

Petition for *Inter Partes* Review of U.S. Patent No. 11,903,546

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.

Case No. IPR2024-01162

U.S. PATENT NO. 11,903,546

PETITION FOR *INTER PARTES* REVIEW

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LIST OF EXHIBITS

Exhibit No.	Description
1001	U.S. Patent No. 11,903,546 (“’546Patent”)
1002	Declaration of Robert Giachetti
1003	<i>Curriculum Vitae</i> of Robert Giachetti
1004	Excerpted File History of U.S. 11,903,546 (App. No. 17/830,529)
1005	PCT Publication No. 2007/084543 to Butler et al. (“Butler”)
1006	Certified English translation of Chinese Patent Publication No. 101,061,932 to Jianan (“Jianan”)
1007	U.K. Patent Publication No. GB283,179 to Inventia Patent-Verwertungs-Gesellschaft (“IPVG”)
1008	U.S. Patent Publication No. 2007/0209335 to Conrad (“Conrad335”)
1009	Swiss Patent No. CH203,675 to Peter (“PeterCH”)
1010	Certified English translation of Swiss Patent No. CH203,675 to Peter (“Peter”)
1011	Complainants’ Exhibit 27, Infringement Claim Chart regarding the ’546Patent, <i>In the Matter of Certain Surface Cleaning Devices and Components Thereof; Inv. No. 337-TA-1404</i>
1012	French Patent No. 1,094,603 to Martelliere (“MartelliereFR”)
1013	Certified English translation of French Patent No. 1,094,603 to Martelliere (“Martelliere”)
1014	International Publication No. WO 02/067753 to Vuijk (“Vuijk”)
1015	Canadian Patent No. 161,428 to Robinson (“Robinson”)
1016	U.S. Patent No. 1,908,834 to Engberg et al. (“Engberg”)
1017	U.S. Patent No. 2,099,172 to McCabe et al. (“McCabe”)

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Exhibit No.	Description
1018	Japanese Patent Publication No. JPH0580451U to Uchida et al. (“UchidaJP”)
1019	Certified English translation of Japanese Patent Publication No. JPH0580451U to Uchida et al. (“Uchida”)
1020	https://www.metmuseum.org/art/collection/search/24952
1021	Chinese Patent Publication No. 101,061,932 to Jianan (“JiananCN”)
1022	U.S. Patent No. 2,768,707 to Campbell (“Campbell”)
1023	U.S. Patent No. 5,078,761 to Dyson (“Dyson”)
1024	U.S. Patent Publication No. 2006/0090290 to Lau (“Lau”)
1025	European Patent Publication No. EP0307240 to Wade et al. (“Wade”)
1026	U.S. Patent No. 5,924,166 to Jones et al. (“Jones”)
1027	U.S. Patent Publication No. 2012/0079671 to Stickney et al. (“Stickney”)
1028	U.S. Patent No. 10,080,472 to Conrad (“Conrad472”)

LIST OF CHALLENGED CLAIMS

Reference Number	Claim Limitation
Claim 1	
[1pre]	A surface cleaning apparatus comprising:
[1a]	(a) a hand vacuum cleaner having a front end having a dirty air inlet, a rear end, a clean air outlet, an upper end, a lower end and a pistol grip handle, the hand vacuum cleaner comprising:
[1a.1]	(i) a main body comprising an upper end, a lower end, a front end and a rear end, the main body housing a suction motor and fan assembly, the suction motor and fan assembly having a suction motor axis of rotation;
[1a.2]	(ii) a cyclone unit comprising a cyclone chamber having a cyclone axis of rotation, a front end, an axially spaced apart rear end, a cyclone air inlet, and a cyclone air outlet provided at the rear end of the cyclone unit, wherein the cyclone axis of rotation intersects the pistol grip handle; and
[1a.3]	(iii) a dirt collection chamber that is exterior to the cyclone chamber and a forward end of the dirt collection chamber is openable;
[1b]	(b) a surface cleaning head having a front end, a rear end, a dirty air inlet and a surface cleaning head air outlet; and,
[1c]	(c) a rigid air flow conduit that is removably mountable to the surface cleaning head and, when attached to the hand vacuum cleaner and the surface cleaning head, extends between the surface cleaning head air outlet and the dirty air inlet of the hand vacuum cleaner,
[1d]	wherein the dirty air inlet of the hand vacuum cleaner is removably drivingly mounted to a downstream end of the rigid air flow conduit whereby when the hand vacuum cleaner is mounted to the downstream end of the rigid air flow conduit, the pistol grip handle is a driving handle for the surface cleaning apparatus, and
[1e]	wherein when the hand vacuum cleaner is positioned with the front end of the hand vacuum cleaner in front of the rear end of the hand vacuum cleaner, the cyclone axis of rotation is generally horizontal.
Claim 2	
[2]	The surface cleaning apparatus of claim 1 wherein the cyclone unit is removably mounted to the main body.
Claim 3	
[3]	The surface cleaning apparatus of claim 1 wherein the cyclone axis

Reference Number	Claim Limitation
	of rotation is generally parallel to the suction motor axis of rotation.
Claim 4	
[4]	The surface cleaning apparatus of claim 1 wherein, when the hand vacuum cleaner is positioned with the front end of the hand vacuum cleaner in front of the rear end of the hand vacuum cleaner, the pistol grip handle extends upwardly and forwardly.
Claim 5	
[5]	The surface cleaning apparatus of claim 1 wherein an enclosed finger grip area is provided on a forward side of the pistol grip handle.
Claim 6	
[6]	The surface cleaning apparatus of claim 1 wherein the cyclone axis of rotation intersects the finger grip area.
Claim 7	
[7]	The surface cleaning apparatus of claim 2 further comprising a pre-motor filter, wherein the pre-motor filter is accessible when the cyclone unit is removed from the main body.
Claim 8	
[8pre]	A surface cleaning apparatus comprising:
[8a]	(a) a hand vacuum cleaner having a front end having a dirty air inlet, a rear end, a clean air outlet, an upper end, a lower end and a pistol grip handle, the hand vacuum cleaner comprising:
[8a.1]	(i) a main body comprising an upper end, a lower end, a front end and a rear end, the main body housing a suction motor and fan assembly, the suction motor and fan assembly having a suction motor axis of rotation; and,
[8a.2]	(ii) a cyclone unit comprising a cyclone chamber having a cyclone axis of rotation, a front end, an axially spaced apart rear end, a cyclone air inlet, and a cyclone air outlet provided at the rear end of the cyclone unit, wherein the cyclone axis of rotation intersects the pistol grip handle;
[8b]	(b) a surface cleaning head having a front end, a rear end, a dirty air inlet and a surface cleaning head air outlet; and,
[8c]	(c) a rigid air flow conduit that is removably mountable to the surface cleaning head and, when attached to the hand vacuum cleaner and the surface cleaning head, extends between the surface cleaning head air outlet and the dirty air inlet of the hand vacuum

Reference Number	Claim Limitation
	cleaner,
[8d]	wherein the dirty air inlet of the hand vacuum cleaner is removably drivingly mounted to a downstream end of the rigid air flow conduit whereby when the hand vacuum cleaner is mounted to the downstream end of the rigid air flow conduit, the pistol grip handle is a driving handle for the surface cleaning apparatus, and
[8e]	wherein when the hand vacuum cleaner is positioned with the front end of the hand vacuum cleaner in front of the rear end of the hand vacuum cleaner, the cyclone axis of rotation is generally horizontal,
[8f]	wherein a pre-motor filter has a height in a direction transverse to the cyclone axis and the height is larger than a diameter of the cyclone.
Claim 9	
[9pre]	A surface cleaning apparatus comprising:
[9a]	(a) a hand vacuum cleaner having a front end having a dirty air inlet, a rear end, a clean air outlet, an upper end, a lower end and a pistol grip handle, the hand vacuum cleaner comprising:
[9a.1]	(i) a main body comprising an upper end, a lower end, a front end and a rear end, the main body housing a suction motor and fan assembly, the suction motor and fan assembly having a suction motor axis of rotation; and,
[9a.2]	(ii) a cyclone unit comprising a cyclone chamber and a dirt collection chamber that is exterior to the cyclone chamber, the cyclone chamber having a cyclone axis of rotation, a front end, an axially spaced apart rear end, a cyclone air inlet, and a cyclone air outlet provided at the rear end of the cyclone unit, wherein the cyclone axis of rotation intersects the pistol grip handle and a line that is parallel to the cyclone axis extends through the dirt collection chamber and a location interior of a radial outer perimeter of a pre-motor filter;
[9b]	(b) a surface cleaning head having a front end, a rear end, a dirty air inlet and a surface cleaning head air outlet; and,
[9c]	(c) a rigid air flow conduit that is removably mountable to the surface cleaning head and, when attached to the hand vacuum cleaner and the surface cleaning head, extends between the surface cleaning head air outlet and the dirty air inlet of the hand vacuum cleaner,
[9d]	wherein the dirty air inlet of the hand vacuum cleaner is removably

Reference Number	Claim Limitation
	drivingly mounted to a downstream end of the rigid air flow conduit whereby when the hand vacuum cleaner is mounted to the downstream end of the rigid air flow conduit, the pistol grip handle is a driving handle for the surface cleaning apparatus, and
[9e]	wherein when the hand vacuum cleaner is positioned with the front end of the hand vacuum cleaner in front of the rear end of the hand vacuum cleaner, the cyclone axis of rotation is generally horizontal.
Claim 10	
[10]	A surface cleaning apparatus comprising:
[10a]	(a) a hand vacuum cleaner comprising:
[10a.1]	(i) a main body comprising a lower end, an upper end, a front end, a rear end and a pistol grip handle, the main body housing a suction motor and fan assembly, the suction motor and fan assembly having a suction motor axis of rotation, the pistol grip handle is provided at the rear end of the main body and extends upwardly and forwardly when the hand vacuum cleaner is positioned with the front end forward of the rear end;
[10a.2]	(ii) a cyclone unit comprising a cyclone chamber having a cyclone axis of rotation, a front end and a rear end wherein air exits the cyclone chamber at the rear end of the cyclone chamber, wherein the suction motor axis of rotation is generally parallel to the cyclone axis of rotation; and
[10b]	(b) a dirt collection chamber that is exterior to the cyclone chamber and a forward end of the dirt collection chamber is openable;
[10c]	(c) a surface cleaning head having a front end, a rear end, a dirty air inlet and a cleaning head air outlet; and,
[10d]	(d) a rigid air flow conduit that is removably mountable to the surface cleaning head and, when attached to the hand vacuum cleaner and the surface cleaning head, extends between the cleaning head air outlet and a hand vacuum cleaner air inlet, the rigid air flow conduit having a longitudinally extending conduit axis,
[10e]	wherein the hand vacuum cleaner is removably mountable to a downstream end of the rigid air flow conduit and, when the hand vacuum cleaner is mounted to the downstream end of the rigid air flow conduit, the handle is a driving handle for the surface cleaning apparatus and the longitudinally extending conduit axis of the rigid air flow conduit is parallel to the cyclone axis of rotation, and

Reference Number	Claim Limitation
[10f]	wherein a finger grip area is provided at a location that is forward of the pistol grip handle and rearward of the cyclone.
Claim 11	
[11]	The surface cleaning apparatus of claim 10 further comprising a pre-motor filter, wherein the cyclone axis of rotation intersects the pre-motor filter.
Claim 12	
[12]	The surface cleaning apparatus of claim 10 wherein the cyclone unit is removably mounted to the main body.
Claim 13	
[13]	The surface cleaning apparatus of claim 10 further comprising a pre-motor filter, wherein the pre-motor filter is accessible when the cyclone unit is removed from the main body.
Claim 14	
[14pre]	A surface cleaning apparatus comprising:
[14a]	(a) a hand vacuum cleaner comprising:
[14a.1]	(i) a main body comprising a lower end, an upper end, a front end, a rear end and a pistol grip handle, the main body housing a suction motor and fan assembly, the suction motor and fan assembly having a suction motor axis of rotation, the pistol grip handle is provided at the rear end of the main body and extends upwardly and forwardly when the hand vacuum cleaner is positioned with the front end forward of the rear end; and,
[14a.2]	(ii) a cyclone unit comprising a cyclone chamber having a cyclone axis of rotation, a front end and a rear end wherein air exits the cyclone chamber at the rear end of the cyclone chamber, wherein the suction motor axis of rotation is generally parallel to the cyclone axis of rotation; and
[14b]	(b) a surface cleaning head having a front end, a rear end, a dirty air inlet and a cleaning head air outlet; and,
[14c]	(c) a rigid air flow conduit that is removably mountable to the surface cleaning head and, when attached to the hand vacuum cleaner and the surface cleaning head, extends between the cleaning head air outlet and a hand vacuum cleaner air inlet, the rigid air flow conduit having a longitudinally extending conduit axis,
[14d]	wherein the hand vacuum cleaner is removably mountable to a downstream end of the rigid air flow conduit and, when the hand

Reference Number	Claim Limitation
	vacuum cleaner is mounted to the downstream end of the rigid air flow conduit, the handle is a driving handle for the surface cleaning apparatus and the longitudinally extending conduit axis of the rigid air flow conduit is parallel to the cyclone axis of rotation, and
[14e]	wherein a finger grip area is provided at a location that is forward of the pistol grip handle and rearward of the cyclone, and
[14f]	wherein a pre-motor filter has a height in a direction transverse to the cyclone axis and the height is larger than a diameter of the cyclone.
[15pre]	A surface cleaning apparatus comprising:
[15a]	(a) a hand vacuum cleaner comprising:
[15a.1]	(i) a main body comprising a lower end, an upper end, a front end, a rear end and a pistol grip handle, the main body housing a suction motor and fan assembly, the suction motor and fan assembly having a suction motor axis of rotation, the pistol grip handle is provided at the rear end of the main body and extends upwardly and forwardly when the hand vacuum cleaner is positioned with the front end forward of the rear end; and,
[15a.2]	(ii) a cyclone unit comprising a cyclone chamber and a dirt collection chamber that is exterior to the cyclone chamber, the cyclone chamber having a cyclone axis of rotation, a front end and a rear end wherein air exits the cyclone chamber at the rear end of the cyclone chamber, wherein the suction motor axis of rotation is generally parallel to the cyclone axis of rotation and a line that is parallel to the cyclone axis extends through the dirt collection chamber and a location interior of a radial outer perimeter of a pre-motor filter,
[15b]	(b) a surface cleaning head having a front end, a rear end, a dirty air inlet and a cleaning head air outlet; and,
[15c]	(c) a rigid air flow conduit that is removably mountable to the surface cleaning head and, when attached to the hand vacuum cleaner and the surface cleaning head, extends between the cleaning head air outlet and a hand vacuum cleaner air inlet, the rigid air flow conduit having a longitudinally extending conduit axis,
[15d]	wherein the hand vacuum cleaner is removably mountable to a downstream end of the rigid air flow conduit and, when the hand vacuum cleaner is mounted to the downstream end of the rigid air flow conduit, the handle is a driving handle for the surface cleaning

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	apparatus and the longitudinally extending conduit axis of the rigid air flow conduit is parallel to the cyclone axis of rotation, and
[15e]	wherein a finger grip area is provided at a location that is forward of the pistol grip handle and rearward of the cyclone.

I. INTRODUCTION

The '546Patent “relates to the field of surface cleaning apparatus[es],” and, specifically, to a hand/stick vacuum cleaner configuration. Ex1001, 1:23-24.

The '546Patent identifies “limited dirt collection capacity” as an alleged problem with existing handvacs and purports to solve this with “an external dirt collection chamber.” *Id.* at 1:39-56. Using an external dirt-collection chamber, “dirt separated in the air treatment chamber travels to the dirt collection chamber via a dirt outlet of the air treatment chamber.” *Id.* Most claims require “a dirt collection chamber that is exterior to the cyclone chamber,” in combination with configurations of handles, cyclonic separators, surface cleaning heads, and other vacuum structures whose arrangement does not purport to solve any technical problem or provide any benefit.

Both an “exterior” dirt-collection chamber and these configurations were well-known in the art, which renders obvious each and every claim.

II. STANDING (§42.104(A))

Petitioners certify that the '546Patent is available for IPR, and that Petitioners are not barred or estopped from requesting IPR to challenge the claims on the grounds herein.

III. RELIEF REQUESTED (§42.104(B))

Petitioners respectfully request review and cancellation under §311 of claims 1-15 as follows¹:

Prior Art	Basis
PCT Pub. 2007/084543 (“Butler”); published 07/26/2007	AIA 102(a)(1) and 102(a)(2)
Chinese Pub. 101,061,932 (“Jianan”); published 10/31/2007	
U.K. Pat. Pub. GB283,179 (“IPVG”); published 08/09/1928	
U.S. Pat. Pub. 2007/0209335 (“Conrad335”); published 09/13/2007	

Grounds	Claims	Basis
1	1-15	§103; Butler and Jianan
2	1-15	§103; IPVG and Conrad335

IV. OVERVIEW OF THE ’546PATENT

The ’546Patent issued from Application No. 17/830,529, filed 06/02/2022, and claims priority through several applications to Provisional Application No. 62/093,189, filed 12/17/2014. Ex1001, Cover.

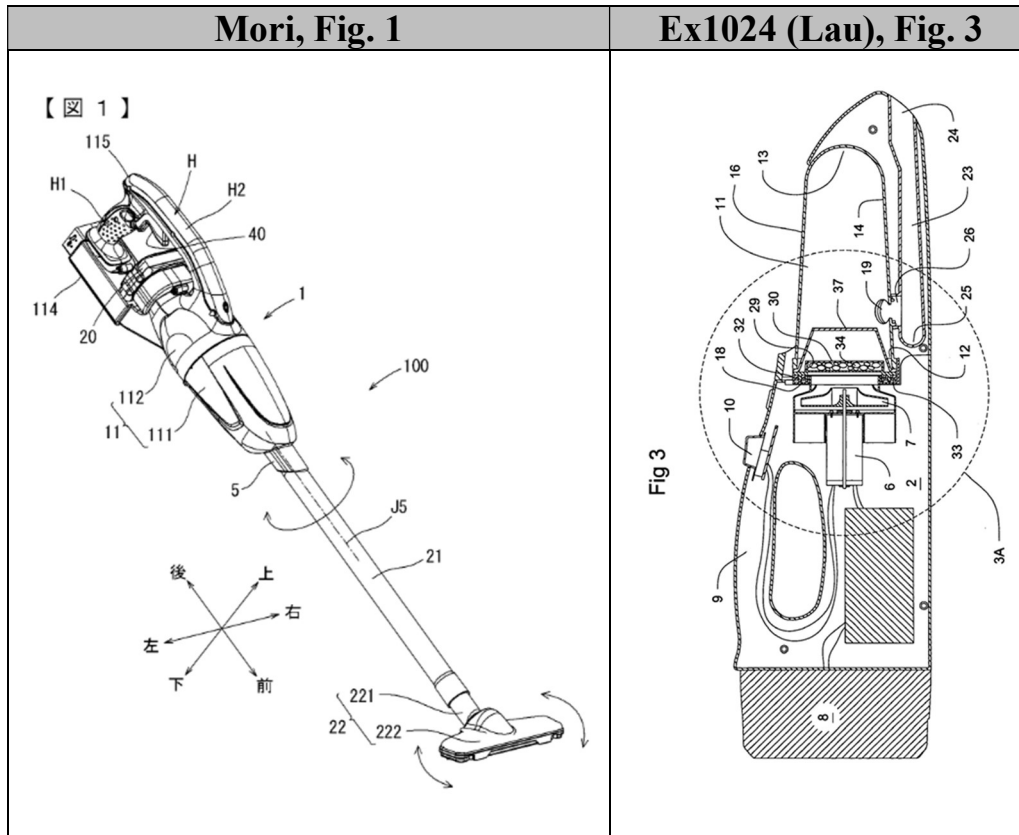
¹ Petitioners do not concede that any claims satisfy other requirements for patentability that cannot be raised in IPR, including §§101 and 112.

A. The Specification

The '546Patent's 174-page, 56-column, 137-figure specification identifies "limited dirt collection capacity" as a problem with existing handvacs, which it purports to solve with an "external dirt collection chamber wherein dirt separated in the air treatment chamber travels to the dirt collection chamber via a dirt outlet of the air treatment chamber." *Id.* at 1:39-56. The '546Patent further states that "[a] sidewall of the air treatment chamber separates the air treatment chamber and the dirt collection chamber." *Id.* at 1:56-58. The '546Patent further states that the vacuum cleaner may have a "drive handle," an "air treatment chamber (such as a cyclone chamber)," "a surface cleaning head," and a "wand," the configuration of which does not purport to solve any technical problem or provide any benefit.

B. The Prosecution History

The Examiner rejected certain then-pending claims as obvious over Publication JP2014083241 ("Mori") in combination with Publication US2006/0090290 ("Lau"):



Ex1004, 442-47.

The Examiner stated that Mori “disclose[s] a filtration filter 14, not a cyclone unit comprising a cyclone chamber,” but “Lau disclose[s] a cyclone unit 11 comprising a cyclone chamber” and that “it would have been obvious to one skilled in the art at the time of the invention to substitute the cyclone unit in Lau for the separation assembly in the hand vacuum cleaner in Mori et al. since the cyclone unit in Lau is used for the same purpose of separating dust particles from air as the separation assembly in Lau.” *Id.*, 445-46.

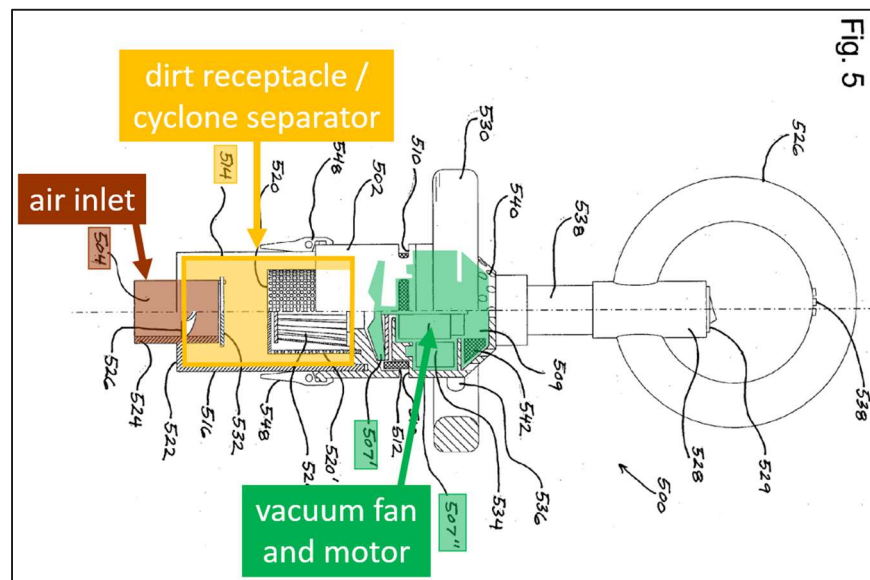
The Applicant did not dispute this. *Id.*, 473-86. Instead, the Applicant amended then-pending independent claims 1 and 11 to include the limitations of

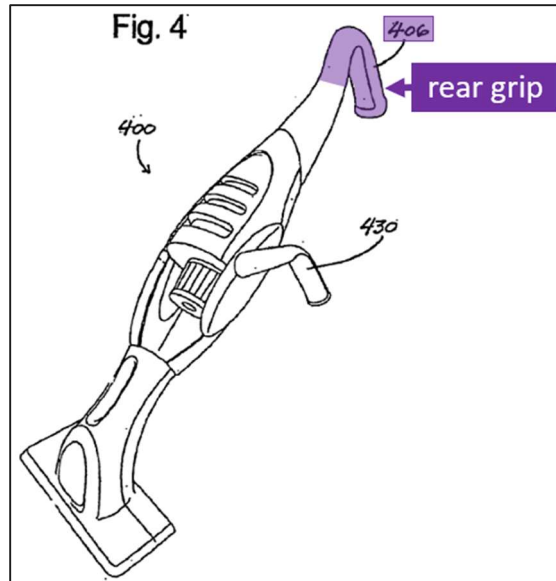
A. Butler

5

Butler is a single vacuum cleaner system that is reconfigurable and optimizable. Butler's various components, including handles, grips, dirt receptacles, air filters, and cleaning tools, "may be interchangeable with one another to provide the user with various cleaning options," and the arrangement of these components may be "used individually or in various other inventive combinations." Ex1005, 16:25-29, 43:29-44:3; *see also id.*, 4:17-28, 18:22-28, 19:9-15, 34:12-13.

Butler's cleaner comprises a "housing" with a "longitudinal axis," an "**air inlet**," a "**dirt receptacle** compris[ing] a **cyclone separator**," a "**vacuum fan and a motor**," and a "**pistol-grip style rear grip**":

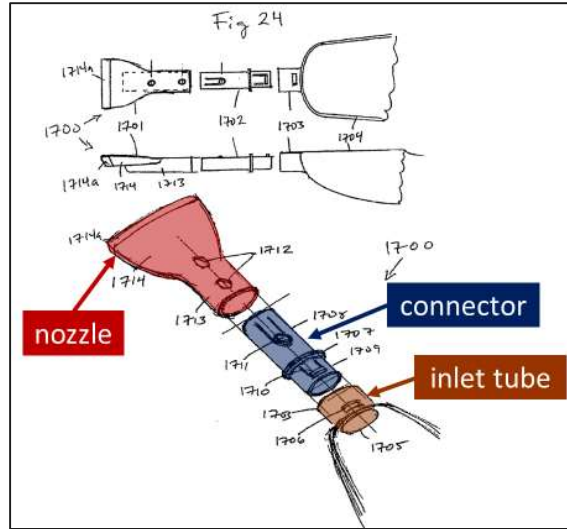




Ex1005, Abstract, 3:20-28, 19:22-24, 22:14-22, Figs. 4-5²; Ex1002 ¶¶64-66.

Butler also teaches a “**connector 1702**,” comprising an upstream “inlet portion 1708,” which is “telescopically received within the **nozzle 1701**,” and a downstream “outlet portion 1709,” which is “telescopically received within or around the **inlet tube 1703**”:

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

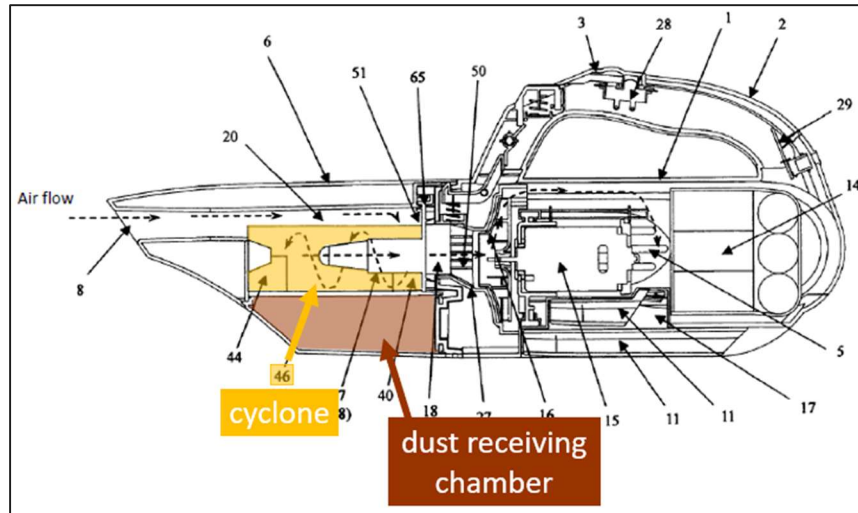


Ex1005, 41:19-29, Fig. 24; Ex1002 ¶¶67.

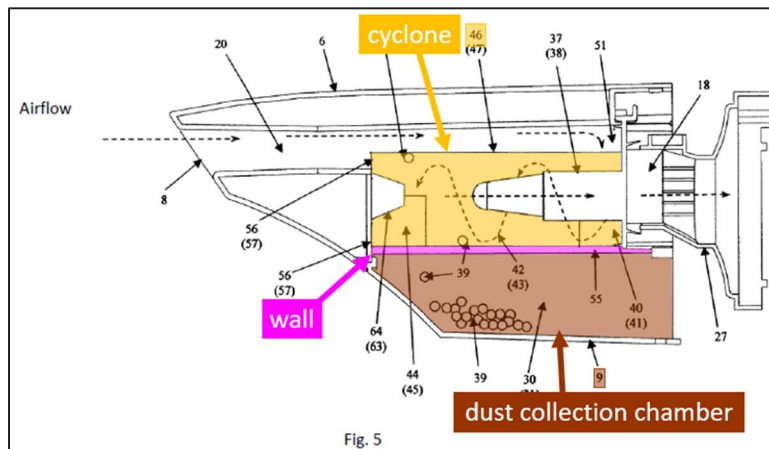
B. Jianan³

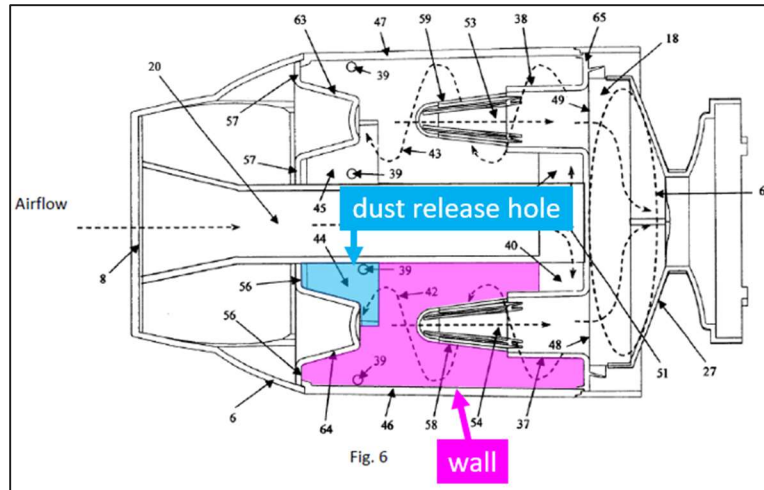
Jianan is a 2007 Chinese publication for a “handheld vacuum” with a “detachable **dust cup**” comprising “two parallel **cyclones** and separate **dust receiving chambers**”:

³ Citations are by page, as the English translation does not include column/line numbers.



Ex1006, Abstract, 4, Fig. 3; Ex1002 ¶68. Jianan teaches a “**wall 55**” with a “**dust release hole**” that separates “**cyclone 46**” and the “independent **dust collection chamber 9**”:

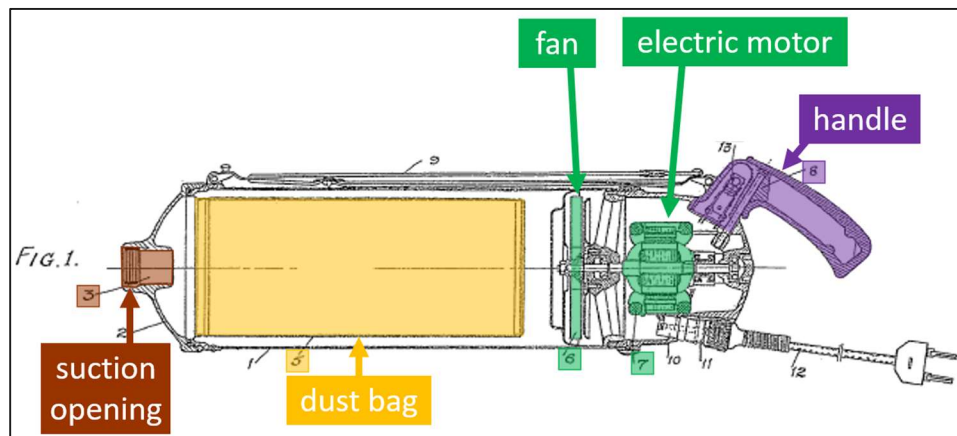




Ex1006, 9-10, Figs. 5-6; Ex1002 ¶69.

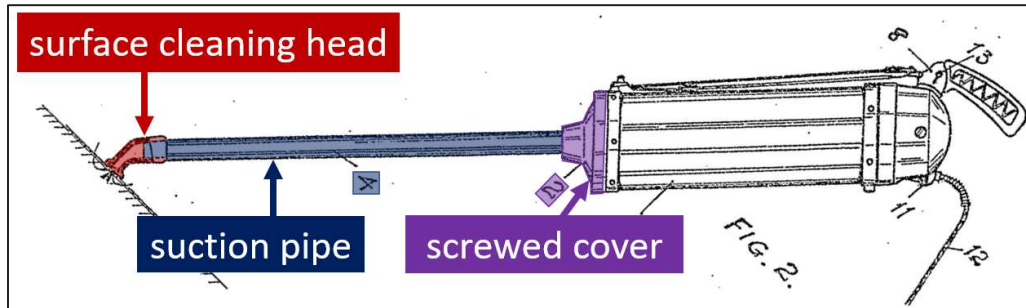
C. IPVG

IPVG is a 1928 U.K. publication for a “portable dust suction apparatus” with “a **suction opening 3**,” “a **dust bag [5] or like member**,” “**handle [8]**,” and “a **fan 6** driven by an **electric motor 7**”:



Ex1007, 1:10-12, 1:22-33, 1:51-62, 2:10-11, Fig. 1; Ex1002 ¶70.

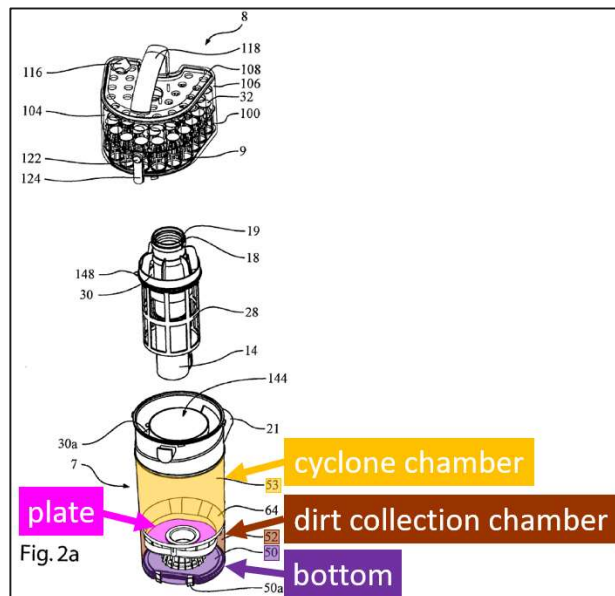
IPVG teaches a “**suction pipe 4**” that screws into “**screwed cover 2**” and also teaches a **surface cleaning head**:



Ex1007, 1:51-57, Fig. 2; Ex1002 ¶71.

D. Conrad335

Conrad335 is a 2007 U.S. publication for a vacuum with “a cyclone separator having ... a **cyclone chamber** and a **dirt collection chamber**” divided by a “**plate 32**,” and “a **bottom** that is openable”:



Ex1008, Abstract, ¶23, Fig. 2a; Ex1002 ¶72. Conrad335’s “cyclonic embodiments ... may be used ... to create a ... hand vacuum.” Ex1008 ¶375-376.

VI. LEVEL OF ORDINARY SKILL IN THE ART

A POSA would have had a bachelor's degree in mechanical engineering or a similar field and 2-3 years of experience in fluid dynamics and/or machine design for devices related to fluid dynamics, 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.

VII. CLAIM CONSTRUCTION

Petitioners are unaware of any “prior claim construction determination” related to the '546Patent. 37 C.F.R. §42.100(b). “[C]laim terms need only be construed to the extent necessary to resolve the controversy.” *Wellman, Inc. v. Eastman Chem. Co.*, 642 F.3d 1355, 1361 (Fed. Cir. 2011) (internal citation omitted). Petitioners do not believe any claim construction is necessary to resolve the parties' controversy in this Petition, and the claims should be given their plain and ordinary meaning for purposes of this IPR.⁴

⁴ Petitioners reserve all rights to raise claim construction arguments and other arguments in litigation.

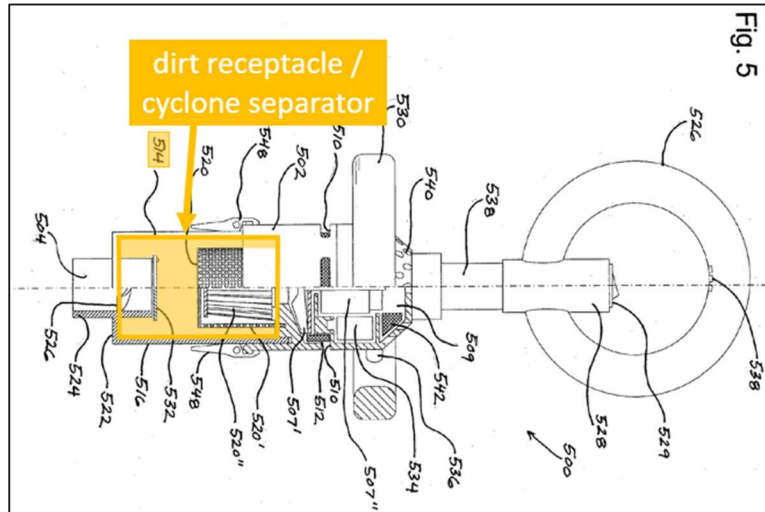
VIII. THE CHALLENGED CLAIMS ARE UNPATENTABLE

A. Ground 1: Butler in Combination with Jianan Renders Obvious Claims 1-15

1. A POSA Would Have Combined Butler and Jianan

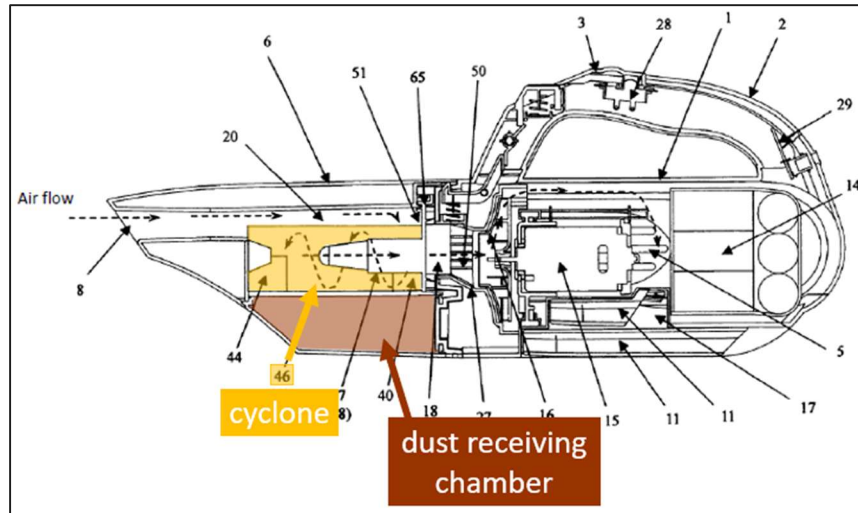
a. Scope and Content of the Prior Art

Butler teaches “an improved vacuum cleaner for cleaning raised and vertical surfaces,” including stairs. Ex1005, 3:10-12. Butler’s vacuum uses a “**dirt receptacle** compris[ing] a **cyclone separator**” to separate dirt from air:

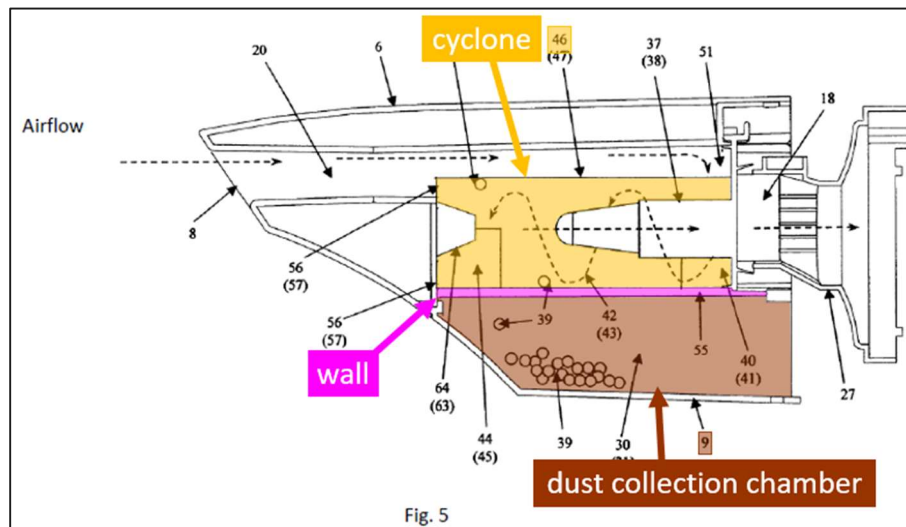


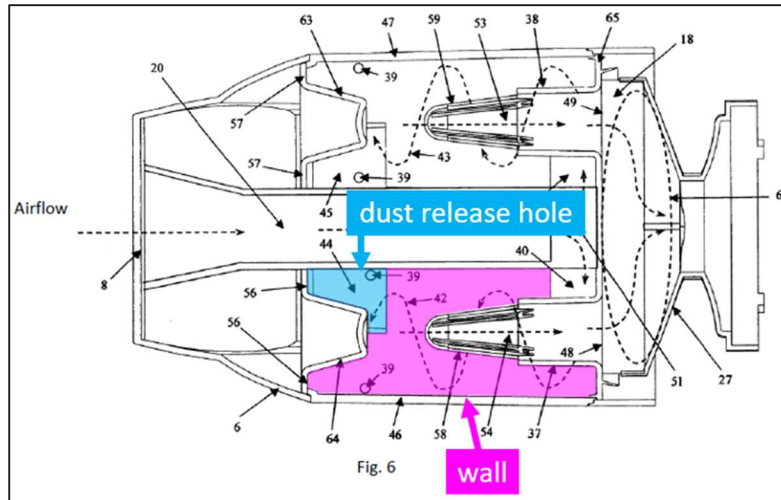
Ex1005, claim 11, Fig. 5; Ex1002 ¶79.

Jianan teaches a “handheld vacuum” with a “detachable dust cup” comprising “two parallel **cyclones** and separate **dust receiving chambers**”:



Ex1006, Abstract, 4, Fig. 3; Ex1002 ¶80. In Jianan, a “**wall 55**” separates “**cyclone 46**” and the “independent **dust collection chamber 9**”:

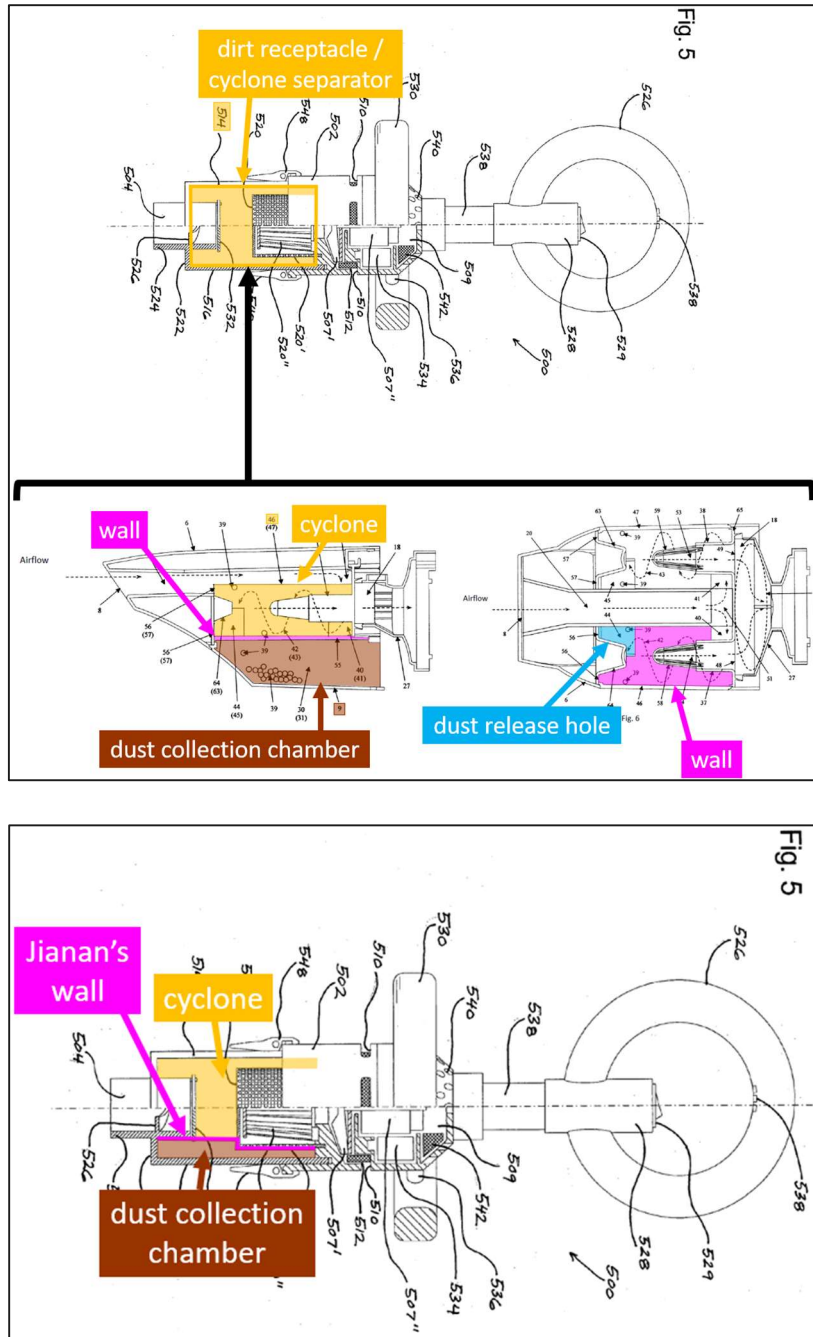




Ex1006, 9-10, Figs. 5-6; Ex1002 ¶¶81-82. “[T]he **dust collection chamber 9** is connected to the cyclone body via the **dust release hole**.” Ex1006, 9.

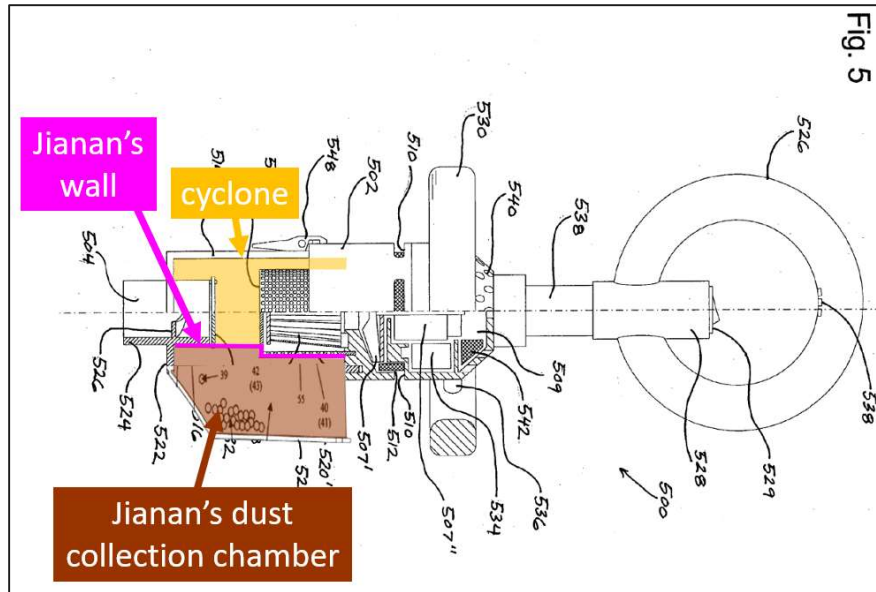
b. Motivation to Combine

A POSA reading Butler would have been motivated to modify Butler to achieve the benefits of Jianan’s cyclonic-separation system having an independent dust-collection chamber in multiple ways. Ex1002 ¶¶83-97. For example, a POSA would have been motivated to modify Butler’s “**dirt receptacle** compris[ing] a **cyclone separator**” to have an “independent **dust collection chamber**,” oriented and functioning in the same way that Jianan teaches—by separating the “**cyclone**” chamber from the “independent **dust collection chamber**” using a horizontal “**wall**” with a “**dust release hole**”:



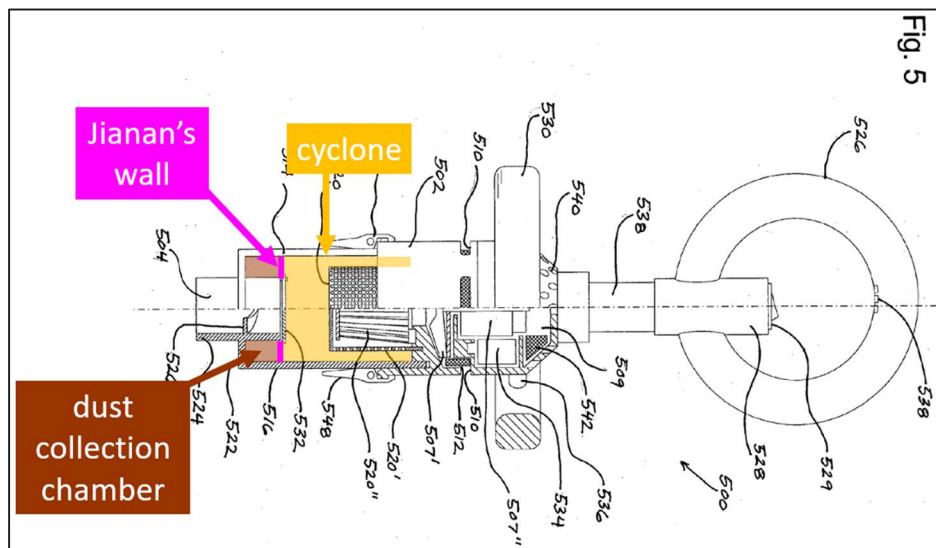
Ex1005, Fig. 5(modified); Ex1006, Figs. 5-6; Ex1002 ¶83.

A POSA also would have been motivated to modify Butler's “**dirt receptacle** compris[ing] a **cyclone separator**” to include an extended “independent **dust collection chamber**” and a horizontal “**wall**” as Jianan teaches:



Ex1005, Fig. 5(modified); Ex1006, Fig. 5(modified); Ex1002 ¶84.

A POSA would have also been motivated to modify Butler’s “**dirt receptacle** compris[ing] a **cyclone separator**” to have an “independent **dust collection chamber**” separated from the cyclone chamber by a vertically oriented “**wall**”:

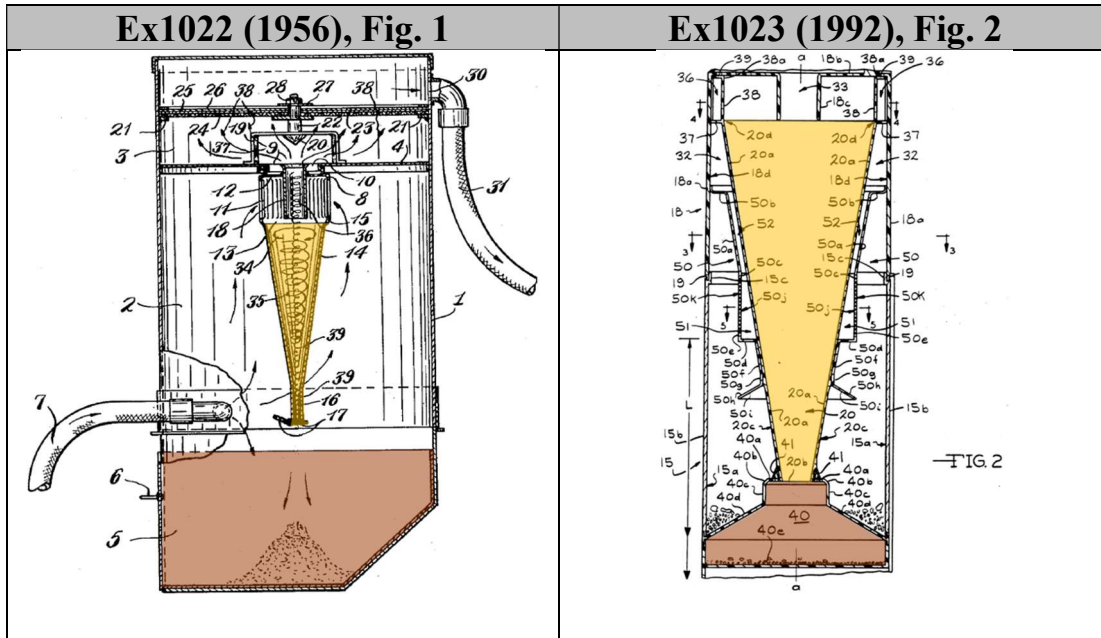


Ex1005, Fig. 5(modified); Ex1002 ¶85.

A POSA would have been motivated to combine Butler and Jianan as described. Ex1002 ¶¶86-97. **First**, Butler and Jianan are analogous art. Ex1002 ¶87. Like Butler, which teaches a hand vacuum cleaner with a removable cyclone unit (“dirt receptacle compris[ing] a cyclone separator” is “remov[ed]” by unclamping “[a] set of over-center clamps 548”) and an openable door (“dirt receptacle 214 may be covered by an access panel or door” to “facilitate the chamber’s emptying”), Ex1005, 18:26-30, 21:8-23, claim 11, Jianan teaches a “handheld vacuum cleaner” with a removable cyclone unit (“detachable dust cup part” “includes” “two parallel cyclones and separate dust receiving chambers”) and an openable door (“dust collection chamber has ... an opening and closing device such as a door or the like”), Ex1006, Abstract, 4, claim 3; Ex1002 ¶87.

Second, Butler and Jianan each provide motivations for this combination. Ex1002 ¶¶88-91. While Butler discloses several cyclonic embodiments, Ex1005, 18:3-14, 22:14-25, 36:2-4, Butler explains that its vacuum “may alternatively comprise[] any known type of dirt separation and retention system,” and that such “variations will be apparent to those of ordinary skill in the art in view of the present disclosure and with routine experimentation with the invention.” *Id.*, 8:26-27, 19:1-3. A POSA would have therefore looked for “known type[s] of dirt separation and retention system[s]” to supplement Butler’s teachings, including a

cyclone unit with a **cyclone chamber** and an **independent dirt collection chamber**, as Jianan teaches, and as existed for 50+ years before the '546Patent:

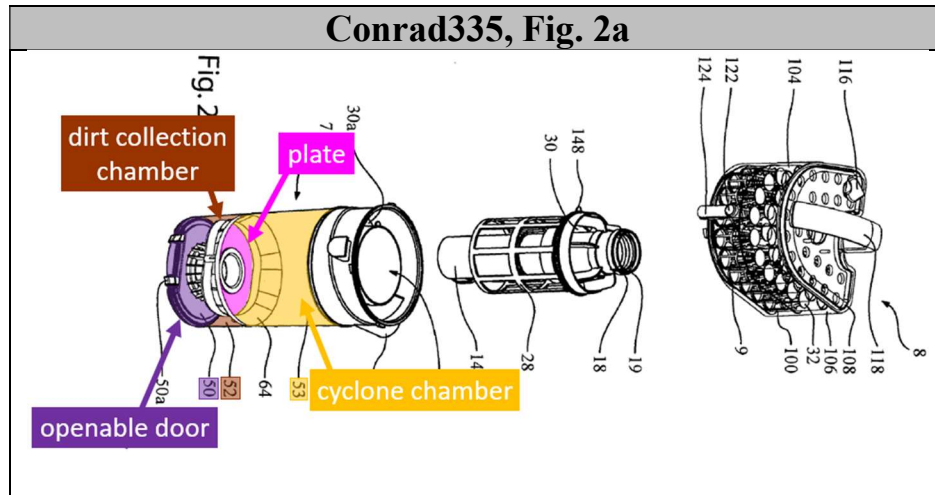


Ex1002 ¶90.

A POSA would have understood that cyclone units with this exterior dirt-collection chamber had certain benefits, including: (1) improved separation, because large dust particles no longer interfere with the cyclonic airflow, (2) improved suction, because less dust accumulates in the filter, and (3) reduced recurring pre-filter cleaning and replacement, because less debris reaches the pre-motor filter. Ex1002 ¶91. Jianan itself teaches two benefits to this design: (1) because “the cyclone system is designed to collect dust 39 in an independent dust collection chamber 9,” “most of the dust ... separated through the cyclone” will remain in the “dust collection chamber,” and “users will not have to clean the filter

as often,” and (2) because “only a small amount of dust (mainly very fine dust) will ... enter the filter,” “users ... will experience constant suction power” and “improvement[s]” in “the efficiency of the cyclone.” Ex1006, 5, 10.

Third, a POSA would have understood these benefits could be achieved by implementing Jianan’s independent dust-collection chamber teachings in various ways, as shown above. Ex1002 ¶¶92-95. Each configuration provides additional benefits for different uses that would have further motivated a POSA to modify Butler. Ex1002 ¶¶92-93. A POSA would have understood that implementing a horizontal “wall” is beneficial for cleaning vertical surfaces, and a vertical “wall” is beneficial for cleaning horizontal surfaces (both Butler’s stated objectives, Ex1005, 7:2-5), because, when so oriented during those use-cases, gravity causes the dust to collect in the correspondingly-oriented independent dust-collection chamber. Ex1002 ¶92. Implementing a vertical “wall” would also make it easier and more hygienic to empty the dust-collection chamber, because it would be provided adjacent to Butler’s openable front door. Ex1005, 18:26-30, 21:8-23; Ex1002 ¶93. And, vacuum cleaners with this configuration were well-known in the art, which would further motivate a POSA and provide a reasonable expectation of success, including as shown in Conrad335:



Further, a POSA would have understood that implementing a horizontal “wall” and an enlarged dust-collection chamber enables longer periods of operation because the vacuum can hold more dust. Ex1002 ¶¶94-95.

Fourth, this combination would have involved a simple substitution of known elements to obtain predictable results. Ex1002 ¶96. Butler teaches a cyclone unit with an integrated dirt-collection chamber/cyclone chamber. Ex1005, Fig. 5. Jianan teaches a cyclone unit with a cyclone chamber separated from a dirt-collection chamber by a wall. Ex1006, Figs. 5-6. A POSA would have understood the simple substitution of an integrated dirt-collection chamber for a separated one would achieve the predictable result of more efficient cyclonic air filtration and reduced pre-filter maintenance. Ex1002 ¶96. Further, as depicted above, Butler and Jianan are directed to hand vacuums having a similar orientation of cyclone unit relative to the overall vacuum configuration, which would have further motivated a POSA to make the combination.

Fifth, it would have been at least obvious to try this combination. Ex1002 ¶97. A POSA would have understood there are a finite number of identified cyclonic separation solutions, including cyclone units with separate cyclone and dirt-collection chambers (as Jianan teaches), and it would have been obvious to try to achieve the known benefits described above. Ex1002 ¶97.

c. Reasonable Expectation of Success

A POSA would have had a reasonable expectation of success implementing Jianan’s “independent dust collection chamber” teachings into Butler’s “dirt receptacle compris[ing] a cyclone separator” for the reasons stated above. Ex1006, 10; Ex1005, claim 11; Ex1002 ¶98. Further, as explained above, Butler and Jianan are very similar, including because they are both hand vacuums having similar orientations and removable cyclonic separating units with openable doors for emptying, which would have further given a POSA a reasonable expectation of success. Ex1005, 18:26-30, 21:8-15, claim 11, Fig. 5; Ex1006, Abstract, 4, claim 3, Figs. 3, 5-6; Ex1002 ¶98.

2. [1]/[8]/[9]/[10]/[14]/[15]

a. [1pre]/[8pre]/[9pre]/[10pre]/[14pre]/[15pre]⁵

To the extent the preambles are limiting, Butler teaches them. Ex1002 ¶¶99-100. Butler teaches a “vacuum cleaner” for cleaning surfaces, including “floors

⁵ See LIST OF CHALLENGED CLAIMS.

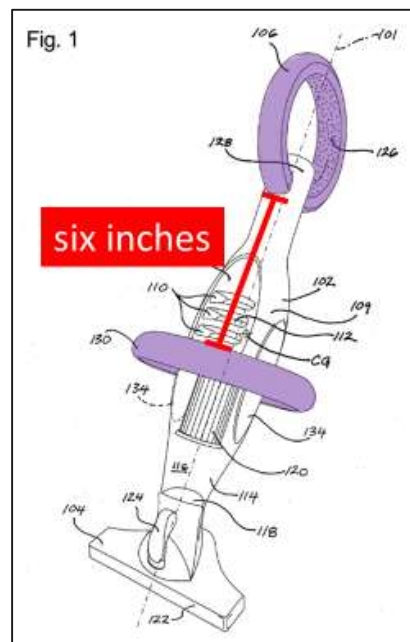
and carpets,” “horizontal surfaces,” and “vertical surfaces.” Ex1005, Title, 7:2-5.

This is a surface cleaning apparatus. Ex1002 ¶100.

b. [1a]/[8a]/[9a]/[10a]/[14a]/[15a]

Butler teaches these limitations. Ex1002 ¶¶101-111.

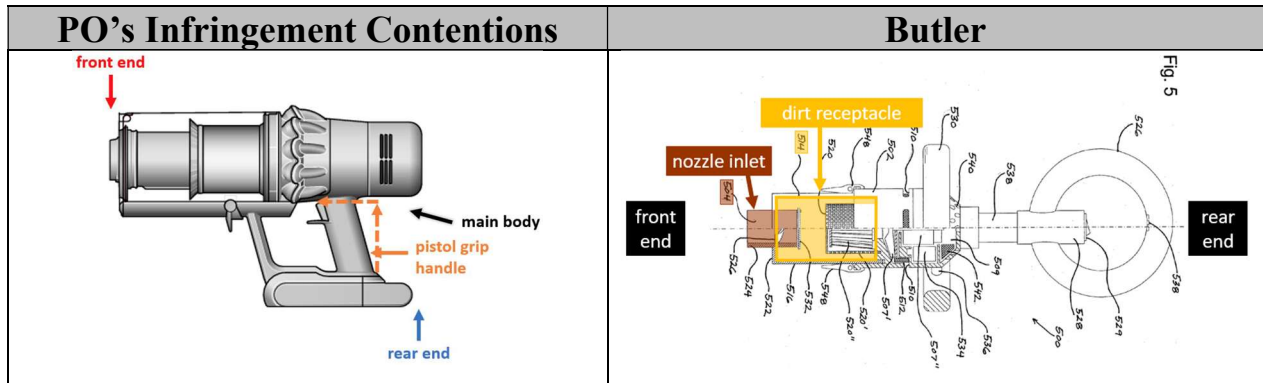
Butler’s “vacuum cleaner” is designed to be used by hand and is a hand vacuum cleaner. Ex1005, Title, Fig. 1; Ex1002 ¶¶102-104. Butler’s cleaner includes a “**rear grip**” and “one or more **foregrips**,” and Butler teaches a range of “compact” sizes, including a distance between the foregrip and the rear grip of **six inches**, and an overall vacuum length of eighteen inches:



Ex1005, 15:5-6, 26:1-10, Fig. 1; Ex1002 ¶¶102-103.

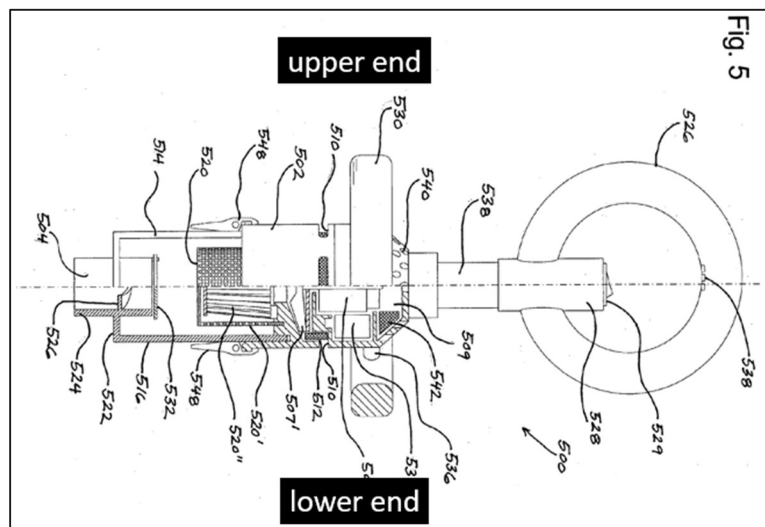
Butler’s “compact” and “maneuver[able]” design is “adapted for cleaning ... stairwells and other confined spaces,” and Butler teaches telescoping handgrip

shown above because “**nozzle inlet 504**” is at the end opposite Butler’s “rear grip 506.” Ex1005, 13:31-14:3, 20:5-6, 22:5, 29:1-5; Ex1002 ¶106. Further, this is at least as much disclosure of these limitations in Butler as PO accuses of infringement:



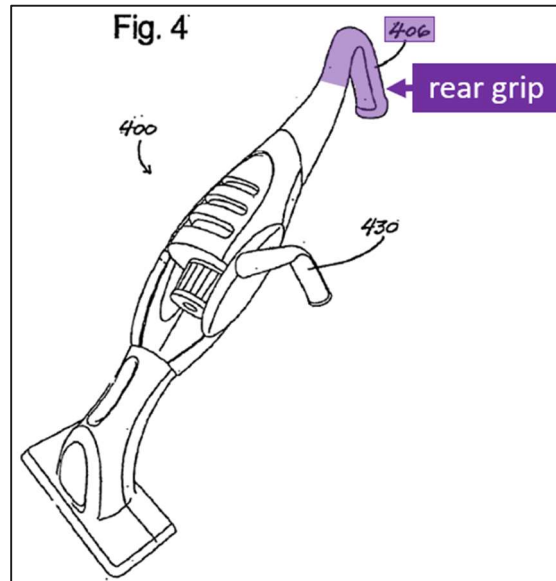
Ex1011, 5(PO’s annotations); Ex1005, Fig. 5; Ex1002 ¶107.

A POSA would have similarly understood that Butler’s hand vacuum has an **upper end** and a **lower end**:



Ex1005, Fig. 5; Ex1002 ¶108.

Butler teaches a pistol-grip handle. Ex1002 ¶¶109-111. Butler’s hand vacuum cleaner “includes a pistol-grip style **rear grip 406**”:

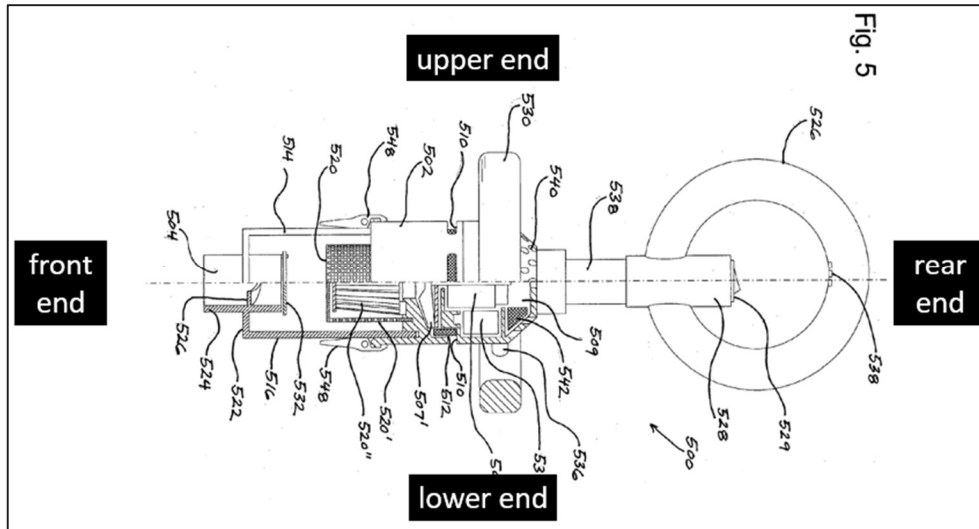


Ex1005, 19:22-24, Fig. 4; Ex1002 ¶109. Butler’s “pistol-grip style rear grip 406” is a pistol-grip handle. Ex1002 ¶110. Further, Butler’s rear grips are interchangeable: “the loop-shaped grips may be replaced by any combination of rear grip and foregrip that provide the user with hand positions to ergonomically maneuver the device,” and “one exemplary variation of the grip construction” is “pistol-grip style rear grip 406.” Ex1005, 19:9-12, 19:18-24.

c. [1a.1]/[8a.1]/[9a.1]/[10a.1]/[14a.1]/[15a.1]

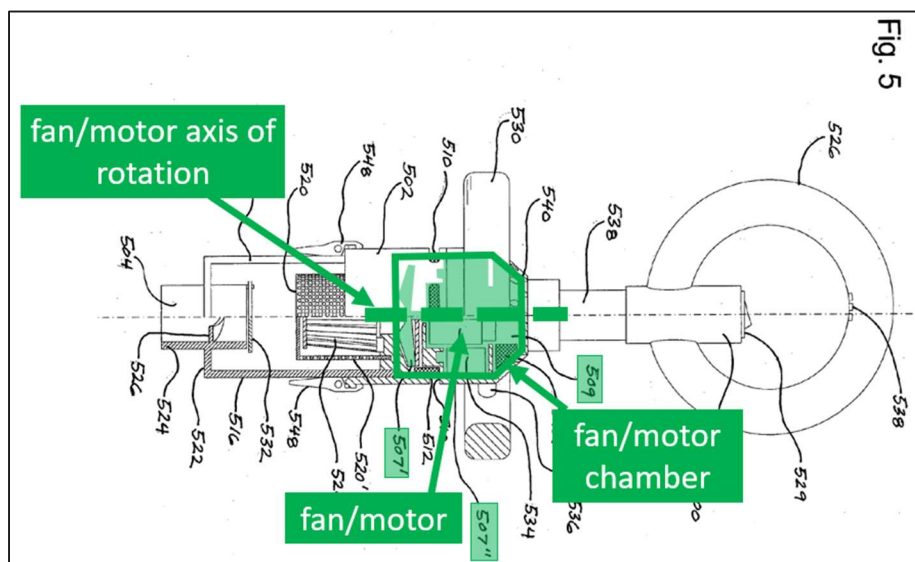
Butler teaches these limitations. Ex1002 ¶¶112-18.

Butler’s hand vacuum cleaner has a main body comprising an **upper end**, a **lower end**, a **front end**, and a **rear end**:



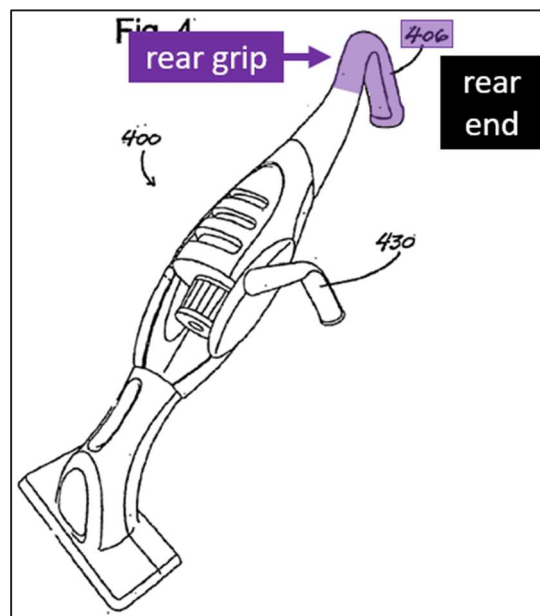
Ex1005, Fig. 5; Ex1002 ¶114; Ground 1, [1a]/[8a]/[9a]/[10a]/[14a]/[15a].

Butler’s hand vacuum main body houses a suction motor and fan assembly having a suction motor axis of rotation. Ex1002 ¶¶115-16. Butler’s vacuum body has a “**fan/motor chamber 509** in which the **fan/motor 507** is located,” and has a **fan/motor axis of rotation**:



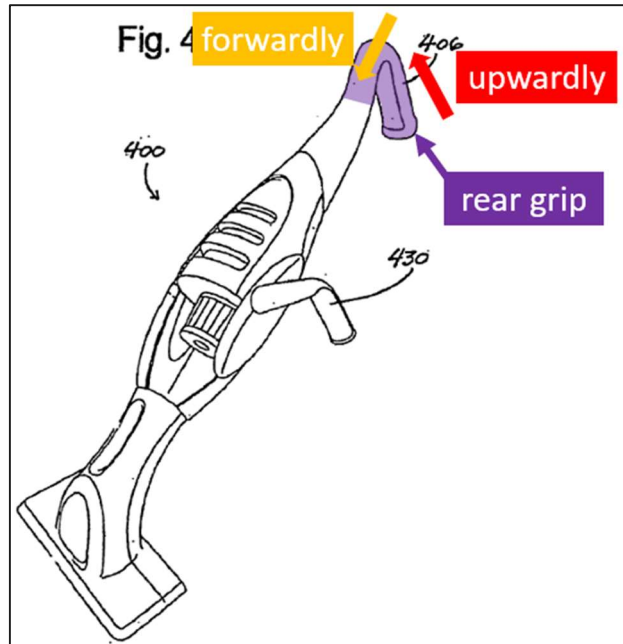
Ex1005, 20:12-14, Fig. 5; Ex1002 ¶115. Butler’s “fan/motor 507” is a suction motor with a suction motor axis of rotation. Ex1002 ¶116.

Regarding [10a.1]/[14a.1]/[15a.1], Butler teaches a pistol-grip handle. Ground 1, [1a]/[8a]/[9a]/[10a]/[14a]/[15a]. Butler’s pistol-grip handle is provided at the rear end of the main body. Ex1002 ¶117. Butler’s “pistol-grip style **rear grip 406**” is at Butler’s main body’s **rear end**:



Ex1005, 19:22-24, Fig. 4; Ex1002 ¶117.

Butler further teaches the pistol-grip handle extends upwardly and forwardly when the hand vacuum cleaner is positioned with the front end forward of the rear end. Ex1002 ¶118. When Butler’s hand vacuum cleaner front end is forward of the rear end, the “pistol-grip style **rear grip 406**” extends **upwardly** and **forwardly**:

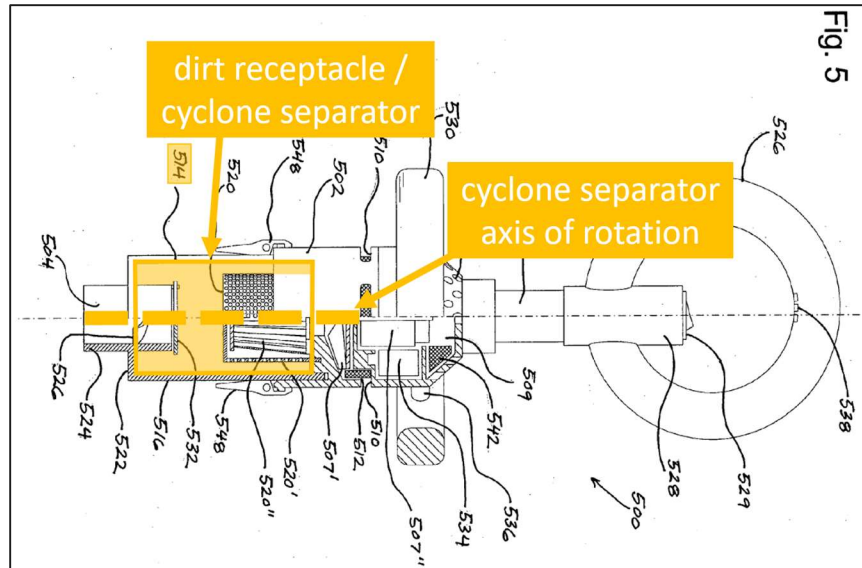


Ex1005, 19:23-24, Fig. 4; Ex1002 ¶118.

d. [1a.2]/[8a.2]/[10a.2]/[14a.2]

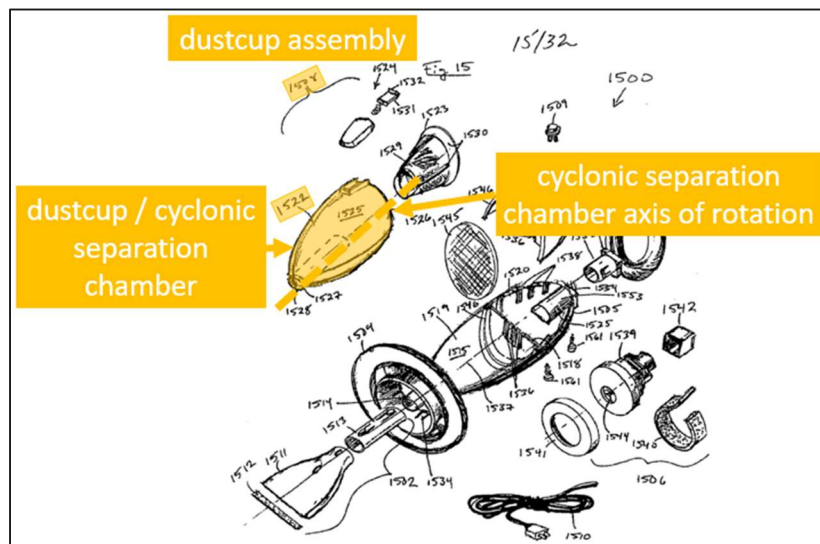
Butler teaches these limitations. Ex1002 ¶¶119-32.

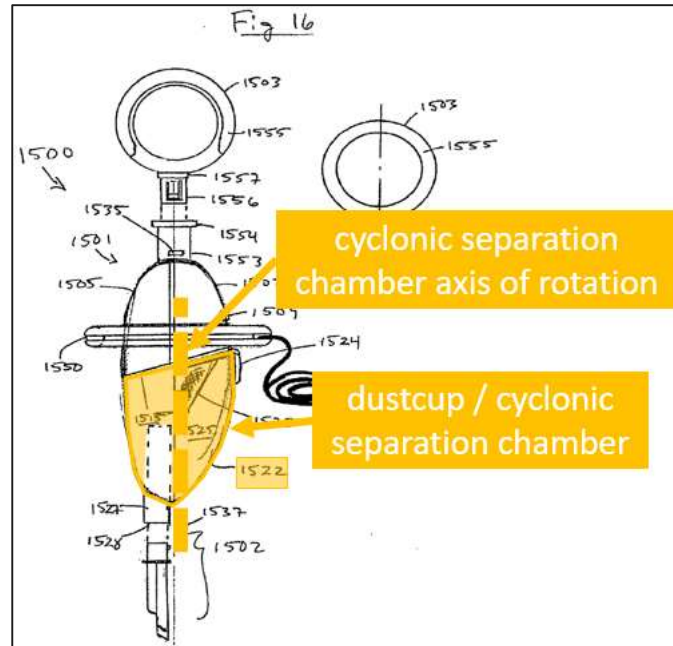
Butler teaches a cyclone unit comprising a cyclone chamber having a cyclone axis of rotation. Ex1002 ¶¶121-23. Butler’s “**dirt receptacle** comprises a **cyclone separator**,” which a POSA would understand is a cyclone unit including a cyclone chamber with a **cyclone separator axis of rotation**:



Ex1005, Claim 11, Fig. 5; Ex1002 ¶121.

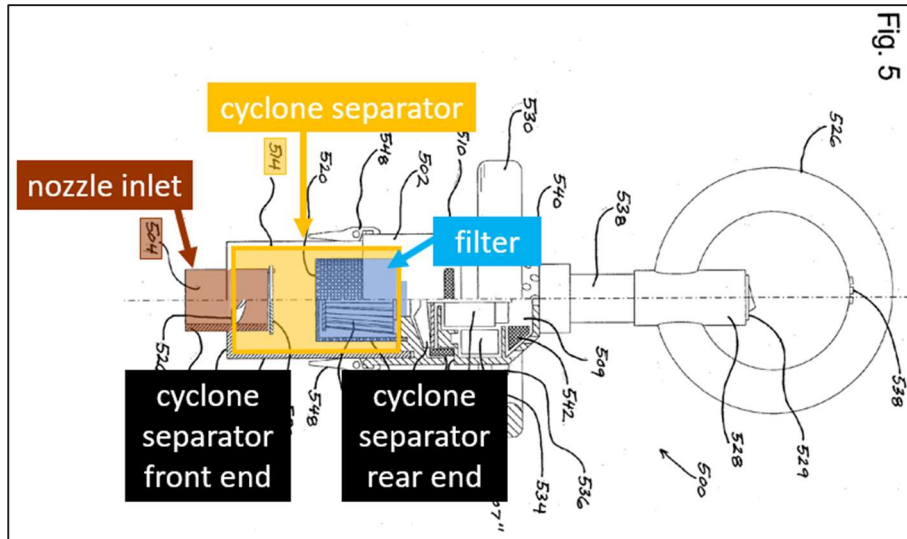
Further, Butler teaches a “**dustcup assembly 1508** compris[ing] a **dustcup 1522**” that “may comprise ... a **cyclonic separation chamber**,” which a POSA would also understand is a cyclone unit including a cyclone chamber with a **cyclonic separation chamber axis of rotation**:





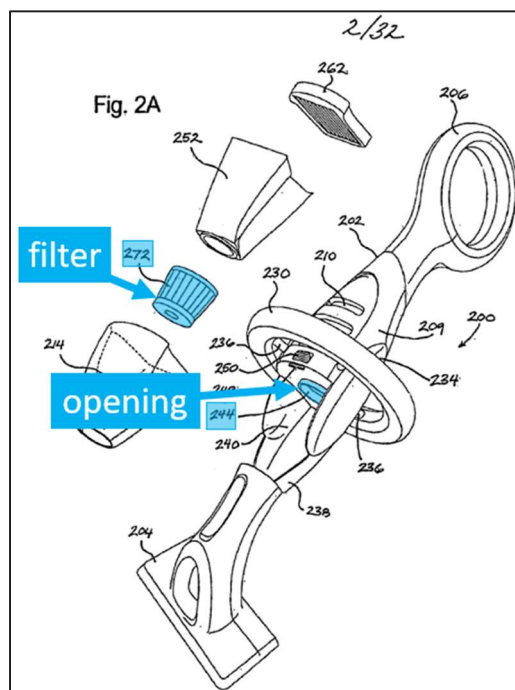
Ex1005, 35:27-36:4, Figs. 15-16; Ex1002 ¶122. Like Butler's grips, Butler's cyclonic separation units are interchangeable: "[t]he present invention may be used with any type of dirt separation system," and "it is envisioned that various different types of dirt receptacle ... may be interchangeable with one another to provide the user with various cleaning options." Ex1005, 16:25-28.

Butler teaches a cyclone chamber front end and an axially spaced apart rear end, a cyclone air inlet, and a cyclone air outlet provided at the rear end of the cyclone unit, wherein air exits the cyclone chamber at the rear end of the cyclone chamber. Ex1002 ¶¶124-28. Butler’s “cyclone separator” comprising a cyclone chamber has a **front end** (including where air enters through “nozzle inlet 504”) and an axially spaced apart **rear end** (including where air exits through a “filter 520 compris[ing] ... fine filter 520’”):



Ex1005, 21:24-28, Fig. 5; Ex1002 ¶124.

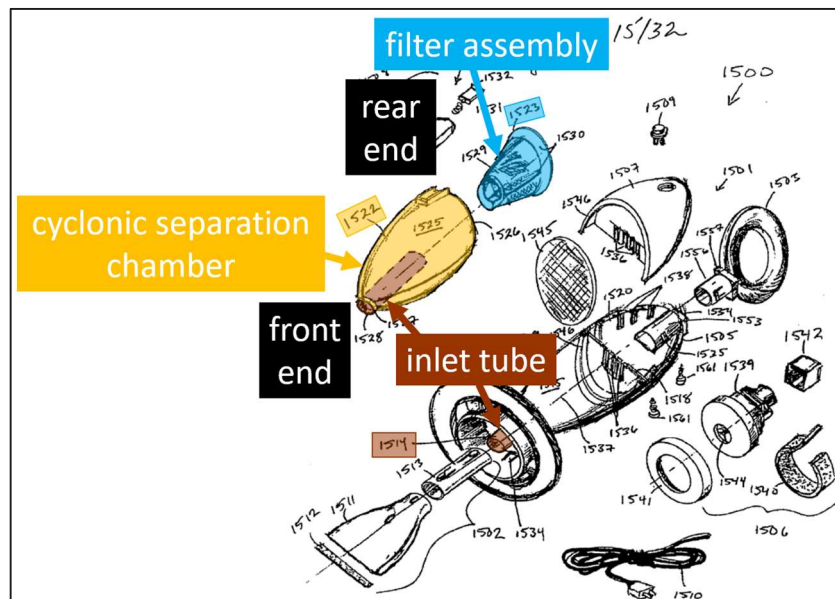
Butler further teaches “frusto-conical **filter 272** ... located over the fan/motor inlet **opening 244**” that “prevent[s] dirt and debris that is not separated by cyclonic action from entering the fan/motor 207”:

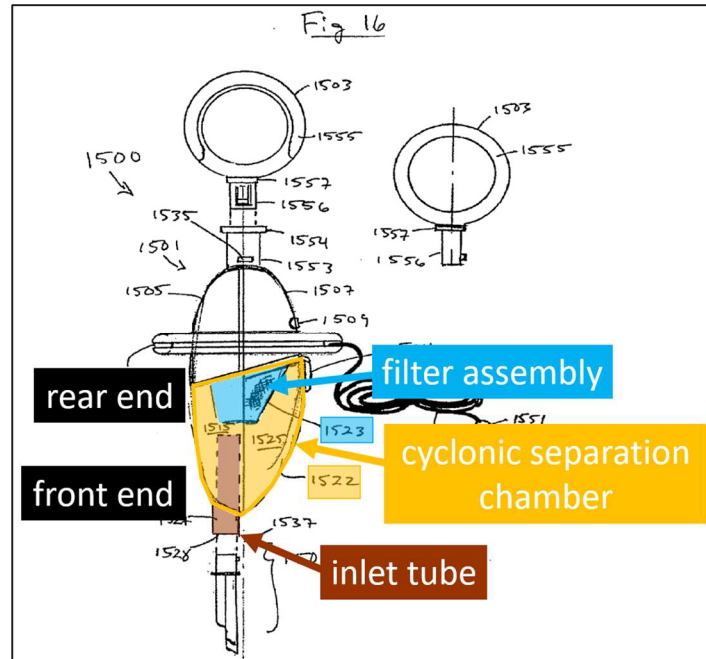


Ex1005, 18:10-12, Fig. 2A; Ex1002 ¶125.

Butler's "filter 520," "filter 272," and "opening 244" are, individually and collectively, a cyclone air outlet provided at the rear end of the cyclone unit because air passes through them, and cyclonic filtering ends, as it exits the rear end of Butler's "cyclone separator," which is also the cyclone chamber's rear end. Ex1002 ¶126.

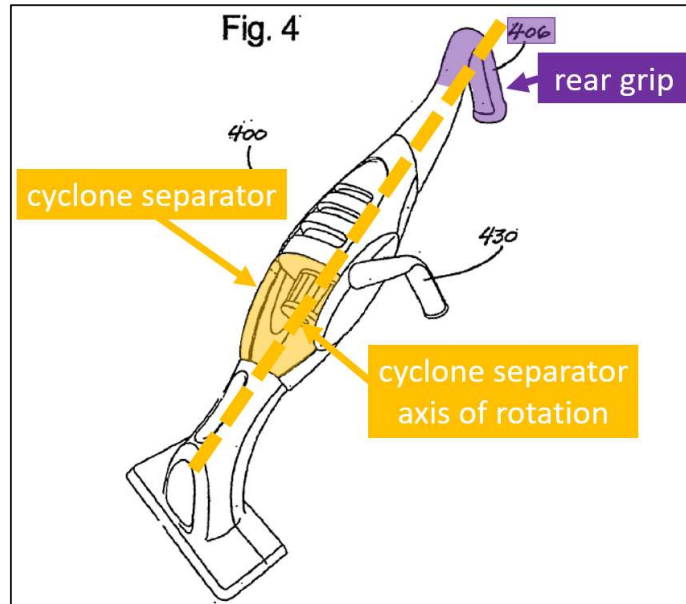
Butler's "**cyclonic separation chamber**" also has a **front end** and an axially spaced apart **rear end** (including where air exits through "**filter assembly 1523** compris[ing] a filter 1529"):





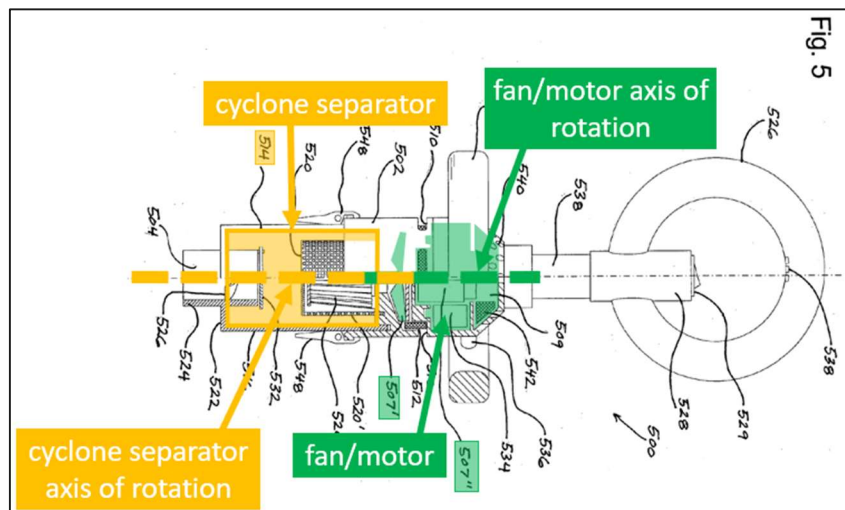
Ex1005, 35:22-24, 36:2-6, Figs. 15-16; Ex1002 ¶127. The “end” at which Butler’s “inlet tube 1514” terminates (the “end” “adjacent to the dustcup chamber 1519 and forms an air passage into the dustcup chamber 1519”) is a cyclone air inlet, because it is the inlet through which dirty air enters Butler’s cyclone chamber; and “filter assembly 1523” is a cyclone air outlet provided at the rear end of the cyclone unit (and the rear end of the cyclone chamber) because air passes through it, and cyclonic filtering ends, as it exits Butler’s “cyclonic separation chamber.” Ex1005, 35:14-16, 35:22-24, Ex1002 ¶128.

Regarding [1a.2]/[8a.2], Butler teaches the cyclone axis of rotation intersects the pistol-grip handle. Ex1002 ¶129. Butler’s “cyclone separator” axis of rotation and “cyclonic separation chamber” axis of rotation (collectively cyclone separator axis of rotation) intersects “pistol-grip style rear grip 406”:

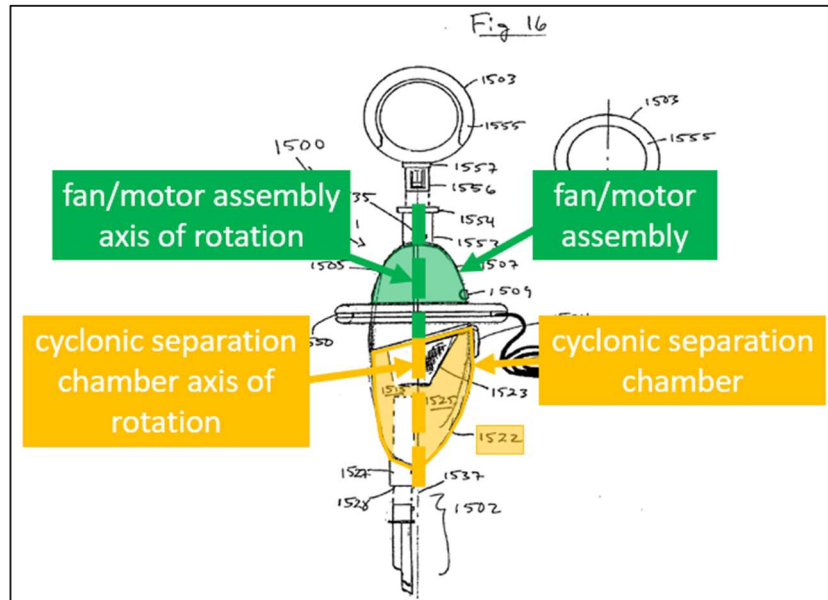


Ex1005, Fig. 4; Ex1002 ¶129.

Regarding [10a.2]/[14a.2], Butler teaches the suction motor axis of rotation is generally parallel to the cyclone axis of rotation. Ex1002 ¶¶130-32. Butler's **fan/motor axis of rotation** is generally parallel to the **cyclone separator axis of rotation**:



Ex1005, Fig. 5; Ex1002 ¶130. Further, Butler’s “fan/motor assembly 1506[’s]” axis of rotation is generally parallel to the cyclonic separation chamber axis of rotation:



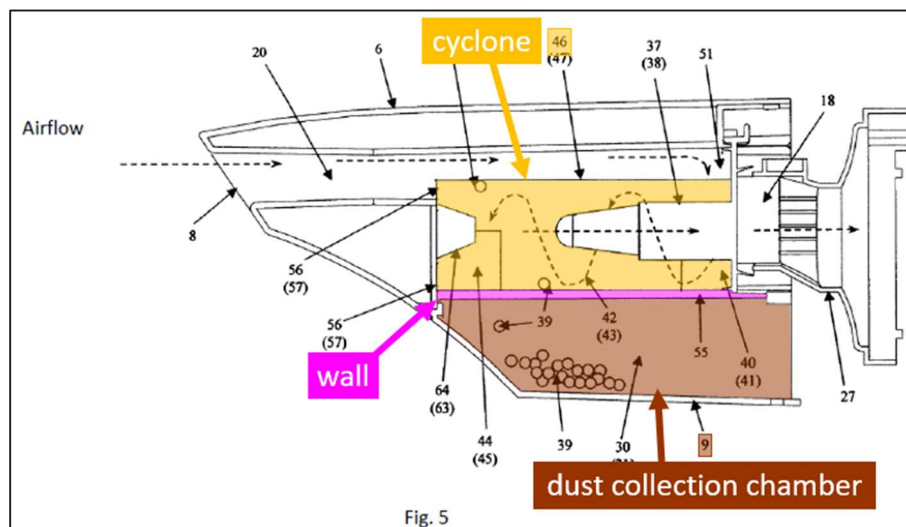
Ex1005, 35:4-6, Fig. 16; Ex1002 ¶131. To the extent Butler’s fan/motor axis and cyclone separator axis are depicted as co-axial in Figures 5 and 16, a POSA would have understood these axes are generally parallel because they extend in the same direction and maintain the same (zero) distance between them. Ex1002 ¶132. Further, PO contends co-axial axes meet this limitation in PO’s infringement contentions. Ex1011, 7.

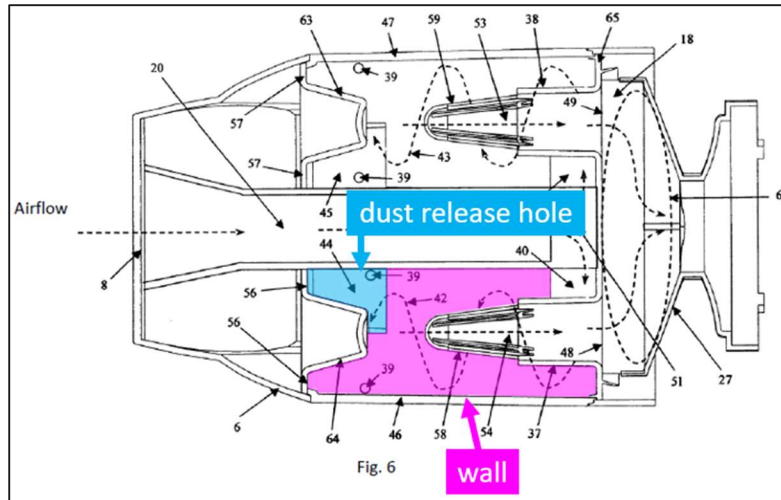
e. [9a.2]/[15a.2]

Butler in combination with Jianan teaches these limitations. Ex1002 ¶¶133-45.

Butler teaches a cyclone unit comprising a cyclone chamber, the cyclone chamber having a cyclone axis of rotation, a front end, an axially spaced apart rear end, a cyclone air inlet, and a cyclone air outlet provided at the rear end of the cyclone unit, wherein air exits the cyclone chamber at the rear end of the cyclone chamber, wherein the suction motor axis of rotation is generally parallel to the cyclone axis of rotation, and wherein the cyclone axis of rotation intersects the pistol-grip handle. Ground 1, [1a.2]/[8a.2]/[10a.2]/[14a.2].

Jianan teaches a dirt-collection chamber that is exterior to the cyclone chamber. Ex1002 ¶¶136-38. Jianan’s “**wall 55**” separates “**cyclone 46**” (which a POSA would have understood is positioned in a cyclone chamber) from the “independent **dust collection chamber 9**”:

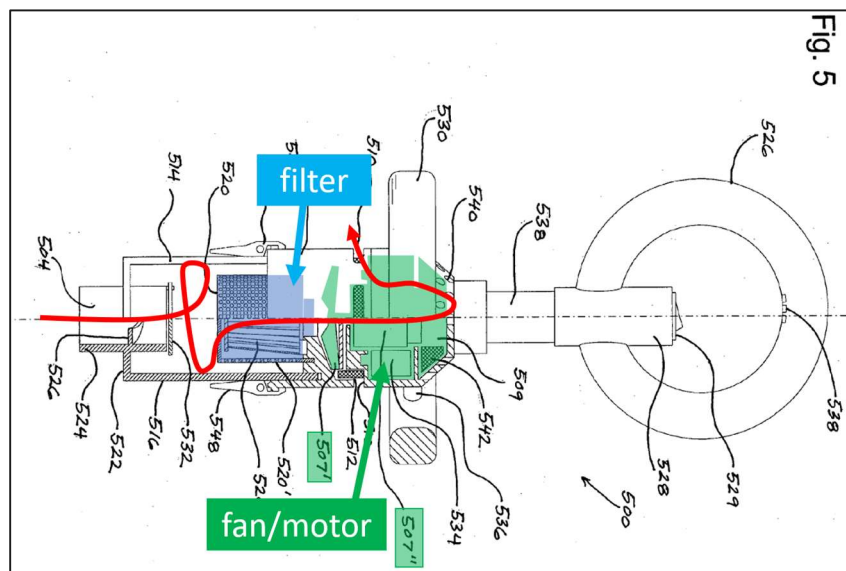




Ex1006, 9-10, Figs. 5-6; Ex1002 ¶136. “[T]he **dust collection chamber 9** is connected to the cyclone body via the **dust release hole**.” Ex1006, 9. “Dust particles escape into the hole cutout” and “most of the dust collects in [the] separate dust receiving chamber.” *Id.*, 4-5; *see also id.*, 10 (“This invention uses an independent dust storage device located far away from the cyclone, and cooperates with an efficient cyclone system.”). Thus, a POSA would have understood Jianan’s “independent dust collection chamber 9” (dirt-collection chamber) is exterior to Jianan’s “cyclone 46” positioned in a cyclone chamber. Ex1002 ¶137. Further, this is at least as much disclosure of these limitations as the ’546Patent:

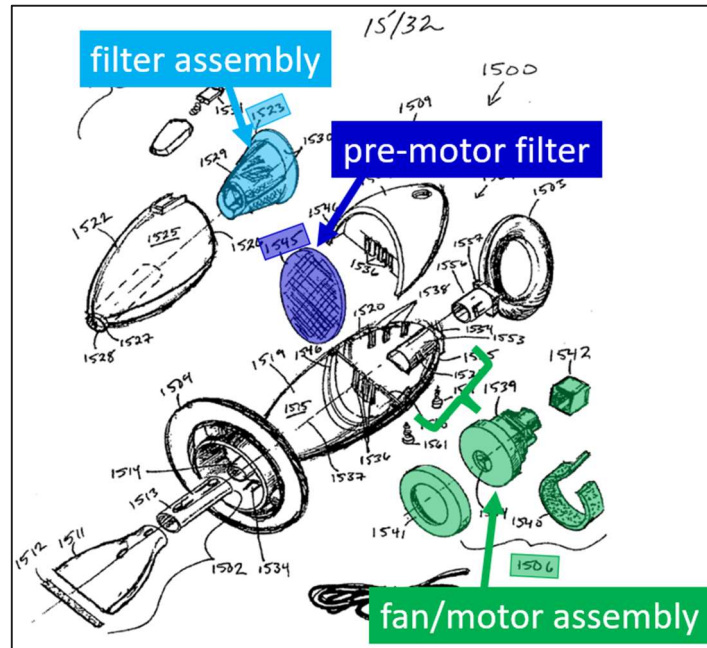
'546Patent	Jianan
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Butler teaches a pre-motor filter. Ex1002 ¶¶139-41. Butler’s “**filter 520** compris[ing] ... **fine filter 520**” is positioned forward of “**fan/motor 507**,” and filters out “fine particle[s]” before the “working **airflow**” “cool[s] the **motor 507**”:



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Butler further teaches a “**filter assembly 1523** compris[ing] a filter 1529” and “**pre-motor filter 1545**” positioned forward of “**fan/motor assembly 1506**”:

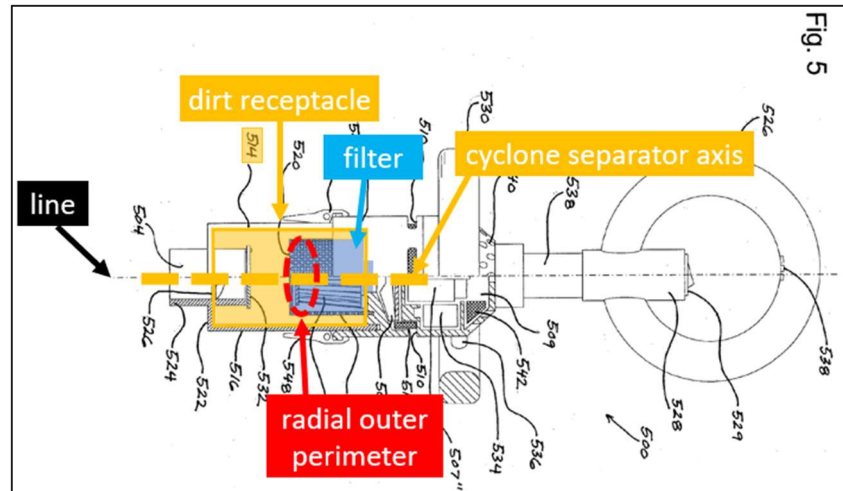


Ex1005, 35:20-24, 36:5-7, Fig. 15; Ex1002 ¶140.

Each of these filters (filter 520, filter assembly 1523, and pre-motor filter 1545) is a pre-motor filter, because each filters air before it reaches the suction motor. Ex1002 ¶141. Butler teaches that “any alternative filter shape, material, construction or filtration grade may be used, and multiple filter layers may also be used.” Ex1005, 18:12-14. A POSA therefore would have understood Butler teaches various physical filters that filter air upstream of Butler’s motor, which are interchangeable pre-motor filters. Ex1002 ¶141.

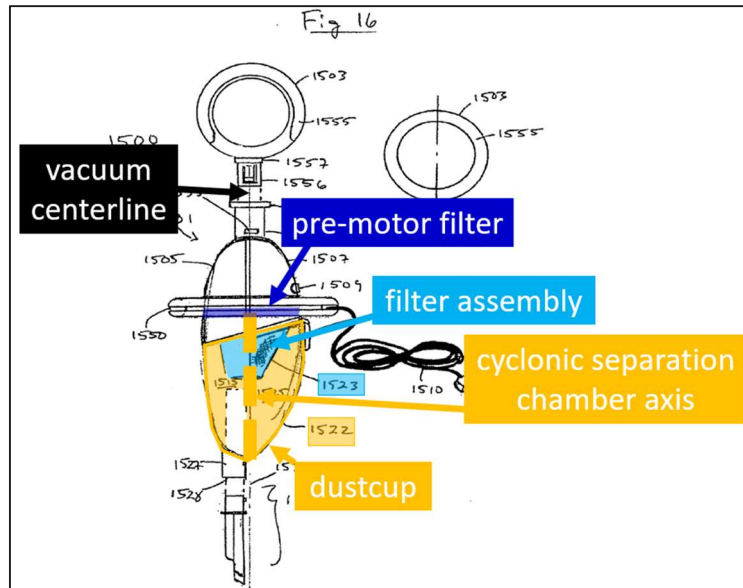
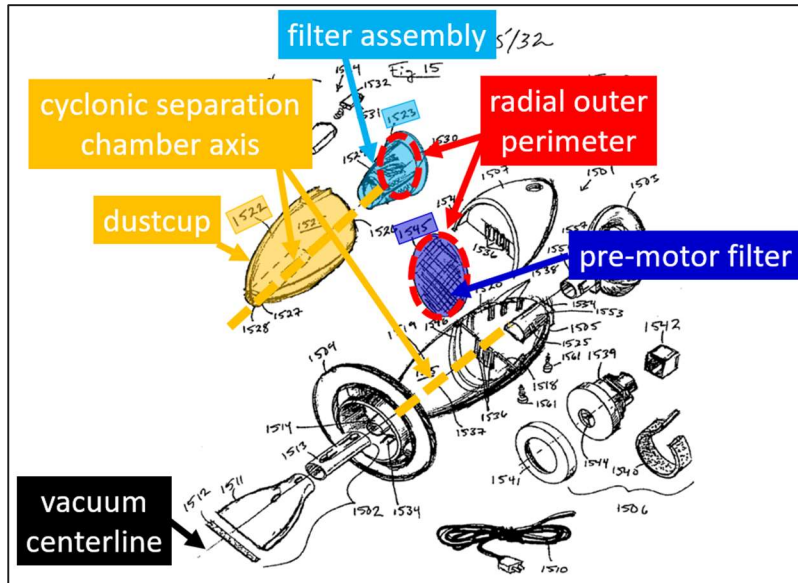
Butler teaches a line that is parallel to the cyclone axis extends through the dirt-collection chamber and a location interior of a radial outer perimeter of a pre-

motor filter. Ex1002 ¶¶142-44. A line parallel to Butler’s cyclone separator axis extends through “dirt receptacle 514” (dirt-collection chamber) and interior of a radial outer perimeter of “filter 520” (pre-motor filter):



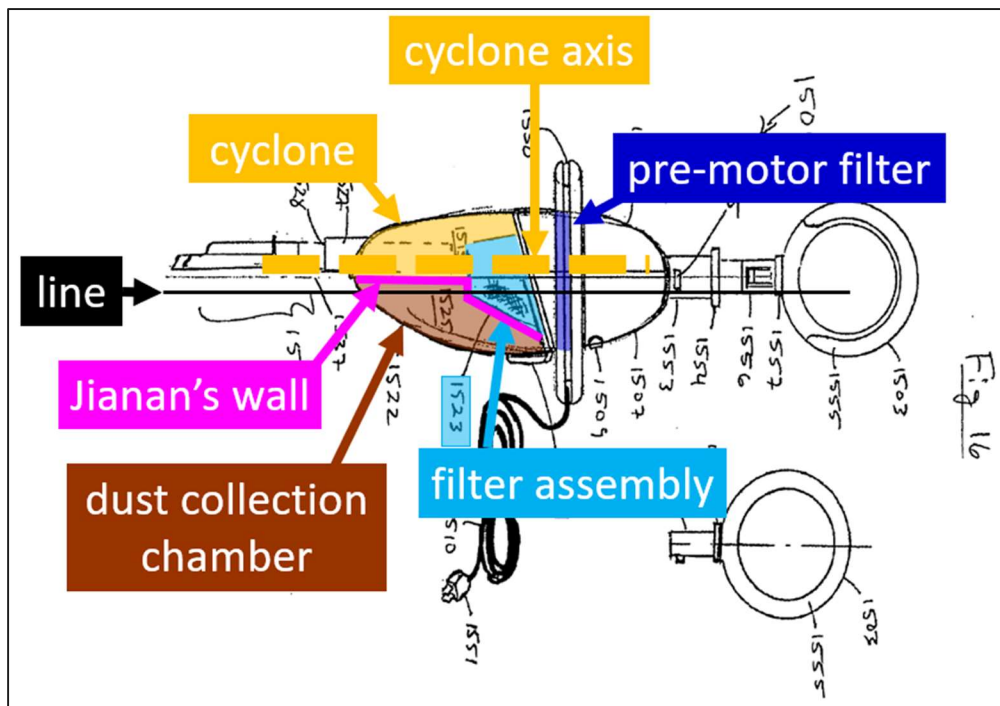
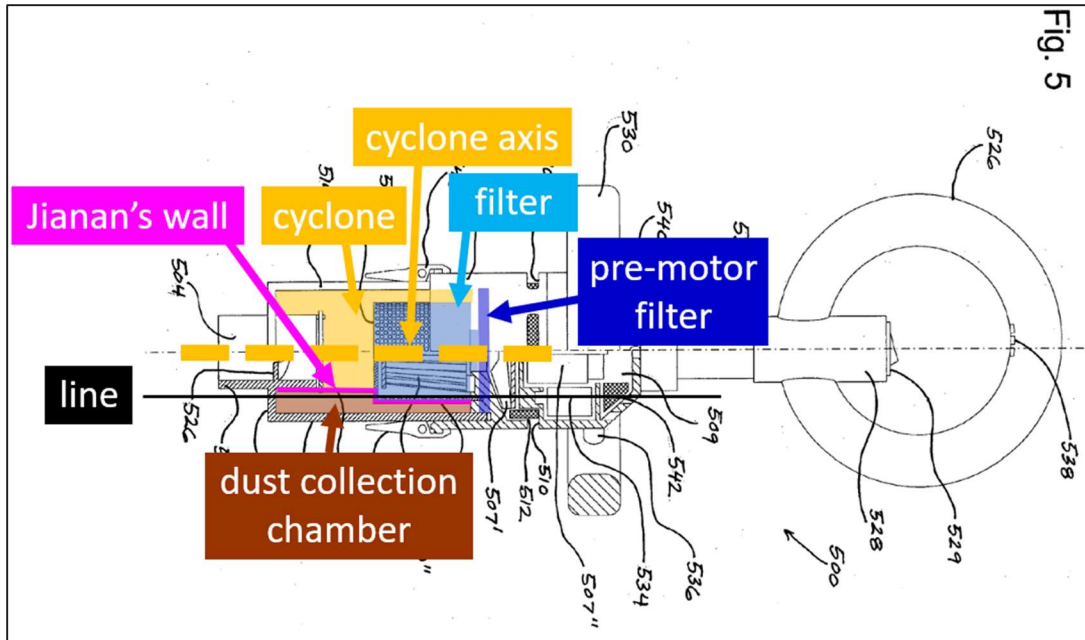
Ex1005, Fig. 5; Ex1002 ¶142.

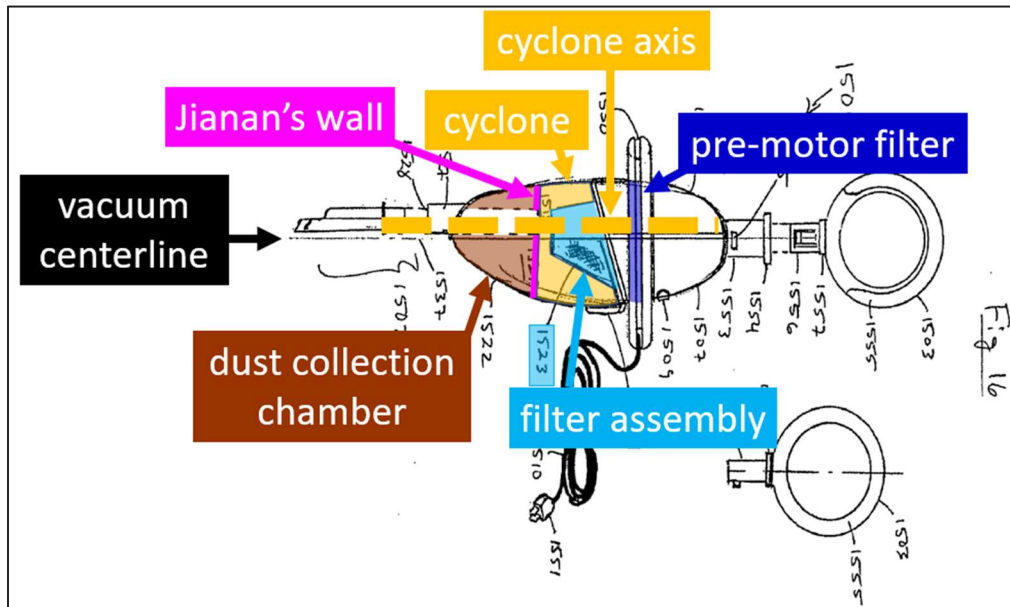
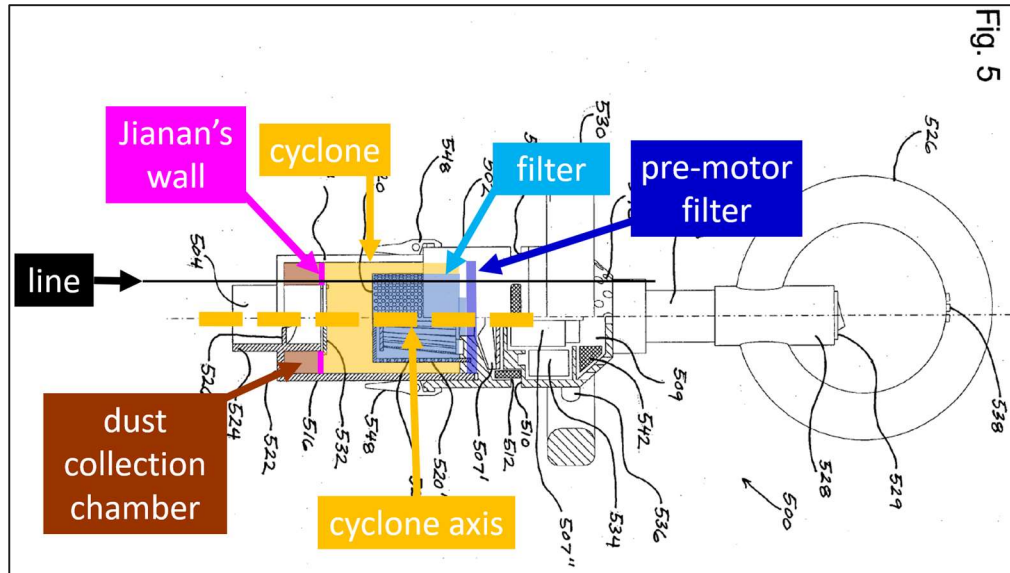
Likewise, a “vacuum centerline 1537” parallel to Butler’s cyclonic separation chamber axis extends through the “dustcup 1522” (dirt-collection chamber) and a location interior of each of a radial outer perimeter of “filter assembly 1523” and “pre-motor filter 1545”:

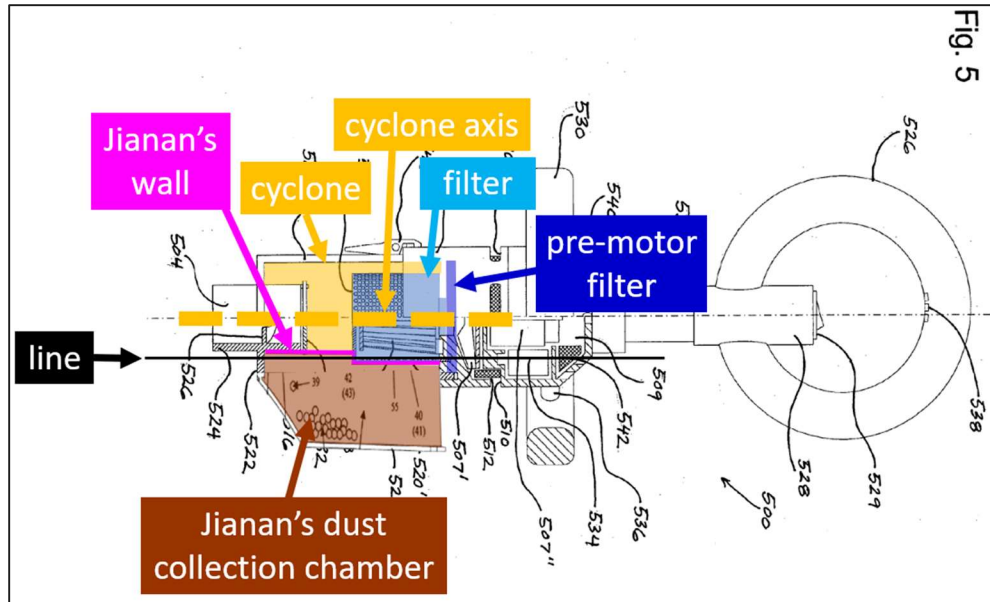


Ex1005, Figs. 15, 16(modified); Ex1002 ¶143.

This limitation is also met when Butler’s “dirt receptacle compris[ing] a cyclone separator” is modified in view of Jianan’s “independent **dust collection chamber**” teachings:







Ex1005, Figs. 5(modified), 16(modified); Ex1006, Fig. 5(modified); Ex1002 ¶144.

A POSA would have been motivated to modify Butler’s “dirt receptacle compris[ing] a cyclone separator” with Jianan’s exterior dirt-collection chamber teachings and would have reasonably expected success. Ground 1, §1.

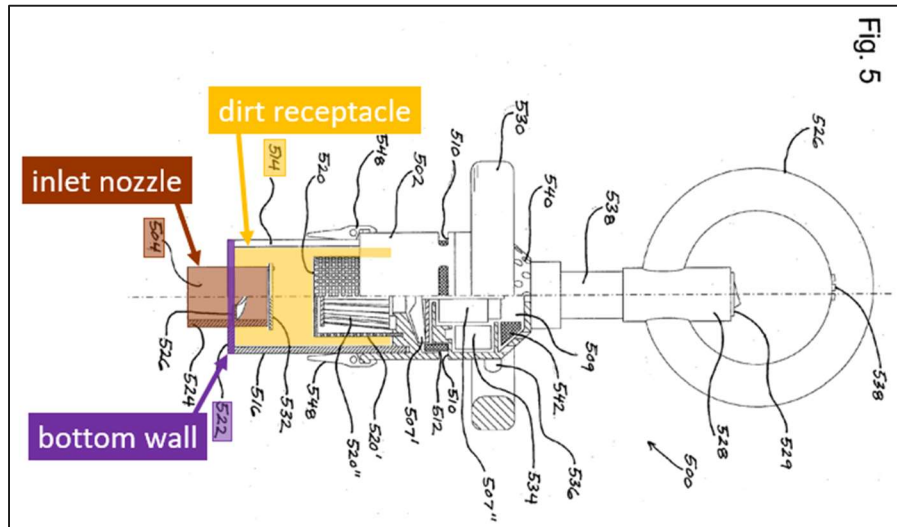
f. [1a.3]/[10b]

Butler in combination with Jianan teaches these limitations. Ex1002 ¶¶146-54.

Butler in combination with Jianan teaches a dirt-collection chamber that is exterior to the cyclone chamber. Ground 1, [9a.2]/[15a.2].

Butler further teaches a forward end of the dirt-collection chamber is openable. Ex1002 ¶¶148-49. Butler’s “dirt receptacle 214 may be covered by an access panel or door” to “facilitate the chamber’s emptying,” and the “bottom end”

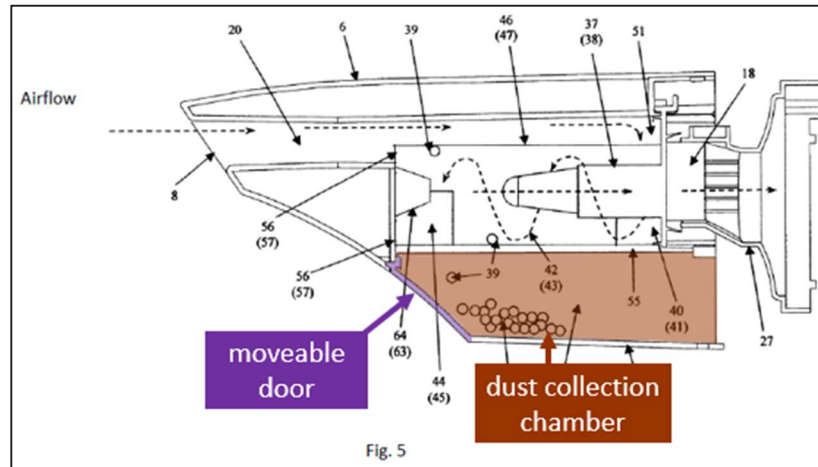
of “**dirt receptacle 514**,” i.e., “**bottom wall 522**,” is “removable from the device, along with the **inlet nozzle 504**”:



Ex1005, 18:26-30, 21:19-21, Fig. 5; Ex1002 ¶148. A POSA would have understood the “removable” front wall (“**bottom wall 522**”) of “**dirt receptacle 514[’s]**” forward end is an openable door. Ex1002 ¶149; Ground 1, [1a]/[8a]/[9a]/[10a]/[14a]/[15a].

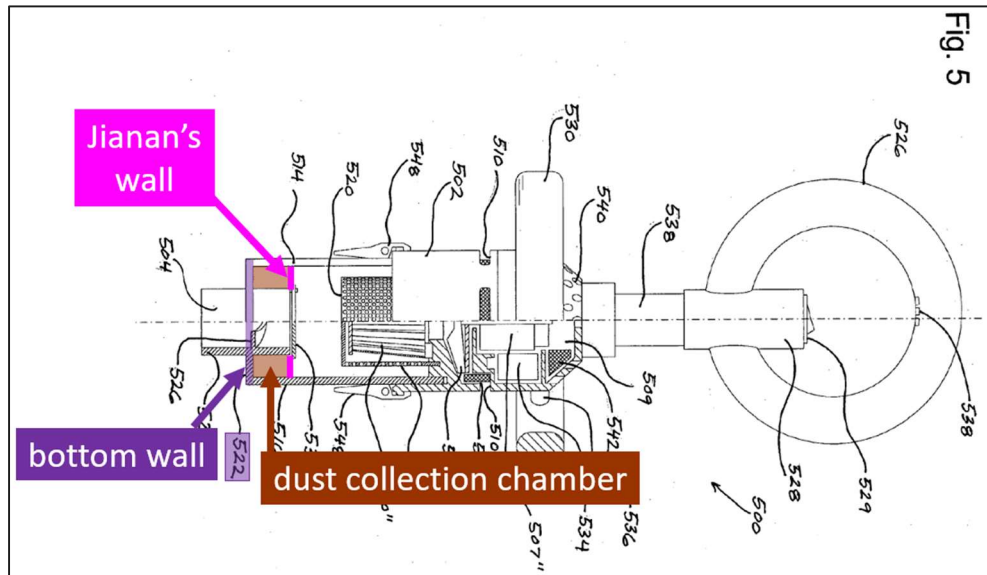
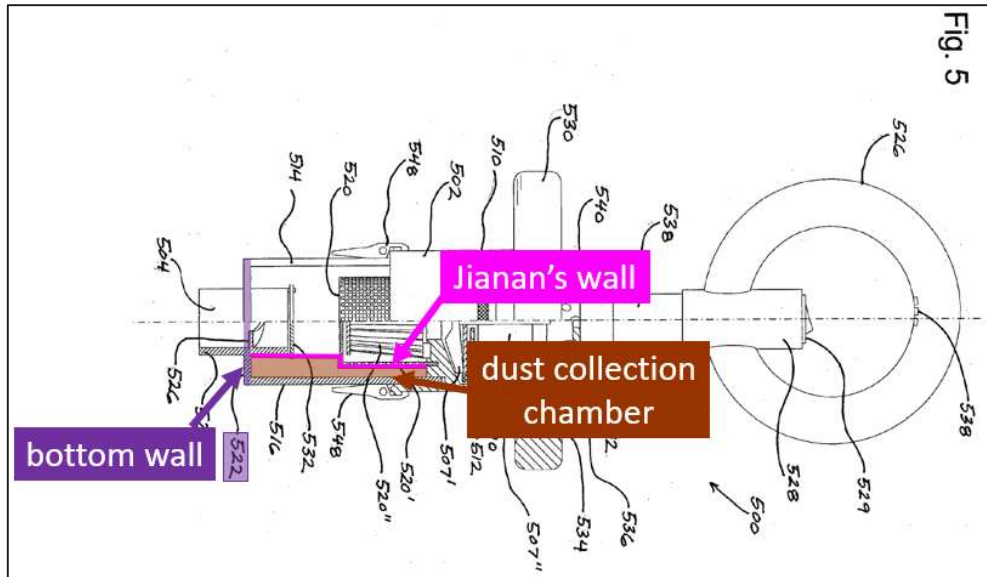
Likewise, Jianan teaches a forward end of the dirt-collection chamber is openable. Ex1002 ¶¶150-51. Jianan’s “dust collection chamber has at least one opening for emptying dirt.” Ex1006, claim 2. In one embodiment, “the dust collection chamber” has a “dust collection chamber opening” that “provides a clean and fast dust removal process.” *Id.*, 10. However, Jianan teaches an “alternative device in which the dust chamber” opening can be replaced with “an

opening and closing device such as a” “**movable door** on the **dust collection chamber**”:

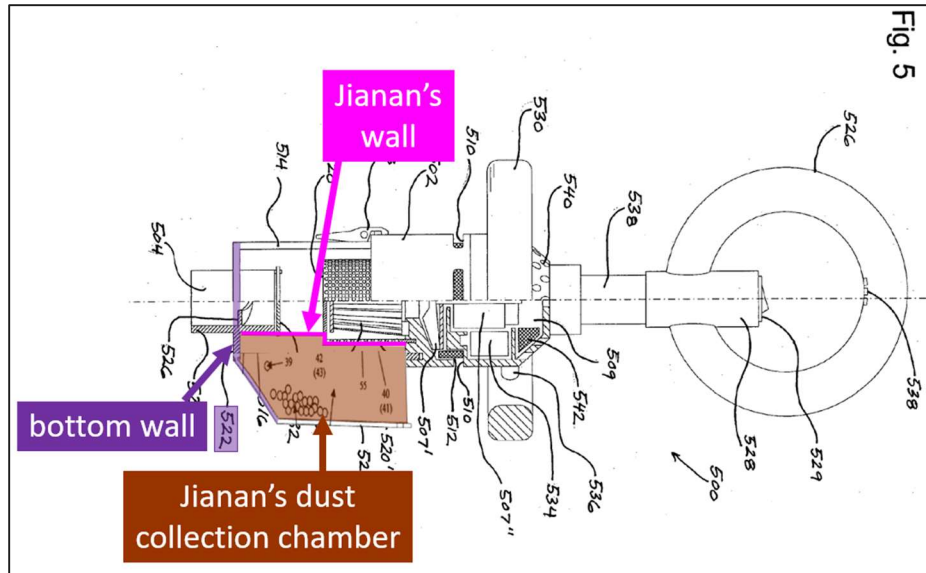


Ex1006, 10, claim 3, Fig. 5; Ex1002 ¶150. A POSA would have understood one of a finite number of openable-door placements on the dirt-collection chamber is on the front end. Ex1002 ¶151.

This limitation is also met when Butler’s “dirt receptacle compris[ing] a cyclone separator” is modified in view of Jianan’s “independent **dust collection chamber**” teachings, as the forward end of the dirt-collection chamber (“**bottom wall 522**”) remains openable:



Ex1005, Fig. 5(modified); Ex1002 ¶¶152-54. Further, a POSA would have understood Jianan's "**dust collection chamber**" "**movable door**" would be openable with Butler's "**bottom wall 522**":



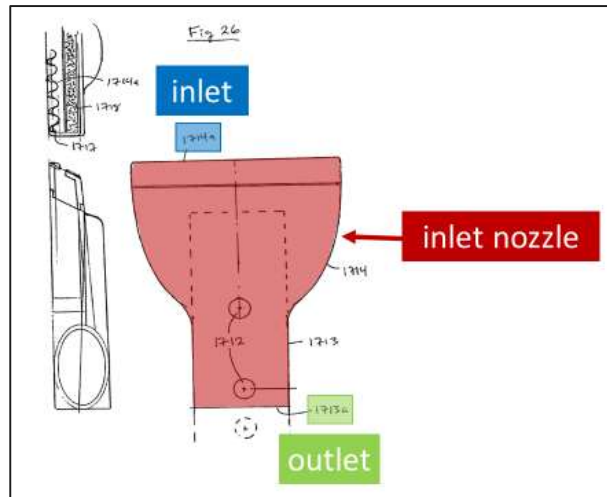
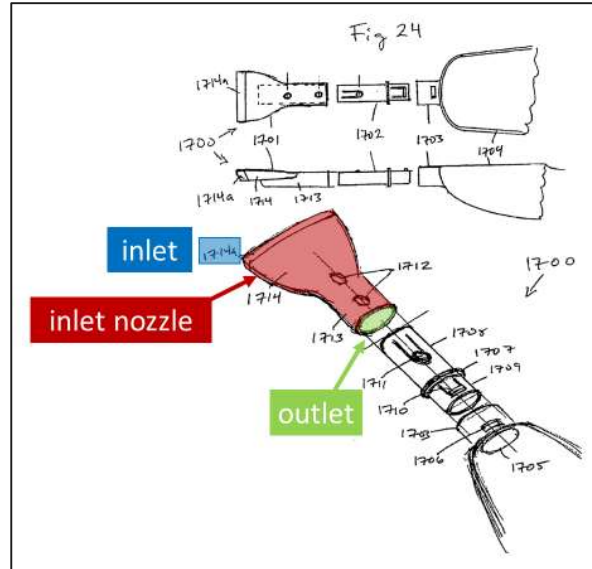
Ex1005, Fig. 5(modified); Ex1006, 10, claim 3, Fig. 5(modified); Ex1002 ¶153.

A POSA would have been motivated to modify Butler’s “dirt receptacle compris[ing] a cyclone separator” with Jianan’s exterior dirt-collection chamber teachings and would have reasonably expected success. Ground 1, §1.

g. [1b]/[8b]/[9b]/[14b]/[15b]/[10c]

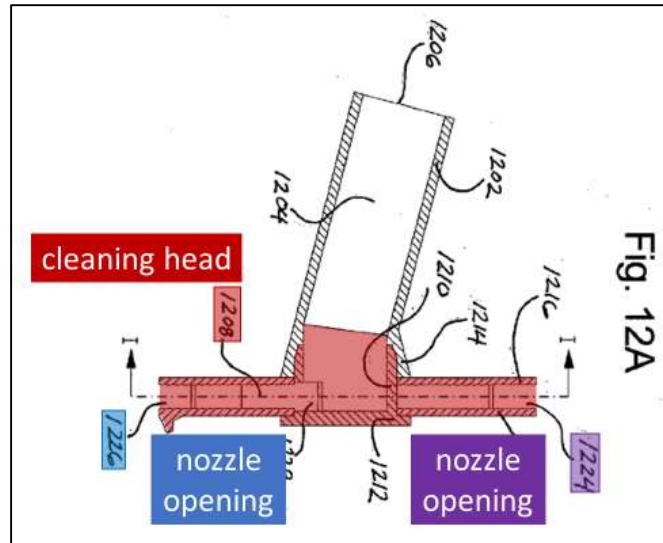
Butler teaches these limitations. Ex1002 ¶¶155-164.

Butler teaches a surface cleaning head having a front end and a rear end. Ex1002 ¶¶157-60. Butler teaches “inlet nozzle 1701” having “inlet 1714a” and “outlet 1713a”:



Ex1005, 42:6-9, Figs. 24, 26; Ex1002 ¶157. Butler’s “**inlet nozzle**” is a surface cleaning head, “**inlet**” is at a front end, and “**outlet**” is at a rear end. Ex1002 ¶158.

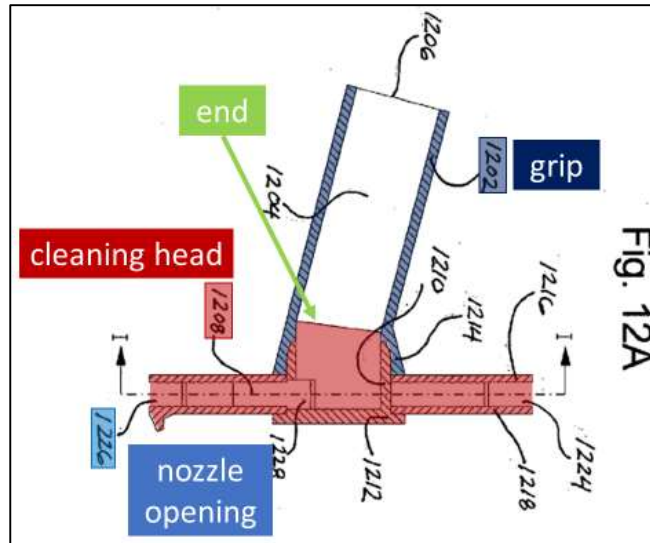
Further, Butler teaches “**cleaning head 1208**” with “**nozzle opening 1226**” and “**nozzle opening 1224**”:



Ex1005, 31:24-27, Fig. 12A; Ex1002 ¶159. Butler’s “**cleaning head**” is also a surface cleaning head, “**nozzle opening**” is at a front end and “**nozzle opening**” is at a rear end. Ex1002 ¶160. Butler’s surface cleaning heads are interchangeable: “any type of cleaning device may be attached.” Ex1005, 22:6-9.

Butler teaches a surface cleaning head having a dirty air inlet and a surface cleaning head air outlet. Ex1002 ¶¶161-64. Butler teaches that air flows into “**inlet nozzle 1701**” at “**inlet 1714a**” and exits “outlet duct 1713” at “**outlet 1713a** for the **inlet nozzle 1701**”:

52

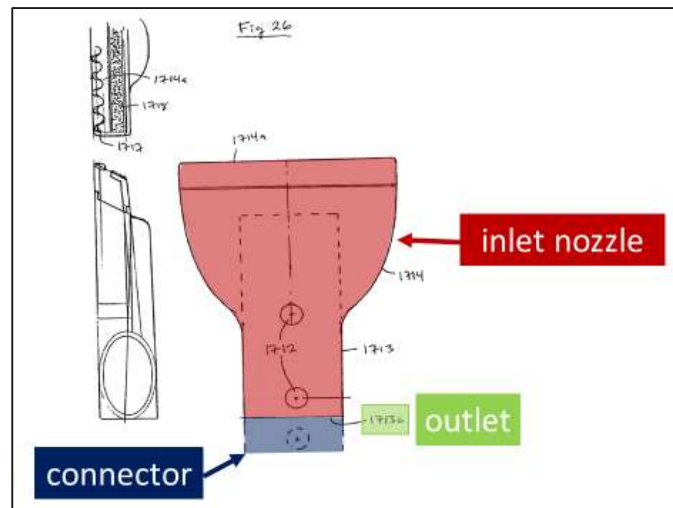
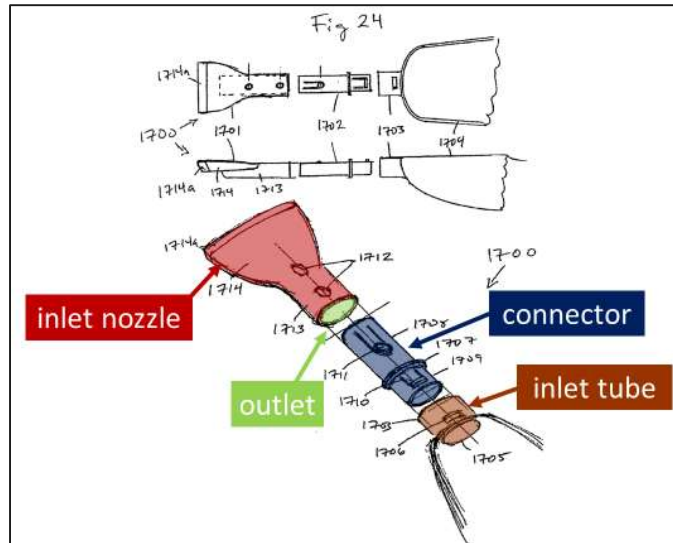


Ex1005, 31:6-27, Fig. 12A; Ex1002 ¶163. Butler’s “nozzle opening” is also a dirty air inlet and Butler’s “end” is also a surface cleaning head air outlet. Ex1002 ¶164.

h. [1c]/[8c]/[9c]/[14c]/[15c]/[10d]

Butler teaches these limitations. Ex1002 ¶¶165-71.

Butler teaches a rigid air flow conduit that is removably mountable to the surface cleaning head and, when attached to the hand vacuum cleaner and the surface cleaning head, extends between the surface cleaning head air outlet and the dirty air inlet of the hand vacuum cleaner. Ex1002 ¶¶167-71. In Butler, “**nozzle connector 1702**” extends between “the **outlet 1713a** for the **inlet nozzle 1701**” and “**inlet tube 1703** located on the housing”:



Ex1005, 41:8-11, 42:7-8, Figs. 24, 26; Ex1002 ¶167.

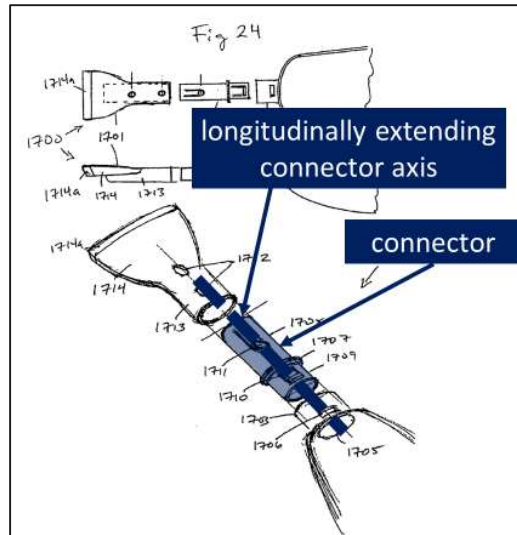
Butler’s “**inlet tube**” is “integrally formed with the housing 1704 and provides fluid communication between the vacuum dust receptacle (not shown) and the rest of the nozzle assembly 1700.” Ex1005, 41:15-18.

Butler’s “**connector 1702** is a hollow tube” “divided into two portions by a collar 1707:” an upstream “inlet portion 1708,” which is “telescopically received within the **nozzle 1701**,” and a downstream “outlet portion 1709,” which is

“telescopically received within or around the **inlet tube 1703**.” *Id.*, 41:19-29. The mounting includes “a flexible nozzle-attaching tab 1711 that corresponds to one or more apertures 1712 in the nozzle 1701,” such that the user may “depress this tab 1711 to remove the nozzle 1701 from the connector 1702.” *Id.*, 41:26-42:1. Likewise, “cantilever tab 1710” fits into the “inlet tube aperture 1706” of the hand vacuum cleaner and a user can depress the “cantilever tab 1710,” clicking it out of the “inlet tube aperture 1706” to remove the “connector 1702” from the “vacuum cleaner.” *Id.*, 41:19-26; Ex1002 ¶169.

Butler’s “connector” is a rigid airflow conduit; “inlet nozzle” is a surface cleaning head; “outlet” is a surface cleaning head air outlet; “inlet tube” is a hand vacuum cleaner dirty air inlet; and Butler teaches a rigid airflow conduit (“connector”) that is removably mountable to the surface cleaning head and the hand vacuum cleaner and extends between the surface cleaning head air outlet and the dirty air inlet of the hand vacuum cleaner. Ex1002 ¶170.

Regarding [14c]/[15c]/[10d], Butler’s **connector** has a **longitudinally extending connector axis**, which is a longitudinally extending conduit axis:



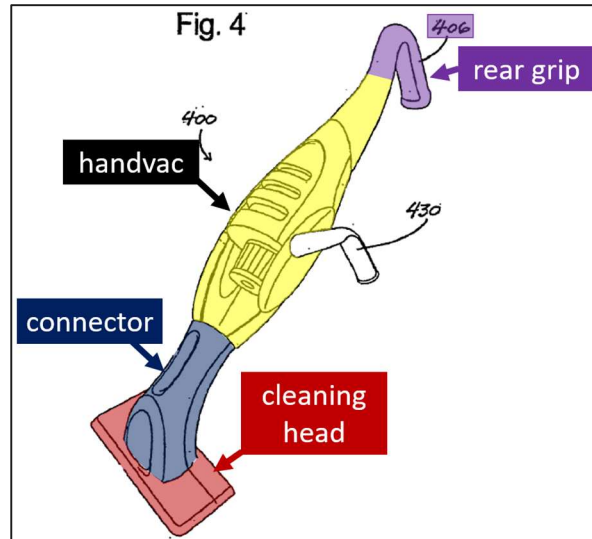
Ex1005, Fig. 24; Ex1002 ¶171.

i. [1d]/[8d]/[9d]/[14d]/[15d]/[10e]

Butler teaches these limitations. Ex1002 ¶¶172-77.

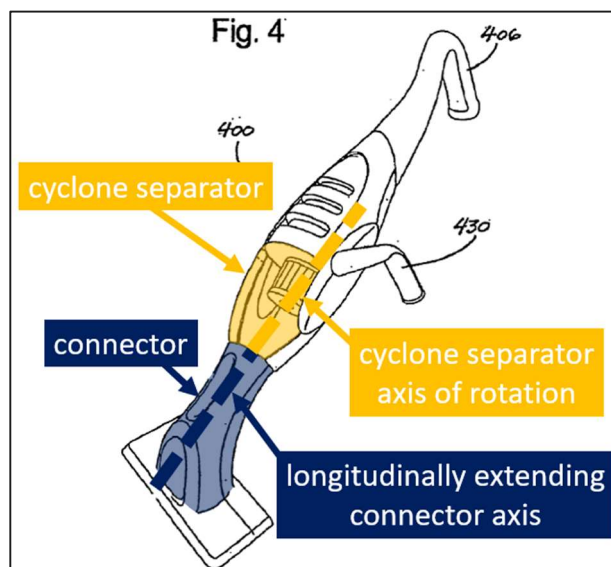
Butler teaches the dirty air inlet of the hand vacuum cleaner is removably drivingly mounted to a downstream end of the rigid air flow conduit. Ground 1, [1c]/[8c]/[9c]/[14c]/[15c]/[10d].

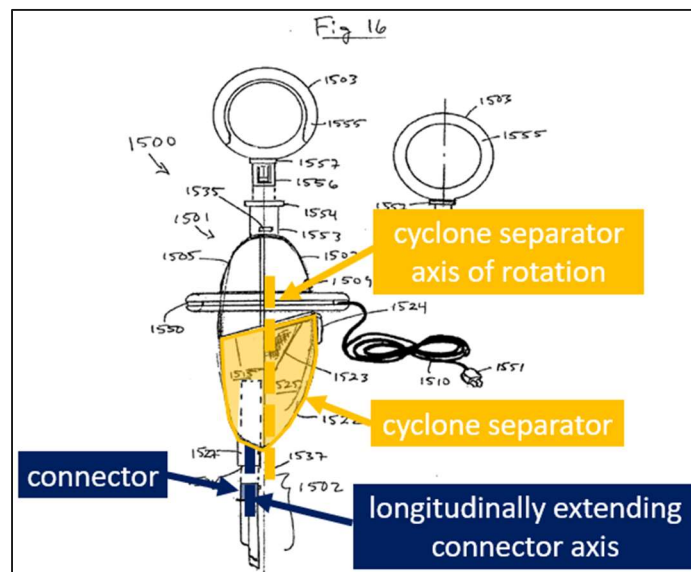
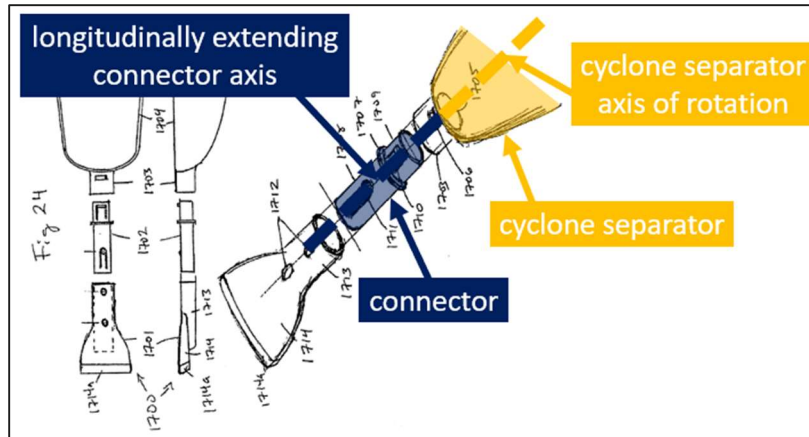
When Butler’s hand vacuum is so mounted, the pistol-grip handle is a driving handle for the surface cleaning apparatus. Ex1002 ¶175. Butler’s “pistol-grip style **rear grip 406**” is used to “ergonomically maneuver the device and rotate it into different positions for cleaning horizontal and inclined surfaces”:



Ex1005, 19:9-12, 19:22-24; Ex1002 ¶175.

Regarding [14d]/[15d]/[10e], when Butler's hand vacuum cleaner is so mounted, the **longitudinally extending connector axis** is parallel to the **cyclone separator's axis of rotation**:





Ex1005, Figs. 4-5, 24, 16; Ex1002 ¶176.

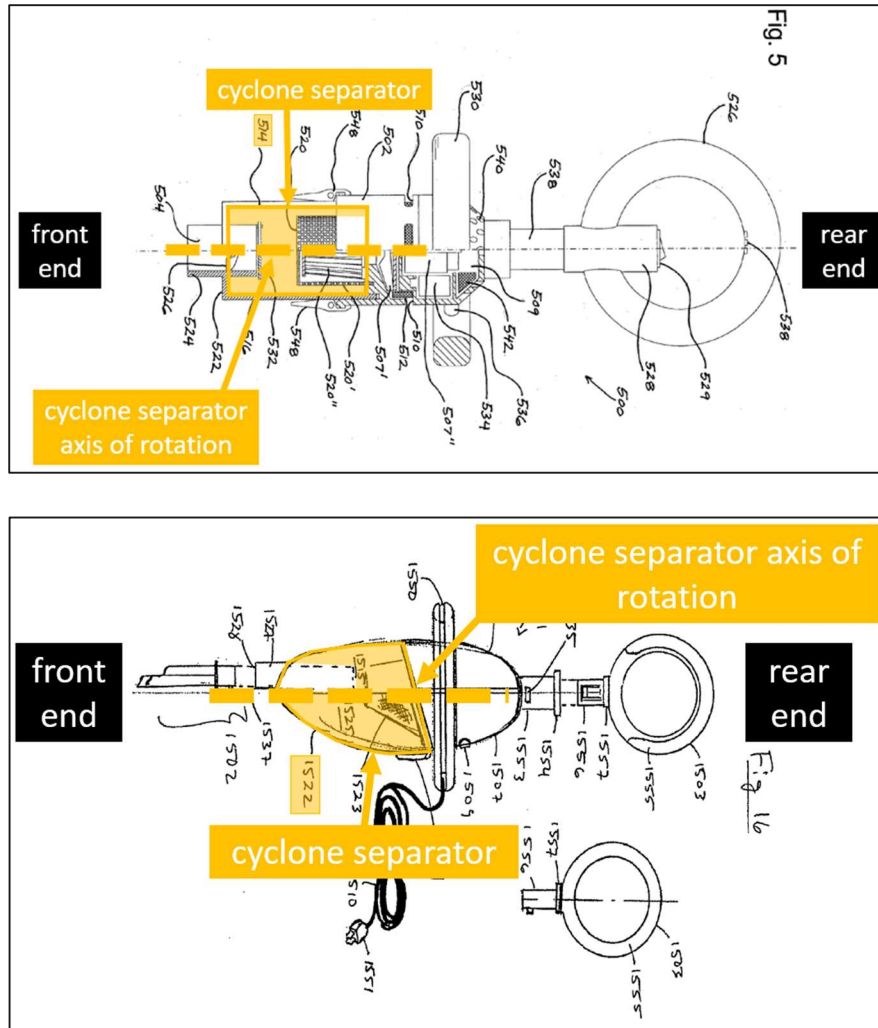
These limitations are also met when Butler is modified in view of Jianan.

Ground 1, §1.

j. [1e]/[8e]/[9e]

Butler teaches these limitations. Ex1002 ¶¶178-80.

When Butler's hand vacuum cleaner is positioned with the **front end** of the hand vacuum cleaner in front of the **rear end** of the hand vacuum cleaner, the **cyclone separator axis of rotation** is generally horizontal:



Ex1005, Fig. 5; Ex1002 ¶179.

These limitations are also met when Butler is modified in view of Jianan.

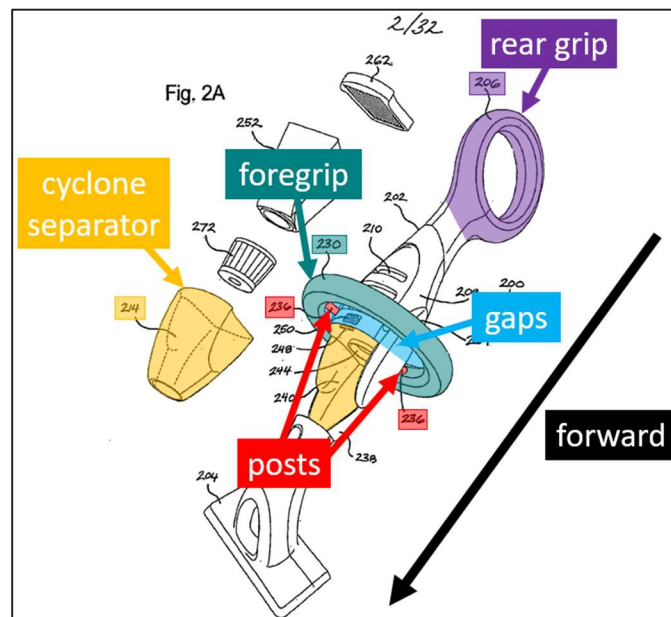
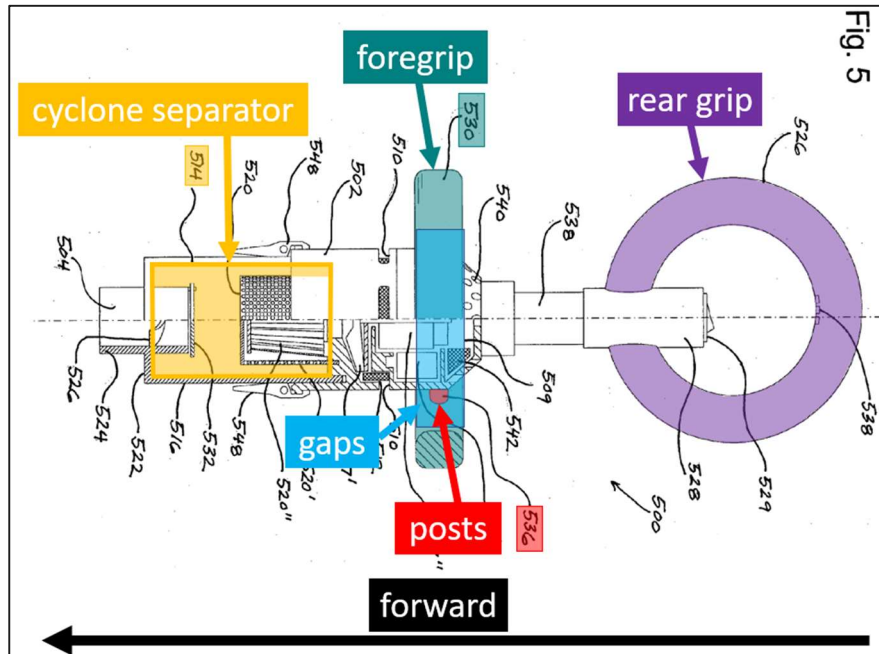
Ground 1, §1.

k. [14e]/[15e]/[10f]

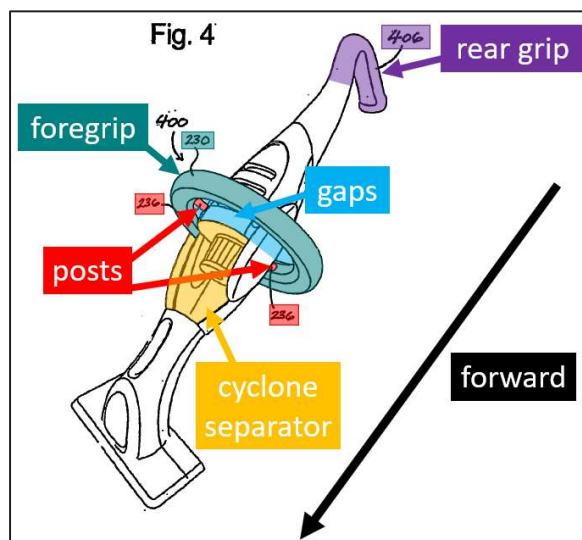
Butler teaches these limitations. Ex1002 ¶¶181-88.

Butler teaches a finger grip area provided at a location that is forward of the pistol-grip handle and rearward of the cyclone. Ex1002 ¶¶182-188.

Butler teaches a “circular or looped” “**foregrip 530** [that] is attached to the housing 502 by a number of radially-extending **posts 536**” at a location rearward of the “**cyclone separator**” and forward of the “**rear grip 506**”:

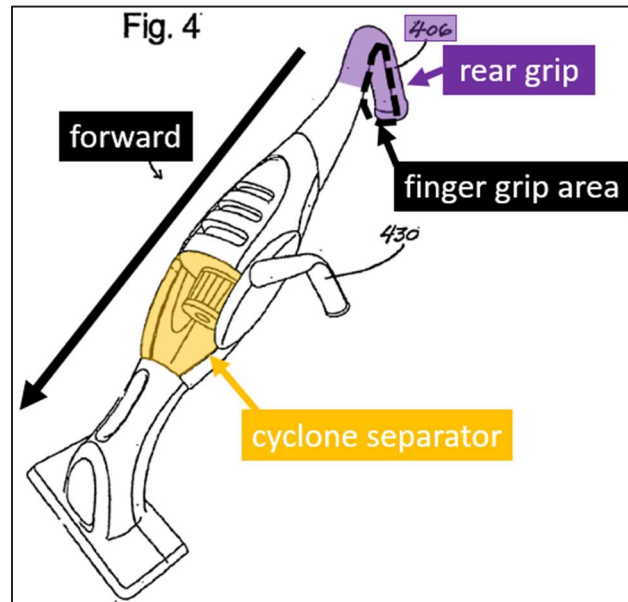


Ex1005, 20:4-6, 20:10-11, Figs. 2A, 5; Ex1002 ¶182. Butler teaches the “radial posts ... provide one or more **gaps** between the foregrip 130 and the housing 102 into which the user may fit his or her fingers or hand.” Ex1005, 11:28-12:2. Butler’s “gaps” between the “foregrip” and the “housing” are finger grip areas provided at a location forward of the “rear grip” and rearward of the “cyclone separator.” Ex1002 ¶183. Butler further teaches that “circular or looped rear grip 506” can be exchanged for other rear grips, e.g., “pistol-grip style rear grip 406”: “[o]f course, other grip shapes may be used, as explained previously herein.” Ex1005, 20:6-7; Ex1002 ¶¶184-85; *see also* Ex1005, 19:9-12, 19:18-24. Thus, when Butler’s “pistol-grip style rear grip 406” replaces figure 2A’s and figure 5’s “circular or looped rear grip,” Butler’s “**gaps**” (finger grip areas) are still provided at a location that is forward of the “pistol-grip style **rear grip 406**” (pistol-grip handle) and rearward of the “**cyclone separator**” (cyclone):



Ex1005, Fig. 4(modified); Ex1002 ¶186.

Likewise, when a user grips Butler’s “pistol-grip style **rear grip 406**,” their fingers wrap around a **finger grip area** located **forward** of “**rear grip 406**,” and rearward of the “**cyclone separator**”:



Ex1005, Fig. 4; Ex1002 ¶187.

These limitations are also met when Butler is modified in view of Jianan.
Ground 1, §1.

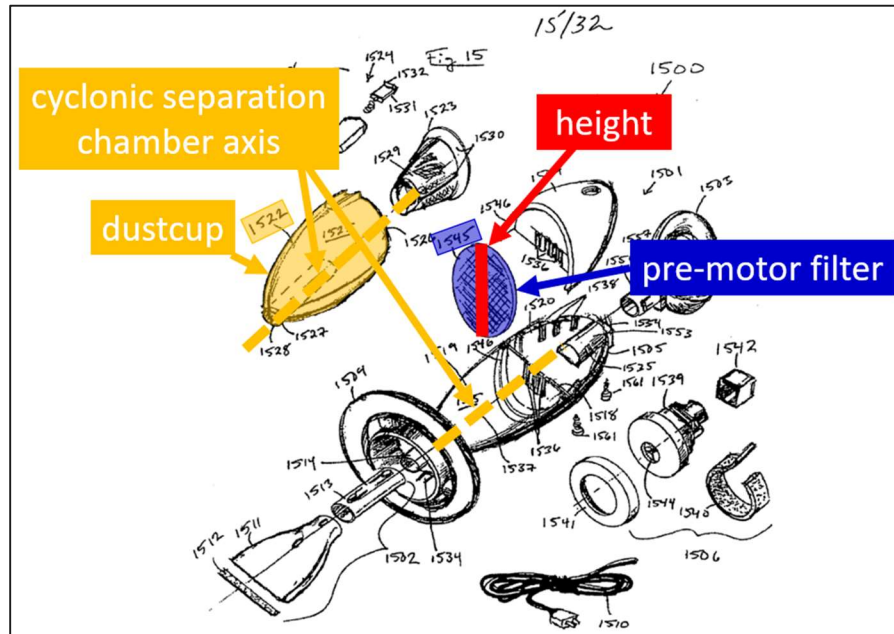
I. [8f]/[14f]

Butler teaches these limitations. Ex1002 ¶¶189-203.

Butler teaches several pre-motor filters. Ground 1, [1a.2]/[8a.2]/[10a.2]/[14a.2].

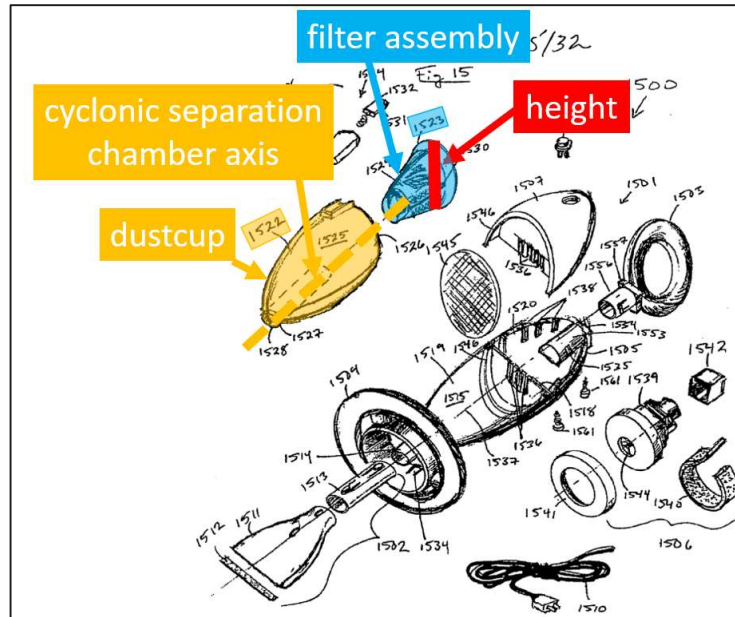
Butler teaches a pre-motor filter having a height in a direction transverse to the cyclone axis. Ex1002 ¶¶191-94. Butler’s “**pre-motor filter 1545**” has a

height in a direction transverse to “**dustcup 1522[’s]**” **cyclonic separation chamber axis**:



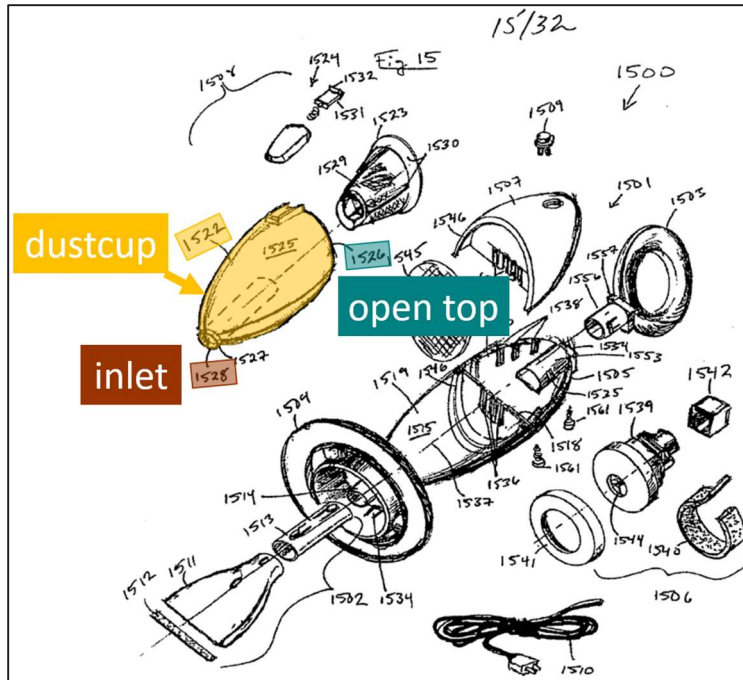
Ex1005, Fig. 15; Ex1002 ¶191. A POSA would have understood Butler’s “pre-motor filter 1545” has a height in a direction transverse to the cyclone axis when the “dustcup 1522” is mounted to the hand vacuum cleaner. Ex1002 ¶192.

Butler’s “**filter assembly 1523**” also has a height in a direction transverse to “**dustcup 1522[’s]**” **cyclonic separation chamber axis**:



Ex1005, Fig. 15; Ex1002 ¶193. A POSA would have understood Butler’s “filter assembly 1523” also has a height in a direction transverse to the cyclone axis when the “dustcup 1522” is mounted to the hand vacuum cleaner. Ex1002 ¶194.

Butler teaches the pre-motor filter height is larger than a diameter of the cyclone. Ex1002 ¶¶195-98. Butler’s “**dustcup 1522** comprises one or more sidewalls 1525 that form an **open top 1526** and taper to an **inlet 1528**”:



Ex1005, 35:28-30, Fig. 15; Ex1002 ¶195. A POSA would have understood the cyclone positioned in “dustcup 1522[’s]” “cyclonic separation chamber” necessarily has a diameter smaller than the height of “dustcup 1522[’s]” “sidewall” located at “open top 1526,” including because cyclonic airflow occurs within the “sidewall[s]” of “dustcup 1522.” Ex1002 ¶196.

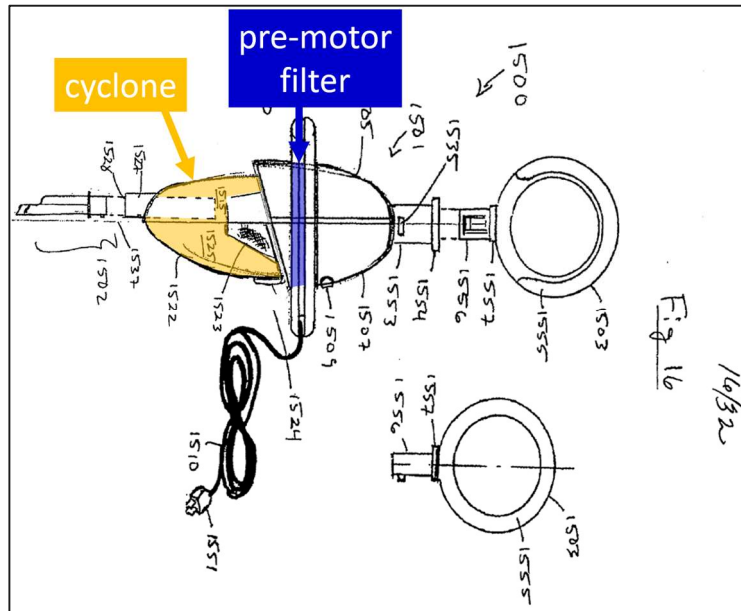
Further, “the filter assembly 1523 comprises a filter 1529 and a frame 1530” that “sealingly engages with the open top 1526.” Ex1005, 36:5-7. Butler’s “pre-motor filter 1545” is positioned rearward of “filter assembly 1523” and covers “frame 1530.” *Id.*, 35:20-36:5, Fig. 15; Ex1002 ¶197. Thus, a POSA would have understood the heights of Butler’s “filter assembly 1523” and “pre-motor filter 1545” are the same or larger than the height of “dustcup 1522[’s]” “sidewall” located at “open top 1526,” and therefore each of Butler’s “filter assembly 1523”

and “pre-motor filter 1545” have a height larger than a diameter of the cyclone contained within the “sidewall.” Ex1002 ¶197.

Likewise, a POSA would have understood Butler’s “filter assembly 1523” and “pre-motor filter 1545” each have a height that is larger than the cyclone diameter that is located at “dustcup 1522[’s]” “taper[ed]” “inlet 1528,” which “is generally smaller than the open top 1526,” Ex1005, 35:28-36:2, and therefore Butler teaches a pre-motor filter having a height that is larger than a diameter of the cyclone. Ex1002 ¶198.

Further, a POSA would have been motivated to increase the amount of pre-motor filtration by increasing the size of Butler’s pre-motor filter 1545, which would also result in the pre-motor filter height being larger than a diameter of the cyclone. Ex1002 ¶199-201. A POSA would have understood increasing filter size (surface area and volume) increases the amount of air filtration and allows the filter to filter more particles before becoming clogged. Ex1028, 9:47-60. A POSA would have been motivated to increase the amount of pre-motor filtration to increase the overall amount of filtration during operation, to further protect the motor from being damaged by dirty air, and to decrease the resistance of airflow through the filter. Ex1002 ¶199. A POSA would have understood “pre-motor filter 1545” could be increased by enlarging Butler’s “housing 502”/“fan motor

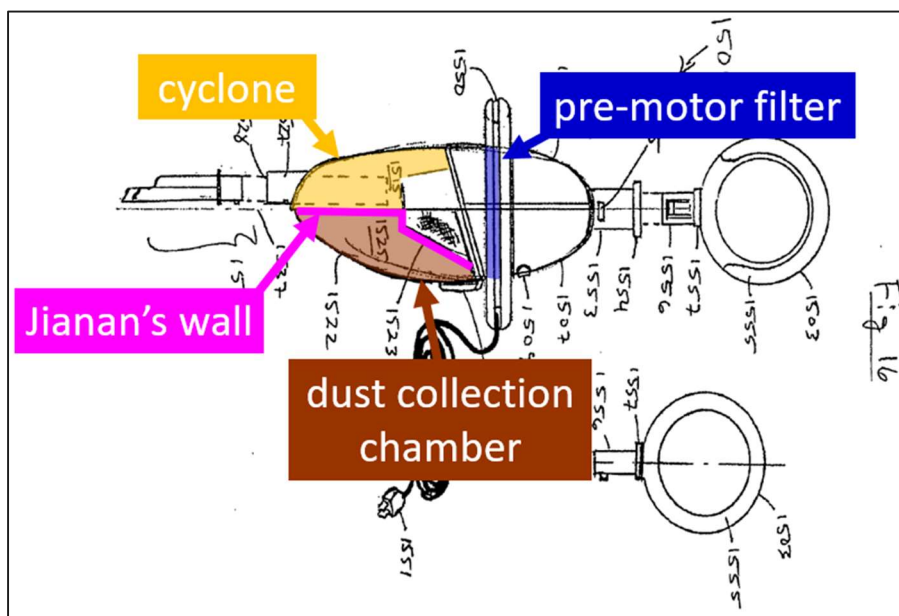
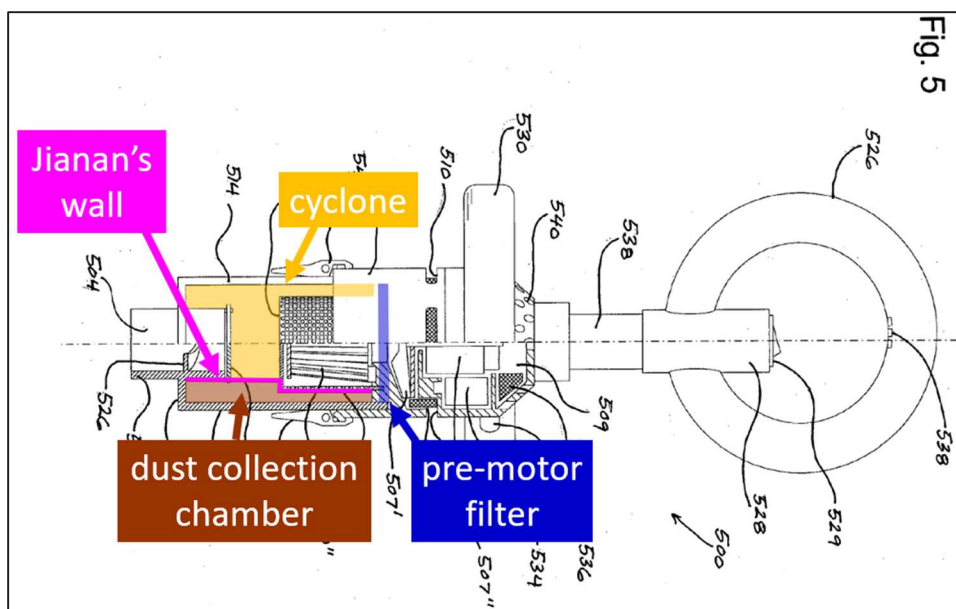
housing 1520” to accommodate the larger “**pre-motor filter 1545**” and would have been motivated to do so:

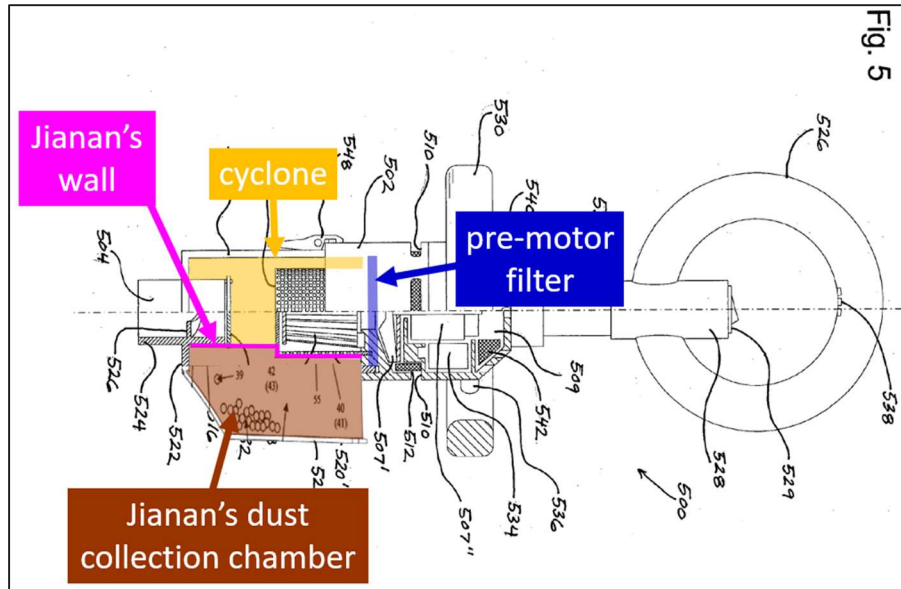


Ex1005, Fig. 16(modified); Ex1002 ¶199. When so modified, the “**pre-motor filter 1545**” has a height larger than a diameter of the **cyclone**. Ex1002 ¶200.

A POSA would have had a reasonable expectation of success making this modification because it would involve modestly enlarging Butler’s pre-motor filter and rear housing components, which would have been straightforward. Ex1002 ¶201.

This limitation is also met when Butler’s “dirt receptacle compris[ing] a cyclone separator” is modified in view of Jianan’s “independent **dust collection chamber**” teachings, as the **pre-motor filter 1545’s** height is larger than a diameter of the **cyclone**, which is contained in the cyclone chamber:





Ex1005, Figs. 5(modified), 16(modified); Ex1006, Fig. 5(modified); Ex1002 ¶¶202-203.

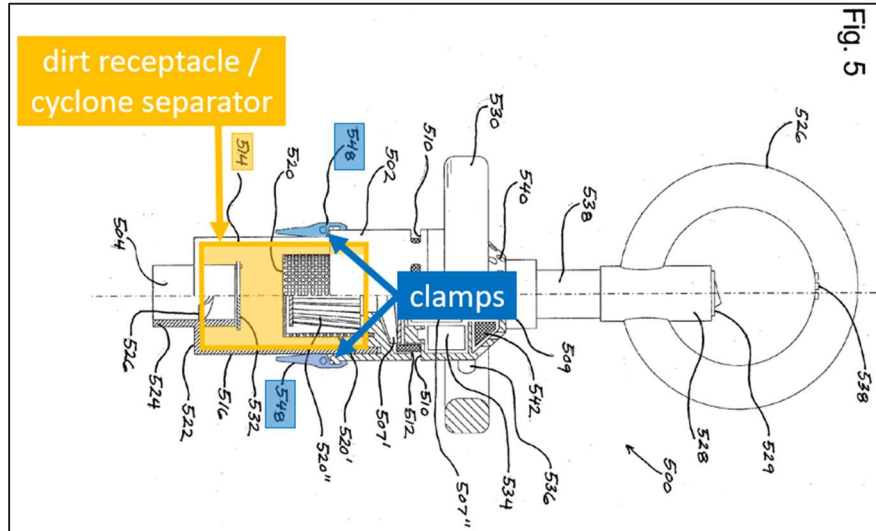
A POSA would have been motivated to modify Butler’s “dirt receptacle compris[ing] a cyclone separator” with Jianan’s exterior dirt-collection chamber teachings and would have reasonably expected success. Ground 1, §1.

3. [2]/[12]

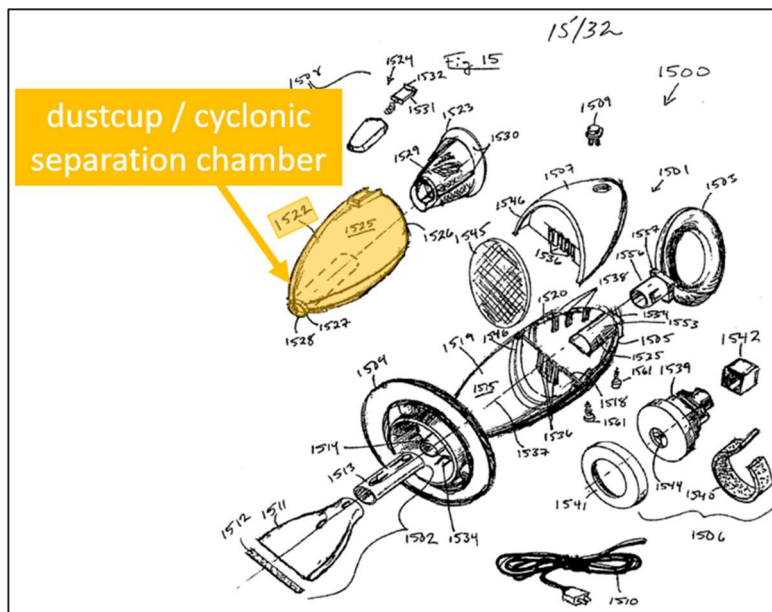
Butler in combination with Jianan renders claims 1 and 10 obvious and Butler teaches the remaining limitations of these claims. Ex1002 ¶¶204-208.

Butler teaches the cyclone unit is removably mounted to the main body. Ex1002 ¶¶206-208. Butler’s “**dirt receptacle [514]** compris[ing] a **cyclone separator**” (cyclone unit) may be “removably attached at a bottom end of the housing 502” (removably mounted to the main body) by “[a] set of over-center

clamps 548 [that] are used to hold the dirt receptacle 514 and housing 502 together”:



Ex1005, 21:8-15, Fig. 5; Ex1002 ¶206. Likewise, Butler’s “dustcup” with a “cyclonic separation chamber” (cyclone unit) “is removably installed in the dustcup chamber 1519” of “[t]he body 1505”:



These limitations are also met when Butler is modified in view of Jianan.
Ground 1, §1.

4. [3]

Butler in combination with Jianan renders claim 1 obvious and Butler teaches the remaining limitations of this claim for the same reasons discussed for [1a.2]/[8a.2]/[10a.2]/[14a.2]. Ground 1, [1a.2]/[8a.2]/[10a.2]/[14a.2]; Ex1002 ¶¶209-210.

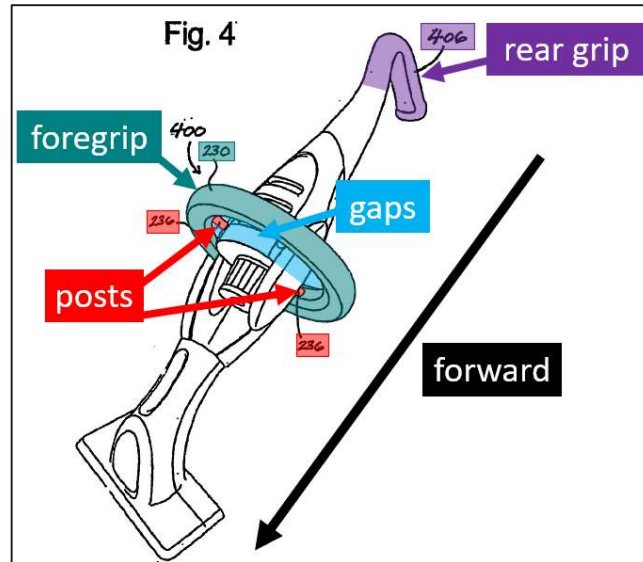
5. [4]

Butler in combination with Jianan renders claim 1 obvious and Butler teaches the remaining limitations of this claim for the same reasons discussed for [1a.1]/[8a.1]/[9a.1]/[10a.1]/[14a.1]/[15a.1]. Ground 1, [1a.1]/[8a.1]/[9a.1]/[10a.1]/[14a.1]/[15a.1]; Ex1002 ¶¶211-12.

6. [5]

Butler in combination with Jianan renders claim 1 obvious and Butler teaches and renders obvious the remaining limitations of this claim. Ex1002 ¶¶213-16.

Butler teaches multiple finger grip areas. Ground 1, [14e]/[15e]/[10f]. Butler further teaches an enclosed finger grip area is provided on a forward side of the pistol-grip handle. Ex1002 ¶¶214-15. Butler's "**gaps**" (finger grip areas) are enclosed by the "circular or looped **foregrip**," "**radial posts**," and the "housing," and are provided on a forward side of "pistol-grip style **rear grip 406**":



Ex1005, Fig. 5; Ex1002 ¶214. A POSA would have understood Butler’s “gaps” are on a forward side of “pistol-grip style rear grip 406,” i.e., the side closest to Butler’s forward end. Ex1002 ¶215.

Further, Butler renders obvious an enclosed finger grip area provided on a forward side of the pistol-grip handle. Ex1002 ¶216. Butler explains “the loop-shaped grips may be replaced by any combination of rear grip and foregrip that provide the user with hand positions to ergonomically maneuver the device,” and the “pistol-grip style rear grip 406” is “one exemplary variation of the grip construction.” Ex1005, 19:9-12, 19:18-24. A POSA reading this teaching would have been motivated to look for other rear grips that “provide the user with hand positions to ergonomically maneuver the device,” including pistol-grips having an enclosed finger area. Ex1002 ¶216. A POSA would have understood such grips beneficially protect a user’s fingers from, for example, being hit or pinched by

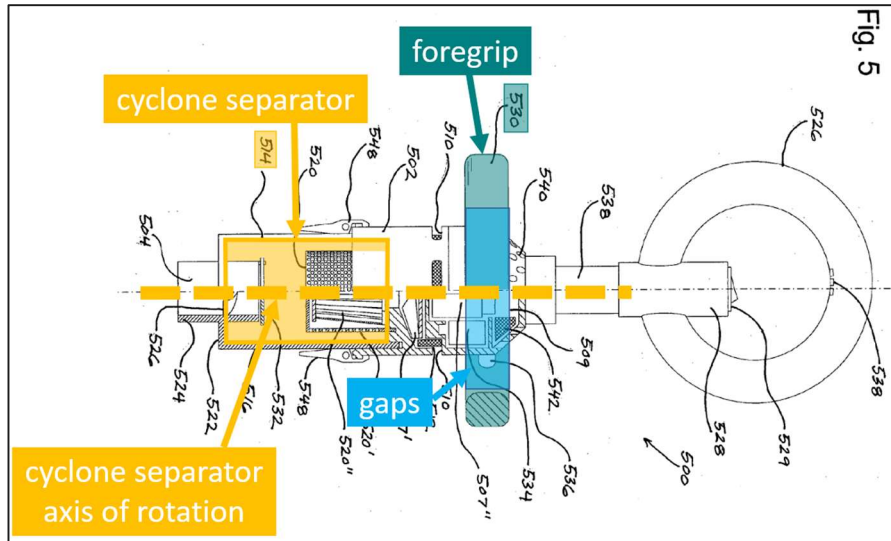
furniture or other obstacles during use of Butler's cleaner, while retaining their ergonomic hand position. Ex1002 ¶216. And a POSA would have understood such grips were well known in the art, including as taught by Butler with Butler's loop-shaped rear grip, which is a grip having an enclosed finger grip area. Ex1005, Figs. 2A, 5; Ex1002 ¶216. A POSA therefore would have found it obvious to modify Butler's "pistol-grip style rear grip 406" to have an enclosed finger grip area provided forward of the pistol-grip style handle, and would have had a reasonable expectation of success because it would have been a straightforward modification of a simple component that Butler teaches can be modified, using an enclosed-grip design that Butler also teaches. Ex1002 ¶216.

7. [6]

Butler in combination with Jianan renders claim 1 obvious and Butler teaches the remaining limitations of this claim. Ex1002 ¶¶217-21.

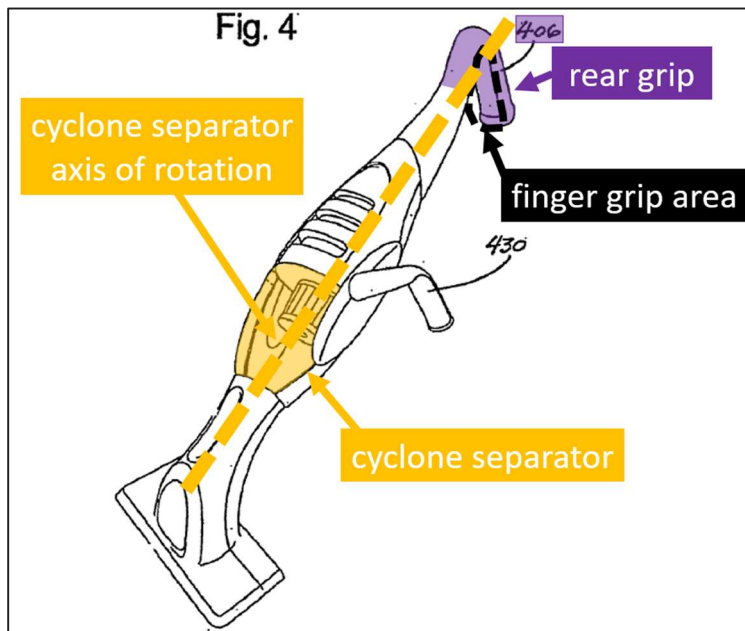
Butler teaches, and the combination of Butler and Jianan teaches a cyclone axis of rotation and a finger grip area. Ground 1, [1a.2]/[8a.2]/[9a.2]/[10a.2]/[14a.2]/[15a.2]/[14e]/[15e]/[10f].

Butler teaches the cyclone axis of rotation intersects the finger grip area. Ex1002 ¶¶219-21. Butler's **cyclone separator axis of rotation** intersects the "gaps" of Butler's "foregrip":



Ex1005, Fig. 5; Ex1002 ¶219.

Likewise, Butler's **cyclone separator axis of rotation** intersects the **finger grip area** of **rear grip 406**:



Ex1005, Fig. 4; Ex1002 ¶220.

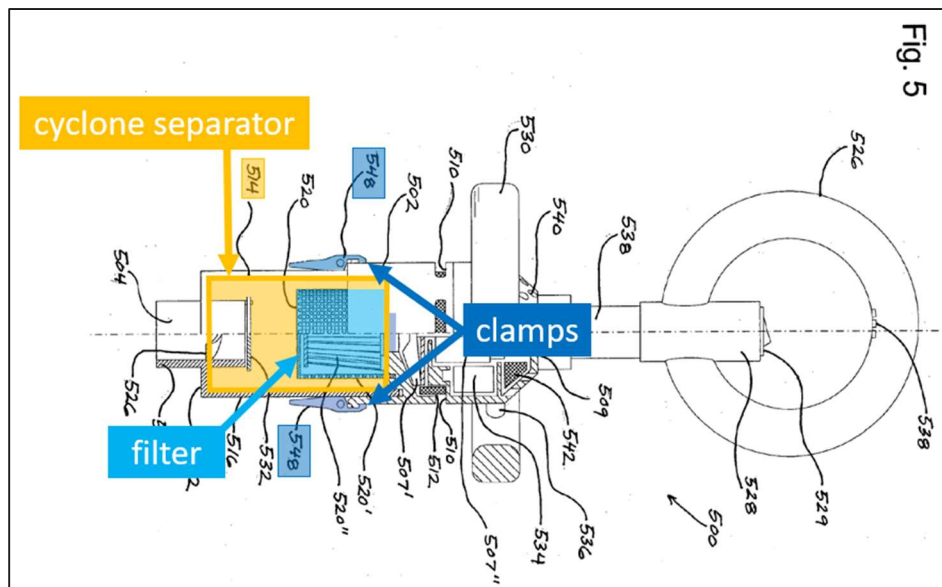
These limitations are also met when Butler is modified in view of Jianan.

Ground 1, §1.

8. [7]/[13]

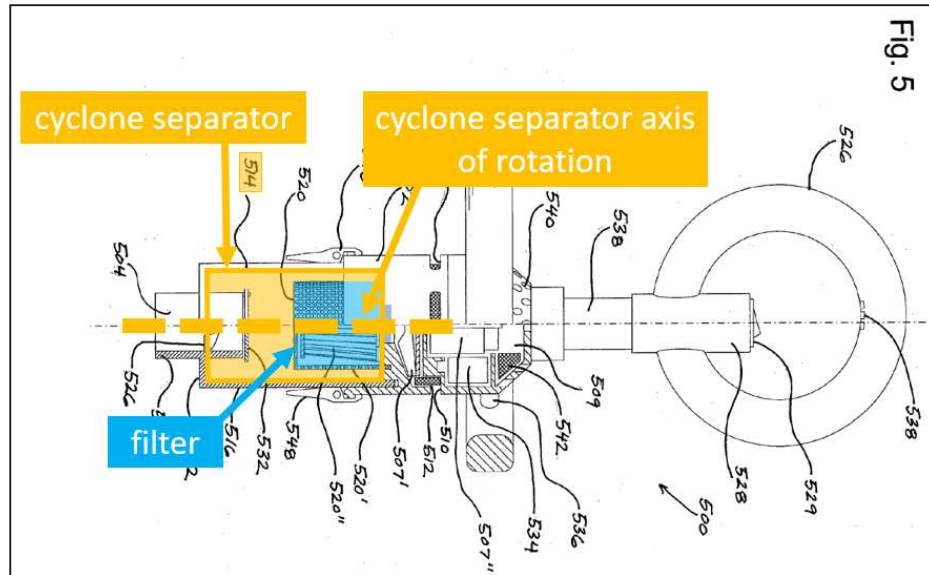
Butler in combination with Jianan renders claims 2/10 obvious and Butler teaches the remaining limitations of these claims. Ex1002 ¶¶222-26.

Butler teaches a pre-motor filter that is accessible when the cyclone unit is removed from the main body. Ex1002 ¶¶224-25. A POSA would have understood that, when Butler’s “cyclone separator” is “remov[ed]” by unclamping “[a] set of over-center clamps 548,” “filter 520 compris[ing] ... fine filter 520'” is accessible:



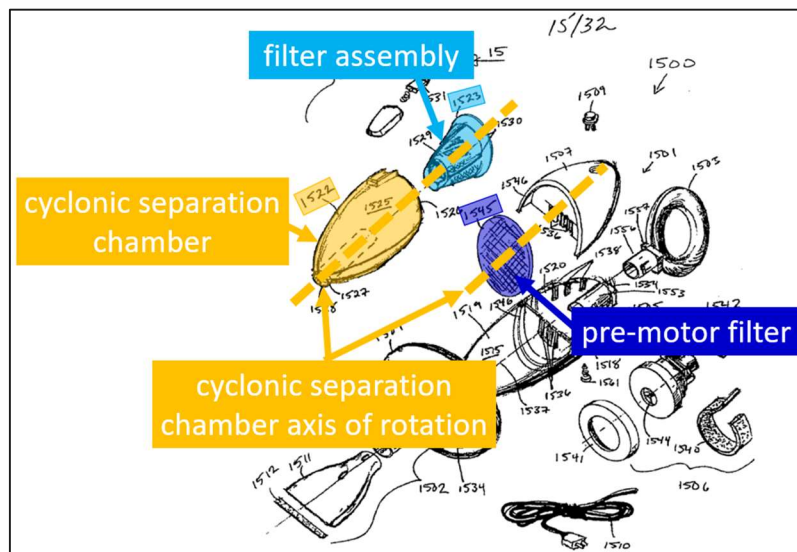
Ex1005, 21:8-15, 21:24-28, Fig. 5; Ex1002 ¶224.

Further, when Butler’s “cyclonic separation chamber” is “remov[ed]” from “[t]he body 1505,” “filter assembly 1523” and “pre-motor filter 1545” are each accessible:



Ex1005, 21:24-28, Fig. 5; Ex1002 ¶229.

Butler’s **cyclonic separation chamber axis of rotation** also intersects both “**filter assembly 1523**” and “**pre-motor filter 1545**”:



Ex1005, Fig. 15; Ex1002 ¶230.

These limitations are also met when Butler is modified in view of Jianan.

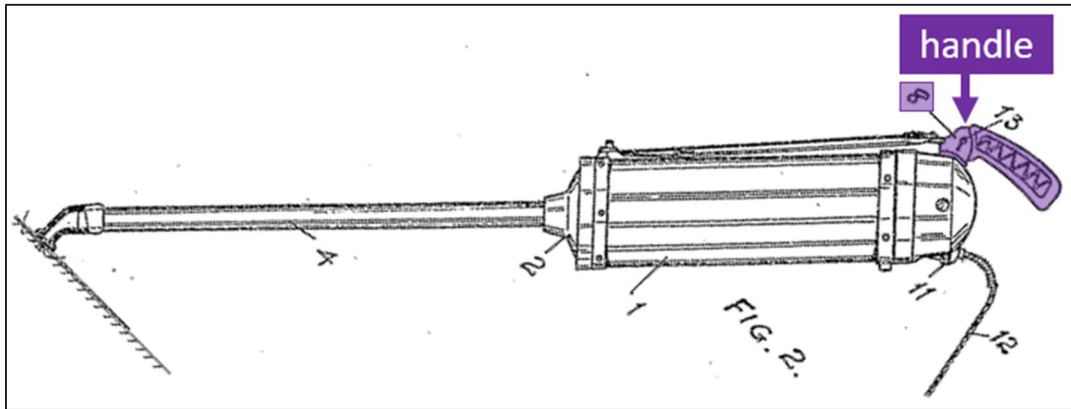
Ground 1, §1.

B. Ground 2: IPVG in Combination with Conrad335 Renders Obvious Claims 1-15

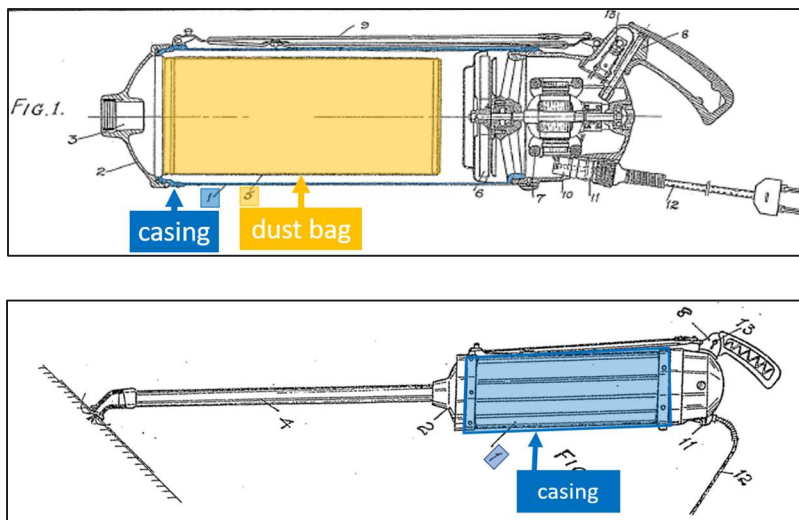
1. A POSA Would Have Combined IPVG and Conrad335

a. Scope and Content of the Prior Art

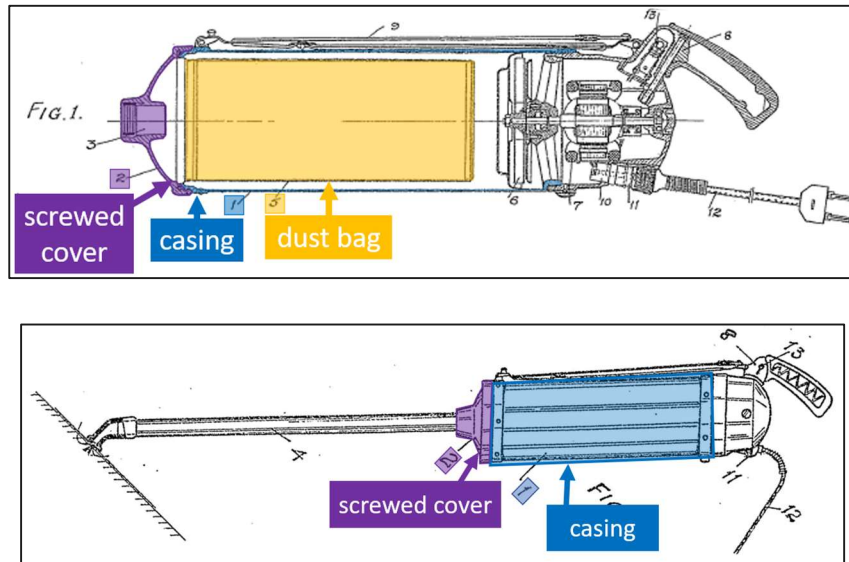
IPVG teaches a “portable dust suction apparatus” with “a **handle [8]**”:



Ex1007, 1:22-33, Fig. 2; Ex1002 ¶232. A POSA would have understood a “portable dust suction apparatus” having a handle and a configuration as illustrated above is a hand vacuum. Ex1002 ¶233. IPVG’s vacuum uses “**dust bag or like member [5]**,” stored in “**casing 1**,” to filter dust:

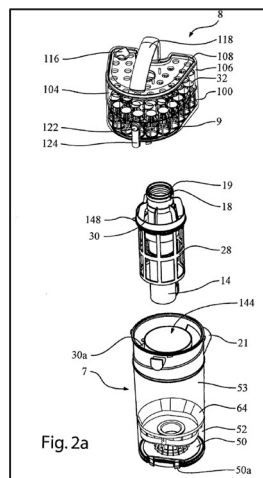


Ex1007, 1:51-57, 2:9-20, Figs. 1-2; Ex1002 ¶234. IPVG’s vacuum is emptied by removing “screwed cover 2” (which “close[s]” “casing 1 ... at the front end”) and removing “dust bag 5”:

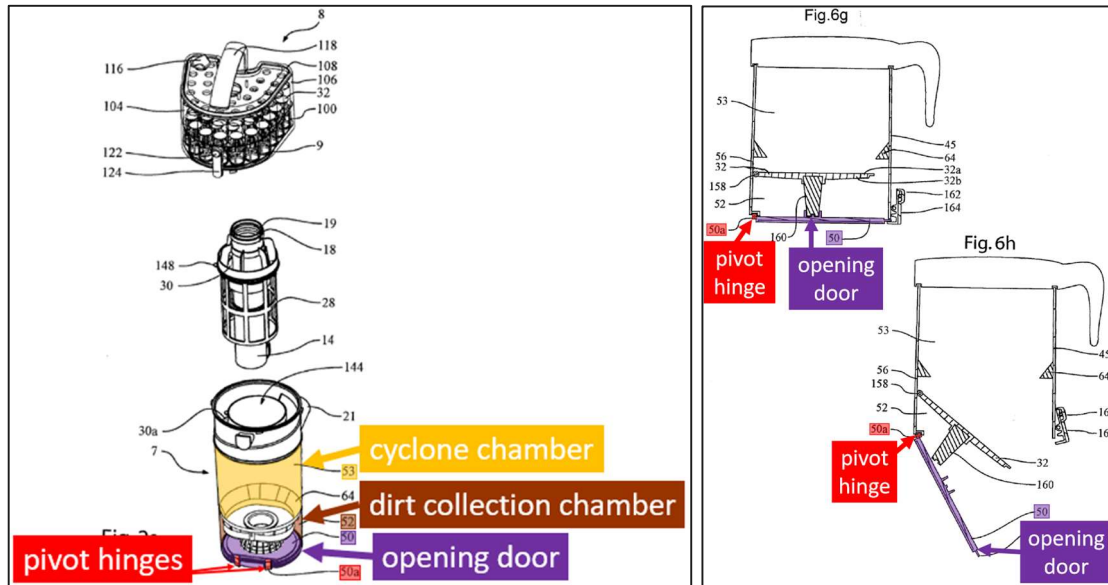


Ex1007, 1:51-57, Figs. 1-2; Ex1002 ¶235.

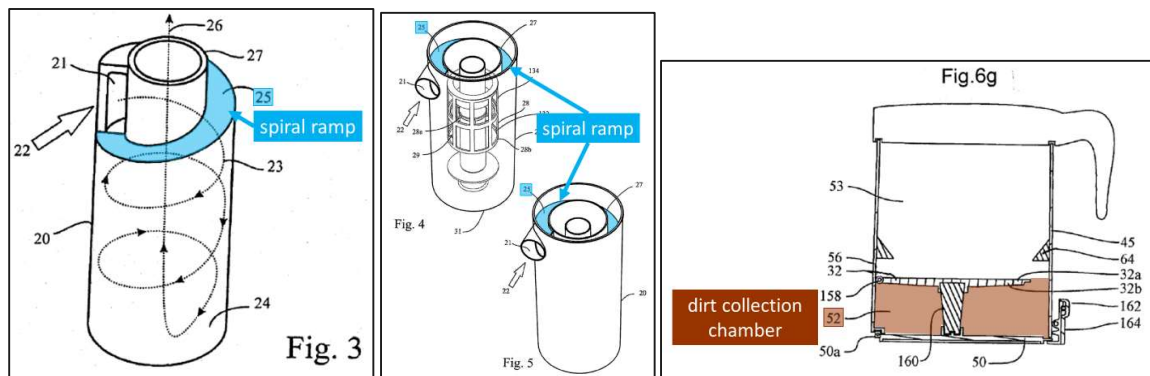
Conrad335 teaches a “cyclone separator” for vacuums, including a “stick” or “hand vacuum”:



Ex1008, Abstract, ¶376, Figs. 1-2a. Conrad335's "cyclone separator" has "a **cyclone chamber [53]** and a **dirt collection chamber [52]**," that is sealed by "opening door 50," with "**pivot hinges 50a**" for emptying collected dirt:



Ex1008, Abstract, ¶¶23, 339, Figs. 2a, 6g-6h; Ex1002 ¶¶236-37. "[S]piral ramp 25 ... create[s] cyclonic circulation 23 in cyclone separator 20," causing "particles ... to be disentrained from the fluid flow stream and accumulate within the lower region," which Conrad335 calls the "**dirt collection chamber [52]**":

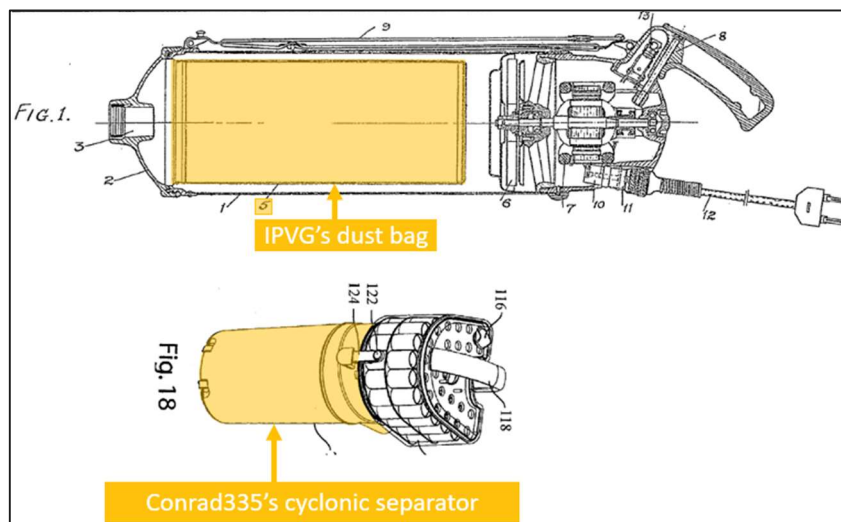


Ex1008, Abstract, ¶¶283-84, Figs. 3-6g; Ex1002 ¶238.

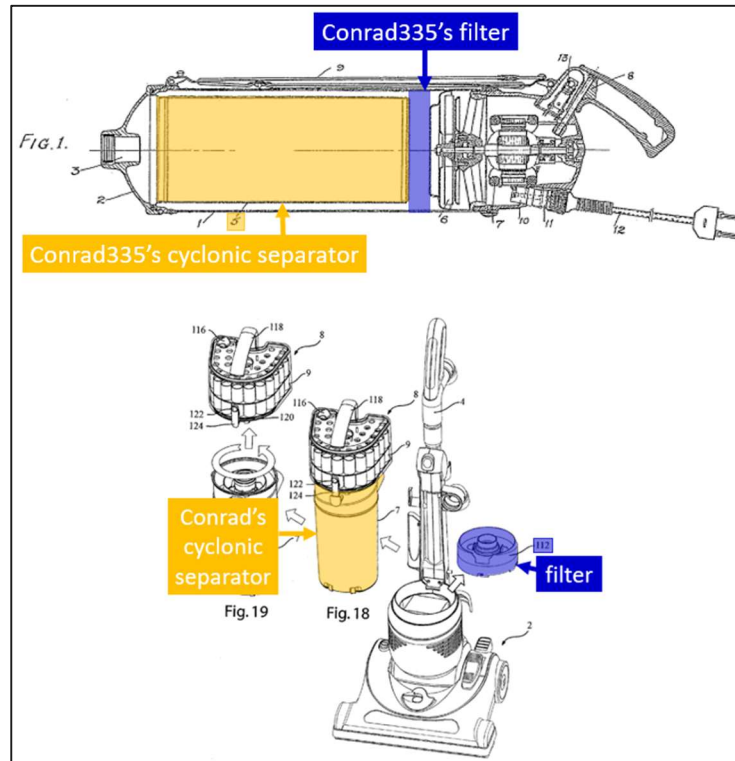
b. Motivation to Combine

A POSA reading IPVG as of the earliest-claimed priority date of the '546 Patent would have been motivated to modify IPVG to achieve the stated benefits of Conrad335's cyclonic-separation system and hinged door. Ex1002 ¶¶239-49. Conversely, a POSA reading Conrad335—including its teaching that “[its] cyclonic embodiments ... may be used in conjunction with ... a hand vacuum” (Ex1008 ¶376)—would have been motivated to incorporate Conrad335's cyclonic-separation unit into hand vacuums such as IPVG's. Ex1002 ¶¶239-49. Specifically, a POSA would have been motivated to combine the teachings of IPVG and Conrad335 as follows:

A POSA would have been motivated to modify IPVG's dust-separation unit (“**dust bag 5**”) to use a cyclonic-filtration unit, such as Conrad335's “**cyclone separator**”:

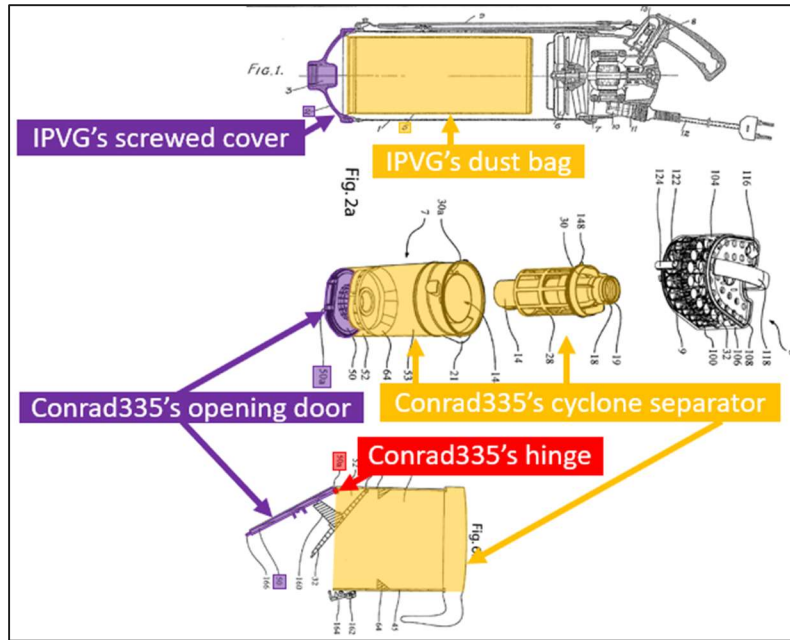


Ex1007, Fig. 1; Ex1008, Fig. 18; Ex1002 ¶240. When making this modification, a POSA would have been further motivated to include a pre-motor filter positioned downstream of the cyclonic separator, such as Conrad335's pre-motor “**filter 112**”:



Ex1007, Fig. 1(modified); Ex1008 ¶373, Figs. 18-19; Ex1002 ¶241.

A POSA also would have been motivated to modify IPVG's screwed-open door (“**screwed cover 2**”) to use a pivot-open door, such as Conrad335's “**opening door 50**” with “**pivot hinges 50a**”:



Ex1007, Fig. 1; Ex1008, Abstract, ¶¶23, 339, Figs. 2a, 6h; Ex1002 ¶242.

A POSA would have been motivated to combine IPVG and Conrad335 as described. Ex1002 ¶¶243-49. **First**, IPVG and Conrad335 are analogous art. Ex1002 ¶243. Like IPVG, which teaches a “portable dust suction apparatus” that uses 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, Conrad335 teaches a “portable vacuum cleaner” that uses an air-filtration unit (a “cyclone separator”) that is sealed at one end by an openable door (“opening door 50”), Ex1008, Abstract, ¶¶23, 84, 339.

Second, Conrad335 and IPVG each provide motivations for this combination. Ex1002 ¶¶244-45. IPVG teaches its air-filtration unit is “a dust bag

or like member through which the air stream passes.” Ex1007, 1:22-33, claim 1. A POSA would have looked for “like members” for filtering air, including cyclonic air-filtration. Ex1002 ¶244. 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) cyclonic cleaners experience comparatively less suction loss as they fill; and (3) cyclonic cleaners give the user a visual indication of how full the container is and when to empty. Ex1002 ¶244. These benefits were well-known in the art at the time the ’546Patent’s priority application was filed. Ex1002 ¶244. 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.” Ex1013, 1.⁶ And a 2002 PCT Publication explained that “so-called bagless vacuum cleaners,” or “cyclonic” cleaners, “are

⁶ Ex1013 is a certified English translation of Ex1012, originally published in French. Citations are by page, as the English translation does not include column/line numbers.

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.” Ex1014, 1:5-10. Further, Conrad335 teaches that its cyclonic separator “may be used ... to create ... a stick” or “hand vacuum.” Ex1008 ¶376. A POSA would have looked for hand/stick vacuum references that could use Conrad335’s cyclonic-filtration teachings, including IPVG’s. As Conrad335 teaches, “[c]yclonic vacuum cleaners are known in the art,” and one “advantage” of Conrad335’s design is that its chamber is transparent so, “when the dirt collection bin is full, a user ... will have a visual signal to empty the cyclonic stage.” Ex1008 ¶¶2, 112.

Further, during the ’546Patent’s prosecution, the Examiner found—and the Applicant did not dispute—that “it would have been obvious to one skilled in the art at the time of the invention to substitute [a] cyclone unit ... for [a non-cyclonic] separation assembly ... since the cyclone unit ... is used for the same purpose of separating dust particles from air as the separation assembly.” Ex1004, 445-46, 473-86.

Third, a POSA would have been motivated to include a pre-motor filter positioned downstream of the cyclone unit when implementing Conrad335’s cyclonic-filtration teachings into IPVG. Ex1002 ¶246. A POSA would have understood that using such a filter had certain benefits, including (1) protecting the

suction motor from debris that remained entrained in the airflow, increasing component longevity, reducing losses in suction motor efficiency, and reducing recurring costs, and (2) more effective air treatment. Ex1002 ¶246. These benefits were well-known at the time '546Patent's priority application was filed. Ex1002 ¶246. For example, in 2007 Jianan disclosed a "filter" located "downstream" of the "cyclones" and explained that "[t]he filter removes any matter from the air that has not been separated by the cyclone," such as "sharp or hard objects" and "very fine dust," and "acts as a safety guard for the impeller and motor." Ex1006, 4-5, 10, Figs. 2a-3, 5-6.

Fourth, a POSA would have known that Conrad335's hinged "opening door 50" had certain benefits over IPVG's "screwed cover 2," including ease of opening for cleaner emptying, and would have been motivated to incorporate Conrad335's hinged-door teachings into IPVG. Ex1002 ¶247. 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, a cleaner having Conrad335's "opening door 50" may be emptied by simply holding the cleaner over a trashcan and pivoting the door open "such as by pushing [a] button." Ex1007, 1; Ex1008 ¶339. By contrast to IPVG's "screwed cover 2," a POSA would have understood Conrad335's "opening door 50" can empty dirt more quickly, conveniently, and hygienically. Ex1002 ¶247.

Fifth, this combination would have involved a simple substitution of known elements for others to obtain predictable results. Ex1002 ¶248. IPVG teaches a cleaner having a dust-separation unit (a dustbag) with a door covering one end that opens with screws. Ex1007, Fig. 1. Conrad335 teaches a dust separation unit (cyclonic airflow and a downstream pre-motor filter) with door covering one end that opens with a hinge. Ex1008, Fig. 2a. A POSA would have understood the simple 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. Ex1002 ¶248. Further, as depicted above, IPVG and Conrad335 are directed to vacuums having a similar orientation of separation unit relative to door, which would have further motivated a POSA to make the substitution. Ex1007, Fig. 1; Ex1008, Figs. 2a, 6h; Ex1002 ¶248.

Sixth, it would have been at least obvious to try this combination. Ex1002 ¶249. A POSA would have understood there were a finite number of identified dust-separation solutions, including dust bags (as IPVG teaches) and cyclonic separators (as Conrad335 teaches). Ex1002 ¶249. And, a POSA would have understood there are a finite number of identified openable-door solutions, including screwed doors (as IPVG teaches) and hinged doors (as Conrad335

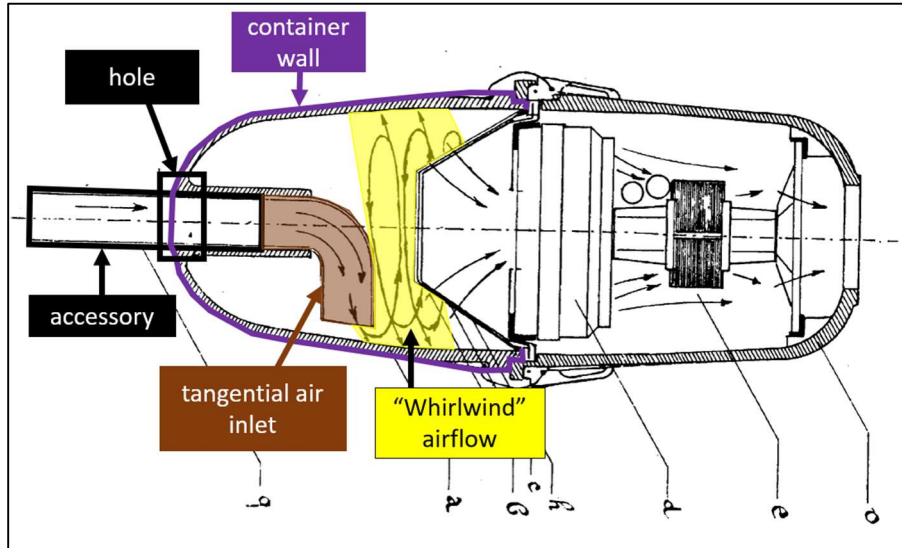
teaches), and it would have been obvious to try to achieve the known benefits described above. Ex1002 ¶249.

c. Reasonable Expectation of Success

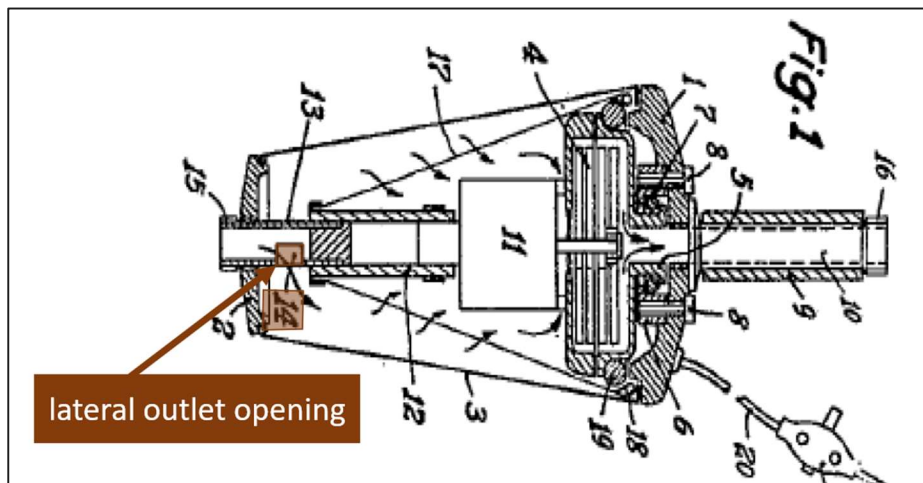
A POSA would have reasonably expected success combining IPVG's and Conrad335's teachings as described. Ex1002 ¶¶250-57. A POSA would have understood these two types of dust-separation units could have been used interchangeably, and that these two openable doors could also have been used interchangeably. Ex1002 ¶250. A POSA would have further expected success for the reasons stated above, including because such modification involved a simple substitution of known elements that perform similar functions in similar ways, and because of the express motivations found in Conrad335 and IPVG to perform such substitutions. Ex1002 ¶250.

Further, a POSA would have reasonably expected success incorporating Conrad335's cyclonic-separation teachings, including "filter 112," into IPVG because it was well-known that front-located air inlets (such as IPVG's) create cyclonic separation by using a tangential opening. As Conrad335 explains, "a spiral or tangential inlet" can create a cyclone. Ex1008 ¶224. Front-located tangential air inlets have been used for cyclonic cleaners since well before the '546Patent. For example, a 1955 French patent taught a "**tangential[]**" **air inlet** and removable **accessory** attached thereto through a **hole** in the "detachable" front

“wall of the ... container” that created cyclonic airflow (“the ‘Whirlwind’ principle”):



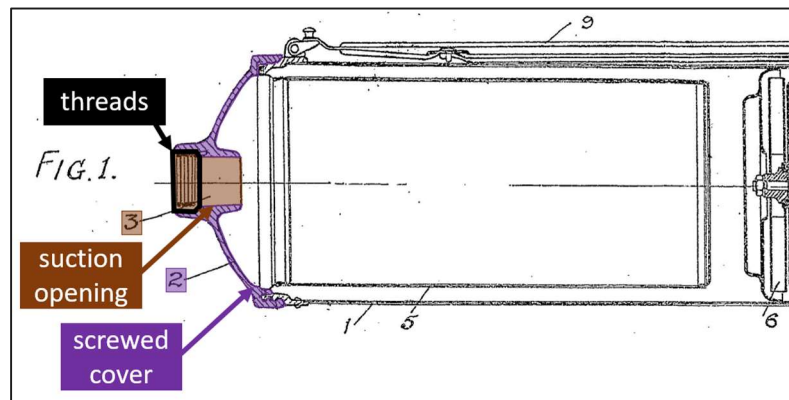
Ex1013, 1, Fig. 1; Ex1002 ¶251. Similarly, a 1938 Swiss patent disclosed a cleaner with a front-mounted accessory and air inlet, which contained “**lateral outlet opening 14**” that a POSA would have understood created cyclonic airflow:



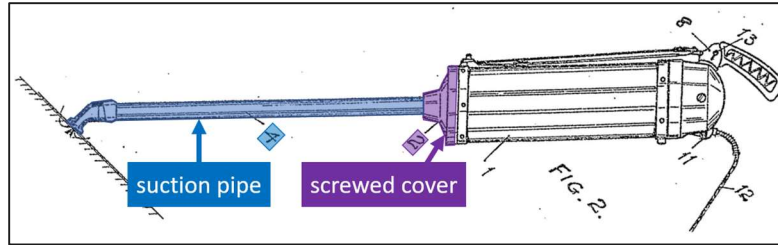
Ex1010, 2, Fig. 1⁷; Ex1002 ¶252.

A POSA would have understood the same configuration would create cyclonic airflow in the combined teachings of IPVG and Conrad335 by simply incorporating a tangential cyclone air inlet, such as Conrad335’s “inlet 21” (Ex1008 ¶283), and such a pipe would connect IPVG’s air inlet with Conrad335’s tangential “inlet 21.” Ex1002 ¶253.

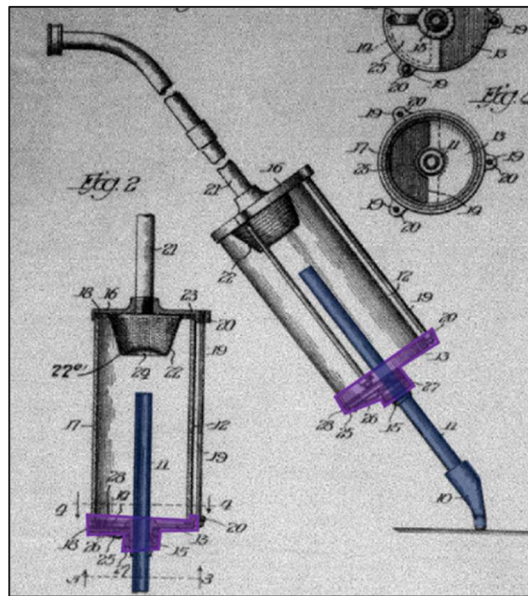
Finally, a POSA would have reasonably expected success incorporating Conrad335’s hinged lid and lid-opening mechanism into IPVG’s vacuum cleaner. Ex1002 ¶¶254-57. IPVG teaches a **threaded “suction opening 3”** to which “a **suction pipe 4**” with corresponding mating threads can be attached for use and detached to allow “**screwed cover 2**” to be removed for emptying the cleaner:



⁷ Ex1010 is a certified English translation of Ex1009, originally published in German. Citations to Ex1010 are by page, as the English translation does not include column/line numbers.

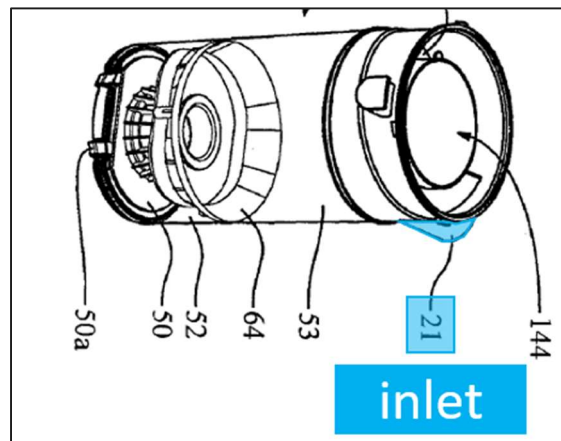


Ex1007, 1:51-57, Figs. 1-2; Ex1002 ¶254. Conrad335's cyclone-separator teachings “may be used ... with ... a stick” or a “hand vacuum,” for which front-mounted accessories were common. Ex1008 ¶376; Ex1002 ¶255. For example, Butler teaches a cyclonic hand vacuum with removable accessories such as an “inlet nozzle” and/or “nozzle connector,” that are removably “attached to the housing ... by snap engagement” for easy attachment and removal. Ground 1; Ex1005, 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. Further, **accessories** projecting through **openable front doors** in cleaners have existed for over a century:



Ex1015, Figs. 1-2 (1915); Ex1002 ¶255. A POSA would have understood front-mounted accessories could be detachable, as IPVG teaches to allow Conrad335's door to pivot open. Ex1002 ¶256.

A POSA also would have understood IPVG's "suction pipe 4" could alternatively attach to a cyclone air inlet positioned on the outside of the dirt separation unit, such as Conrad335's "**inlet 21**":



Ex1008, Fig. 2a; Ex1002 ¶257.

2. [1]/[8]/[9]/[10]/[14]/[15]

a. [1pre]/[8pre]/[9pre]/[10pre]/[14pre]/[15pre]

To the extent the preambles are limiting, IPVG teaches them. Ex1002 ¶¶258-60.

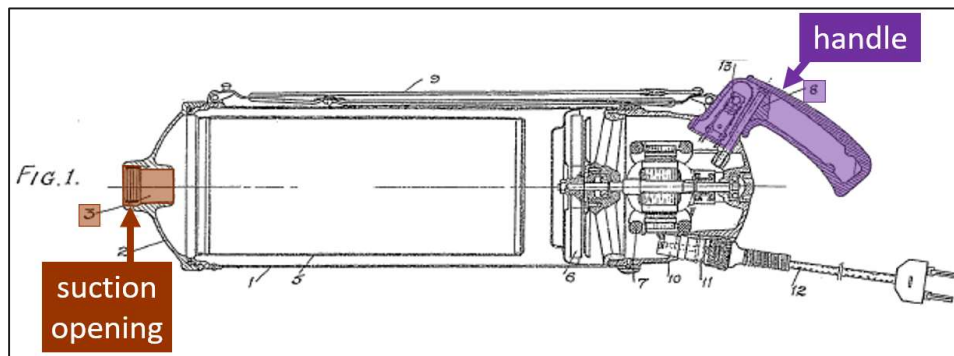
IPVG teaches a "portable dust suction apparatus." Ex1007, 1:10-21. This is a surface cleaning apparatus. Ex1002 ¶259.

Likewise, Conrad335 teaches "[a] surface cleaning apparatus." Ex1008, Abstract.

b. [1a]/[8a]/[9a]/[10a]/[14a]/[15a]

IPVG teaches these limitations. Ex1002 ¶¶261-74.

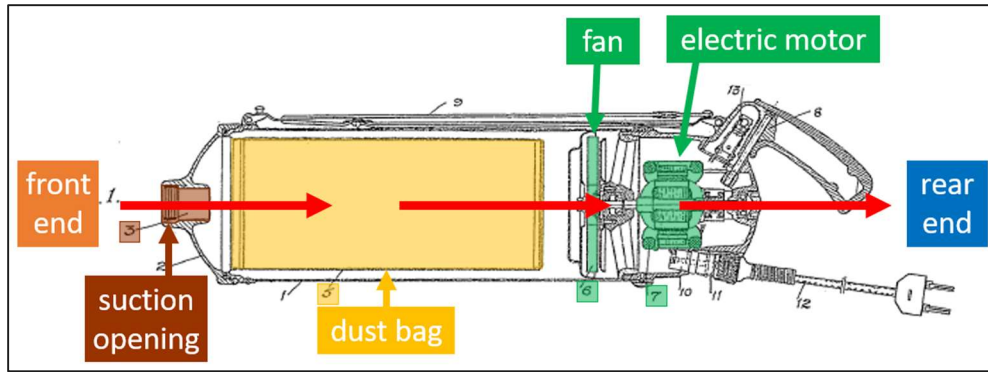
IPVG teaches a hand vacuum cleaner. Ex1002 ¶¶262-63. IPVG teaches a “portable dust suction apparatus” that “may be readily lifted” by a “**handle [8]**” that the operator holds with a single hand “during manipulation of the apparatus”:



Ex1007, 1:10-33, claims 1-2, Fig. 1; Ex1002 ¶¶262. This is a hand vacuum cleaner. Ex1002 ¶¶263.

Likewise, Conrad335 teaches a “hand vacuum.” Ex1008 ¶¶1, 376.

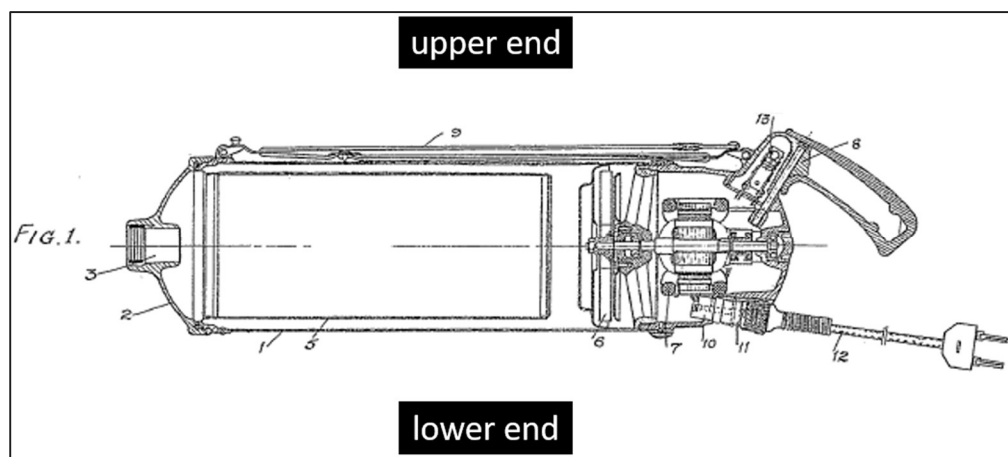
Regarding [1a]/[8a]/[9a], IPVG’s hand vacuum has a front end having a dirty air inlet, a rear end, and a clean air outlet. Ex1002 ¶¶265-66. IPVG’s hand vacuum cleaner has a “casing 1 closed at the **front end** by a screwed cover 2.” Ex1007, 1:51-57. In use, air flows in “**suction opening 3**” (located 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**:



Ex1007, 1:51-62, 1:92-2:2, Fig. 1; Ex1002 ¶265. IPVG’s “suction opening 3” is a dirty air inlet, and IPVG’s “exhaust or blowing end of the casing” is a clean air outlet. Ex1002 ¶266.

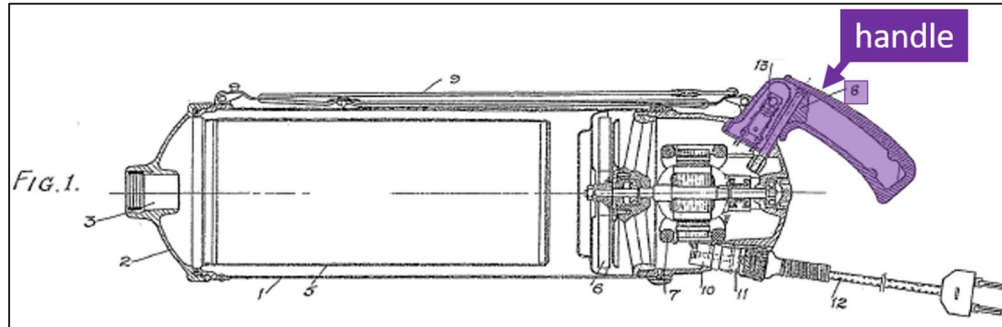
Likewise, Conrad335 teaches a dirty air inlet and a clean air outlet. Ex1002 ¶267. Conrad335 has a “dirty air inlet” and uses cyclonic separation to clean the air that then “travels ... to a fluid flow motor that is preferably a suction motor 15 prior to exiting vacuum cleaner 1.” Ex1008 ¶274.

IPVG’s vacuum has an **upper end** and a **lower end**:

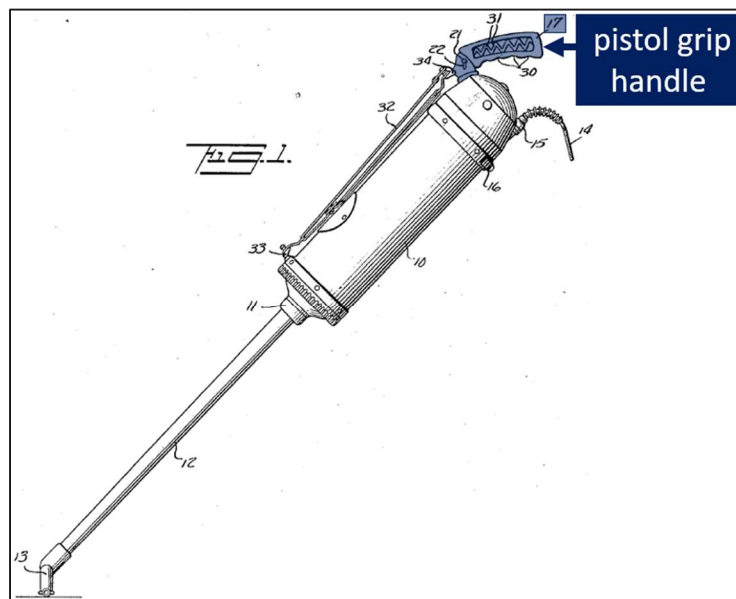


Ex1007, Fig. 1; Ex1002 ¶268.

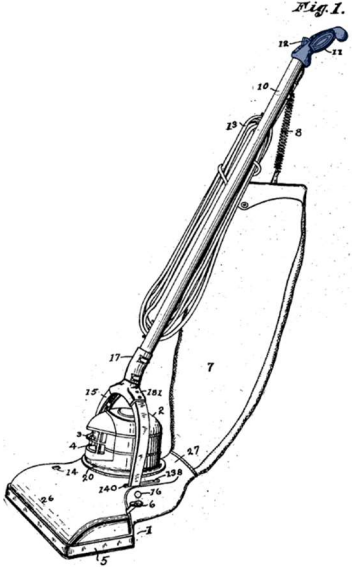
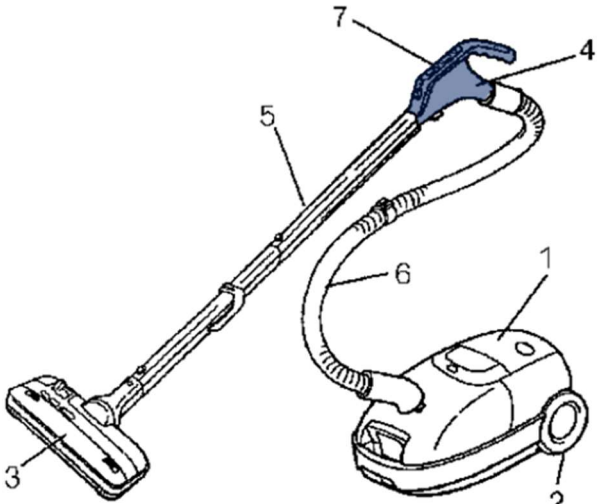
IPVG teaches a pistol-grip handle. Ex1002 ¶¶269-73. A POSA would have understood IPVG’s “**handle 8**” is a pistol-grip handle:



Ex1007, Fig. 1; Ex1002 ¶269. 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 ha[ving] the general form of a pistol grip,” which looks nearly identical to IPVG’s handle:



Ex1016, 1:53-54, Fig. 1; Ex1002 ¶270. Likewise, various other prior-art handles that resemble IPVG’s handle have been described as **pistol-grip vacuum handles**:

Ex1017, 2:28-32 (“pistol grip 11”), Fig. 1 (1937)	Ex1019 ¶6 (“4 is a gun-type handle”), Fig. 1 (1993)
 A technical drawing of a mechanical device, likely a vacuum cleaner, featuring a pistol grip labeled 11. The device includes a long handle (10) and a base (7) with various internal components and rollers (e.g., 1, 2, 3, 4, 5, 6, 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 technical drawing of a device with a gun-type handle labeled 4. The device includes a long handle (5) and a base (1) with a roller (2). A cable (6) connects the handle to the base. The handle has a trigger (3) and a button (7).

Further, pistols with handles like IPVG’s handle have existed for centuries:



Thus, a POSA would have understood IPVG’s “handle 8” is a pistol-grip handle. Ex1002 ¶273.

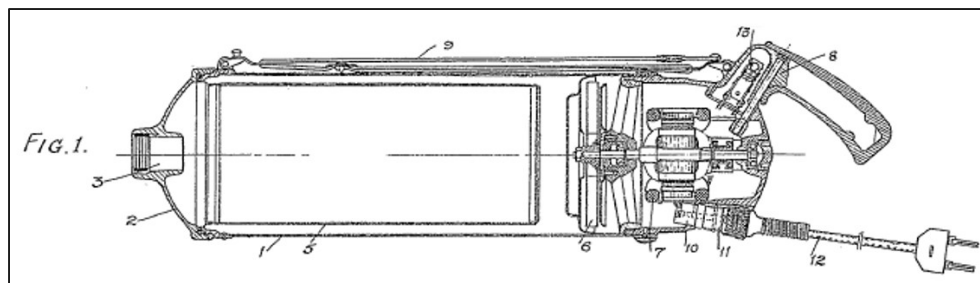
A POSA would have been motivated to combine the teachings of IPVG and Conrad335 and would have reasonably expected success, Ground 2, §1, and would

have been motivated to use an airflow passage from a dirty air inlet to a clean air outlet. Ex1002 ¶274. 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) to a clean air outlet, such as IPVG’s “exhaust.” Ex1002 ¶274.

c. [1a.1]/[8a.1]/[9a.1]/[10a.1]/[14a.1]/[15a.1]

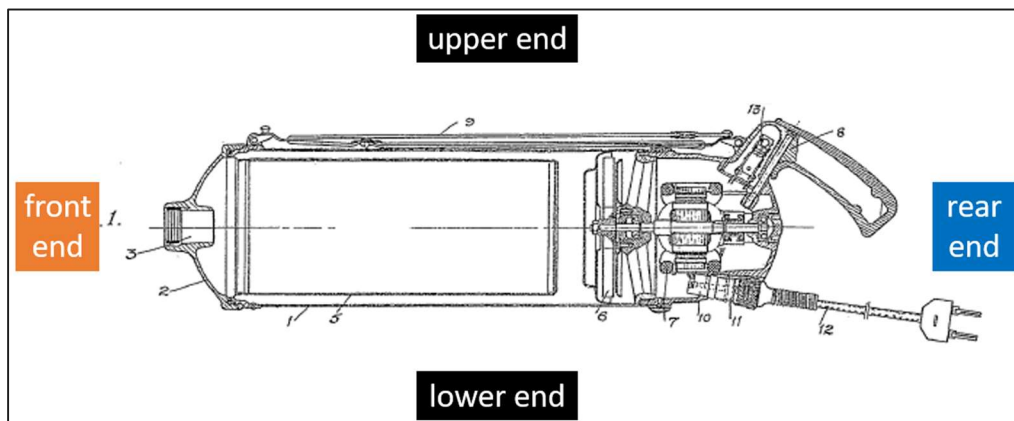
IPVG teaches these limitations. Ex1002 ¶¶275-84.

IPVG’s vacuum has a main body:



Ex1007, Fig. 1; Ex1002 ¶277.

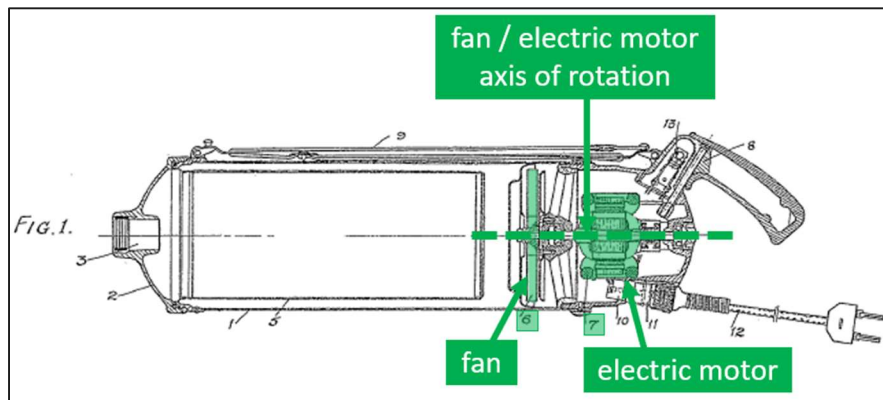
IPVG’s main body comprises an **upper end**, a **lower end**, a “**front end**,” and a “**rear end**”:



Ex1007, Fig. 1; Ex1002 ¶278; Ground 2, [1a]/[8a]/[9a]/[10a]/[14a]/[15a].

IPVG's main body houses a suction motor and fan assembly, the suction motor and fan assembly having a suction motor axis of rotation. Ex1002 ¶¶279-80.

IPVG's main body houses “**fan 6** driven by an **electric motor 7**,” which has a **fan/electric motor axis of rotation**:

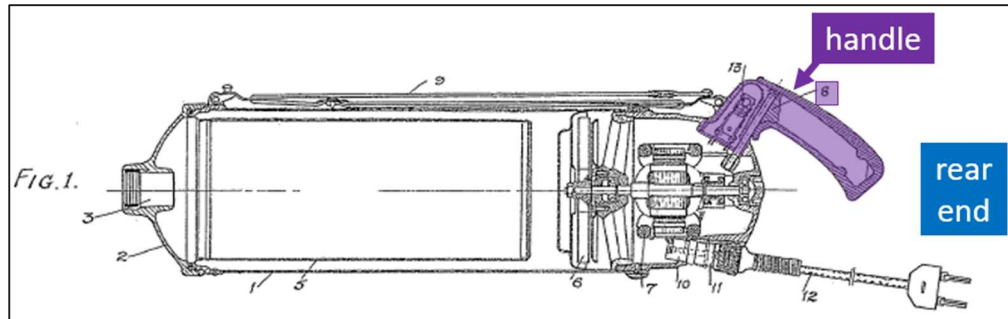


Ex1007, 1:51-57, Fig. 1; Ex1002 ¶279. IPVG's “fan 6” and “electric motor 7” are a suction motor and fan assembly with an axis of rotation. Ex1002 ¶280.

Likewise, Conrad335's main body houses “a suction motor 15.” Ex1008, ¶274.

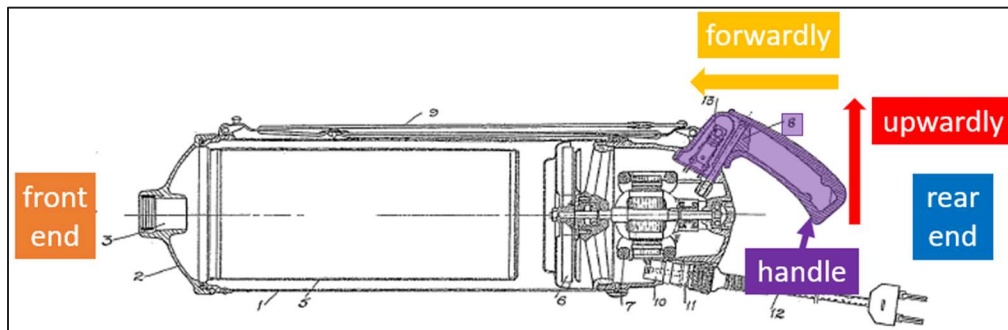
Regarding [10a.1]/[14a.1]/[15a.1], IPVG teaches a pistol-grip handle. Ground 2, [1a]/[8a]/[9a]/[10a]/[14a]/[15a].

Further, IPVG's pistol-grip “**handle 8**” is provided at the “**rear**” **end** of the main body:



Ex1007, Fig. 1; Ex1002 ¶283; Ground 1, [1a]/[8a]/[9a]/[10a]/[14a]/[15a].

IPVG teaches the pistol-grip handle extends upwardly and forwardly when the hand vacuum cleaner is positioned with the front end forward of the rear end. Ex1002 ¶284. When IPVG's vacuum is positioned with the “**front end**” forward of the “**rear**” end, pistol-grip “**handle 8**” extends **upwardly** and **forwardly**:



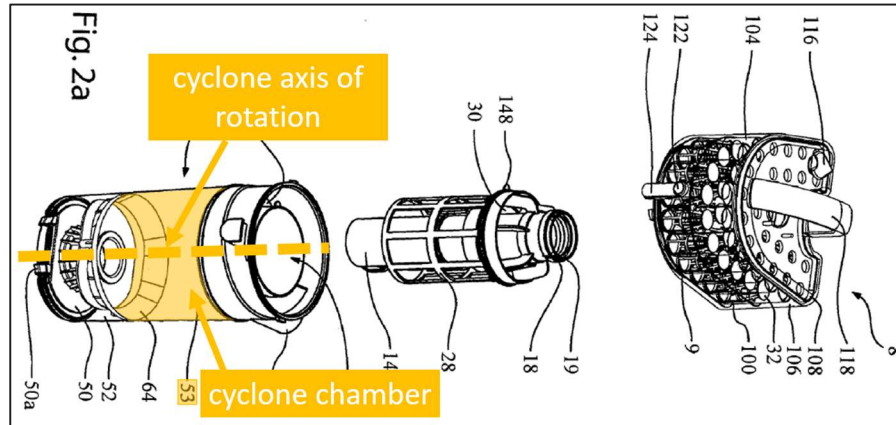
Ex1007, Fig. 1; Ex1002 ¶284.

d. [1a.2]/[8a.2]/[9a.2]/[10a.2]/[14a.2]/[15a.2]

IPVG in combination with Conrad335 teaches these limitations. Ex1002 ¶¶285-304.

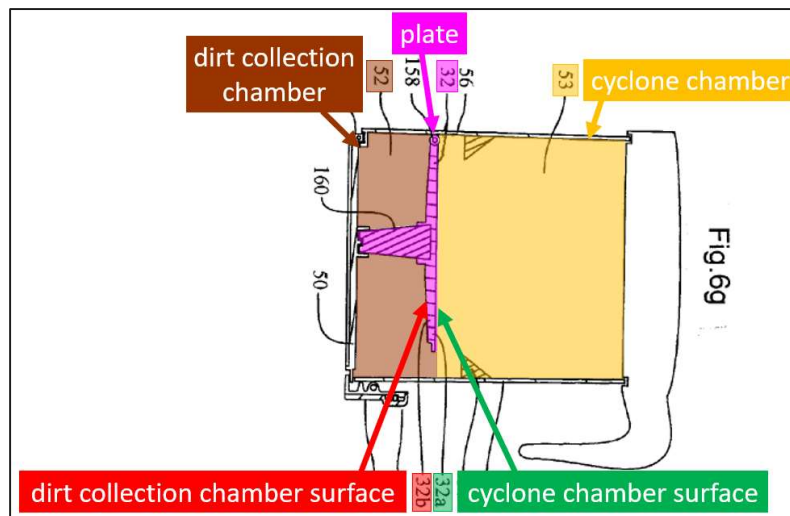
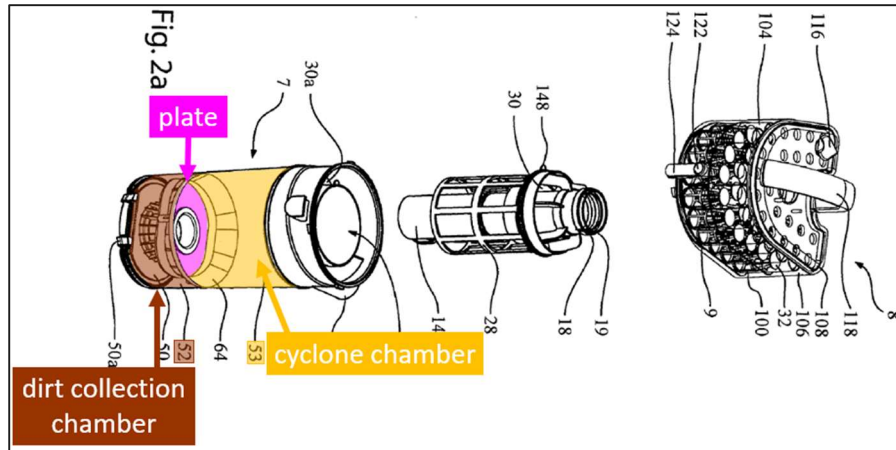
IPVG teaches a “dust bag 5” “through which the suction air stream passes,” which is an air-filtration unit. Ex1007, 1:51-57, claim 1; Ex1002 ¶289.

Conrad335 teaches a cyclone unit comprising a cyclone chamber having a cyclone axis of rotation. Ex1002 ¶¶290-91. Conrad335 teaches “cyclone separator 20,” which includes “a cyclonic region or **cyclone chamber 53**” with a **cyclone axis of rotation**:



Ex1008 ¶318, Fig. 2a; Ex1002 ¶290. Conrad335’s “cyclone separator 20” is a cyclone unit and includes a cyclone in “cyclone chamber 53” with an axis of rotation. Ex1002 ¶291; *see also* Ex1008 ¶¶283-284, 318.

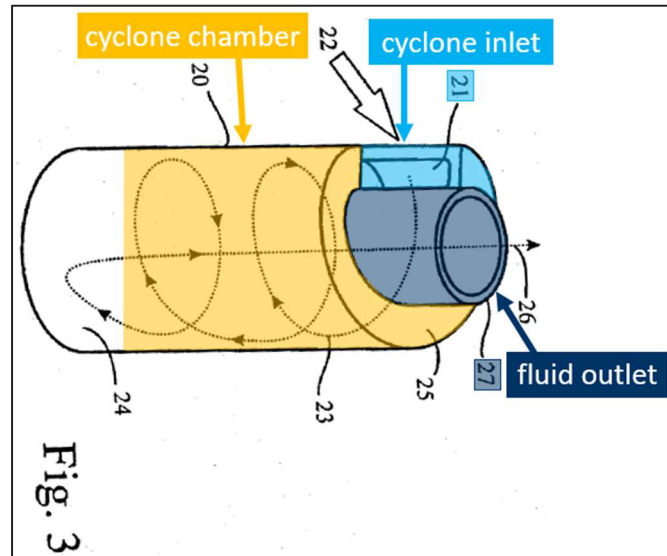
Regarding [9a.2]/[15a.2], Conrad335 teaches a dirt-collection chamber that is exterior to the cyclone chamber. Ex1002 ¶¶292-93. In Conrad335, a “**plate 32** ... divide[s] the interior of a cyclone separator 20 into a cyclonic region or **cyclone chamber 53** and a **dirt collection region or chamber [52]**”:



Ex1008 ¶318, Figs. 2a, 6g; Ex1002 ¶292. Conrad335 further states: “**plate 32** has an upper or **cyclone chamber surface 32a**, [and] a lower or **dirt collection chamber surface 32b**.” Ex1008 ¶318. Conrad335’s “dirt collection region or chamber [52]” is thus exterior to the “cyclone chamber 53.” Ex1002 ¶293.

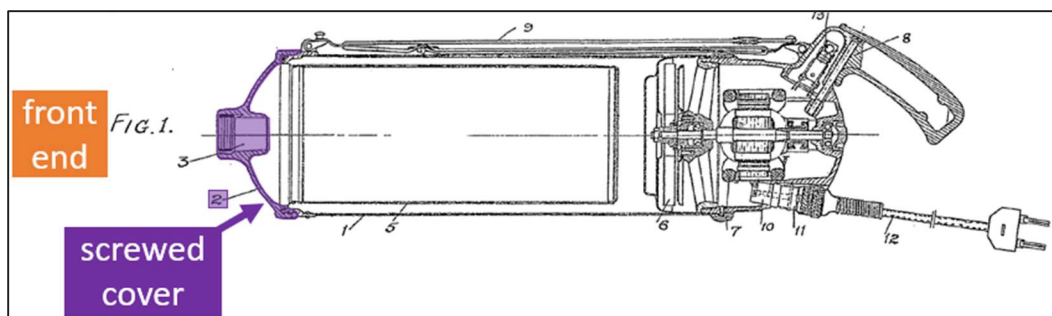
Conrad335 teaches the cyclone chamber having a front end, an axially spaced apart rear end, a cyclone air inlet, and a cyclone air outlet provided at the rear end of the cyclone unit, wherein air exits the cyclone chamber at the rear end of the cyclone chamber. Ex1002 ¶294. Conrad335’s “**cyclone chamber 53**” has a

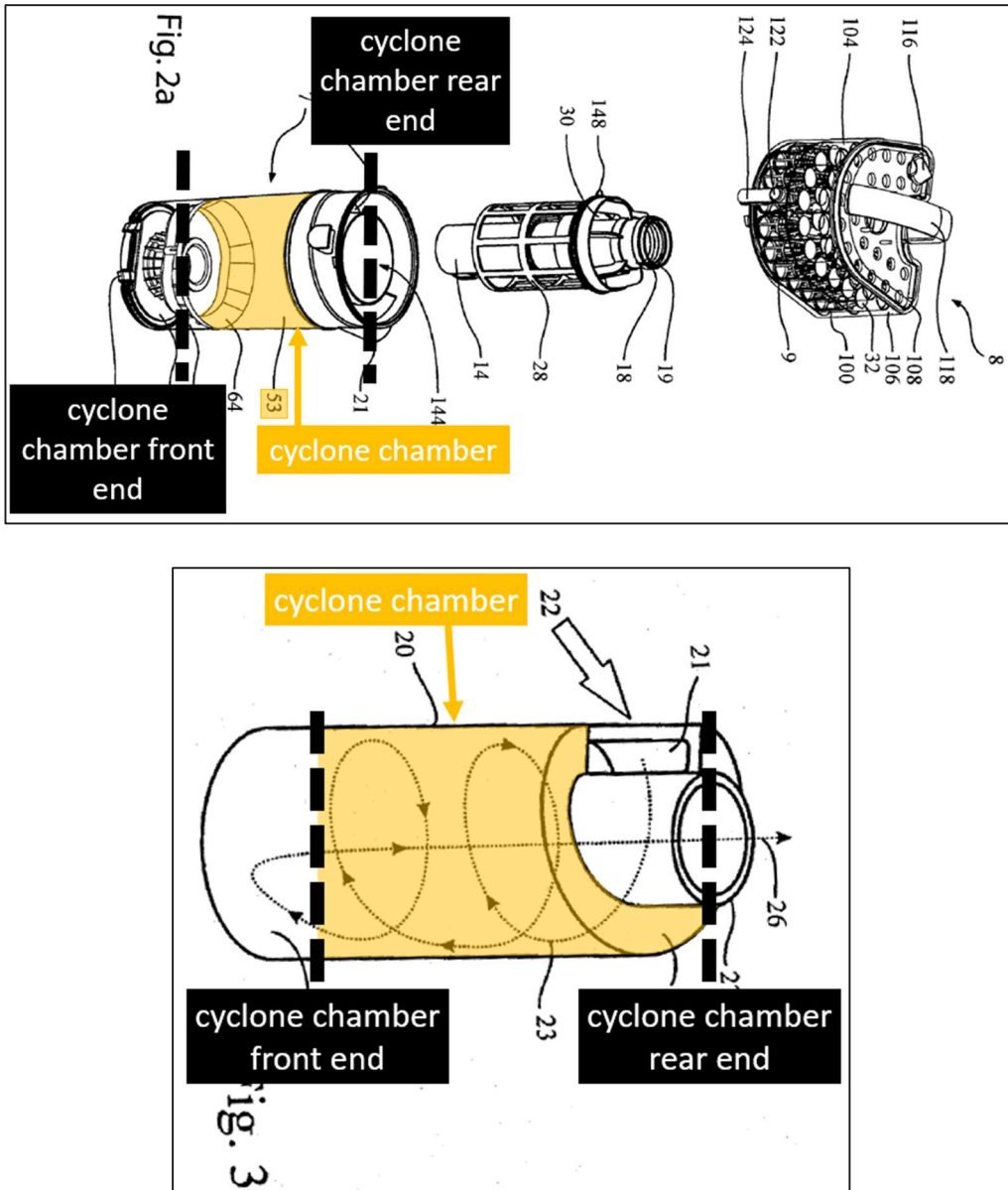
“cyclone inlet 21,” which is a cyclone air inlet, and “fluid outlet 27,” which is a cyclone air outlet:



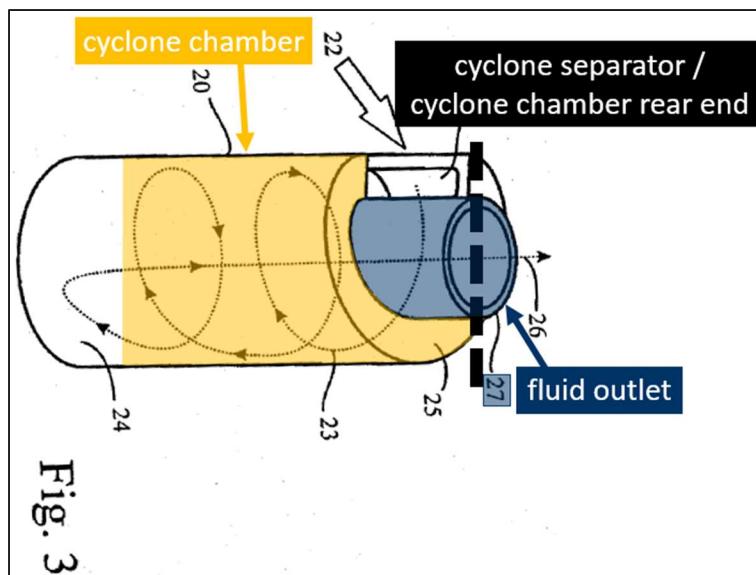
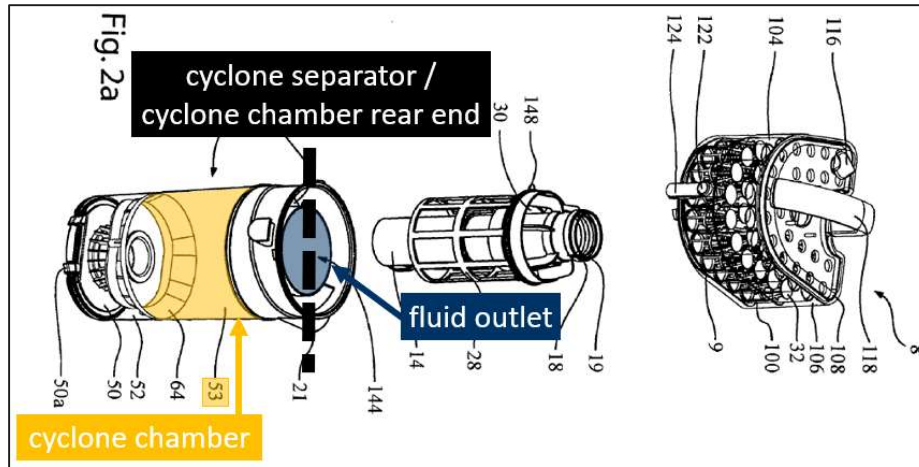
Ex1008 ¶¶284, 324, Fig. 3; Ex1002 ¶294.

When Conrad335’s “cyclone separator 20,” including “cyclone chamber 53” is incorporated into IPVG’s vacuum, Conrad335’s cyclone chamber has a **front end** at IPVG’s “front end” (near “screwed cover 2”), which is at the cleaner front end, and an axially spaced apart **rear end** at the opposite end:



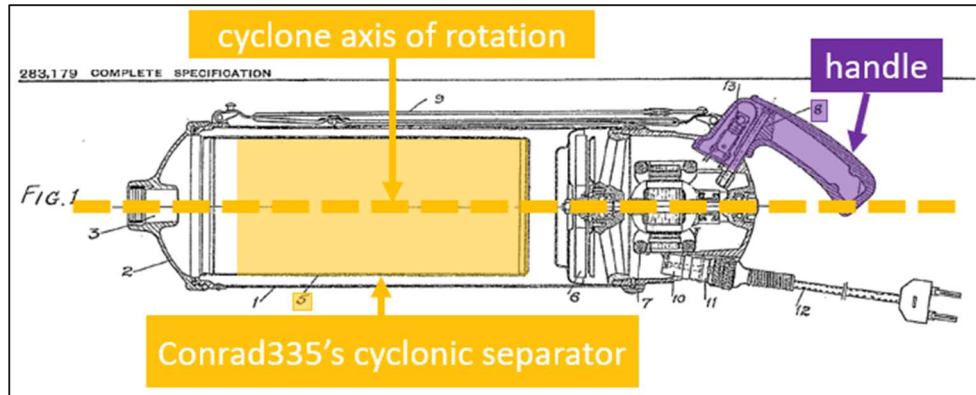


Ex1007, Fig. 1; Ex1008, Figs. 2a, 3; Ex1002 ¶295. Further, Conrad335’s “**fluid outlet 27**” (where air exits the “**cyclone chamber 53**”) is located at the **rear end** of the “cyclone separator 20” (cyclone unit) and “**cyclone chamber 53**”:



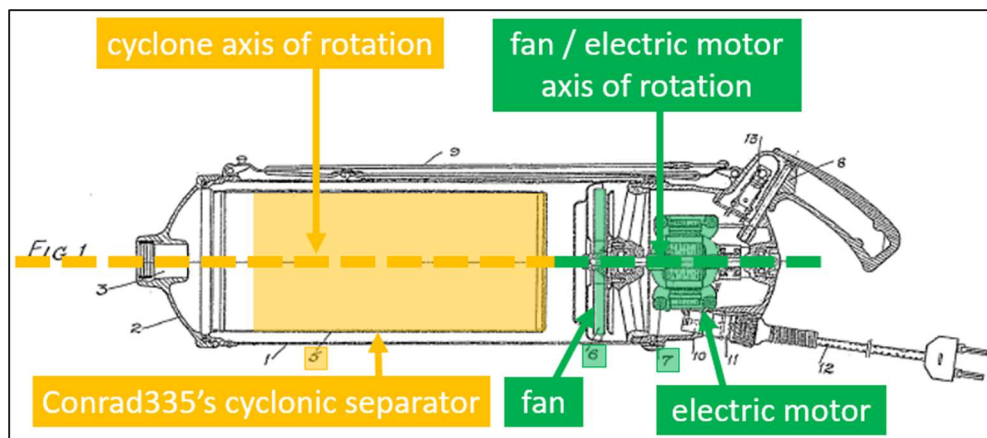
Ex1008, Figs. 2a, 3; Ex1002 ¶296.

Regarding [1a.2]/[8a.2]/[9a.2], IPVG combined with Conrad335 teaches the cyclone unit axis of rotation intersects the pistol-grip handle. Ex1002 ¶297. When Conrad335’s “cyclone separator 20” teachings are incorporated into IPVG’s vacuum, Conrad335’s “cyclone chamber 53[’s]” cyclone axis of rotation intersects IPVG’s pistol-grip “handle 8”:



Ex1007, Fig. 1(modified); Ex1002 ¶297.

Regarding [10a.2]/[14a.2]/[15a.2], IPVG combined with Conrad335 teaches the suction motor axis of rotation is generally parallel to the cyclone axis of rotation. Ex1002 ¶¶298-99. When Conrad335's "cyclone separator 20" teachings are incorporated into IPVG's vacuum, IPVG's **fan/electric motor axis of rotation** is generally parallel to Conrad335's **cyclone axis of rotation**:

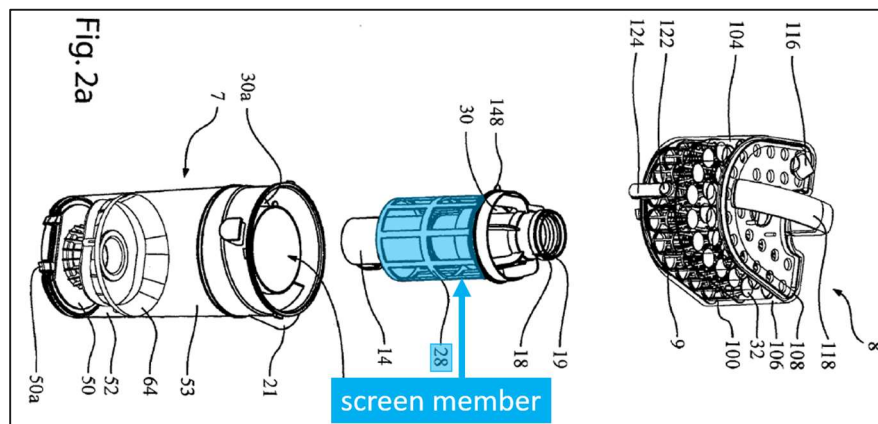


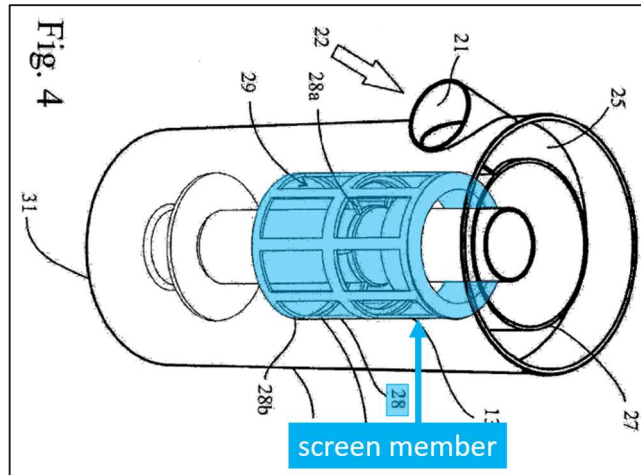
Ex1007, Fig. 1(modified); Ex1002 ¶298.

To the extent the IPVG-Conrad335 combination's fan/motor axis and cyclone separator axis are co-axial, a POSA would have understood that these axes

are generally parallel because they extend in the same direction and maintain the same (zero) distance between them. Ex1002 ¶299. Further, PO contends that co-axial axes meet this limitation in PO's infringement contentions. Ex1011, 7.

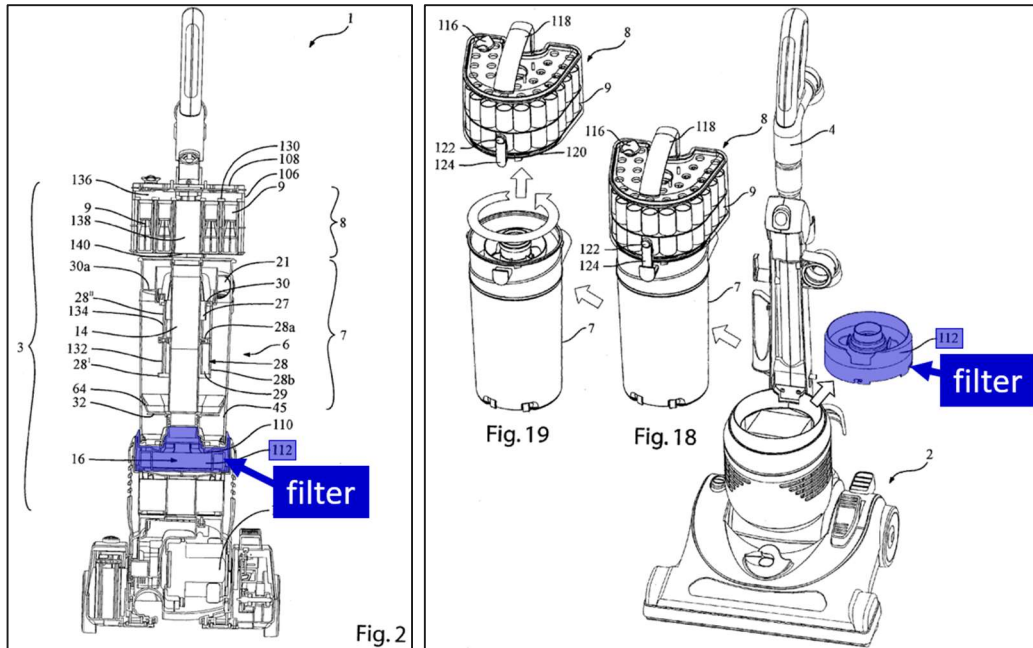
Regarding [9a.2]/[15a.2], IPVG combined with Conrad335 teaches a line that is parallel to the cyclone axis extends through the dirt-collection chamber and a location interior of a radial outer perimeter of a pre-motor filter. Ex1002 ¶¶300-304. Conrad335 teaches a pre-motor filter. Ex1002 ¶¶300-303. Conrad335's "cyclone separator 20" includes "a **screen member 28** [that] is preferably constructed from a fine mesh" "to assist in the entrapment of fibers, hairs or particles":





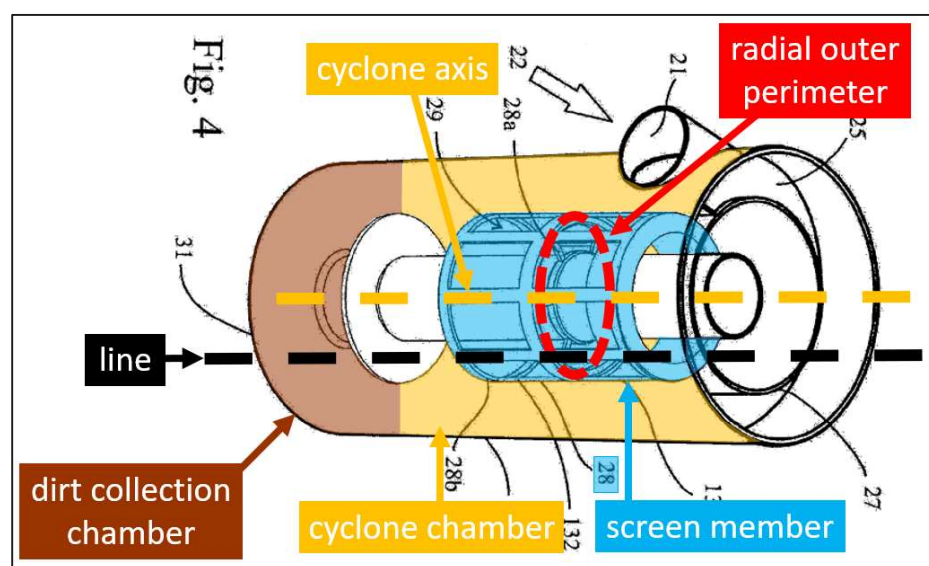
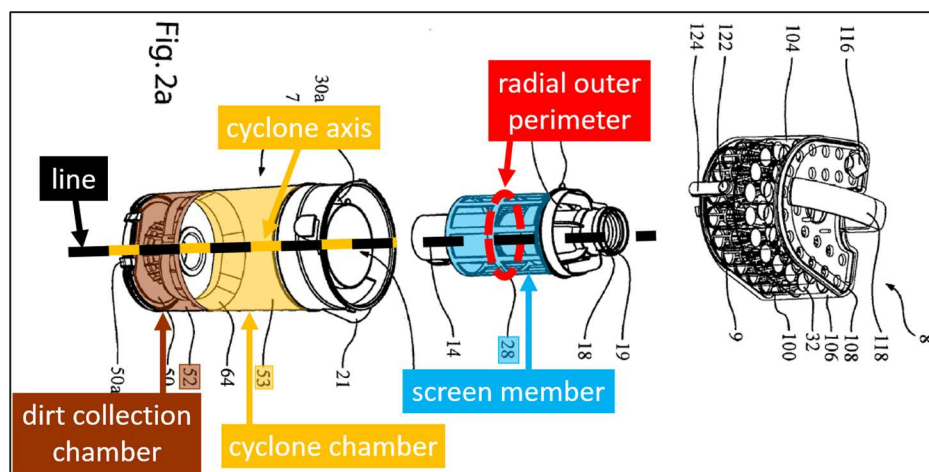
Ex1008 ¶¶287-288, Figs. 2a, 4; Ex1002 ¶300. “Accordingly, the air that is traveling through the cyclone chamber towards the cyclone outlet must travel through the ... screen member 28” before it reaches the “suction motor 15 prior to exiting vacuum cleaner 1.” Ex1008 ¶¶274, 290. Conrad335’s “screen member 28” is a pre-motor filter. Ex1002 ¶301.

Conrad335 further teaches “a **filter 112** ... may be provided in a housing 110,” which “is a pre-motor filter”:



Ex1008 ¶373, Figs. 2, 18-19; Ex1002 ¶302.

Conrad335 teaches a line that is that is parallel to the cyclone axis extends through the dirt-collection chamber and a location interior of a radial outer perimeter of a pre-motor filter. Ex1002 ¶303. A **line** that is parallel to Conrad335's **cyclone axis** extends through "**dirt collection chamber 52**" and a location interior to the **radial outer perimeter** of "**screen member 28**" and "**filter 112**":



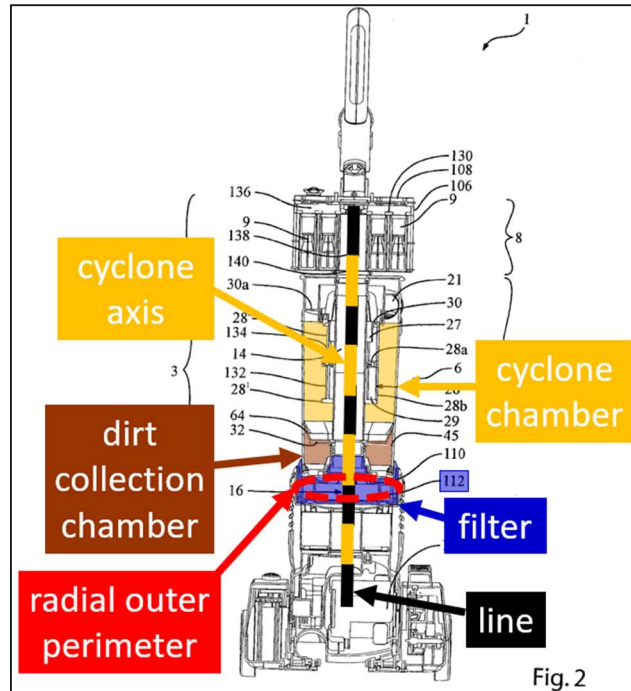


Fig. 2

Ex1008, Figs. 2-2a, 4; Ex1002 ¶303.

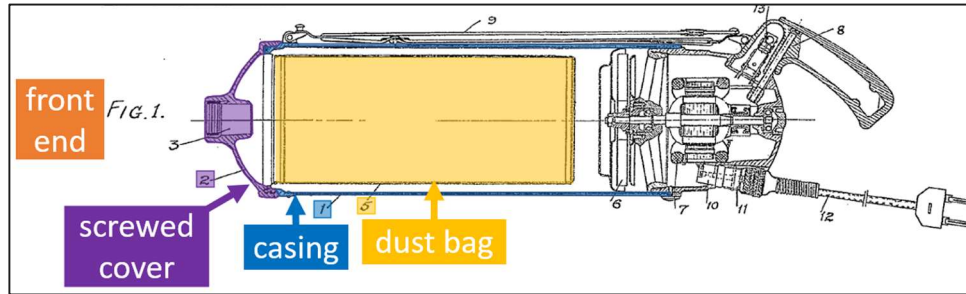
A POSA would have been motivated to modify IPVG’s “dust bag 5” with Conrad335’s cyclone-separator and pre-motor filter teachings and would have reasonably expected success. Ground 2, §1. The combined teachings meet these limitations because they incorporate Conrad335’s cyclone-separator and pre-motor filter teachings, including “screen member 28” and “filter 112.” Ex1002 ¶304.

e. [1a.3]/[10b]

IPVG in combination with Conrad335 teaches these limitations. Ex1002 ¶¶305-11.

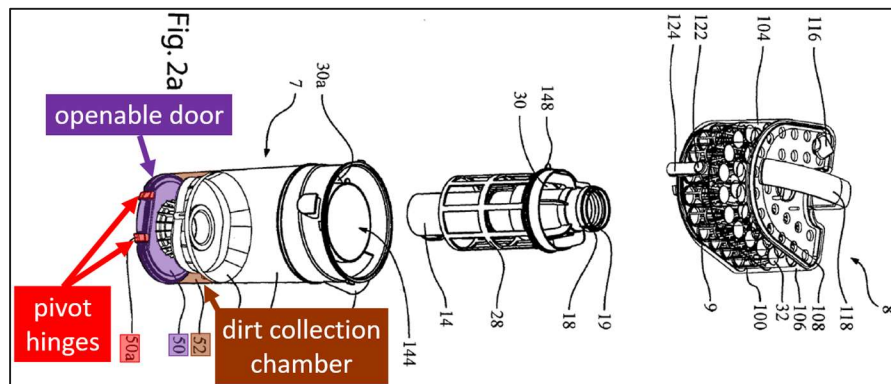
Conrad335 teaches a dirt-collection chamber that is exterior to the cyclone chamber. Ground 1, [1a.2]/[8a.2]/[9a.2]/[10a.2]/[14a.2]/[15a.2].

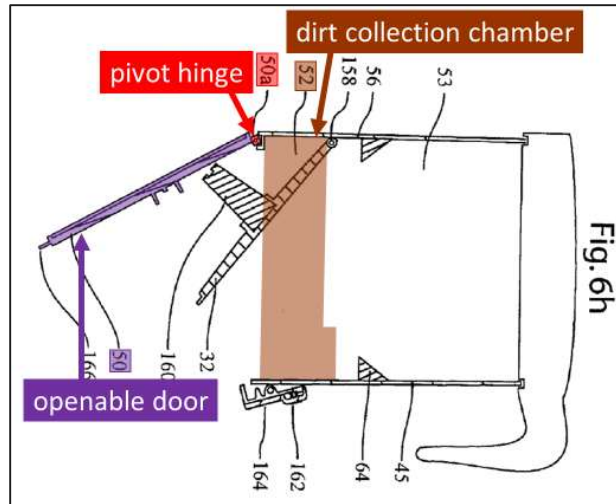
IPVG combined with Conrad335 teaches a forward end of the dirt-collection chamber is openable. Ex1002 ¶¶307-11. IPVG teaches a “**dust bag or like member [5]**” that is positioned in “**casing 1** closed at the **front end** by a **screwed cover 2**”:



Ex1007, 1:51-57, Fig. 1; Ex1002 ¶307. IPVG’s “screwed cover 2” is an openable forward end of IPVG’s “casing 1,” which, individually or together with IPVG’s dust bag 5,” is a dirt-collection chamber. Ex1002 ¶308.

Likewise, Conrad335 teaches an “**openable door [50]**” that can be “pivoted open about, e.g. **pivot hinges 50a**,” and Conrad335 depicts the “**dirt collection chamber 52**” in an opened position when “**openable door [50]**” is pivoted open:





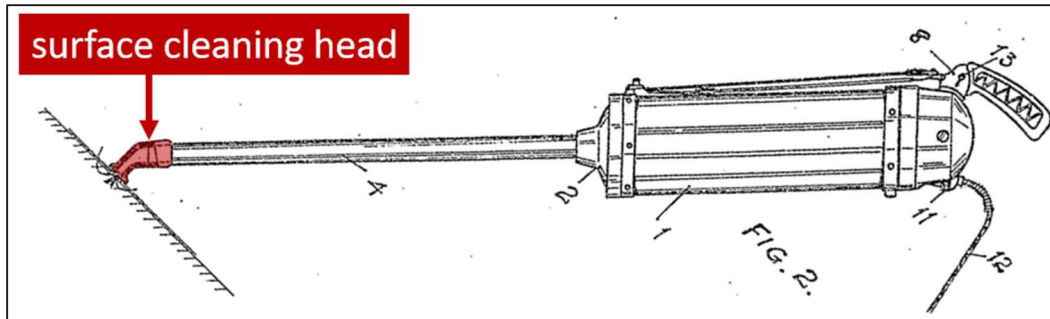
Ex1008 ¶¶147, 338-39, Figs. 2a, 6h; Ex1002 ¶309. Conrad335’s “dirt collection chamber has a bottom that is openable,” and when “[c]yclonic [cleaning] stage 7” is full, it “may then be emptied, e.g., by opening a bottom pivoting door 50.” Ex1008 ¶¶23, 350.

A POSA would have been motivated to modify IPVG’s “dust bag 5” with Conrad335’s cyclone-separator teachings and modify IPVG’s “screwed cover 2” with Conrad335’s openable-door teachings and would have reasonably expected success. Ground 2, §1. The combined teachings meet these limitations because Conrad335’s “opening door 50” would cover a forward end of the dirt-collection chamber that is exterior to the cyclone chamber. Ex1002 ¶311.

f. [1b]/[8b]/[9b]/[14b]/[15b]/[10c]

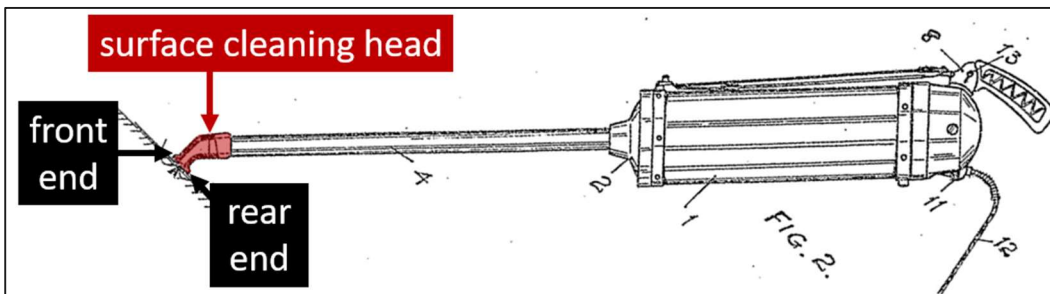
IPVG teaches these limitations. Ex1002 ¶¶312-17.

IPVG teaches a **surface cleaning head**:



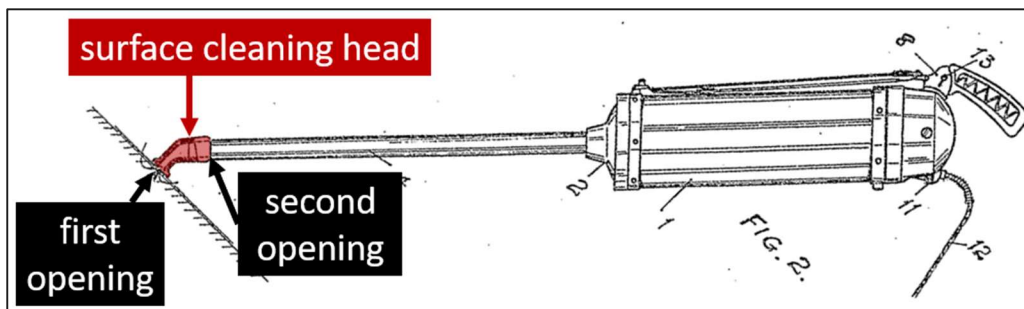
Ex1007, Fig. 2; Ex1002 ¶314.

IPVG's **surface cleaning head** has a **front end** and a **rear end**:



Ex1007, Fig. 2; Ex1002 ¶315.

IPVG's surface cleaning head has a dirty air inlet and a surface cleaning head outlet. Ex1002 ¶¶316-17. In IPVG, air flows into the **surface cleaning head** via a **first opening**, and exits via a **second opening**:

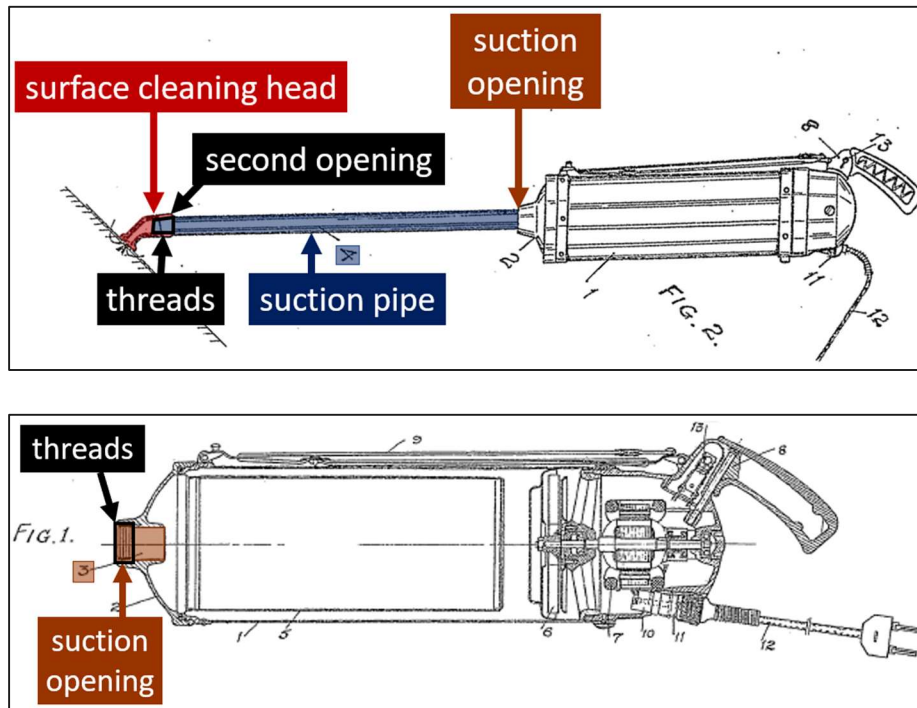


Ex1007, Fig. 2; Ex1002 ¶316. IPVG's first opening is a dirty air inlet, and IPVG's second opening is a surface cleaning head air outlet. Ex1002 ¶317.

g. [1c]/[8c]/[9c]/[14c]/[15c]/[10d]

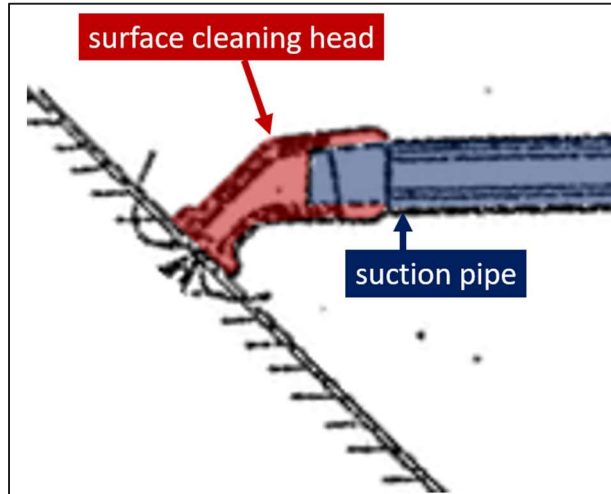
IPVG teaches these limitations. Ex1002 ¶¶318-23.

IPVG teaches a rigid air flow conduit that is removably mountable to the surface cleaning head and, when attached to the hand vacuum cleaner and the surface cleaning head, extends between the surface cleaning head air outlet and the dirty air inlet of the hand vacuum cleaner. Ex1002 ¶¶320-22. IPVG teaches a threaded “**suction pipe 4**” with a downstream end “for attaching” to a “**suction opening 3**,” and an upstream end for attaching to the **second opening** of the **surface cleaning head**:



Ex1007, 1:51-57, Figs. 1-2; Ex1002 ¶320. IPVG’s “suction opening 3” and second opening each have mating **threads** that correspond to “**suction pipe 4**[’s]” threads. Ex1002 ¶321. As shown above, IPVG’s “**suction pipe 4**” is detached from

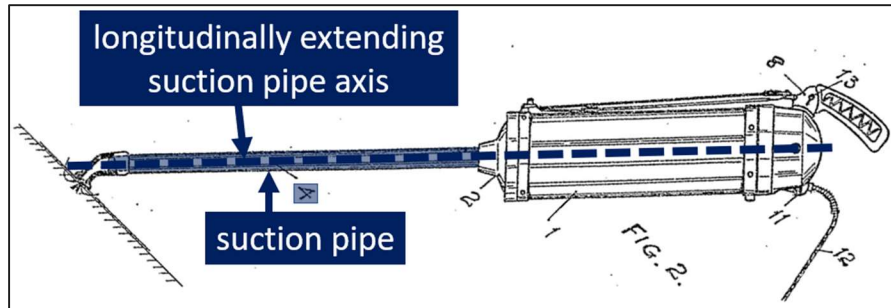
IPVG's “**suction opening 3**” in figure 1, and IPVG depicts the **surface cleaning head** and “**suction pipe 4**” as two separate components in figure 2:



Ex1007, Fig. 2; Ex1002 ¶321.

Thus, a POSA would have understood that IPVG's “suction pipe” is a rigid airflow conduit; the second opening of the surface cleaning head is a surface cleaning head air outlet; “suction opening” is a hand vacuum dirty air inlet; and IPVG teaches a rigid airflow conduit that is removably mountable to the surface cleaning head and the hand vacuum cleaner and extends between the surface cleaning head air outlet and the dirty air inlet of the hand vacuum cleaner. Ex1002 ¶322.

Regarding [14c]/[15c]/[10d], IPVG's **suction pipe** has a **longitudinally extending suction pipe axis**, which is a longitudinally extending conduit axis:



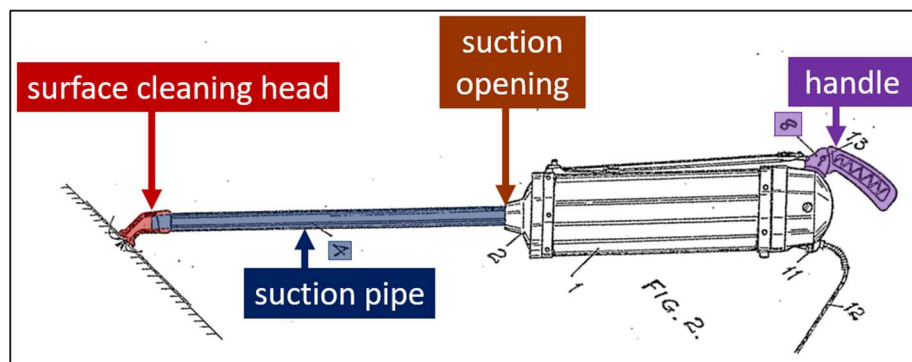
Ex1007, Fig. 2; Ex1002 ¶323.

h. [1d]/[8d]/[9d]/[14d]/[15d]/[10e]

IPVG in combination with Conrad335 teaches these limitations. Ex1002 ¶¶324-29.

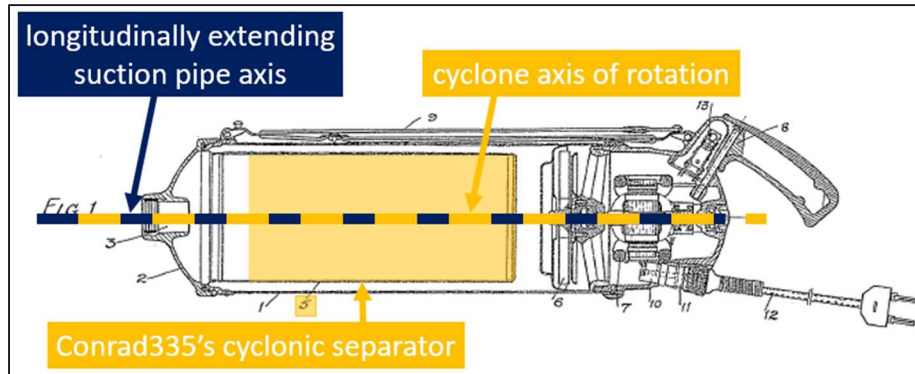
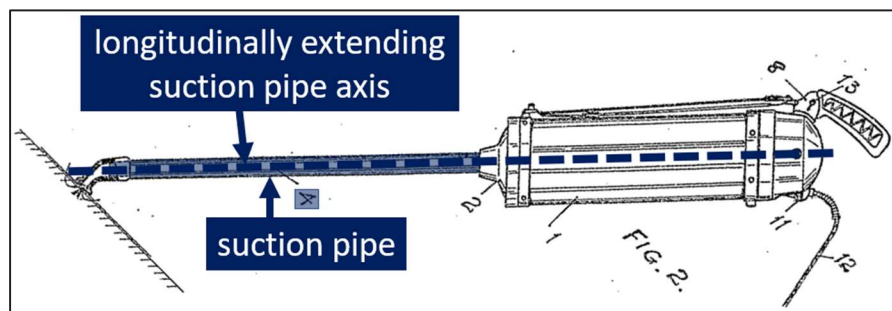
IPVG teaches the dirty air inlet of the hand vacuum cleaner is removably drivingly mounted to a downstream end of the rigid air flow conduit. Ground 2, [1c]/[8c]/[9c]/[14c]/[15c]/[10d].

When IPVG's vacuum is so mounted, the pistol-grip handle is a driving handle for the surface cleaning apparatus. Ex1002 ¶327. IPVG's pistol-grip “**handle [8]**” is used to “readily lift[]” the “portable dust suction apparatus” “during operation,” and is a driving handle:



Ex1007, 1:10-12, 1:22-33, Fig. 2; Ex1002 ¶327.

Regarding [14d]/[15d]/[10e], IPVG combined with Conrad335 teaches the longitudinally extending conduit axis of the rigid air flow conduit is parallel to the cyclone axis of rotation. Ex1002 ¶328. When Conrad335’s “cyclone separator 20” teachings are incorporated into IPVG’s vacuum, IPVG’s **longitudinally extending suction pipe axis** is parallel to Conrad335’s **cyclone axis of rotation**:



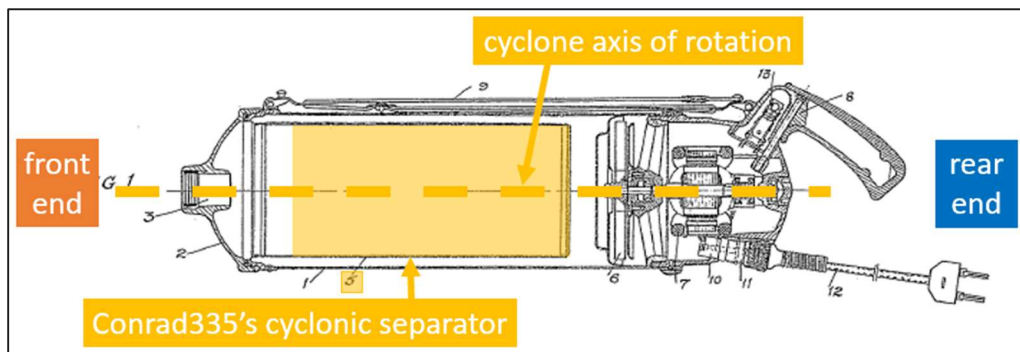
Ex1007, Figs. 1(modified)-2; Ex1002 ¶328.

A POSA would have been motivated to modify IPVG’s “dust bag 5” with Conrad335’s cyclone-separator teachings and would have reasonably expected success. Ground 2, §1.

i. [1e]/[8e]/[9e]

IPVG in combination with Conrad335 teaches these limitations. Ex1002 ¶¶330-32.

When Conrad335’s “cyclone separator 20” teachings are incorporated into IPVG, and IPVG’s hand vacuum is positioned with the “**front end**” of the hand vacuum cleaner in front of the “**rear**” **end** of the hand vacuum cleaner, Conrad335’s **cyclone separator axis of rotation** is generally horizontal:



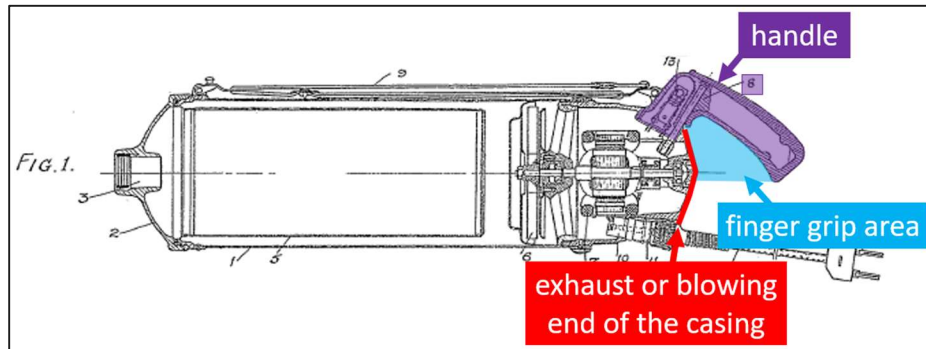
Ex1007, Fig. 1(modified); Ex1002 ¶331.

A POSA would have been motivated to modify IPVG’s “dust bag 5” with Conrad335’s cyclone-separator teachings and would have reasonably expected success. Ground 2, §1.

j. [14e]/[15e]/[10f]

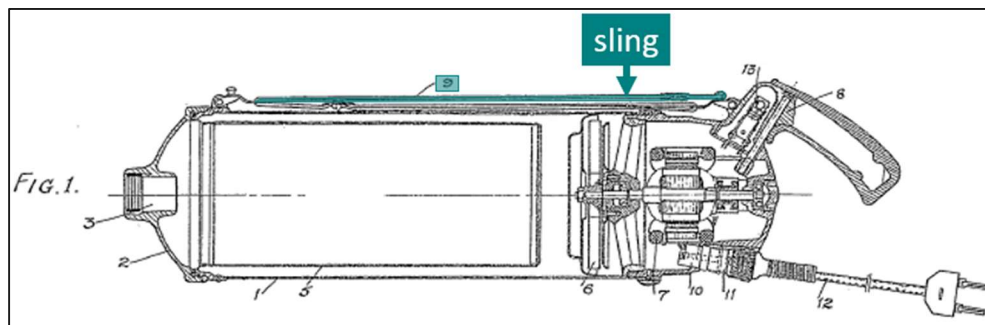
IPVG in combination with Conrad335 teaches these limitations. Ex1002 ¶¶333-39.

IPVG teaches a finger grip area. Ex1002 ¶¶334-37. IPVG teaches a **finger grip area** between IPVG’s “**handle 8**” and “the **exhaust or blowing end of the casing**”:



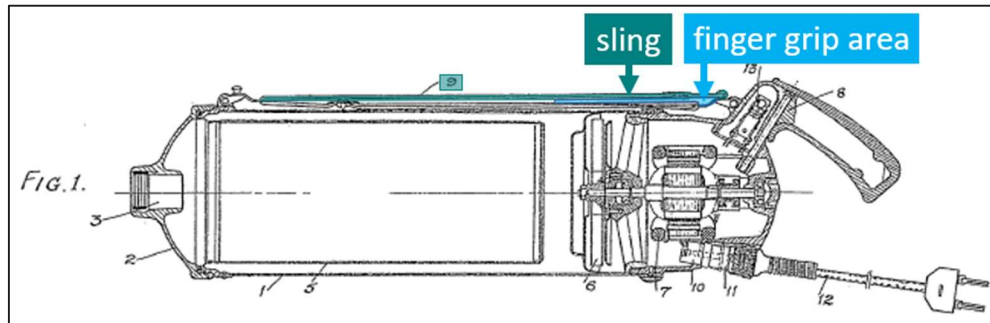
Ex1007, 1:57-62, Fig. 1; Ex1002 ¶334. A POSA would have understood when a user grips IPVG’s “handle 8,” their fingers wrap into the finger grip area identified above. Ex1002 ¶335.

IPVG also teaches “a **sling 9** which may be used to support the body of the apparatus in known matter”:



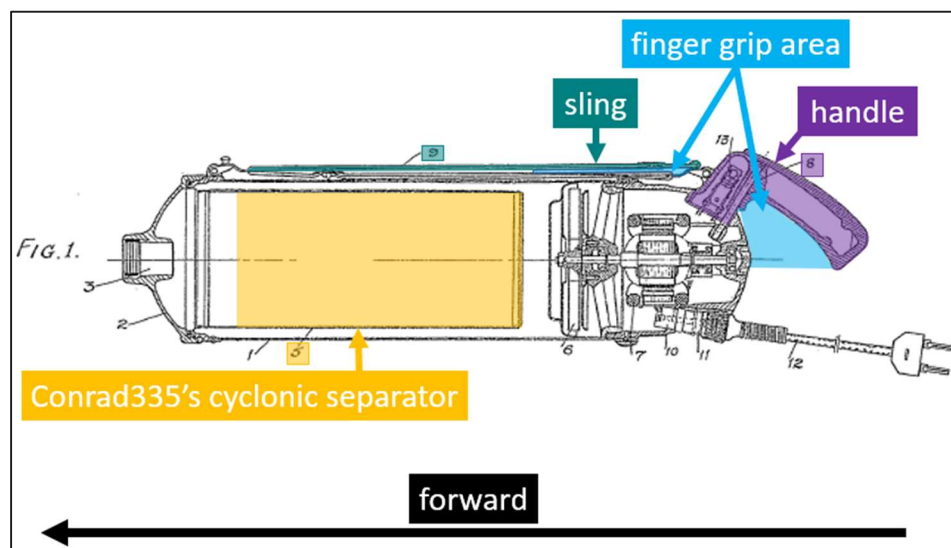
Ex1007, 1:57-62, Fig. 1; Ex1002 ¶336. A POSA would have understood one way a user “may ... use[]” “sling 9” “to support the body of the apparatus” would be to grab it with their fingers, e.g., when holding “handle 8” with one hand and “sling

9” with the other hand. Ex1002 ¶337. When gripping “**sling 9**,” the users’ fingers wrap into a **finger grip area** between “**sling 9**” and “casing 1”:



Ex1007, Fig. 1; Ex1002 ¶337.

IPVG combined with Conrad335 teaches a finger grip area is provided at a location that is forward of the pistol-grip handle and rearward of the cyclone. Ex1002 ¶¶338-39. When Conrad335’s “cyclone separator 20” teachings are incorporated into IPVG, both of the **finger grip areas** identified above are provided **forward** of “**handle 8**” and rearward of Conrad335’s “**cyclone separator**” comprising a cyclone:



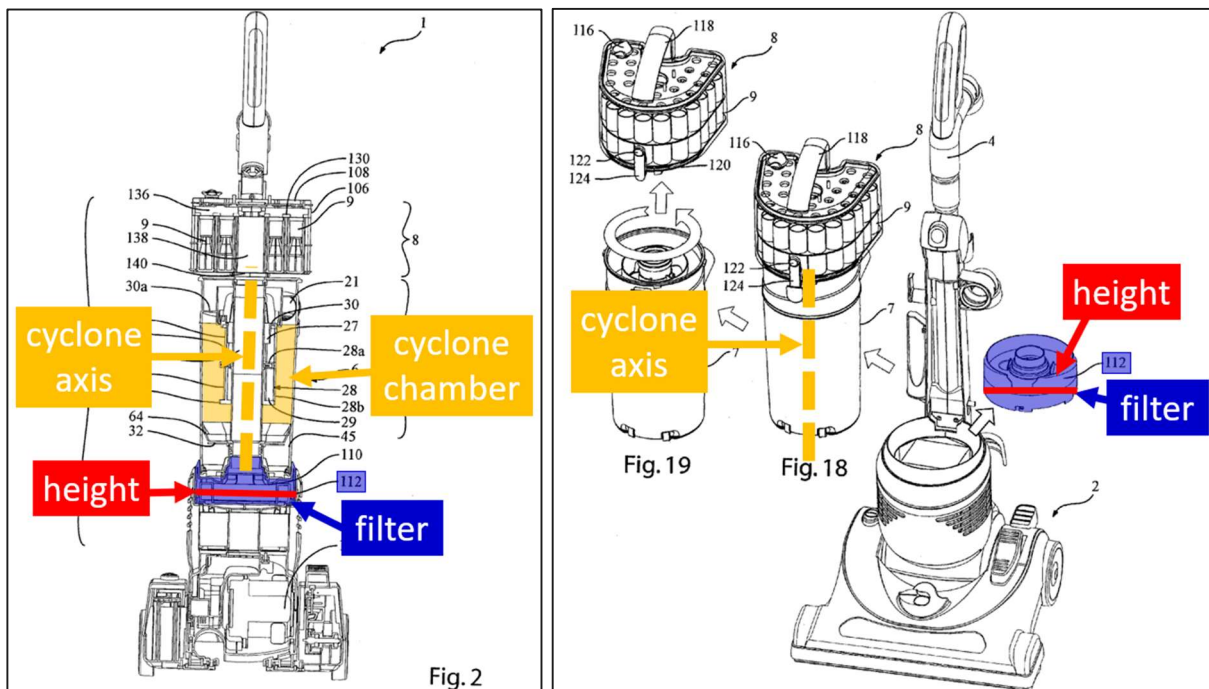
Ex1007, Fig. 1(modified); Ex1002 ¶338.

A POSA would have been motivated to modify IPVG's "dust bag 5" with Conrad335's cyclone-separator teachings and would have reasonably expected success. Ground 2, §1.

k. [8f]/[14f]

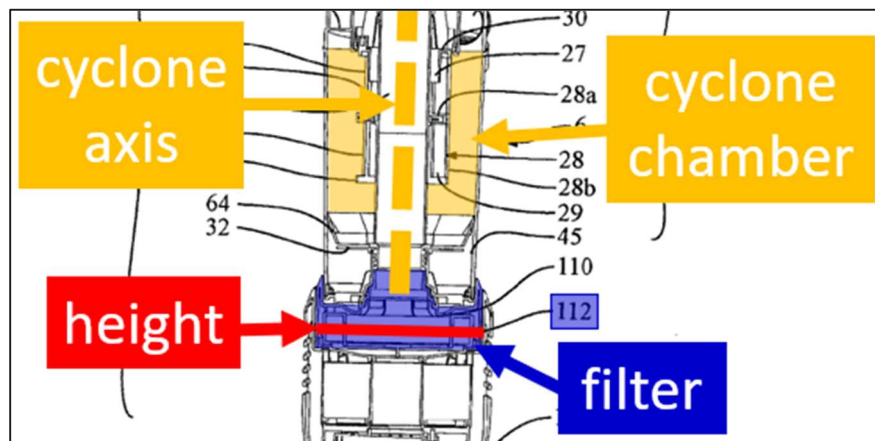
IPVG in combination with Conrad335 teaches these limitations. Ex1002 ¶¶340-44.

Conrad335 teaches that a pre-motor filter has a height in a direction transverse to the cyclone axis. Ex1002 ¶341. Conrad335's "**filter 112**" has a **height** in a direction transverse to "**cyclone chamber 53['s]**" **cyclone axis**:



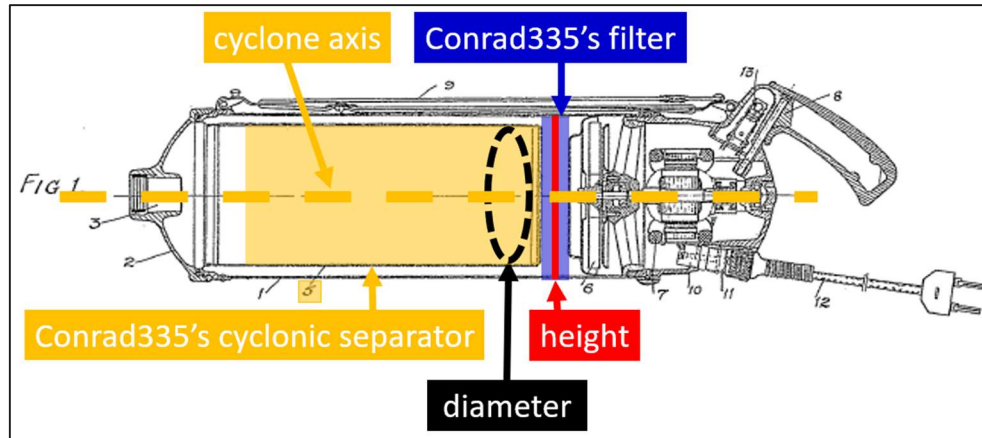
Ex1008, Figs. 2, 18-19; Ex1002 ¶341.

Conrad335 teaches the pre-motor filter height is larger than the diameter of the cyclone. Ex1002 ¶¶342-43. Conrad335’s “cyclone separator 20” has a “cyclone separator wall 45” with an “inner surface 56.” Ex1008 ¶¶320, 322. A POSA would have understood the diameter of the cyclone in Conrad335’s “cyclone chamber 53” is contained within “inner surface 56,” because that is where cyclonic airflow occurs. Ex1002 ¶342. Further, the height of Conrad335’s “filter 112” is greater than the diameter of the “cyclone separator wall 45.” Ex1002 ¶342. As shown in Figure 2 below, Conrad335’s “cyclone separator” fits within the outer edges (i.e., the height in a direction transverse to the cyclone axis) of “filter 112,” which is wider than the “cyclone separator”:



Ex1008, Fig. 2; *see also id.*, Fig. 18; Ex1002 ¶342. Thus, the height of Conrad335’s “filter 112” in a direction transverse to the cyclone axis is larger than the diameter of Conrad335’s “cyclone chamber 53” comprising a cyclone. Ex1002 ¶343.

A POSA would have been motivated to modify IPVG’s “dust bag 5” with Conrad335’s cyclone-separator teachings, including “filter 112,” and would have reasonably expected success. Ground 2, §1. When Conrad335’s “cyclone separator 20” teachings are incorporated into IPVG’s vacuum, Conrad335’s “filter 112” has a **height** in a direction transverse to Conrad335’s cyclone axis and the **height** is larger than a **diameter** of the cyclone positioned within Conrad335’s cyclonic separator:

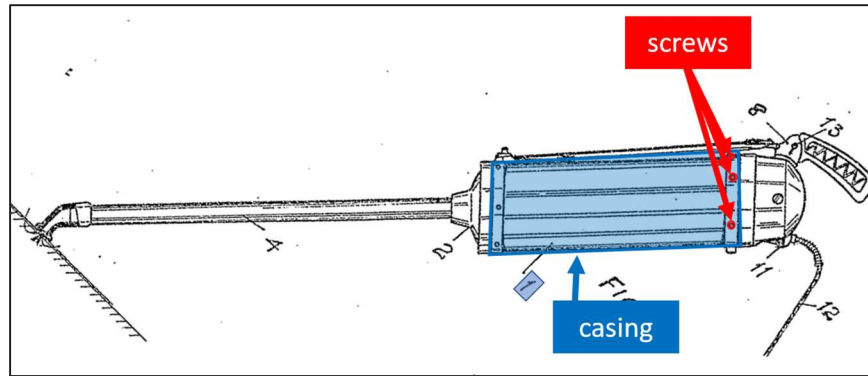


Ex1007, Fig. 1(modified); Ex1002 ¶344.

3. [2]/[12]

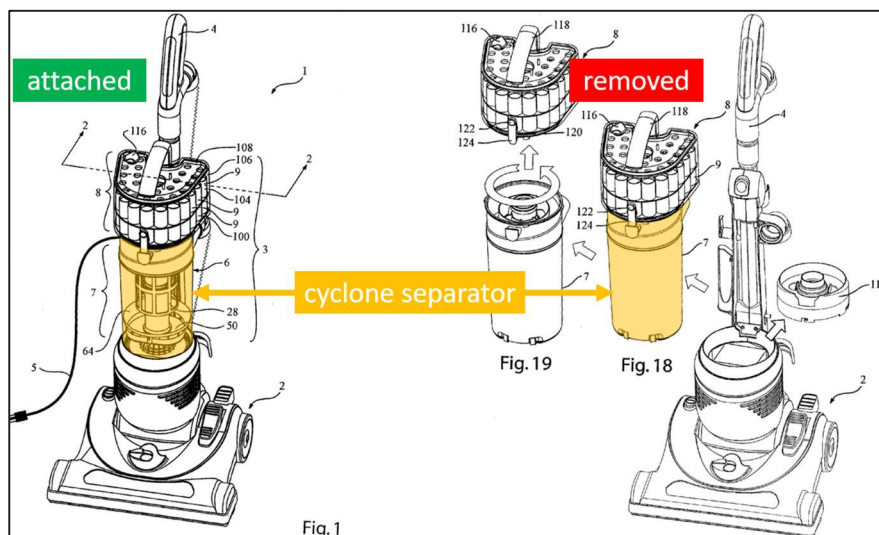
IPVG in combination with Conrad335 renders claims 1/10 obvious and teaches the remaining limitations of these claims. Ex1002 ¶¶345-51.

IPVG’s “casing 1,” in which “dust bag 5” is stored, is removable from the hand vacuum cleaner by removing the **screws**:



Ex1007, Fig. 2; *see also id.*, 1:70-2:3 (describing use of “screws” in context of the handle); Ex1002 ¶347-348. IPVG’s “casing 1,” together with “dust bag 5” are thus a removable air-filtration unit. Ex1002 ¶349.

Likewise, Conrad335’s “first and second cyclonic stages 7, 8 may be removed at the same time from the vacuum cleaner” “so that they may be transported to a garbage can or the like for emptying.” Ex1008 ¶¶177, 350. Conrad335 depicts the “**first cyclonic stage 7**” comprising “**cyclone separator 20**” being removably mounted to the vacuum main body:



Ex1008, Figs. 1, 18-19; Ex1002 ¶350.

These limitations are met when Conrad335's teachings are incorporated with IPVG's, either by using IPVG's screws or Conrad335's cyclonic-separator connection-and-release mechanism, which a POSA would have been motivated to do for convenient emptying and maintenance and would have reasonably expected success doing. Ground 2, §1; Ex1002 ¶351.

4. [3]

IPVG in combination with Conrad335 renders claim 1 and the remaining limitations of this claim obvious for the same reasons discussed for [1a.2]/[8a.2]/[9a.2]/[10a.2]/[14a.2]/[15a.2]. Ground 2, [1a.2]/[8a.2]/[9a.2]/[10a.2]/[14a.2]/[15a.2]; Ex1002 ¶¶352-53.

5. [4]

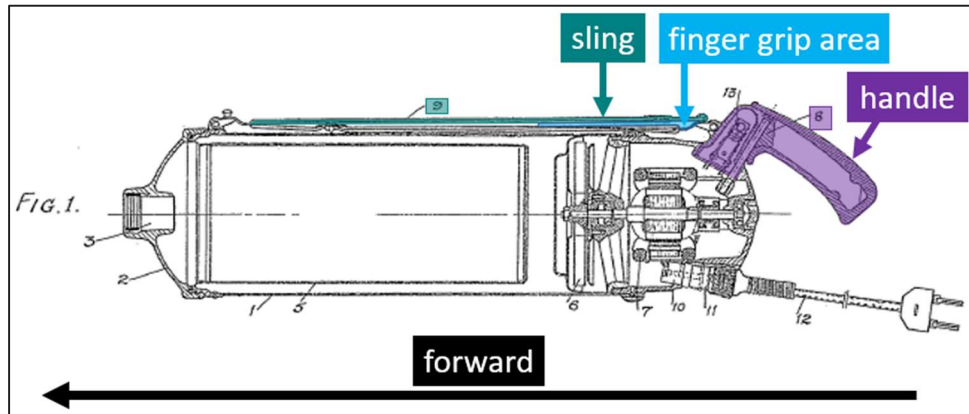
IPVG in combination with Conrad335 renders claim 1 and the remaining limitations of this claim obvious for the same reasons discussed for [1a.1]/[8a.1]/[9a.1]/[10a.1]/[14a.1]/[15a.1]. Ground 2, [1a.1]/[8a.1]/[9a.1]/[10a.1]/[14a.1]/[15a.1]; Ex1002 ¶¶354-55.

6. [5]

IPVG in combination with Conrad335 renders claim 1 obvious and IPVG teaches and renders obvious the remaining limitations of this claim. Ex1002 ¶¶356-63.

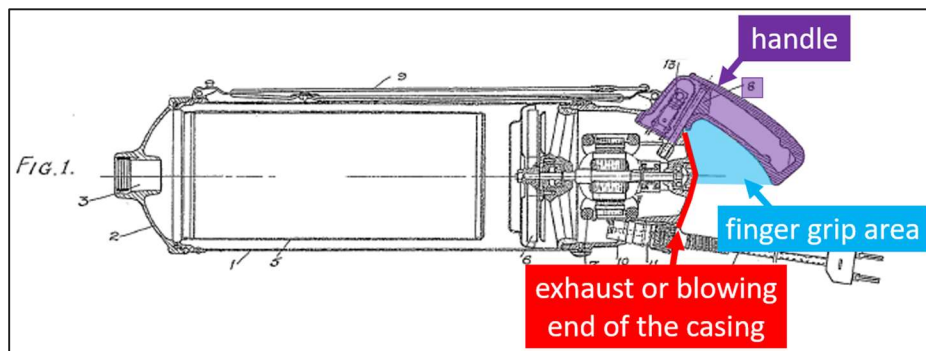
IPVG teaches a pistol-grip handle and multiple finger grip areas. Ground 2, [1a]/[8a]/[9a]/[10a]/[14a]/[15a]/[14e]/[15e]/[10f].

IPVG teaches an enclosed **finger grip area** between “**sling 9**” and “casing 1” that is provided on a **forward** side of “**handle 8**”:

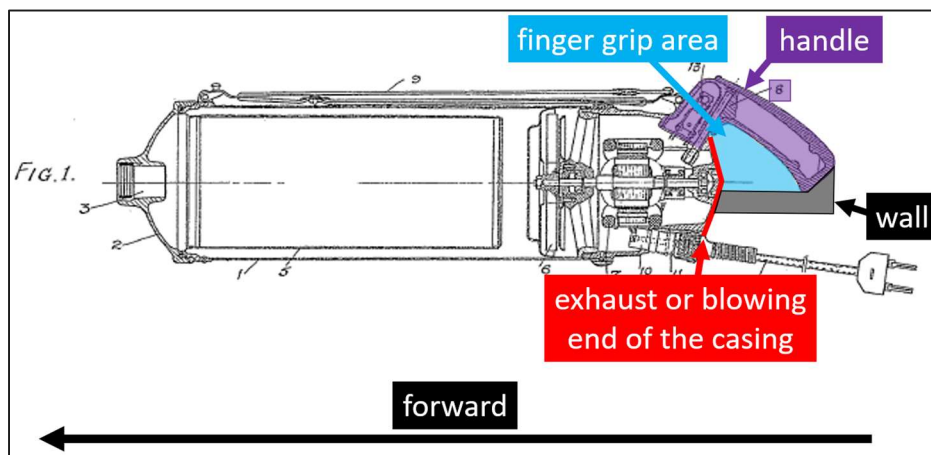


Ex1007, Fig. 1; Ex1002 ¶358. A POSA would have understood the enclosed finger grip area identified above is provided on a forward side of IPVG’s “handle 8,” i.e., the side closest to IPVG’s forward end. Ex1002 ¶359.

To the extent PO argues the enclosed finger grip above is not provided on a forward side of the pistol-grip handle, IPVG renders it obvious. Ex1002 ¶¶360-63. IPVG teaches a **finger grip area** between IPVG’s “**handle 8**” and “the **exhaust or blowing end of the casing**”:

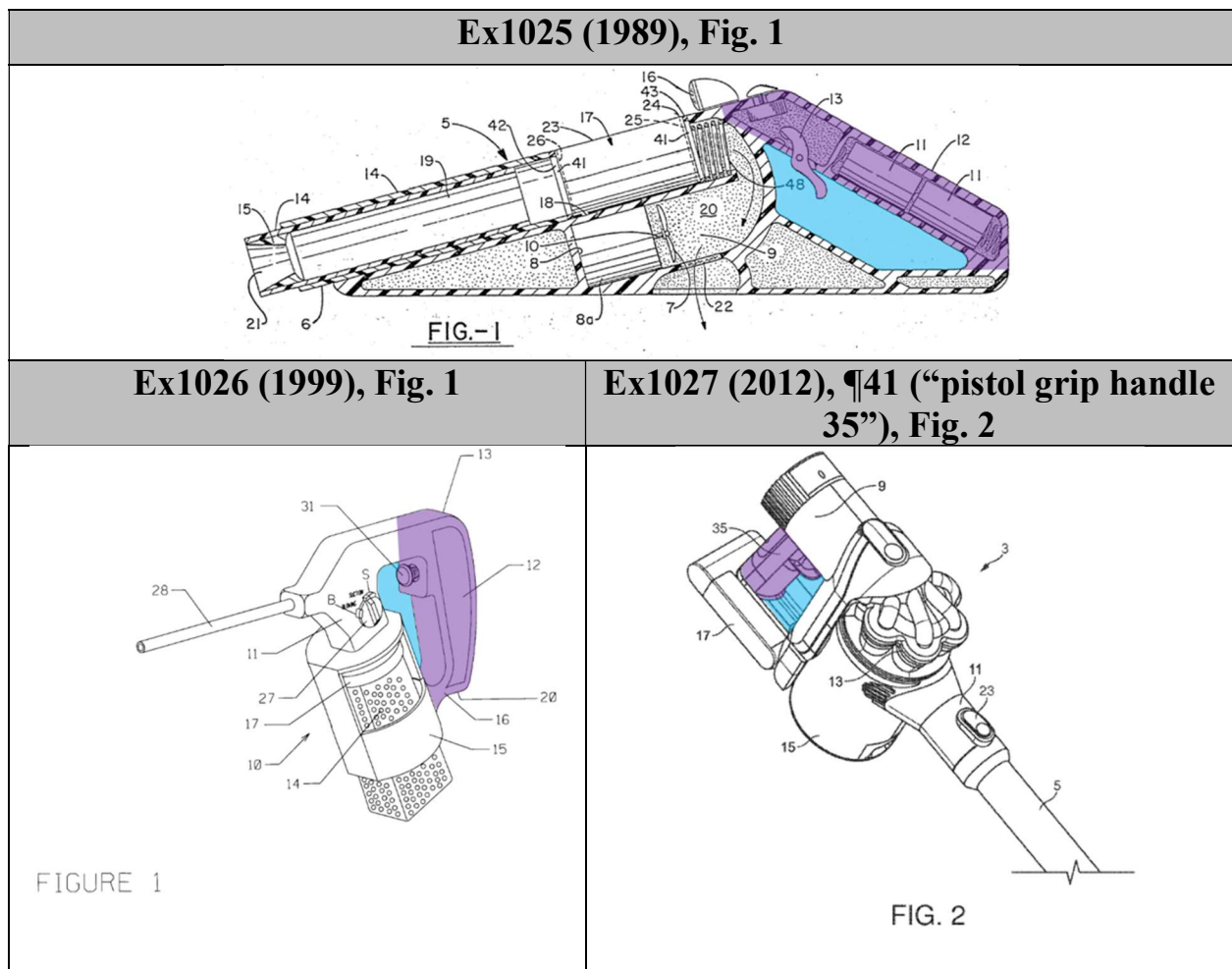


Ex1007, 1:57-62, Fig. 1; Ex1002 ¶360. A POSA would have been motivated by IPVG's disclosures to modify IPVG to include an enclosed finger grip area. Ex1002 ¶361-62. IPVG explains its handle is designed to protect the user's hand: "handle 8" has a "cover 18 ... formed of soft or hard rubber or other suitable insulating material" "so that the operator ... may be fully protected against accidental contact with current carrying parts of the apparatus." Ex1007, 1:13-21, 1:87-89. A POSA would have understood that, to further this objective by protecting the user's hand against current and against physical objects during use, it would have been obvious to enclose IPVG's **finger grip area** with a **wall** that extends from "the **exhaust or blowing end of the casing**" to the bottom of "**handle 8**" and is provided on a **forward** side of "**handle 8**":



Ex1007, Fig. 1(modified); Ex1002 ¶361. A POSA would have understood modifying IPVG as shown above would have certain benefits, including (1) protecting the user's fingers from being hit or pinched by objects during use, (2)

providing multiple hand grip positions for different use cases, and (3) providing an additional mounting location for IPVG’s handle, thereby reducing stress on the handle mount and increasing component longevity. Ex1002 ¶362. Further, a POSA would have understood there were a finite number of handle configurations, including open handles and enclosed handles. Ex1002 ¶362. **Pistol-grip handles** with **enclosed finger grip areas** were well-known in the art:



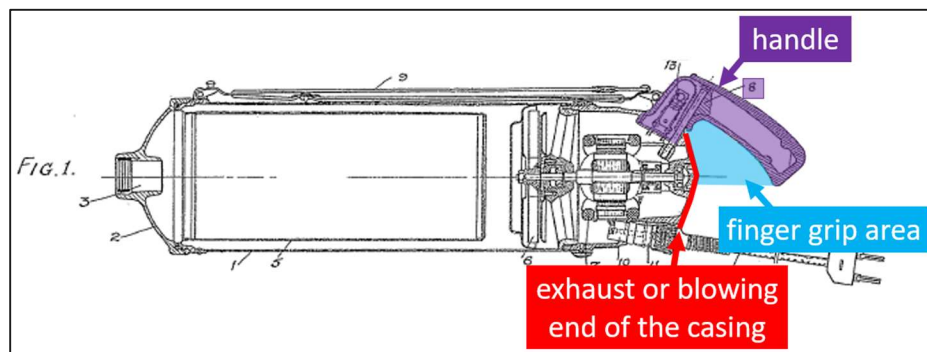
Thus, modifying IPVG as described would have been obvious to try, easy to implement, and would have yielded the predictable result of “protect[ing]” “the

operator[’s]” hand. Ex1007, 1:13-21, 1:87-89. A POSA would have reasonably expected success making this modification because it would have only involved incorporating a straightforward, well-known part—namely, a rigid wall. Ex1002 ¶363.

7. [6]

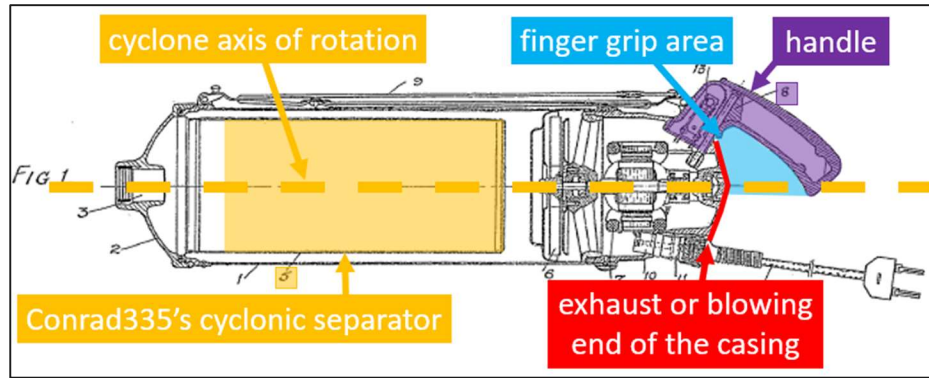
IPVG in combination with Conrad335 renders claim 1 obvious and teaches the remaining limitations of this claim. Ex1002 ¶¶364-67.

IPVG teaches a **finger grip area** between IPVG’s “**handle 8**” and “the **exhaust or blowing end of the casing**”:



Ex1007, 1:57-62, Fig. 1; Ex1002 ¶365.

When Conrad335’s “**cyclone separator 20**” teachings are incorporated into IPVG’s vacuum, Conrad335’s **cyclone axis of rotation** intersects IPVG’s **finger grip area**:



Ex1007, Fig. 1(modified); Ex1002 ¶366.

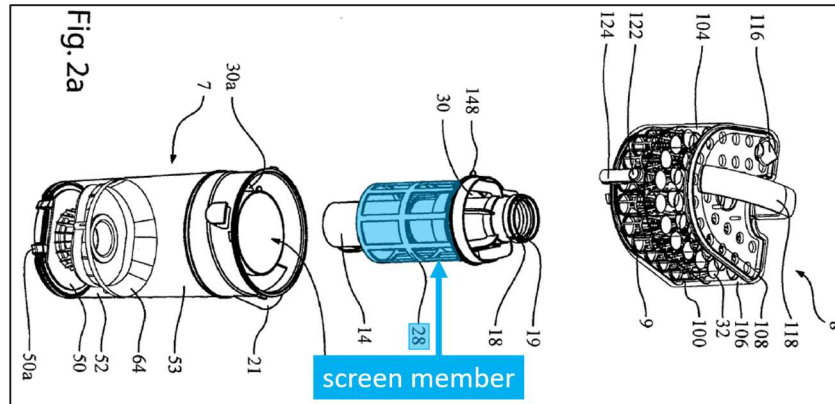
A POSA would have been motivated to modify IPVG's "dust bag 5" with Conrad335's cyclone-separator teachings and would have reasonably expected success. Ground 2, §1.

8. [7]/[13]

IPVG in combination with Conrad335 renders claims 2/10 obvious and teaches the remaining limitations of these claims. Ex1002 ¶¶368-73.

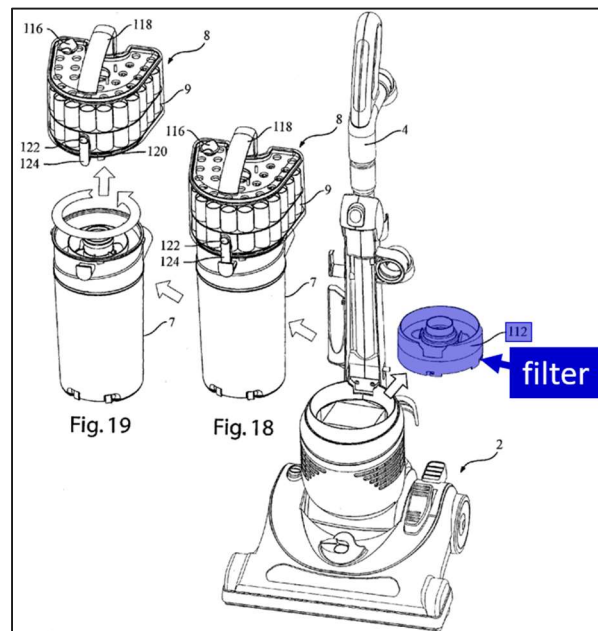
Conrad335 teaches multiple pre-motor filters, and IPVG combined with Conrad335 teaches a removable cyclone unit. Ground 2, [1a.2]/[8a.2]/[9a.2]/[10a.2]/[14a.2]/[15a.2], Claims 2/12.

Conrad335 further teaches the pre-motor filter is accessible when the cyclone unit is removed from the main body. Ex1002 ¶¶371-72. When "cyclone separator 20" is removed from the main body, "screen [member] 28 may be removed" and "placed over a garbage can and banged against the side to loosen the dirt contained therein":



Ex1008 ¶¶287, 292, Fig. 2a; Ex1002 ¶371.

Likewise, “when **filter 112** is dirty and requires cleaning or replacement,” “the first and second cyclonic stages are removed” and “the consumer ... [may] remov[e] **filter 112** from the vacuum cleaner”:



Ex1008 ¶¶271, 373; Ex1002 ¶372.

These limitations are met when Conrad335’s teachings are incorporated with IPVG’s, either by using IPVG’s screws or Conrad335’s cyclonic-separator

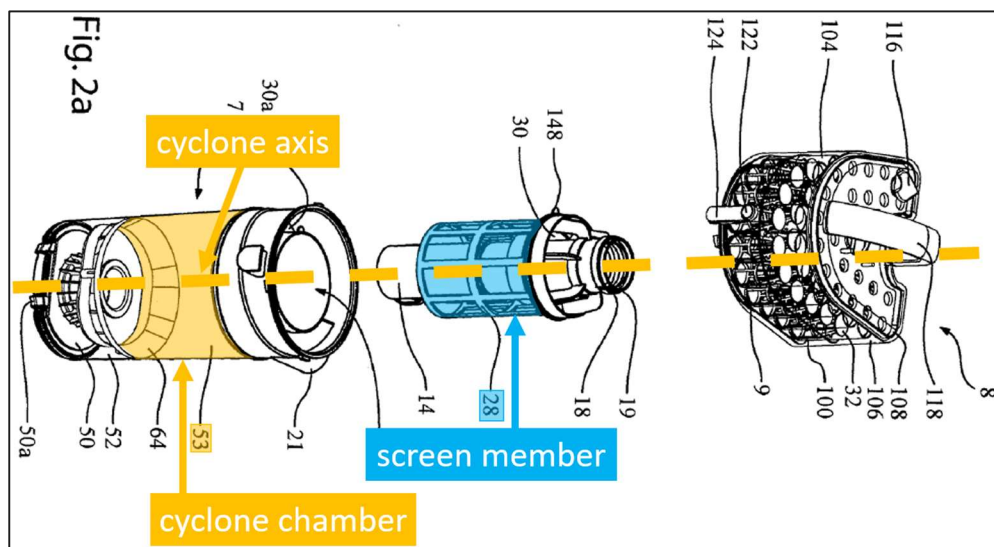
connection-and-release mechanism to release the cyclone unit and provide access to the pre-motor filters, which a POSA would have been motivated to do for convenient emptying and maintenance and would have reasonably expected success doing. Ground 2, §1; Ex1002 ¶373.

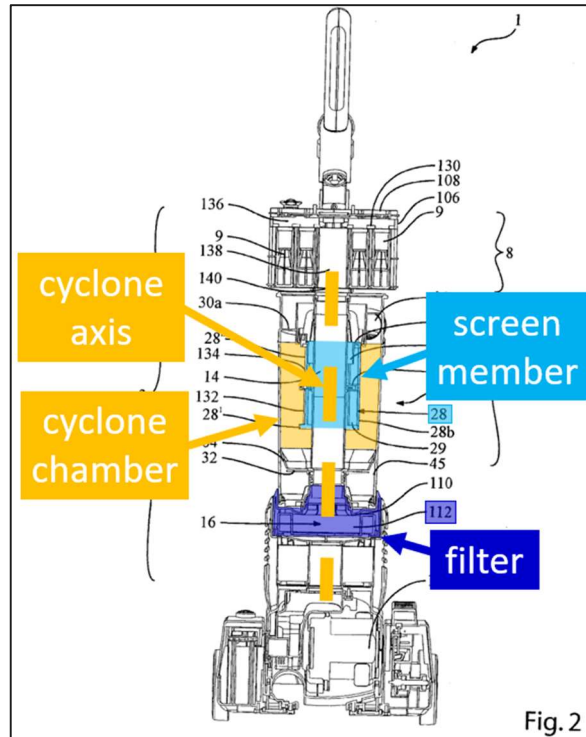
9. [11]

IPVG in combination with Conrad335 renders claim 10 obvious and teaches the remaining limitations of this claim. Ex1002 ¶¶374-77.

Conrad335 teaches multiple pre-motor filters. Ground 2, [1a.2]/[8a.2]/[9a.2]/[10a.2]/[14a.2]/[15a.2].

Conrad335 further teaches the cyclone axis of rotation intersects the pre-motor filters. Ex1002 ¶376. Conrad335's **cyclone axis of rotation** intersects “**screen member 28**” and “**filter 112**”:





Ex1008, Figs. 2-2a; Ex1002 ¶376.

A POSA would have been motivated to modify IPVG’s “dust bag 5” with Conrad335’s cyclone-separator teachings and would have reasonably expected success. Ground 2, §1. The combined teachings likewise meet these limitations. Ex1002 ¶377.

IX. DISCRETIONARY FACTORS FAVOR INSTITUTION

A. §314(a)

Fintiv should not be followed because it exceeds the Director’s authority, is arbitrary and capricious, was adopted without notice-and-comment rulemaking, violates the APA and AIA, and because it “does not apply to parallel U.S. International Trade Commission (ITC) proceedings” USPTO Interim

Procedure For Discretionary Denials In AIA Post-Grant Proceedings With Parallel District Court Litigation, June 21, 2022, 2, 4-5 (the “Guidance”).

B. §325(d)

The §325(d) factors favor institution, as all six *Becton Dickinson* factors weigh in favor of institution. *Becton, Dickinson, & Co. v. B. Braun Melsungen AG*, IPR2017-01586, Paper 8 (PTAB Dec. 15, 2017); *see also Advanced Bionics, LLC v. Med-El Elektromedizinische Geräte GmbH*, IPR2019-01469, Paper 6 at 8 (PTAB Feb. 13, 2020).

The Board has consistently “held that a reference that ‘was neither applied against the claims nor discussed by the Examiner’ does not weigh in favor of exercising [] discretion under §325(d).” *Fasteners for Retail, Inc. v. RTC Indus., Inc.*, IPR2019-00994, Paper 9 at 7-11 (PTAB Nov. 5, 2019). *Butler* and *IPVG* were not cited on the face of the ’546Patent. While *Jianan* and *Conrad335* were cited in an IDS during the ’546Patent’s prosecution, among hundreds of other cited references, the Examiner neither discussed them nor applied them against the claims. *See Ex1004*, 435-447. The combination of prior art presented in this Petition, and the relied-upon references were not previously meaningfully before the Office, nor are they cumulative, and Examiner did not address them. *Advanced Bionics*, IPR2019-01469, Paper 6 at 9-11.

Even if the Board finds *Advanced Bionics* part one is met, this Petition demonstrates that, under part two, the Office committed material error. During prosecution, the Office overlooked the key disclosures of Jianan and Conrad335 relied upon in this Petition; namely, that Jianan discloses a hand vacuum cleaner with an external dirt-collection chamber that reduces the need to replace filters and improves cyclone efficiency, and that Conrad335 discloses a cyclonic vacuum cleaner having an external dirt-collection chamber that “may be used ... to create a ... hand vacuum.” §§VIII.A.1, VIII.B.1.

Further, Dr. Giachetti’s expert testimony cited in this Petition shows how the references disclose or render obvious every limitation of the challenged claims and the reasons a POSA would have made the relied-upon combinations. Thus, this Petition advances additional evidence and arguments that the Office did not consider, which weighs against exercising discretion under §325(d). *Mylan Pharms. Inc. v. Merck Sharp & Dohme Corp.*, IPR2020-00040, Paper 21 at 20 (PTAB May 12, 2020) (unconsidered expert testimony weighs against exercise of §325(d) denial).

Because Petitioners “cannot be expected to anticipate every argument that may be raised by a patent owner” regarding §325(d), if PO raises such a challenge, Petitioners request the opportunity to respond, including to address why such a challenge was not reasonably foreseeable; why the references that were not

disclosed are non-cumulative; and/or why the Examiner misapprehended and/or overlooked the art at issue. *Google LLC v. Valtrus Innovations Ltd.*, IPR2022-01197, Paper 12 at 5 (PTAB Mar. 29, 2023) (vacating denial of institution based on §325(d)).

X. SECONDARY CONSIDERATIONS

Petitioners are unaware of any secondary considerations of non-obviousness.

XI. MANDATORY NOTICES UNDER 37 C.F.R. §42.8

A. Real Parties-in-Interest

Petitioners identify themselves as the real parties-in-interest.

B. Related Matters

To the best of Petitioners' knowledge, apart from the above-mentioned litigation, *Certain Surface Cleaning Devices and Components Thereof*, Dkt. No. 337-TA-1404 (the "ITC Litigation"), the '546Patent has not been involved in any litigation, *inter partes* or post-grant review prior to this proceeding.

C. Lead and Backup Counsel, Service, and Power of Attorney

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Petitioners concurrently submit a Power of Attorney, 37 C.F.R. § 42.10(b), and consent to electronic service at DysonIPR@kirkland.com.

XII. PAYMENT OF FEES UNDER 37 C.F.R. §42.103

Petitioners concurrently electronically submit the required fees for this Petition. The Board is authorized to charge Deposit Account No. 506092 for any fee deficiency.

Petition for *Inter Partes* Review of U.S. Patent No. 11,903,546

Date: July 11, 2024

Respectfully submitted,

/s/ Christian Huehns

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Attorneys for Petitioner

CERTIFICATE OF COMPLIANCE

This Petition complies with the type-volume limitations as mandated in 37 C.F.R. § 42.24, totaling 13,949 words. Counsel has relied upon the word count feature provided by Microsoft Word.

/s/ Christian Huehns

CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. §§ 42.6(e)(4)(i) et seq. and 42.105(b), the undersigned certifies that a copy of the foregoing document with the accompanying Exhibits listed in Petitioners' Exhibit List was caused to be served by Federal Express, costs prepaid, to Patent Owner at the following address of record:

1059 – Bereskin & Parr LLP / S.E.N.C.R.L., srl.
40 King Street West
40th Floor
Toronto, ON
Canada

A copy was also served via electronic mail and FTP on the following attorneys of record in the related matter of Inv. No. 337-TA-1404, In the Matter of Certain Surface Cleaning Devices and Components Thereof at:

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sharkninja-dysonitc@gibsondunn.com

/s/ Sheryl A. Brongiel
Sheryl A. Brongiel