UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SHARKNINJA, INC.,
SHARKNINJA OPERATING LLC,
SHARKNINJA MANAGEMENT LLC, AND
SHARKNINJA SALES COMPANY

Petitioners,

v.

DYSON TECHNOLOGY LIMITED,
Patent Owner.

Case No. IPR2023-01322
U.S. Patent No. 10,433,687

Petition for *Inter Partes* Review of U.S. Patent No. 10,433,687

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PETITIONER'S EXHIBIT LIST

Exhibit	Description
1001	U.S. Patent No. 10,433,687
1002	File History for U.S. Patent No. 10,433,687 (Appl. No. 15/269,430)
1003	Declaration of Joseph Fester
1004	U.S. Patent Publication No. 2011/0314630 ("Conrad'630")
1005	EP Publication No. 1,199,023 ("Matsumoto")
1006	U.S. Patent Publication No. 2016/0174787 ("Conrad'787")
1007	Int'l Publication No. WO 2008/009888 ("Dyson")
1008	U.S. Patent No. 9,301,663 ("Conrad'663")

TABLE OF ABBREVIATIONS

Abbreviation	Term
’687 patent	U.S. Patent No. 10,433,687 (Ex-1001)
AIA	America Invents Act
Board	Patent Trial and Appeal Board
Challenged Claims	Claims 1–4, 8 and 10 of U.S. Patent No. 10,433,687
Conrad’630	U.S. Patent Publication No. 2011/0314630 (Ex-1004)
Conrad’663	U.S. Patent No. 9,301,663 (Ex-1008)
Conrad’787	U.S. Patent Publication No. 2016/0174787 (Ex-1006)
Dyson	Int’l Publication No. WO 2008/009888 (Ex-1007)
Ex.	Exhibit
Fester Declaration	Declaration of Joseph Fester (Ex-1003)
Fig.	Figure
IPR	*inter partes* review
Matsumoto	EP Publication No. 1,199,023 (Ex-1005)
Patent Office	United States Patent and Trademark Office
Petitioners	SharkNinja Operating LLC, SharkNinja Management LLC, and SharkNinja Sales Company
POSITA	person of ordinary skill in the art

MANDATORY NOTICES

A. Real Parties-in-Interest [37 C.F.R. § 42.8(b)(1)]

The real parties-in-interest are Petitioners SharkNinja, Inc. SharkNinja Operating LLC, SharkNinja Management LLC, and SharkNinja Sales Company (collectively, "Petitioners"). Petitioners further identify SharkNinja Midco LLC, SharkNinja Appliance LLC, SharkNinja Appliance UK Holdco Limited and SharkNinja Global SPV, Ltd. as real-parties-in-interest out of an abundance of caution. No entity not named above is funding, controlling, or directing this Petition, or otherwise has had an opportunity to control or direct this Petition or Petitioners' participation in any resulting IPR.

B. Related Matters [37 C.F.R. § 42.8(b)(2)]

There are no judicial or administrative matters that would affect, or be affected by, a decision in this proceeding.

C. Lead and Back-Up Counsel [37 C.F.R. § 42.8(b)(3)]

Pursuant to 37 C.F.R. §§ 42.8(b)(3), 42.8(b)(4), and 42.10(a), Petitioners provide the following designation of counsel:

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A Power of Attorney accompanies this Petition in accordance with 37 C.F.R. § 42.10(b).

D. Service Information [37 C.F.R. § 42.8(b)(4)]

Service via hand delivery or postal mail may be made at the addresses of the lead and back-up counsel above. Petitioners hereby consent to electronic service, and service by electronic mail may be made at the following email address:

- GDC-SharkNinjaIPRD@gibsondunn.com

I. INTRODUCTION

Pursuant to 35 U.S.C. § 311, Petitioners hereby petition for *inter partes* review of U.S. Patent No. 10,433,687 (Ex-1001) and seek cancellation of claims 1–4, 8 and 10 ("Challenged Claims") as unpatentable under 35 U.S.C. § 103.

The Challenged Claims of the '687 patent add nothing to the prior art. The patent claims a handheld cyclonic vacuum cleaner that has a) a dirt collector that empties with a pivoting front door; and b) a pistol grip handle in the rear. Ex-1001 at 1:16-34, 2:61-3:2, Figs. 2, 8. The patent explains that the claimed design allows a user to easily hold the vacuum while emptying dirt out of the front with little spillage. *Id*. at 5:64-6:11.

But the claimed design was not new at the time of filing. For example, Conrad'630 discloses a handheld cyclonic vacuum cleaner that meets every single element of the Challenged Claims other than the claimed pistol grip handle. Conrad'630 even touts the same benefit of its dirt collector with a pivoting front door as the '687 patent. Ex-1004, ¶6. Conrad'630 also explains that the handle can be of "any design" and placed "at the rear" of the vacuum. *Id*, ¶52.

As for the handle design, another patent by the same inventor, Conrad'787, explicitly describes using a pistol grip handle (exactly as claimed in the Challenged Claims) on such a handheld cyclonic vacuum cleaner, and touts the benefits of such a handle design. Ex-1006, ¶¶312, 314, 317. The examiner identified Conrad'787 during prosecution as disclosing the claimed pistol grip handle, and the patentee

agreed, authorizing amendments to add dirt collector features to get the claims allowed. As another example, the patentee's own prior filed application (Dyson) also discloses the same rear pistol grip handle for a handheld cyclonic vacuum cleaner. It would be obvious to use a pistol grip handle as disclosed in Conrad'787 or Dyson at the rear of the handheld cyclonic vacuum cleaner of Conrad'630 (as the latter explicitly suggests) to arrive at the Challenged Claims.

In addition, Matsumoto also discloses every aspect of the design of the Challenged Claims other than rear pistol grip handle on a handheld device. As described below, it would be obvious to use the rear pistol grip handle of either Conrad'787 or Dyson to modify the cyclonic vacuum of Matsumoto to make it a handheld device. Indeed, Matsumoto explicitly suggests miniaturizing the described vacuum cleaner, and a POSITA would easily recognize that the ergonomic pistol group handle of Conrad'787 or Dyson would be more comfortable than the long skinny handle disclosed in Matsumoto.

While Conrad'787 was before the examiner during prosecution, these specific combinations were not. Because there was nothing new about the use of a rear pistol grip handle on a front-emptying handheld cyclonic vacuum cleaner, the Board should institute IPR to invalidate the Challenged Claims of this patent.

II. REQUIREMENTS OF *INTER PARTES* REVIEW

A. Standing

Pursuant to 37 C.F.R. § 42.104(a), Petitioners certify that the '687 patent is available for IPR and that Petitioners are not barred or estopped from requesting an IPR on the grounds identified herein.

B. Identification of Challenge and Relief Requested

Pursuant to 37 C.F.R. § 42.104(b), Petitioners request that the Board institute IPR of claims 1–4, 8 and 10 of the '687 patent under AIA 35 U.S.C. § 103.

The '687 patent issued from an application filed September 19, 2016, which purports to claim priority to a UK patent application filed September 17, 2015. For purposes of this Petition only, Petitioners do not challenge whether the Challenged Claims are entitled to a priority date of September 17, 2015.

The precise relief requested by Petitioners is that claims 1–4, 8 and 10 be canceled based on the grounds below:

Ground	Claims	Basis for Rejection[1]
1	1–4, 8 and 10	Obviousness over Conrad'630 and Conrad'787
2	1–4, 8 and 10	Obviousness over Conrad'630 and Dyson
3	1–4, 8 and 10	Obviousness over Matsumoto and Conrad'787

[1]All obviousness grounds include the knowledge of a POSITA.

Ground	Claims	Basis for Rejection[1]
4	1–4, 8 and 10	Obviousness over Matsumoto and Dyson

The above challenges are made in view of the following prior art references:

1. U.S. Patent Publication No. 2011/0314630 ("Conrad'630") (Ex-1003)

U.S. Patent Publication No. 2011/0314630 ("Conrad'630"), titled "Hand vacuum cleaner with removable dirt chamber," published on December 29, 2011. Conrad'630 therefore qualifies as prior art to the '687 patent under AIA 35 U.S.C. § 102(a)(1). Although a family member of Conrad'630 is cited on the face of the '687 patent, that family member to Conrad'630 was not applied in any Office Actions during prosecution of the '687 patent, nor highlighted or discussed by the Examiner or the Applicant. Conrad'630 itself was not cited nor discussed.

2. EP Publication No. 1,199,023 ("Matsumoto") (Ex-1004)

EP Publication No. WO 1,199,023 ("Matsumoto") titled "Vacuum cleaner," published on April 24, 2004. Matsumoto therefore qualifies as prior art to the '687 patent under AIA 35 U.S.C. § 102(a)(1). Matsumoto was not of record during prosecution of the '687 patent.

3. U.S. Patent Publication No. 2016/0174787 ("Conrad'787") (Ex-1005)

U.S. Patent Publication No. 2016/0174787 ("Conrad'787"), titled "Surface cleaning apparatus," published on June 23, 2016, from a non-provisional application

filed on August 10, 2015. Conrad'787 therefore qualifies as prior art to the '687 patent under AIA 35 U.S.C. § 102(a)(2). Although Conrad'787 was cited on the face of the '687 patent, and was applied in an Office Actions during prosecution of the '687 patent, it was not considered in view of either Conrad'630 or Matsumoto.

4. Int'l Publication No. WO 2008/009888 ("Dyson") (Ex-1006)

Int'l Publication No. WO 2008/009888 ("Dyson") titled "A hand-held cleaning appliance," published on January 24, 2008. Dyson therefore qualifies as prior art to the '687 patent under AIA 35 U.S.C. § 102(a)(1). Dyson was not of record during prosecution of the '687 patent.

C. How the Challenged Claims Are To Be Construed Under 37 C.F.R. § 42.104(b)(3)

A claim subject to IPR shall be construed using the same standard as in a civil action. 37 C.F.R. § 42.100(b). The Board need only construe terms "to the extent necessary to resolve the controversy." *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017). Petitioners submit that no construction of any claim term is necessary for the Board to resolve this Petition. Petitioners maintain that the Challenged Claims would have been obvious under any reasonable construction.

D. How the Challenged Claims Are Unpatentable Under 37 C.F.R. § 42.104(b)(4)

An explanation of how the Challenged Claims are unpatentable under the statutory grounds identified above, including the identification of where each element of the claim is found in the prior art patents or printed publications, is provided below.

E. Supporting Evidence Under 37 C.F.R. § 42.104(b)(5)

The exhibit numbers of the supporting evidence relied upon and the relevance of the evidence to the challenged claims, including an identification of specific portions of the evidence that support the challenge, are provided below. A list of exhibits with the exhibit number and a brief description of each exhibit is also included in this Petition pursuant to 37 C.F.R. § 42.63(e). The technical information and grounds for rejection explained in this Petition are further supported by the Declaration of Joseph Fester. Ex-1003, ¶¶1-246.

F. Payment of Fees

Pursuant to 37 C.F.R. §§ 42.103 and 42.15(a), the required fee is being submitted herewith. The Office is authorized to charge any fee deficiency, or credit overpayment, to deposit account no. 50-1408, including additional fees due in connection with this Petition.

III. TECHNICAL BACKGROUND

A. Summary of the Alleged Invention of the '687 Patent

The '687 patent purports to provide a handheld vacuum cleaner having an allegedly improved arrangement for emptying a dirt collector. Ex-1001 at 1:16-34. Specifically, the '687 patent discloses a handheld vacuum cleaner 2 with a handle 6, a cyclonic separating unit 8, and a suction generator 11. *Id*. at 2:45-60. The handle 6 is arranged in a "pistol grip configuration," and in particular, "the handle axis H is arranged at 110 degrees with respect to the longitudinal axis X of the cyclonic separating unit 8," as demonstrated by angle θ_1. *Id.* at 2:61-67; Fig. 2 (annotated below).

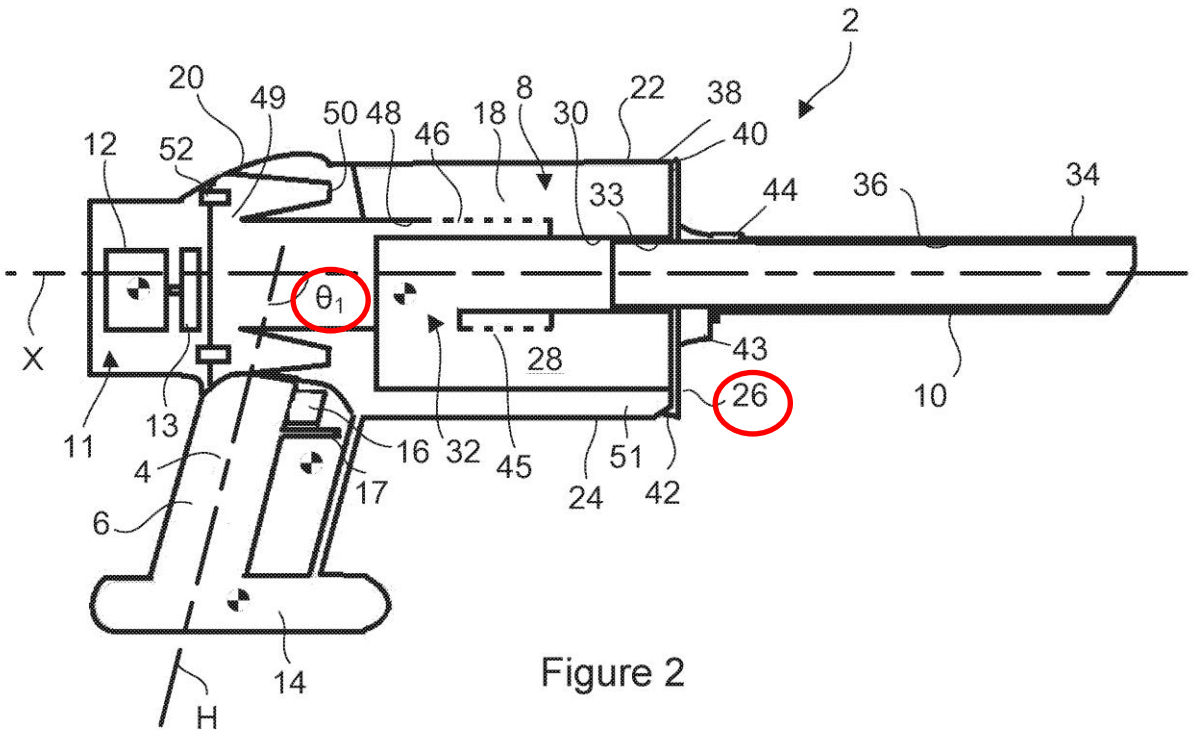


Figure 2

Ex-1001, Fig. 2.

Moreover, the cyclonic separating unit 8 has a separator body 22 in the form of a bin having a cylindrical outer wall 24 and an end wall 26. *Id.* at 3:12-15. The end wall 26 and a portion of the cylindrical outer wall 24 define a dirt collector 38, where dirt is collected. *Id*. at 3:49-53. The end wall 26 is connected to the outer wall 24 by a pivot 40 and held in a closed position by a catch 42. *Id*. at 3:54-56. As shown in Fig. 8 (reproduced below), the "end wall 26 can be moved from the closed position, in which dirt is retained within the dirt collector 38, to an open position, in which dirt can be removed from the dirt collector 38, by releasing the catch 42 and pivoting the end wall 26 away from the end of the cylindrical outer wall 24." *Id*. at 3:56-61.

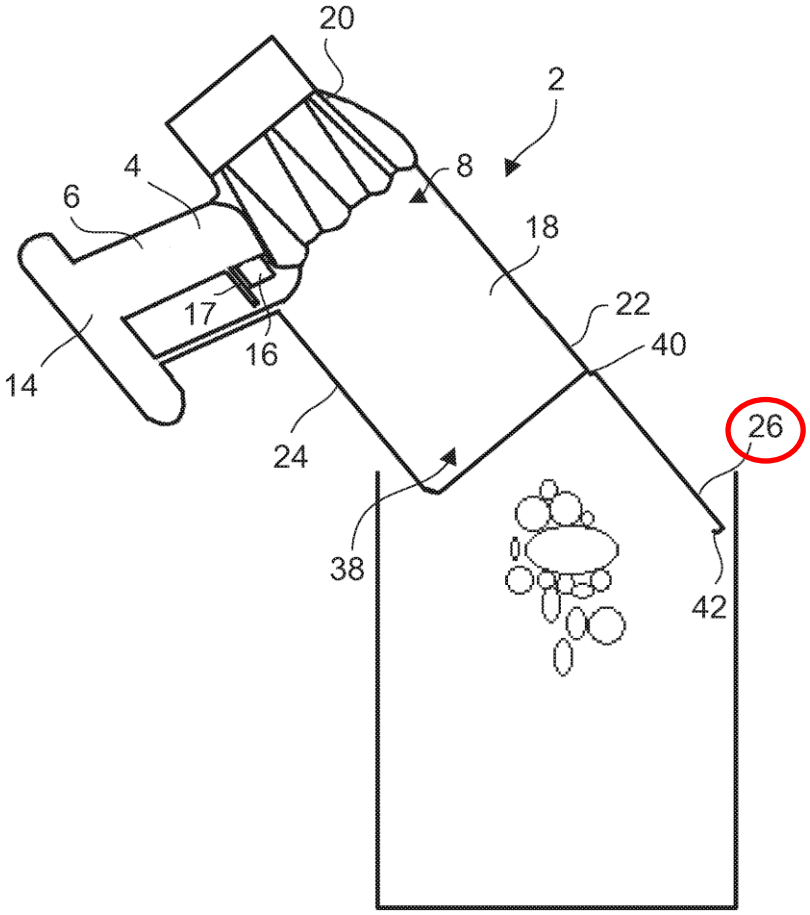


Figure 8

Ex-1001, Fig. 8 (annotated).

The ’687 patent explains the process for emptying the dirt collector 38 at follows:

> [W]hilst gripping the handle 6, the user points the vacuum cleaner 2 towards a suitable receptacle (e.g. a waste bin or bag) into which the dirt is to be emptied. The catch 42 is then released by the user and the end wall 26 pivoted from its closed position into its open position. Since the cyclonic separating unit 8 is pointed away from the user, there is no need for the user to adopt a different grip or posture from that which is adopted during normal cleaning. Consequently, the process by which the dirt collector 38 and the fine duct collector 51 are emptied is very

> intuitive and ergonomic. Furthermore, dirt exits the dirt collector 38/fine dust collector 51 from the end of the cyclonic separating unit 8 which is furthest from the handle 6. Therefore, there is less risk that dirt will spill from the dirt collector 38/fine dust collector 51 onto a user during emptying.

Id. at 5:64-6:11.

Claim 1 is representative of the claimed subject matter:[2]

> 1. A handheld vacuum cleaner comprising:
>
> a handle by which the vacuum cleaner is supported during normal use;
>
> a cyclonic separating unit having a longitudinal axis and a dirt collector at one end of the cyclonic separating unit, the cyclonic separating unit comprising an end wall having a closed configuration in which dirt is retained within the dirt collector by the end wall and an open configuration for the removal of dirt from the dirt collector, wherein the end wall is movable relative to the longitudinal axis and, when the end wall is in the closed configuration, the longitudinal axis extends through a region bounded by a perimeter of the end wall, wherein the handle has a pistol grip configuration in which the handle is inclined with respect to the cyclonic separating unit to form an angle of not less than 85 degrees and not greater than 140 degrees between a handle axis and the longitudinal axis of the cyclonic separating unit, and wherein the handle axis and the longitudinal axis intersect within the vacuum cleaner.

Ex-1001, cl. 1.

[2] The underlined claim elements were added during prosecution. *See, infra*, III.B; Ex-1002, 33-38, 168-177, 195-200.

B. Summary of the Prosecution History of the '687 Patent

During prosecution and prior to allowance, the patentee amended the claims twice and the Examiner once. Ex-1002, 33-38, 168-177, 195-200.

In an Office Action dated August 27, 2018 (the "First Office Action"), the Examiner rejected claims 1, 3-6, 8 and 10 as anticipated by U.S. Patent Publication No. 2017/0071426 to Krebs. *Id*., 257-269. As illustrated by the Examiner (and copied below), the Examiner found that Krebs discloses a handle that is "inclined with respect to the cyclonic separating unit to form an angle of not less than 85 degrees and not greater than 140 degrees between a handle axis and the longitudinal axis of the cyclonic separating unit," as claimed. *Id*., 260-261.

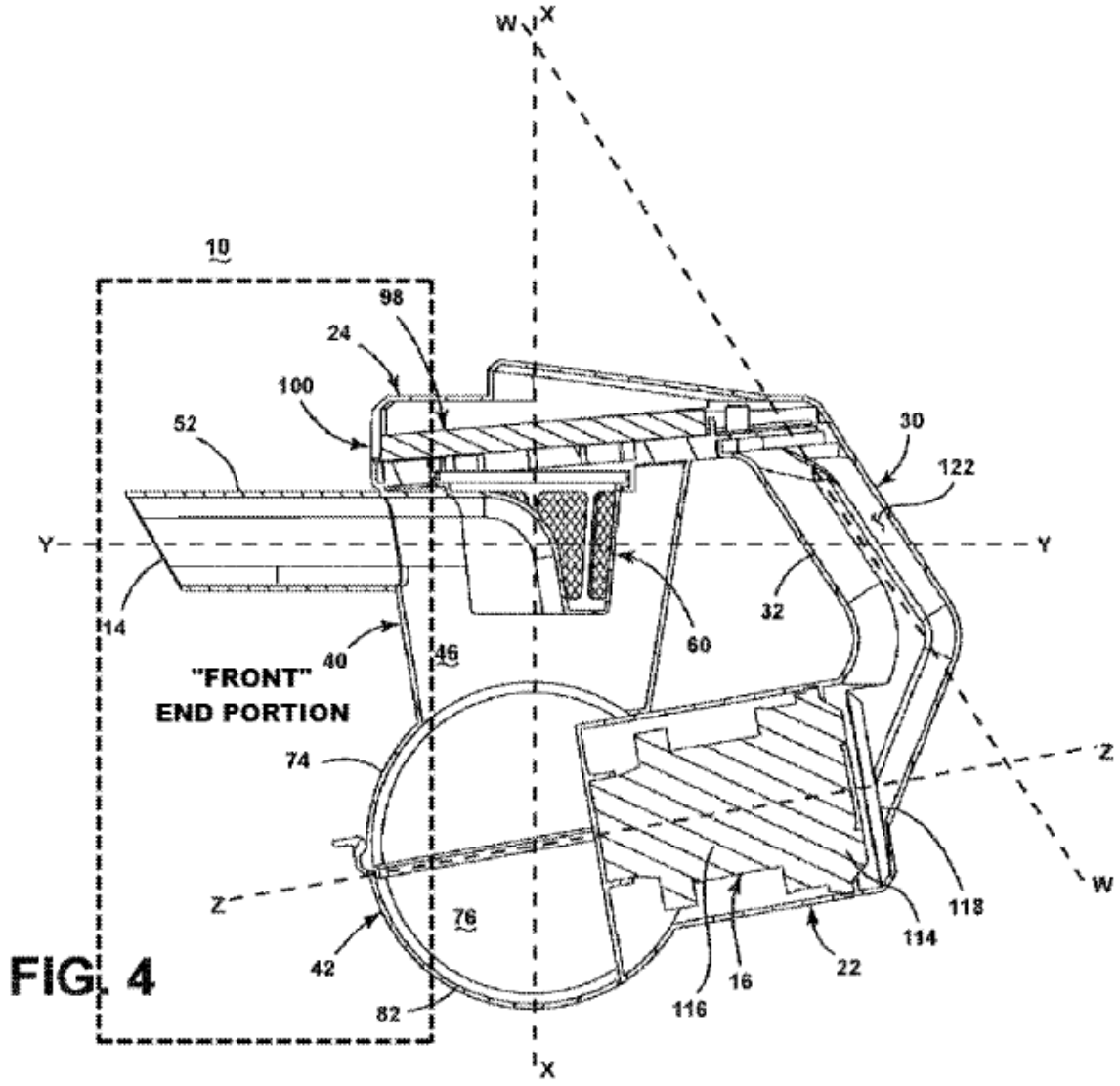


FIG. 4

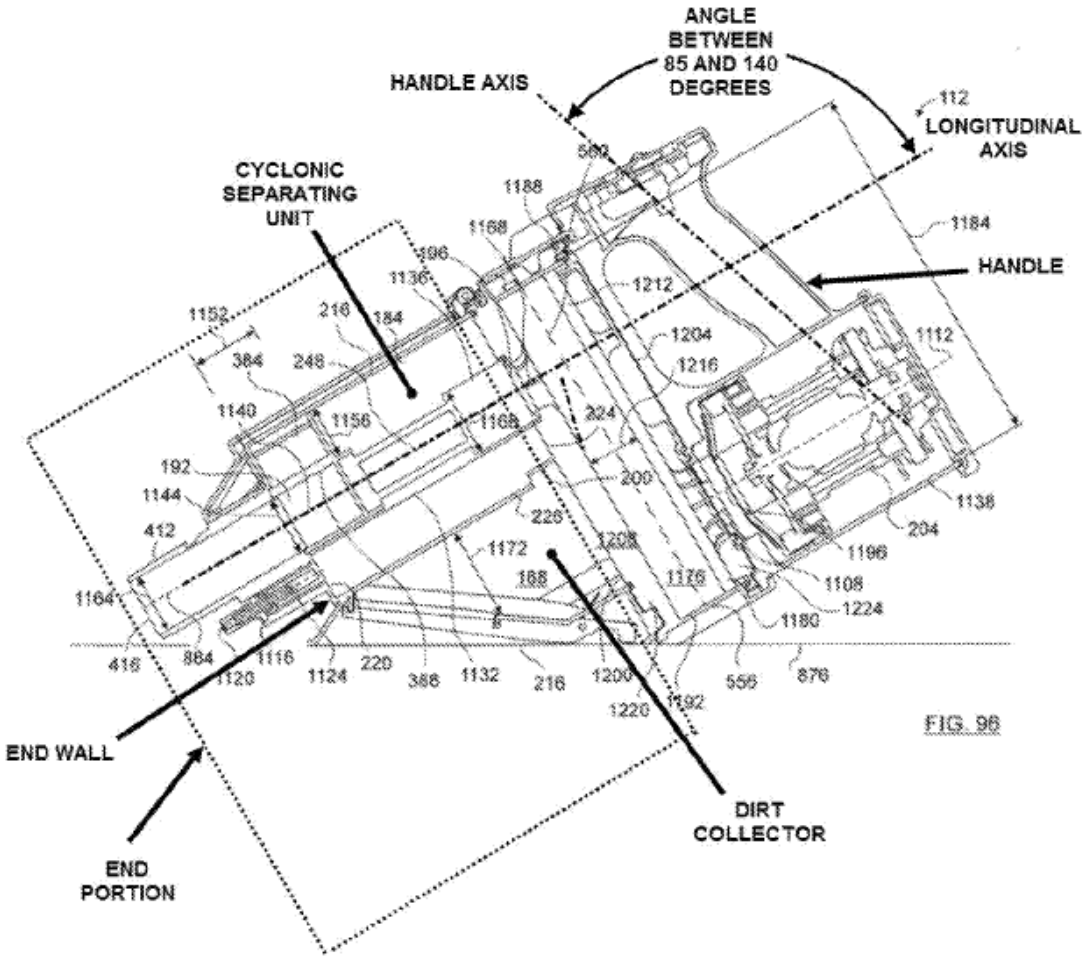
Ex-1002, 261 (Krebs Fig. 4, as annotated by the Examiner).

Moreover, the Examiner rejected claims 2 and 9 as obvious in view of Krebs alone. *Id*., 264-268. As to claim 2, the Examiner explained that Krebs "teaches a claimed angle of approximately 135 degrees which is merely at most 10 degrees outside the claimed range." *Id*., 265-266. The Examiner also explained that it "is common knowledge to a designer that the ergonomic angle would be related to the

center of gravity of the device and the angle of intended use…It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the angle based on the center of gravity and the angle of intended use with the motivation to optimize the ergonomic comfort during operation." *Id*.

In response to the First Office Action, the patentee amended the claims on November 27, 2018 to "recite that the intersection between the handle axis and the longitudinal axis is 'within the vacuum cleaner,'" which Krebs did not disclose. *Id*., 195-200.

But, as the Examiner recognized, Conrad'787 does disclose the exact handle configuration as claimed. In an Office Action dated February 11, 2019 ("Second Office Action"), the Examiner rejected claims 1-5 and 8-10 as anticipated by Conrad'787. *Id*., 184-192. In support of the rejection, the Examiner annotated Conrad'787 Figure 96 as shown below:



Ex-1002, 187-188 (Conrad'787 Fig. 96, as annotated by the Examiner).

In response to the Second Office Action, the patentee amended the claims on May 13, 2019 to recite that "at least part of the end portion moves across the longitudinal axis when the end portion moved from the closed configuration to the open configuration." *Id*., 168-177. The patentee explained that "[n]o part of the bottom wall 216 moves across the longitudinal axis 248 when the dirt collection chamber 188 is emptied." *Id*., 168.

Thus, both the Examiner and the patentee acknowledged that the handle configuration, as claimed in both claims 1 and 2, is not new and was disclosed by Conrad'787. Ex-1003, ¶¶22-26.

On June 12, 2019, following a telephone interview with the patentee's representative, the Examiner issued a Notice of Allowance along with an Examiner's amendment which amended claim 1 to recite "end wall," instead of "end portion," and also to recite: "wherein the end wall is movable relative to the longitudinal axis and, when the end wall is in the closed configuration, the longitudinal axis extends through a region bounded by a perimeter of the end wall." Ex-1002, 33-38. This additional limitation purportedly distinguishes the claimed dirt collection chamber of the '687 patent from the Conrad'787, which has a dirt collection chamber 188 having a bottom wall 216 that is beneath the longitudinal axis of the vacuum and pivots open in a direction away from that axis. Ex-1006, ¶¶200, 202, 364, Fig. 96; Ex-1003, ¶26.

The '687 patent issued on October 8, 2019. Ex-1001. Because more than nine months have passed since issuance, the '687 patent is eligible for IPR. 35 U.S.C. § 311(c)(1).

C. Person of Ordinary Skill in the Art

The '687 patent relates to the field of vacuums cleaners. Ex-1001, Abstract. A POSITA in the field on or around September 17, 2015, would have had a

Bachelor's degree in Mechanical Engineering (or an equivalent discipline) or equivalent work experience, and at least one year's worth of experience in research, design and/or development related to vacuum cleaners (or other comparable industrial design). Additional education could substitute for experience, and vice versa. Ex-1003, ¶¶56-58.

IV. GROUNDS OF UNPATENTABILITY

A. Ground 1: Conrad'630 in View of Conrad'787 Render Obvious Claims 1–4, 8 and 10

As explained below, Conrad'630 discloses a handheld vacuum cleaner having a dirt collector as claimed in the '687 patent and a handle configuration at the rear thereof. Ex-1003, ¶¶61-119. While Conrad'630 does not explicitly disclose the specific handle configuration claimed in the '687 patent, it explicitly states that "any design" of a handle can be used "at the rear" of the vacuum, and Conrad'787 teaches exactly the claimed handle configuration. *Id.*, ¶61. A POSITA would have been motivated to combine the teachings of Conrad'630 with Conrad'787 for the reasons discussed below. *Id.*, ¶¶62-76. Thus, the combination of Conrad'630 and Conrad'787 renders obvious claims 1–4, 8 and 10 of the '687 patent. *Id.*, ¶¶61-119.

1. Overview of Ground

a. Summary of Conrad'630

As shown in Figures 1, 5 and 6, Conrad'630—just like the '687 patent—discloses a handheld vacuum cleaner 100 with a handle 102, a cyclone 122 (yellow)

with a dirt collection chamber 124 having a first portion 148 (green) and a front wall 158 (purple) that can be opened by pivoting it relative to the longitudinal axis (red). *See* Ex-1004, ¶¶ Abstract, 52, 70, 74, 76-77; Ex-1003, ¶¶31-36.

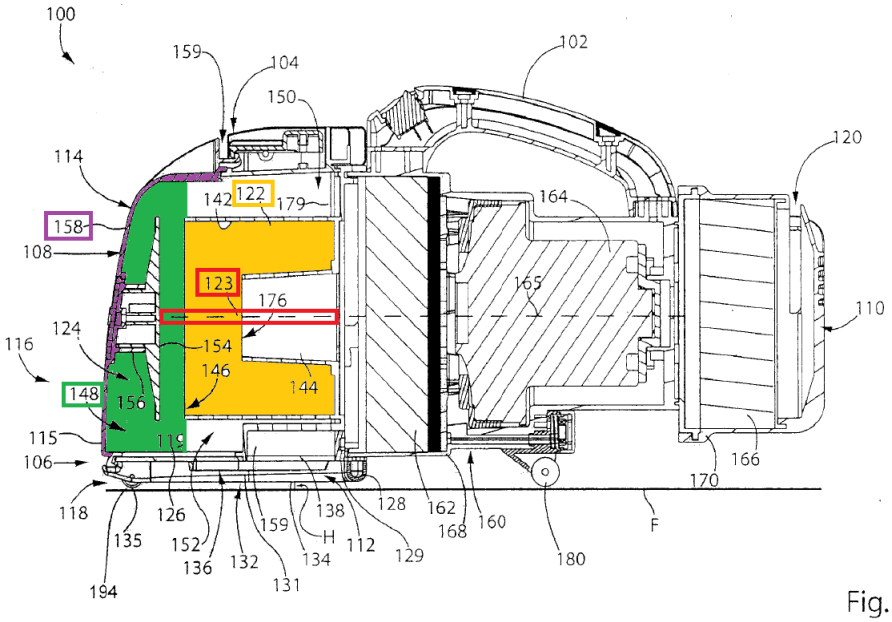


Fig. 6

Ex-1004, Fig. 6 (annotated).

While handheld vacuum cleaner of Conrad'630 is illustrated as having a handle 102 on its upper portion, the specification also teaches modifying the vacuum cleaner 100 to relocate the handle 102 to another location on the vacuum cleaner 100. In particular, Conrad'630 teaches that the "handle 102 may be provided elsewhere on the vacuum cleaner 100, for example at the rear 110 and may be of any design." Ex-1004, ¶52.

Handheld vacuum cleaner 100 also has a nozzle 112 with an opening 138 (green) positioned on the bottom thereof. Ex-1004, ¶¶56, 69, Fig. 7a. The bottom

thereof has optional wheels 135, which are arranged to be in contact with a surface to be cleaned. *Id*., ¶¶65, 67-70. In use, a user could use the handle 102 to push the vacuum cleaner 100 over the surface to be cleaned, e.g., a floor, sofa, or stairs. *Id*., Ex-1003, ¶¶31-36.

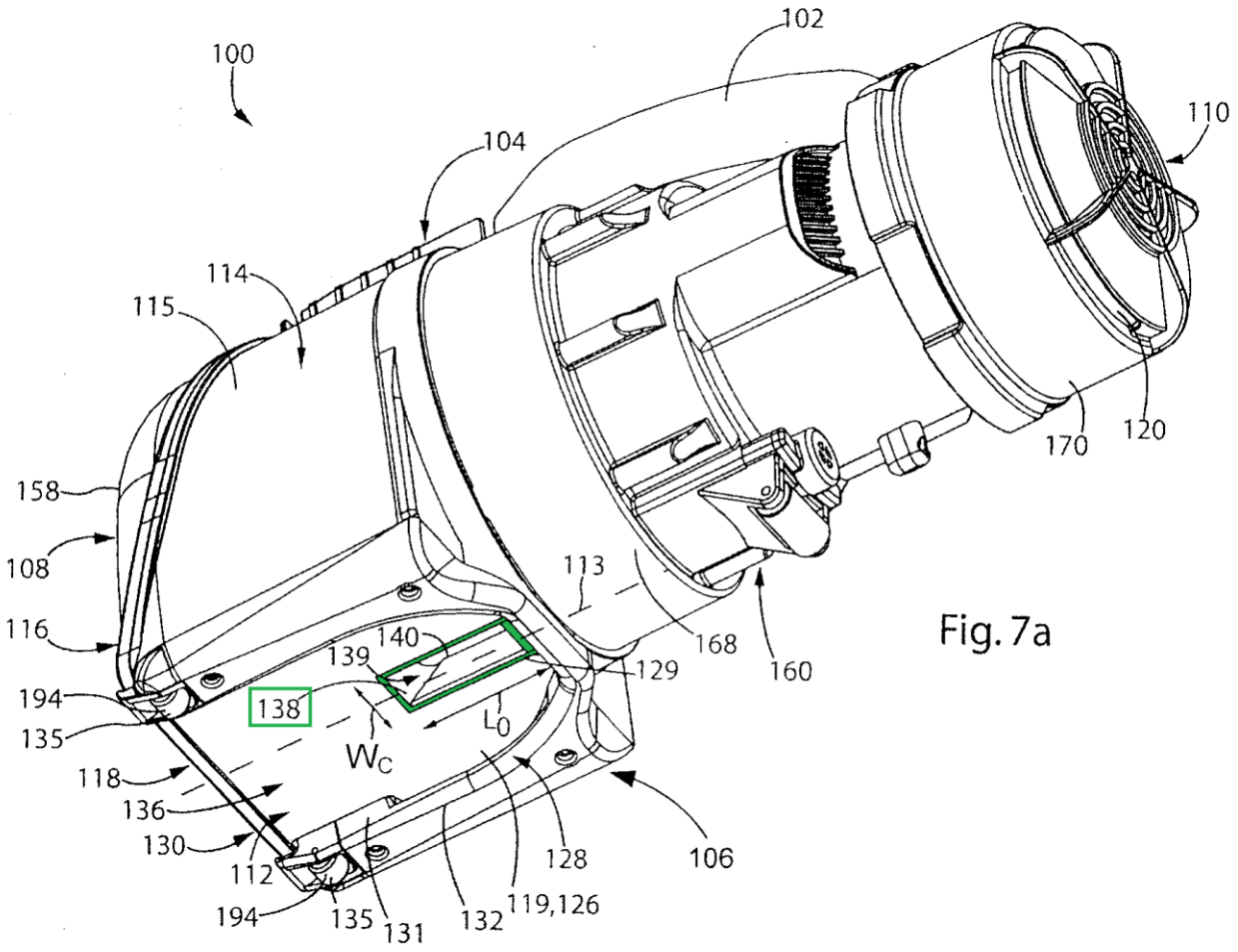


Fig. 7a

Ex-1004, Fig. 7a (annotated).

Like the vacuum cleaner of the ’687 patent, the vacuum cleaner of Conrad’630 is emptied from the end furthest from the handle 102 by pivoting the catch

mechanism (front wall 158, shown in purple) relative to the longitudinal axis (red).

Ex-1004, ¶¶ Abstract, 52, 70, 74, 76-77; Ex-1003, ¶¶31-36.

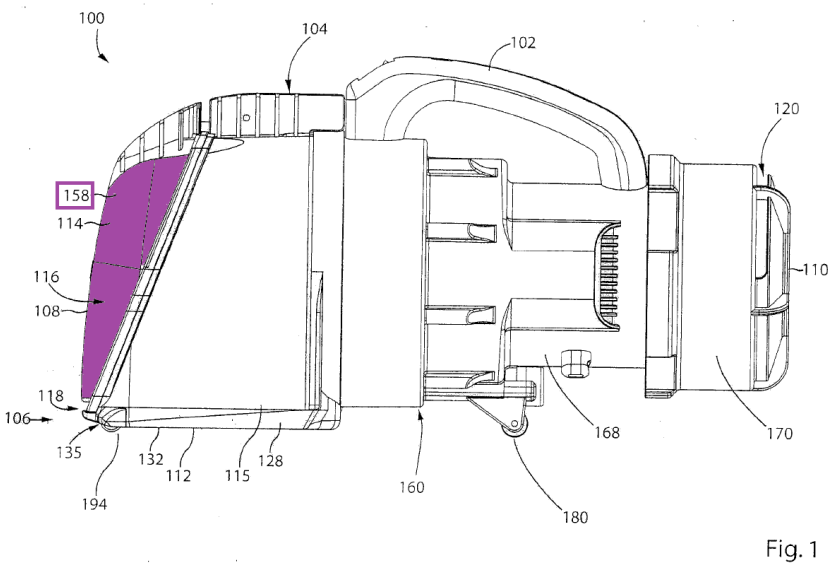


Fig. 1

Ex-1004, Fig. 1 (annotated).

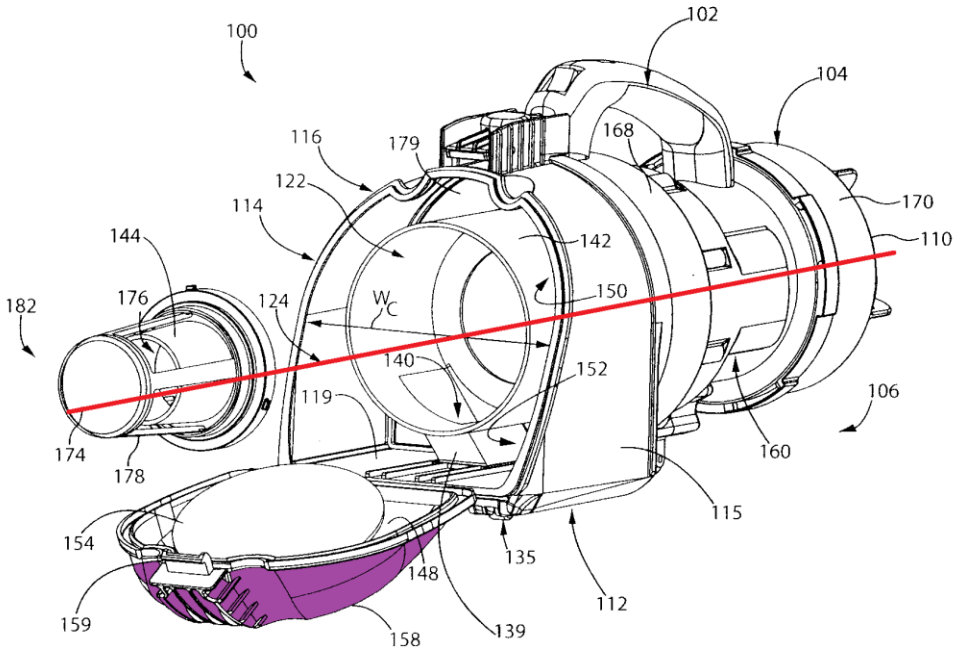


Fig. 5

Ex-1004, Fig. 5 (annotated).

Conrad'630 explains that the configuration of its dirt collection chamber allows for "dirt collected in the chamber [to] be transported to a disposal site (e.g., a garbage can) without the dirt being dispersed as the dirt collection chamber is conveyed to the disposal site." *Id*., ¶6. Accordingly, like the '687 patent "there is less risk that dirt will spill from the dirt collector [] onto a user during emptying." Ex-1001, 6:9-11.

Yet another advantage of this design, as Conrad'630 explains, is that "the hand surface cleaning apparatus may have a simplified structure. By providing the nozzle as part of the dirt collection chamber, and preferably as part of a cyclone unit, such

an assembly may be removably mounted to a motor housing. Accordingly, a skeleton or backbone to which individual components are mounted is not required and is preferably not used. Such a design may be lighter, permitting a user to use the hand surface cleaning apparatus for a longer continuous period of time." *Id*., ¶19.

b. Summary of Conrad'787

As shown below in Figure 78, Conrad'787 also discloses a handheld cyclonic vacuum cleaner 112 (also referred to as handvac 112) having a handle 484 (pink). As further explained below, handle 484 (pink) is shaped in a configuration that matches precisely the "pistol grip configuration" of the '687 patent. Ex-1006, ¶¶312, 314, 317, 329, Figs. 78 and 96. The handle 484 (pink) extends along a handle axis 888 (purple), which is illustrated at an angle (green) of approximately ***105 degrees*** relative to a nozzle axis 884 (red). *Id.*; Ex-1003, ¶¶41-47. Moreover, Conrad'787 explains that this handle configuration can be "comfortably operated in an orientation that does not require an application of torque by the user's hands when the handvac 112 is held by handle 484," because "the center of gravity 524 of the handvac 112 is aligned vertically below the user's hand." Ex-1006, ¶314.

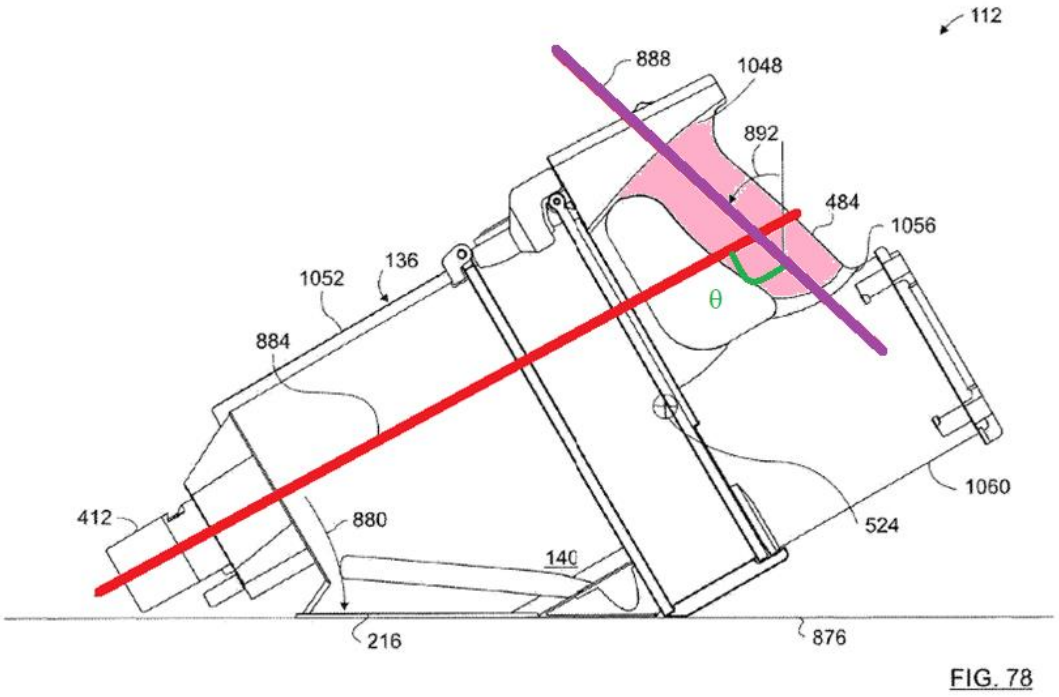


FIG. 78

Ex-1006, Fig. 78 (annotated).

Moreover, Conrad'787 discloses that "[a]ngle 880 may be an acute angle which may be between 10 and 80 degrees, and preferably between 25 and 65 degrees, more preferably between 35 and 55 degrees or between 20 and 40 degrees," and "angle 892 is an acute angle of between 10 and 80 degrees, more preferably between 20 and 70 degrees and most preferably between 30 and 60 degrees." *Id*., ¶¶312, 317. As explained below (Claim Element 1[d]), Conrad'787 therefore discloses a range for angle θ (green) that falls within the range claimed in claims 1 and 2. Ex-1003, ¶¶41-47.

c. Motivation to Combine Conrad'630 and Conrad'787

A POSITA reviewing Conrad'630 would have been motivated to use a different handle configuration at the rear because of Conrad'630's express disclosure to move the handle 101 to other locations and with other designs. *See* Ex-1004, Fig. 6, ¶52 (explaining that "handle 102 may be provided elsewhere on the vacuum cleaner 100, for example at the rear 110 and may be of any design."); Ex-1003, ¶¶64-77.

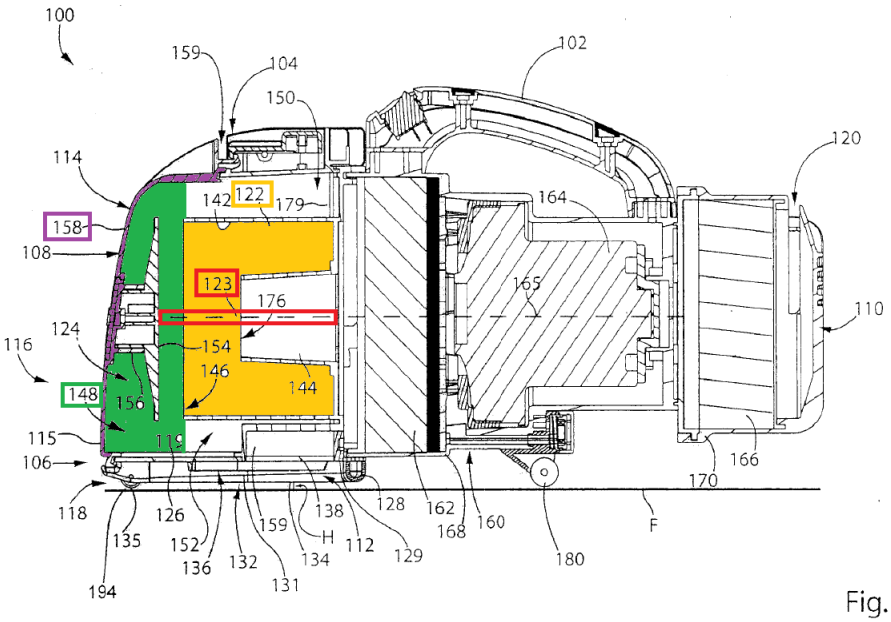


Fig. 6

Ex-1004, Fig. 6 (annotated).

Conrad'787—by the same inventor as Conrad'630—discloses a handvac 112 with a handle of a different design "at the rear." Ex-1006, Fig. 78; *see also* Section A.1.b. Conrad'787 discloses that its handle configuration allows the handheld vacuum to be "comfortably operated in an orientation that does not require an

application of torque by the user's hands when the handvac 112 is held by handle 484," because "the center of gravity 524 of the handvac 112 is aligned vertically below the user's hand." Ex-1006, ¶314. Conrad'787 further explains that in "the illustrated embodiment, handle axis 888 of handle 484 extends at a (non-zero) forward angle 892 to the vertical (e.g., when bottom wall 216 is horizontal). This may provide a comfortable handle alignment for grasping by a user when picking up handvac 112, and when using handvac 112 for cleaning surfaces below the user's elbows." *Id*. at ¶317.

Moreover, a POSITA would have recognized that both the handheld vacuums of Conrad'630 and Conrad'787 are designed to be used with various attachments, as was commonplace as the time of the '687 patent. Ex-1003, ¶¶69-77. For example, Conrad'787 discloses that "handvac 112 may include an electrical connector 1116 for providing power to an upstream attachment (e.g. a surface cleaning head)." Ex-1006, ¶331. Indeed, another patent in the same family as Conrad'630 discloses that the exact vacuum cleaner of Conrad'630 can be used with attachments. Ex-1008, Fig. 3b (showing flexible hose 124 attached to attachment member 120 of a handheld vacuum cleaner 400), 11:50-52 ("[F]lexible hose 124 serves as an extended cleaning attachment for the hand vacuum cleaner 400."), 12:7-12 (describing that nozzle 412 may be "directly connected to any one of a number of cleaning tools…including wands, brushes, crevasse tools and other hoses."); *see also* Figs. 6-10.

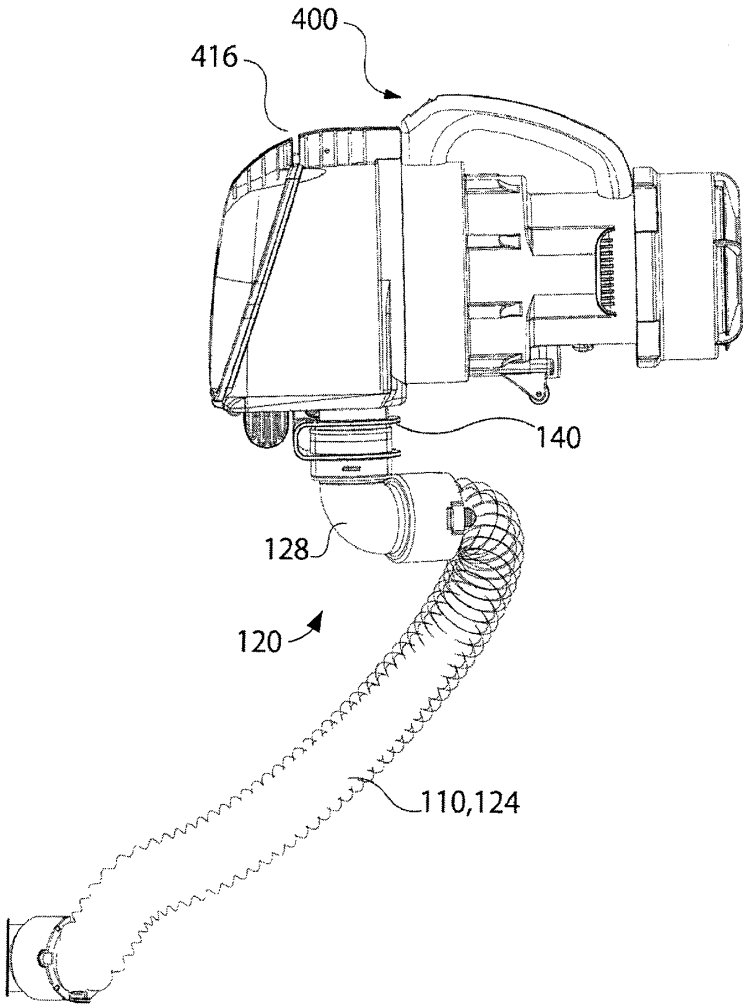


Fig. 3b

Ex-1008, Fig. 3b. Thus, a POSITA would readily understand that one application for Conrad'630 would be to hold the vacuum cleaner in one hand while manipulating an attachment (such as a hose or wand) with the other. Ex-1003, ¶¶64-77.

A POSITA would have therefore been motivated to combine Conrad'630 with Conrad'787 in a way that incorporates the latter's teachings concerning the handle 484, including the shape and angle arrangement disclosed by Conrad'787. *See*, *infra*, IV.A.2.e (Claim Element 1[d]); Ex-1003, ¶¶64-77, 88-101. Conrad'630's

express teaching that the handle 102 may be provided "at the rear 110" and be "of any design" is an explicit statement that would encourage a POSITA to use a different design handle at the rear of the vacuum. *Id*. The same considerations present in Conrad'787 that motivate the implementation of a pistol grip in its handheld vacuum cleaner apply equally in Conrad'630. For example, because both vacuums are designed to be used with attachments, a POSITA would have recognized additional advantages associated with providing the handle at the rear. A user of a vacuum and its attachments would want to carry the vacuum cleaner in one hand while using an attachment with the other, and, as Conrad '787 teaches, a pistol grip provides the user with a better grip and more comfort in such a configuration. *Id*. In another example, one using the Conrad'630 vacuum to vacuum surfaces elevated from floor, such as furniture or stairs, would have benefited from additional advantages associated with Conrad'787's "drive handle"—such as easier guiding and steering of the vacuum cleaner and allowing the user to push the vacuum cleaner without requiring the application of torque—which would further motivate the combination. *Id*.; Ex-1006, ¶¶314, 316. At bottom, when Conrad'630 suggests that the handle in its system can be placed at the rear, the most natural solution would be the most common, ubiquitous type of handle placed at the rear of handheld vacuum—the pistol grip handle disclosed in Conrad'787. And pistol grip handles, used nearly universally in various handheld tools, not limited to vacuum cleaners,

are characteristically angled forward of vertical for the same ergonomic reasons discussed in Conrad'787—improved comfort, maneuverability, and control.

And, a POSITA would wish to retain the advantages of Conrad'630's design (*see*, *supra*, Section IV.A.1.a), including its improved dustbin configuration. Ex-1004, ¶¶6, 7; Ex-1003, ¶¶31-36, 64-77.

Moreover, a POSITA would incorporate a handle that conforms with Conrad'787's teachings concerning handle 484 (pink)—including as to the shape and the range for angle θ—to the rear of Conrad'630, as instructed by Conrad'630. Ex-1003, ¶¶64-77; Ex-1004 at ¶52 (explaining that "handle 102 may be provided elsewhere on the vacuum cleaner 100, for example at the rear 110 and may be of any design."); *see*, *supra*, Section IV.A.1.b. A POSITA would have recognized that the location of the "driving handle 484" on the back of the vacuum cleaner would both promote the forward movement of the vacuum cleaner 100 over the surface to be cleaned, and in particular for the types of surfaces that would be cleaned using a handheld vacuum, *e.g.*, such as stairs, couches and bedding, and further allow for more flexibility in using the handheld vacuum with an attachment for different types of cleaning. Ex-1003, ¶¶64-77.

A POSITA would have had a reasonable expectation of success to do so, because the improved handle would not interfere with the vacuum's components. *Id.* While Conrad'630 explains that "clean air outlet 120 is preferably at the rear

110 of the cleaner 100," (Ex-1004., ¶54), it would have been a simple design choice for a POSITA to add additional air outlets on the side towards the rear of the vacuum to direct airflow away from the location of the new handle. Ex-1003, ¶¶64-77. For example, a POSITA could have designed a handle that attaches to the vacuum cleaner of Conrad'630 at the same location that the current handle attaches, and which extends to the rear of the vacuum cleaner and then forms a pistol shaped handle, which is sloped relative to the longitudinal axis 123 (red) at an angle consistent with the disclosure of Conrad'787 (which is within the range claimed by claims 1 and 2 of the '687 patent). *Id*. The Fester Declaration depicts several examples of how such a handle might be designed and attached to the vacuum cleaner of Conrad'630.[3] *Id*., ¶¶64-77.

2. Detailed Analysis of Ground 1

a. Element 1[pre]

"A handheld vacuum cleaner, comprising"

To the extent the preamble of claim 1 is limiting, Conrad'630 discloses it. Ex-1003, ¶¶77-79. Conrad'630 discloses a handheld vacuum cleaner 100. Ex-1004,

[3] While it is not necessary for Petitioners to show how a POSITA would physically combine the references, Petitioners provide mockups of the combined vacuum cleaner to illustrate that a POSITA could do so readily.

Abstract; ¶6 ("According to one broad aspect, a hand surface cleaning apparatus is disclosed having a simplified structure for emptying the surface cleaning apparatus."); ¶52 ("The vacuum cleaner 100 is a hand vacuum cleaner."); Figs. 1-8.

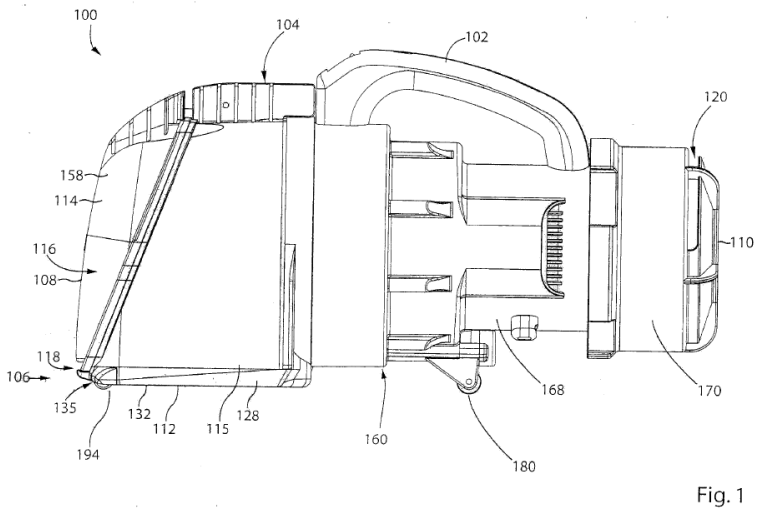


Fig. 1

Ex-1004, Fig. 1.

Similarly, Conrad'787 discloses a handheld vacuum cleaner, referred to as "handvac 122" having a handle 484. Ex-1006, ¶¶185, 312, 314, 316, Figs. 78, 96; Ex-1003, ¶80.

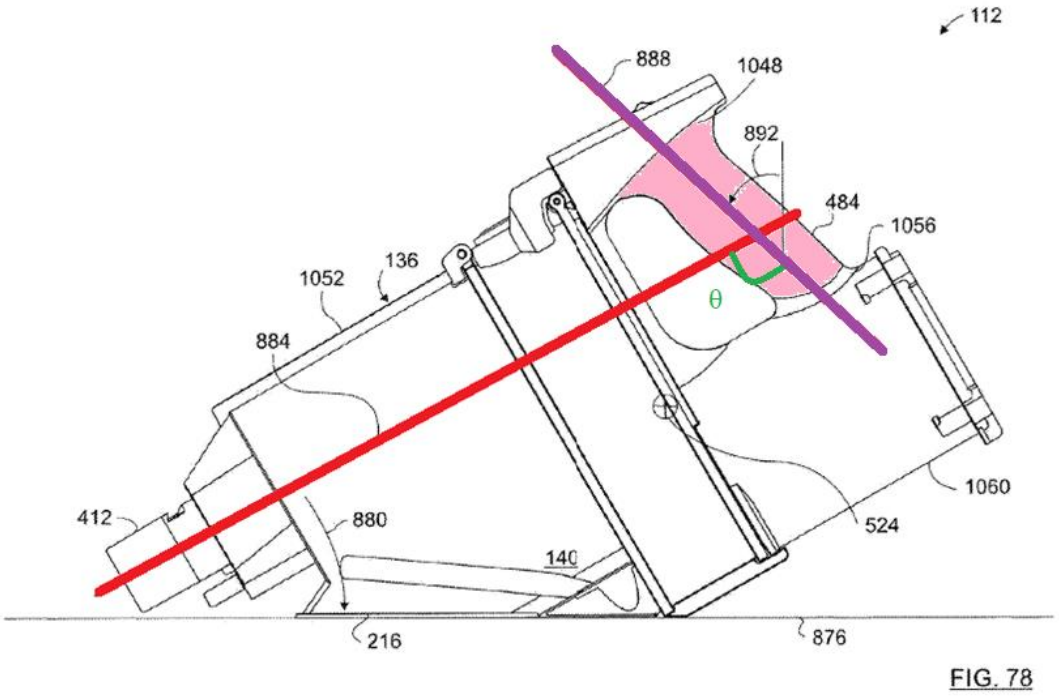


FIG. 78

Ex-1006, Fig. 78 (annotated).

b. Element 1[a]

"a handle by which the vacuum cleaner is supported during normal use;"

Conrad'630 discloses this limitation. Ex-1003, ¶¶81-82. Conrad'630 discloses that vacuum 100 is supported by handle 102 during normal use. Ex-1004, ¶52 ("The vacuum cleaner 100 is a hand vacuum cleaner, and is movable along a surface to be cleaned by gripping and maneuvering handle 102…In the example shown, handle 102 is provided at the upper portion 104. In alternate examples, handle 102 may be provided elsewhere on the vacuum cleaner 100, for example at the rear 110 and may be of any design."); Figs. 1-8.

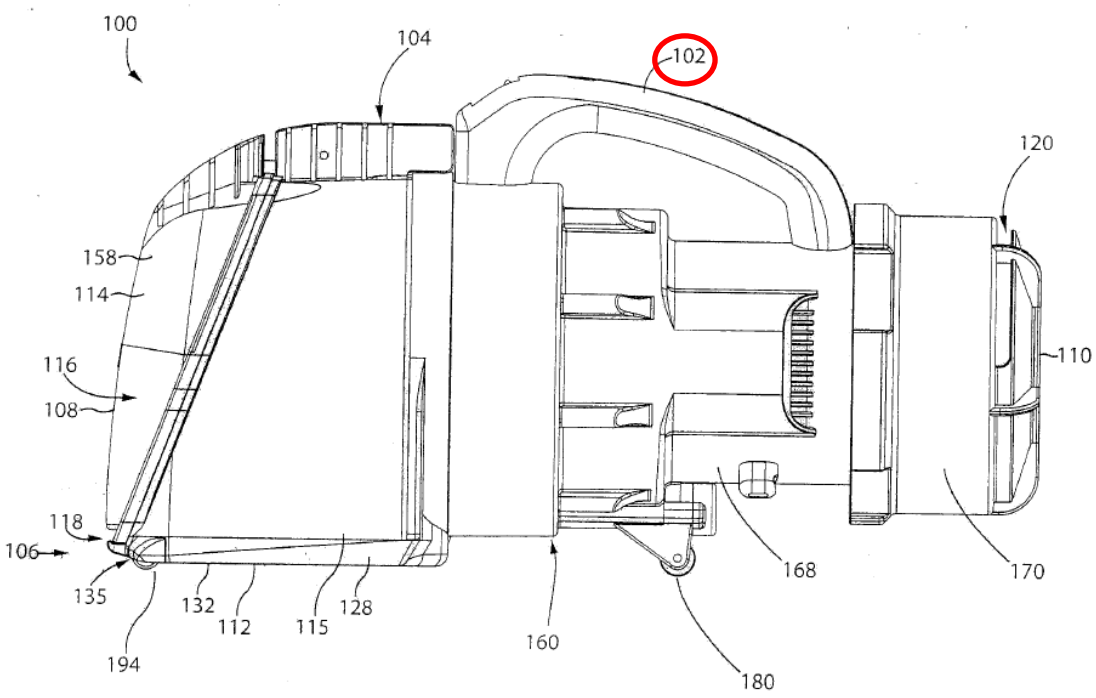


Fig. 1

Ex-1004, Fig. 1.

Similarly, Conrad'787 discloses that handvac 122 has a handle 484 (pink). Ex-1006, ¶¶185, 312-316, Figs. 78, 96; Ex-1003, ¶83. Thus, the proposed combination also teaches the use of a handle in a handheld vacuum. Ex-1003, ¶¶81-83.

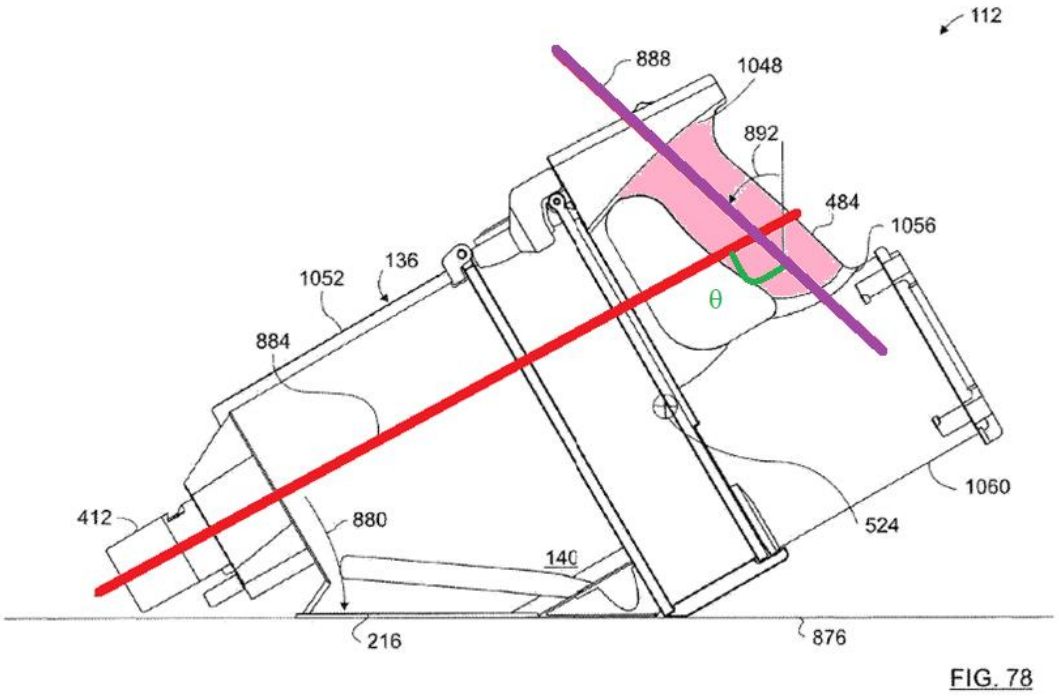


FIG. 78

Ex-1006, Fig. 78 (annotated).

c. Element 1[b]

"a cyclonic separating unit having a longitudinal axis and a dirt collector at one end of the cyclonic separating unit,"

Conrad'630 discloses this limitation. Ex-1003, ¶¶84-85. Conrad'630 discloses a cyclone unit 114 with a cyclone 122 (yellow) having a longitudinal axis 123 (red) and a dirt collector (*i.e.*, the first portion 148 (green) of dirt collection chamber 124) at one end of the cyclone unit 114. Ex-1004, Fig. 6 (annotated below); *see also*, *id*., ¶70 ("The cyclone 122 extends along an axis 123…preferably parallel to the nozzle axis, and preferably extends generally horizontally when cleaner 100 is in use and wheels 135 are seated on a surface."); ¶74 ("In the example shown, dirt

collection chamber 124 preferably comprises two portions," one "immediately adjacent the dirt outlet…at the front 108 of the cleaner" and one "concentric with the cyclone 122," and configured such that "dirt chamber 124 may comprise an annular chamber surrounding the cyclone 122.").

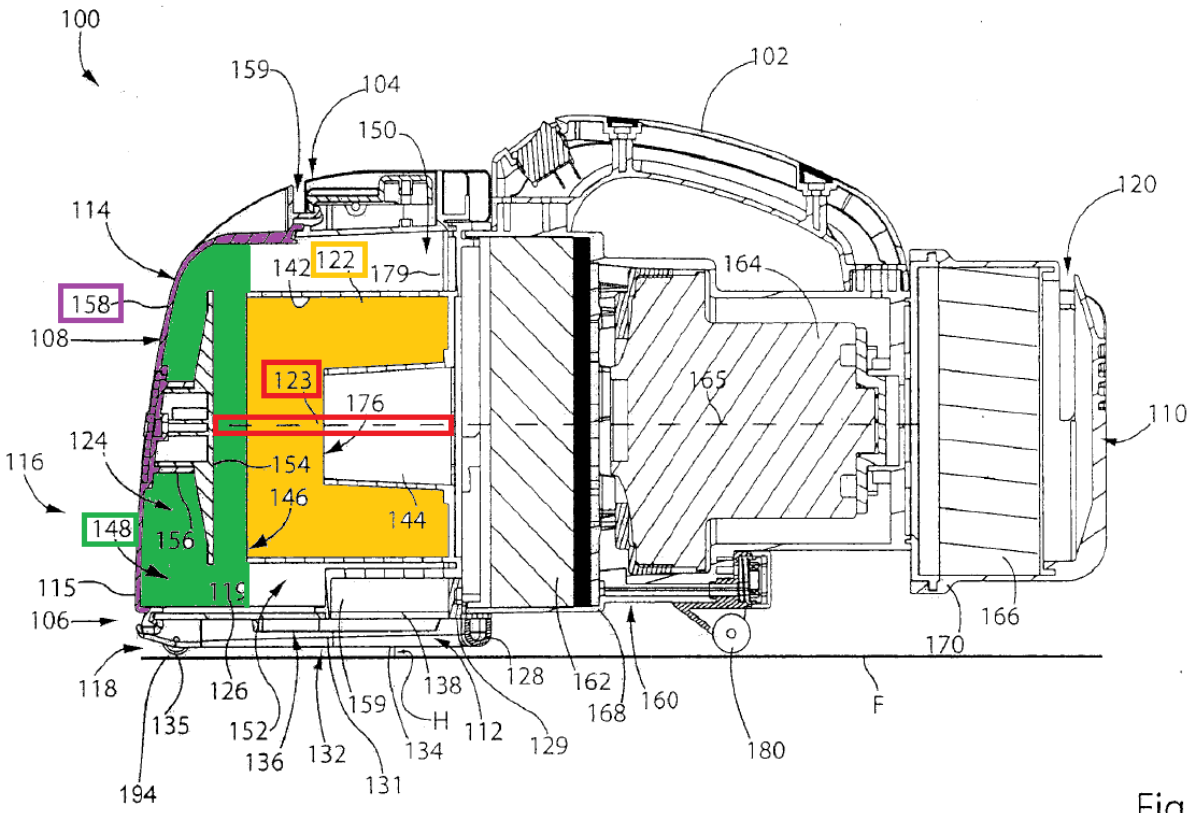


Fig. 6

Ex-1004, Fig. 6 (annotated).

d. Element 1[c]

"the cyclonic separating unit comprising an end wall having a closed configuration in which dirt is retained within the dirt collector by the end wall and an open configuration for the removal of dirt from the dirt collector, wherein the end wall is movable relative to the longitudinal axis and, when the end wall is in the closed configuration, the longitudinal axis extends through a region bounded by a perimeter of the end wall,"

Conrad'630 discloses this limitation. Ex-1003, ¶¶86-87. Conrad'630 discloses that cyclone unit 114 having a cyclone 122 (yellow) and comprising an end wall 158 (referred to in Conrad'630 as front wall 158) (purple) having a closed configuration (Ex-1004, Figs. 1 and 6) in which dirt is retained within dirt collection chamber 124 (green) by the end wall 158 (purple) and an open configuration (*id.*, Fig. 5) for the removal of dirt from the dirt collector, wherein the end wall 158 (purple) is movable relative to the longitudinal axis 123 (red) and, when the end wall is in the closed configuration, the longitudinal axis 123 (red) extends through a region bounded by a perimeter of the end wall (the perimeter of the end wall is shown in purple below). *Id*., ¶76 ("Cyclone unit 114 may be emptied by any means known in the art. For example, one of the ends of the cyclone unit 114 may be openable…an openable door may be positioned at the front end of the vacuum cleaner and preferably comprises a front wall thereof…The door may be openably mounted to the cyclone unit, dirt collection chamber 124 or another portion of vacuum cleaner

100 by any means known in the art. For example, one or more latches 159 may secure the door in position. Alternately, the door may be opened, e.g., pivoted open, and then optionally removable."); ¶77 ("As exemplified in FIGS. 4 and 5, front wall 158 is pivotally mounted to the cyclone unit wall 115 and serves as an openable door of the dirt chamber 124, such that dirt collection chamber 124 is openable, and dirt collection chamber 124 may be emptied. The dirt collection chamber is therefore preferably openable both when the dirt collection chamber is mounted to the hand vacuum cleaner, or when it is removed.").

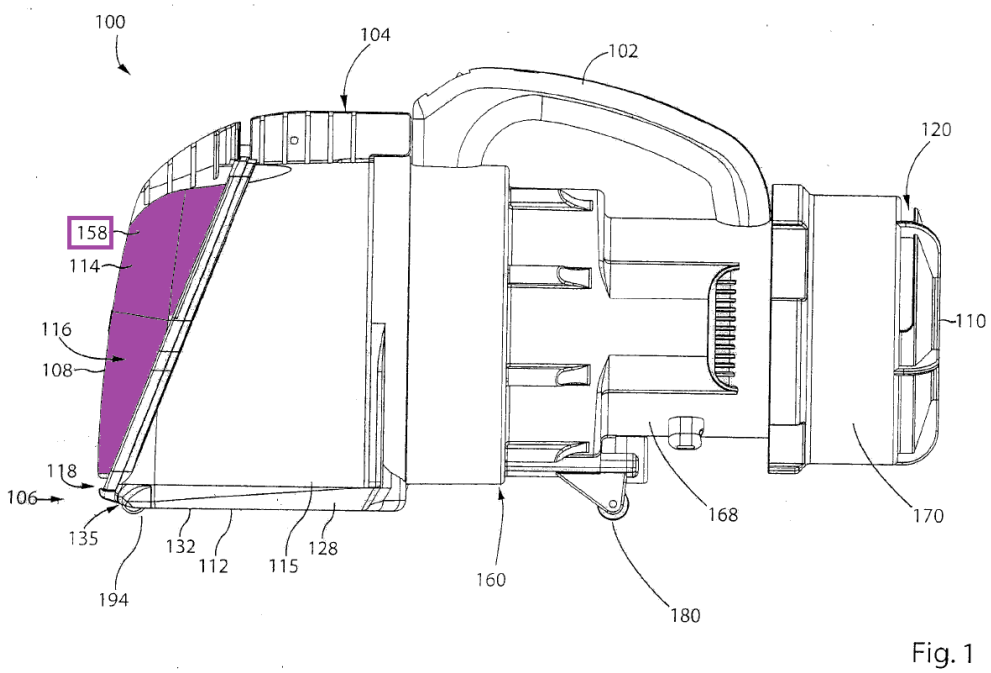


Fig. 1

Ex-1004, Fig. 1 (annotated).

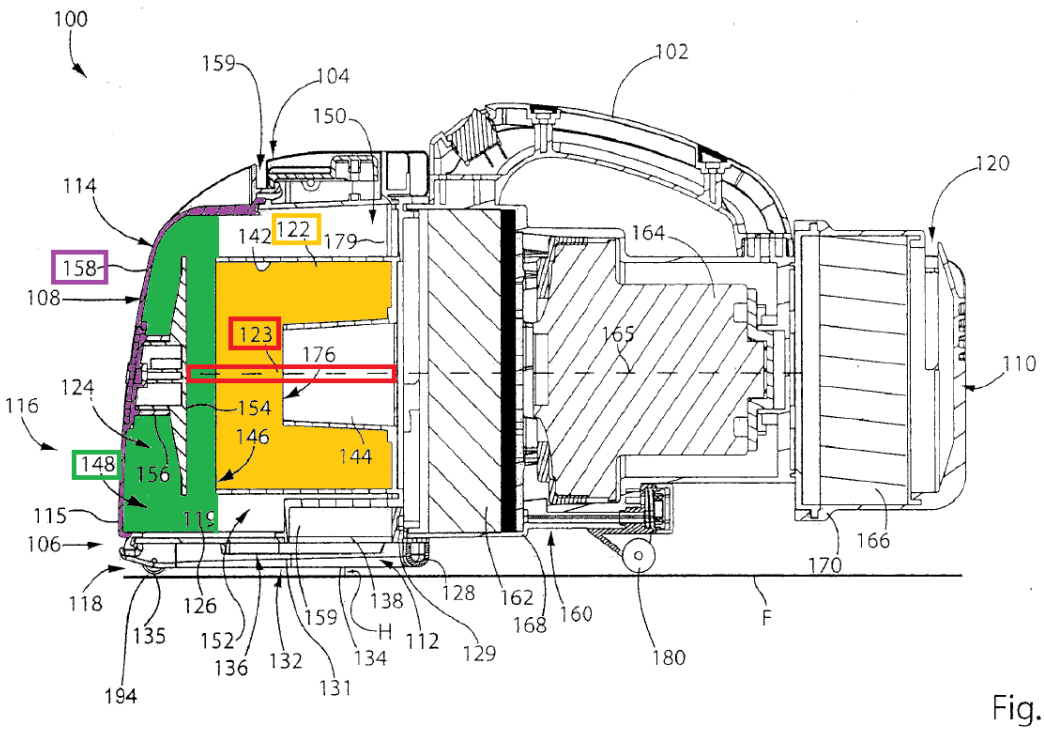


Fig. 6

Ex-1004, Fig. 6 (annotated).

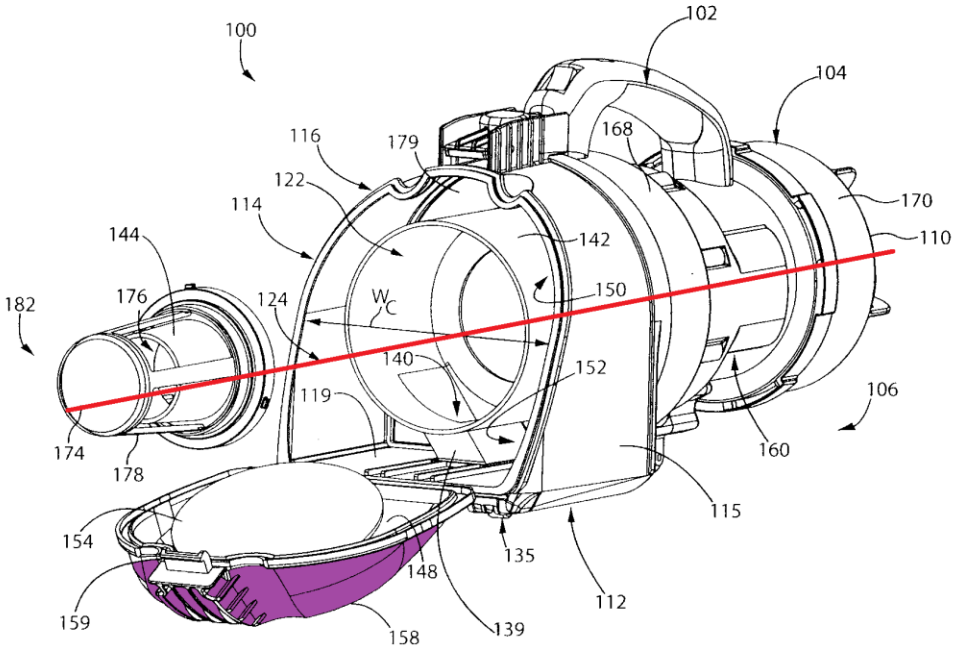


Fig. 5

Ex-1004, Fig. 5 (annotated).

e. Element 1[d]

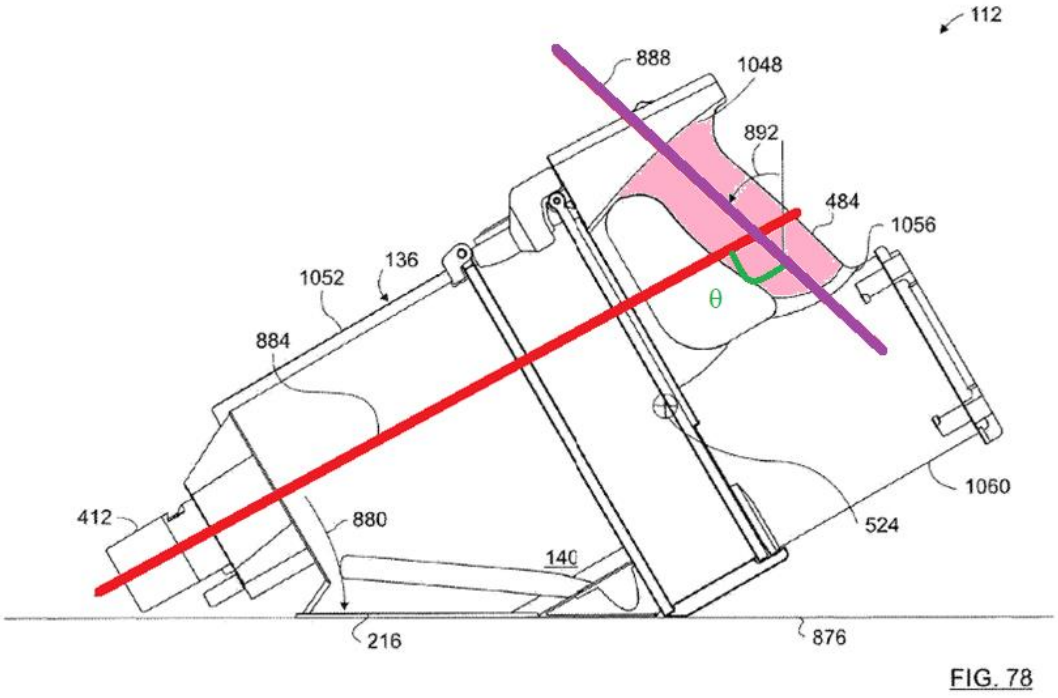
"wherein the handle has a pistol grip configuration in which the handle is inclined with respect to the cyclonic separating unit to form an angle of not less than 85 degrees and not greater than 140 degrees between a handle axis and the longitudinal axis of the cyclonic separating unit, and wherein the handle axis and the longitudinal axis intersect within the vacuum cleaner."

Conrad'630 discloses one embodiment where handle 102 is mounted on an upper portion of vacuum clean 100 and also teaches that handle 102 may be moved such that "handle 102 may be provided elsewhere on the vacuum cleaner 100, for example at the rear 110 and may be of any design," but does not explicitly disclose a "pistol grip configuration" as claimed. Ex-1004, ¶52; Ex-1003, ¶88.

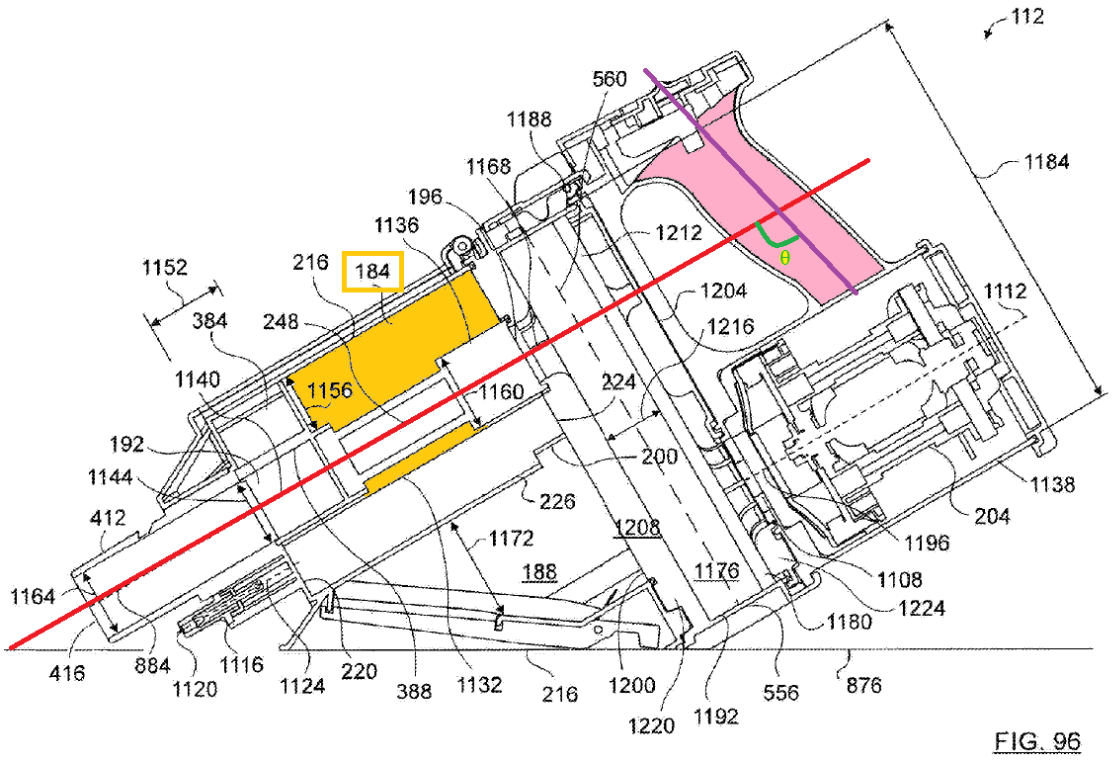
Conrad'787 discloses this limitation. Ex-1003, ¶¶89-98. Conrad'787 discloses a handle 484 (pink) that has the claimed pistol grip configuration. Ex-1006, Fig. 78. The handle 484 is inclined with respect to the cyclonic separating unit 184 to form an angle θ (green) of not less than 85 degrees and not greater than 140 degrees between a handle axis 888 (purple) and a longitudinal axis 884 (red) of the cyclonic separating unit 184. *Id.*, Figs. 78, 96, ¶¶312, 314, 317, 329. In particular, as illustrated in Figures 78 and 96, and measured by Joseph Fester, angle θ (green) is approximately 105 degrees. *Id.*; Ex-1003, ¶¶90-91. The specific angle

of approximately 105 degrees, which is depicted in Figures 78 and 96, falls within the claimed range of 85 to 140 degrees, and thus discloses the claimed range.

Moreover, the handle axis 888 (purple) and the longitudinal axis 884 (red) intersect within the vacuum cleaner, as illustrated in the annotated Figure 78 below. *Id.*, Fig. 78.



Ex-1006, Fig. 78 (annotated).



Ex-1006, Fig. 96 (annotated).

Conrad'787 discloses specific ranges for angles 880 and 892 (shown in Figure 78), which in turn dictate the specific range for angle θ (green). *Id*., ¶¶312, 317. In particular, Conrad'787 discloses that "[a]ngle 880 may be an acute angle which may be between 10 and 80 degrees, and preferably between 25 and 65 degrees, more preferably between 35 and 55 degrees or between 20 and 40 degrees," and "angle 892 is an acute angle of between 10 and 80 degrees, more preferably between 20 and 70 degrees and most preferably between 30 and 60 degrees." *Id*. Given the geometry, as further explained by Joseph Fester, the relationship between angle θ (green) and angles 880 and 892 is:

$$\textit{Angle } \theta \textit{ (green)} = \textit{Angle 892} - \textit{Angle 880} + 90°$$

Ex-1003, ¶¶89-96. Given Conrad'787's disclosure of the ranges of angles 880 and 892, and the relationship between the three angles, angle θ (green) – which corresponds to the claimed "angle . . . between a handle axis and the longitudinal axis of the cyclonic separating unit" – falls within the claimed range of 85 degrees to 140 degrees. *Id.*, ¶97. Disclosure of a specific angle with a claimed range is sufficient invalidate the claim. *Ineos USA LLC v. Berry Plastics Corp.*, 783 F.3d 865, 869 (Fed. Cir. 2015); *Alcon Research, Ltd. v. Apotex Inc.*, 687 F.3d 1362, 1368 (Fed. Cir. 2012) ("[I]f prior art discloses a portion of the claimed range, the entire claim is invalid.").

Conrad'787 further explains that the specific angles disclosed for angle 892 and 880 ensure that the configuration "provide[s] a comfortable handle alignment for grasping by a user when picking up handvac 112, and when using handvac 112 for cleaning surfaces below the user's elbows," and provides "a center of gravity 524 vertically aligned with or between the support elements for stability . . ." *Id.* Conrad'787 also explains this is a "comfortable in-use orientation[] of handvac 112." *Id.*, ¶314.

A POSITA would have considered Conrad'787's specific teachings as to the specific angle θ (green) as shown in Figure 78 and the shape of the handle 484 and incorporated those design elements into the combined handheld vacuum. Ex-1003, ¶100. The POSITA would have recognized that advantages associated with

Conrad'787's handle described above are attributable to those design elements, and would have therefore sought to incorporate such design elements into the combined handheld vacuum. *Id*. As such, the POSITA would have designed a combined handheld vacuum that has a handle on the rear (as taught by Conrad'630), and which handle was shaped in a pistol grip configuration and which had an incline relative to the longitudinal axis having an angle θ (green) as specifically disclosed in Figure 78, 96, which falls within the claimed range of claim 1 or, alternatively, having an angle θ (green) within the ranges disclosed in Conrad'787, which overlap with the claimed range of range 1.

Thus, for the reasons explained in Section IV.A.1.c (incorporated herein by reference), a POSITA would have been motivated to combine Conrad'630 and Conrad'787 and would have had a reasonable expectation of success in making the combination. Ex-1003, ¶¶64-77, 88-101. Thus, the proposed combination of Conrad'630 with Conrad'787 meets this limitation.

f. Claim 2

The handheld vacuum cleaner of claim 1, wherein the handle is inclined with respect to the cyclonic separating unit to form an angle of not less than 100 degrees and not greater than 125 degrees between the handle axis and the longitudinal axis of the cyclonic separating unit.

Conrad'787 discloses this limitation. Ex-1003, ¶¶102-106. Claim 2 recites the same limitation as Element 1[d], but claims a narrower range for the claimed

angle. Conrad'787 discloses the narrower range. As explained above, and as illustrated in Figures 78 and 96, angle θ (green) is approximately 105 degrees, which falls within the claimed range in claim 2. Ex-1006, Figs. 78, 96, ¶¶312-317, 329; Ex-1003, ¶104; Section IV.A.2.e (Element 1[d]) (incorporated herein by reference). Moreover, as also explained above, given Conrad'787's disclosure of the ranges of angles 880 and 892, and the relationship between the three angles, angle θ (green) – which corresponds to the claimed "angle…between the handle axis and the longitudinal axis of the cyclonic separating unit" – falls within the claimed range of 100 degrees to 125 degrees. Ex-1003, ¶104; Section IV.A.2.e.

As discussed above (Section IV.A.2.e), a POSITA would have considered Conrad'787's specific teachings as to the specific range for angle θ (green) incorporated that design elements into the combined handheld vacuum. Ex-1003, ¶105. The POSITA would have recognized that advantages associated with Conrad'787's handle described above are attributable to that design elements, and would have therefore sought to incorporate such design element into the combined handheld vacuum. *Id*. As such, the POSITA would have designed a combined Conrad'630/Conrad'787 handheld vacuum that has a handle on the rear (as taught by Conrad'630), that was in a pistol grip configuration having an incline relative to the longitudinal axis that was within the specific range for angle θ (green) taught by Conrad'787, which falls within the claimed range of claim 2. *Id*., ¶¶103-106.

For the reasons explained in Sections IV.A.1.c, IV.A.1.e (incorporated herein by reference), a POSITA would have been motivated to combine Conrad'630 and Conrad'787 to achieve the claimed range. *Id.*

g. Claim 3

The handheld vacuum cleaner of claim 1, wherein the end wall comprises an end wall of the cyclonic separating unit.

Conrad'630 discloses this limitation. Ex-1003, ¶¶107-109. Conrad'630 discloses that the handheld vacuum cleaner 100 has a cyclone unit 114 with a cyclone 122 (yellow) which comprises a front wall 158 (which is the claimed end wall) (purple). The front wall 158 (purple) forms an end wall of the cyclone unit 114. Ex-1004, Figs. 1, 5, and 6; *see also* Section IV.A.1.d (Element 1(c)); incorporated herein by reference).

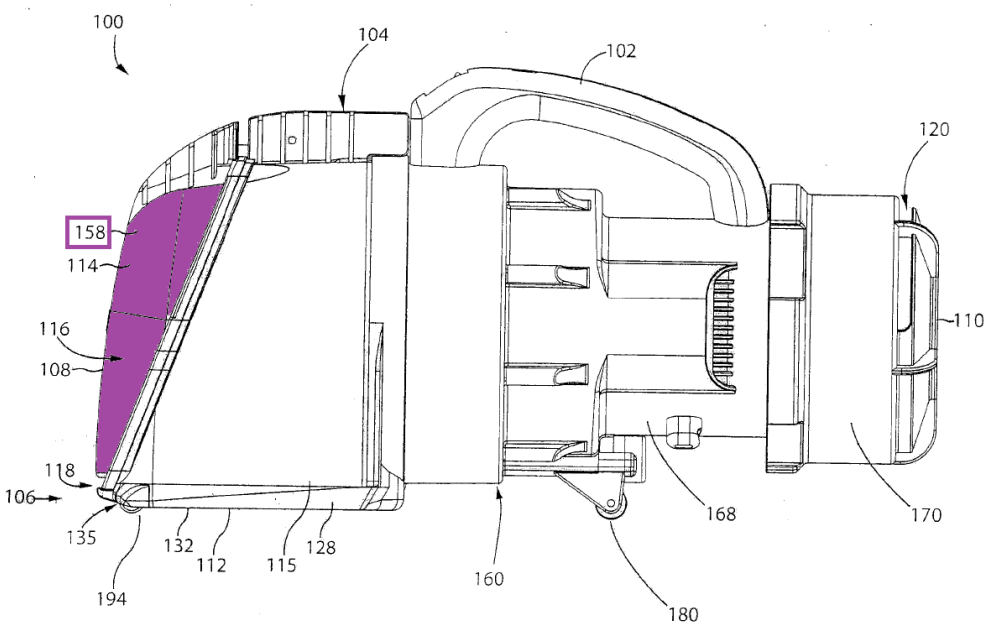


Fig. 1

Ex-1004, Fig. 1 (annotated).

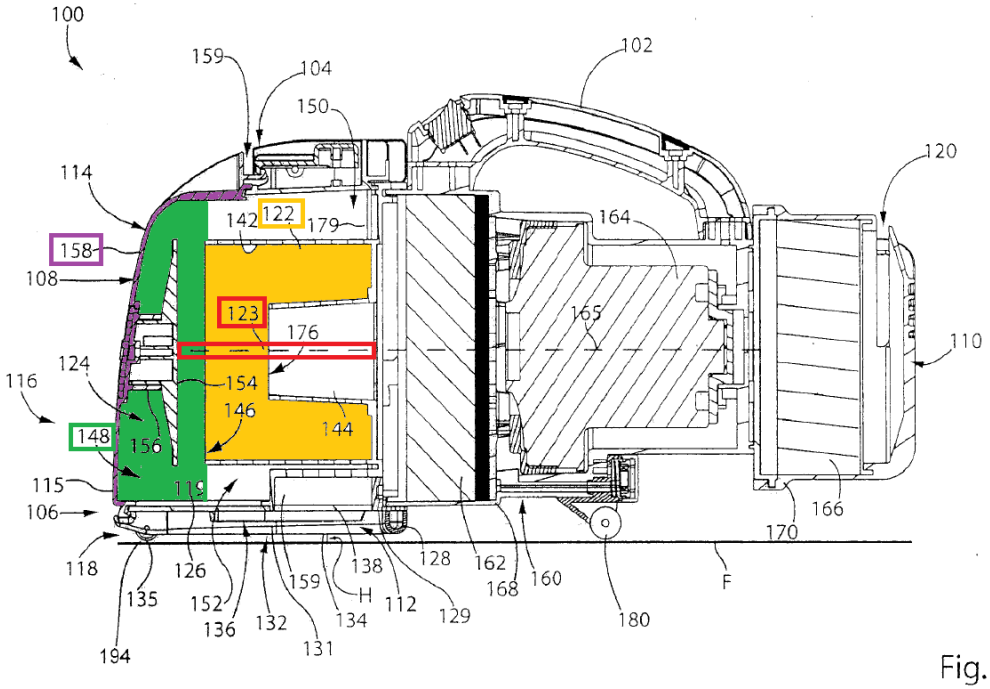


Fig. 6

Ex-1004, Fig. 6 (annotated).

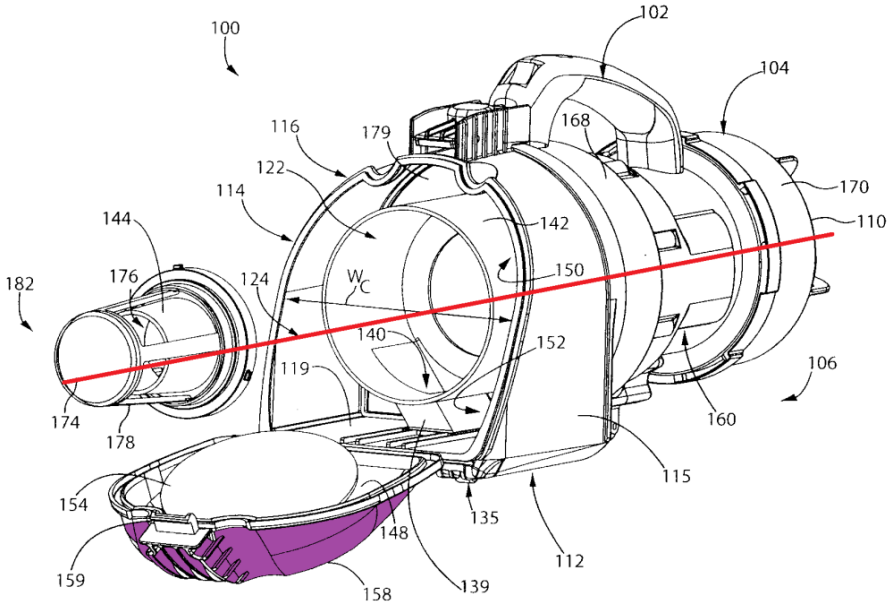


Fig. 5

Ex-1004, Fig. 5 (annotated).

h. Claim 4

The handheld vacuum cleaner of claim 1, wherein the end wall is arranged to pivot between the closed configuration and the open configuration.

Conrad'630 discloses this limitation. Ex-1003, ¶¶110-112. Conrad'630 discloses that the handheld vacuum cleaner 100 has a front wall 158 (purple) (the claimed end wall) that is arranged to pivot between the closed configuration (Ex-1004, Figs. 1, 2, 6) and the open configuration (*id.*, Fig. 4, 5). *See also id.*, ¶76 ("Alternately, the door may be opened, e.g., pivoted open, and then optionally removable."); ¶77 ("front wall 158 is pivotally mounted to the cyclone unit wall 115 and serves as an openable door of the dirt chamber 124, such that dirt collection chamber 124 is openable"); Section IV.A.1.d (Element 1(c)); incorporated herein by reference).

i. Claim 8

The handheld vacuum cleaner of claim 1, wherein the dirt collector is disposed forward of the handle.

Conrad'630 discloses this limitation. Ex-1003, ¶¶113-116. Conrad'630 discloses that the handheld vacuum cleaner 100 has a dirt collector (*i.e.*, the first portion 148 (green) of dirt collection chamber 124) that is disposed forward of the handle 102 (pink). Ex-1004, Figs. 5-6; *see also id*., ¶94, Fig. 8 (illustrating airflow

from nozzle 812 to the dirt collector 824, and further illustrating that the air flows from the dirt collector 824 in the direction of the handle 802); Ex-1003, ¶113.

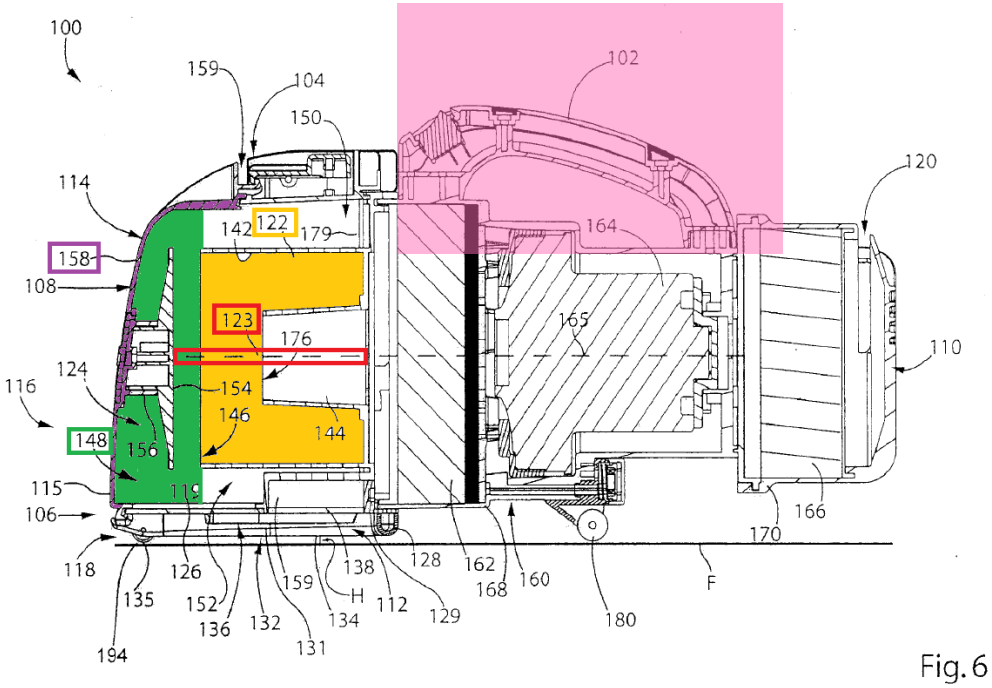


Fig. 6

Ex-1004, Fig. 6 (annotated).

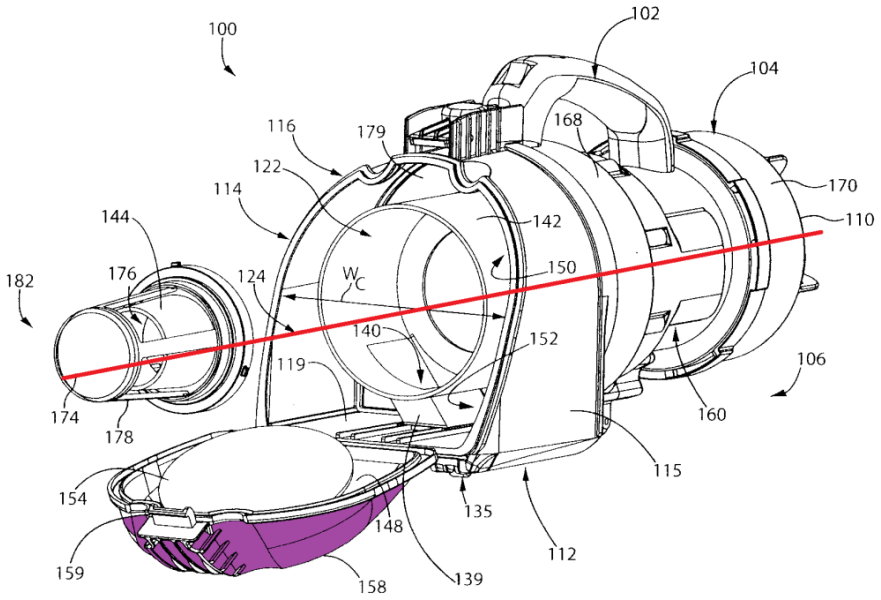


Fig. 5

Ex-1004, Fig. 5 (annotated).

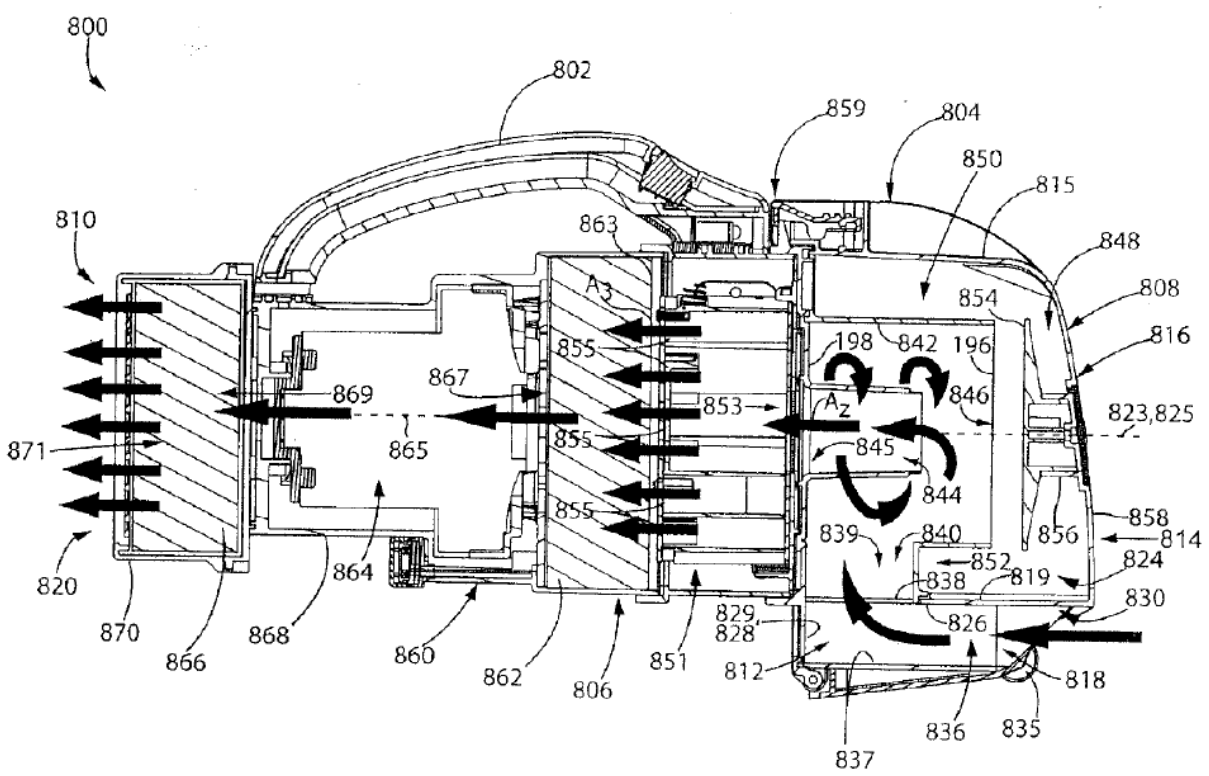


Fig. 8

Ex-1004, Fig. 8 (annotated). Conrad'630 discloses the dirt collector forward of the handle. The proposed combination proposes moving the hand further to the rear of the device. Thus, in the proposed combination, the dirt collector remains forward of the handle. Ex-1003, ¶¶113-116.

j. Claim 10

The handheld vacuum cleaner of claim 1, wherein the cyclonic separating unit comprises a cyclonic separator having an axis that defines the longitudinal axis of the cyclonic separating unit.

Conrad'630 discloses this limitation. Ex-1003, ¶¶117-119. Conrad'630 discloses a cyclone unit 114 with a cyclone 122 (yellow) having a longitudinal axis

123 (red). Ex-1004, Fig. 6. Longitudinal axis 123 defines the longitudinal axis of the cyclonic separating unit. *Id.*; *see also* Section IV.A.1.d (Element 1(c)); incorporated herein by reference).

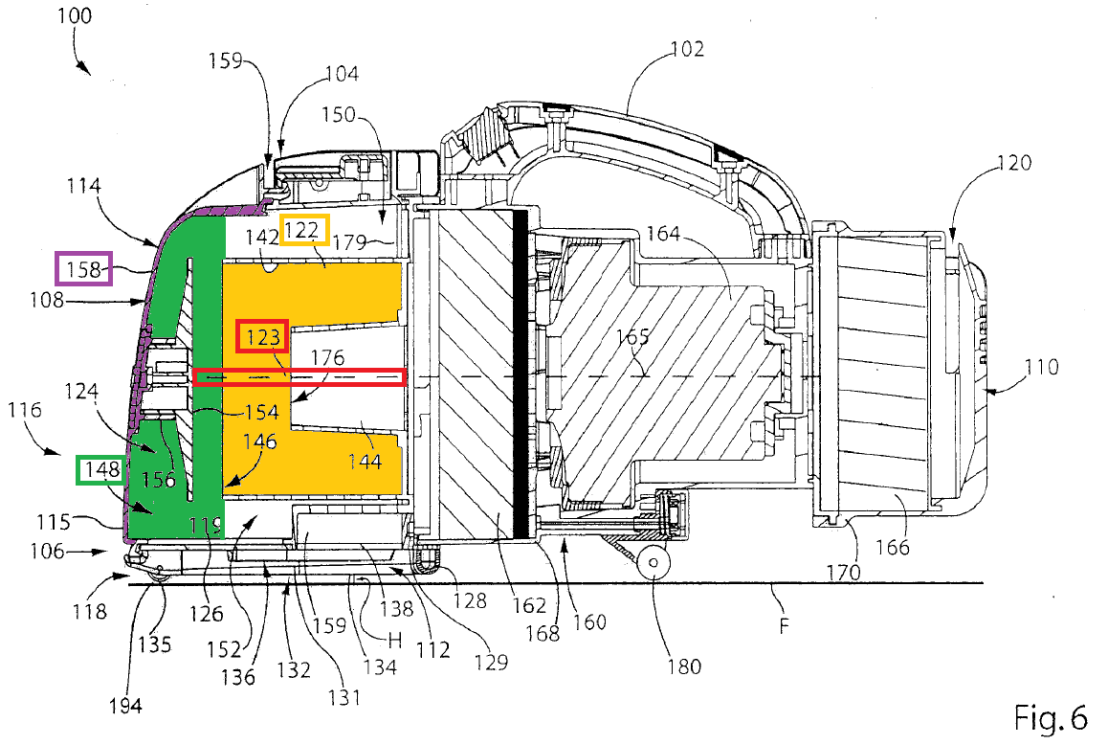


Fig. 6

Ex-1004, Fig. 6 (annotated).

B. Ground 2: Conrad'630 in View of Dyson Render Obvious Claims 1–4, 8 and 10

As explained above (*see* Ground 1), Conrad'630 discloses a handheld vacuum cleaner having a dirt collector as claimed in the '687 patent and a handle configuration at the rear thereof. Ex-1003, ¶¶61-119. While Conrad'630 does not explicitly disclose the specific pistol grip handle configuration claimed in the '687 patent, Dyson teaches that element. *Id.*, ¶¶120-158. And a POSITA would have

been motivated to combine the teachings of Conrad'630 with Dyson for the reasons explained below. *Id.*, ¶¶123-132. Thus, the combination of Conrad'630 and Dyson renders obvious claims 1–4, 8 and 10 of the '687 patent. *Id.*, ¶¶120-158.

1. Overview of Ground

a. Summary of Dyson

Dyson discloses a handheld vacuum cleaner 10 that has a cyclonic separating apparatus 18 (yellow) that is in communication with the suction conduit 14 and the suction opening 16. Ex-1007, 3:11-14; Fig. 2. The cyclonic separating apparatus 18 has two cyclones, upstream cyclone 20 and downstream cyclone 22. *Id*., 3:15-19. Handheld vacuum cleaner 10 also includes a handgrip 28 (pink) for manipulating the vacuum during use. *Id*., 3:23-25. A flowpath extends from the suction opening 16, through the suction conduit 14 and into the cyclonic separating apparatus 18 along a longitudinal axis Y-Y (red). *Id*., 3:21-23.

Moreover, Dyson discloses that "handgrip 28 takes the form of an elongate handle and has a first end 46, a second end 48 and an axis X-X" (purple). *Id*., 4:9-11. In one embodiment disclosed, "the axis X-X is arranged at an angle to the longitudinal axis Y-Y which is close to 90°. This arrangement feels comfortable for a user." *Id.*, 4:27-29. Dyson further explains that "the location of the longitudinal axis Y-Y of the suction conduit 14 close to the centre of the hand-held vacuum cleaner 10 means that the longitudinal axis Y-Y of the suction conduit 14 will be

coincident, or close to, the longitudinal axis of rotation of the user's forearm. This results in little or no axial displacement of the suction opening 14 when the hand-held vacuum cleaner 10 is rotated." *Id.*, 6:17-23.

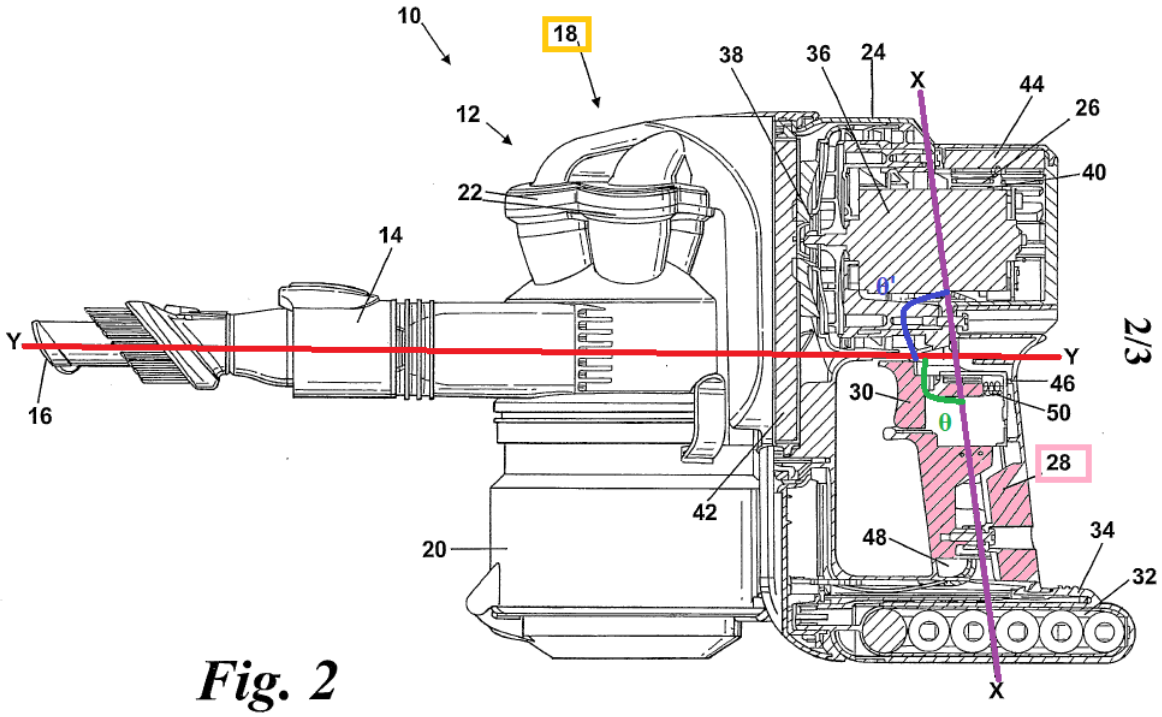


Fig. 2

Ex-1007, Fig. 2 (annotated).

Moreover, Dyson discloses specific ranges for angle θ' (blue), which is equal to *180 - angle θ (green)*. Ex-1003, ¶¶48-55, ; Ex-1007, 2:21-23 ("Preferably, the elongate handle lies at an angle to the longitudinal axis in the range of 80 to 90°. More preferably, the elongate handle lies at an angle to the longitudinal axis which is close to a right angle."); 4:25-28 ("The longitudinal axis Y-Y passes through the suction opening 16. In this embodiment, the axis X-X is arranged at an angle to the

longitudinal axis Y-Y which is close to 90°. This arrangement feels comfortable for a user."). Accordingly, applying basic geometry, Dyson discloses that angle θ (green) is preferably in the range of 100 to 90 degrees. As explained below (Claim Element 1[d]), Dyson therefore discloses a range for angle θ (green) that falls within the range claimed in claims 1 and 2. Ex-1003, ¶¶48-55.

Dyson further explains that "[i]n use, a user may wish to clean a variety of surfaces which may be orientated at different angles. Therefore, a user will need to lift and move the hand-held vacuum cleaner 10 into a variety of positions and orientations in order to clean effectively. The location of the handgrip 28 between the airflow generator 36 and the power source 32 allows the hand-held vacuum cleaner 10 to be manipulated easily in use. This is because the user's hand will be located between the two heaviest components of the hand-held vacuum cleaner 10…in which the weight of the hand-held vacuum cleaner 10 is distributed on both sides of the user's hand." *Id*., 6:4-11.

b. Motivation to Combine Conrad'630 and Dyson

A POSITA reviewing Conrad'630 would have been motivated to explore alternative handle configurations because of Conrad'630's express disclosure to move the handle 101 to other locations. *See* Ex-1004, Fig. 6, ¶52 (explaining that "handle 102 may be provided elsewhere on the vacuum cleaner 100, for example at the rear 110 and may be of any design."); Ex-1003, ¶¶123-132.

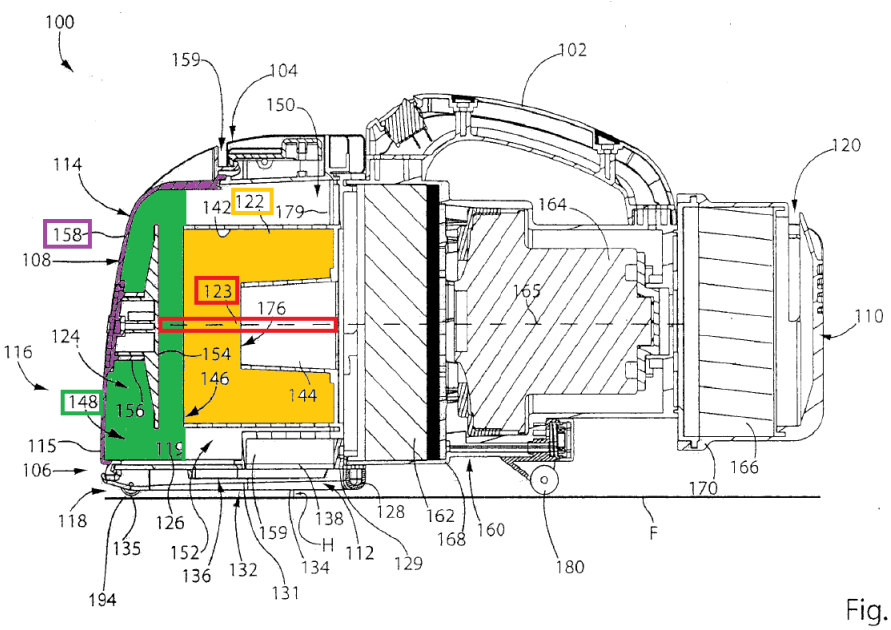


Fig. 6

Ex-1004, Fig. 6 (annotated).

Dyson discloses a handgrip that "feels comfortable for a user," and allows the user to "maintain a comfortable wrist position and movement of the hand-held vacuum cleaner feels comfortable." *Id.*, 2:17-19, 4:27-29. A POSITA would have therefore sought to take advantage of the improved handle configuration provided in Dyson while retaining the advantages of Conrad'630's design (*see*, *supra*, Section IV.A.1.a), including its improved dustbin configuration. Ex-1004, ¶¶6, 7; Ex-1003, ¶125.

Moreover, a POSITA would have recognized that both the handheld vacuums of Conrad'630 and Dyson are designed to be used with various attachments, as was commonplace as the time of the '687 patent, as explained above. Ex-1003, ¶126; Section IV.A.1.c (incorporated herein by reference).

A POSITA would have therefore been motivated to combine the two references in a way that incorporates Dyson's teachings concerning the handle 28, including the shape and angle arrangement taught by Dyson. *See*, *infra*, IV.A.2.b (Claim Element 1[d]); Ex-1003, ¶¶127, 140-145. First, Conrad'630's express teaching that the handle 102 may be "of any design" and provided "at the rear 110" is an explicit statement that would encourage a POSITA to explore different designs and alternative locations, including the rear. *Id*. Second, because both vacuums are designed to be used with attachments, a POSITA would have recognized additional advantages associated with providing the handle at the rear, including that the user will have a better grip and more comfort when using the handheld vacuum with an attachment. *Id*. Third, the advantages associated with Dyson's handle—such as improved comfort—would further motivate the combination. *Id*., ¶¶123-132; Ex-1007, 2:17-19, 4:27-29. Fourth, a POSITA would wish to retain the advantages of Conrad'630's design (*see, supra*, Section IV.A.1.a), including its improved dustbin configuration. Ex-1004, ¶¶6, 7; Ex-1003, ¶127.

Moreover, a POSITA would incorporate a handle that conforms with Dyson's teachings concerning handle 28 (pink)—including as to the shape and the range for angle θ—to the rear of Conrad'630, as instructed by Conrad'630. Ex-1003, ¶¶123-132; Ex-1004 at ¶52 (explaining that "handle 102 may be provided elsewhere on the vacuum cleaner 100, for example at the rear 110 and may be of any design."); *see*,

supra, Section IV.B.1.a. The location of the handle 28 on the back of the vacuum cleaner would promote the forward movement of the vacuum cleaner 100 over the surface to be cleaned—and in particular for the types of surfaces that would be cleaned using a handheld vacuum, *e.g.*, couches and bedding—and allow for more flexibility when using the handheld vacuum with various attachments. Ex-1003, ¶132.

Moreover, a POSITA would have had a reasonable expectation of success to do so, because the improved handle would not interfere with the vacuum's components. Ex-1003, ¶129. While Conrad'630 explains that "clean air outlet 120 is preferably at the rear 110 of the cleaner 100," (Ex-1004, ¶54), it would have been a simple design choice for a POSITA to add additional air outlets on the side towards the rear of the vacuum to direct airflow away from the location of the new handle, as disclosed in Dyson. *Id*., ¶129; Ex-1007, Figs. 1, 3 (illustrating exhaust vents 26 on the sides of vacuum 10), 3:21-23, 5:26-6:2. For example, a POSITA could have designed a handle that attaches to the vacuum cleaner of Conrad'630 at the same location that the current handle attaches, and which extends to the rear of the vacuum cleaner and then forms a pistol shaped handle, which is sloped relative to the longitudinal axis 123 (red) at an angle consistent with the disclosure of Dyson (which is within the range claimed by claims 1 and 2 of the '687 patent). Ex-1003,

¶129. The Fester Declaration depicts several examples of how such a handle might be designed and attached to the vacuum cleaner of Conrad'630. *Id.*, ¶123-132.

2. Detailed Analysis of Ground 2

a. Elements 1[pre]–1[c]

For each of claim elements 1[pre]–1[c], petitioners incorporate by reference the corresponding analysis of Ground 1 above. *See supra* Section IV.A.2; Ex. 1003, ¶¶133-138.

b. Element 1[d]

Conrad'630 discloses one embodiment where handle 102 is mounted on an upper portion of vacuum clean 100 and further teaches that "handle 102 may be provided elsewhere on the vacuum cleaner 100, for example at the rear 110 and may be of any design," but does not explicitly disclose a "pistol grip configuration" as claimed. Ex-1004, ¶52; Ex-1003, ¶88.

Dyson discloses this limitation. Ex-1003, ¶¶140-145. Dyson discloses a handgrip 28 (pink) that has a pistol grip configuration, which Dyson describes as a "dumbbell-like configuration." Ex-1007, 6:10, Figs. 1-2. The handgrip 28 (pink) is inclined with respect to the cyclonic separating apparatus 18 to form an angle θ (green) of not less than 85 degrees and not greater than 140 degrees between a handle axis X-X (purple) and a longitudinal axis Y-Y (red) of the cyclonic separating apparatus 18. *Id.*, Figs. 1-2, 2:21-23, 3:11-30, 4:9-11, 4:22-27. In particular, as

illustrated in Figure 2, angle θ (green) is approximately 95 degrees. *Id.*; Ex-1003, ¶¶140-145.

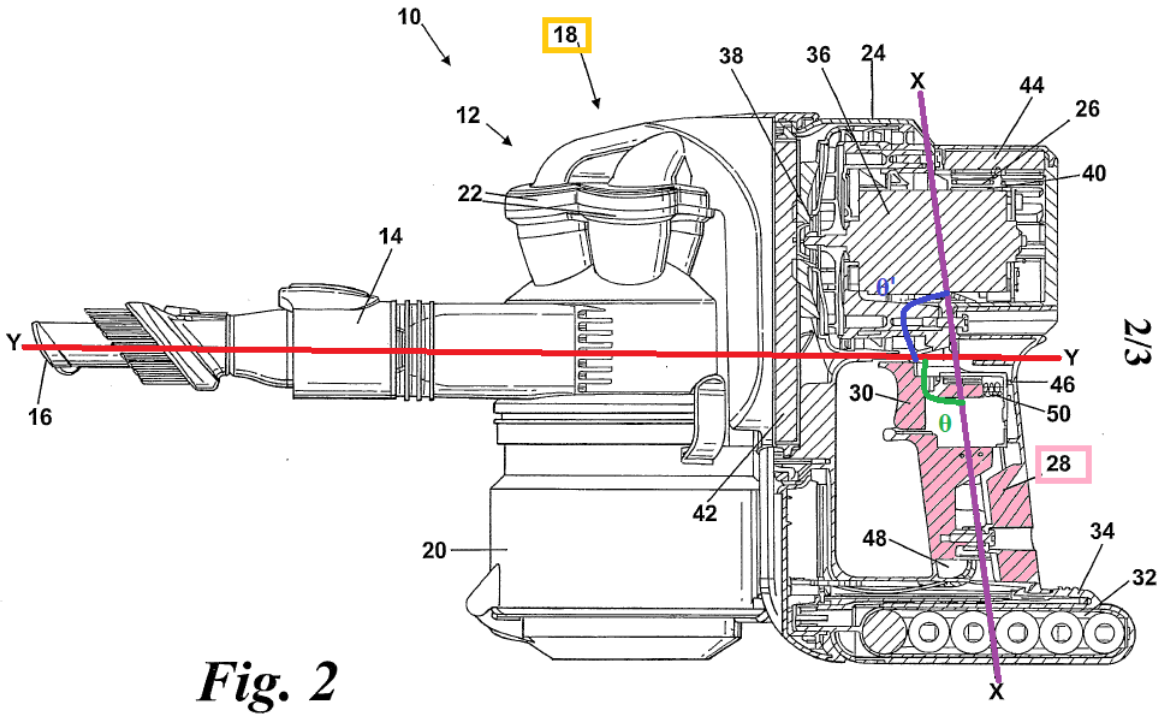


Fig. 2

Ex-1007, Fig. 2 (annotated).

Furthermore, Dyson discloses specific ranges for angle θ' (blue), which is equal to *180 - angle θ (green)*. Ex-1003, ¶142; Ex-1007, 2:21-23 ("Preferably, the elongate handle lies at an angle to the longitudinal axis in the range of 80 to 90°. More preferably, the elongate handle lies at an angle to the longitudinal axis which is close to a right angle."); 4:25-28 ("The longitudinal axis Y-Y passes through the suction opening 16. In this embodiment, the axis X-X is arranged at an angle to the longitudinal axis Y-Y which is close to 90°. This arrangement feels comfortable for

a user."). Accordingly, applying basic geometry, Dyson discloses that angle θ (green) is preferably in the range of 100 to 90 degrees. Ex-1003, ¶142. Moreover, disclosure of a specific angle with a claimed range is sufficient invalidate the claim. *Ineos*, 783 F.3d at 869; *Alcon*, 687 F.3d at 1368.

Moreover, the handle axis X-X (purple) and the longitudinal axis Y-Y (red) intersect within the vacuum cleaner, as illustrated in the annotated Figure 2 above. Ex-1003, ¶143; Ex-1007, Fig. 2, 7:1-6.

A POSITA would have considered Dyson's specific teachings as to the specific range for angle θ (green) and the shape of the handle 28 and incorporated those design elements into the combined handheld vacuum. Ex-1003, ¶144. The POSITA would have recognized that advantages associated with Dyson's handle described above are attributable to those design elements, and would have therefore sought to incorporate such design elements into the combined handheld vacuum. *Id*. As such, the POSITA would have designed a combined handheld vacuum that has a handle on the rear (as taught by Conrad'630), and which handle was shaped in a pistol grip configuration and which had an incline relative to the longitudinal axis that was within the specific range for angle θ (green) taught by Dyson, which falls within the claimed range of claim 1.

Thus, for the reasons explained in Section IV.B.1.b (incorporated herein by reference), a POSITA would have been motivated to combine Conrad'630 and

Dyson and would have had a reasonable expectation of success in making the combination. Ex-1003, ¶¶123-132, 140-145. Thus, the proposed combination of Conrad'630 with Dyson meets this limitation. *Id.*, ¶¶140-145.

c. Claim 2

Dyson discloses this limitation. Ex-1003, ¶¶146-150. Claim 2 recites the same limitation as Element 1[d], but claims a narrower range for the claimed angle. Dyson discloses the narrower range. As explained above, Dyson discloses specific ranges for angle θ' (blue), which is equal to *180 - angle θ (green)*. Ex-1003, ¶¶140-145; Ex-1007, 2:21-23 ("Preferably, the elongate handle lies at an angle to the longitudinal axis in the range of 80 to 90°. More preferably, the elongate handle lies at an angle to the longitudinal axis which is close to a right angle."); 4:25-28 ("The longitudinal axis Y-Y passes through the suction opening 16. In this embodiment, the axis X-X is arranged at an angle to the longitudinal axis Y-Y which is close to 90°. This arrangement feels comfortable for a user."). Accordingly, Dyson discloses that angle θ (green) is preferably in the range of 100 to 90 degrees. Ex-1003, ¶148; Section IV.B.2.b (Element 1[d]) (incorporated herein by reference).

Moreover, as discussed above (Section IV.B.2.b), a POSITA would have considered Dyson's specific teachings as to the specific range for angle θ (green) and the shape of the handle 28 and incorporated those design elements into the combined handheld vacuum. Ex-1003, ¶149. The POSITA would have recognized

that advantages associated with Dyson's handle described above are attributable to those design elements, and would have therefore sought to incorporate such design elements into the combined handheld vacuum. *Id*. As such, the POSITA would have designed a combined handheld vacuum that has a handle on the rear (as taught by Conrad'630), and which handle was shaped in a pistol grip configuration and which had an incline relative to the longitudinal axis that was within the specific range for angle θ (green) taught by Dyson, which falls within the claimed range of claim 2.

For the reasons explained in Sections IV.B.1.b and IV.B.2.b (incorporated herein by reference), a POSITA would have been motivated to combine Conrad'630 and Dyson, which would result in a vacuum with a handle having the claimed range. Ex-1003, ¶¶123-132, 140-150.

d. Claims 3, 4, 8 and 10

For each of claims 3, 4, 8 and 10, petitioners incorporate by reference the corresponding analysis of Ground 1 above. *See supra* Section IV.A.2; Ex. 1003, ¶¶107-119, 151-158.

C. Ground 3: Matsumoto in View of Conrad'787 Render Obvious Claims 1–4, 8 and 10

As explained below, Matsumoto discloses a vacuum cleaner having a dirt collector as claimed in the '687 patent and a handle configuration at the rear thereof. Ex-1003, ¶¶159-206. While Matsumoto does not explicitly disclose the specific

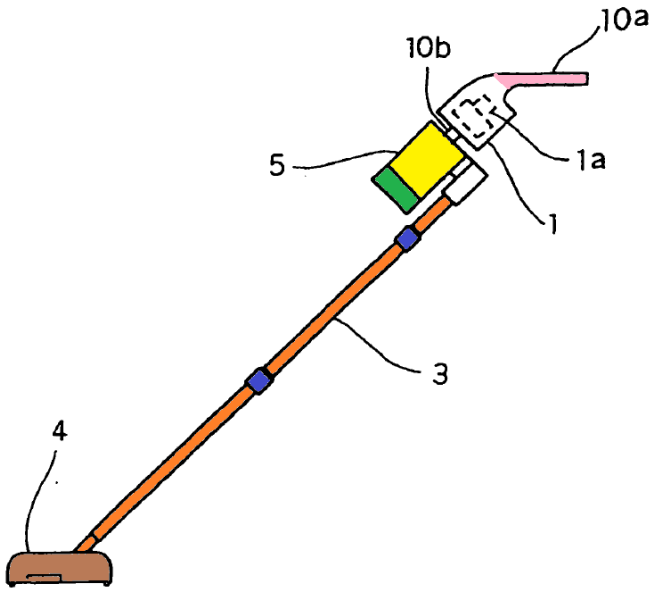
pistol grip handle configuration claimed in the '687 patent, Conrad'787 teaches that element. *Id.*, ¶159. And a POSITA would have been motivated to combine the teachings of Matsumoto with Conrad'787 for the reasons explained below. *Id.*, ¶¶161-170. Thus, the combination of Matsumoto and Conrad'787 renders obvious claims 1–4, 8 and 10 of the '687 patent. *Id.*, ¶¶159-206.

1. Overview of Ground

a. Summary of Matsumoto

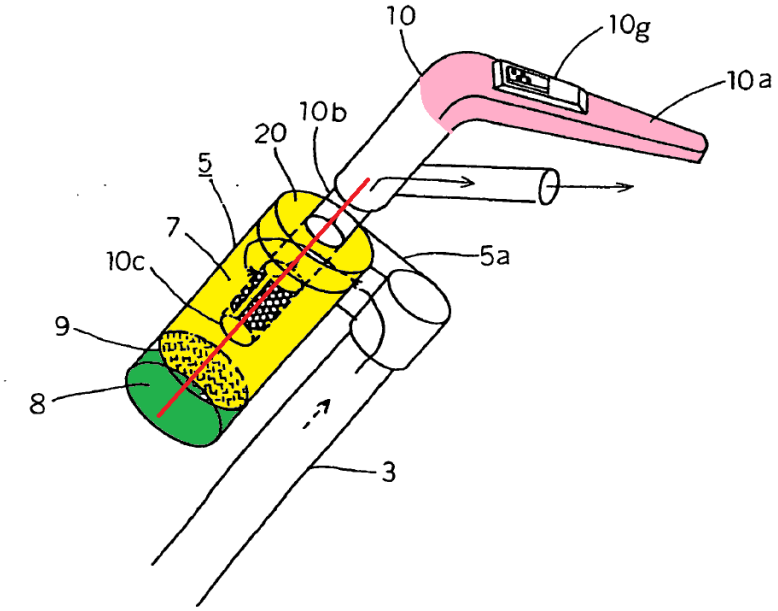
Matsumoto discloses a vacuum cleaner having a body 1 and a handle 10a (pink). Ex-1005, Figs. 25, 1, and 2, ¶60. The body 1 is coupled to a cyclone dust collecting part 5, having a first dust collecting chamber (yellow) and a second dust collecting chamber 8 (green), which are coupled to suction port body 4 (brown) by a connection pipe 3 (orange). *Id.*, ¶¶25, 27. Suction air passes through the first dust collecting chamber 7 (yellow) of the cyclone 5. *Id.*, ¶43. Fine dust particles are separated and collected in dust collecting chamber 8 (green). *Id.*

FIG. 25



Ex-1005, Fig. 25 (annotated).

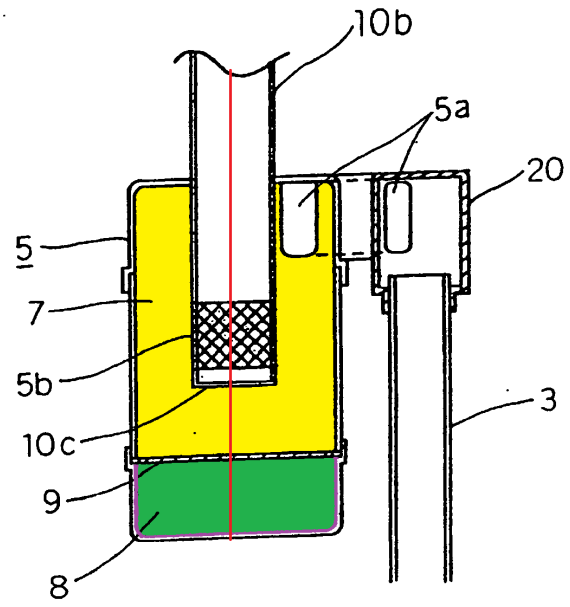
FIG. 2



Ex-1005, Fig. 2 (annotated).

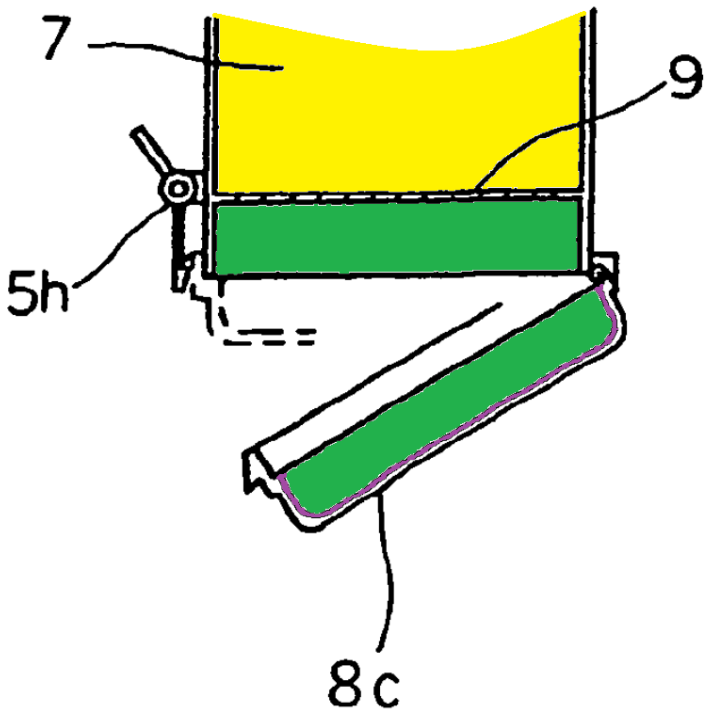
Dust collecting chamber 8 (green) has a lid 8c (purple). Lid 8c (purple) has a closed configuration for use, and an open configuration for removing dirt from dust collecting chamber 8 (green). *Id.*, Figs. 3, 18, ¶45 ("Furthermore, as shown in Fig. 18, the second dust collecting chamber 8 may be so structured that a lid 8c at its lid is openable by means of a coupling part 5h realized by screw engagement, with a bayonet, with a clamp, or by another means."). Lid 8c is movable relative to the longitudinal axis (red) of cyclone dust collecting part 5, and, when the lid 8c (purple) is in the closed configuration (Figure 3). *Id.* Matsumoto also explains that "the openable lid 8c makes the disposal of refuse easier." *Id.*, ¶46, *see also*, *id.*, ¶9, 17; Ex. 1003, ¶¶37-40.

FIG. 3



Ex-1005, Fig. 3 (annotated).

FIG. 18



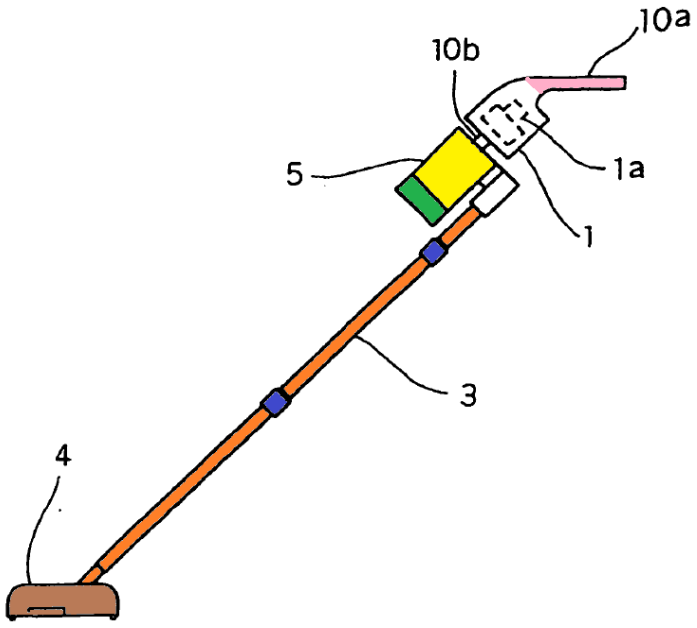
Ex-1005, Fig. 18 (annotated).

b. Motivation to Combine Matsumoto and Conrad'787

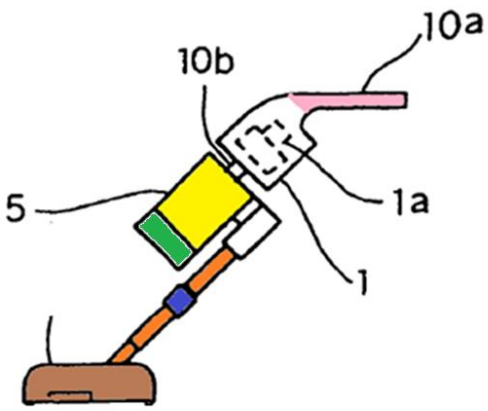
Matsumoto discloses a handheld stick-type vacuum cleaner that is suited for cleaning floors. Ex-1005, Figs. 25, 1, ¶25; Ex-1003, ¶¶161-162. A POSITA would have been motivated to use Matsumoto in a handheld vacuum configuration. *Id.*, ¶162. Matsumoto explicitly suggests that "miniaturiz[ing] [the] vacuum cleaner" would "enhance the operability thereof." Ex-1005, ¶68. As such, a POSITA would have been motivated to "miniaturize [the] vacuum cleaner" in order to operate it in a handheld configuration. Ex-1003, ¶162. Matsumoto's body 1 is coupled to a

cyclone dust collecting part 5 (yellow + green), which is coupled to suction port body 4 (brown) by a connection pipe 3 (orange). Ex-1005, ¶¶25, 27. Matsumoto's illustrations of the connection pipe also show collars (blue), which indicate the connection pipe 3 is made of multiple pipes connected to one another. *Id*., Fig. 25; Ex-1003, ¶163. Thus, a POSITA would have understood that Matsumoto's vacuum cleaner could be used as a handheld vacuum by using only the uppermost connection pipe 3, and connecting suction port body 4 (or any other attachment, as was commonly known at the time) to the shortened connection pipe 3, as illustrated in the mockup of Figure 25 shown below. Ex-1003, ¶164.

FIG. 25



Ex-1005, Fig. 25 (annotated).



Ex-1003, ¶164 (Mockup of Matsumoto's Figure 25 to show use of Matsumoto's vacuum as a handheld.).

A POSITA would have also recognized that Matsumoto's handle is unergonomic and uncomfortable because of its shape and angle. *Id*., ¶165. As shown in Figure 25, the angle of the handle during use is approximately parallel to the ground. *Id*., ¶165. A POSITA would have recognized that such an angle would strain a user's wrist over extended use. *Id*. A POSITA would have also recognized that Matsumoto's handle would be likely to break because of its shape and because it acts as a cantilever that absorbs force during use. *Id*., ¶166.

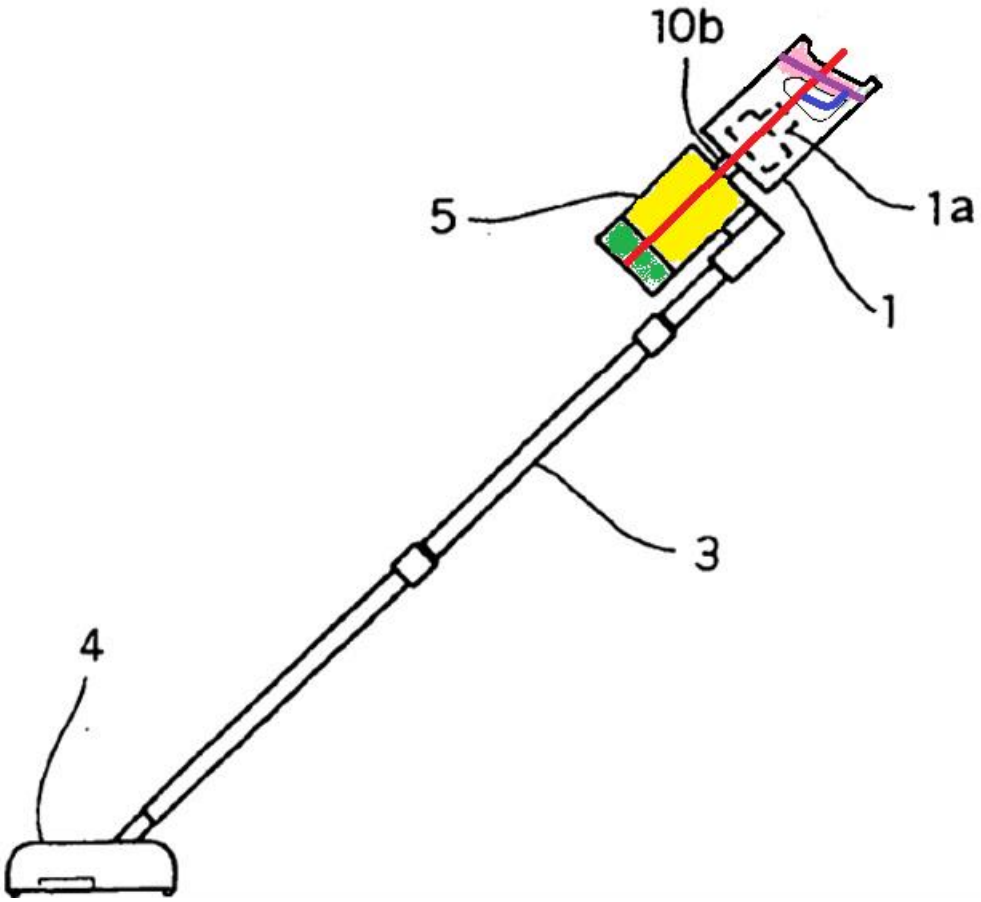
A POSITA would have therefore been motivated to implement use a more comfortable handle with Matsumoto's vacuum. *Id*., ¶167. In 2015 (at the time of the priority of the '687 patent), a POSITA would have known that handheld vacuum cleaners with handles that have a "pistol-grip" configuration were commonplace due to the added comfort in use, in particular as compared with vacuum cleaners from

the time Matsumoto's priority application was filed in 1999. *Id*., ¶167. Conrad'787 discloses such a handle. *Id*., ¶167. It also discloses that its handle configuration allows a user to "operate handvac 112 during cleaning," Ex-1006, ¶314, and explains that this handle configuration can be "comfortably operated in an orientation that does not require an application of torque by the user's hands when the handvac 112 is held by handle 484," because "the center of gravity 524 of the handvac 112 is aligned vertically below the user's hand." *Id*. Conrad'787 further explains that in "the illustrated embodiment, handle axis 888 of handle 484 extends at a (non-zero) forward angle 892 to the vertical (e.g….when bottom wall 216 is horizontal). This provides a comfortable handle alignment for grasping by a user when picking up handvac 112, and when using handvac 112 for cleaning surfaces below the user's elbows." *Id*. at ¶317. A POSITA would have therefore sought to take advantage of the improved handle configuration provided in Conrad'787 while retaining the improved dustbin configuration of Matsumoto. *See, supra*, Section IV.C.1 (incorporated herein by reference).

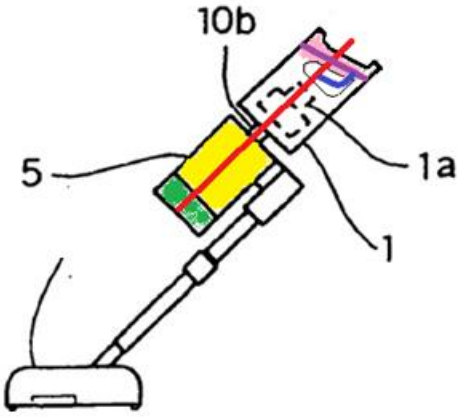
A POSITA would have therefore been motivated to combine the two references in a way that incorporates Conrad'787's teachings concerning the handle 484, including the shape and angle arrangement disclosed by Conrad'787. *See*, *supra*, IV.A.2.e (Claim Element 1[d]); Ex-1003, ¶169; *see also*, *supra* Section IV.A.1.c (incorporated here by reference).

Moreover, a POSITA would have had a reasonable expectation of success in modifying Matsumoto's handle, which is already at the back of vacuum cleaner 100, to have the same configuration (*i.e.*, including as to the shape and the range for angle θ) as Conrad'787's more comfortable handle 484. *Id*., ¶170. Moreover, the location of the handle would not otherwise interfere with any other component of Matsumoto's vacuum. *Id*.

As illustrated in the mockups below, a POSITA would replace Matsumoto's uncomfortable long and skinny handle with Conrad'787's more ergonomic handle 484 (pink), or with another handle similar to Conrad'787's that adapts Conrad'787's teachings as the shape and angle θ of the handle. *Id*.



Ex-1003, ¶170 (Mockup of Matsumoto's Figure 25 to show combined Matsumoto/Conrad'787 vacuum cleaner.).



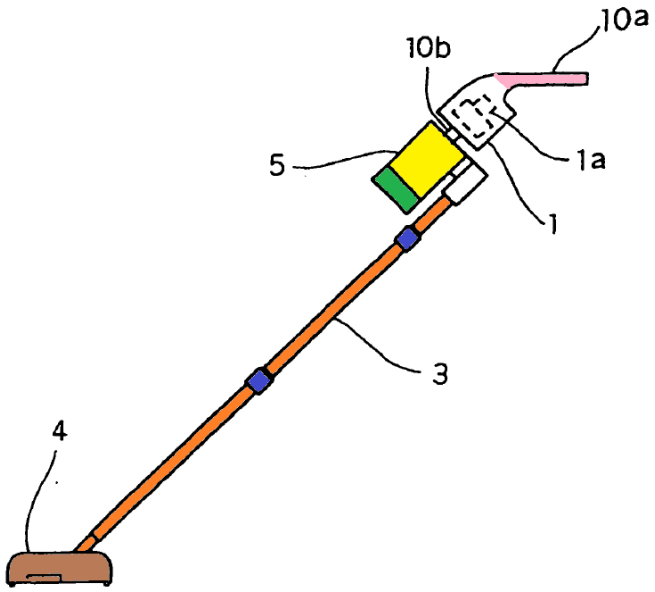
Ex-1003, ¶170 (Mockup of Matsumoto's Figure 25 in a miniaturized form to show combined Matsumoto/Conrad'787 vacuum cleaner.).

2. Detailed Analysis of Ground 3

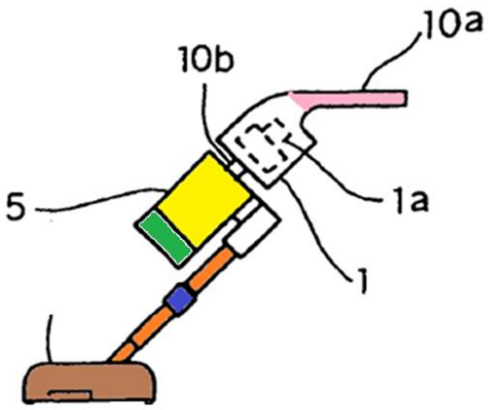
a. Element 1[pre]

To the extent the preamble of claim 1 is limiting, Matsumoto discloses it. Ex-1003, ¶¶171-173. Matsumoto discloses a vacuum cleaner having a body 1 and a handle 10a (pink). Ex-1005, Figs. 25, 1, and 2, ¶60. The body 1 is coupled to a cyclone dust collecting part 5 (yellow + green), which is coupled to suction port body 4 (brown) by a connection pipe 3 (orange). *Id*., ¶¶25, 27. Matsumoto's illustrations of the connection pipe also show collars (blue), which indicate the connection pipe 3 is made of multiple pipes connected to one another and which can be disconnected from each other. *Id*., Fig. 25; Ex-1003, ¶173. As explained above (Section IV.C.1.b), a POSITA would have understood that Matsumoto could be used as a handheld vacuum by using only the uppermost connection pipe 3, and connecting suction port body 4 to the shortened connection pipe 3, as illustrated in the mockup of Figure 25 shown below. Ex-1003, ¶173.

FIG. 25



Ex-1005, Fig. 25 (annotated).



Mockup of Figure 25.

Conrad'787 discloses a handheld vacuum cleaner, referred to as "handvac 122" having a handle 484. Ex-1006, ¶¶185, 312, 314, 316, Figs. 78, 96; Ex-1003, ¶174.

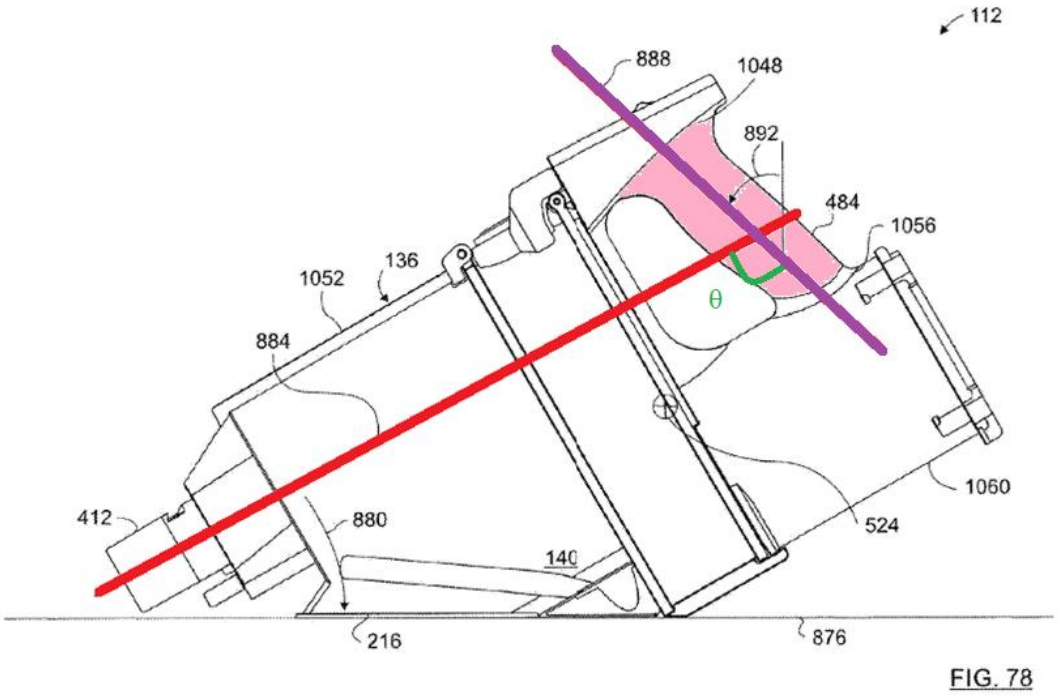


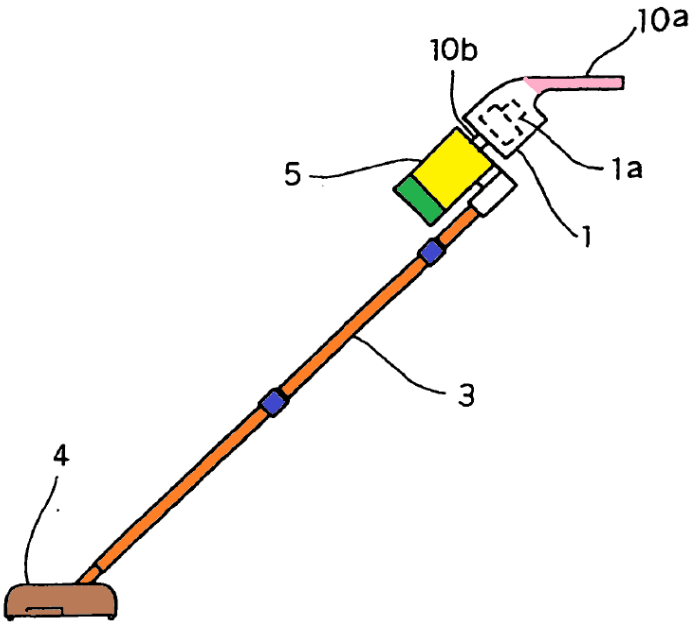
FIG. 78

Ex-1006, Fig. 78 (annotated).

b. Element 1[a]

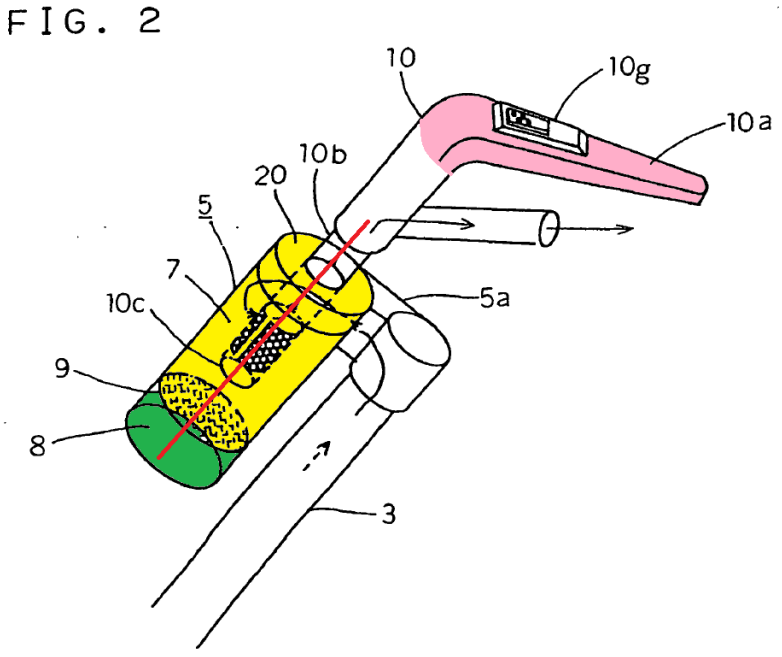
Matsumoto discloses this limitation. Ex-1003, ¶¶175-176. Matsumoto discloses a vacuum cleaner having a body 1 and a handle 10a (pink). Ex-1005, Figs. 25, 1, and 2, ¶60.

FIG. 25



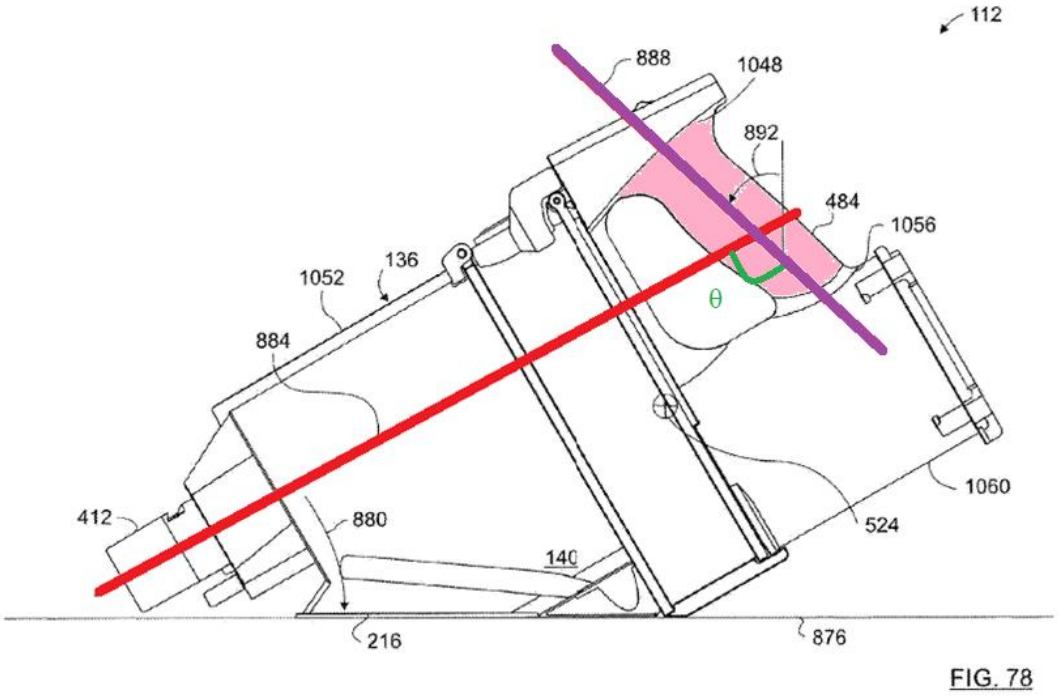
Ex-1005, Fig. 25 (annotated).

FIG. 2



Ex-1005, Fig. 2 (annotated).

Similarly, Conrad'787 discloses that handvac 122 has a handle 484 (pink). Ex-1006, ¶¶185, 312, 314, 316, Figs. 78, 96; Ex-1003, ¶177. Thus, the proposed combination also teaches the use of a handle in a handheld vacuum. Ex-1003, ¶¶175-177.



Ex-1006, Fig. 78 (annotated).

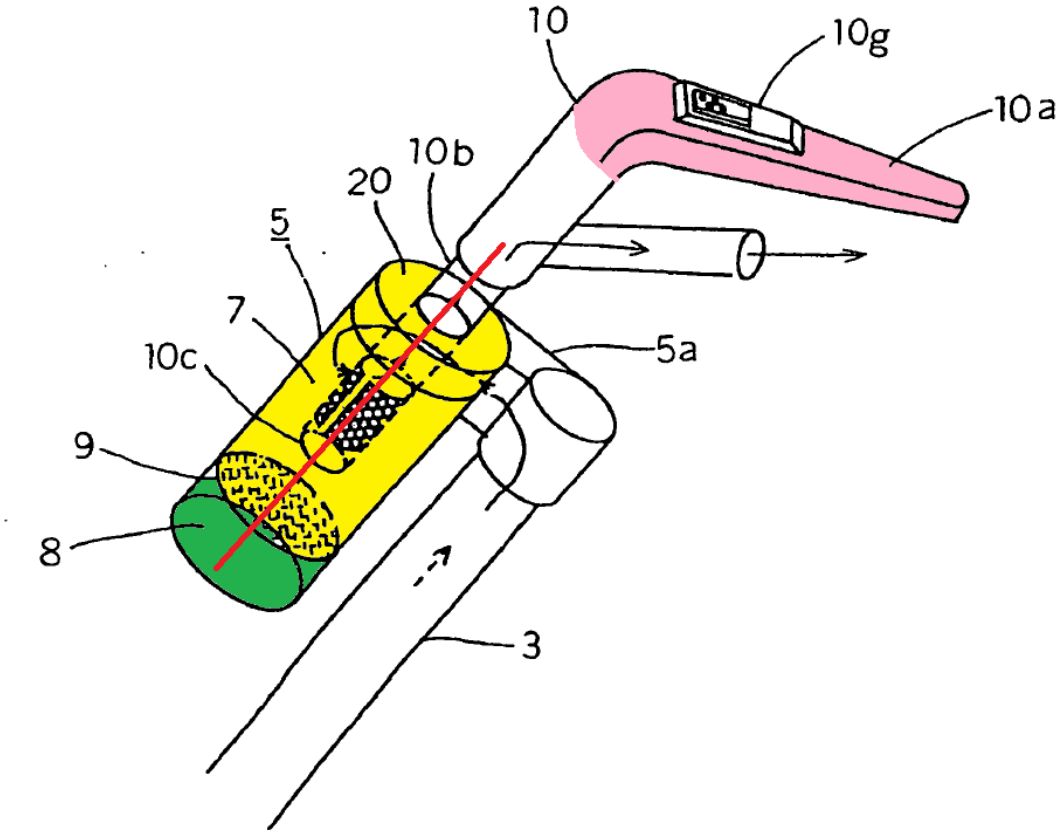
c. Element 1[b]

Matsumoto discloses this limitation. Ex-1003, ¶¶178-180. Matsumoto discloses a cyclone dust collecting part 5 having a longitudinal axis (red), a dust collecting chamber 7 (yellow) and a dust collecting chamber 8 (green) at one end of the cyclone dust collecting part 5. Ex-1005, Fig. 2, 3, ¶¶25-28, 30 41, 43. The cyclone dust collecting part 5, which includes a first dust collecting chamber 7

(yellow) and a dust collecting chamber 8 (green), corresponds to the claimed "cyclonic separating unit." *Id*., Claim 1 ("the cyclone type dust collecting part (5) has a first dust collecting chamber (7) and a second dust collecting chamber (8)"); Ex-1003, ¶179.

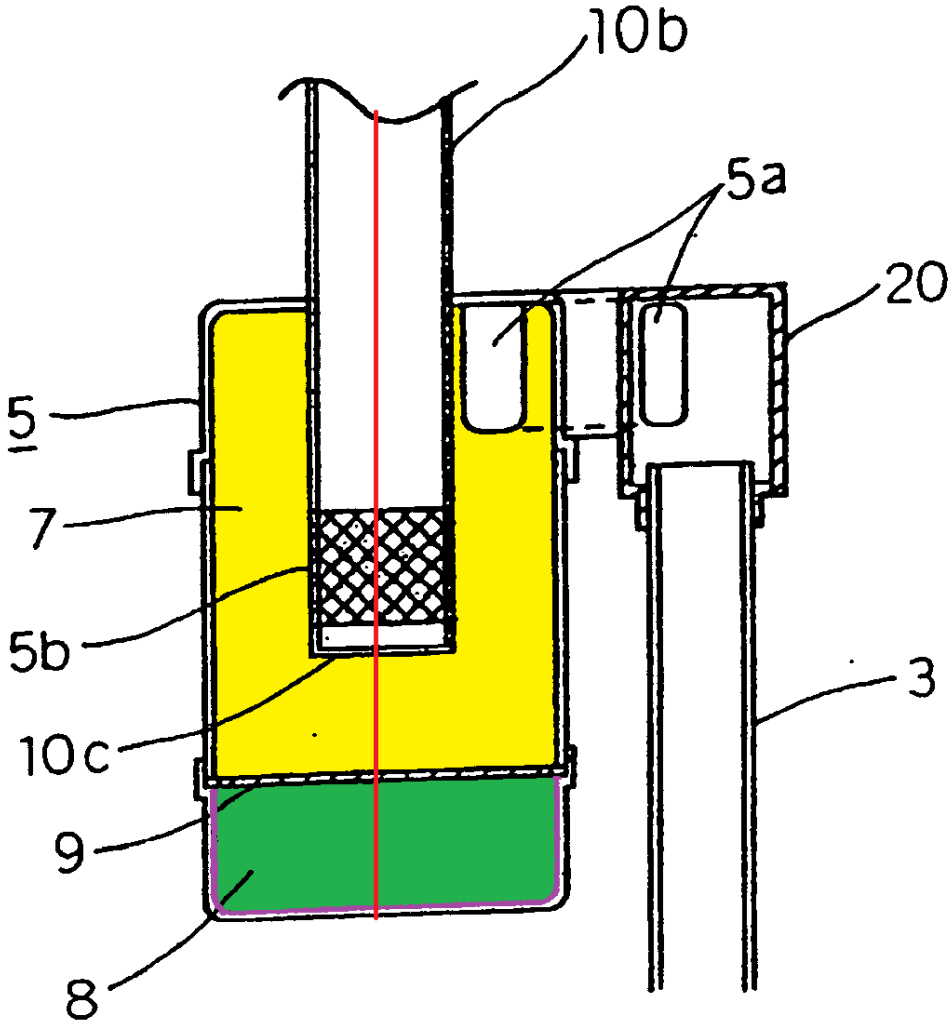
Matsumoto explains that "suction air collides with an inner wall 5c of the cyclone dust collecting part 5 and is thereby formed into a whirling stream, dust is separated from the suction air and is collected in a first dust collecting chamber 7." *Id.*, ¶30. Suction air passes through a first dust collecting chamber 7 (yellow) of the cyclone 5. *Id.*, ¶43. Fine dust particles are separated and collected in dust collecting chamber 8 (green). *Id*. Moreover, dust collecting chamber 8 (green), as illustrated in Figures 2 and 3, is at one end of the cyclone dust collecting part 5 (yellow).

FIG. 2



Ex-1005, Fig. 2 (annotated).

FIG. 3



Ex-1005, Fig. 3 (annotated).

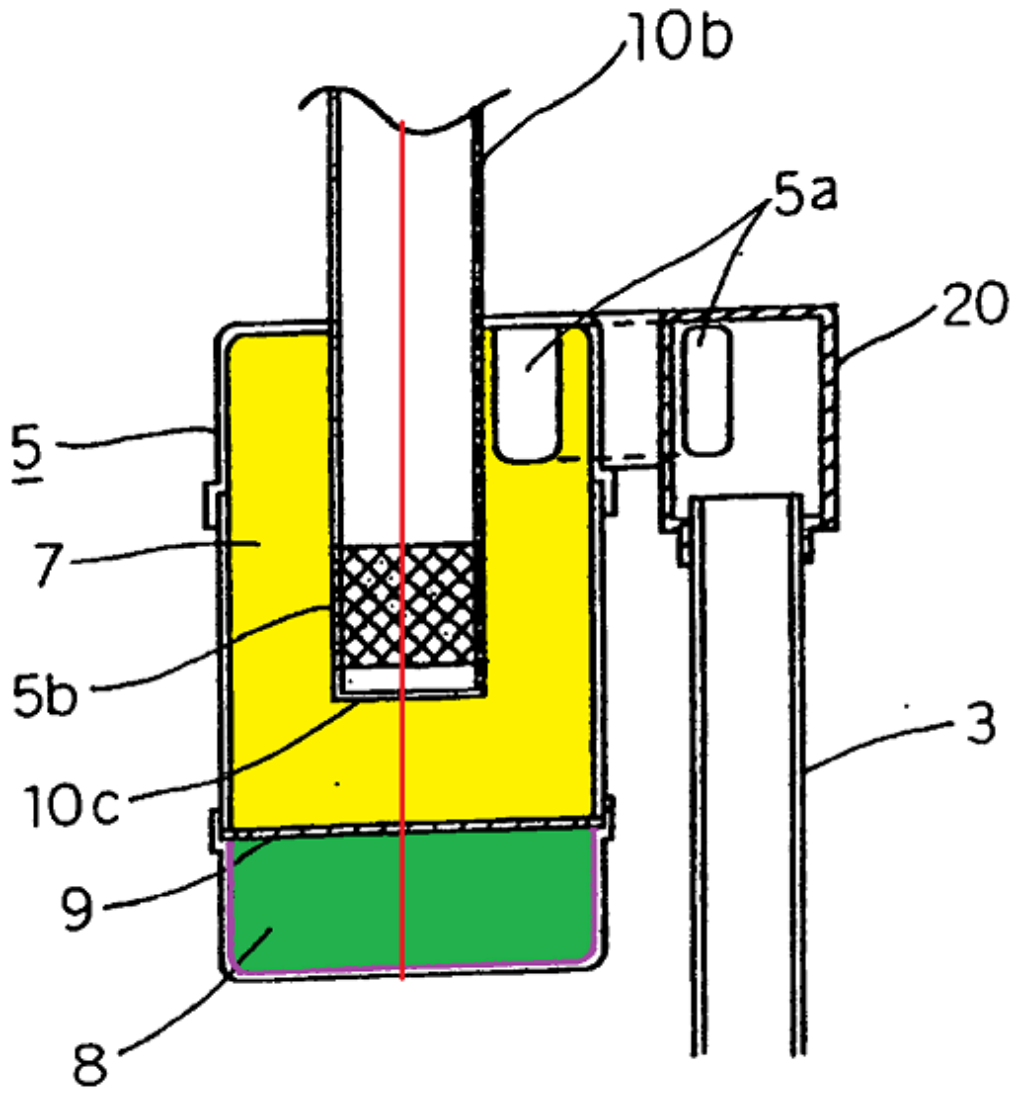
d. Element 1[c]

Matsumoto discloses this limitation. Ex-1003, ¶¶181-183. Matsumoto discloses a cyclone dust collecting part 5 having a first dust collecting chamber 7 (yellow) and a second first dust collecting chamber 8 (green), with a lid 8c (purple) that has an end wall. Ex-1005, Fig. 2, 3, 18, ¶45. The lid 8c (purple) has a closed

configuration in which dirt is retained within dust collecting chamber 8 (green) by the lid 8c (purple). *Id*., Fig. 3, ¶45. The lid 8c (purple) also has an open configuration for the removal of dirt from dust collecting chamber 8 (green). *Id*., Fig. 18, ¶45 ("Furthermore, as shown in Fig. 18, the second dust collecting chamber 8 may be so structured that a lid 8c at its lid is openable by means of a coupling part 5h realized by screw engagement, with a bayonet, with a clamp, or by another means.").

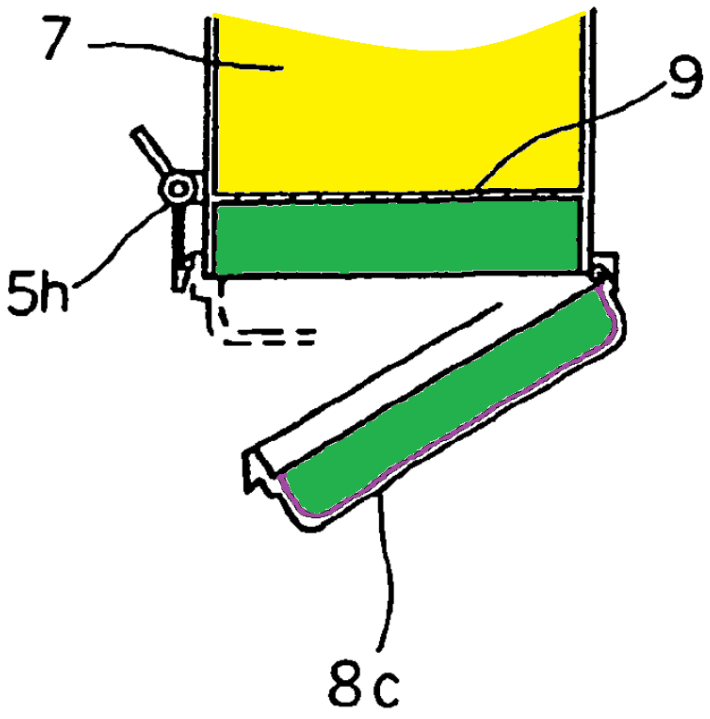
Lid 8c is also movable relative to the longitudinal axis (red) of cyclone dust collecting part 5 (yellow), and, when the lid 8c (purple) is in the closed configuration (Figure 3), the longitudinal axis (red) extends through a region bounded by a perimeter of lid 8c (purple). *Id.* Matsumoto also explains that "the openable lid 8c makes the disposal of refuse easier." *Id*., ¶46.

FIG. 3



Ex-1005, Fig. 3 (annotated).

FIG. 18



Ex-1005, Fig. 18 (annotated).

e. Element 1[d]

Conrad'787 discloses this limitation, as explained above. *See* Section IV.A.2.e (Ground 1, Element 1[d]) (incorporated herein by reference). Ex-1003, ¶¶88-101, 184-188.

A POSITA would have considered Conrad'787's specific teachings as to the specific range for angle θ (green) and the shape of the handle 484 and incorporated those design elements into the combined handheld vacuum. Ex-1003, ¶185. The POSITA would have recognized that advantages associated with Conrad'787's

handle described above are attributable to those design elements, and would have therefore sought to incorporate such design elements into the combined handheld vacuum. *Id.* As such, the POSITA would have designed a combined handheld vacuum that had a pistol grip configuration and which had an incline relative to the longitudinal axis that was within the specific range for angle θ (green) taught by Conrad'787, which falls within the claimed range of claim 1.

Moreover, in the specific mockup of the proposed combination provided (which is provided only as an inherently obvious example of such a combination), the handle from Conrad'787 would be inclined with respect to cyclonic separating unit 5 (yellow/green) to form an angle (blue) of approximately 110 degrees between the handle axis (purple) and the longitudinal axis (red) of the cyclonic separating unit 5. *See id*., ¶187 (Mockup of Matsumoto's Figure 25 to show combined Matsumoto/Conrad'787 vacuum cleaner). Thus, the proposed combination of Matsumoto and Conrad'787 inherently discloses a handle that falls within the claimed angle range of Element 1[d]. *Id.*, ¶¶185-186. In the proposed combination, the handle axis (purple) and the longitudinal axis (red) intersect within the vacuum cleaner. *Id.*, ¶187. A POSITA would have been motivated to combine Matsumoto and Conrad'787 with a reasonable expectation of success for the reasons explained in Section IV.C.1.b (incorporated herein by reference). *Id.*, ¶¶161-170. Thus, the

proposed combination of Matsumoto with Conrad'787 meets this limitation. *Id.*, ¶¶184-188.

f. Claim 2

Conrad'787 discloses this limitation, as explained above. *See* Section IV.A.2.f (Ground 1, Claim 2) (incorporated herein by reference). Ex-1003, ¶¶102-106, 189-193.

A POSITA would have considered Conrad'787's specific teachings as to the specific range for angle θ (green) and the shape of the handle 484 and incorporated those design elements into the combined handheld vacuum. Ex-1003, ¶191. The POSITA would have recognized that advantages associated with Conrad'787's handle described above are attributable to those design elements, and would have therefore sought to incorporate such design elements into the combined handheld vacuum. *Id*. As such, the POSITA would have designed a combined handheld vacuum that had a pistol grip configuration and which had an incline relative to the longitudinal axis that was within the specific range for angle θ (green) taught by Conrad'787, which falls within the claimed range of claim 2.

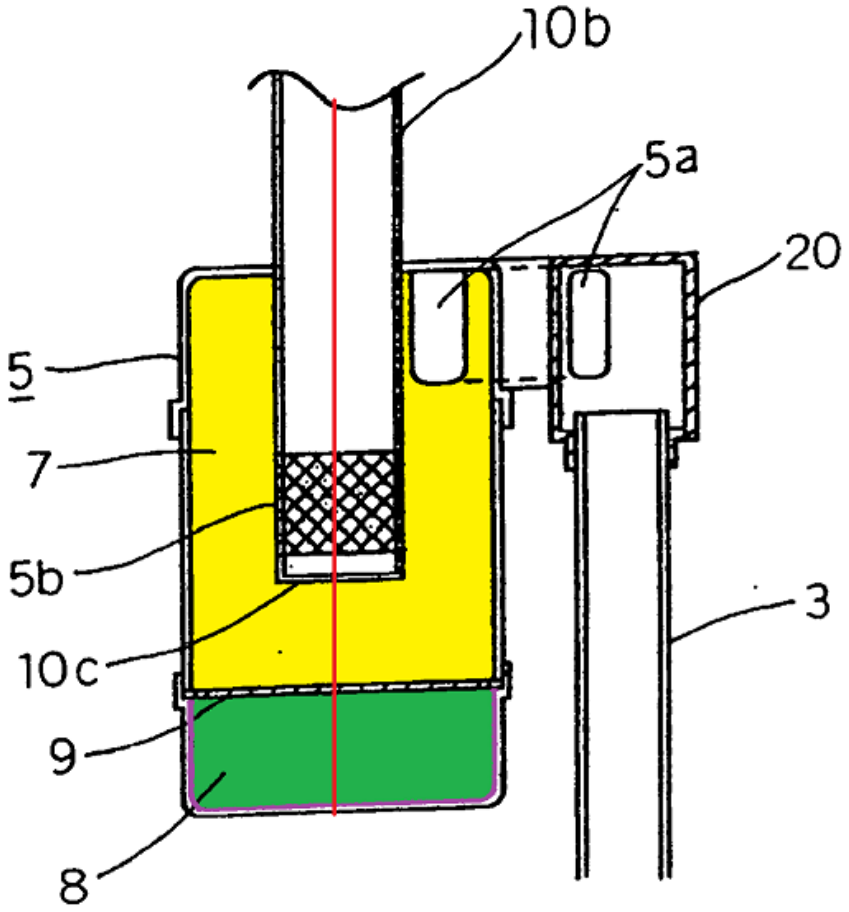
In the specific mockup of the proposed combination provided (which is provided only as an inherently obvious example of such a combination), the handle from Conrad'787 would be inclined with respect to cyclonic separating unit 5 (yellow/green) to form an angle (blue) of approximately 110 degrees between the

handle axis (purple) and the longitudinal axis (red) of the cyclonic separating unit 5. *See id*., ¶192 (Mockup of Matsumoto's Figure 25 to show combined Matsumoto/Conrad'787 vacuum cleaner). Thus, the proposed combination of Matsumoto and Conrad'787 inherently discloses a handle that falls within the claimed angle range of Claim 2. *Id.* A POSITA would have been motivated to combine Matsumoto and Conrad'787 with a reasonable expectation of success for the reasons explained in Section IV.C.1.b (incorporated herein by reference). *Id.*, ¶¶161-170. Thus, the proposed combination of Matsumoto with Conrad'787 meets this limitation. *Id.*, ¶¶189-193.

g. Claim 3

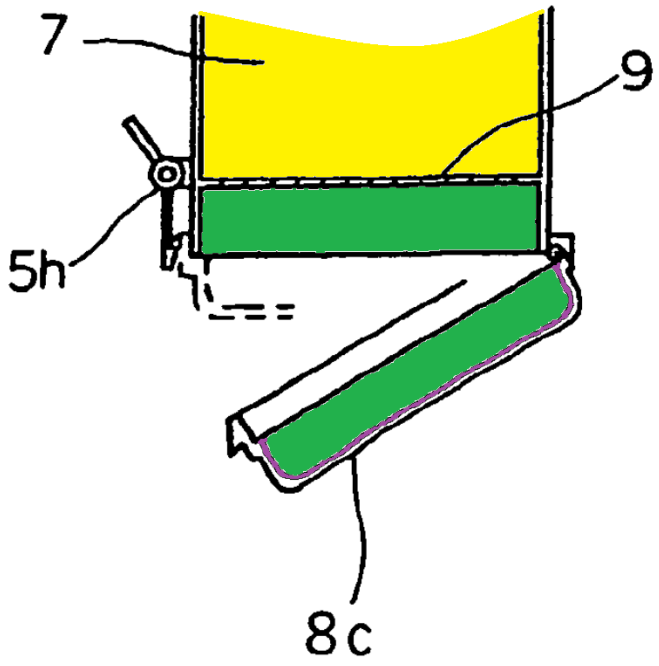
Matsumoto discloses this limitation. Ex-1003, ¶¶194-196. Matsumoto discloses that lid 8c forms an end wall of the cyclone dust collecting part 5 (yellow/green). Ex-1006, Figs. 2, 3, 18, ¶¶25-28, 30, 32, 33, 44; *see also* Section IV.C.1.d (Element 1(c)); incorporated herein by reference).

FIG. 3



Ex-1005, Fig. 3 (annotated).

FIG. 18

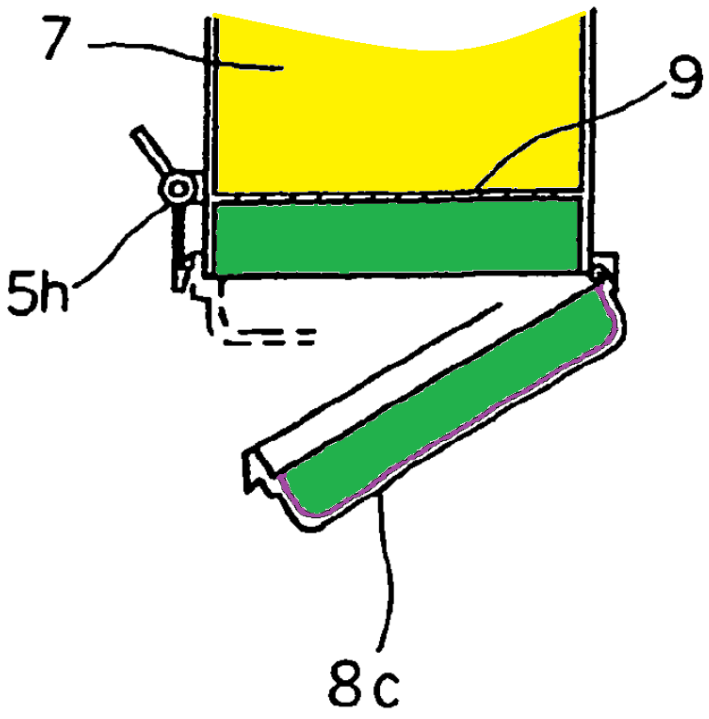


Ex-1005, Fig. 18 (annotated).

h. Claim 4

Matsumoto discloses this limitation. Ex-1003, ¶¶197-200. Matsumoto discloses that lid 8c is arranged to pivot between the closed configuration and the open configuration. Ex-1005, Figs. 3, 18 (illustrating a pivot), ¶45 ("Furthermore, as shown in Fig. 18, the second dust collecting chamber 8 may be so structured that a lid 8c at its lid is openable by means of a coupling part 5h realized by screw engagement, with a bayonet, with a clamp, or by another means."). Matsumoto also explains that "the openable lid 8c makes the disposal of refuse easier." *Id.*, ¶46. *See also* Section IV.C.1.d (Element 1(c)); incorporated herein by reference).

FIG. 18

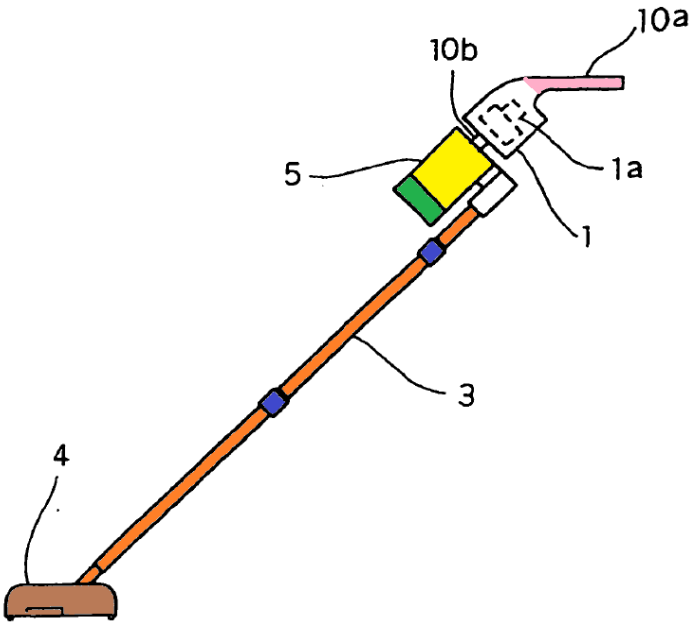


Ex-1005, Fig. 18 (annotated).

i. Claim 8

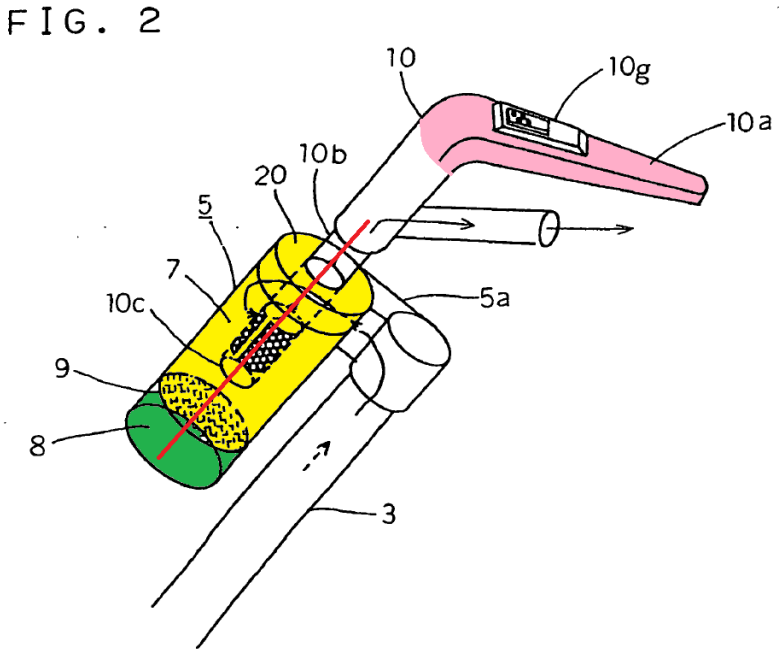
Matsumoto discloses this limitation. Ex-1003, ¶¶201-203. Matsumoto discloses that the dust collecting chamber 8 (green) is disposed forward of handle 10a (pink). Ex-1005, Fig. 25, 2; Ex-1003, ¶202. A POSITA would have understood that the dust collecting chamber 8 (green) is forward of the handle 10a (pink) because the dust collecting chamber 8 (green) is in ahead of the handle 10a during use, e.g., as shown in Figure 25. Ex-1003, ¶202.

FIG. 25



Ex-1005, Fig. 25 (annotated).

FIG. 2



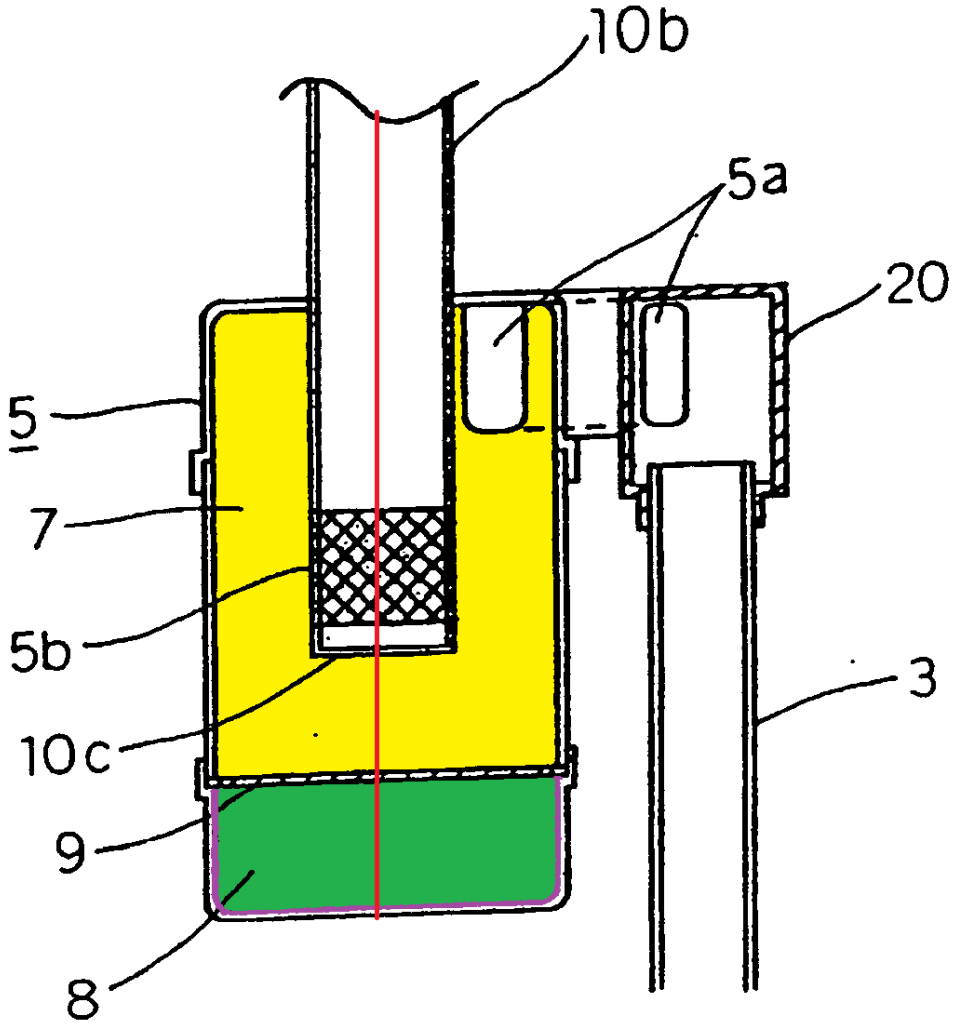
Ex-1005, Fig. 2 (annotated). Matsumoto discloses the dirt collector forward of the handle. The proposed combination would also result in the handle being at the rear

of the device. Thus, in the proposed combination, the dirt collector remains forward of the handle. Ex-1003, ¶¶201-203.

j. Claim 10

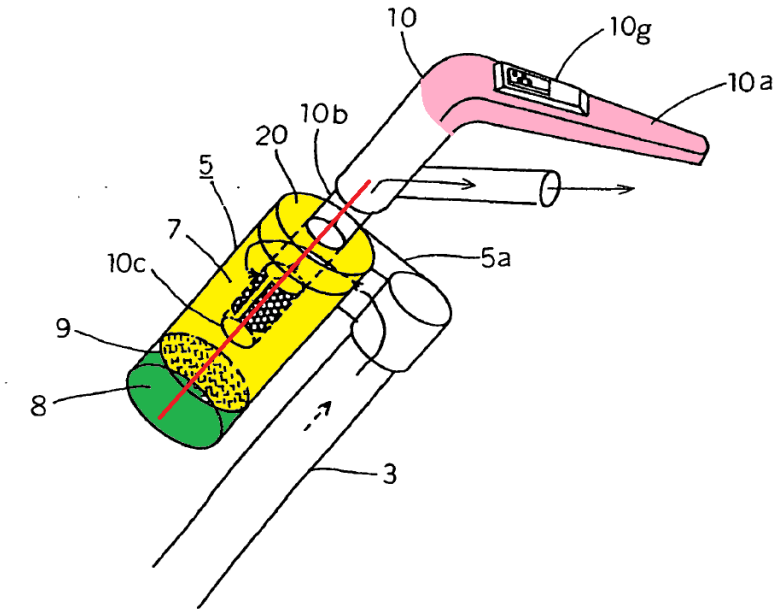
Matsumoto discloses this limitation. Ex-1003, ¶¶204-206. Matsumoto discloses that the cyclone dust collecting part 5 (yellow/green) has an exhaust port 5b that functions as a cyclonic separator, and which has an axis (red) that defines the longitudinal axis of the cyclone dust collecting part 5 (yellow/green). Ex-1003, ¶206; Ex-1005, Figs. 2, 3, 12-13, ¶38 (explaining that "the exhaust port 5b is formed as mesh having a large number of through holes."), ¶41 ("The mesh of the exhaust port 5b is as fine as or finer than the mesh of the partition wall 9 so that the coarse particles of dust collected in the first dust collecting chamber 7 do not evade through the exhaust port 5b. Fine particles of dust are collected in the second dust collecting chamber 8, which is arranged outside the suction air passage away from the exhaust port 5b, and are thereby prevented from evading through the exhaust port 5b."); *see also* Section IV.C.1.d (Element 1(c)); incorporated herein by reference).

FIG. 3



Ex-1005, Fig. 3 (annotated).

FIG. 2



Ex-1005, Fig. 2 (annotated).

D. Ground 4: Matsumoto in View of Dyson Render Obvious Claims 1–4, 8 and 10

As explained above (*see* Ground 3), Matsumoto discloses a vacuum cleaner having a dirt collector as claimed in the ’687 patent and a handle configuration at the rear thereof. Ex-1003, ¶¶159-206. While Matsumoto does not explicitly disclose the specific pistol grip handle configuration claimed in the ’687 patent, Dyson teaches that element. *Id.*, ¶207. And a POSITA would have been motivated to combine the teachings of Matsumoto with Dyson for the reasons explained below. *Id.*, ¶¶209-218. Thus, the combination of Matsumoto and Dyson renders obvious claims 1–4, 8 and 10 of the ’687 patent. *Id.*, ¶¶207-242.

1. Overview of Ground

a. Motivation to Combine Matsumoto and Dyson

Matsumoto discloses a handheld stick-type vacuum cleaner that is suited for cleaning floors. Ex-1005, Figs. 25, 1, ¶25; Ex-1003, ¶¶37-40, 209-210. Matsumoto explicitly suggests that "miniaturiz[ing] [the] vacuum cleaner" would "enhance the operability thereof." Ex-1005, ¶68. Matsumoto, however, does not explicitly disclose a miniature handheld vacuum cleaner for cleaning other types of surfaces, such as couches and bedding. Ex. 1003, ¶210. As explained above (Section IV.C.1.b, incorporated here by reference), a POSITA would have been motivated to "miniaturize" Matsumoto for use in a handheld vacuum configuration. *Id.*, ¶¶161-170, 210-212.

Also, as explained above (Section IV.C.1.b, incorporated here by reference), a POSITA would have also recognized that Matsumoto's handle is unergonomic and uncomfortable because of its shape and angle. *Id.*, ¶213.

A POSITA would have therefore been motivated to implement a more comfortable handle with Matsumoto's vacuum. *Id.*, ¶¶213-215. In 2015 (at the time of the priority of the '687 patent), a POSITA would have known that handheld vacuum cleaners with handles that have a "pistol-grip" configuration were commonplace due to the added comfort in use as compared with vacuum cleaners from the time Matsumoto's priority application was filed in 1999. *Id.*, ¶213.

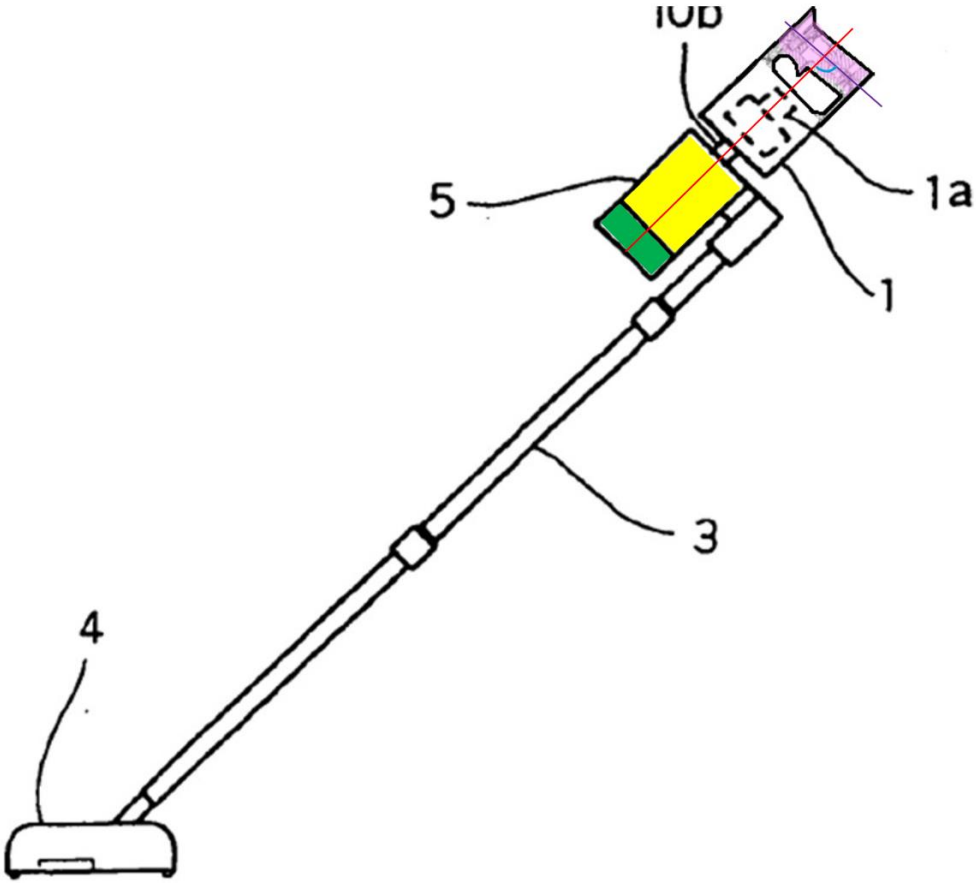
Dyson—like Conrad'787—discloses such a handle. *Id*. Dyson discloses that its handgrip configuration ensures that "the weight of the hand-held vacuum cleaner 10 is distributed on both sides of the user's hand." Ex-1007, 6:10-11. Dyson explains that this configuration is important because "a user may wish to clean a variety of surfaces which may be orientated at different angles," and "will need to lift and move the hand-held vacuum cleaner 10 into a variety of positions and orientations in order to clean effectively." *Id*., 6:4-7. In short, as Dyson explains, "[t]his arrangement feels comfortable for a user," and allows the user to "maintain a comfortable wrist position and movement of the hand-held vacuum cleaner feels comfortable." *Id*., 2:17-19, 4:27-29. A POSITA would have therefore sought to take advantage of the improved handle configuration provided in Dyson while retaining the improved dustbin configuration of Matsumoto. *See*, *supra*, Section IV.C.1.b (incorporated herein by reference); Ex-1003, ¶¶213-216.

A POSITA would have therefore been motivated to combine the two references in a way that incorporates Dyson's teachings concerning the handle 28, including the shape and angle arrangement disclosed by Dyson. *See*, *supra*, IV.B.2.e (Claim Element 1[d]); Ex-1003, ¶217.

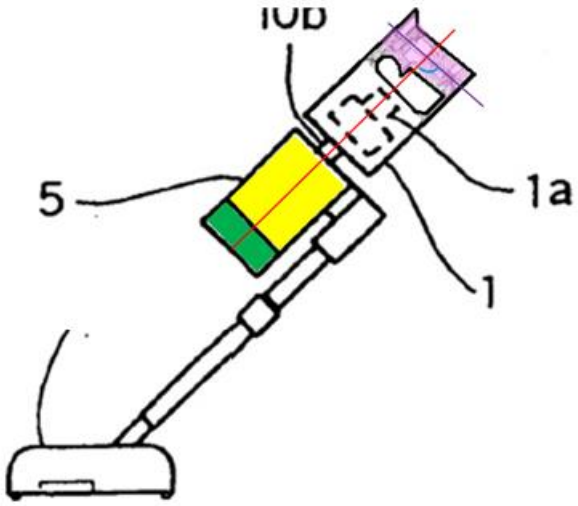
Moreover, a POSITA would have had a reasonable expectation of success in modifying Matsumoto's handle, which is already at the back of vacuum cleaner 100, to have the same configuration as Dyson's handgrip 28 (*i.e.*, including as to the shape

and the range for angle θ). *Id*., ¶218. The location of the handle would not otherwise interfere with any other component of Matsumoto's vacuum. *Id*.

As illustrated in the mockup below, a POSITA would simply replace Matsumoto's uncomfortable long and skinny handle with Dyson's more ergonomic handgrip 28 (pink), or with another handle similar to Dyson's that adapts Dyson's teachings as the shape and angle θ of the handle. Ex-1003, ¶218.



Ex-1003, ¶218 (Mockup of Matsumoto's Figure 25 to show combined Matsumoto/Dyson vacuum cleaner).



Ex-1003, ¶218 (Mockup of Matsumoto's Figure 25 in a miniaturized form to show combined Matsumoto/Dyson vacuum cleaner).

2. Detailed Analysis of Ground 4

a. Elements 1[pre]–1[c]

For each of claim elements 1[pre]–1[c], petitioners incorporate by reference the corresponding analysis of Ground 3 above. *See supra* Section IV.C.2; Ex. 1003, ¶¶220-223.

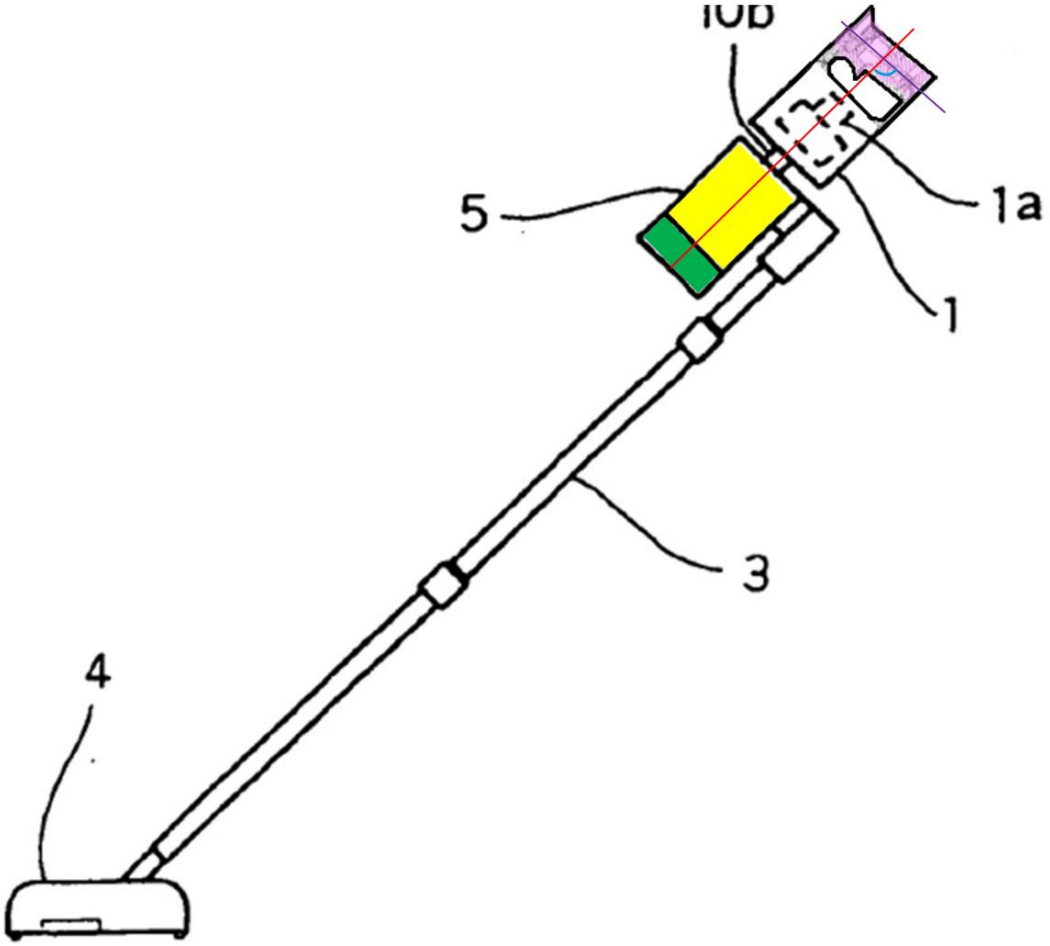
b. Element 1[d]

Dyson discloses this limitation, as explained above. *See* Section IV.B.2.b (Ground 2, Element 1[d]) (incorporated herein by reference). Ex-1003, ¶¶184-188, 224-229.

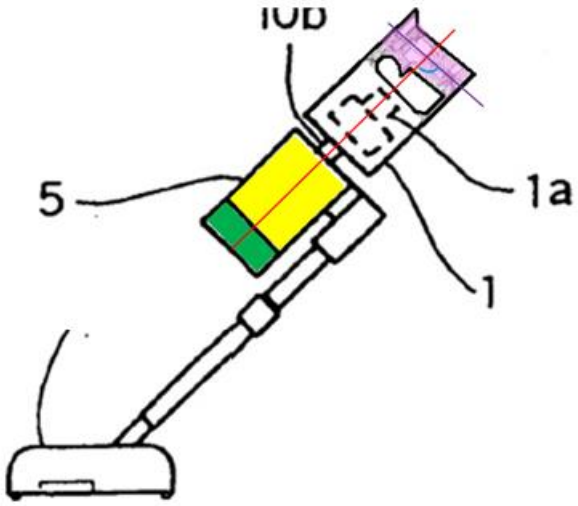
A POSITA would have considered Dyson's specific teachings as to the specific range for angle θ (green) and the shape of the handle 484 and incorporated

those design elements into the combined handheld vacuum. Ex-1003, ¶226. The POSITA would have recognized that advantages associated with Dyson's handle described above are attributable to those design elements, and would have therefore sought to incorporate such design elements into the combined handheld vacuum. *Id*. As such, the POSITA would have designed a combined handheld vacuum that had a pistol grip configuration having an incline relative to the longitudinal axis that was within the specific range for angle θ (green) taught by Dyson, which falls within the claimed range of claim 1.

Moreover, in the specific mockup of the proposed combination (which is provided only as an inherently obvious example of such a combination), the handle from Dyson would be inclined with respect to cyclonic separating unit 5 (yellow/green) to form an angle (blue) of approximately 95 degrees between the handle axis (purple) and the longitudinal axis (red) of the cyclonic separating unit 5. Thus, the proposed combination of Matsumoto and Conrad'787 inherently discloses a handle that falls within the claimed angle range of Element 1[d]. *Id.* Moreover, in the proposed combination, the handle axis (purple) and the longitudinal axis (red) intersect within the vacuum cleaner. *Id.* Thus, the proposed combination of Matsumoto with Conrad'787 meets this limitation. *Id.*, ¶¶224-229.



Ex-1003, ¶228 (Mockup of Matsumoto's Figure 25 to show combined Matsumoto/Dyson vacuum cleaner).



Ex-1003, ¶218 (Mockup of Matsumoto's Figure 25 in a miniaturized form to show combined Matsumoto/Dyson vacuum cleaner.).

A POSITA would have been motivated to combine Matsumoto and Dyson with a reasonable expectation of success for the reasons explained in Section IV.D.1.a (incorporated herein by reference). *Id.*, ¶¶209-218.

c. Claim 2

Dyson discloses this limitation, as explained above. *See* Section IV.A.2.f (Ground 1, Claim 2) (incorporated herein by reference). Ex-1003, ¶¶102-106, 230-234.

A POSITA would have considered Dyson's specific teachings as to the specific range for angle θ (green) and the shape of the handle 28 and incorporated those design elements into the combined handheld vacuum. *Id.*, ¶232. The POSITA would have recognized that advantages associated with Dyson's handle described

above are attributable to those design elements and would have therefore sought to incorporate such design elements into the combined handheld vacuum. *Id*. As such, the POSITA would have designed a combined handheld vacuum that had a pistol grip configuration and which had an incline relative to the longitudinal axis that was within the specific range for angle θ (green) taught by Dyson, which falls within the claimed range of claim 2.

Thus, for the reasons explained in Section IV.D.1.a (incorporated herein by reference), a POSITA would have been motivated to combine Matsumoto and Dyson. Ex-1003, ¶¶230-234.

d. Claims 3, 4, 8 and 10

For each of claims 3, 4, 8 and 10, petitioners incorporate by reference the corresponding analysis of Ground 3 above. *See supra* Section IV.C.2; Ex. 1003, ¶¶194-206, 235-242.

V. ENABLEMENT AND SECONDARY CONSIDERATIONS

The prior art references relied upon in this Petition are enabled.

Petitioners are not aware of any secondary considerations of non-obviousness tied to the Challenged Claims. Ex-1003, ¶¶243-245. To the extent Patent Owner alleges that any secondary considerations of non-obviousness are tied to the Challenged Claims, Petitioners may request leave to file a reply to respond to any such allegations. In any event, where, as here, there is a strong showing of

obviousness, the Federal Circuit has held that even relevant secondary considerations supported by substantial evidence do not dislodge the primary conclusion of obviousness. *See, e.g.*, *Ohio Willow Wood Co. v. Alps S., LLC*, 735 F.3d 1333, 1344 (Fed. Cir. 2013).

VI. PTAB DISCRETION SHOULD NOT PRECLUDE INSTITUTION

A. Discretionary Denial Under Section 314(a) Is Not Warranted

SharkNinja filed this Petition before any Complaint was filed by Patent Owner against SharkNinja for infringement of the Challenged Claims. Given the lack of any pending lawsuit, the *Fintiv* Factors are neutral or weigh in favor of institution. If Patent Owner later brings an infringement action against SharkNinja asserting any of the Challenged Claims, SharkNinja may request leave to file a reply to address any such developments.

B. Discretionary Denial Under Section 325(d) Is Not Warranted

The arguments presented in this Petition are new. Although a family member of Conrad'630 was cited by the Examiner, the Examiner did not apply that family member during prosecution of the '687 patent. *See generally* Ex-1002. Further, neither Matsumoto nor Dyson were before the Examiner during prosecution. And as explained above, while Conrad'787 is cited on the face of the '687 patent, this Petition challenges the '687 patent claims as obvious over the combination of Conrad'630 and Conrad'787, and Matsumoto and Conrad'787, which were not considered by the Examiner during prosecution. The Grounds raised in this IPR are

non-cumulative of the art considered because Conrad'630 and Matsumoto both show a dust bin having the same configuration as claimed by the Challenged Claims.

VII. CONCLUSION

Petitioners have established a reasonable likelihood that the Challenged Claims are unpatentable. Petitioners therefore respectfully request that IPR be instituted.

DATED: August 21, 2023

Respectfully Submitted,

/Brian M. Buroker/

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CERTIFICATION UNDER 37 C.F.R. § 42.24(d)

Under the provisions of 37 C.F.R. § 42.24(d), the undersigned attorney hereby certifies that the word count for Sections I–VII of the foregoing Petition for *Inter Partes* Review is 13,991, according to the word count tool in Microsoft Word.

DATED: August 21, 2023

By: /Brian M. Buroker/

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CERTIFICATE OF SERVICE

The undersigned certifies service pursuant to 37 C.F.R. §§ 42.6(e) and 42.105(a), (b) on the Patent Owner via FedEx overnight mail of a copy of this Petition for *Inter Partes* Review and supporting materials at the Patent Owner at the correspondence address of record for the '687 patent:

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APPENDIX: CHALLENGED CLAIM LISTING

No.	Limitation
1[pre]	A handheld vacuum cleaner, comprising:
1[a]	a handle by which the vacuum cleaner is supported during normal use;
1[b]	a cyclonic separating unit having a longitudinal axis and a dirt collector at one end of the cyclonic separating unit,
1[c]	the cyclonic separating unit comprising an end wall having a closed configuration in which dirt is retained within the dirt collector by the end wall and an open configuration for the removal of dirt from the dirt collector, wherein the end wall is movable relative to the longitudinal axis and, when the end wall is in the closed configuration, the longitudinal axis extends through a region bounded by a perimeter of the end wall,
1[d]	wherein the handle has a pistol grip configuration in which the handle is inclined with respect to the cyclonic separating unit to form an angle of not less than 85 degrees and not greater than 140 degrees between a handle axis and the longitudinal axis of the cyclonic separating unit, and wherein the handle axis and the longitudinal axis intersect within the vacuum cleaner.
2	The handheld vacuum cleaner of claim 1, wherein the handle is inclined with respect to the cyclonic separating unit to form an angle of not less than 100 degrees and not greater than 125 degrees between the handle axis and the longitudinal axis of the cyclonic separating unit.
3	The handheld vacuum cleaner of claim 1, wherein the end wall comprises an end wall of the cyclonic separating unit.
4	The handheld vacuum cleaner of claim 1, wherein the end wall is arranged to pivot between the closed configuration and the open configuration.
8	The handheld vacuum cleaner of claim 1, wherein the dirt collector is disposed forward of the handle.
10	The handheld vacuum cleaner of claim 1, wherein the cyclonic separating unit comprises a cyclonic separator having an axis that defines the longitudinal axis of the cyclonic separating unit.