, the combined teachings of IPVG, Nakai, and Sunderland render obvious the hand vacuum cleaner of claim 3 and Sunderland teaches an enclosed finger grip area.

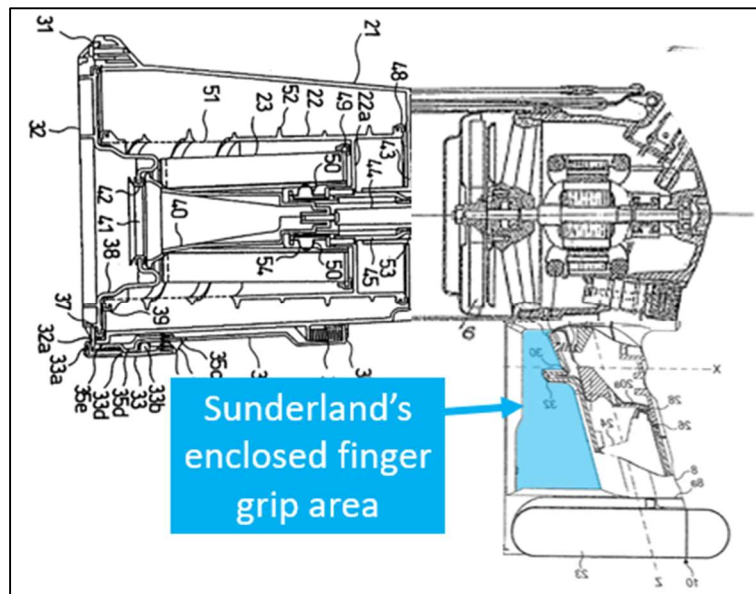
315. In my opinion, the combined teachings of IPVG, Nakai, and Sunderland render obvious the hand vacuum cleaner of claim 13 and Sunderland teaches an enclosed finger grip area.

316. In my opinion, Sunderland teaches an **enclosed finger grip area** where the user “grasp[s] the **handle [8]**,” as shown in the annotated image below:



Ex1017, 27:31-28:4, Fig. 2.

317. In my opinion, a POSA would have been motivated to combine IPVG, Nakai, and Sunderland and would have reasonably expected success. Ground 3, §1. In my opinion, in the combined teachings, the hand vacuum comprises an **enclosed finger grip area**, as shown in the annotated image below:



Ex1007, Fig. 1(modified); Ex1008, Fig. 3(modified); Ex1017, Fig. 2(modified).

5. [5]/[15]

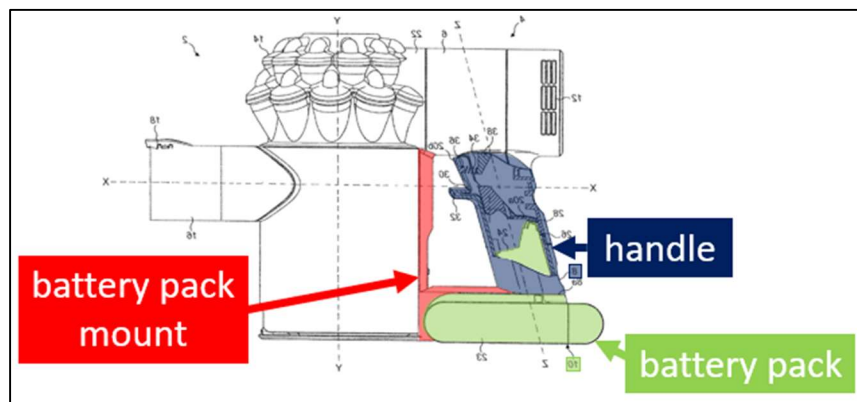
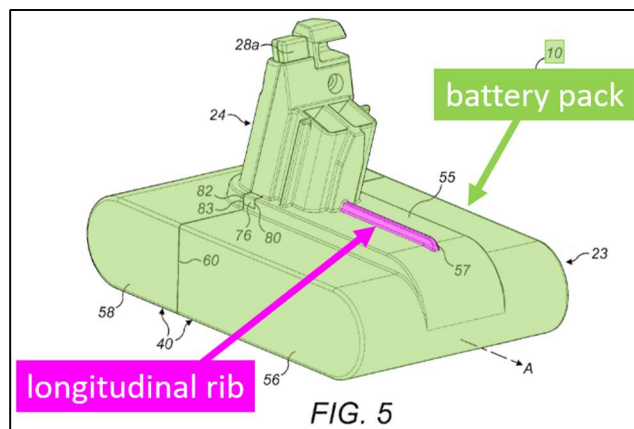
Reference Number	Claim Limitation
[5]	“The hand vacuum cleaner of claim 4 wherein a battery pack mount forms part of the enclosed finger grip area.”
[15]	“The hand vacuum cleaner of claim 14 wherein a battery pack mount forms part of the enclosed finger grip area.”

318. In my opinion, the combined teachings of IPVG, Nakai, and Sunderland renders obvious the hand vacuum cleaner of claim 4 and Sunderland

teaches a battery pack mount forms part of the enclosed finger grip area.

319. In my opinion, the combined teachings of IPVG, Nakai, and Sunderland renders obvious the hand vacuum cleaner of claim 14 and Sunderland teaches a battery pack mount forms part of the enclosed finger grip area.

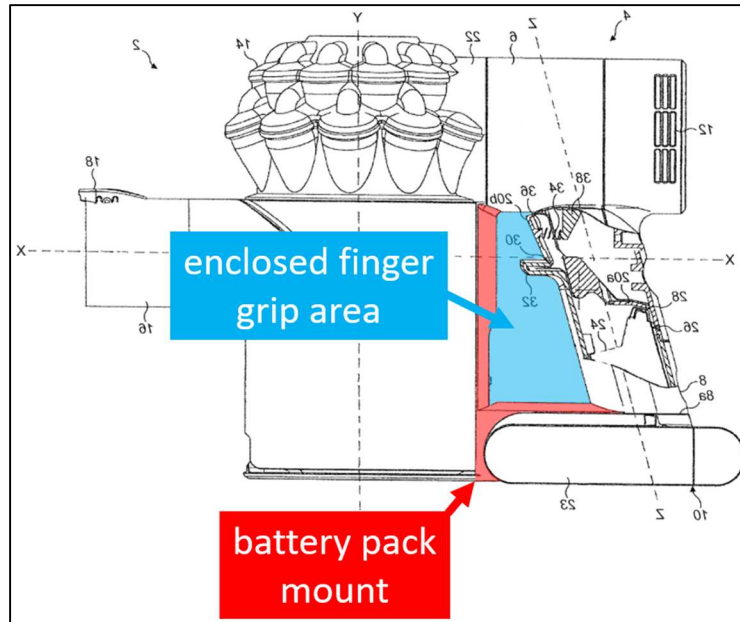
320. In my opinion, Sunderland teaches a battery pack mount. Sunderland's “removable battery pack [10] ... is receivable in a dock opening in the end of [the] handle [8],” and includes “[a] longitudinal rib 57” that “provides a means to strengthen the engagement with the vacuum cleaner”'s battery pack mount, as shown in the annotated images below:



Ex1017, 1:19-22, 7:13-14, 9:24-25, Figs. 2, 5.

321. In my opinion, a POSA would have understood that Sunderland teaches a battery pack mount as identified above, at least because Sunderland's "battery pack 10"'s "longitudinal rib 57" "engage[s]" with it when attached.

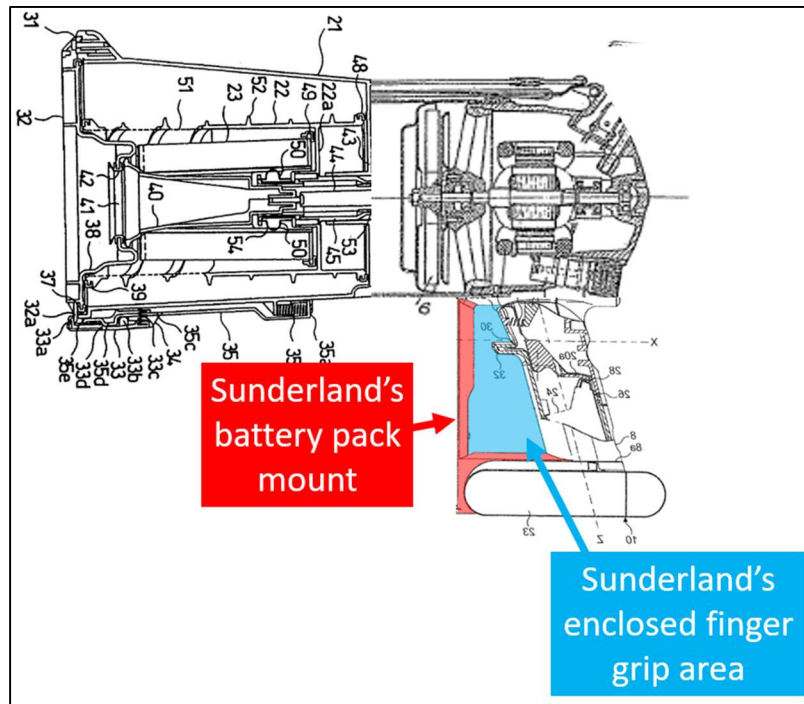
322. Further, in my opinion, Sunderland's **battery pack mount** forms part of the **enclosed finger grip area**, as shown in the annotated image below:



Ex1017, Fig. 2.

323. In my opinion, a POSA would have been motivated to combine IPVG, Nakai, and Sunderland and would have reasonably expected success. Ground 3, §1. In my opinion, in the combined teachings, a **battery pack mount** forms part of the **enclosed finger grip area**, as shown in the

annotated image below:



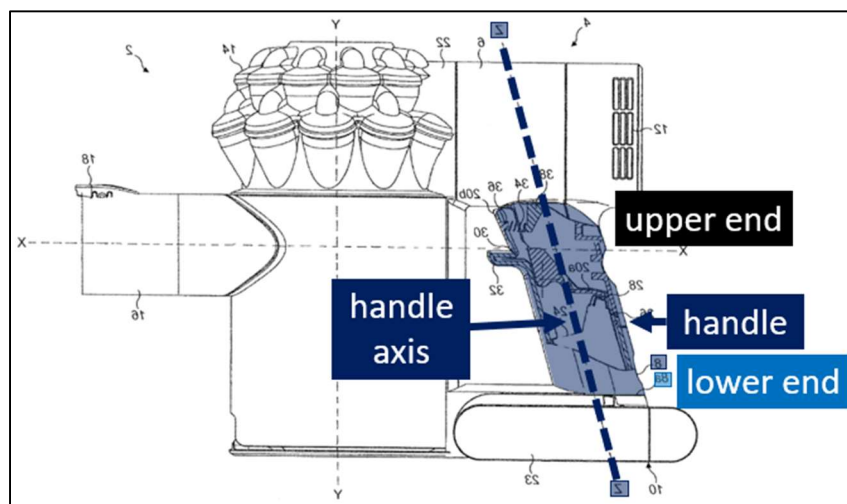
Ex1007, Fig. 1(modified); Ex1008, Fig. 3(modified); Ex1017, Fig. 2(modified).

6. [6]/[11]

Reference Number	Claim Limitation
[6]	"The hand vacuum cleaner of claim 2 wherein a pistol grip axis extends through the pistol grip handle from a lower end of the pistol grip handle to an upper end of the pistol grip handle and the pistol grip axis intersects the suction motor."
[11]	"The hand vacuum cleaner of claim 10 wherein a pistol grip axis extends through the pistol grip handle from a lower end of the pistol grip handle to the upper end of the pistol grip handle and the pistol grip axis intersects the suction motor."

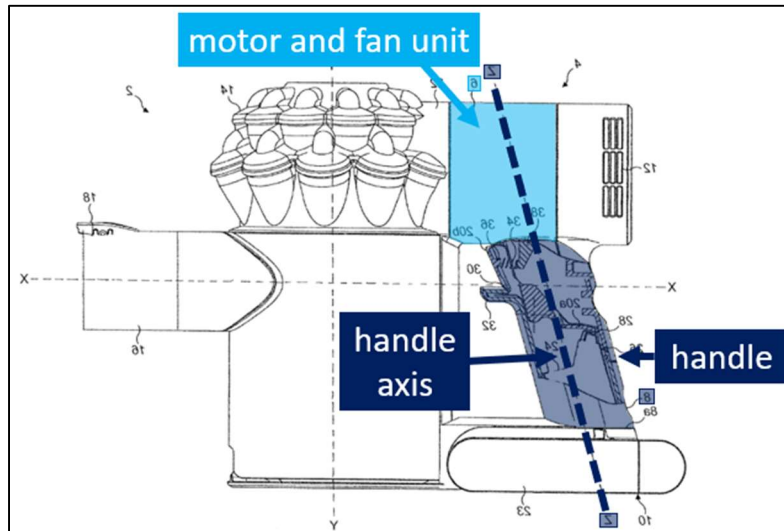
324. In my opinion, the combined teachings of IPVG, Nakai, and Sunderland render obvious the hand vacuum cleaner of claim 2 and Sunderland teaches a pistol grip axis extends through the pistol grip handle from a lower end

- of the pistol grip handle to an upper end of the pistol grip handle and the pistol grip axis intersects the suction motor.
325. In my opinion, the combined teachings of IPVG, Nakai, and Sunderland render obvious the hand vacuum cleaner of claim 10 and Sunderland teaches and renders obvious a pistol grip axis extends through the pistol grip handle from a lower end of the pistol grip handle to an upper end of the pistol grip handle and the pistol grip axis intersects the suction motor.
326. A POSA would have understood that Sunderland teaches a pistol grip axis extends through the pistol grip handle from a lower end of the pistol grip handle to an upper end of the pistol grip handle. Sunderland's "**handle 8** ... oriented in a pistol-grip formation" has "an **axis Z-Z**" that extends from "[t]he **lower end 8a** of the **handle 8**" to an/the **upper end**, as shown in the annotated image below:



Ex1017, 6:7-12, Fig. 2.

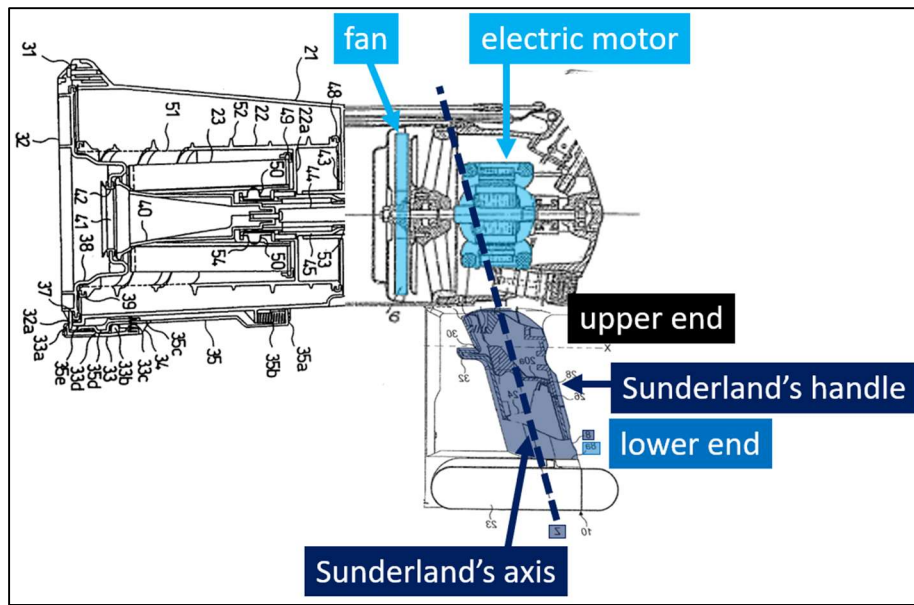
327. In my opinion, Sunderland further teaches the pistol grip axis intersects the suction motor. Sunderland's **"handle 8"** **"axis Z-Z"** intersects **"motor and fan unit 6,"** as shown in the annotated image below:



Ex1017, 5:17-18, 6:7-12, Fig. 2.

328. In my opinion, a POSA would have understood that Sunderland's "motor" and "fan" of "motor and fan unit 6," individually or together, are a suction motor.

329. In my opinion, a POSA would have been motivated to combine IPVG, Nakai, and Sunderland and would have reasonably expected success. Ground 3, §1. In my opinion, in the combined teachings, the **"handle 8"** **"axis Z-Z"** extends from a **"lower end 8a"** of **"handle 8"** to an/the **upper end** of **"handle 8,"** and the **"axis Z-Z"** intersects the **"fan 6 driven by an electric motor 7,"** as shown in the annotated image below:



Ex1007, Fig. 1(modified); Ex1008, Fig. 3(modified); Ex1017, Fig. 2(modified).

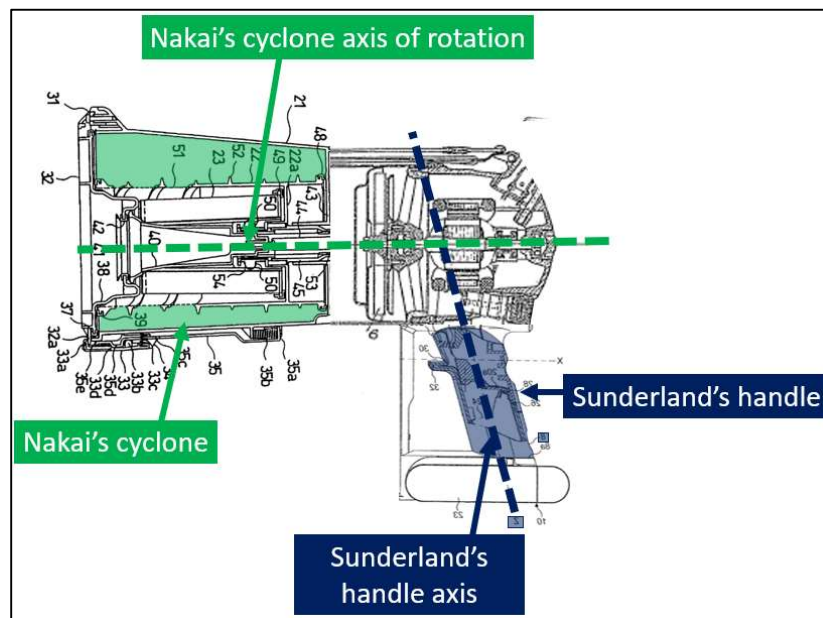
7. [7]/[12]

Reference Number	Claim Limitation
[7]	"The hand vacuum cleaner of claim 6 wherein the pistol grip axis and the cyclone axis of rotation intersect within the hand vacuum cleaner."
[12]	"The hand vacuum cleaner of claim 11 wherein the pistol grip axis and the cyclone axis of rotation intersect within the hand vacuum cleaner."

330. In my opinion, the combined teachings of IPVG, Nakai, and Sunderland render obvious the hand vacuum cleaner of claim 6 wherein the pistol grip axis and the cyclone axis of rotation intersect within the hand vacuum cleaner.
331. In my opinion, the combined teachings of IPVG, Nakai, and Sunderland render obvious the hand vacuum cleaner of claim 11 wherein the pistol

grip axis and the cyclone axis of rotation intersect within the hand vacuum cleaner.

332. In my opinion, IPVG in combination with Nakai and Sunderland renders obvious the pistol grip axis and the cyclone axis of rotation intersect within the hand vacuum cleaner. In my opinion, a POSA would have been motivated to combine IPVG, Nakai, and Sunderland and would have reasonably expected success. Ground 3, §1. In my opinion, in the combined teachings, the “**handle 8**” “**axis Z-Z**” and the **cyclone axis of rotation** intersect within the hand vacuum cleaner, as shown in the annotated image below:



Ex1007, Fig. 1(modified); Ex1008, Fig. 3(modified); Ex1017, Fig. 2(modified).

8. [16]

Reference Number	Claim Limitation
[16]	“The hand vacuum cleaner of claim 14 wherein the actuator is spaced towards the rear end of the cyclone.”

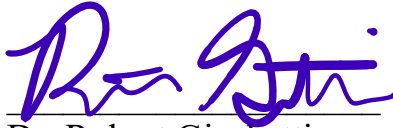
333. In my opinion, the combined teachings of IPVG, Nakai, and Sunderland render obvious the hand vacuum cleaner of claim 14 wherein the actuator is spaced towards the rear end of the cyclone.

334. In my opinion, IPVG in combination with Nakai and Sunderland renders this claim obvious for the same reasons discussed for Limitation [1d]. Ground 2, Limitation [1d].

XI. SECONDARY CONSIDERATIONS OF NON-OBVIOUSNESS

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

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

Signature: 
Dr. Robert Giachetti

Dated: 6/25/24