Doc Code: PA..
Document Description: Power of Attorney

PTO/AIA/82A (07-13)
Approved for use through 03/31/2021. OMB 0651-0035
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

TRANSMITTAL FOR POWER OF ATTORNEY TO ONE OR MORE REGISTERED PRACTITIONERS

NOTE: This form is to be submitted with the Power of Attorney by Applicant form (PTO/AIA/82B) to identify the application to which the Power of Attorney is directed, in accordance with 37 CFR 1.5, unless the application number and filing date are identified in the Power of Attorney by Applicant form. If neither form PTO/AIA/82A nor form PTO/AIA82B identifies the application to which the Power of Attorney is directed, the Power of Attorney will not be recognized in the application.

Application Number	N/A
Filing Date	October 2, 2019
First Named Inventor	Wayne Ernest Conrad
Title	SURFACE CLEANING APPARATUS
Art Unit	3723
Examiner Name	N/A
Attorney Docket Number	10452-P46958US13

SIGNATURE of Applicant or Patent Practitioner

Signature	/Philip C. Mendes da Costa/	Date (Optional)	2019-10-02
Name	Philip C. Mendes da Costa	Registration Number	33,106
Title (if Applicant is a juristic entity)	Vice-President and Agent of Record		
Applicant Name (if Applicant is a juristic entity)	Omachron Intellectual Property Inc.		

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. If more than one applicant, use multiple forms.

☐ *Total of _____ forms are submitted.

This collection of information is required by 37 CFR 1.131, 1.32, and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Doc Code: PA..
Document Description: Power of Attorney

PTO/AIA/82B (07-13)
Approved for use through 03/31/2021. OMB 0651-0035
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number

POWER OF ATTORNEY BY APPLICANT

I hereby revoke all previous powers of attorney given in the application identified in either the attached transmittal letter or the boxes below.

Application Number	Filing Date

(Note: The boxes above may be left blank if information is provided on form PTO/AIA/82A.)

☑ I hereby appoint the Patent Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above.

01059

OR

☐ I hereby appoint Practitioner(s) named in the attached list (form PTO/AIA/82C) as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the patent application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above. (Note: Complete form PTO/AIA/82C.)

Please recognize or change the correspondence address for the application identified in the attached transmittal letter or the boxes above to:

☑ The address associated with the above-mentioned Customer Number

OR

☐ The address associated with Customer Number:

OR

☐ Firm or Individual Name					
Address					
City		State		Zip	
Country					
Telephone		Email			

I am the Applicant (if the Applicant is a juristic entity, list the Applicant name in the box):

Omachron Intellectual Property Inc.

☐ Inventor or Joint Inventor (title not required below)

☐ Legal Representative of a Deceased or Legally Incapacitated Inventor (title not required below)

☑ Assignee or Person to Whom the Inventor is Under an Obligation to Assign (provide signer's title if applicant is a juristic entity)

☐ Person Who Otherwise Shows Sufficient Proprietary Interest (e.g., a petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document) (provide signer's title if applicant is a juristic entity)

SIGNATURE of Applicant for Patent

The undersigned (whose title is supplied below) is authorized to act on behalf of the applicant (e.g., where the applicant is a juristic entity).

Signature		Date (Optional)	2019-10-02
Name	Philip C. Mendes da Costa		
Title	Vice-President		

NOTE: Signature - This form must be signed by the applicant in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. If more than one applicant, use multiple forms.

☐ Total of forms are submitted.

This collection of information is required by 37 CFR 1.131, 1.32, and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Doc Code: PD.TO.AUTH
Document Description: Auth or Resc of Auth to Access Appl by DAS/PDX Office

PTO/SB/39 (11-15)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

AUTHORIZATION OR RESCISSION OF AUTHORIZATION TO PERMIT ACCESS TO APPLICATION-AS-FILED BY PARTICIPATING OFFICES

Send completed form to: Commissioner for Patents
P.O. Box 1450, Alexandria, VA 22313-1450

Application Number (if known):	Filing Date: October 2, 2019
First Named Inventor: Wayne Ernest Conrad	Attorney Docket Number: 10452-P46958US13
Title (Required) SURFACE CLEANING APPARATUS	

Check either box 1 or 2 below, but **not** both:

1. ☒ By checking this box, the undersigned hereby **grants the USPTO authority** to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the State Intellectual Property Office of the People's Republic of China (SIPO), the World Intellectual Property Organization(WIPO), and any other foreign intellectual property office participating with the USPTO in a bilateral or multilateral priority document exchange agreement in which a foreign application claiming priority to the instant patent application is filed, access to: (1) the instant patent application-as-filed and its related bibliographic data, (2) any foreign or domestic application to which priority or benefit is claimed by the instant application and its related bibliographic data, and (3) the date of filing of this Authorization. See 37 CFR 1.14(h)(1).

2. ☐ By checking this box, the undersigned hereby **rescinds the previous authority granted to the USPTO** to provide the EPO, JPO, KIPO, SIPO, WIPO or any other foreign intellectual property office participating with the USPTO in a bilateral or multilateral priority document exchange agreement access to the documents and information identified in paragraph 1 above.

This rescission of the previous authorization will not be effective unless and until an appropriate USPTO official recognizes and acts on the rescission.

However, once the application has published or is otherwise publicly available, the USPTO may provide access to the application in accordance with 37 CFR 1.14.

NOTE: This form must be signed by an authorized party in accordance with 37 CFR 1.14(c). Please see 37 CFR 1.4(d) for the form of the signature. If necessary, submit multiple forms for more than one signature, see below.*

Signature /Philip C. Mendes da Costa/	Date October 2, 2019
Name (Print/Typed) Philip C. Mendes da Costa	Practitioner Registration Number (if applicable) 33,106
Name of Assignee (if applicable)	Title (if applicable)

☐ *Total of _____ forms are submitted.

This collection of information is required by 37 CFR 1.14(h). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 6 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Doc Code: SREXR141
Document Description: Auth or Resc of Auth to Access Search Results

PTO/SB/69 (11-15)

AUTHORIZATION OR RESCISSION OF AUTHORIZATION TO PERMIT ACCESS TO SEARCH RESULTS BY THE EUROPEAN PATENT OFFICE (EPO)

Send completed form to: Commissioner for Patents
P.O. Box 1450, Alexandria, VA 22313-1450

Application Number (if known):	Filing Date: October 2, 2019
First Named Inventor: Wayne Ernest Conrad	Attorney Docket Number: 10452-P46958US13

Title (Required)
SURFACE CLEANING APPARATUS

Check either box 1 or 2 below, but **not** both:

1. ☒ By checking this box, the undersigned hereby **grants the USPTO authority** to provide the EPO access to the bibliographic data and search results from the instant patent application when a European patent application claiming priority to the instant application is filed. See 37 CFR 1.14(h)(2).

The applicant is reminded that the EPO's Rule 141(1) EPC (European Patent Convention) requires applicants to submit a copy of search results from the instant application without delay in a European patent application that claims priority to the instant application.

2. ☐ By checking this box, the undersigned hereby **rescinds the previous authority granted to the USPTO** to transmit to the EPO any search results from the instant patent application.

This rescission of the previous authorization will not be effective unless and until an appropriate USPTO official recognizes and acts on the rescission.

However, once the application has published or is otherwise publicly available, the USPTO may provide access to the application in accordance with 37 CFR 1.14.

NOTE: This form must be signed by an authorized party in accordance with 37 CFR 1.14(c). Please see 37 CFR 1.4(d) for the form of the signature. If necessary, submit multiple forms for more than one signature, see below.*

/Philip C. Mendes da Costa/ Signature	2019-10-02 Date
Philip C. Mendes da Costa Name (Print/Typed)	Practitioner Registration Number (If applicable) 33,106
Name of Assignee (if applicable)	Title (if applicable)

☐ *Total of _____ forms are submitted.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Doc Code: ECOMM.AUTH/ECOMM.WTDW
Doc Description: Internet Communications Authorized/Internet Communications Authorization Withdrawn

PTO/SB/439 (11-15)

AUTHORIZATION FOR INTERNET COMMUNICATIONS IN A PATENT APPLICATION OR REQUEST TO WITHDRAW AUTHORIZATION FOR INTERNET COMMUNICATIONS		
	Application No.	
	Filing Date	October 2, 2019
	First Named Inventor	Wayne Ernest Conrad
	Art Unit	3723
	Examiner Name	n/a
	Practitioner Docket No.	10452-P46958US13

To: Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

I. To authorize permission for Internet Communications.

☑ Recognizing that Internet communications are not secure, I hereby authorize the USPTO to communicate with the undersigned and practitioners in accordance with 37 CFR 1.33 and 37 CFR 1.34 concerning any subject matter of this application via video conferencing, instant messaging, or electronic mail. I understand that a copy of these communications will be made of record in the application file. (MPEP 502.03)

II. To withdraw authorization for Internet Communications.

☐ The authorization given on _____, to the USPTO to communicate with the undersigned and any practitioner in accordance with 37 CFR 1.33 and 37 CFR 1.34 concerning any subject matter of this application via Internet communications such as video conferencing, instant messaging, or electronic mail is hereby withdrawn. I understand that the withdrawal is effective when approved rather than when received.

I am the

☐ applicant.

☑ attorney or agent of record. Registration number 33,106.

☐ attorney or agent acting under 37 CFR 1.34. Registration number _____.

/Philip C. Mendes da Costa/ — Signature

October 2, 2019 — Date

Philip C. Mendes da Costa — Typed or printed name

416.957.1695 — Telephone Number

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. Juristic entities must be represented by a patent practitioner (see 37 CFR 1.31, which is applicable to any paper filed on or after September 16, 2012, that is presented on behalf of a juristic entity, regardless of application filing date). Submit multiple forms if more than one signature is required, see below*.

☐ * Total of _____ forms are submitted.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Patent Application Fee Transmittal

Application Number:	
Filing Date:	
Title of Invention:	SURFACE CLEANING APPARATUS
First Named Inventor/Applicant Name:	Wayne Ernest Conrad
Filer:	Philip C. Mendes da Costa/Snezana Lisowsky
Attorney Docket Number:	10452-P46958US13

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
UTILITY APPLICATION FILING	1011	1	300	300
UTILITY SEARCH FEE	1111	1	660	660
UTILITY EXAMINATION FEE	1311	1	760	760
Pages:				
UTILITY APPL SIZE FEE PER 50 SHEETS >100	1081	2	400	800
Claims:				
Miscellaneous-Filing:				
Petition:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**2520**

Electronic Acknowledgement Receipt	
EFS ID:	37346901
Application Number:	16590972
International Application Number:	
Confirmation Number:	3958
Title of Invention:	SURFACE CLEANING APPARATUS
First Named Inventor/Applicant Name:	Wayne Ernest Conrad
Customer Number:	1059
Filer:	Philip C. Mendes da Costa/Snezana Lisowsky
Filer Authorized By:	Philip C. Mendes da Costa
Attorney Docket Number:	10452-P46958US13
Receipt Date:	02-OCT-2019
Filing Date:	
Time Stamp:	15:38:17
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$2520
RAM confirmation Number	E201902F38499901
Deposit Account	022095
Authorized User	Snezana Lisowsky
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: 37 CFR 1.16 (National application filing, search, and examination fees) 37 CFR 1.17 (Patent application and reexamination processing fees)	

37 CFR 1.19 (Document supply fees)

37 CFR 1.20 (Post Issuance fees)

37 CFR 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Specification	P46958US13_Specification_2019-10-02.PDF	231633 47840006f08c0bde113baba147a2873db2ae6c63	no	85
Warnings:					
Information:					
2	Claims	P46958US13_Claims_2019-10-02.PDF	61868 33047aec96fbfc3f1a8bba3febfb1ec8ed61cf95	no	3
Warnings:					
Information:					
3	Abstract	P46958US13_Abstract_2019-10-02.PDF	35621 f97fc4ae93a788fc7a8aaaf7019f28b62089a9aa3	no	1
Warnings:					
Information:					
4	Drawings-only black and white line drawings	P46958US13_DRAWINGS_2019-10-02.PDF	4774970 1ccc8020d9843b9283bbec11ddea617ee4ecfd62	no	130
Warnings:					
Information:					
5	Application Data Sheet	P46958US13_ADS_2019-10-02.PDF	1293813 4631b49a8b38d6558bcdcaf2a5686c86cd945f7e	no	8
Warnings:					
Information:					
6	Oath or Declaration filed	P46958US11_US13_Declaration.PDF	813566 0e8260f579da4a99f7978e0bf836a553fa496c58	no	1
Warnings:					
Information:					

7	Power of Attorney	P46958US13_POA_executed_2019-10-02.PDF	710667 e5e3112a1fed82ca5378e3f2b27d4b2239fb46c2	no	2
Warnings:					
Information:					
8	Auth or Resc of Auth to Access Appl by DAS/PDX Office	P46958US13_DASPDX_2019_10_02.PDF	135984 26b956789d8e250c82841826afe852bbc8c1d448	no	2
Warnings:					
Information:					
9	Auth or Resc of Auth to Access Search Results	P46958US13_EPOaccess_2019-10-02.PDF	160888 2239f0bf05bca1245d6e0a620897b536a49d6e34	no	2
Warnings:					
Information:					
10	Internet Communications Authorized	P46958US13_Internet_2019-10-02.PDF	79987 4fdcf58f0998064985cdbf5512151a855211245e	no	2
Warnings:					
Information:					
11	Fee Worksheet (SB06)	fee-info.pdf	36850 a8f2bef8eba9d3f9e84e0588f7c266b59dc00133	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	8335847		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

TITLE: SURFACE CLEANING APPARATUS

INVENTOR: WAYNE CONRAD

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application is a divisional of co-pending United States Patent Application No. 16/156,006 filed on October 10, 2018 and which is now allowed, which is a continuation of co-pending United States Patent Application No. 15/088,876 filed on April 1, 2016, now issued as United States Patent No. 10,219,662, which is a continuation of United States Patent Application No. 14/822,211, filed August 10, 2015, now issued as United States Patent No. 9,888,817, which claimed priority from United States Provisional Patent Application No. 62/093,189, filed December 17, 2014, the entirety of which are hereby incorporated by reference.

FIELD

[0002] This disclosure relates to the field of surface cleaning apparatus. In some aspects, this disclosure relates to a type of stick vacuum cleaner wherein a hand vacuum cleaner is removably mounted to a drive handle and provides motive power to draw dirty air into the surface cleaning head.

INTRODUCTION

[0003] Various types of surface cleaning apparatus are known. These include upright vacuum cleaner, stick vacuum cleaners, hand vacuum cleaners and canister vacuum cleaners. Stick vacuum cleaners and hand vacuum cleaners are popular as they tend to be smaller and may be used to clean a small area or when a spill has to be cleaned up. Hand vacuum cleaners or handvacs are advantageous as they are lightweight and permit above floor cleaning and cleaning in hard to reach locations. However, they have a limited dirt collection capacity. Upright vacuum cleaners enable a user to clean a floor and may be have a pod that is removably attached for above

floor cleaning. In such cases, the pod comprises, e.g., a cyclone, a dirt collection chamber and the suction motor for the upright vacuum cleaner. However, such the pods tend to be bulky since they comprise the total dirt collection capacity for the upright vacuum cleaner.

SUMMARY

[0004] In accordance with one aspect of this disclosure, a stick vacuum cleaner is provided which has a removable hand vacuum cleaner and also a supplemental bin which may function as a main dirt collection bin when the hand vacuum cleaner forms part of the stick vacuum cleaners. An advantage of this design is that the supplemental bin may provide enhanced dirt collection capacity for the stick vacuum cleaner. The supplemental bin may be removable so as to reduce the size of the stick vacuum cleaner when a smaller sized stick vacuum cleaner is desired, e.g., for cleaning in small or confined spaces.

[0005] In accordance with this aspect, there is provided a multimode surface cleaning apparatus comprising:

(a) a surface cleaning head having a dirty air inlet;

(b) an upright section moveably mounted to the surface cleaning head, the upright section moveable between a plurality of reclined floor cleaning positions;

(c) a hand vacuum cleaner removably mounted to the upright section, the hand vacuum cleaner comprising a cyclone chamber, a dirt collection region, a suction motor and a clean air outlet; and,

(d) an auxiliary dirt collection assembly removably mounted to the upright section

wherein, in a first upright mode of operation, the auxiliary dirt collection assembly is removed from the upright section and the hand vacuum cleaner is in airflow communication with the dirty air inlet and, in a second upright mode of operation,

the multimode surface cleaning apparatus is operable with the auxiliary dirt collection assembly mounted to the upright section.

[0006] In some embodiments, the auxiliary dirt collection assembly may comprise a dirt collection chamber and when the auxiliary dirt collection assembly is mounted to the upright section, dirt separated in the cyclone chamber is collectable in the dirt collection chamber of the auxiliary dirt collection assembly.

[0007] In some embodiments, when the auxiliary dirt collection assembly may be mounted to the upright section, the dirt collection chamber of the auxiliary dirt collection assembly is selectively connectable in communication with the dirt collection region of the hand vacuum cleaner.

[0008] In some embodiments, in the second upright mode of operation, the dirt collection region of the hand vacuum cleaner may be positioned above the dirt collection chamber of the auxiliary dirt collection assembly.

[0009] In some embodiments, the cyclone chamber may have a dirt outlet and the dirt collection region comprises a dirt collection chamber of the hand vacuum cleaner.

[0010] In some embodiments, the dirt collection chamber may have a manually openenable dumping door and the dirt collection chamber of the auxiliary dirt collection assembly may be in communication with the dirt collection chamber of the hand vacuum cleaner when the dumping door is opened.

[0011] In some embodiments, when the auxiliary dirt collection assembly is mounted to the upright section, the dirt collection chamber of the auxiliary dirt collection assembly may be automatically connected in communication with a dirt outlet of the cyclone chamber.

[0012] In some embodiments, in the second upright mode of operation, the dirt collection region of the hand vacuum cleaner may be positioned above the dirt collection chamber of the auxiliary dirt collection assembly.

[0013] In some embodiments, the dirt collection region of the hand vacuum cleaner may be in communication with the dirt outlet of the cyclone chamber and the dirt collection region may have a dumping door that is automatically opened when the auxiliary dirt collection assembly is mounted to the upright section and the dirt collection chamber of the auxiliary dirt collection assembly is in communication with the dirt collection region of the hand vacuum cleaner when the dumping door is opened.

[0014] In some embodiments, the auxiliary dirt collection assembly may comprise a cyclone chamber and a dirt collection region.

[0015] In some embodiments, in the second upright mode of operation, the cyclone chamber of the auxiliary dirt collection assembly may be connected in series with the cyclone chamber of the hand vacuum cleaner.

[0016] In some embodiments, in the second upright mode of operation, the cyclone chamber of the auxiliary dirt collection assembly may be connected in parallel with the cyclone chamber of the hand vacuum cleaner.

[0017] In some embodiments, in the second upright mode of operation, the cyclone chamber of the hand vacuum cleaner may be bypassed and air exiting the cyclone chamber of the auxiliary dirt collection assembly passes through a pre-motor filter of the hand vacuum cleaner, the suction motor and exits via the clean air outlet of the hand vacuum cleaner.

[0018] In some embodiments, the auxiliary dirt collection assembly may further comprise a pre-motor filter.

[0019] In some embodiments, in the second upright mode of operation, the cyclone chamber of the auxiliary dirt collection assembly may be connected in parallel with the cyclone chamber of the hand vacuum cleaner.

[0020] In some embodiments, in the second upright mode of operation, the cyclone chamber of the hand vacuum cleaner and a pre-motor filter of the hand

vacuum cleaner may be bypassed and air exiting the cyclone chamber of the auxiliary dirt collection assembly may pass through the pre-motor filter of the auxiliary dirt collection assembly, the suction motor and exits via the clean air outlet of the hand vacuum cleaner.

[0021] In some embodiments, the auxiliary dirt collection assembly may further comprise an auxiliary dirt collection assembly suction motor.

[0022] In some embodiments, in the second upright mode of operation, at least a portion of air entering the dirty air inlet may bypass the hand vacuum cleaner and exit via an alternate clean air outlet.

[0023] In some embodiments, the alternate clean air outlet may be provided on the auxiliary dirt collection assembly.

[0024] In some embodiments, the hand vacuum cleaner may have a handle and, when the multimode surface cleaning apparatus is in the first and second upright modes of operation, the handle may be a drive handle of the multimode surface cleaning apparatus.

[0025] In some embodiments, the upright section may comprise an up flow duct and the auxiliary dirt collection assembly may be removably mounted to the up flow duct.

[0026] In some embodiments, the up flow duct may comprise a rigid extension cleaning wand and the rigid extension cleaning wand may be removable from one of the upright section and the surface cleaning head and, in a first above floor mode of operation, an above floor cleaning unit may comprise the hand vacuum cleaner and the rigid extension cleaning wand.

[0027] In some embodiments, the up flow duct may comprise a rigid tube, the hand vacuum cleaner may have a handle and, the hand vacuum cleaner may have an air inlet that is drivingly engageable with the rigid tube whereby, when the multimode surface cleaning apparatus is in the first and second upright modes of

operation, the handle may be a drive handle of the multimode surface cleaning apparatus.

[0028] In some embodiments, the auxiliary dirt collection assembly may have a longitudinal axis that is generally parallel to the up flow duct.

[0029] In some embodiments, the auxiliary dirt collection assembly may comprise a cyclone chamber having a longitudinal axis that is generally parallel to the up flow duct.

[0030] In some embodiments, the hand vacuum cleaner may be provided on a rear portion of the upright section and the auxiliary dirt collection assembly may be provided on a front portion of the upright section.

[0031] In some embodiments, the upright section may comprise an up flow duct and the auxiliary dirt collection assembly may be removably mounted to a front side of the up flow duct and a portion of the hand vacuum cleaner may be positioned rearward of the up flow duct.

[0032] In some embodiments, the suction motor may be positioned rearward of the up flow duct.

[0033] In some embodiments, the upright section may comprise a lower portion and an upper portion and the upper section may be moveable forwardly relative to the lower section and the auxiliary dirt collection assembly may be removably mounted to the lower section.

[0034] In some embodiments, the upright section may comprise an up flow duct having a lower portion and an upper portion and the upper section may be moveable forwardly relative to the lower section and the auxiliary dirt collection assembly may be removably mounted to the lower section.

[0035] In some embodiments, the up flow duct may comprise a rigid tube, the hand vacuum cleaner may have a handle and, the hand vacuum cleaner may have an air inlet that is drivingly engageable with the rigid tube whereby, when the

multimode surface cleaning apparatus is in the first and second upright modes of operation, the handle may be a drive handle of the multimode surface cleaning apparatus.

DRAWINGS

[0036] FIG. 1 is a front perspective view of a surface cleaning apparatus in accordance with at least one embodiment;

[0037] FIG. 2 is a rear perspective view of the apparatus of FIG. 1;

[0038] FIG. 3 is a side elevation view of the apparatus of FIG. 1;

[0039] FIG. 4 is a front perspective view of the apparatus of FIG. 1 with a supplemental dirt collection chamber partially removed;

[0040] FIG. 5 is a front perspective view of a surface cleaning apparatus in accordance with another embodiment;

[0041] FIG. 6 is a rear perspective view of the apparatus of FIG. 5;

[0042] FIG. 7 is a side elevation view of the apparatus of FIG. 5 with an electrical cord bag;

[0043] FIG. 8 is a front elevation view of the apparatus of FIG. 5;

[0044] FIG. 9 is a rear elevation view of the apparatus of FIG. 5;

[0045] FIG. 10 is a top plan view of the apparatus of FIG. 5;

[0046] FIG. 11 is a bottom plan view of the apparatus of FIG. 5;

[0047] FIG. 12 is an exploded front perspective view of the apparatus of FIG. 5;

[0048] FIG. 12a is an exploded front perspective view of an alternate apparatus of FIG. 5;

[0049] FIG. 13 is a front perspective view of a surface cleaning apparatus in accordance with another embodiment;

[0050] FIG. 14 is a rear perspective view of the apparatus of FIG. 13;

[0051] FIG. 15 is a side elevation view of the apparatus of FIG. 13;

[0052] FIG. 16 is a front elevation view of the apparatus of FIG. 13;

[0053] FIG. 17 is a rear elevation view of the apparatus of FIG. 13;

[0054] FIG. 18 is a top plan view of the apparatus of FIG. 13;

[0055] FIG. 19 is a bottom plan view of the apparatus of FIG. 13;

[0056] FIG. 20 is a front perspective view of the apparatus of FIG. 13 with a supplemental cyclone bin assembly partially removed;

[0057] FIG. 21 is a cross-sectional view taken along line 21-21 in FIG. 1;

[0058] FIG. 22 is a bottom perspective view of a handvac of the apparatus of FIG. 1;

[0059] FIG. 23 is a perspective cross-sectional view of a cyclone bin assembly of the handvac of FIG. 22 transverse to the cyclone axis;

[0060] FIG. 23a is a top plan view of the cross-section of FIG. 23;

[0061] FIG. 24 is a front perspective view of the supplemental dirt collection chamber of the apparatus of FIG. 1;

[0062] FIG. 25 is a cross-sectional view taken along line 25-25 in FIG. 5;

[0063] FIG. 26 is a cross-sectional view taken along line 26-26 in FIG. 13;

[0064] FIG. 27 is a front perspective view of the apparatus of FIG. 1 in a lightweight upright mode;

[0065] FIG. 28 is a rear perspective view of the apparatus of FIG. 1 in the lightweight upright mode of FIG. 27;

[0066] FIG. 29 is a side elevation view of the apparatus of FIG. 1 in the lightweight upright mode of FIG. 27;

[0067] FIG. 30 is a cross-sectional view taken along line 30-30 in FIG. 27;

[0068] FIG. 31 is a front perspective view of the apparatus of FIG. 1 in an above-floor cleaning mode;

[0069] FIG. 32 is a rear perspective view of the apparatus of FIG. 1 in the above-floor cleaning mode of FIG. 31;

[0070] FIG. 33 is a side elevation view of the apparatus of FIG. 1 in the above-floor cleaning mode of FIG. 31;

[0071] FIG. 34 is a front perspective view of the apparatus of FIG. 1 in a stair-cleaning mode;

[0072] FIG. 35 is a rear perspective view of the apparatus of FIG. 1 in the stair-cleaning mode of FIG. 34;

[0073] FIG. 36 is a side elevation view of the apparatus of FIG. 1 in in the stair cleaning mode of FIG. 34;

[0074] FIG. 36a is a front perspective view of the apparatus of FIG. 5 in an above-floor cleaning mode;

[0075] FIG. 37 is a front perspective view of the apparatus of FIG. 13 in a lightweight upright mode;

[0076] FIG. 38 is a rear perspective view of the apparatus of FIG. 13 in the lightweight upright mode of FIG. 37;

[0077] FIG. 39 is a front elevation view of the apparatus of FIG. 13 in the lightweight upright mode of FIG. 37;

[0078] FIG. 40 is a rear elevation view of the apparatus of FIG. 13 in the lightweight upright mode of FIG. 37;

[0079] FIG. 41 is a side elevation view of the apparatus of FIG. 13 in the lightweight upright mode of FIG. 37;

[0080] FIG. 42 is a top plan view of the apparatus of FIG. 13 in the lightweight upright mode of FIG. 37;

[0081] FIG. 43 is a bottom plan view of the apparatus of FIG. 13 in the lightweight upright mode of FIG. 37;

[0082] FIG. 44 is a cross-sectional view taken along line 44-44 in FIG. 37;

[0083] FIG. 44a is a perspective view of the apparatus of FIG. 13 in an above-floor cleaning mode;

[0084] FIG. 44b is another perspective view of the apparatus of FIG. 13 in the above-floor cleaning mode of FIG. 44a;

[0085] FIG. 45 is a rear perspective view of the supplemental dirt collection chamber of FIG. 24;

[0086] FIG. 46 is a side elevation view of the supplemental dirt collection chamber of FIG. 24;

[0087] FIG. 47 is a front perspective view of a surface cleaning apparatus in accordance with another embodiment;

[0088] FIG. 48 is a cross-sectional view taken along line 48-48 in FIG. 47;

[0089] FIG. 49 is a cross-section view taken along line 49-49 in FIG. 47;

[0090] FIG. 50 is a side elevation view of the apparatus of FIG. 47;

[0091] FIG. 51 is a front elevation view of the apparatus of FIG. 47;

[0092] FIG. 52 is a front perspective view of an upright section of the apparatus of FIG. 13 including a diversion valve in a closed position;

[0093] FIG. 53 is a front perspective view of the upright section of FIG. 52 with a cyclone bin assembly seated on a pedal of the diversion valve;

[0094] FIG. 54 is a front perspective view of the upright section of FIG. 52 with the cyclone bin assembly connected to a wand, and the diversion valve in the open position;

[0095] FIG. 55 is a cross-sectional view taken along line 55-55 in FIG. 52;

[0096] FIG. 56 is a cross-sectional view taken along line 56-56 in FIG. 53;

[0097] FIG. 57 is a cross-sectional view taken along line 57-57 in FIG. 54;

[0098] FIG. 58 is a front perspective view of an upright section of the apparatus of FIG. 13 including another diversion valve in a closed position

[0099] FIG. 59 is a front perspective view of the upright section of FIG. 58 with the cyclone bin assembly being connected to a wand, and the diversion valve in the closed position;

[00100] FIG. 60 is a front perspective view of the upright section of FIG. 58 with the cyclone bin assembly connected to the wand, and the diversion valve in the open position

[00101] FIG. 61 is a cross-sectional view taken along line 61-61 in FIG. 58;

[00102] FIG. 62 is a cross-sectional view taken along line 62-62 in FIG. 59;

[00103] FIG. 63 is a cross-sectional view taken along line 63-63 in FIG. 60;

[00104] FIG. 64 is a front perspective view of an upright section of the apparatus of FIG. 13 including another diversion valve in a closed position;

[00105] FIG. 65 is a front perspective view of the upright section of FIG. 64 with the diversion valve in a partially opened position;

[00106] FIG. 66 is a front perspective view of the upright section of FIG. 64 mounted to the wand with the diversion valve in an open position;

[00107] FIG. 67 is a cross-sectional view of the upright section of FIG. 64;

[00108] FIG. 68 is another cross-sectional view of the upright section of FIG. 64;

[00109] FIG. 69 is an enlarged view of a portion of FIG. 68;

[00110] FIG. 70 is a cross-sectional view taken along line 70-70 in FIG. 65;

[00111] FIG. 71 is a cross-sectional view taken along line 71-71 in FIG. 66;

[00112] FIG. 72 is a front perspective view of an upright section of the apparatus of FIG. 13 with another diversion valve in a closed position;

[00113] FIG. 73 is a front perspective view of the upright section of FIG. 72 being connected to the wand and with the diversion valve in a closed position;

[00114] FIG. 74 is a front perspective view of the upright section of FIG. 72 connected to the wand and with the diversion valve in an open position;

[00115] FIG. 75 is a cross-section view taken along line 75-75 in FIG. 72;

[00116] FIG. 76 is a cross-section view taken along line 76-76 in FIG. 73;

[00117] FIG. 77 is a cross-section view taken along line 77-77 in FIG. 74;

[00118] FIG. 78 is a side elevation view of the handvac of the apparatus of FIG. 1;

[00119] FIG. 79 is a side elevation view of the handvac of the apparatus of FIG. 5;

[00120] FIG. 80 is a side elevation view of the apparatus of FIG. 5 in an upright storage position with a surface cleaning head having rearwardly deployed wheels;

[00121] FIG. 81 is a side elevation view of the apparatus of FIG. 80 in a reclined in-use position with the rear wheels of the surface cleaning head retracted;

[00122] FIG. 82 is a front perspective view of the apparatus of FIG. 13 with a cyclone bin assembly in accordance with at least one embodiment;

[00123] FIG. 83 is a rear perspective view of the cyclone bin assembly of FIG. 82 in a closed position;

[00124] FIG. 84 is a side elevation view of the cyclone bin assembly of FIG. 82 in a closed position;

[00125] FIG. 85 is a front elevation view of the cyclone bin assembly of FIG. 82 in a closed position;

[00126] FIG. 86 is a front elevation view of the cyclone bin assembly of FIG. 82 with a cyclone chamber portion in an open position;

[00127] FIG. 87 is a front elevation view of the cyclone bin assembly of FIG. 82 with the cyclone chamber portion and a dirt collection portion in open positions;

[00128] FIG. 88 is a top perspective view of the cyclone bin assembly of FIG. 82 with the cyclone chamber portion and the dirt collection portion in open positions;

[00129] FIG. 89 is a front perspective view of the cyclone bin assembly of the apparatus of FIG. 13;

[00130] FIG. 90 is a rear perspective view of the cyclone bin assembly of FIG. 89;

[00131] FIG. 91 is a front elevation view of the cyclone bin assembly of FIG. 89;

[00132] FIG. 92 is a rear elevation view of the cyclone bin assembly of FIG. 89;

[00133] FIG. 93 is a side elevation view of the cyclone bin assembly of FIG. 89;

[00134] FIG. 94 is a top plan view of the cyclone bin assembly of FIG. 89;

[00135] FIG. 95 is a bottom plan view of the cyclone bin assembly of FIG. 89;

[00136] FIG. 95b is a front perspective view of the cyclone bin assembly of FIG. 89 with a bottom portion in an open position;

[00137] FIG. 95c is a front perspective view of the cyclone bin assembly of FIG. 89 with top and bottom portions in open positions;

[00138] FIG. 96 is a cross-sectional view taken along line 96-96 in FIG. 22;

[00139] FIG. 97a is a bottom perspective view of the handvac of the apparatus of FIG. 1;

[00140] FIG. 97b is a partial cross-sectional view taken along line 97b-97b of FIG. 97a;

[00141] FIG. 98a is a bottom perspective view of the handvac of the apparatus of FIG. 1 with an open door;

[00142] FIG. 98b a partial cross-sectional view taken along line 98b-98b of FIG. 98a;

[00143] FIG. 99 is a partial cross-sectional view of a surface cleaning apparatus having a handvac disconnected from the upright section, and a bypass valve in a first closed position;

[00144] FIG. 100 is a cross-sectional view of the surface cleaning apparatus of FIG. 99 having a handvac connected to the upright section and the bypass valve in the first closed position;

[00145] FIG. 101 is a cross-sectional view of the surface cleaning apparatus of FIG. 99 having the handvac connected to the upright section and a supplementary cyclone bin assembly, and the bypass valve in a second open position;

[00146] FIG. 102 is a cross-sectional view of a surface cleaning apparatus having a having a bypass airflow path and a pre-motor filter in a supplemental cyclone bin assembly;

[00147] FIG. 103 is a cross-sectional view of a surface cleaning apparatus having a clean air suction motor in a surface cleaning head;

[00148] FIG. 104a is a cross-sectional view of a surface cleaning apparatus having a having a clean air suction motor in a supplemental cyclone bin assembly;

[00149] FIG. 104b is a cross-sectional view of another surface cleaning apparatus having a clean air suction motor in a supplemental cyclone bin assembly;

[00150] FIG. 105a is a perspective view of a surface cleaning apparatus having a supplemental cyclone bin assembly disconnected from an upright section;

[00151] FIG. 105b is a perspective view of a surface cleaning apparatus having a cyclone chamber and dirt collection chamber disconnected from an upright section;

[00152] FIG. 106 is a side elevation view a surface cleaning apparatus in accordance with another embodiment;

[00153] FIG. 107 is a partial side elevation view of the apparatus of FIG. 106 with a handvac disconnected from an upright section;

[00154] FIG. 108 is a side elevation view of the apparatus of FIG. 106 in a reclined in-use position with an arm assembly in a first position;

[00155] FIG. 109 is a side elevation view of the apparatus of FIG. 106 in a steeply reclined in-use position with the arm assembly in a second position;

[00156] FIG. 110a is a rear perspective view of the handvac of the apparatus of FIG. 1 in an open position;

[00157] FIG. 110b is a front perspective view of the handvac of FIG. 110a in the open position;

[00158] FIG. 111 is a front perspective view of the dirt collection chamber of the apparatus of FIG. 1 in an open position;

[00159] FIG. 112 is a rear perspective view of the dirt collection chamber of FIG. 111 in the open position;

[00160] FIG. 113 is a side elevation view of the dirt collection chamber of FIG. 111 in the open position;

[00161] FIG. 114 is a front perspective view of the upright section of the apparatus of FIG. 5 with a cyclone bin assembly in a closed position;

[00162] FIG. 115 is a front perspective view of the upright section of FIG. 114 with the cyclone bin assembly in an open position;

[00163] FIG. 116 is a cross-sectional view of the handvac of the apparatus of FIG. 1 having a pre-motor filter chamber in an open position;

[00164] FIG. 117 is a exploded view of the handvac of FIG. 116;

[00165] FIG. 118 is a cross-sectional view of a surface cleaning apparatus having a plurality of cyclone chambers in parallel;

[00166] FIG. 119a is a cross-sectional view of a surface cleaning apparatus having a dirty air suction motor in a surface cleaning head in series with a clean air suction motor in a handvac;

[00167] FIG. 119b is a cross-sectional view of the surface cleaning apparatus of FIG. 119a with a supplemental cyclone bin assembly removed;

[00168] FIG. 120 is a cross-sectional view of a surface cleaning apparatus having a clean air suction motor in a surface cleaning head in series with a clean air suction motor in a handvac;

[00169] FIG. 121a is a cross-sectional view of a surface cleaning apparatus having a clean air suction motor in a supplemental cyclone bin assembly in series with a clean air suction motor in a handvac;

[00170] FIG. 121b is a cross-sectional view of the surface cleaning apparatus of FIG. 121a with a hose connecting the handvac suction motor and the suction motor of the supplemental cyclone bin assembly;

[00171] FIG. 122 is a cross-sectional view of a surface cleaning apparatus having an airflow which bypasses the handvac;

[00172] FIG. 123 is a perspective view of a surface cleaning apparatus in accordance with another embodiment;

[00173] FIG. 124 is an exploded perspective view of the surface cleaning apparatus of FIG. 123;

[00174] FIG. 125 is a cross-sectional view taken along line 125-125 in FIG. 123;

[00175] FIG. 126 is enlarged partial view of FIG. 125; and

[00176] FIG. 127 is an enlarged partial view of FIG. 126.

DESCRIPTION OF VARIOUS EMBODIMENTS

[00177] Numerous embodiments are described in this application, and are presented for illustrative purposes only. The described embodiments are not intended to be limiting in any sense. The invention is widely applicable to numerous embodiments, as is readily apparent from the disclosure herein. Those skilled in the art will recognize that the present invention may be practiced with modification and alteration without departing from the teachings disclosed herein. Although particular features of the present invention may be described with reference to one or more particular embodiments or figures, it should be understood that such features are not limited to usage in the one or more particular embodiments or figures with reference to which they are described.

[00178] The terms "an embodiment," "embodiment," "embodiments," "the embodiment," "the embodiments," "one or more embodiments," "some embodiments," and "one embodiment" mean "one or more (but not all) embodiments of the present invention(s)," unless expressly specified otherwise.

[00179] The terms "including," "comprising" and variations thereof mean "including but not limited to," unless expressly specified otherwise. A listing of items does not imply that any or all of the items are mutually exclusive, unless expressly specified otherwise. The terms "a," "an" and "the" mean "one or more," unless expressly specified otherwise.

[00180] As used herein and in the claims, two or more parts are said to be “coupled”, “connected”, “attached”, or “fastened” where the parts are joined or operate together either directly or indirectly (i.e., through one or more intermediate parts), so long as a link occurs. As used herein and in the claims, two or more parts are said to be “directly coupled”, “directly connected”, “directly attached”, or “directly fastened” where the parts are connected directly in physical contact with each other.

As used herein, two or more parts are said to be “rigidly coupled”, “rigidly connected”, “rigidly attached”, or “rigidly fastened” where the parts are coupled so as to move as one while maintaining a constant orientation relative to each other. None of the terms “coupled”, “connected”, “attached”, and “fastened” distinguish the manner in which two or more parts are joined together.

General Overview

[00181] Referring to FIGS. 1-3, a surface cleaning apparatus 100 is shown in accordance with a first embodiment. In the embodiment shown, the surface cleaning apparatus 100 is a type of upright vacuum cleaner which is referred to as a stick vacuum cleaner. As illustrated, surface cleaning apparatus 100 includes a surface cleaning head 104, an upright section 108, and a hand-carriable vacuum cleaner 112 (also referred to as handvac or hand vacuum cleaner 112).

[00182] Upright section 108 may be movably and drivingly connected to surface cleaning head 104. For example, upright section 108 may be permanently or removably connected to surface cleaning head 104 and moveably mounted thereto for movement from a storage position to an in use position, such as by a pivotable joint 116. Joint 116 may permit upright section 108 to pivot (i.e. rotate) with respect to surface cleaning head 104 about a horizontal axis. Accordingly, upright section 108 may be rotatable rearwardly so as to be positionable in a plurality of reclined floor cleaning positions (see for example Figures 81 and 108).

[00183] Upright section 108 may also be steeringly connected to surface cleaning head 104 for maneuvering surface cleaning head 104. For example, joint 116 may be a swivel joint.

[00184] Handvac 112 may be removably connected to upright section 108. When mounted to upright section 108, a user may grasp handvac 112 to manipulate upright section 108 to steer surface cleaning head 104 across a surface to be cleaned. Accordingly, when handvac 112 is mounted to upright section 108, handle 484 is the drive handle of surface cleaning apparatus 100

[00185] Surface cleaning apparatus 100 has at least one dirty air inlet, one clean air outlet, and an airflow path extending between the inlet and the outlet. In the illustrated example, lower end 120 of surface cleaning head 104 includes a dirty air inlet 124, and a rear end 128 of handvac 112 includes a clean air outlet 132. An airflow path extends from dirty air inlet 124 through surface cleaning head 104, upright section 108, and handvac 112 to clean air outlet 132.

[00186] As exemplified, at least one suction motor, and preferably the only suction motor, and one air treatment member, which may be the only air treatment member, is provided in the handvac 112 to permit handvac 112 to operate independently when disconnected from surface cleaning head 104 and optionally from upright section 108. It will be appreciated that while at least one suction motor and at least one air treatment member are positioned in the airflow path to separate dirt and other debris from the airflow, that when used with other aspects disclosed herein, each of the suction motor and the air treatment member may be provided in the surface cleaning head 104, the upright section 108, and/or the handvac 112.

[00187] The air treatment member may be any suitable air treatment member, including, for example, one or more cyclones, filters, and bags. Preferably, at least one air treatment member is provided upstream of the suction motor to clean the dirty air before the air passes through the suction motor. In the illustrated embodiment, handvac 112 includes a cyclone bin assembly 136 including a cyclone chamber and a dirt collection region. In some embodiments, the dirt collection region may be a portion (e.g., a lower portion) of the cyclone chamber. In other embodiments, the dirt collection region may be a dirt collection chamber that is separated from the cyclone chamber by a dirt outlet of the cyclone chamber. Plurality of Dirt Collection Chambers

[00188] In accordance with one aspect of this disclosure, which may be used by itself or in combination with any one or more other aspects of this disclosure, a stick surface cleaning apparatus may have more than one dirt collection chamber. For example, the handvac may include a first dirt collection chamber, and the upright

section may include a second dirt collection chamber. The second dirt collection chamber provides the surface cleaning apparatus with an enlarged dirt collection capacity in comparison with the dirt collection capacity of the handvac alone. Accordingly, the surface cleaning apparatus may operate for longer intervals before one or more of the dirt collection chambers needs to be emptied.

[00189] In accordance with this aspect, and as exemplified in FIG. 4, upright section 108 may have an auxiliary dirt collection assembly 140, which may comprise or consist of an auxiliary dirt collection chamber 141. For example, the auxiliary dirt collection chamber 140 may be the only component provided in the auxiliary dirt collection assembly and therefore the auxiliary dirt collection chamber 140 may be the auxiliary dirt collection assembly. Alternately, as disclosed in alternate embodiments, the auxiliary dirt collection assembly may also include one or more of a pre-motor filter, one or more cyclone chambers that may have one or more associated dirt collection chambers and a suction motor.

[00190] As illustrated, up flow duct 144 (also referred to as a wand if removable for use, e.g., in an above floor cleaning mode as exemplified in Figures 33 and 44a) may define the airflow path between surface cleaning head 104 and handvac 112. Auxiliary dirt collection chamber 140 may be a supplemental dirt collection chamber that is selectively mounted to up flow duct 144 and augments the dirt collection capacity of surface cleaning apparatus 100 when mounted to upper section 108.

[00191] It will be appreciated that if up flow duct 144 is the member that supports handvac 112 when auxiliary dirt collection assembly 140 is removed, the up flow duct is designed to be load supporting and may be a rigid tube. Further if the up flow duct is removable to function as an above floor cleaning wand, then the up flow duct may also be a rigid tube. In other embodiments, e.g., the up flow duct is not a load supporting member, then all or a portion of up flow duct 144 may be flexible, such as a flexible hose.

[00192] As exemplified in FIGS. 1 and 21, the dirt collection assembly 140 of the upright section 108 may collect at least a portion of the dirt separated from the dirty airflow by the handvac 112. Accordingly, the dirt collection assembly 140 of the upright section 108 may be in communication with the dirt collection chamber of handvac 112 all or a portion of the time when the handvac 112 is mounted to the upright section 108. For example, the dirt collection chamber of handvac 112 may have a door that automatically opens when handvac 112 is mounted to the upright section 108. Accordingly, dirt separated by handvac 112 may travel to the supplemental dirt collection assembly 140. Alternately, the door may be manually operable by a user. Accordingly, dirt may only be transferred to the supplemental dirt collection assembly 140 when a user elects to open the door. Alternately, the supplemental dirt collection assembly 140 may receive dirt from an auxiliary air treatment member, in which case the auxiliary dirt collection assembly may comprise a housing having both the auxiliary air treatment member and the auxiliary dirt collection chamber.

[00193] The dirt collection chamber of auxiliary dirt collection assembly 140 and handvac dirt collection chamber 188 may be of any suitable volumetric sizes. Preferably, the volumetric storage capacity of the dirt collection chamber of auxiliary dirt collection assembly 140 is at least equal to the volumetric storage capacity of handvac dirt collection chamber 188, and more preferably larger than the volumetric storage capacity of handvac dirt collection chamber 188. For example, the volumetric storage capacity of the dirt collection chamber of auxiliary dirt collection assembly 140 may be 1-20 times the volumetric storage capacity of handvac dirt collection chamber 188, more preferably 1.5-10 times, and most preferably 3-5 times. In alternative embodiments, the volumetric storage capacity of the dirt collection chamber of auxiliary dirt collection assembly 140 may be less than that of handvac dirt collection chamber 188.

[00194] As exemplified in FIG. 21, handvac 112 may include a cyclone bin assembly 136 including one or more cyclone chambers 184 and one or more dirt

collection chambers 188. The cyclone chamber or chambers and the dirt collection chamber or chambers may be of any design. As exemplified, cyclone chamber 184 includes an air inlet 192 in fluid communication with wand 144, an air outlet 196 downstream of air inlet 192, and a dirt outlet 200 in fluid communication with dirt collection chamber 188. Suction motor 204 or another suction source may draw dirty air to enter air inlet 192 and travel cyclonically across cyclone chamber 184 to dirt outlet 200 where dirt is ejected into dirt collection chamber 188. Afterwards, the air is discharged from cyclone chamber 184 at air outlet 196.

[00195] As exemplified in FIGS. 21-23, cyclone bin assembly 136 may include laterally opposed side walls 208, a top wall 212, a bottom wall 216, a first end wall 220, and a second end wall 224. As shown, a common interior wall 226 may divide cyclone chamber 184 from dirt collection chamber 188. For example, cyclone chamber 184 may be defined by top wall 212 and interior wall 226 which extend between end walls 220 and 224. Top wall 212 and interior wall 226 may be curved to define a substantially cylindrical or frustroconical sidewall of cyclone chamber 184. In alternative embodiments, cyclone chamber 184 may have a sidewall of any other suitable shape that is conducive to cyclonic flow. In some alternative embodiments, interior wall 226 of cyclone chamber 184 may be discrete from dirt collection chamber 188 instead of forming a common wall dividing cyclone chamber 184 from dirt collection chamber 188.

[00196] Dirt collection chamber 188 may be defined by bottom wall 216, side walls 208, and interior wall 226. In some embodiments, bottom wall 216 may be openable for fluidly connecting handvac dirt collection chamber 188 to supplemental dirt collection assembly 140 of upright section 108. This may permit dirt separated by cyclone chamber 184 and discharged through dirt outlet 200 to move through opened bottom wall 216 and collect in supplemental dirt collection assembly 140.

[00197] Optionally, when the auxiliary dirt collection assembly is mounted to upright section 108, dirt separated in the cyclone chamber is collectable in the dirt

collection chamber of the auxiliary dirt collection assembly. The auxiliary dirt collection assembly may be selectively connectable in communication with the dirt collection region of the hand vacuum cleaner by, e.g., an openable door 228 (also referred to as a dumping door). The door may be manually openable, such as by a handle, or automatically operated, such as when the auxiliary dirt collection assembly is mounted to upright section 108. In this case, dirt will collect in the handvac 112 and will remain there until door 228 is openable so as to allow the collected dirt to transfer to supplemental dirt collection assembly 140. In the latter case, supplemental dirt collection assembly 140 is automatically connected in communication with a dirt outlet of the cyclone chamber when the auxiliary dirt collection assembly is mounted to upright section 108. In this case, dirt will collect in the supplemental dirt collection assembly 140 when handvac 112 is mounted to the upright section 108.

[00198] In the illustrated example, bottom wall 216 includes a door 228, which may be a pivotally openable door 228. As shown, door 228 may be pivotally connected to dirt collection chamber 188 by a hinge 232 for rotation about a hinge axis 236. Door 228 may extend forwardly from a rear end 240 to a front end 244. Preferably, hinge 232 and hinge axis 236 are positioned at rear end 240 of door 228. In alternative embodiments, hinge 232 and hinge axis 236 may be positioned at front end 244 or intermediate front and rear ends 240 and 244.

[00199] Door 228 is preferably outwardly pivotal of dirt collection chamber 188. For example, door 228 may be movable between a closed position (FIG. 22) in which door 228 closes bottom wall 216, and an open position (FIG. 21) in which door 228 is rotated away from dirt collection chamber 188 for opening bottom wall 216 to permit dirt to move from handvac dirt collection chamber 188 to supplemental dirt collection assembly 140. As shown, in the open position front end 244 of door 228 may be moved away from handvac dirt collection chamber 188.

[00200] Hinge axis 236 may have any suitable orientation. In the illustrated example, hinge axis 236 extends laterally side-to-side of surface cleaning apparatus

100. Hinge axis 236 may be transverse to one or more of cyclone axis 248 of cyclone chamber 184, motor axis 252 of suction motor 204, or downstream direction 256 through air inlet 192. In the example shown, hinge axis 236 is perpendicular to cyclone axis 248, motor axis 252, and downstream direction 256. In alternative embodiments, hinge axis 236 may be substantially parallel to one or more of cyclone axis 248, motor axis 252, or downstream direction 256.

[00201] In some embodiments, door 228 may extend upwardly and forwardly between rear end 240 and front end 244. For example, front end 244 may be positioned closer to cyclone chamber 184 and cyclone axis 248 than rear end 240. When door 228 is opened (FIG. 21), this may provide a bottom opening 260 having a transverse width 264 between cyclone chamber 184 and bottom wall 216.

[00202] Optionally, the dirt collection region (the dirt collection chamber) of the hand vacuum cleaner is positioned above the supplemental dirt collection assembly 140. Accordingly, dirt that is received in the dirt collection chamber of the hand vacuum cleaner may be transferred by due to gravity to the supplemental dirt collection assembly 140. Accordingly, for example, dirt outlet 200 may be positioned on a bottom end 268 of cyclone chamber 184 for discharging dirt toward bottom wall 216 and opening 260 to be delivered by gravity into supplemental dirt collection assembly 140 of upright section 108.

[00203] Reference is now made to FIGS. 21, 22, and 24. Preferably, when handvac 112 is connected to upright section 108, opening 260 is fluidly coupled to an inlet to dirt collection assembly 140. In the illustrated example, door 228 and opening 260 of cyclone bin assembly 136 align with an inlet 272 of dirt collection assembly 140. As shown, inlet 272 may be formed as an opening in an upper portion 276 of dirt collection assembly 140. In some embodiments, inlet 272 may include a door (not shown) which opens automatically and concurrently with door 228. Optionally, the door of inlet 272 may be biased (e.g. by a spring) to close inlet 272 and seal dirt

collection assembly 140 when door 228 is closed or handvac 112 is disconnected from upright section 108.

[00204] Preferably, opening 260 and inlet 272 of upper portion 276 of dirt collection assembly 140 are sized and positioned to receive at least a portion of door 228 when door 228 is in the open position. This may permit door 228 to open outwardly into the open position as shown in FIG. 21.

[00205] If door 228 is moveable from the closed position to the open position automatically upon connecting handvac 112 to upright section 108, then handvac 112 may include an actuator drivingly connected to door 228 to move door 228 (e.g., pivot door 228 about hinge axis 236) to the open position when handvac 112 is connected to upright section 108. In the illustrated embodiment, door 228 includes an arm 280 pivotally connected at hinge 232. As shown, arm 280 may include a lever portion 284 which extends rearwardly of hinge 232, and which may be depressed to pivot door 228 to the open position. Further, dirt collection assembly 140 is shown including an engaging member 288 positioned to align with lever portion 284 of arm 280. In use, engaging member 288 may depress lever portion 284 of arm 280 upon connecting handvac 112 to upright section 108 to automatically pivot door 228 into the open position, whereby opening 260 may be fluidly connected to inlet 272 of supplemental dirt collection assembly 140. In one aspect, this may permit a user, who has used handvac 112 when disconnected from upright section 108, to automatically empty handvac dirt collection chamber 188 by connecting handvac 112 to upright section 108. Afterwards, handvac 112 may be disconnected from upright section 108 with an empty dirt collection chamber 188.

[00206] If door 228 is manually moveable from the closed position to the open position then, as exemplified in FIGS. 97a-b and 98a-b, door 228 may be provided with an actuator, e.g., a manually operable lever portion 284. Lever portion 284 may extend downwardly from door 228 such that lever portion 284 is user-accessible and user-operable while handvac 112 is mounted to upright section 108. As exemplified,

lever portion 284 may protrude from the bottom wall 216 of cyclone bin assembly 136 to provide user-accessibility to lever portion 284.

[00207] As exemplified in FIGS. 21, 22, 24, 97a-b, and 98a-b, whether door 228 is manually or automatically operable, door 228 may be biased to the closed position. For example, door 228 may be biased for rotation about hinge axis 236 toward the closed position by a biasing member (not shown), such as a torsion spring. This may permit door 228 to close automatically upon disconnecting handvac 112 from upright section 108, to prevent dirt from spilling from dirt collection chamber 188 and to permit immediate use of handvac 112 for cleaning. In alternative embodiments, door 228 may not be biased toward the closed position. For example, door 228 may remain in the open position upon disconnecting handvac 112 from upright section 108. In such a case, door 228 may remain open until manually closed. For example, referring to FIGS. 98a-b, door 228 may remain in the open position shown until lever portion 284 of arm 280 is user-activated to move door 228 to the closed position.

Removable Supplemental Dirt Collection Assembly

[00208] In accordance with another aspect of this disclosure, which may be used by itself or in combination with any one or more other aspects of this disclosure, a surface cleaning apparatus has two or more dirt collection chambers wherein one of the dirt collection chambers is optionally removable, and the surface cleaning apparatus is operable when the removable dirt collection chamber has been removed. Accordingly, as discussed with respect to the previous embodiment, a supplemental dirt collection chamber may be provided on the up flow duct or wand of a stick vacuum cleaner and may be the main dirt collection chamber (e.g., it may collect most or all of the separated dirt when the stick vacuum cleaner is operated with the supplemental dirt collection chamber in position). This may be referred to as a large dirt capacity upright mode or a second upright mode of operation.

[00209] The supplemental dirt collection chamber may be removable for emptying and to reconfigure the vacuum to a light weight upright mode or a first

upright mode of operation. Once removed, the vacuum cleaner may be operable to separate dirt and collect the separated dirt in another dirt collection chamber (e.g. the handvac dirt collection chamber). An advantage of the light weight upright mode is that the size and weight of the vacuum cleaner may be reduced by removal of the supplemental dirt collection chamber. This may be of assistance when the vacuum cleaner is used to clean around and under furniture, and when the vacuum cleaner is to be carried upstairs.

[00210] As exemplified in FIGS. 1 and 4, dirt collection assembly 140 of upright section 108 may be removably connected to wand 144 and handvac 112. This may permit dirt collection assembly 140 to be removed for emptying, or to operate apparatus 100 in a light weight upright mode. It will be appreciated that, in alternate embodiments, wand 144 and dirt collection assembly 140 of upright section 108 may be integrally formed or permanently connected as a one piece assembly.

[00211] Dirt collection assembly 140 may be removably mounted to wand 144 in any suitable fashion. In the illustrated embodiment, a lower end 292 of dirt collection assembly 140 may be toed onto a lower end 296 of wand 144, and then dirt collection assembly 140 may be pivoted about lower end 292 toward wand 144 and held in position by a suitable releasable fastening mechanism.

[00212] In the illustrated embodiment, handvac 112 may remain in fluid communication with wand 144 and surface cleaning head 104 while supplemental dirt collection assembly 140 is disconnected from wand 144 and removed altogether from apparatus 100. This may permit dirt collection assembly 140 to be removed (e.g., for emptying or to operate apparatus 100 in a light weight upright mode) without disrupting the operation of apparatus 100.

Upstream Air Treatment Member

[00213] In accordance with another aspect of this disclosure, which may be used by itself or in combination with any one or more other aspects of this disclosure, an upstream air treatment member may be provided. The upstream air treatment

member may be removably connectable upstream of the handvac. For example, the supplemental dirt collection assembly may have one or more cyclone chambers associated therewith. Accordingly, when the supplemental dirt collection assembly is positioned on upright section 108 (e.g., up flow duct 144), a supplemental cyclone chamber assembly 160 may be connected in series or parallel with the cyclone chamber of the handvac. Accordingly, when operated as an upright vacuum, the surface cleaning apparatus may be a dual cyclonic stage surface cleaning apparatus. When used in an above floor cleaning mode, the handvac may be a single cyclonic stage surface cleaning apparatus. Typically, the surface cleaning apparatus may be used as an upright vacuum cleaner (i.e., with the supplemental cyclonic bin assembly attached) for cleaning floors. This may represent the majority of area that is to be cleaned. Therefore, for a majority of the use of the surface cleaning apparatus, it may be used as a dual stage cyclonic surface cleaning apparatus.

[00214] In accordance with this aspect, the upright section may include a first air treatment member for separating at least large dirt particles from the airflow, and the air treatment member of the handvac may be positioned downstream of the first air treatment member for separating small dirt particles ("fines") from the airflow. In this case, the greatest volume of separated dirt may be collected in the dirt collection chamber of the upright section, and a lesser volume of fines may be collected in the dirt collection chamber of the handvac. This may reduce the rate at which the handvac dirt collection chamber may be filled, and reduce the frequency at which the handvac dirt collection chamber must be emptied. It will be appreciated that each cyclonic stage may be of any design and may be designed to remove any type of dirt.

[00215] It will be appreciated that, in some embodiments, dirt separated by the handvac may be collected in the supplemental dirt collection assembly. In such a case, the dirt collection region of the handvac may be in communication (automatically or manually selectively) with a dirt collection region in the supplemental dirt collection assembly, which region may be isolated from the dirt

collection chamber for the cyclonic stage of the supplemental cyclone chamber assembly.

[00216] It will be appreciated that, if air travels through up flow duct 144 to handvac 112, when cyclone bin assembly 160 is connected to wand 144, air travelling through wand 144 may be diverted into cyclone bin assembly 160 and returned to wand 144 from cyclone bin assembly 160 downstream of the diversion. Optionally, in accordance with another aspect with is discussed in more detail subsequently, and which is exemplified in the embodiment of FIGS. 20 and 26, in some embodiments the diversion may occur automatically upon mounting of the supplemental cyclone bin assembly 160 to upright section 108. For example, cyclone bin assembly 160 may include a diversion member 428 which may be positionable in the conduit of wand 144 between the upstream and downstream ends 364 and 360 of wand 144. As shown, diversion member 428 may divide wand 144 into an upstream wand portion 440 and a downstream wand portion 444. Diversion member 428 may form an air-tight seal inside wand 144 for redirecting substantially all air travelling through upstream wand portion 440 into air inlet 316 of cyclone bin assembly 160. In turn, air outlet 320 of cyclone bin assembly 160 may discharge into downstream wand portion 444 for travel downstream to handvac 112.

[00217] As exemplified in the embodiment of FIGS. 5, 12, and 25 supplemental cyclone bin assembly 160, 160 may be any suitable cyclone bin assembly and may include a cyclone chamber 308 and a dirt collection chamber 141. Cyclone chamber 308 may include an air inlet 316 for receiving dirty air from the surface cleaning head, e.g., via wand 144, an air outlet 320 for discharging air, e.g., to handvac 112, a dirt outlet 324 for discharging separated dirt into dirt collection chamber 141, a vortex finder 400 and a cyclone axis 392. Wand 144 may include an upstream end 360 connected to surface cleaning head 104, and a downstream end 364 connected to air inlet 316 of cyclone chamber 308.

[00218] From cyclone bin assembly 160, the airflow may flow downstream to handvac 112. Accordingly, handvac cyclone bin assembly 136 is positioned downstream of and in series with supplemental cyclone bin assembly 160. The air may be received in handvac cyclone bin assembly 136 where additional particulate matter may be further separated from the airflow and deposited into dirt collection chamber 188. In many cases, the additional particulate matter separated by cyclone bin assembly 136 may constitute less than 30% of the total volume of dirt separated from apparatus 100, and may constitute all or a majority of the fines that are separated. Accordingly, dirt collection chamber 188 may be filled at a lower volumetric rate than supplemental dirt collection chamber 141. This may help to maintain dirt collection capacity in handvac 112.

[00219] In operation, air exiting air outlet 320 of cyclone bin assembly 160 may enter handvac 112 for a second stage of cleaning by cyclone bin assembly 136. As illustrated, handvac 112 may include a nozzle 412 having an upstream end 416 and a downstream end 420. When handvac 112 is connected to upright section 108, upstream end 416 may be fluidly connected with air outlet 320 of upright section 108, and downstream end 420 may be fluidly connected with inlet 192 of handvac cyclone chamber 184.

[00220] In operation, air may be drawn into dirty air inlet 124 and enter upstream wand portion 440. Diversion member 428 may redirect the air traveling through upstream wand portion 440 to enter air inlet 316 of cyclone chamber 308. Air may travel through air inlet 316 tangentially to sidewall 376 and spiral downwardly toward lower end wall 368, whereby dirt may be separated from the airflow and pass through dirt outlet 324 to accumulate in dirt collection chamber 141. The airflow may then travel downstream into vortex finder 400 and exit cyclone chamber 308 at air outlet 320 at downstream end 404 of vortex finder 400, into an outlet passage 476. Outlet passage 476 may have a downstream end fluidly connected to downstream wand portion 444. The air may travel through downstream wand portion 444 to downstream wand end 364 into handvac 112. In handvac 112, additional dirt may be

separated from the airflow by cyclone bin assembly 136 before the air is discharged through clean air outlet 132.

[00221] It will be appreciated that, in accordance with this aspect, cyclone bin assembly 160 may be any suitable cyclone bin assembly. In the example shown in FIGS. 5, 12, and 25, cyclone chamber 308 includes a lower end wall 368, an upper end wall 372, and a sidewall 376 extending between the lower end wall 368 and the upper end wall 372. Preferably, sidewall 376 is substantially cylindrical or frustroconical in accordance with conventional cyclone chamber design.

[00222] Dirt outlet 324 may be formed as an opening in sidewall 376 for directing separated dirt into dirt collection chamber 141. In some embodiments, at least a portion of sidewall 376 of cyclone chamber 308 may form a common dividing wall between cyclone chamber 308 and dirt collection chamber 141. In this case, dirt outlet 324 may be formed as an opening in the common portion of sidewall 376.

[00223] Dirt outlet 324 may be formed at any suitable position on sidewall 376. In the illustrated example, dirt outlet 324 is positioned at an upper end of cyclone chamber 308 proximate upper end wall 372. More particularly, the illustrated embodiment includes a dirt outlet 324 defined by a slot 380 in sidewall 376 bordered by upper end wall 372. This may increase the capacity of dirt collection chamber 141. More specifically, dirt may accumulate by gravity from the bottom of dirt collection chamber 141 upwardly. Thus, the capacity of the dirt collection chamber 141 may be defined at least in part by the position of dirt outlet 324. Dirt collection chamber 141 is full when the level of dirt in dirt collection chamber 141 rises to dirt outlet 324. Accordingly, the capacity of dirt collection chamber 141 is the volume of the dirt collection chamber 141 below dirt outlet 324. Thus, the capacity of dirt collection chamber 141 may be increased by positioning dirt outlet 324 in an uppermost position, such as proximate the upper end wall 372 of cyclone chamber 308 as shown.

[00224] Alternately, in some embodiments as exemplified in FIG 26, lower end wall 368 may comprise or be an arrester plate 1280 which separates cyclone chamber 308 from dirt collection chamber 141. In this case, dirt outlet 324 may be formed by a gap between arrester plate 1280 and sidewall 376, where dirt particles may fall by gravity into dirt collection chamber 141.

[00225] In accordance with another aspect which is discussed in more detail subsequently, as exemplified, cyclone chamber 308 may include an inlet passage 384 for redirecting axially-directed inlet air to flow tangentially to promote cyclonic action in cyclone chamber 308. An upstream end 388 of inlet passage 384 may face axially (i.e. substantially parallel to cyclone axis 392), and a downstream end (not shown) of inlet passage 384 may face tangentially to cyclone chamber 308. Air entering upstream end 388 of inlet passage 384 from air inlet 316 may travel along inlet passage 384 and exit downstream end (not shown) in a tangential direction. After spiraling upwardly around vortex finder 400 of cyclone chamber 308, the airflow may enter vortex finder 400 and exit cyclone chamber 308 through air outlet 320 at a downstream end 404 of vortex finder 400.

[00226] Handvac cyclone chamber 184 may be any suitable cyclone chamber. In some embodiments, cyclone chamber 184 is substantially similar to cyclone chamber 308. For example, cyclone chamber 184 may include an air inlet 192, an inlet passage 420, a dirt outlet 200, a vortex finder 424, a dirt outlet 200, an air outlet 196, and a cyclone axis 248. Air from upright section 108 may axially enter air inlet 192, be redirected to a tangential direction by inlet passage 420, spiral upwardly around vortex finder 424, deposit dirt into dirt outlet 200, and then exit cyclone chamber 184 through air outlet 196 at a downstream end of vortex finder 424.

Modes of Operation

[00227] In accordance with another aspect of this disclosure, which may be used by itself or in combination with any one or more other aspects of this disclosure, the surface cleaning apparatus is reconfigurable to operate in a plurality of different

modes of operation. For example, the surface cleaning apparatus may be operable in two or more of a handvac mode, a stair-cleaning mode, an above-floor cleaning mode, a large dirt capacity upright mode, a lightweight upright mode, or a dual motor upright mode. In some cases, the surface cleaning apparatus may be reconfigurable between different modes of operation with a single act of connection or disconnection. This may permit the surface cleaning apparatus to be quickly reconfigured with minimal interruption.

[00228] Referring to FIGS. 1, 5, and 13, surface cleaning apparatus 100, 152, and 168 are shown in a large dirt capacity upright cleaning mode. In the large dirt capacity upright cleaning mode, surface cleaning apparatus 100, 152, and 168 may include surface cleaning head 104, upright section 108 including wand 144 and supplemental dirt collection assembly 140, and handvac 112. The airflow path may extend from dirty air inlet 124 of surface cleaning head 104 downstream through wand 144 and then cyclone bin assembly 136 of handvac 112 to separate dirt from the airflow and deposit that dirt into dirt collection chamber 141 of upright section 108 and/or handvac dirt collection chamber 188. In apparatus 152 and 168, cyclone bin assembly 160 is also positioned in the airflow path for separating and collecting dirt from the airflow and cyclone bin assembly 136 of handvac 112 may optionally be bypassed as discussed subsequently.

[00229] As exemplified in FIGS. 12 and 12a one or more of the surface cleaning head 104, upright section 108, and handvac 112 may be removably connected to each other so as to be able to be assembled in a number of different combinations to provide apparatus 152 with a number of different modes of operation. In some embodiments, the wand 144 and supplemental assembly 140, 160 of upright section 108 may also be removably connected to each other to provide additional modes of operation. For example, in the large dirt capacity upright cleaning mode, surface cleaning head 104 may be connected to upstream end 360 of wand 144, downstream end 364 of wand 144 may be connected to an air inlet 316 of cyclone

bin assembly 160, and air outlet 320 of cyclone bin assembly 160 may connected to upstream end 416 of handvac nozzle 412.

[00230] The large dirt capacity upright cleaning mode as shown may be particularly effective for cleaning large surface areas (e.g. the floor of one or more rooms). The user may grasp handvac handle 484 to steer surface cleaning head 104 across the surface to be cleaned (i.e. handle 484 may be a drive handle of the surface cleaning apparatus). The tall height 492 of apparatus 100, 152, and 168 provided in part by the interposition of wand 144 between surface cleaning head 104 and handvac 112 may permit apparatus 100 to be operated by a user standing upright. The large dirt capacity of dirt collection chamber 141 of upright section 108 may permit extended usage of apparatus 100 before the dirt collection chamber 141 becomes full and must be emptied.

[00231] As exemplified in FIGS. 4, 5, 12, 12a, 20 and 27-30, and 37-44 dirt collection assembly 140 or cyclone bin assembly 160 may be selectively disconnected from upright section 108 to reconfigure apparatus 100, 152, or 168 from the large dirt capacity upright mode to a light weight upright mode. Likewise, dirt collection assembly 140 or cyclone bin assembly 160 may be selectively reconnected to upright section 108 to reconfigure apparatus 100, 152, or 168 from a light weight mode to a large dirt capacity upright mode.

[00232] Preferably, reconfiguring the apparatus from the large dirt capacity upright mode to the light weight upright mode may require only a single user action (e.g., disconnecting the dirt collection assembly 140 or cyclone bin assembly 160 from the upright section 108 may automatically close a dumping door of the handvac if the dumping door is open and may also automatically close a diversion member if the vacuum cleaner includes a supplemental cyclone bin assembly 160).

[00233] As exemplified in apparatus 100, door 228 which may have been open in the large dirt capacity upright mode for connecting dirt collection chambers 188 and 141, may close automatically (i.e. without any further user interaction) upon

disconnecting dirt collection chamber 141, to seal bottom wall 216 of dirt collection chamber 141. Exemplary mechanisms include a biasing member, such as a spring and a mechanical or electrical drive member drivingly connected to the door to close the door as supplemental assembly 140, 160 is removed.

[00234] As exemplified in apparatus 168, disconnecting cyclone bin assembly 160 from wand 144 may automatically reroute the airflow path to extend directly from upstream wand end 360 to downstream wand end 364 without the intermediary diversion to cyclone bin assembly 160. Therefore, the airflow path between surface cleaning head 104 and handvac 112 is automatically reconfigured by disconnection of cyclone bin assembly 160 to reconfigure apparatus 168 to the light weight upright mode. Accordingly apparatus 168 may be continually operated while being reconfigured.

[00235] In alternative embodiments, door 228 of apparatus 100 may be manually closed as another step before, during or after dirt collection assembly 140 is disconnected from upright section 108 to complete the reconfiguration to the light weight upright mode. For example, a user may manually close the door. In other embodiments, as described in more detail below, a diversion valve of apparatus 168 may require manual closure as another step after cyclone bin assembly 160 is disconnected from wand 144 to complete the reconfiguration to the light weight upright mode. Alternately, a single actuator may be manually operated to close the door and the diversion valve.

[00236] As exemplified in FIG. 4, apparatus 152 may be reconfigurable from the large dirt capacity upright mode to a light weight upright mode by disconnecting assembly 140, 160 from wand 144. In some cases, it may be desirable to momentarily reconfigure an apparatus to the lightweight upright mode to complete a task (e.g. clean under an article of furniture), and afterward reconfigure the apparatus to the large dirt capacity upright mode. In the illustrated example, the airflow path between surface cleaning head 104 and handvac 112 persists during and after

reconfiguration of apparatus 100 from the large dirt capacity upright mode to the lightweight upright mode. This may permit apparatus 100,to be operated continuously (i.e. air to continue to travel between inlet 124 and outlet 132) before, during, and after reconfiguration to the lightweight upright mode. In turn, this may allow for a quick reconfiguration with little or no disruption. It will be appreciated that if a cyclone is provided in the supplemental assembly (e.g., assembly 160), there may be a short period during which the diversion valve is not closed during the transition.

[00237] In some cases, reconfiguring apparatus 100, 152, or 168 from the large dirt capacity upright mode to the lightweight upright mode may provide a reduction in weight (i.e. by the removal of dirt collection assembly 140 or cyclone bin assembly 160), and a more slender profile. Thus, the lightweight upright mode may make apparatus 100, 152, or 168 easier to lift (e.g. carry upstairs), and easier to maneuver under and around furniture and the like. However, in this mode, all of the dirt separated by cyclone bin assembly 136 in the lightweight upright mode is collected in dirt collection chamber 188. Thus, apparatus 100, 152, or 168 may have less dirt collection capacity in the lightweight upright mode as compared with the large dirt capacity upright mode.

[00238] Referring now to FIGS. 31-33, 44a, and 44b, apparatus 100 and 168 are shown in an above-floor cleaning mode. As illustrated, apparatus 100 and 168 in the above-floor cleaning mode include handvac 112 and wand 144. Apparatus 100, 152, and 168 may be reconfigured from the lightweight upright mode to the above-floor cleaning mode by disconnecting surface cleaning head 104 from wand 144. It will be appreciated that assembly 140,160 may be retained in an above floor cleaning mode if desired. However, this would add extra weight to the apparatus in the above floor cleaning mode.

[00239] Referring to FIG. 36a, apparatus 152 is shown in another above-floor cleaning mode. As shown, apparatus 152 in an above-floor cleaning mode may

include handvac 112 and an accessory wand 145. Accessory wand 145 may be provided supplementary to wand 144 of upright section 108. For example, accessory wand 145 may be removably mountable to a sidewall of upright section 108, as shown in FIG. 5. Still referring to FIG. 36a, in the above-floor cleaning mode shown, upstream end 360 may provide the dirty air inlet, and downstream end 364 may be removably fluidly connected to handvac nozzle 412. Accessory wand 145 may have any suitable length 516. For example, wand 144 may have a length sufficient to permit apparatus 100 to be used as an upright vacuum cleaner in the configuration of Figure 5. Accordingly, wand 144 may be 2 – 4 feet long. In contrast, accessory wand 145 may be shorter than wand 144 (e.g., a user wants to be closer to the area to be cleaned in an above floor cleaning mode) and accordingly accessory wand 145 may be 6-18 inches.

[00240] In the above-floor cleaning mode, the upstream end 496 of wand 144 may provide the dirty air inlet of apparatus 100, 152, or 168. The above-floor cleaning mode may be well suited to cleaning surfaces above the floor, or more generally surfaces that are not substantially horizontal, and for cleaning in crevices which surface cleaning head 104 might be unable to access. The wand 144 may provide extended reach for distant cleaning surfaces (e.g. curtains, and ceilings). An auxiliary cleaning tool such as a crevice tool, brush or the like may be attached to the inlet end of the wand.

[00241] Preferably, apparatus 100, 152, or 168 may be reconfigured from the lightweight upright mode to the above-floor cleaning mode by a single user action – disconnection of surface cleaning head 104 from the upstream end 496 of wand 144. This may permit the apparatus to be quickly reconfigured with little or no disruption. For example, the apparatus may operate continuously before, during, and after reconfiguration from the lightweight upright mode to the above-floor cleaning mode. This may permit a user to conveniently reconfigure the apparatus to the above-floor cleaning mode to clean a surface inaccessible in the lightweight upright mode, and

afterward reconfigure the apparatus to the lightweight upright mode to continue cleaning, e.g. the floor.

[00242] In some embodiments, the above-floor cleaning mode may further include dirt collection assembly 140. For example, a user may reconfigure apparatus 100, 152, or 168 from the large dirt capacity upright mode (FIGS. 1, 5, and 13) to the above-floor cleaning mode by disconnecting surface cleaning head 104 from wand 144, while maintaining dirt collection assembly 140 in place on wand 144. An above-floor cleaning mode of this configuration may provide apparatus 100 with the reach of the above-floor cleaning mode, and the storage capacity of the large dirt capacity upright mode. In some embodiments, dirt collection assembly 140 may be a one piece assembly with the wand 144 (i.e. irremovably connected to wand 144), in which case the wand 144 may be an up flow duct.

[00243] Referring to FIG. 22, apparatus 100, 152, and 168 may be reconfigured to a handvac mode from any other mode of operation by disconnecting handvac 112 (e.g. from wand 144). As illustrated, the handvac mode may include handvac 112 alone. In the handvac mode, upstream end 416 of nozzle 412 may provide the dirty air inlet. Optionally, one or more accessories (not shown), such as a brush, crevice tool, auxiliary wand 145 may be connected to nozzle 412. If a wand 144 is part of dirt collection assembly 140 then an accessory wand 145 may be provided which is connectable to nozzle 412.

[00244] The handvac mode of apparatus 100 may be lighter, smaller, and more agile than the other modes of operation. However, the handvac mode may have a smaller dirt collection capacity than the large dirt capacity upright mode (FIGS. 1, 5, and 13) for example.

[00245] In some cases, a user may wish to momentarily disconnect handvac 112 for use in the handvac mode (e.g. to clean a surface that is more accessible in the handvac mode), and then return the apparatus to the previous mode. For example, apparatus 100, 152, or 168 may be momentarily reconfigured from the

large dirt capacity upright mode (FIGS. 1, 5, and 13) or from the lightweight upright mode (FIGS. 27 and 37) to the handvac mode be merely removing the handvac and afterward reconfigured again to the upright mode.

[00246] It may be beneficial for the dirt collection chamber 188 of handvac 112 to have capacity available for use in the handvac mode upon disconnecting handvac 112 from upright section 108. Further, it may be beneficial for dirt collection chamber 188 of handvac 112 to reclaim capacity after reconnecting handvac 112 to upright section 108. This may be achieved by having dirt collection chamber 188 empty into assembly 140, 160 continually while handvac 112 is attached to the assembly, manually before removal of the handvac or upon removal of the handvac. The dirt capacity may be reclaimed by having dirt collection chamber 188 empty into assembly 140, 160 upon replacing handvac 112 to the assembly (either manually or automatically upon replacement).

[00247] An example of such a reconfiguration is discussed with respect to the embodiment of FIG. 21, In the illustrated example, handvac dirt collection chamber 188 has a bottom wall 216 that remains open to dirt collection assembly 140 while the handvac is attached to permit dirt from handvac dirt collection chamber 188 to transfer (e.g., by gravity) to dirt collection chamber 141 thereby preventing dirt collection chamber 188 from being filled while the apparatus is used in one of the upright operating modes. .

[00248] Apparatus 100 may be reconfigured from the handvac mode to the large dirt capacity upright mode by reconnecting handvac 112 to upright section 108. Preferably, reconnecting handvac 112 to upright section 108 automatically opens handvac dirt collection chamber 188 to dirt collection chamber 141 for transferring at least a portion of the dirt, collected while in the handvac mode, to dirt collection chamber 141 thereby emptying dirt collection chamber 188 so that dirt collection chamber 188 is not full when the handvac is once again used in the handvac mode.

[00249] In some embodiments, handvac dirt collection chamber 188 does not empty into assembly 140, 160 when attached to the assembly, manually or automatically. For example, FIGS. 25 and 26 show exemplary embodiments of apparatus 152 and 168 where assemblies 160 and 188 receive and store dirt separately at all times. As shown, upright dirt collection chamber 141 may receive and collect dirt separated by auxiliary cyclone bin assembly 160, and handvac dirt collection chamber 188 may separately receive and collect dirt separated by handvac cyclone bin assembly 136.

[00250] Turning now to FIGS. 123-126, apparatus 152 is shown in accordance with another embodiment. As exemplified, handvac cyclone bin assembly 136 may include a plurality of cyclonic cleaning stages arranged in series. For example, and referring to FIGS. 125 and 126, cyclone bin assembly 136 may include a first cyclonic cleaning stage 640 arranged in series upstream from a second cyclonic cleaning stage 644. First cyclonic cleaning stage 640 may include one or more air outlet(s) 196a which discharge into air inlet(s) 192b of second cyclonic cleaning stage 644.

[00251] Referring now to FIG. 127, each cyclonic cleaning stage 640 and 644 may include one or more cyclone chambers 184 in parallel. For example, cyclonic cleaning stages 640 and 644 may each include one cyclone chamber 184, or may each include a plurality of cyclone chambers 184. Alternatively, one of cyclonic cleaning stages 640 and 644 may include one cyclone chamber 184 and the other stage may include a plurality of cyclone chambers 184. In the illustrated example, first cyclonic cleaning stage 640 includes one cyclone chamber 184a, and second cyclonic cleaning stage 644 includes a plurality of cyclone chambers 184b arranged in parallel. For example, second cyclonic cleaning stage 644 may include four or more cyclone chambers 184b arranged in parallel.

[00252] Second stage cyclone chamber(s) 184b may have any suitable orientation relative to first stage cyclone chamber(s) 184a. For example, each of second stage cyclone chamber(s) 184b may have an air inlet 192b and an air outlet

196b both positioned proximate a rear end 648 of the second cyclonic cleaning stage 644 (rearward with respect to the inlet of the handvac), or both positioned proximate a front end 652 of the second cyclonic cleaning stage 644. Alternatively, each of second stage cyclone chamber(s) 184b may have an air inlet 192 positioned proximate one of the front and rear ends 648 and 652, and an air outlet 196b positioned proximate the other of the front and rear ends 648 and 652. In the illustrated example, second stage cyclone chambers 184b are shown including air inlets 192b at front end 648 and air outlets at rear end 652. This may reduce directional changes in the airflow which may reduce backpressure developed through second stage cyclone chambers 184b for enhanced airflow efficiency. As shown, axes 248b of second stage cyclone chamber 184b may be parallel to axis 248a of first stage cyclone chamber 184a.

[00253] Handvac cyclone bin assembly 136 may include one or more dirt collection regions 188. For example, cyclone chambers 184 of first and second cyclonic cleaning stages 640 and 644 may separate dirt into one common dirt collection region 188, or each cyclonic cleaning stage 640 and 644 may include a separate dirt collection region 188. In the latter case, all first stage cyclone chamber(s) 184a may discharge dirt into the first stage dirt collection region 188a, and all second stage cyclone chamber(s) 184b may discharge dirt into the second stage dirt collection region 188b. In the illustrated embodiment, handvac cyclone bin assembly 136 includes one first stage dirt collection region 188a, and a plurality of second stage dirt collection regions 188b, where each second sage dirt collection region 188b receives dirt discharged by a respective second stage cyclone chamber 184b.

[00254] Reference is now made to FIGS. 34-36, which show apparatus 100, 152, or 168 in a stair-cleaning mode of operation. As shown, apparatus 100, 152, or 168 in stair-cleaning mode may include handvac 112 directly connected to surface cleaning head 104. For example, nozzle 412 may be connected to pivot joint 116 of surface cleaning head 104.

[00255] The stair-cleaning mode of operation may be especially suitable for cleaning stairs and the like, where frequent lifting is required to clean the desired surface areas.

Handvac Center of Gravity in the Upright Modes

[00256] In accordance with another aspect of this disclosure, which may be used by itself or in combination with any one or more other aspects of this disclosure, when the apparatus is in an upright mode and, in particular in a large dirt capacity upright mode, the center of gravity of the handvac may be located directly above the cyclone bin assembly (or dirt collection chamber) of the upright section.

[00257] As exemplified in FIGS. 21 and 25, apparatus 100 is shown in a large dirt capacity upright mode in a storage position. In the illustrated example, handvac 112 is shown including a handvac center of gravity 524. As shown, center of gravity 524 may be positioned vertically above dirt collection assembly 140/cyclone bin assembly 160 between the front and rear ends 532, 544 and 536, 548 of dirt collection assembly 140/cyclone bin assembly 160. Preferably, center of gravity 524 is positioned substantially centrally between front and rear ends 532, 544 and 536, 548 of dirt collection assembly 140/cyclone bin assembly and may be aligned with the wand.

[00258] Alternately, or in addition, as exemplified, center of gravity 524 is positioned between cyclone bin assembly 136 and suction motor 204, inside premotor filter chamber 556 of handvac 112.

Configuration of the Auxiliary Assembly

[00259] In accordance with another aspect of this disclosure, which may be used by itself or in combination with any one or more other aspects of this disclosure, a surface cleaning apparatus may have an upright section with an auxiliary dirt collection assembly 140 or auxiliary cyclone bin assembly 160 sized, shaped, and positioned according any one of a plurality of different configurations relative to the wand of the upright section and the handvac.

[00260] In some embodiments, a surface cleaning apparatus is provided having an upright mode wherein the auxiliary assembly 140, 160 and the handvac are positioned on the same side of the wand. As exemplified in FIGS. 1, 21, 24, 45, and 46, auxiliary assembly 140, 160 and handvac dirt collection chamber 188 may both extend rearwardly of wand 144. Referring to FIG 21, rear end 536 of dirt collection assembly 140 is shown positioned a rearward distance 564 from wand axis 568. Bottom wall 216 of dirt collection chamber 188 is shown positioned a rearward distance 576 from wand axis 568. Preferably, distances 564 and 576 are substantially equal. In alternative embodiments, distances 564 and 576 may be different. For example, distance 560 may be greater than distance 576, or distance 576 may be greater than distance 564. If rear end 536 is at an angle to the vertical as exemplified, then the handvac is preferable designed such that the rear end does not extend rearwardly past a projection of the line of rear end 536. Accordingly, the lowest extend to which upright section 108 may be pivoted rearwardly is determined by the auxiliary assembly and not the handvac.

[00261] In some embodiments, a surface cleaning apparatus is provided having a upright mode wherein the auxiliary assembly 140, 160 and the handvac are positioned on opposite sides of the wand. As exemplified in FIG. 26, dirt collection assembly 140 of upright section 108 is positioned forwardly of wand 144, and handvac dirt collection chamber 188 is positioned rearwardly of wand 144. An advantage of this design is that the weight of the auxiliary assembly 140, 160 is on the opposite side of wand 144 from the handvac and may assist in offsetting the hand weight of the handvac felt by a user holding the handle of the handvac.

[00262] In some embodiments, a surface cleaning apparatus is provided having a upright mode where the auxiliary assembly 140, 160 and handvac are positioned on opposite left and right sides of the wand. For example, in apparatus 168, cyclone bin assembly 160 may be mounted to one of the left or right sides of upright section 108, and handvac 112 may be oriented relative to the upright section 108 such that

dirt collection chamber 188 extends to the other of the left or right sides of upright section 108.

[00263] In some embodiments, the auxiliary assembly 140, 160 of the upright section surrounds at least a portion of the wand. Referring to FIGS. 1, 21, 24, 45 and 46, apparatus 100 is shown including an upright section 108 having dirt collection assembly 140 which partially surrounds wand 144. In the illustrated example, dirt collection assembly 140 includes a channel 584 for receiving at least a portion of wand 144. As shown, channel 584 may extend the height 588 of dirt collection assembly 140 between lower and upper ends 292 and 596. Channel 584 may also extend in depth from front end 532 rearwardly toward rear end 536.

[00264] As exemplified, dirt collection assembly 140 includes left and right portions 600 and 604 on opposite left and right sides of channel 584. In the upright mode of apparatus 100, wand 144 may be at least partially received in channel 584, whereby left and right portions 600 and 604 are positioned to the left and right sides of wand 144. As shown, a front end 532 of dirt collection assembly 140 may extend forwardly of wand 144, such that at least a portion of wand 144 is positioned between the front and rear ends 532 and 536 of dirt collection assembly 140.

[00265] In the illustrated embodiment, dirt collection assembly 140 may also surround at least a portion of handvac 112 in the upright mode of apparatus 100. In the illustrated embodiment, an outlet end 608 of wand 144 may be received in channel 584 of dirt collection assembly 140. Accordingly, a front portion of handvac 112 may extend into channel 584 for connection with outlet end 608 of wand 144. In the illustrated embodiment, nozzle 412 and inlet passage 420 of handvac 112 may be positioned inside channel 584 of dirt collection assembly 140 in the upright mode of apparatus 100.

Upright section with a Plurality of Cyclones

[00266] In accordance with another aspect of this disclosure, which may be used by itself or in combination with any one or more other aspects of this disclosure,

the supplemental cyclone bin assembly 160 may have a plurality of cyclones positioned in series and/or in parallel in the airflow path. The cyclones may be positioned to the same side of the upright section (e.g., front or back, left or right), or on different sides of the upright section (e.g., one front and one back or one on the right side and one on the left side).In one embodiment, the upright section may use two cyclones and the wand may be positioned between the two cyclones.

[00267] As exemplified in FIGS. 47-51,auxiliary cyclone assembly 160 comprises first and second supplemental cyclone bin assemblies 161, which may be individual units or may be formed as a single unit or housing. Each cyclone bin assembly 161 is shown including a cyclone chamber 308 and a dirt collection chamber141. Dirt collection chambers 141 may be combined to form a common repository for dirt separated by both cyclone bin assemblies 161 or each cyclone bin assembly 161 may have a separate dirt collection chamber 141.

[00268] Each cyclone chamber 308 may be any suitable cyclone chamber and maybe the same or different. As shown, each cyclone chamber 308 may include a tangential air inlet 344 proximate upper end 374, and an axial air outlet 320 at a downstream end of vortex finder400.

[00269] Cyclone bin assemblies 161 may be positioned in parallel in the airflow path between surface cleaning head 104 and handvac 112. As exemplified, the airflow path may extend from surface cleaning head 104 through an upstream wand portion 440, diverge into the inlets 316 of cyclone chambers 308 through cyclone chambers 308 to their respective air outlets 320. Each cyclone bin assembly 161 may include an outlet passage 476 connecting air outlets 320 to downstream portion 444 of wand 144 where the airflow path converges. From downstream portion 444 of wand 144, the airflow path may extend through handvac 112 and exit out clean air outlet 132.

[00270] As exemplified, upstream and downstream portions 440 and 444 of wand 144 may be divided by a diversion member 712, which is described

subsequently with respect to a further alternate aspect. Air traveling downstream through upstream portion 440 may contact diversion member 712 and be redirected laterally into air inlets 316 of cyclone chambers 308. Outlet passages 476 of cyclone bin assemblies 161 may converge to form a single airflow path in downstream portion 444 of wand 144 above diversion member 712.

Diversion Valve

[00271] In accordance with another aspect of this disclosure, which may be used by itself or in combination with any one or more other aspects of this disclosure, a diversion valve is provided which diverts air travelling through upright section 108 (e.g., the wand 144) into the auxiliary assembly 160 (e.g., supplemental cyclone or cyclones 308). Preferably, the diversion valve operates automatically upon the auxiliary assembly 160 being disconnected from and/or connected to the surface cleaning apparatus.

[00272] As exemplified in FIG. 20, cyclone bin assembly 160 may be selectively connected to upright section 108 whereby the airflow path may be reconfigured to extend through cyclone bin assembly 160. Similarly, cyclone bin assembly 160 may be selectively disconnected from upright section 108 whereby the airflow path may be reconfigured to extend through wand 144 from end to end without diversion. Preferably, the airflow path reconfiguration is automatic upon connection and/or disconnection of cyclone bin assembly 160 to upright section 108.

[00273] In some embodiments, wand 144 may include a diversion outlet 704 and a diversion inlet 708 positioned between the upstream and downstream ends 360 and 364 of wand 144. The diversion outlet 704 and diversion inlet 708 may be selectively opened when connecting cyclone bin assembly 160 to upright section 108 to reconfigure the airflow path to divert into the cyclone bin assembly 160 at diversion outlet 704, and to return to the wand 144 from cyclone bin assembly 160 at diversion inlet 708. Upright section 108 may include a diversion valve for opening and closing diversion outlet 704 and inlet 708.

[00274] A diversion valve 712 according to a first embodiment is exemplified in FIGS. 52-57. As exemplified, diversion valve 712 may include a sleeve 716 positioned inside of wand 144, and a pedal 720 for moving sleeve 716 between an open position and a closed position.

[00275] Sleeve 716 may be a conduit for fluidly coupling upstream and downstream wand portions 440 and 444 in the closed position of diversion valve 712 (see FIGS. 52 and 55) to bypass diversion outlet and inlet 704 and 708. Preferably, sleeve 716 may be a rigid conduit. Alternatively, sleeve 716 may include flexible and/or collapsible elements. Effectively, sleeve 716 may close diversion outlet and inlet 704 and 708 in the closed position of diversion valve 712. Optionally, diversion valve 712 may include one or more sealing members (e.g. O-rings) which may form an air-tight seal between sleeve 716 and upstream wand portion 440, and between sleeve 716 and downstream wand portion 444 to help prevent the escape of air through diversion outlet and inlet 704 and 708 in the closed position of diversion valve 712.

[00276] Sleeve 716 may be movable axially along wand 114 between the closed position (FIGS. 52 and 55) and the open position (FIGS. 54 and 57). Preferably, sleeve 716 is moved to the open position automatically by mounting cyclone bin assembly 160 to upright section 108 (e.g. connecting to wand 144), and/or moved to the closed position automatically by dismounting cyclone bin assembly 160 from upright section 108 (e.g. disconnecting from wand 144). In the illustrated embodiment, sleeve 716 is drivingly coupled to a pedal 720. Pedal 720 may be depressed to move sleeve 716 from the closed position of FIGS. 52 and 55 to the open position of FIGS. 54 and 57. As shown, pedal 720 may be positioned axially below sleeve 716 and extend outwardly of wand 144 to be depressed by cyclone bin assembly 160 when mounting cyclone bin assembly 160 to upright section 108. Pedal 720 and sleeve 716 may be integrally molded, or separately formed and connected, to move axially up and down as a unit.

[00277] As exemplified, pedal 720 and sleeve 716 may be movably mounted to wand 144 for axial movement between the open and closed position. As shown, pedal 720 and sleeve 716 may move downwardly from the closed position (FIGS. 52 and 55) to the open position (FIGS. 54 and 57). In the closed position, sleeve 716 may extend the airflow path directly across the threshold between the upstream and downstream wand portions 440 and 444. In the open position, sleeve 716 may be retracted into the upstream wand portion 440 to open diversion outlet 704 and inlet 708, and thereby permit the airflow path to be diverted through diversion outlet 704, cyclone bin assembly 160 and diversion inlet 708. As shown, diversion outlet 704 may be positioned at a downstream end 724 of upstream wand portion 440, and diversion inlet 708 may be positioned at an upstream end 728 of downstream wand portion 444.

[00278] In an alternative embodiment, sleeve 716 may have one or more openings which align with diversion outlet and inlet 704 and 708 in the open position of valve 712. In the closed position, the openings in sleeve 716 may be closed by alignment with solid wall portions of wand 144, and diversion outlet and inlet 704 and 708 may be closed by alignment with solid wall portions of sleeve 716. In this case, sleeve 716 may be positioned inside the upstream and downstream wand portions 440 and 444 in both the open and closed positions of valve 712.

[00279] Preferably, sleeve 716 is biased to the closed position. For example, valve 712 may include a biasing member which acts on sleeve 716 to bias sleeve 716 to the closed position. In the illustrated example, valve 712 includes a spring 732 which acts on pedal 720 to urge pedal 720 and sleeve 716 upwardly to the closed position. In alternative embodiments, sleeve 716 may not be biased to the closed position. For example, sleeve 716 may include an actuator, such as a switch or lever, which must be manually activated to move sleeve 716 to the closed position or is moved by assembly 160 when assembly 160 is removed..

[00280] Still referring to FIGS. 52-57, cyclone bin assembly 160 may include an engagement member for mating with pedal 720 to mount cyclone bin assembly 160 on pedal 720. In the illustrated example, a cavity 736 is formed in sidewall 376 of cyclone bin assembly 160 for receiving pedal 720. In use, cyclone bin assembly 160 may be set onto pedal 720 such that pedal 720 is received in cavity 736. Preferably, the weight of cyclone bin assembly 160 on pedal 720 is sufficient to overcome the bias of valve biasing member 732, and move pedal 720 and sleeve 716 downwardly to the open position. In alternative embodiments, additional downward force must be applied by the user to move pedal 720 and sleeve 716 downwardly against the bias of the biasing member 732 and/or an actuator, such as a foot pedal, may be utilized.

[00281] Cyclone bin assembly 160 may be toed onto pedal 720 (see e.g., FIGs 53, 56), and then pivoted on pedal 720 into position (see e.g., FIGs 54, 57) after pedal 720 and sleeve 716 have moved downwardly to the open position. In the illustrated example, cyclone bin assembly 160 may be set onto pedal 720 with cyclone axis 392 extending at a (non-zero) angle to wand axis 740, and then lowered with pedal 720 to move valve 712 to the open position, and finally pivoted about pedal 720 toward wand 144 to complete the connection of cyclone bin assembly 160 to wand 144. An locking member, such as a latch 744, which may be located at the end of the upper end or wand 144, may be provided to secure assembly 160 in position. In some embodiments, cyclone axis 392 may be substantially parallel to wand axis 740 when cyclone bin assembly 160 is connected to wand 144.

[00282] Cyclone bin assembly 160 may include a diversion member 428 for dividing wand 144 into upstream and downstream wand portions 440 and 444, and for diverting flow from the upstream wand portion 440 into cyclone bin assembly inlet 316. Diversion member 428 may take any suitable form. In the illustrated embodiment, diversion member 428 is a substantially flat plate which extends outboard of sidewall 376 for protruding into wand 144 through one of diversion outlet 704, diversion inlet 708, or another opening into wand 144. Alternatively, diversion member 428 may be curved to provide a less abrupt change in airflow direction,

which may reduce the pressure drop across the diversion member 428. Optionally, diversion member 428 may include or interface with a sealing member (e.g. a deformable elastomeric seal) to form an airtight barrier between upstream and downstream wand portions 440 and 444. Alternately, the diversion member may be a separate member that is installed as a separate step when (i.e. before, during, and/or after) connecting cyclone bin assembly 160 to the wand 144.

[00283] As exemplified, when cyclone bin assembly 160 is mounted to wand 144, as shown in FIGS. 54 and 57, air inlet 316 of cyclone chamber 308 is connected to diversion outlet 704 for receiving air from upstream wand portion 440 into cyclone chamber 308, and outlet passage 476 is connected to diversion inlet 708 for discharging air from cyclone bin assembly 160 into downstream wand portion 444.

[00284] Cyclone bin assembly 160 may be removably mounted to wand 144 by any suitable mechanism. In the illustrated embodiment, cyclone bin assembly 160 includes a latch 744 on handle 616 for engaging a tab 746 which extends outwardly of wand 144. Latch 744 may be user-operable by a user grasping handle 616 to release latch 744 from tab 746 for disconnecting cyclone bin assembly 160 from wand 144. Preferably, biasing member 732 of valve 712 automatically and immediately moves sleeve 716 to the closed position upon disconnection of cyclone bin assembly 160 to reconfigure the airflow pathway by closing diversion inlet and outlet 704 and 708.

[00285] A diversion valve 712 according to a second embodiment is exemplified in FIGS. 58-63. Diversion valve 712 is similar to diversion valve 712 of FIGS. 52-57 in many respects except, for example that sleeve 716 is embodied by a collapsible hose 716 instead of a more rigid conduit.

[00286] As exemplified, diversion valve 712 includes a collapsible sleeve 716 positioned inside of wand 144, and a pedal 720 for moving hose 716 been an open position and a closed position.

[00287] Sleeve 716 may be a collapsible conduit for fluidly coupling upstream and downstream wand portions 440 and 444 in the closed position of diversion valve 712 (see FIGS. 60 and 63) to bypass diversion inlet and outlet 708 and 712. Optionally, diversion valve 712 may include one or more seals (e.g. O-rings) which form an air-tight seal between sleeve 716 and upstream wand portion 440, and between sleeve 716 and downstream wand portion 444 to help prevent the escape of air through diversion inlet and outlet 704 and 708 in the closed position of diversion valve 716.

[00288] In the illustrated embodiment, sleeve 716 has a fixed-position upstream end 756 sealed to upstream wand portion 440, and a downstream end 760 axially movable inside wand 144. Downstream end 760 may be movable toward upstream end 756 to the open position (FIG. 60 and 63) whereby sleeve 716 is partially collapsed with downstream end 760 positioned in the upstream wand portion 440 upstream of diversion outlet 704. Downstream end 760 may also be movable away from upstream end 756 to the closed position (FIGS. 58 and 61) whereby sleeve 716 is extended with downstream end 760 position in the downstream wand portion 444 downstream of diversion inlet 708.

[00289] As exemplified, pedal 720 may be drivingly coupled to downstream end 760 of sleeve 716. Pedal 720 may be depressed (e.g. by the weight of cyclone bin assembly 160) to move downstream end 760 into the upstream wand portion 440, collapsing sleeve 716 into the open position of FIGS. 60 and 63. Pedal 720 may also be raised (e.g. automatically by action of biasing member 732 upon release of pedal 720 or pulled upwardly by assembly 160) to move downstream end 760 into the downstream wand portion 444, extending sleeve 716 into the closed position of FIGS. 58 and 61. Alternately, a manual actuator may be used.

[00290] A diversion valve 712 according to a third embodiment is exemplified in FIGS. 64-71. As exemplified, diversion valve 712 may include a diversion outlet door 772 and a diversion inlet door 776. Doors 772 and 776 may be opened when

cyclone bin assembly 160 is connected to wand 144 for reconfiguring the airflow path to extend through cyclone bin assembly 160. Doors 772 and 776 may also be closed when cyclone bin assembly 160 is disconnected from wand 144 for reconfiguring the airflow path to extend directly across the threshold between upstream and downstream wand portions 440 and 444.

[00291] In the illustrated embodiment, doors 772 and 776 are pivotally mounted to wand 144 for movement between a closed position (see FIGS. 64 and 67-69) in which doors 772 and 776 seal diversion outlet 704 and inlet 708 respectively, and an open position (see FIGS. 66 and 71) in which doors 772 and 776 are open to allow air to flow through doors 772 and 776 between wand 144 and cyclone bin assembly 160. Doors 772 and 776 may be pivotally mounted to wand 144 in any suitable manner. In the example shown, doors 772 and 776 are pivotally mounted to wand 144 by a common hinge 780. As shown, door 772 may pivot inwardly about hinge 780 toward a downstream direction, and door 776 may pivot inwardly about hinge 780 toward an upstream direction. In alternative embodiments, each of doors 772 and 776 may be pivotally mounted to wand 144 by a different hinge.

[00292] Preferably, doors 772 and 776 open automatically by connecting cyclone bin assembly 160 to wand 144. In the illustrated example, cyclone bin assembly 160 includes an inlet nose 784 for pushing open diversion outlet door 772, and an outlet nose 788 for pushing open diversion inlet door 776. As shown, noses 784 and 788 may extend outwardly of sidewall 376 for projecting through diversion outlet and inlet 704 and 708 respectively upon connecting cyclone bin assembly 160 to wand 144.

[00293] Preferably, when cyclone bin assembly 160 is connected to wand 144, an airflow path is formed between diversion outlet 704 and air inlet 316, and between diversion inlet 708 and air outlet 320, such that the airflow path from upstream wand portion 440 to downstream wand portion 444 is reconfigured to extend through cyclone bin assembly 160. In the illustrated example, connecting cyclone bin

assembly 160 to wand 144 may include pushing noses 784 and 788 into diversion outlet and inlet 704 and 708 respectively to open doors 772 and 776.

[00294] Noses 784 and 788 may take any suitable form. As exemplified, nose 784 may be formed as a diversion member including an inlet passage having an upstream end 792 and a downstream end 796. Upstream end 792 may extend into wand 144 and form a seal with upstream wand portion 440 to redirect the airflow in upstream wand portion 440 to enter nose 784 toward downstream end 796. In the illustrated embodiment, upstream wand portion 440 includes a sealing ring 800 adjacent an upstream side 804 of diversion outlet door 772 onto which downstream end 796 may be seated for forming an airtight seal between upstream wand portion 440 and downstream end 796. Alternatively, or in addition, upstream side 804 may include a sealing member. Downstream end 796 of nose 784 may be integrally formed or otherwise connected with air inlet 316.

[00295] In the illustrated example, nose 788 is formed as a triangular plate which projects outwardly from air outlet 320. In other embodiments, nose 788 may have another suitable form for pushing diversion inlet door 776, such as a circular or rectangular plate or a rod for example. As shown, when cyclone bin assembly 160 is connected to wand 144, nose 788 projects into diversion inlet 708 pushing open diversion inlet door 776. This may permit air outlet 320 to sealingly abut diversion inlet 708 for forming an airflow path between air outlet 320 and downstream wand portion 444. Optionally, a seal 808 may be provided at the interface between air outlet 320 and diversion inlet 708 for enhancing the airtightness of the connection.

[00296] It will be appreciated that in alternative embodiments, nose 788 may be formed as an outlet passage, which may be curved similar to nose 784. This may make the change in airflow direction across nose 788 less abrupt, which may reduce pressure losses.

[00297] Preferably, when cyclone bin assembly 160 is disconnected from wand 144, doors 772 and 776 automatically close to reconfigure the airflow passage to

extend directly from upstream wand portion 440 to downstream wand portion 444 without diversion through diversion outlet 704 or inlet 708. For example, doors 772 and 776 may be biased to the closed position by a biasing member, such as a spring. In the illustrated embodiment, diversion valve 712 includes a torsional spring 812. Spring 812 may be positioned to bias both of doors 772 and 776 to the closed position. In the illustrated embodiment, spring 812 is held in a spring housing 816 mounted to an inside face 820 of diversion outlet door 772. As shown, spring 812 may have an arm 824 connected to diversion inlet door 776, effectively biasing doors 772 and 776 away from each other to their respective closed positions. In alternative embodiments, each of doors 772 and 776 may have a separate biasing member.

[00298] A diversion valve 712 according to a fourth embodiment is exemplified in FIGS. 72-77. Diversion valve 712 is similar to diversion valve 712 of FIGS. 64-71 in many respects except, for example, the door which selectively closes diversion outlet 704 and inlet 708.

[00299] In the illustrated embodiment, diversion valve 712 includes a door 772. Door 772 may be movable between a closed position (FIGS. 72 and 75) in which door 772 seals diversion outlet 704 and inlet 708, and an open position (FIGS. 74 and 77) in which door 772 is unsealed from outlet 704 and inlet 708 to allow the airflow to pass through diversion outlet 704 and inlet 708. As exemplified, diversion valve 712 may include one door 772 for closing both of diversion outlet 704 and inlet 708, or separate doors 772 for diversion outlet 704 and inlet 708.

[00300] As shown, door 772 may be pivotally mounted to wand 144 in any suitable manner for movement between the open and closed positions. For example, door 772 may be pivotally mounted outside of wand 144 by a hinge 780. In the illustrated example, door 772 may pivot outwardly about hinge 780 away from wand 144 to the open position, and may pivot inwardly about hinge 780 toward wand 144 to the closed position. Preferably, door 772 is manually openable, whereby a user may grasp door 772 and manually move door 772 from the closed position to the

open position. For example, door 772 may have a lever 840, a handle, or another gripping member for a user to grasp for manipulating the position of door 772.

[00301] Once door 772 is opened, as shown in FIGS. 73 and 76, cyclone bin assembly 160 may be connected to wand 144. In the illustrated embodiment, cyclone bin assembly 160 includes a diversion member 428 of the type describe above with reference to FIGS. 52-57. Diversion member 428 may be moved into wand 144 through diversion outlet 704, diversion inlet 708, or another opening in wand 144, for dividing wand 144 into an upstream portion 440 and a downstream portion 444, substantially as described above.

[00302] When cyclone bin assembly 160 is disconnected from wand 144, door 772 may be moved back into the closed position for reconfiguring the airflow path in wand 144 to extend directly from upstream portion 440 to downstream portion 444 without diversion. For example, door 772 may be manually moved from the open position to the closed position by hand, or door 772 may move automatically to the closed position by the bias of a biasing member (e.g. a spring).

[00303] In some embodiments, door 772 may be held in the closed position by the bias of a biasing member, or by a releasable locking mechanism (e.g. a latch). This may permit door 772 to form a tight seal against diversion outlet 704 and inlet 708.

[00304] In some embodiments, pedal 720 may be foot operable and may be located close to or on the surface cleaning head..

Angular Surface of Upright section

[00305] In accordance with another aspect of this disclosure, which may be used by itself or in combination with any one or more other aspects of this disclosure, a surface cleaning apparatus is provided having an upright section with a dirt collection chamber or cyclone bin assembly having a side profile that tapers or narrows from top to bottom. For example, the rear wall of the supplemental dirt collection chamber or supplemental cyclone bin assembly may extend upwardly at an

acute angle relative to the wand axis such that the rear wall is farther from the wand axis at the top end than at the bottom end of the dirt collection chamber or cyclone bin assembly. An advantage of this design is that the surface cleaning apparatus may extend under furniture while providing a large dirt collection capacity.

[00306] As exemplified in FIGS. 3 and 7, surface cleaning apparatus 100 and 152 include an upright section 108 having a dirt collection chamber 140 or cyclone bin assembly 160 that extends from a lower end 292, 856 proximate surface cleaning head 104 to an upper end 596, 860. A rear end 536, 548 of auxiliary assembly 140/160 may extend upwardly from lower end 292 or 856 at a (non-zero) acute angle 848 to wand axis 568. Angle 848 is preferably between 10 and 70 degrees, and more preferably between 20 and 40 degrees. For example, a distance 538 between wand axis 568 and rear end 536, 548, measured normal to wand axis 568, may increase continually or generally continuously from lower end 292, 856 upwardly. As shown, distance 538 is greater at upper end 596. 860 than at lower end 292, r 856.

Handvac with Angled Bottom Wall

[00307] In accordance with another aspect of this disclosure, which may be used by itself or in combination with any one or more other aspects of this disclosure, a handvac may be provided having a bottom, such as a flat bottom wall, for supporting the handvac on a horizontal surface, and which extends at an acute angle (e.g., between 20 and 40 degrees) away from the inlet nozzle axis, and optionally at about the in-use orientation of the hand vac. This may provide the handvac with a resting orientation that is closer to or essentially at the in-use orientation of the handvac. For example, the in-use orientation of the handvac may normally have the inlet nozzle axis extending at a downward angle relative to a horizontal surface to be cleaned. Thus, a user may not have to substantially reorient the handvac upon grasping the handvac in the resting orientation to reposition the handvac into the in-use orientation.

[00308] Reference is now made FIG. 78, where handvac 112 is shown resting on a horizontal surface 876. As shown, nozzle axis 884 extends at an angle 880 to horizontal surface 876. Angle 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. It will be appreciated that handvac 112 may be stably supported in any suitable manner, with nozzle axis 884 extending at angle 880 to horizontal surface 876. For example, handvac 112 may include one or more support elements (e.g. a wall or feet) which collectively provide a support for handvac 112 on a horizontal planar surface at a desired acute angle, and a center of gravity 524 vertically aligned with or between the support elements for stability when handvac 112 is so supported by the support element(s) on the horizontal surface.

[00309] As exemplified, bottom wall 216 of handvac 112 may extend at an angle 880 to inlet nozzle axis 884 of nozzle 412. Bottom wall 216 may be planar, and the plane of bottom wall 216 may intersect with nozzle axis 884 at angle 880. Bottom wall 216 may provide a flat planar surface for making broad contiguous contact with horizontal surface 876, or bottom wall 216 may include a plurality of discrete contact points or surfaces which collectively contact the horizontal surface 876 to support the handvac 112 (e.g. as in the feet of a tripod, or the wheels of a car). Preferably, handvac center of gravity 524 is preferably aligned vertically above bottom wall 216 when handvac 112 is supported on horizontal surface 876 by bottom wall 216. This may permit handvac 112 to rest stably (i.e. statically without tipping over) on horizontal surface 876 while supported solely by bottom wall 216.

[00310] Handvac 112 may have an in-use orientation relative to horizontal surface 876 at which a user may comfortably operate handvac 112 during cleaning. Typically, handvac 112 is most 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. This may be the case where the center of gravity 524 of the handvac 112 is aligned vertically below the user's hand. Accordingly, the center of gravity 524

may be vertically aligned below handle 484 in comfortable in-use orientations of handvac 112.

[00311] Preferably, center of gravity 524 is aligned vertically below handle 484 when handvac 112 is supported on horizontal surface 876. In the illustrated embodiment, center of gravity 524 is aligned vertically below handle 484 when bottom wall 216 is horizontal and supporting handvac 112 on a horizontal surface 876. Thus, the resting orientation of handvac 112 supported by bottom wall 216 on a horizontal surface 876 may be substantially the same as the in-use orientation of handvac 112. Accordingly, when a user grasps handvac 112 by handle 484 and lifts handvac 112, handvac 112 may already be in a balanced in-use position with the center of gravity 524 aligned below the user's hands.

[00312] In many cases, handvac 112 may be stored on a surface below a user's elbows. A user may angle their forearm downwardly to grasp handle 484 of handvac 112. In this case, the user's fingers and palm may be naturally aligned for grasping a handle which is angled forwardly of vertical. For example, to grasp a vertically oriented handle that is positioned below a user's elbow, a user may need to contort their wrist to conform to the orientation of the handle.

[00313] In the illustrated embodiment, handle axis 888 of handle 484 extends at a (non-zero) forward angle 892 to the vertical (e.g., 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. Preferably, 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.

[00314] Bottom wall 216 may be a wall of any component of handvac 112. In the illustrated embodiment, bottom wall 216 is a wall of cyclone bin assembly 136. Preferably, bottom wall 216 is a wall of dirt collection chamber 188. In the example

shown, bottom wall 216 is an openable wall of dirt collection chamber 188. FIG. 79 shows another embodiment of handvac 112 where bottom wall 216 is not openable.

[00315] Referring to FIG. 78, bottom wall 216 of handvac 112 may include front wheels, rear wheels, or both. Wheels may provide rolling support for handvac 112 when cleaning under furniture, for example. In alternative embodiments, handvac 112 may not include wheels on bottom wall 216 as shown.

Handle Position

[00316] In accordance with another aspect of this disclosure, which may be used by itself or in combination with any one or more other aspects of this disclosure, a floor cleaning apparatus is provided having a handvac with a handle, and an upright section with a cyclone bin assembly or dirt collection chamber with a handle. Preferably, the handles are centrally aligned with a plane of symmetry of the apparatus. This may permit the handles to be grasped for a balanced control of the apparatus. For example, the handles may be parallel to the same plane of symmetry.

[00317] Alternately, as exemplified in FIG. 2, one handle may be parallel to a plane of symmetry and the other transverse thereto but positioned such that the plane of symmetry extends through the transversely oriented handle. In the illustrated example, handvac 112 includes a handle 484 which extends along a handle axis 888. As exemplified, handle axis 888 may lie in a vertical plane 1044, which is aligned centrally between left and right sides of apparatus 100 (i.e., a plane of symmetry). Turning to FIG. 78, handle 484 is shown extending in length between a first handle end 1048 at the upper end 1052 of handvac 112, and a second handle end 1056 intermediate the upper and lower ends 1052 and 1060 of handvac 112.

[00318] Returning to FIG. 2, assembly 140 is shown including a handle 1064. As illustrated, handle 1064 may have a handle axis 1068 which extends perpendicularly or transverse to plane 1044 and handle axis 888. Handle 1064 may be formed in a rear end 536 of assembly 140. For example, handle 1064 may be flush with rear end 536 and include a concave finger cavity 1072 to facilitate grasping

handle 1064. Preferably, handle 1064 is positioned laterally centrally such that plane 1044 intersects handle 1064, and optionally bisects handle 1064 at a midpoint between handle ends 1076 and 1080.

[00319] Handles 484 and 1064 may be positioned on opposite sides of surface cleaning apparatus 100. For example, handle 484 is shown extending from an upper end 1052 proximate the front surface of apparatus 100, and handle 1064 is shown extending flush with a rear surface of apparatus 100.

[00320] Apparatus 100 may include one or more actuator controls (e.g. buttons, levers, or switches) for controlling various functionality such as opening or disconnected elements, or connecting power to elements. Preferably, at least some of the actuator controls are positioned on or within finger reach of a handle to permit the control to be activated while grasping the handle. This may permit single handed operation of the function provided by the control.

[00321] Referring to FIG. 1, apparatus 100 is shown including a power switch 1084 located on upper end 1052 of handvac 112 proximate first handle end 1048 within finger-reach when grasping handvac handle 484. As illustrated, power switch 1084 may be laterally centrally positioned such that plane 1044 intersects and more preferably bisects power switch 1084.

[00322] Referring now to FIGS. 15 and 16, apparatus 168 is shown including an upright section 108 having a cyclone bin assembly 160 with a handle 616, and handvac 112 with handle 484. As shown, handle axis 1092 of handle 616, and handle axis 888 of handvac handle 484 may extend in a same plane 1096. Preferably, plane 1096 is a vertical plane positioned laterally centrally between left and right sides of apparatus 168 as shown. In the illustrated embodiment, plane 1096 bisects handles 616 and 484.

[00323] In the illustrated embodiment, handvac 112 includes a power switch 1084 located on upper end 1052 of handvac 112 which is bisected by plane 1044. Handle 616 of cyclone bin assembly 160 is also shown including a button 1100 for

releasing latch 744 to disconnect cyclone bin assembly 160 from wand 144. As illustrated, button 1100 may be positioned laterally centrally between left and right sides of apparatus 168 such that button 1100 is bisected by plane 1096.

Handvac Axial Alignment

[00324] In accordance with another aspect of this disclosure, which may be used by itself or in combination with any one or more other aspects of this disclosure, a plurality of airflow path segments in the handvac may extend in parallel. In some cases, this may reduce the number of bends in the airflow path through the handvac, which may reduce the pressure drop across the airflow path.

[00325] As exemplified in FIG. 96, handvac inlet nozzle 412 may extend in length from an upstream nozzle end 416 rearwardly along a nozzle axis 884, handvac cyclone chamber 184 may extend from an air inlet 192 along a cyclone axis 248 to an air outlet 196, and handvac suction motor 204 may extend from a motor inlet 1108 along a motor axis 252 to a motor outlet 1112.

[00326] In some embodiments, two or more of nozzle axis 884, cyclone axis 248, and motor axis 252 may be parallel. For example, in the illustrated embodiment, nozzle axis 884, cyclone axis 248, and motor axis 252 are parallel. In some embodiments, two or more of nozzle axis 884, cyclone axis 248, and motor axis 252 may be co-axial. For example, in the illustrated embodiment, nozzle axis 884 and cyclone axis 248 are co-axial. In other embodiments, nozzle axis 884, cyclone axis 248, and motor axis 252 may all be co-axial.

[00327] In the illustrated embodiment, handvac 112 may include an electrical connector 1116 for providing power to an upstream attachment (e.g. a surface cleaning head). As shown, connector 1116 may extend from a front connector end 1120 along a connector axis 1124 to a rear connector end 1128. In some embodiments, connector axis 1124 may be parallel to one or more of nozzle axis 884, cyclone axis 248, and motor axis 252. In the illustrated embodiment, connector axis 1124 is parallel to nozzle axis 884, cyclone axis 248, and motor axis 252.

[00328] In some embodiments, handvac 112 may include one or more electrical cables 1132 which extend from electrical connector 1116 rearwardly to electrically couple electrical connector 1116 with a source of power (not shown). In the illustrated embodiment, electrical cables 1132 extend from electrical connector 1116 rearwardly along vortex finder 1136 of cyclone chamber 184 toward motor housing 1138. As shown, at least the portion of electrical cables 1132 which along vortex finder 1136 across cyclone chamber 184 is parallel to cyclone axis 248.

Axial Cyclone Inlet

[00329] In accordance with another aspect of this disclosure, which may be used by itself or in combination with any one or more other aspects of this disclosure, a handvac may be provided having a cyclone chamber with an axial inlet. That is, the inlet axis may be parallel to the cyclone axis, and more preferably co-axial with the cyclone axis. In some cases, this may reduce the bends in the airflow path through the cyclone, which may reduce the pressure drop across the cyclone for better pneumatic efficiency. Preferably, the cyclone is a uniflow cyclone wherein the air outlet is at the opposite end from the air inlet. Alternately, or in addition, the axial inlet includes a portion that converts the axial flow to a tangential flow wherein the portion is provided within the diameter of the cyclone chamber. Optionally, the axial inlet is parallel to and may be co-axial with the handvac air inlet.

[00330] As exemplified in FIG. 96, handvac cyclone chamber 184 includes an air inlet 192 and an air outlet 196. As shown, air inlet 192 may include an inlet axis 1140 which is parallel to cyclone axis 248. Air inlet 192 may have a circular section transverse to axis 1140 with an inlet diameter 1144, or rectangular with a side dimension 1144. Preferably, the cross-sectional area of air inlet 192 is approximately equal to the cross-sectional area of inlet nozzle 412. Preferably, the cross-sectional area of air inlet 192 is between 80%-125% of the cross-sectional area of the inlet nozzle 412, more preferably 90%-120%, and most preferably 100%-115%.

[00331] Preferably, inlet 192 is in fluid communication with an upstream end 388 of an inlet passage 384. Inlet passage 384 may redirect the axial flow through inlet 192 to a tangential flow for developing a cyclonic motion inside cyclone chamber 184. Referring to FIGS. 23 and 23a, inlet passage 384 may extend from upstream passage end 388 to downstream passage end396 across an arcuate angular extent 1148. Preferably angular extent 1148 is between 45 and 300°, more preferably between 60 and 250°, and most preferably between 90 and 200°.

[00332] Returning to FIG. 96, inlet passage 384 is shown having a width 1152, and a height 1108. In some embodiments, the cross-sectional area of inlet passage 384 may be approximately equal to the cross-sectional area of air inlet 192. Preferably, the cross-sectional area of inlet passage 384 is between 80%-125% of the cross-sectional area of the inlet passage 384, more preferably 90%-120%, and most preferably 100%-115%.

[00333] Vortex finder 1136 may define an outlet passage to air outlet 196 of cyclone chamber 184. As shown, vortex finder 1136 may be substantially cylindrical having a diameter 1160. In the illustrated embodiment, the cross-sectional area of vortex finder 1136 may be approximately equal to the cross-sectional area of inlet nozzle 412. For example, diameter 1160 may be approximately equal to diameter 1164 of inlet nozzle 412. Preferably, the cross-sectional area of vortex finder 1136 is between 80%-125% of the cross-sectional area of the inlet nozzle 412, more preferably 90%-120%, and most preferably 100%-115%.

Uniflow Cyclone

[00334] In accordance with another aspect of this disclosure, which may be used by itself or in combination with any one or more other aspects of this disclosure, a handvac may be provided having a cyclone chamber wherein the air outlet is at the opposite end from the air inlet. In some cases, this may reduce the bends in the airflow path through the cyclone, which may reduce the pressure drop across the

cyclone for better pneumatic efficiency. Optionally, the cyclone inlet is at the front or inlet end of the handvac and may be parallel to or co-axial with the handvac air inlet.

[00335] As exemplified in FIG. 96, handvac inlet 192 is shown positioned at a front end 220 of cyclone chamber 184, and outlet 196 is shown positioned at a rear end 224 of cyclone chamber 184. Inlet 192 may have an inlet axis 1140 that is parallel to the outlet axis 1168 of air outlet 196. In the illustrated embodiment, inlet axis 1140 is co-axial with outlet axis 1168.

[00336] Optionally, the suction motor axis may be parallel to or co-axial with axis 1140, 1168. Accordingly, air may travel in a generally uniform direction through the components of the handvac.

Handvac Cyclone Dirt Collection Chamber

[00337] In accordance with another aspect of this disclosure, which may be used by itself or in combination with any one or more other aspects of this disclosure, the dirt collection chamber of the handvac may have a dirt inlet which is located at the upper end of the dirt collection chamber when the hand vac is oriented for cleaning a floor (see e.g., FIGS 81 and 103). In addition, the dirt collection chamber may be shaped to encourage dirt to collect at another end of the handvac away from the dirt outlet of the cyclone chamber (e.g., it may extend downwardly away from the dirt inlet). This may clear the dirt inlet to permit additional dirt to enter.

[00338] As exemplified in FIG. 96, dirt may enter dirt collection chamber 188 from cyclone chamber 184 through dirt outlet 200 of cyclone chamber 184. In the illustrated embodiment, dirt outlet 200 is at a rear end 224 of cyclone chamber 184. In use, handvac 112 may be normally oriented with the nozzle 412 at the front end oriented downwardly for cleaning a surface below. Accordingly, dirt entering dirt collection chamber 188 from dirt outlet 200 may fall by gravity toward front end 220 of dirt collection chamber 188 away from dirt outlet 200. This may help to keep dirt outlet 200 clear for subsequent dirt to move through dirt outlet 200 during use.

[00339] In the illustrated embodiment, handvac 112 may be supportable on a horizontal surface 876 by contact between dirt collection chamber 188 and the horizontal surface 876. For example, dirt collection chamber 188 may include a bottom wall 216 for supporting handvac 112 on horizontal surface 876. Preferably, as discussed previously, handvac 112 is inclined with nozzle 412 facing downwardly when handvac 112 is supported on horizontal surface 876 by bottom wall 216. In the illustrated embodiment, bottom wall 216 is angled downwardly between front end 220 and rear end 224 for orienting nozzle axis 884 downwardly to horizontal when handvac 112 is supported on horizontal surface 876. As shown, this may provide dirt collection chamber 188 with a wedge-like shape having a height 1172 measured between upper and lower dirt collection chamber walls 226 and 216 which increases from the front end 220 to the rear end 224.

Pre-motor Filter Housing

[00340] In accordance with another aspect of this disclosure, which may be used by itself or in combination with any one or more other aspects of this disclosure, a pre-motor filter housing may be provided in the airflow path between the cyclone bin assembly and the suction motor for directing the airflow through one or more pre-motor filters contained therein.

[00341] As exemplified in FIGS. 96 and 117, handvac 112 has a pre-motor filter chamber 556 containing pre-motor filters 1176 and 1180, and a suction motor housing 1138 containing suction motor 204. The airflow path from inlet nozzle 412 to clean air outlet 132 may extend downstream from cyclone bin assembly 136 to pre-motor filter chamber 556 to suction motor housing 1138. That is, cyclone bin assembly 136, pre-motor filter chamber 556, and suction motor housing 1138 may be positioned in the airflow path with pre-motor filter chamber 556 downstream of cyclone bin assembly 136 and suction motor housing 1138 downstream of pre-motor filter chamber 556.

[00342] In the illustrated example, pre-motor filter chamber 556 extends in height 1184 between an upper end 1188 to a lower end 1192 in the direction of pre-motor filter axis 560, and extends in depth 1216 between front wall 1220 and rear wall 1224. In some embodiments, cyclone axis 248 and motor axis 252 may be parallel and vertically offset as shown. For example, each of cyclone axis 248 and motor axis 252 may intersect pre-motor filter chamber 556 as shown. In some embodiments, outlet axis 1168 of cyclone chamber outlet 196 and, motor inlet axis 1196 of motor inlet 1108 may be parallel and vertically offset. For example, each of outlet axis 1168 and motor inlet axis 1196 may intersect pre-motor filter chamber 556 as shown.

[00343] In some embodiments, cyclone chamber outlet 196 discharges air from cyclone chamber 184 into pre-motor filter chamber 556, and pre-motor filter chamber 556 discharges air into motor inlet 1108. For example, cyclone chamber outlet 196 may be positioned at the threshold between cyclone chamber 184 and pre-motor filter chamber 556, and motor inlet 1108 may be positioned at the threshold between pre-motor filter chamber 556 and suction motor housing 1138. In alternative embodiments, one or more conduits (not shown) may separate pre-motor filter chamber 556 from cyclone chamber outlet 196 and/or motor inlet 1108.

[00344] In the illustrated embodiment, pre-motor filter chamber 556 extends in length between a front end 1200 and a rear end 1204. As shown, pre-motor filter chamber 556 may hold pre-motor filters 1176 and 1180 in the airflow path between cyclone chamber outlet 196 and motor inlet 1108 for filtering residual dirt particles remaining in the airflow. In some embodiments, pre-motor filter chamber 556 may hold pre-motor filters 1176 and 1180 in spaced apart relation to front and rear ends 1200 and 1204. An upstream plenum 1208 may be provided in the space between upstream pre-motor filter 1176 and front end 1200. A downstream plenum 1212 may be provided in the space between downstream pre-motor filter 1176 and rear end 1204. Air entering upstream plenum 1208 from cyclone bin assembly 136 may

distribute across the surface area of pre-motor filter 1176 for traversing filters 1176 and 1180 to downstream plenum 1212.

[00345] In the illustrated embodiment, cyclone chamber outlet 196 may direct air into an upper portion of upstream plenum 1208. For example, cyclone chamber outlet 196 may be connected to pre-motor filter chamber 556 proximate upper end 1188. In the illustrated embodiment, motor inlet 1108 may receive air from a lower portion of downstream plenum 1212. For example, motor inlet 1108 may be connected to pre-motor filter chamber 556 proximate lower end 1192. Accordingly, pre-motor filter chamber 556 may be used to redirect the air from transversely to the cyclone and motor axis without requiring conduits having bends therein.

Battery Power

[00346] In accordance with another aspect of this disclosure, which may be used by itself or in combination with any one or more other aspects of this disclosure, the surface cleaning head or upright section of the surface cleaning apparatus may include one or more batteries for powering the handvac when the handvac is connected to the surface cleaning head or upright section. The handvac may also include handvac batteries which may power the handvac when connected to or disconnected from the upright section and surface cleaning head (e.g. in an above-floor cleaning mode or handvac mode). When the handvac is electrically connected to the surface cleaning head, the batteries in the surface cleaning head may supplement the batteries in the handvac or be the sole power source.

[00347] As exemplified in FIG. 3, surface cleaning apparatus 100 (or any other surface cleaning apparatus embodiment disclosed herein) may include one or more handvac batteries 1268 mounted to the handvac 112, and one more supplemental batteries 1272. Supplemental batteries 1272 may be mounted to any other suitable component of apparatus 100 other than handvac 112. For example, supplemental batteries 1272 are shown mounted to surface cleaning head 104. Alternatively or additionally, supplemental batteries 1272 may be mounted to upright section 108.

[00348] As used herein, the plural term “batteries” means one or more batteries. For example, supplemental batteries 1272 may be one battery or a plurality of batteries. Similarly, handvac batteries 1268 may be one battery or a plurality of batteries. Batteries 1272 and 1268 may be any suitable form of battery such as NiCad, NiMH, or lithium batteries, for example. Preferably, batteries 1272 and 1268 are rechargeable, however, in alternative embodiments, one or both of batteries 1272 and 1268 may be non-rechargeable single-use batteries.

[00349] In the illustrated embodiment, when handvac 112 is connected to upright section 108, an electrical connection may be formed between supplemental batteries 1272 and handvac 112, e.g. for powering suction motor 204.

[00350] In some embodiments, supplemental batteries 1272 may provide handvac 112 with enhanced power for generating greater suction with suction motor 204. For example, suction motor 204 may operate in a high power consumption mode, drawing power from supplemental batteries 1272, or supplemental batteries 1272 and handvac batteries 1268 simultaneously.

[00351] In some embodiments, supplemental batteries 1272 may provide the handvac 112 with extra energy for prolonged cleaning time between charges. For example, supplemental batteries 1272 may have a greater energy capacity (e.g. measured in Watt-hours) than handvac batteries 1268, such that handvac 112 may be sustained by supplemental batteries 1272 for a longer operating time. In some embodiments, handvac 112 may draw power from both of supplemental batteries 1272 and handvac batteries 1268, which have a greater combined energy storage capacity than handvac batteries 1268 alone.

[00352] In some embodiments, supplemental batteries 1272 may supply power to the handvac in preference to the handvac batteries 1268 to delay or avoid draining the handvac batteries 1268. For example, handvac 112 may draw power from supplemental batteries 1272 until substantially depleted before drawing power from handvac batteries 1268. This may conserve power in handvac batteries 1268 for use

when handvac 112 is disconnected from supplemental batteries 1272 (e.g. in an above-floor cleaning mode, or handvac mode of apparatus 100). In some embodiments, handvac 112 may never draw power from handvac batteries 1268 when handvac 112 is electrically connected to supplemental batteries 1272.

[00353] In some embodiments, handvac 112 may draw power from supplemental batteries 1272 to recharge handvac batteries 1268. This may help to ensure that handvac batteries 1268 are not depleted when handvac 112 is disconnected from supplemental batteries 1272 (e.g. for use in an above-floor cleaning mode, or handvac mode of apparatus 100). In some cases, supplemental batteries 1272 may recharge handvac batteries 1268 only when apparatus 100 is not turned on.

[00354] In some embodiments, supplemental batteries 1272 may be recharged whenever the surface cleaning apparatus is connected to an external power outlet. In some cases, handvac batteries 1268 may be recharged when handvac 112 is electrically connected to an external power outlet (e.g. when surface cleaning head 104 or upright section 108 is connected to a power outlet by an electrical cord (not shown), and handvac 112 is connected to the surface cleaning head 104 or upright section 108).

[00355] In some embodiments, one or more of supplemental batteries 1272 and handvac batteries 1268 may be positioned in the airflow path. This may provide cooling for the batteries so positioned, which may help to prevent the batteries from overheating and may improve the performance of the batteries. In the illustrated example, handvac batteries 1268 are positioned in the airflow path inside motor housing 1138. For example, handvac batteries 1268 may be positioned inside motor housing 1138 between suction motor 204 and clean air outlet 132. The air passing over the handvac batteries 1268 may help to keep the batteries 1268 cool.

[00356] Supplemental batteries 1272 may be positioned in the airflow path to promote cooling of the batteries 1272. In the illustrated example, supplemental

batteries 1272 are shown positioned inside surface cleaning head 104 in the airflow path between dirty air inlet 124 and downstream end 1240. The air passing over batteries 1272 may help to keep batteries 1272 cool.

[00357] In alternative embodiments, one or both of supplemental batteries 1272 and handvac batteries 1268 may be positioned outside of the airflow path (e.g. to be cooled passively).

Handvac Wheels

[00358] In accordance with another aspect of this disclosure, which may be used by itself or in combination with any one or more other aspects of this disclosure, the handvac may be provided with one or more sets of wheels, and a handle which may articulate to facilitate different cleaning postures.

[00359] As exemplified in FIGS. 106-109, surface cleaning apparatus 1292 may include a surface cleaning head 104, an upright section 108 (which may receive any assembly 140, 160 discussed previously), and a handvac 112. An airflow path through apparatus 1292 may extend from dirty air inlet 124 in surface cleaning head 104, downstream through upright section 108 and then handvac 112 to clean air outlet 1304. Upright section 108 may include a wand 144 having an upstream end 360 drivingly connected to a pivot joint 116 of surface cleaning head 104, and a downstream end 364 connected to an inlet nozzle 412 of handvac 112.

[00360] Handvac 112 may include an air treatment member positioned in the airflow path between inlet nozzle 412 for separating dirt from the airflow. In the illustrated example, handvac 112 includes a cyclone bin assembly 136 including a cyclone chamber 184, and a dirt collection chamber 188. Optionally, a bottom wall 216 of dirt collection chamber 188 may be pivotally openable for emptying dirt collection chamber 188.

[00361] As exemplified, apparatus 1292 may be movable between an upright storage position (FIG. 106) in which handvac 112 is substantially vertically aligned above surface cleaning head 104 and wand 144 is substantially vertically oriented,

and an in-use floor cleaning position (FIG. 108) in which surface cleaning head 104 is positioned behind surface cleaning head 104 and wand 144 extends at an angle to vertical.

[00362] In the illustrated example, apparatus 1292 may include a handle 1340. Handle 1340 may be connected to wand 144 by an arm assembly 1344. As shown, arm assembly 1344 may include a first arm 1348 joined to a second arm 1352 by an articulating joint 1356. First arm 1348 may be connected to wand 144 and joint 1356, and second arm 1352 may be connected to handle 1340. Alternately, joint 1356 may be used to connect second arm 1352 to wand 144.

[00363] As shown, first arm 1348 may be rigidly connected to wand 144, and extend transversely to wand 144. For example, first arm 1348 may extend perpendicularly to wand 144. Second arm 1352 may be rotatable about joint 1356 between at least two positions. In the first position (FIG. 108), second arm 1352 may extend at an angle to first arm 1348 substantially in parallel with wand 144. In the second position (FIG. 109), second arm 1352 may extend substantially parallel to first arm 1348. An actuator (e.g., a button) 1358 may be provided on handle 1340 for toggle joint 1356 between an unlocked position in which second arm 1352 can move with respect to first arm 1348, and a locked position in which the position of second arm 1352 is fixed with respect to first arm 1348. Optionally, joint 1356 may be locked in a number of alternate positions. Alternately, joint 1356 may not be locked in the second bent position shown in FIG 109.

[00364] The first position (FIG. 108) may be suitable for cleaning open areas where vertical clearance is not an issue. The second position (FIG. 109) may be suitable for cleaning under furniture and the like, where wand 144 must be lowered to clear the furniture height. In the second position, the orientation of second arm 1352 may permit a user to grasp handle 1340 and lower wand 144 while conveniently standing upright.

[00365] In some embodiments, handvac 112 may include one or more front wheels 1364. Front wheel 1364 may be positioned to make rolling contact with a horizontal surface when wand 144 is lowered sufficiently. Thus, front wheel 1364 may assist with supporting the weight of handvac 112 and permit handvac 112 to roll across the horizontal surface. In the illustrated example, a front end 1360 of bottom wall 216 is provided with one or more front wheels 1364.

[00366] It will be appreciated that if rear end of assembly 140,160 is tapered as discussed previously, then assembly 140, 160 is configured to permit the vacuum cleaner to extend further under furniture than if the assembly 140,160 had the depth (front to back when in an upright storage position) as the upper end of the assembly 140, 160.

Openable Handvac Cyclone Bin Assembly

[00367] In accordance with another aspect of this disclosure, which may be used by itself or in combination with any one or more other aspects of this disclosure, the cyclone bin assembly of the handvac may be opened to empty the cyclone chamber and/or the dirt collection chamber, to access the pre-motor filter or access a door to open the cyclone chamber and/or the dirt collection chamber by moving part or all of the cyclone bin assembly relative to a main body of the handvac which include the suction motor while the parts remain connected together. For example, the parts may be pivotally mounted to each other.

[00368] Referring to FIGS. 110a and 110b, front portion 1372 of handvac 112 may be pivotally connected to rear portion 1376 of handvac 112 for pivoting between the open position shown and a closed position. In the open position, cyclone bin assembly 136 may be accessible, e.g. for emptying or cleaning.

[00369] Front portion 1372 may be pivotally connected to rear portion 1376 in any suitable fashion. In the illustrated embodiment, front portion 1372 is pivotally connected to rear portion 1376 by a hinge 1380 for rotation about a hinge axis 1384 between the open and closed positions.

[00370] In the illustrated embodiment, front portion 1372 and rear portion 1376 separate at the interface between cyclone bin assembly 136 and pre-motor filter chamber 556. For example, front portion 1372 may include cyclone bin assembly 136 except for second end wall 224, and rear portion may include pre-motor filter chamber 556 and second end wall 224 of cyclone bin assembly 136. Accordingly, in the open position, access may be provided to empty and clean dirt collection chamber 188 and cyclone chamber 184 of cyclone bin assembly 136.

[00371] Referring to FIG. 116, in some embodiments handvac 112 may include a handle assembly 300 including handle 484 and suction motor 204. As exemplified, handle assembly 300 and rear wall 1224 of pre-motor filter chamber 556 may be removable from (entirely, or pivotally connected to) pre-motor filter chamber 556 as a unit toaccess the pre-motor filters 1176 and 1180 inside pre-motor filter chamber 556, e.g. for cleaning or replacement. As shown in FIG. 117, in some embodiments, handle assembly 300 may also be removably connected to rear wall 1224. In alternative embodiments, handle assembly 300 may be permanently connected to rear wall 1224.

Openable Dirt Collection Chamber

[00372] In accordance with another aspect of this disclosure, which may be used by itself or in combination with any one or more other aspects of this disclosure, the supplemental assembly may have a top and/or bottom openable portion.

[00373] As exemplified in FIGS. 111-113, dirt collection assembly 140 is shown including an upper portion 276 in an open position. Upper portion 276 may be moveably connected to (e.g., pivotally) or removable from dirt collection assembly 140 in any suitable manner. As exemplified, upper portion 276 may be connected to dirt collection chamber 140 by a hinge 1392 for rotation about a hinge axis 1(not shown) between the open and closed positions.

[00374] Upper portion 276 may be retained in the closed position in any suitable fashion. In the illustrated example, dirt collection chamber 140 includes a latch 1400

for securing upper portion 276 in the closed position. Latch 1400 may be user operable for selectively releasing upper portion 276 for movement to the open position.

[00375] As exemplified in FIGS. 114 and 115, upright section 108 of surface cleaning apparatus 152 is shown including a cyclone bin assembly 160. Cyclone bin assembly 160 is preferably openable for accessing cyclone chamber 308 and dirt collection chamber 141, e.g. for cleaning or emptying. Preferably, an upper and/or lower portion of cyclone bin assembly 160 may be openable. In the illustrated embodiment, upright section 108 includes an upper portion 1408 and a lower portion 1412. As shown, upper portion 1408 may be moveably connected to (e.g.,pivotally connected to) or removable from lower portion 1412 for movement been a closed position (FIG. 114) and an open position (FIG. 115).

[00376] Upper portion 1408 may be pivotally connected to lower portion 1412 in any suitable manner. In the illustrated embodiment, lower portion 1412 is pivotally connected to lower portion 1412 by a hinge 1416 for rotation about a hinge axis 1420 between the closed and open positions.

[00377] Upper portion 1408 may be retained in the closed position in any suitable manner. For example, upper portion 108 may include a releasable catch for selectively securing upper portion 1408 to lower portion 1412 in the closed position.

Handvac Cyclone Bin Assembly Bypass

[00378] In accordance with another aspect of this disclosure, which may be used by itself or in combination with any one or more other aspects of this disclosure, the cyclonic air treatment member of the handvac may be bypassed when a supplemental cyclonic bin assembly is provided. This may prevent accumulation of dirt in the handvac so that the handvac may have more or all of its dirt collection capacity available when disconnected from the upright section. Alternately or in addition, a pre-motor filter of handvac 112 may be bypassed when a supplemental cyclonic bin assembly is provided. For example, the supplemental cyclonic bin

assembly may be provided with a pre-motor filter. The pre-motor filter may have a larger surface area than the pre-motor filter of handvac 112. Accordingly, by bypassing the pre-motor filter of handvac 112, the pre-motor filter of handvac 112 may only be used in an above floor cleaning mode thereby extending the useable time of the pre-motor filter of handvac 112 before cleaning or replacement may be needed.

[00379] Referring to FIGS. 99-101, handvac 112 may include a primary airflow path 1228 and a bypass airflow path 1232. As shown, primary airflow path 1228 may extend from air inlet 192 through cyclone bin assembly 136 to suction motor 204, and bypass airflow path 1232 may extend from air inlet 192 to suction motor 204 bypassing cyclone bin assembly 136. In some embodiments, bypass airflow path 1232 may extend through the pre-motor filters of pre-motor filter chamber 556, and in other embodiments, bypass airflow path 1232 may bypass pre-motor filters of pre-motor filter chamber 556. It will be appreciated that the cyclone and/or the pre-motor filter of the handvac may be bypassed. If both are bypassed, then the handvac may be used to provide some or all of the motive force to draw air through apparatus 168 but not any air treatment upstream of the suction motor.

[00380] In the illustrated embodiment, bypass airflow path 1232 is formed in part by a bypass passage 1236. Bypass passage 1236 may have an upstream end 1238 in airflow communication with handvac inlet 416, and a downstream end 1240 in airflow communication with motor inlet 1108. As exemplified by the embodiment illustrated in FIG. 101, upstream end 1238 may be formed in a sidewall of handvac nozzle 412, and downstream end 1239 may be formed in a wall of premotor filter chamber 556. In some embodiments, downstream end 1239 may direct air from bypass passage 1236 into upstream plenum 1208 for routing bypass airflow path 1228 through pre-motor filters 1176 and 1180 as shown. In alternative embodiments, downstream end 1239 may direct air from bypass passage 1236 into downstream plenum 1212 for bypassing pre-motor filters 1176 and 1180.

[00381] As exemplified, apparatus 168 may include a bypass valve 1240 for selectively opening and closing primary and bypass airflow paths 1228 and 1232. Bypass valve 1240 may be positioned in any one or more of handvac 112, wand 144, and supplemental cyclone bin assembly 160, and may take any suitable form. For example, in some embodiments bypass valve 1240 may include components parts positioned in two or more of handvac 112, wand 144, and supplemental cyclone bin assembly 108 which cooperate and interact to open and close primary and bypass airflow paths 1228 and 1232.

[00382] In the illustrated embodiment bypass valve 1240 is positioned in inlet nozzle 412 of handvac 112. Bypass valve 1240 may be movable between a first position (FIGS. 99 and 100) in which bypass airflow path 1232 is closed and primary airflow path 1228 is open, and a second position (FIG. 101) in which bypass airflow path 1232 is open and primary airflow path 1228 is closed.

[00383] As exemplified in FIGS. 99-101, bypass valve 1240 may include a wheel 1242, a door 1244, and an actuator 1246. Wheel 1242 may be rotatably connected to nozzle 412 for rotation about its center. Door 1244 may be rigidly connected to wheel 1242 for rotation as one with wheel 1242. For example, door 1244 and wheel 1242 may rotate together as a unit. As shown, door 1244 and wheel 1242 may be rotatable between a first position (FIGS. 99 and 100) in which door 1244 seals an upstream end 1238 of bypass passage 1236, and a second position (FIG. 101) in which door 1244 seals an air inlet 192 of cyclone chamber 184.

[00384] As exemplified, actuator 1246 may include an upper end 1248 connected to wheel 1242 radially outboard of the center of wheel 1242. Actuator 1246 may be movable vertically between a lowered position (FIGS. 99 and 100), and a raised position (FIG. 101). As shown, moving actuator 1246 from the lowered position to the raised position may rotate wheel 1242 and door 1244 clockwise which may move door 1244 to the second position (FIG. 101) in which door 1244 seals air inlet 192 of cyclone chamber 184. Further, moving actuator 1246 from the raised

position to the lowered may rotate wheel 1242 and door 1244 counter clockwise which may move door 1244 to the first position (FIGS. 99 and 100) in which door 1244 seals upstream end 1238 of bypass passage 1236.

[00385] In some embodiments, actuator 1246 may be biased to the lowered position (FIGS. 99 and 100). Consequently, door 1244 and wheel 1242 may be biased to the first position (FIGS. 99 and 100) in which door 1244 seals an upstream end 1238 of bypass passage 1236. Actuator 1246 may be biased in any suitable fashion, such as by a linear coil spring 1250. In alternative embodiments, wheel 1242 may be biased clockwise in a suitable manner, such as by a torsional spring.

[00386] Actuator 1246 may have a lower end 1252 which extends outside of the airflow path. Lower end 1252 may be acted upon to move actuator 1246 vertically from the lowered position to the raised position for opening bypass airflow path 1232 and closing primary airflow path 1228. As shown, when handvac 112 is disconnected from wand 144 (FIG. 99), bypass valve 1240 may close the bypass airflow path 1232 (e.g. under the bias of spring 1250). Further, when handvac 112 is connected to wand 144 without supplemental cyclone bin assembly 160 (FIG. 100), bypass valve 120 may also close the bypass airflow path 1232. In each of these cases, the air entering handvac 112 is directed through handvac cyclone bin assembly 136 to separate dirt from the airflow. This may permit handvac 112 to operate when disconnected from supplemental cyclone bin assembly 160.

[00387] As shown in FIG. 101, when handvac 112 and cyclone bin assembly 160 are both connected to wand 144, an upper end 1254 of cyclone bin assembly 160 (handle 1254 in the illustrated example) may push against actuator lower end 1252 thereby moving actuator 1246 upwardly. This may rotate wheel 1242 and door 1244 counter clockwise, opening bypass airflow path 1232 and closing primary airflow path 1228. As shown, air exiting cyclone bin assembly 160 may travel through bypass airflow path 1232 toward suction motor 204 bypassing cyclone chamber 184. This may permit supplemental cyclone bin assembly 160 to separate

and collect dirt from the airflow path instead of handvac cyclone bin assembly 136. In turn, this may inhibit dirt accumulation in handvac dirt collection chamber 188, which may help to maximize the available dirt collection capacity of handvac dirt collection chamber 188 when the user chooses to disconnect cyclone bin assembly 160.

[00388] In the illustrated example, lower end 1252 is sloped. This may permit supplemental bin assembly 160 to be toed into wand 144 and then rotated horizontally towards wand 144 to complete the connection with wand 144, whereby the upper end 1254 of supplemental bin assembly 160 may ride the slope of lower end 1252 to push actuator 1246 upwardly.

[00389] Accordingly, bypass valve 1240 may be actuated to reconfigure the airflow path through handvac 112 automatically upon connecting and disconnecting supplemental bin assembly 160 from airflow communication with handvac 112. For example, bypass valve 1240 may be biased to close bypass airflow path 1232 whenever handvac 112 is not in airflow communication with supplemental bin assembly 160 so that the air treatment member of handvac 112 may separate dirt from the airflow. Similarly, bypass valve 1240 may be configured to open bypass airflow path 1232 and close primary airflow path 1228 whenever handvac 112 is in airflow communication with supplemental bin assembly 160 so that the air treatment member of handvac 112 does not separate and store dirt from the airflow.

[00390] The following is a description of numerous embodiments of surface cleaning apparatus 168. In the figures associated with some embodiments, a bypass valve 1232 and/or a diversion valve 712 may be represented schematically. It will be appreciated that the embodiments may be practiced using the bypass valves 1232 and/or diversion valves 712 described above, or other suitable valves.

[00391] Referring to FIG. 102, in some embodiments supplemental cyclone bin assembly 160 may include one or more pre-motor filters 1256 (herein after referred to as pre-motor filter 1256 in the singular) positioned in the airflow path. Preferably,

pre-motor filter 1256 is positioned downstream of cyclone chamber 308. As shown, pre-motor filter 1256 may be positioned between cyclone chamber air outlet 320 and outlet passage 476.

[00392] In some embodiments, pre-motor filter 1256 may separate fine dirt particles from the airflow in substitution for the pre-motor filters 1176 and 1180 of handvac 112. As shown, bypass valve 1232 may divert air from supplemental cyclone bin assembly 160 into a bypass airflow path which bypasses handvac cyclone bin assembly 136 and pre-motor filters 1176 and 1180. For example, downstream end of 1239 of bypass passage 1236 may direct the bypass airflow path 1232 to downstream plenum 1212 for bypassing pre-motor filters 1176 and 1180.

[00393] It will be appreciated that a pre-motor filter will have a certain filtering capacity of fine particles at which point the filter should be cleaned or replaced. By incorporating a pre-motor filter into the supplemental cyclone bin assembly 160, and using this filter whenever the supplemental cyclone bin assembly 160 is connected to the handvac, the filtering capacity of the handvac pre-motor filters may be preserved. This may permit extended use of the handvac pre-motor filters before they require cleaning or replacement.

[00394] It will also be appreciated that there will be a measurable pressure drop across a pre-motor filter placed in an airflow path. If positioned in series, too many filters may produce a pressure drop that materially reduces air flow at the dirty air inlet. By filtering the airflow alternately by the supplemental pre-motor filter 1256 and by the handvac pre-motor filter when the handvac is used without assembly 140, 160 attached the operational life of the handvac pre-motor filter may be extended.

[00395] As exemplified in the alternate embodiment of FIG. 103, surface cleaning head 104 may include a second suction motor 1258. Second suction motor 1258 may operate in parallel with or alternately instead of handvac suction motor 204 when handvac 112 is attached in flow communication with surface cleaning head 104. For example, a portion of air exiting supplemental cyclone bin assembly 160

may proceed to handvac suction motor 204 and a different portion may proceed to second suction motor 1258. In the illustrated embodiment, a second airflow path 1260 from diversion valve 712 to second suction motor 1258 is formed by an airflow conduit 1262 which connects diversion valve 712 to surface cleaning head 104.

[00396] As shown, when supplemental cyclone bin assembly 160 is in airflow communication with handvac 112, the airflow path extends through the air treatment member(s) of supplemental cyclone bin assembly 160 (e.g. cyclone chamber 308 and pre-motor filter 1256) and then divides into two parallel air flow paths 1232 and 1260. Bypass airflow path 1232 directs one portion of the airflow to the handvac suction motor 204 bypassing handvac cyclone chamber 184 (and optionally bypassing handvac pre-motor filters 1176 and 1180), and second airflow path 1260 directs a second portion of the airflow path to the second suction motor 1258 in head 104.

[00397] It will be appreciated that suction motors 1258 and 204 operating in parallel may generate greater suction at surface cleaning head 104 than any one of suction motors 1258 and 204 may generate operating alone. This may also permit supplemental cyclone bin 160 to include a pre-motor filter 1256 having greater surface area than the pre-motor filter of the handvac, where the additional pressure drop due to the use of two pre-motor filters may be compensated for by the enhanced suction generation of the parallel motors 1258 and 204.

[00398] As exemplified in the alternate embodiment of FIG. 104a, supplemental suction motor 160 may include a second suction motor 1258 which may operate in the same way as the embodiment of FIG 103. Second suction motor 1258 may operate in parallel with handvac suction motor 204. For example, a portion of air exiting supplemental cyclone chamber 160 may proceed to handvac suction motor 204 and a different portion may proceed to second suction motor 1258. In the illustrated embodiment, a second airflow path 1260 from outlet passage 478 to second suction motor 1258 is formed by an airflow conduit 1262.

[00399] As shown, when supplemental cyclone bin assembly 160 is in airflow communication with handvac 112, the airflow path extends through the air treatment member(s) of supplemental cyclone bin assembly 160 (e.g. cyclone chamber 308 and pre-motor filter 1256) and then divides into two parallel air flow paths 1232 and 1260. Bypass airflow path 1232 directs one portion of the airflow to the handvac suction motor 204 bypassing handvac cyclone chamber 184 (and optionally bypassing handvac pre-motor filters 1176 and 1180), and second airflow path 1260 directs a second portion of the airflow path to the second suction motor 1258.

[00400] As shown, second suction motor 1258 may be positioned below dirt collection chamber 140 and cyclone chamber 308 of supplemental cyclone bin assembly 160, and second suction motor 1258 may be vertically aligned above surface cleaning head 104. This may help to lower the center of gravity of the apparatus 168 for enhanced stability against tipping.

[00401] In some embodiments, a pre-motor filter may be positioned in each of bypass airflow path 1232 and second airflow path 1260, as shown. For example, a pre-motor filter 1256 may be positioned in the second airflow path 1260 between outlet passage 478 and second suction motor 1258, and bypass airflow path 1232 may direct the airflow through handvac pre-motor filters 1176 and 1180. In the illustrated embodiment, pre-motor filter 1256 is shown positioned below dirt collection chamber 140 of supplemental cyclone bin assembly 160.

[00402] In alternative embodiments, air exiting cyclone chamber 308 may pass through a common pre-motor filter before dividing between the second airflow path 1260 and bypass airflow path 1232. For example, in FIG. 104b pre-motor filter 1256 is shown positioned downstream of cyclone chamber 308 and upstream of outlet passage 478. As shown, bypass airflow path 1232 may bypass handvac pre-motor filters 1176 and 1180. This may permit the filtration capacity of handvac pre-motor filters 1176 and 1180 to be preserved for use when supplemental cyclone bin assembly 160 is disconnected from airflow communication with handvac 112. In

alternative embodiments, pre-motor filters 1176 and 1180 may be positioned in the bypass airflow path 1232.

[00403] As exemplified in FIG. 105a dirt collection chamber 140 and cyclone chamber 308 may be removable as a sealed unit from wand 144 and second suction motor 1258. For example, second suction motor 1258 may be mounted or removably mounted to wand 144 so that dirt collection chamber 140 and cyclone chamber 308 may be removed while second suction motor 1258 remains mounted to wand 144. This may permit cleaning and/or emptying of dirt collection chamber 140 and cyclone chamber 308 (e.g. carrying the same to a garbage bin to dump their contents) without having to carry second suction motor 1258 (which may have a non-trivial weight). Also, assembly 160 may be removable as a unit to convert the apparatus to a lightweight or above floor operating mode.

[00404] As exemplified in FIG. 118, the air treatment members of handvac 112 and supplementary cyclone bin assembly 160 may operate in parallel. For example, handvac 112 and supplementary cyclone bin assembly 160 may separate dirt from mutually exclusive portions of the airflow entering dirty air inlet 124.

[00405] In the illustrated example, wand 144 may define two airflow paths. A first airflow path 1428 may be formed by a first division of wand 144 and may direct airflow moving therein to supplemental cyclone bin assembly 160 for cleaning, and then from supplemental cyclone bin assembly 160 to bypass airflow path 1232 of handvac 112. A second airflow path 1432 may be formed by a second division of wand 144 and may direct airflow moving therein to primary airflow path 1228 of handvac 112 for cleaning by cyclone bin assembly 136.

[00406] As exemplified, dirty air entering dirty air inlet 124 may divide into two airflows at wand upstream end 360 and then travel through the first and second airflow paths 1428 and 1432. Dirt may be separated from each airflow stream by a different one of supplementary cyclone bin assembly 160 and handvac 112. In the illustrated embodiment, the two airflows may recombine in pre-motor filter chamber

556. For example, the two airflows may recombine at the upstream plenum 1208 so that both airflows pass through pre-motor filters 1176 and 1180 before exiting through suction motor 204. In alternative embodiments, the two airflows may recombine at the downstream plenum 1212. For example, supplemental cyclone bin assembly 160 may have its own pre-motor filter for filtering the air of the first airflow path 1428.

[00407] In some embodiments, surface cleaning apparatus 168 may include two or more suction motors operating in series. In one aspect, this may enhance the suction at dirty air inlet 124 and/or compensate for suction loss from additional or higher efficiency air treatment members.

[00408] Referring to FIGS. 119a and 119b, a second suction motor 1258 may be positioned in the airflow path between dirty air inlet 124 and handvac 112. For example, second suction motor 1258 may be a dirty air suction motor positioned in surface cleaning head 104. As shown, dirty air entering dirty air inlet 124 may be drawn through second suction motor 1258 before the airflow is cleaned by supplemental dirt collection chamber 160 and/or handvac 112 and discharged through handvac suction motor 204.

[00409] Referring to FIG. 120, second suction motor 1258 may be a clean air motor positioned downstream of handvac suction motor 204. As exemplified, motor outlet 1112 of handvac suction motor 204 may be fluidly connected to second suction motor 1258 in surface cleaning head 104 by an airflow path 1436. As shown, airflow path 1436 may be formed by a conduit 1440.

[00410] Referring to FIG. 121a, in some embodiments second suction motor 1258 may be positioned in supplementary cyclone bin assembly 160. For example, second suction motor 1258 may be positioned below dirt collection chamber 140. As shown, airflow path 1436 from motor outlet 1112 may direct air from suction motor 204 to second suction motor 1258 in supplementary cyclone bin assembly 160. For example, conduit 1440 may extend from motor outlet 1112 to second suction motor

1258. Conduit 1440 may take any suitable form. For example, conduit 1440 may be a rigid conduit as shown. Alternatively, FIG. 121b shows an embodiment where conduit 1440 is a flexible hose.

[00411] In some embodiments, when handvac is connected with supplement cyclone bin assembly 160, handvac 112 may not be positioned in the airflow path through the surface cleaning apparatus. For example, air entering the dirty air inlet 124 of the surface cleaning head may be cleaned by the supplementary cyclone bin assembly 160 and discharged without ever passing through handvac 112. In this way, handvac 112 may act as a handgrip for manipulating and steering surface cleaning apparatus 168 in the upright mode but not as an air cleaning implement.

[00412] In some embodiment, as exemplified in FIG. 122, , the handvac may be bypassed when assembly 160 is attached to upright section 108. As exemplified, air entering dirt air inlet 124 may move through wand 144 to supplemental cyclone bin assembly 160 and be discharged without moving through handvac 112. For example, the airflow path through surface cleaning apparatus 168 may direct all air from dirty air inlet 124 through wand 144 to cyclone chamber 308 to outlet passage 476 to second airflow path 1260 to suction motor 1258 of supplemental cyclone bin assembly 160, which may discharge the air to the outside environment.

[00413] Still referring to FIG. 122, in some embodiments there may be a plurality of suction motors in series. In the illustrated embodiment, surface cleaning head 104 includes a suction motor 1258 positioned in the airflow path between dirty air inlet 124 and wand 144. In alternative embodiments, suction motor 1258 may be the only suction motor in the airflow path.

[00414] While the above description provides examples of the embodiments, it will be appreciated that some features and/or functions of the described embodiments are susceptible to modification without departing from the spirit and principles of operation of the described embodiments. Accordingly, what has been described above has been intended to be illustrative of the invention and non-limiting

and it will be understood by persons skilled in the art that other variants and modifications may be made without departing from the scope of the invention as defined in the claims appended hereto. The scope of the claims should not be limited by the preferred embodiments and examples, but should be given the broadest interpretation consistent with the description as a whole.

CLAIMS:

1. A surface cleaning apparatus comprising:

(a) a surface cleaning head having a front end, a rear end, a dirt air inlet and a cleaning head air outlet;

(b) a rigid air flow conduit having a rigid wand inlet end having an air inlet in communicable with the cleaning head air outlet, a rigid wand outlet end and a longitudinally extending conduit axis, the rigid air flow conduit is moveably mountable to the surface cleaning head between an upper position and an in-use floor cleaning position in which the rigid air flow conduit extends at an angle to the vertical, the rigid wand outlet end having an air outlet; and,

(c) a hand vacuum cleaner removably mountable to the rigid wand outlet end, the hand vacuum cleaner having a front end, a rear end, an upper end, a lower end and a hand vacuum cleaner air inlet, the hand vacuum cleaner comprising:

(i) a main body comprising a handle and a suction motor and fan assembly, the suction motor and fan assembly having a suction motor axis of rotation, the handle having a hand grip portion, a first handle portion and a second handle portion, the first handle portion is mounted to the main body rearward of the suction motor and fan assembly;

(ii) a first cyclonic stage provided at the front end of the hand vacuum cleaner, the first cyclonic stage having a front end, a rear end and a cyclone axis of rotation extends between the front and rear ends of the first cyclonic stage; and,

(iii) a second cyclonic stage having a front end, a rear end and at least one second stage cyclone having a cyclone axis of rotation that extends between the front and rear ends of the second cyclonic stage and the

rear end of the second cyclonic stage is rearward of the rear end of the first cyclonic stage,

wherein the suction motor is positioned rearward of the first cyclonic stage, and

wherein, when the hand vacuum cleaner is mounted to the rigid wand outlet end, handle is drivingly connected to the surface cleaning head.

2. The surface cleaning apparatus of claim 1 wherein the suction motor and fan assembly axis of rotation intersects the handle.

3. The surface cleaning apparatus of claim 1 further comprising a finger receiving area positioned between the handle and the main body and a first portion of the finger receiving area is positioned rearward of the suction motor.

4. The surface cleaning apparatus of claim 3 wherein a second portion of the finger receiving area is positioned above an upper end of the main body.

5. The surface cleaning apparatus of claim 3 wherein the suction motor and fan assembly axis of rotation intersects the handle.

6. The surface cleaning apparatus of claim 5 wherein when the hand vacuum cleaner is oriented such that the cyclone axis of rotation extends horizontally and the upper end of the hand vacuum cleaner above the lower end of the hand vacuum cleaner, the second handle portion is positioned above the suction motor.

7. The surface cleaning apparatus of claim 1 wherein when the hand vacuum cleaner is oriented such that the cyclone axis of rotation extends horizontally and the upper end of the hand vacuum cleaner above the lower end of the hand vacuum cleaner, the second handle portion is positioned above the suction motor.

8. The surface cleaning apparatus of claim 6 wherein the first portion of the handle is mounted to a rear end of the main body.

9. The surface cleaning apparatus of claim 1 wherein the first portion of the handle is mounted to a rear end of the main body.

10. The surface cleaning apparatus of claim 1 wherein the handle is also attached to a sidewall of the main body.

11. The surface cleaning apparatus of claim 1 wherein handle is attached to the main body at two locations.

12. The surface cleaning apparatus of claim 1 wherein the rigid wand outlet end has an outlet end electrical connector, the hand vacuum cleaner further comprises a hand vacuum cleaner electrical connector provided adjacent the hand vacuum cleaner air inlet, and the hand vacuum cleaner electrical connector is releaseably engageable with the outlet end electrical connector.

13. The surface cleaning apparatus of claim 1 wherein when the hand vacuum cleaner is mounted to the rigid wand outlet end, the longitudinally extending conduit axis extends in a same direction as the suction motor axis of rotation.

14. The surface cleaning apparatus of claim 1 wherein the front end of the second cyclonic stage is rearward of the rear end of the first cyclonic stage.

15. The surface cleaning apparatus of claim 1 wherein the front face has the hand vacuum cleaner air inlet.

ABSTRACT

A surface cleaning apparatus comprises a hand vacuum cleaner, a surface cleaning head and a rigid air flow conduit. The hand vacuum cleaner has a main body housing dual cyclonic cleaning stages and a suction motor and fan assembly.

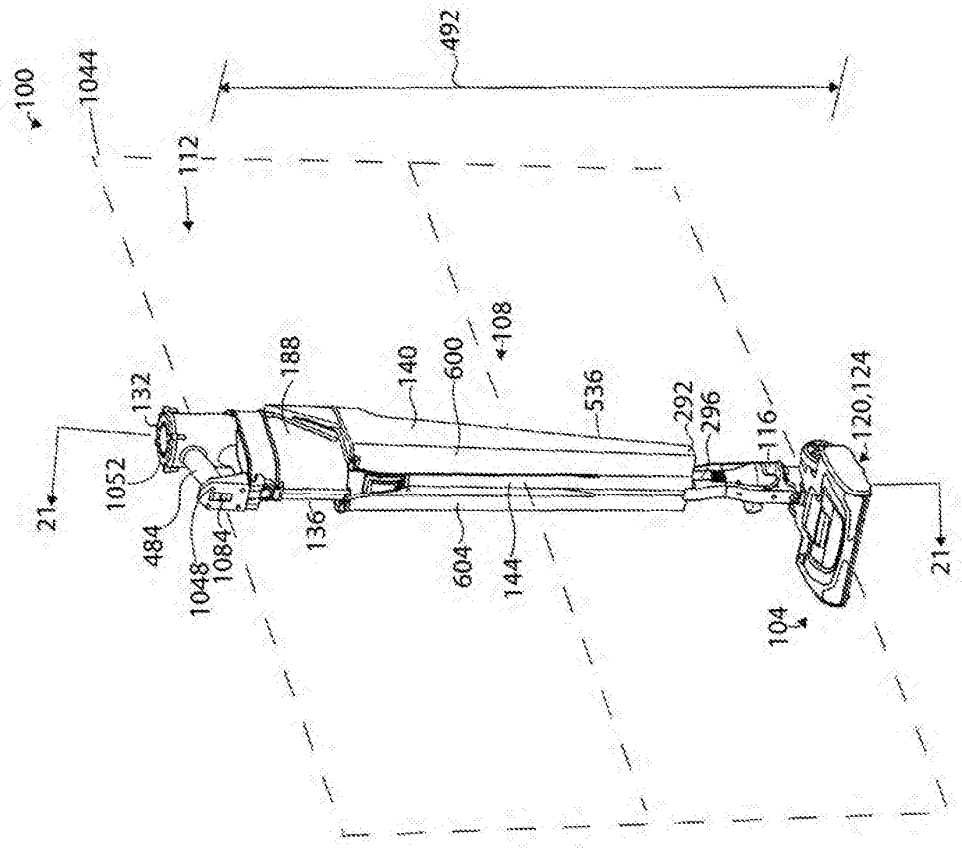

100
1044
492
112
108
188
140
600
536
292
296
116
120,124
132
1052
21
484
1048
1084
136
604
144
104
21

FIG. 1

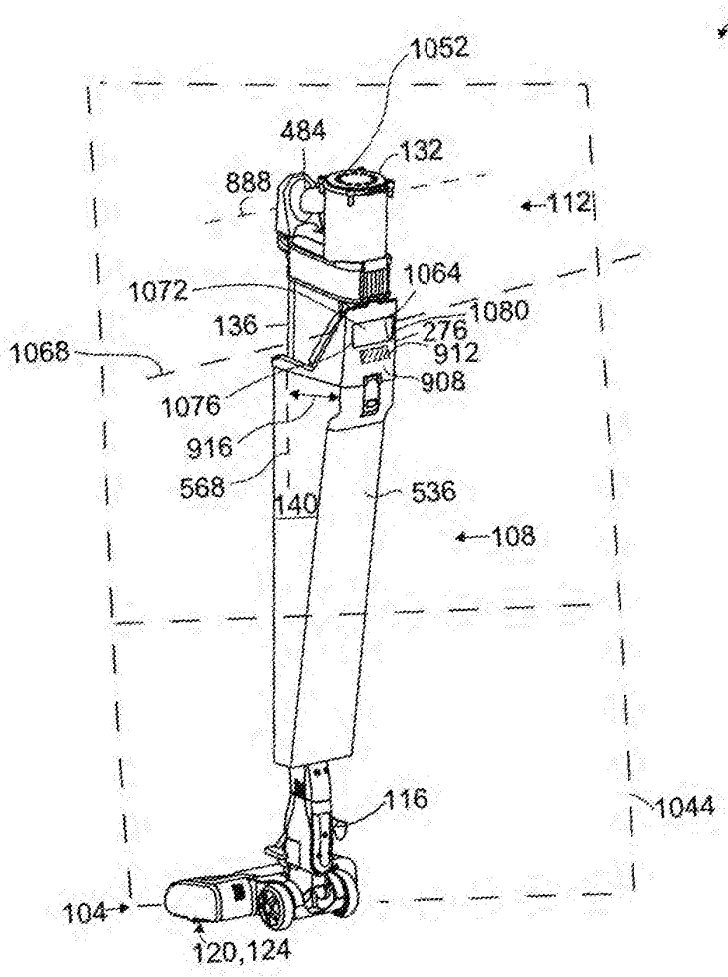


FIG. 2

Dyson Ex1004
Page 105

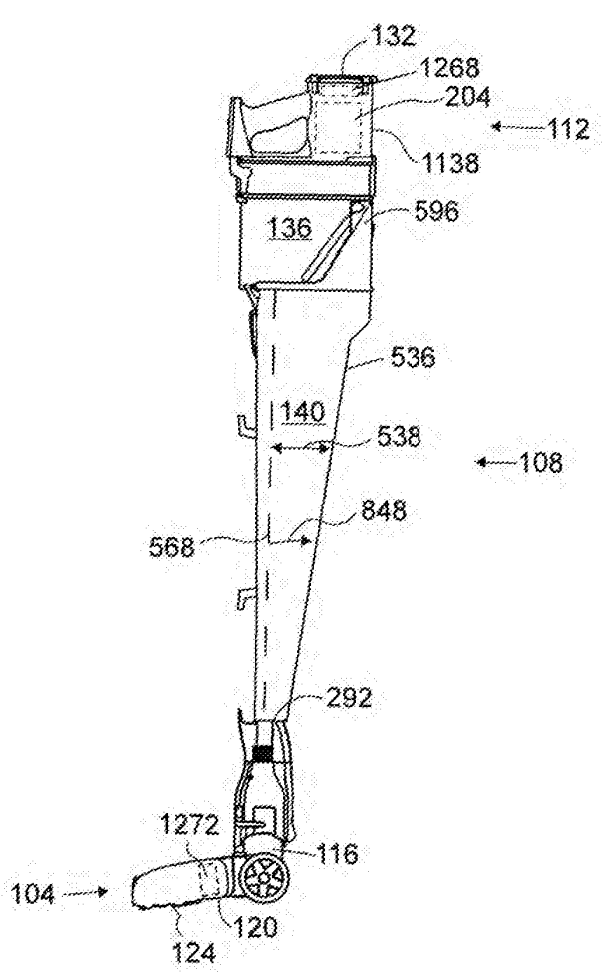


FIG. 3

Dyson Ex1004
Page 106

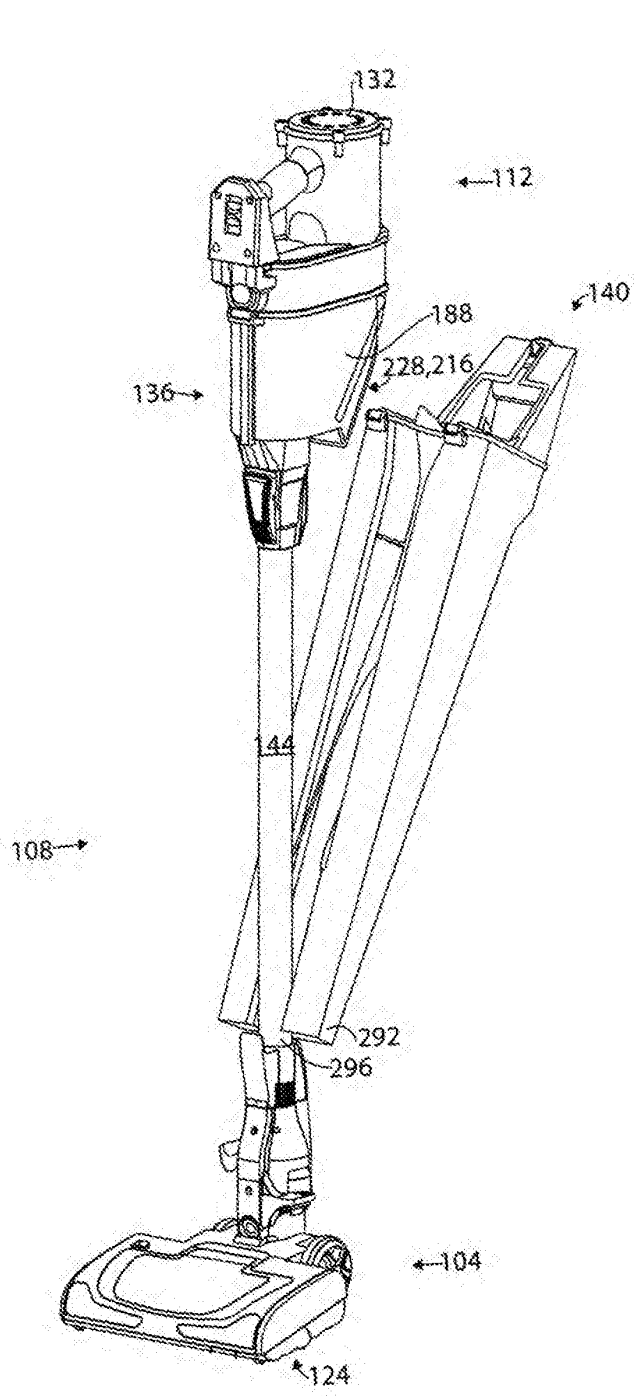


FIG. 4

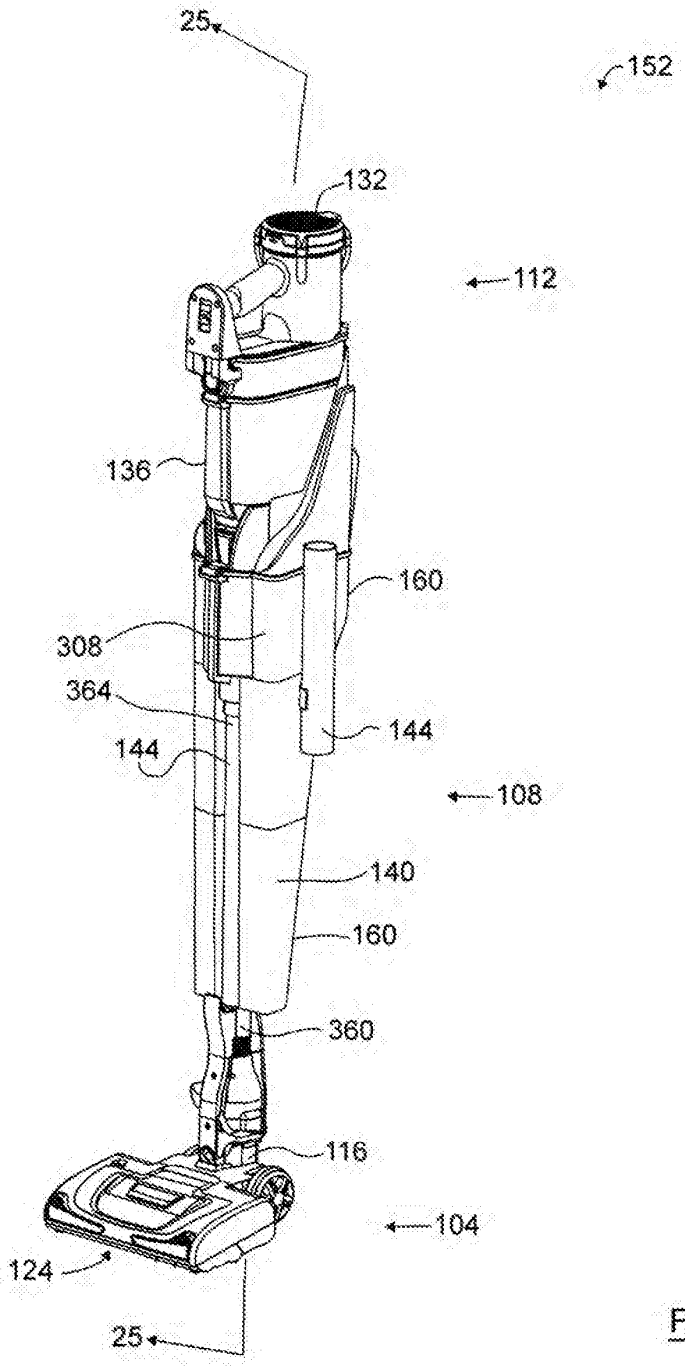

25
152
132
112
136
160
308
364
144
144
108
140
160
360
116
104
124
25

FIG. 5

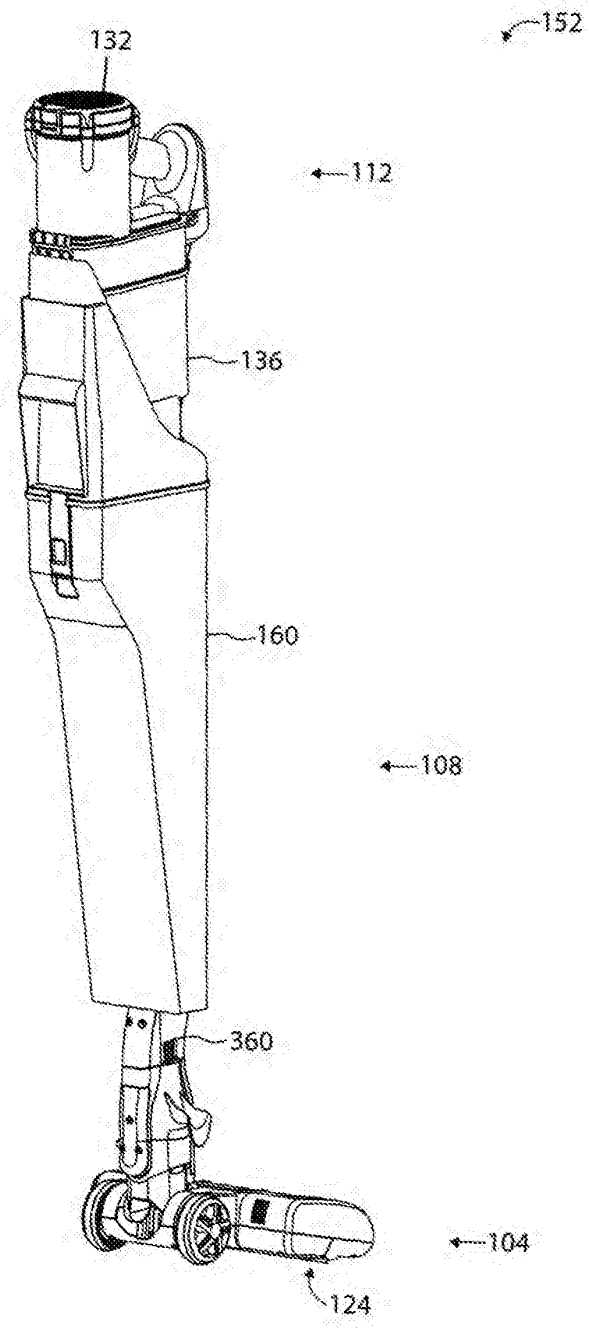


FIG. 6

FIG. 7

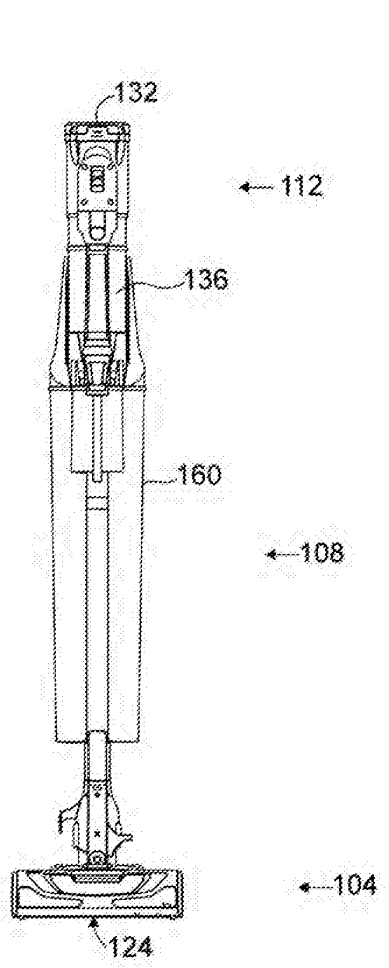


FIG. 8

Dyson Ex1004
Page 111

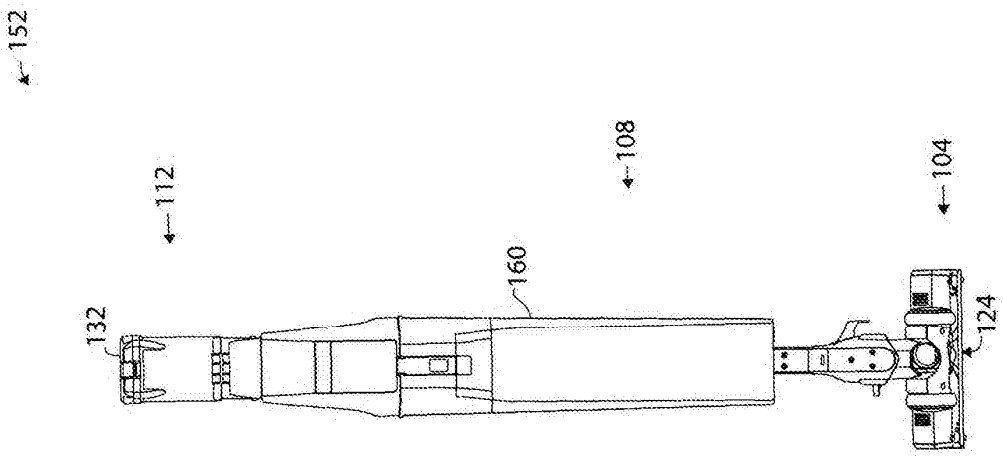


FIG. 9

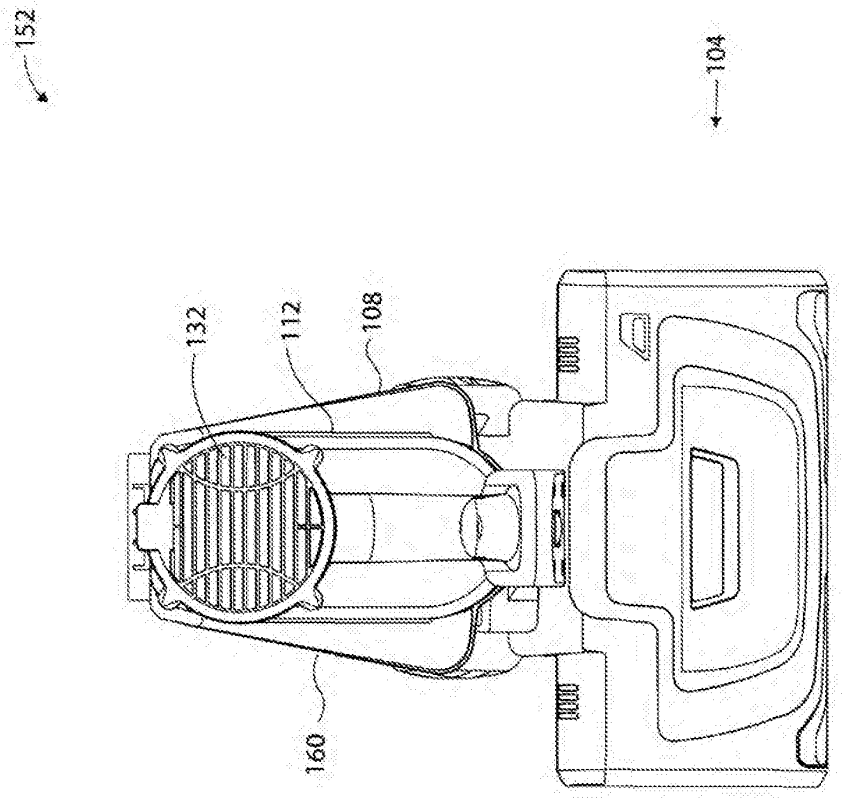


FIG. 10

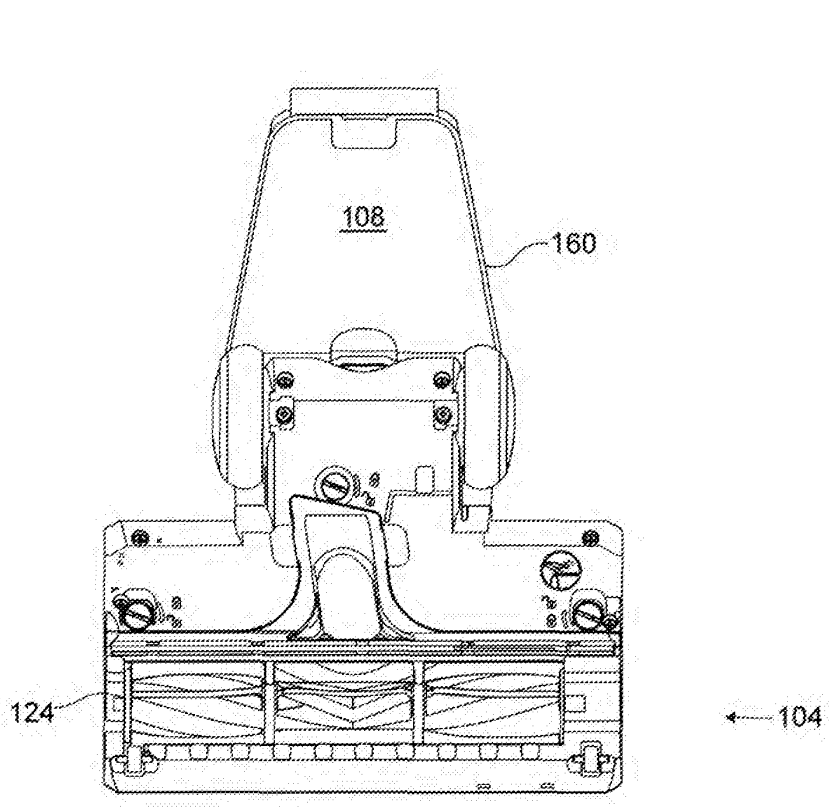


FIG. 11

Dyson Ex1004
Page 114

FIG. 12

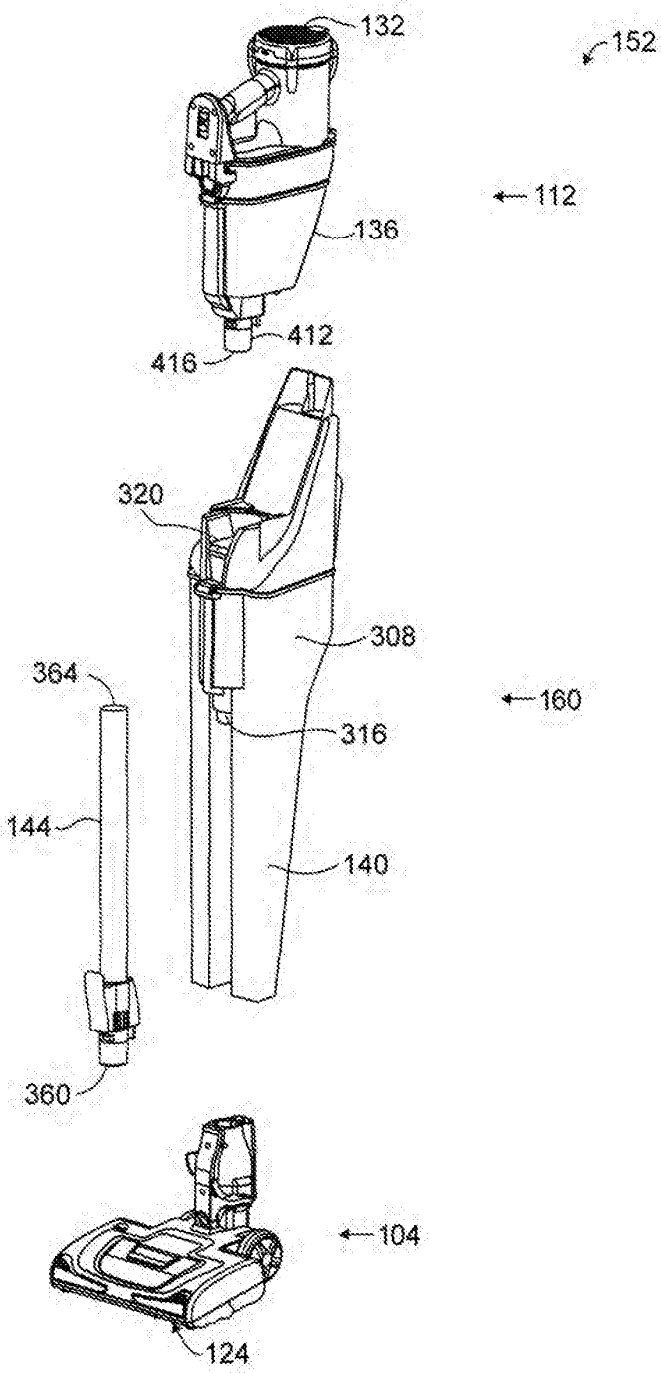


FIG 12a

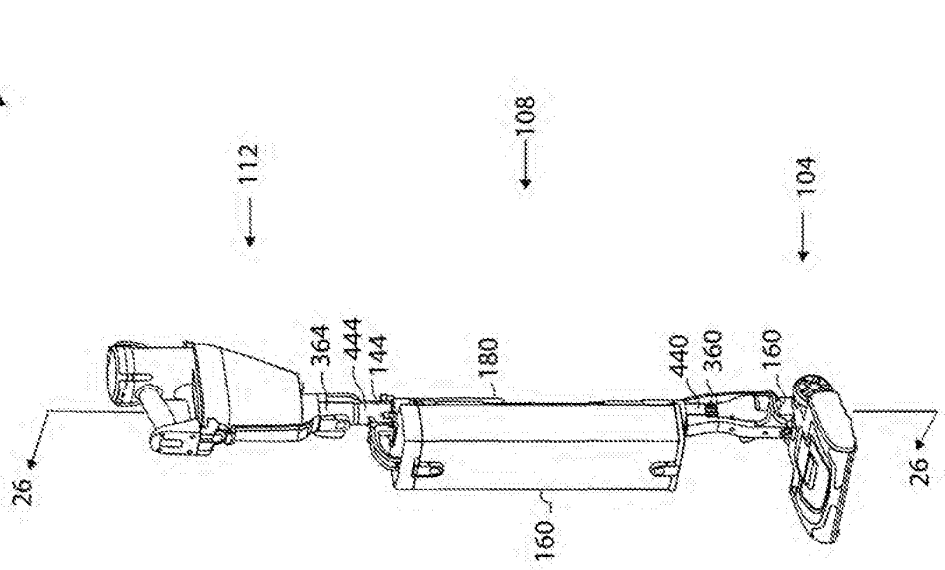


FIG. 13

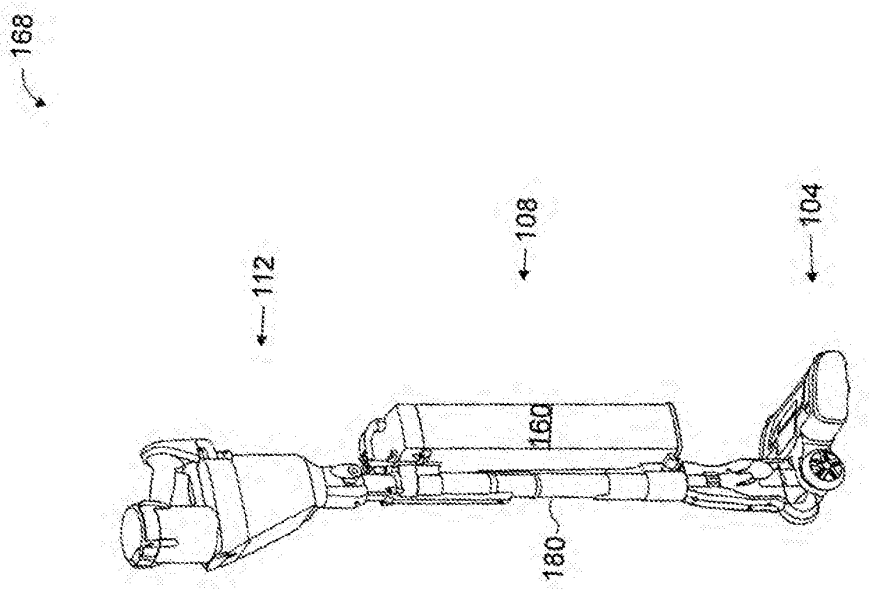


FIG. 14

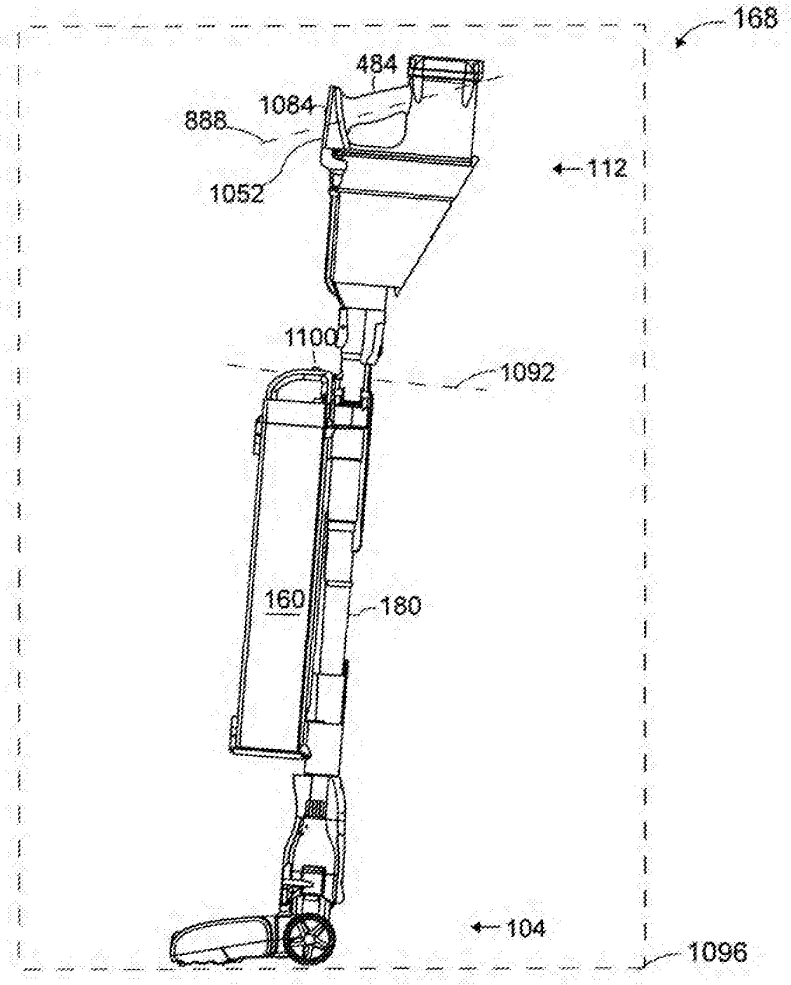


FIG. 15

Dyson Ex1004
Page 119

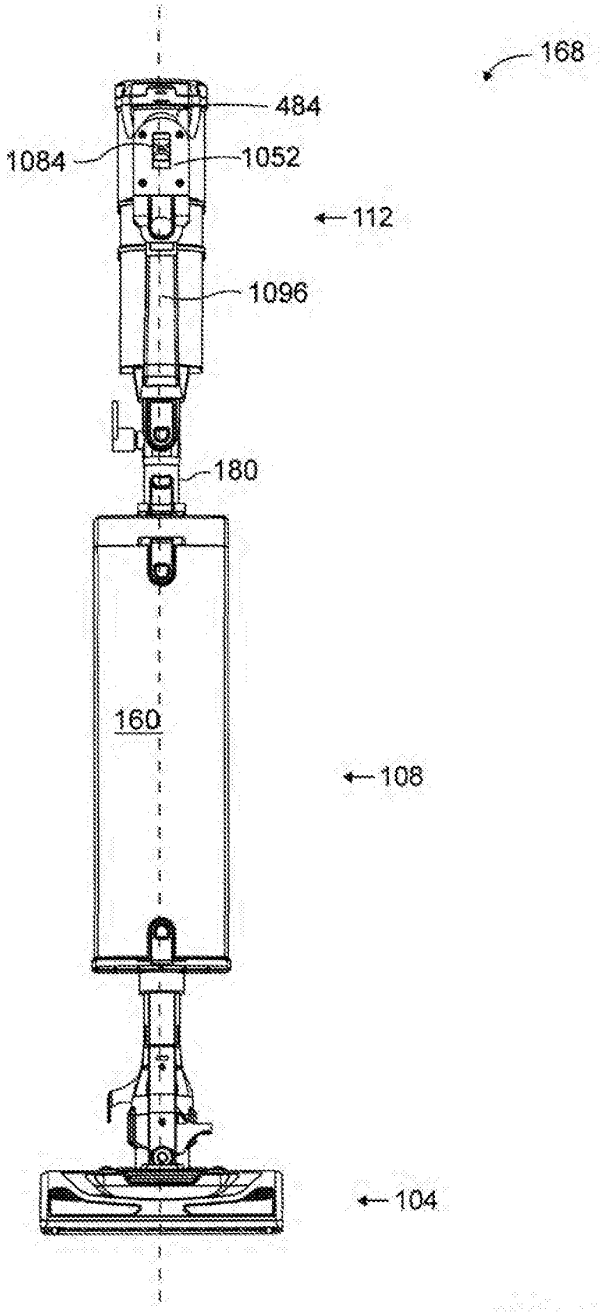


FIG. 16

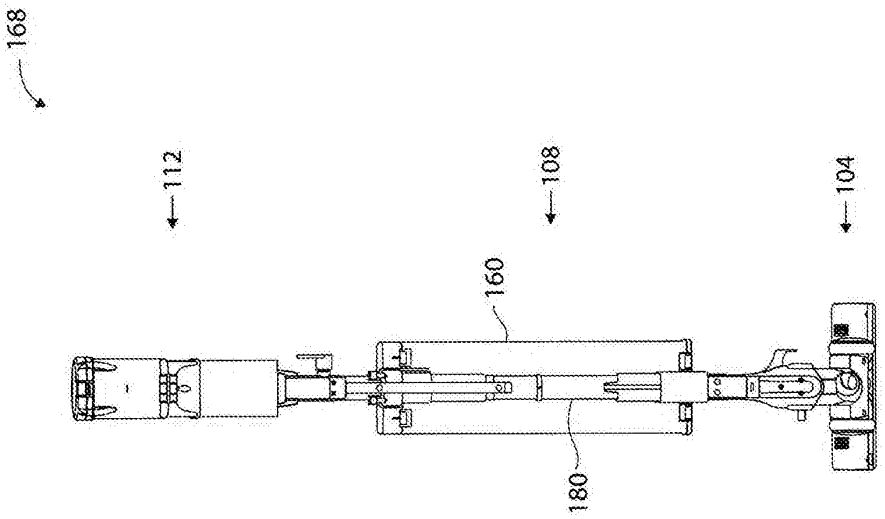


FIG. 17

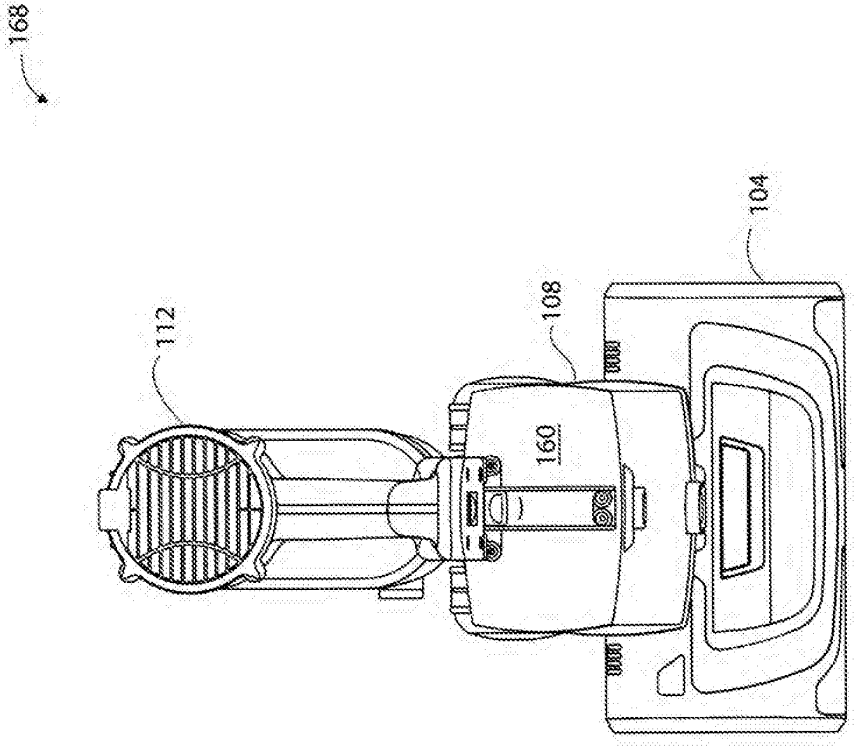


FIG. 18

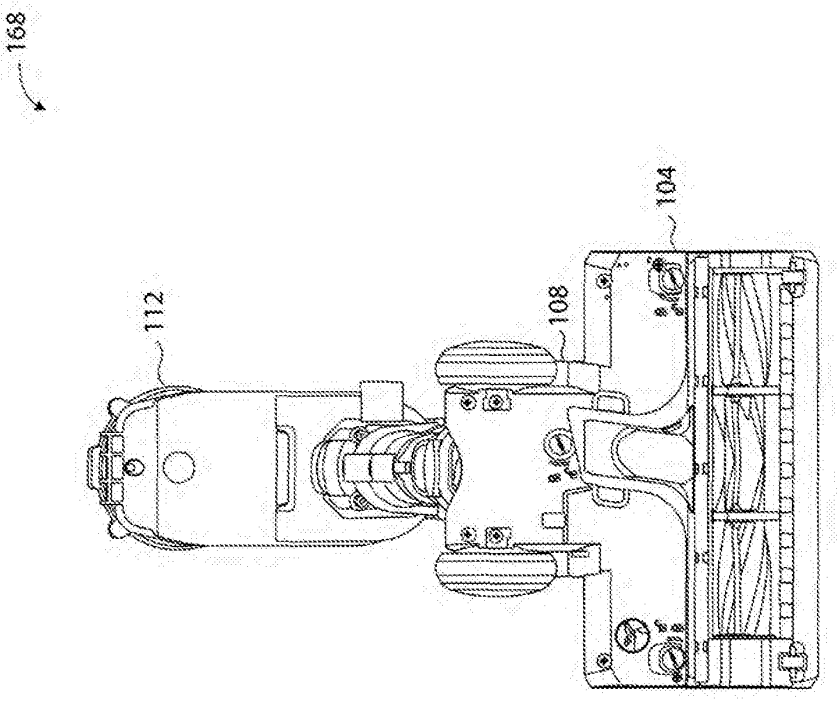


FIG. 19

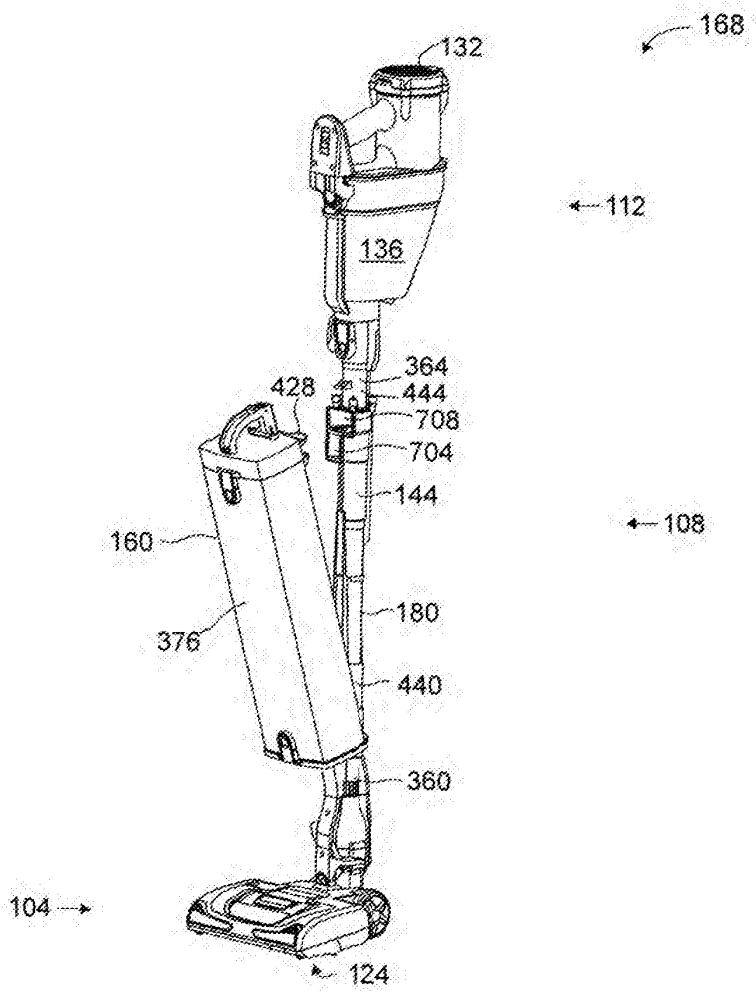


FIG. 20

Dyson Ex1004
Page 124

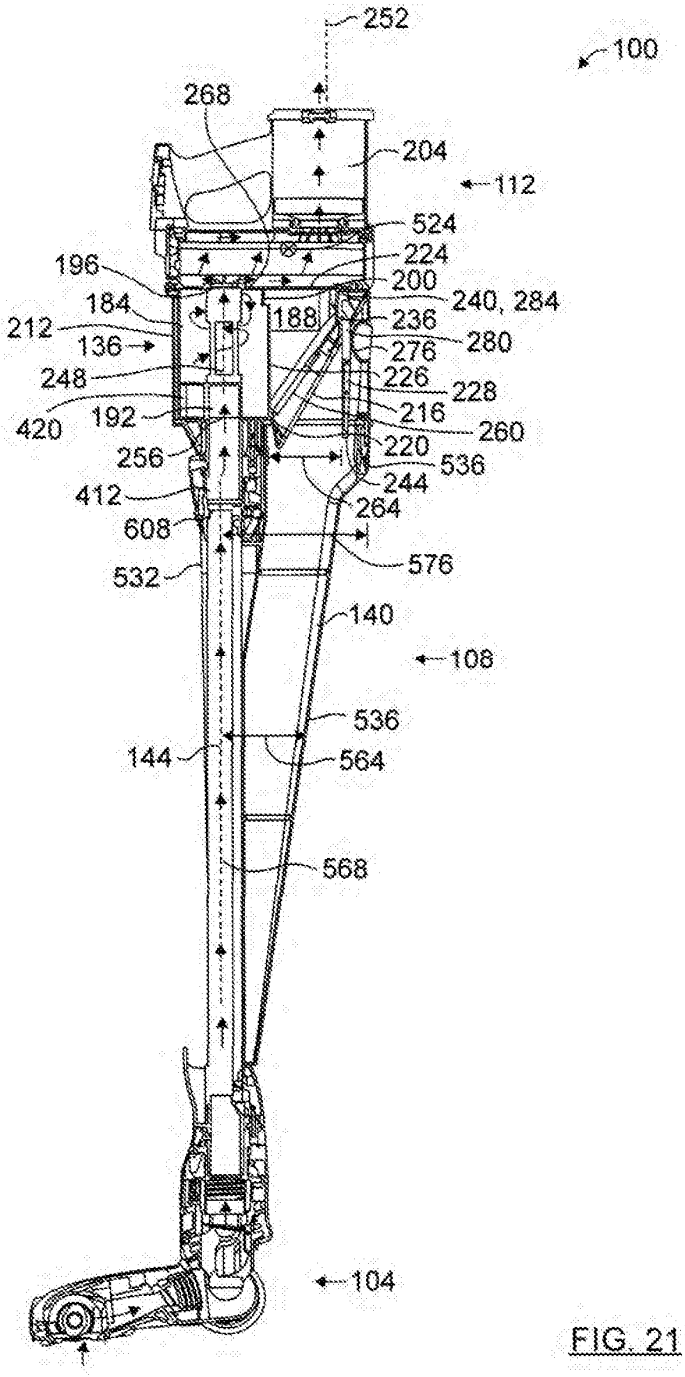

252
100
268
204
112
524
224
196
200
240, 284
184
188
236
212
136
276
280
248
226
228
216
420
192
260
220
256
536
244
412
264
608
576
532
140
108
536
144
564
568
104

FIG. 21

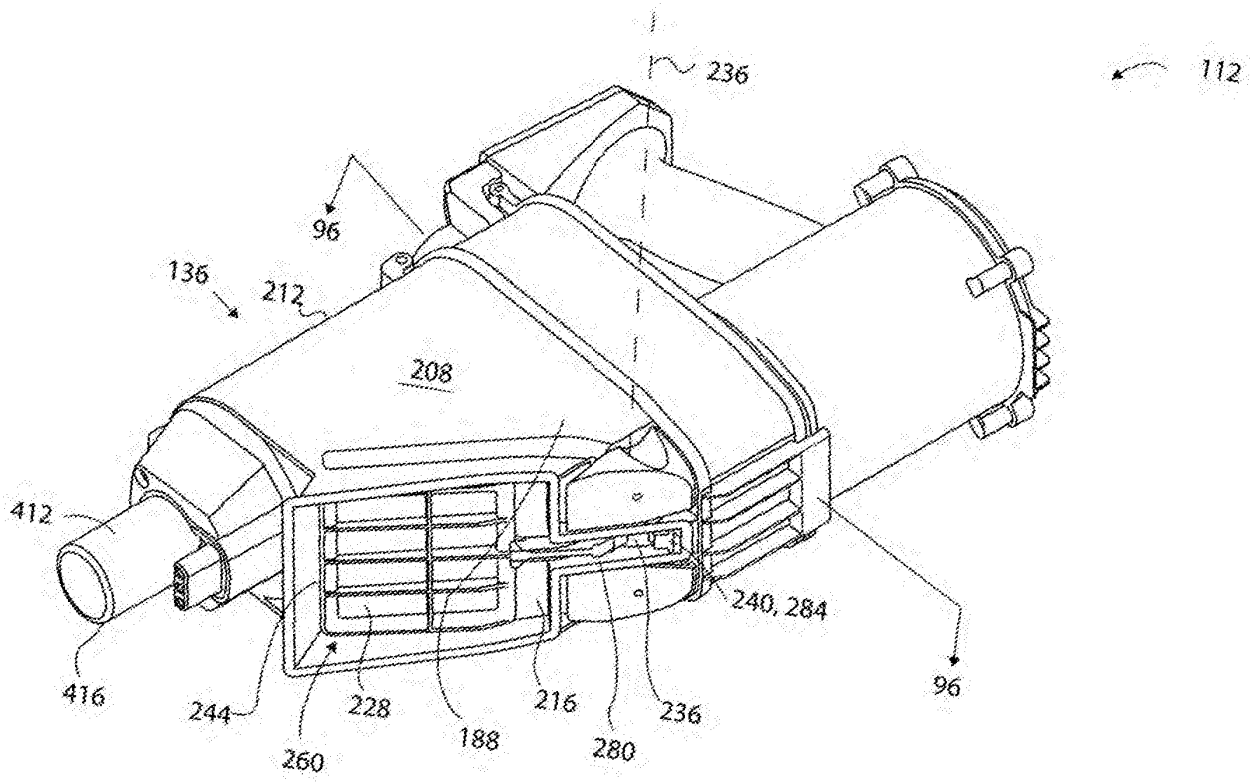


FIG. 22

Dyson Ex1004
Page 126

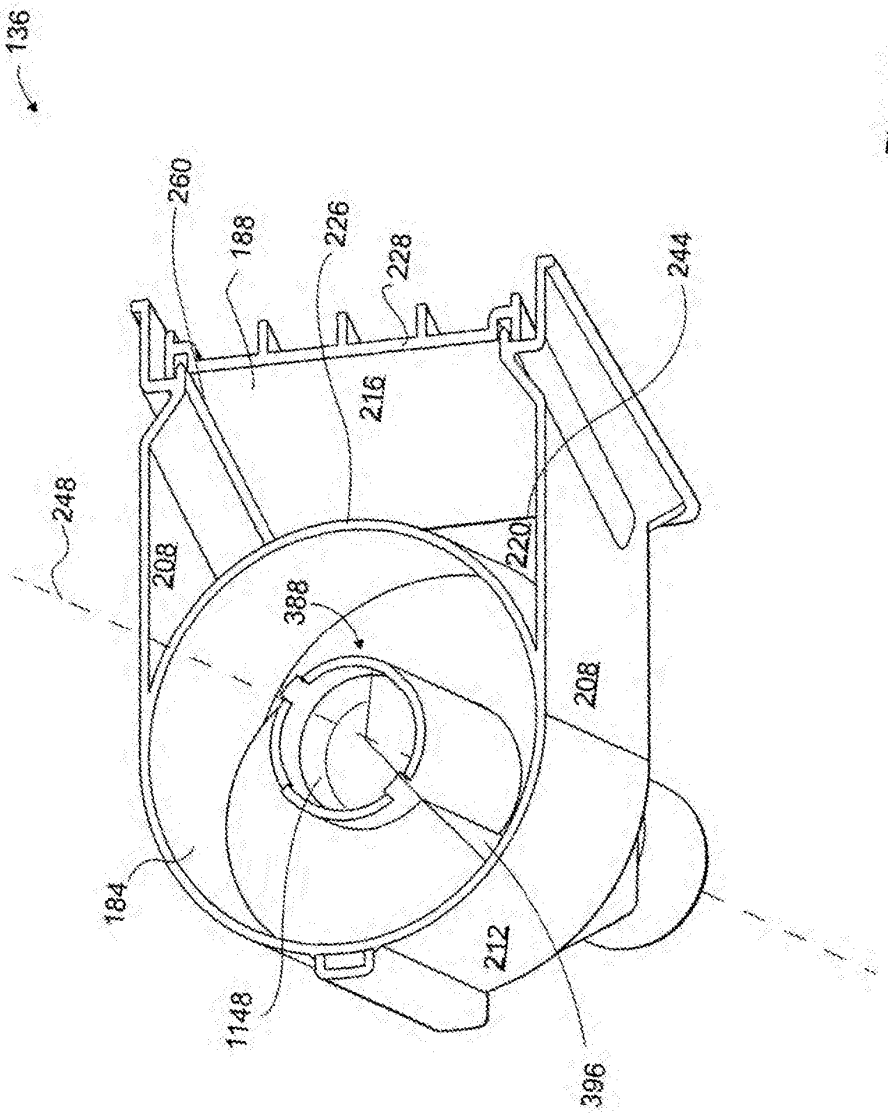


FIG. 23

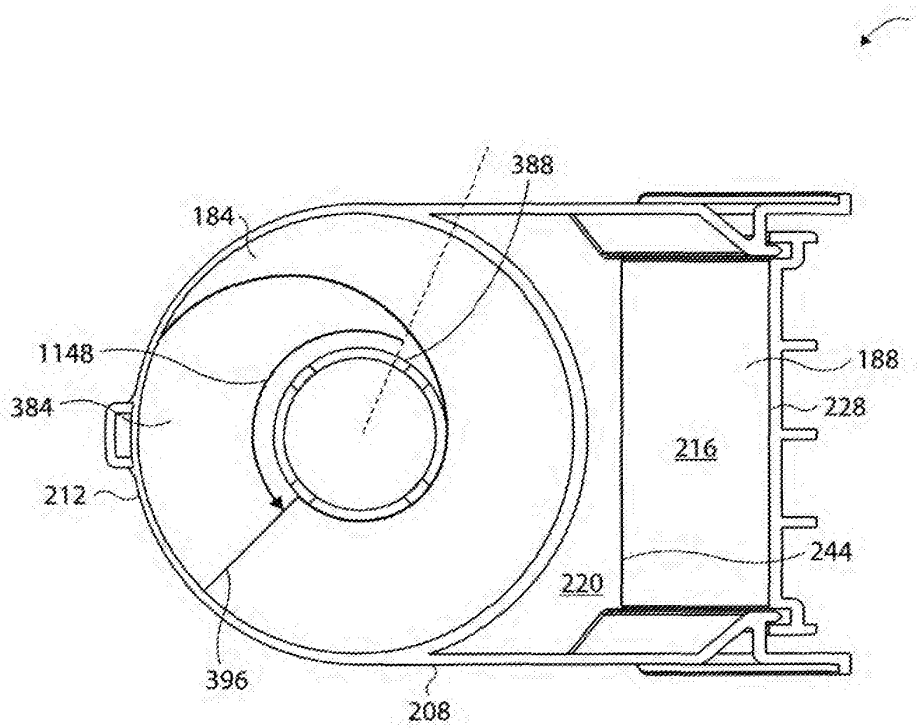


FIG. 23a

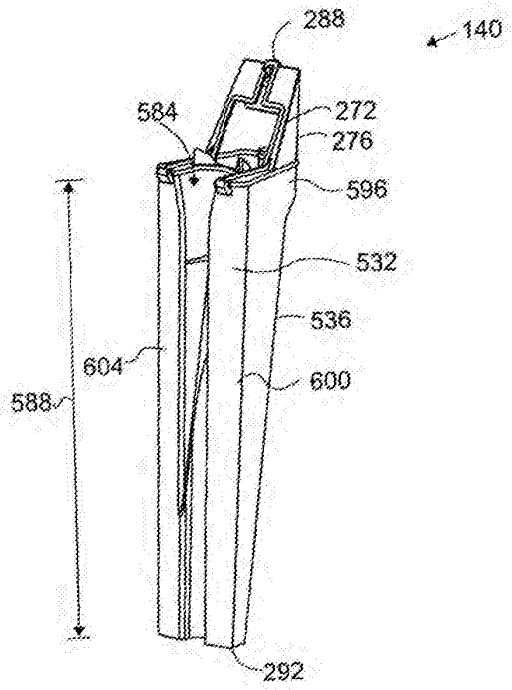


FIG. 24

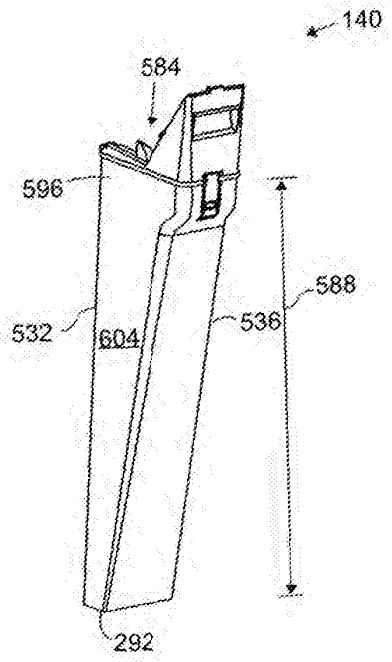


FIG. 45

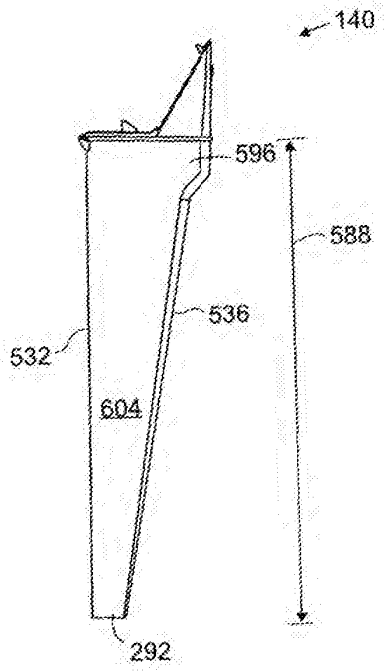


FIG. 46

Dyson Ex1004
Page 129

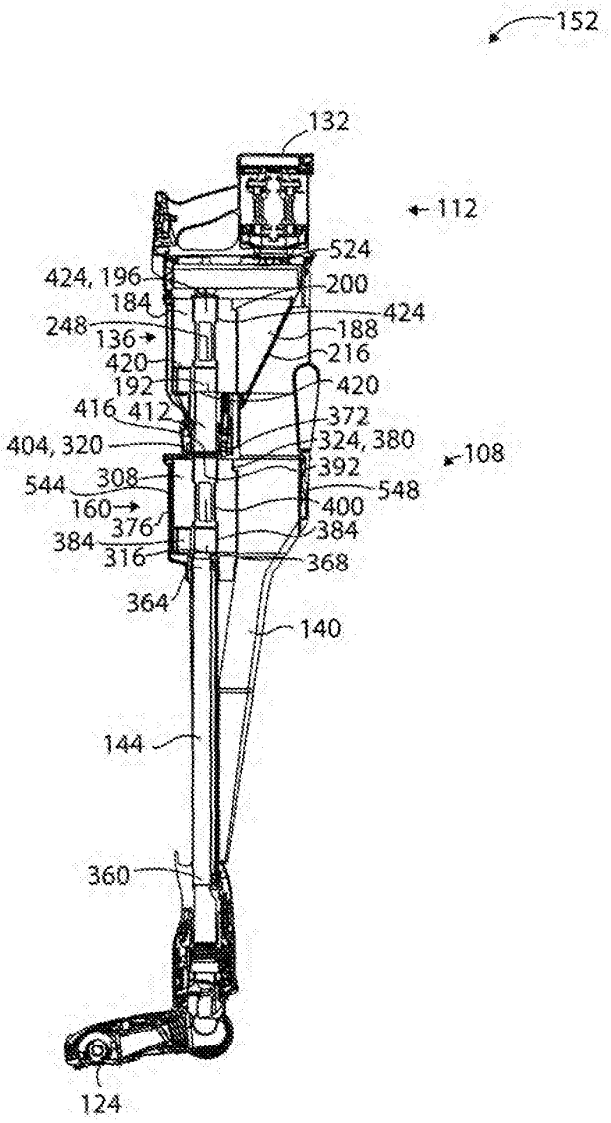

152
132
112
524
424, 196
200
184
424
248
188
136
216
420
420
192
372
416, 412
324, 380
404, 320
108
392
544
308
548
160
400
376
384
384
316
368
364
140
144
360
124

FIG. 25

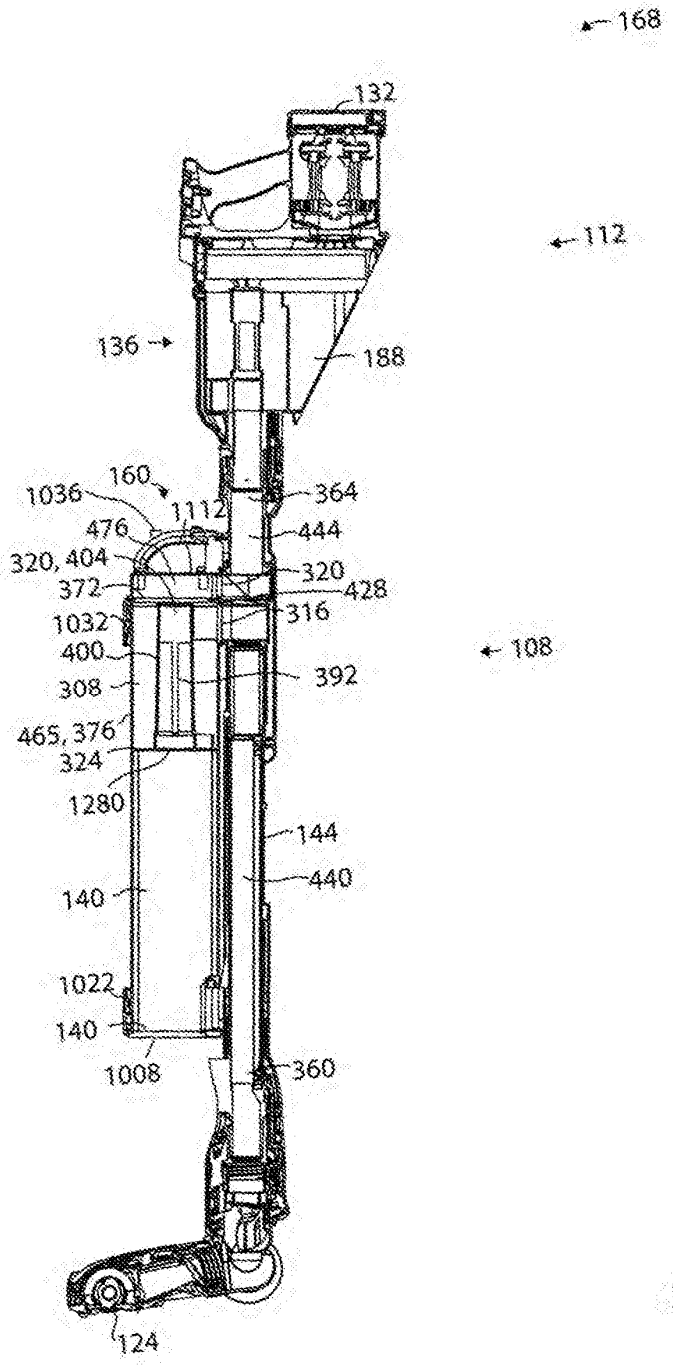

168
132
112
136
188
160
1036
1112
364
476
444
320, 404
320
372
428
1032
316
400
108
392
308
465, 376
324
1280
144
440
140
1022
140
1008
360
124

FIG. 26

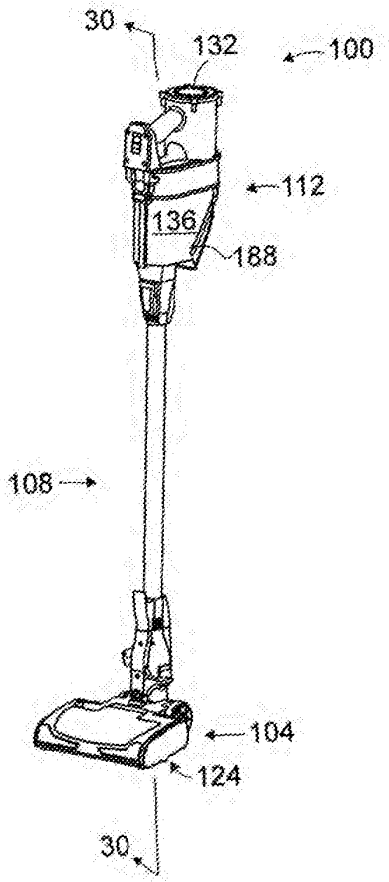


FIG. 27

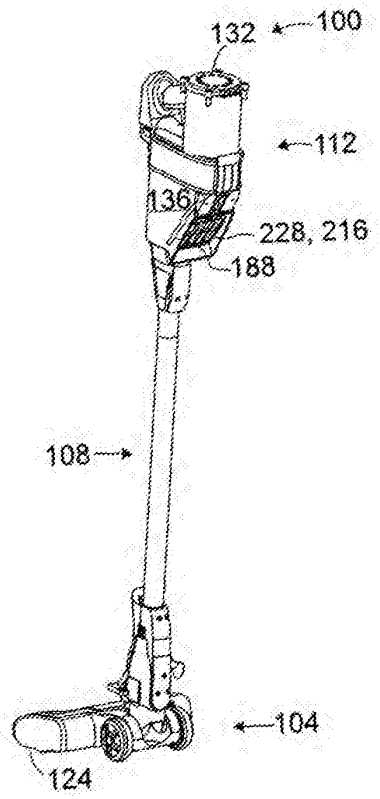


FIG. 28

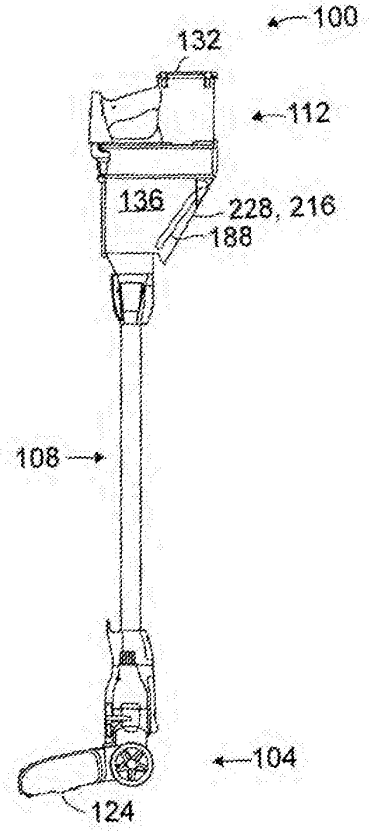


FIG. 29

Dyson Ex1004
Page 132

FIG. 30

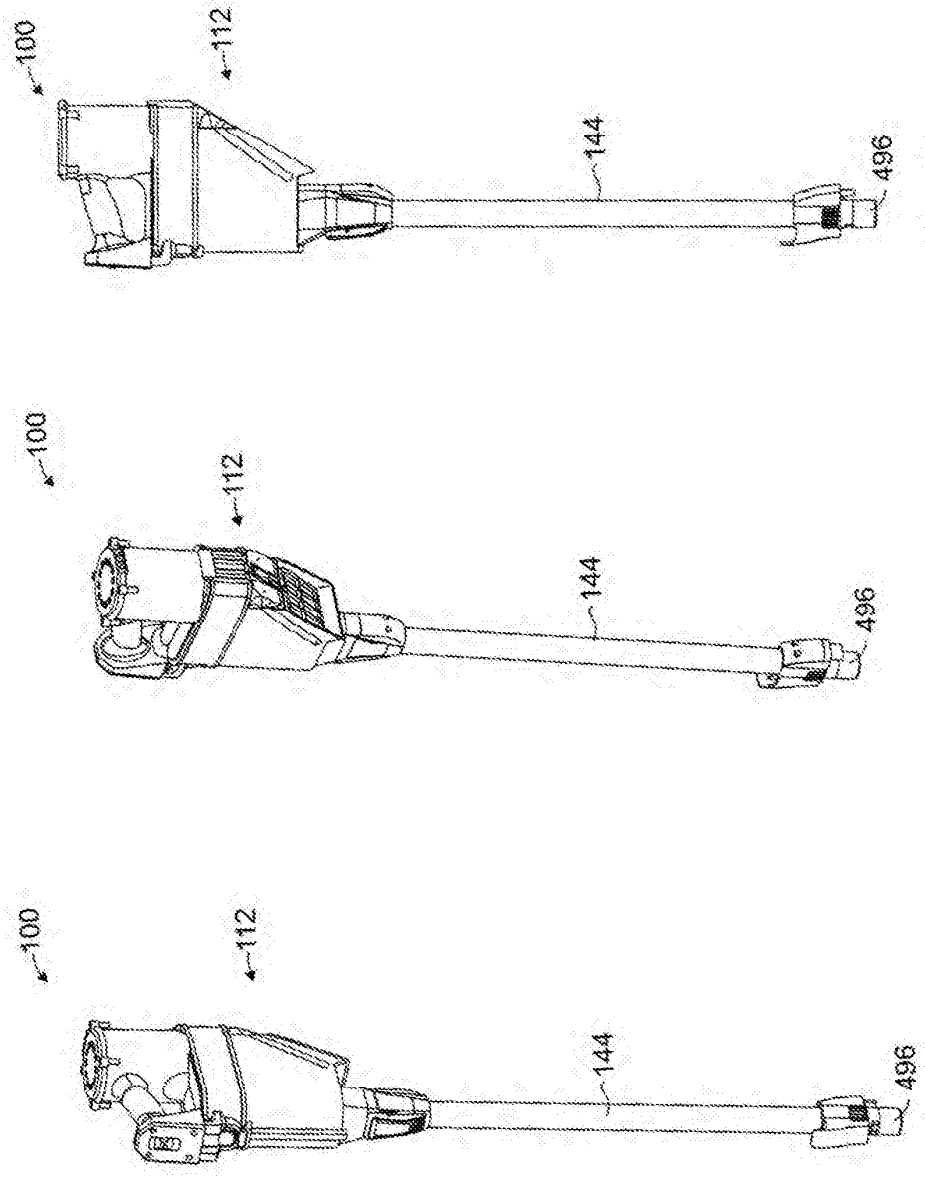


FIG_31

FIG_32

FIG_33

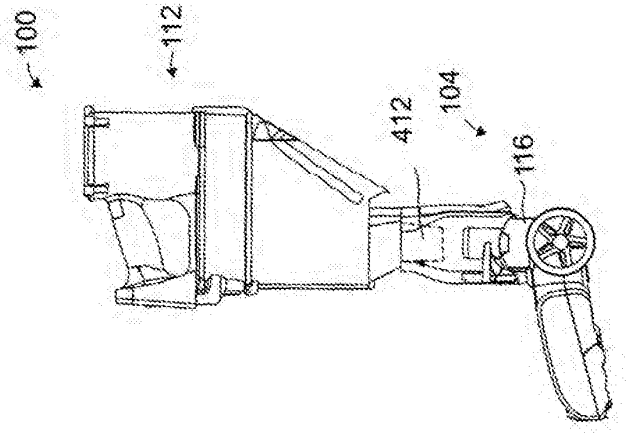


FIG. 36

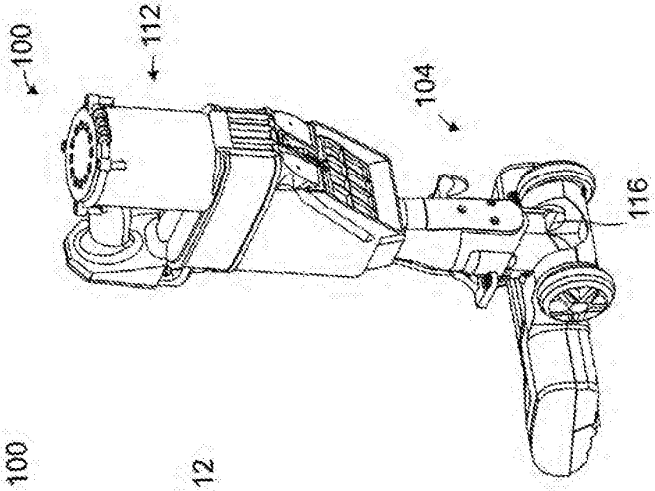


FIG. 35

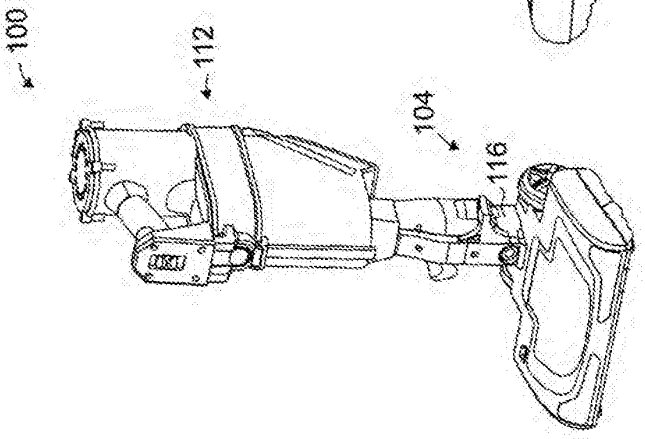


FIG. 34

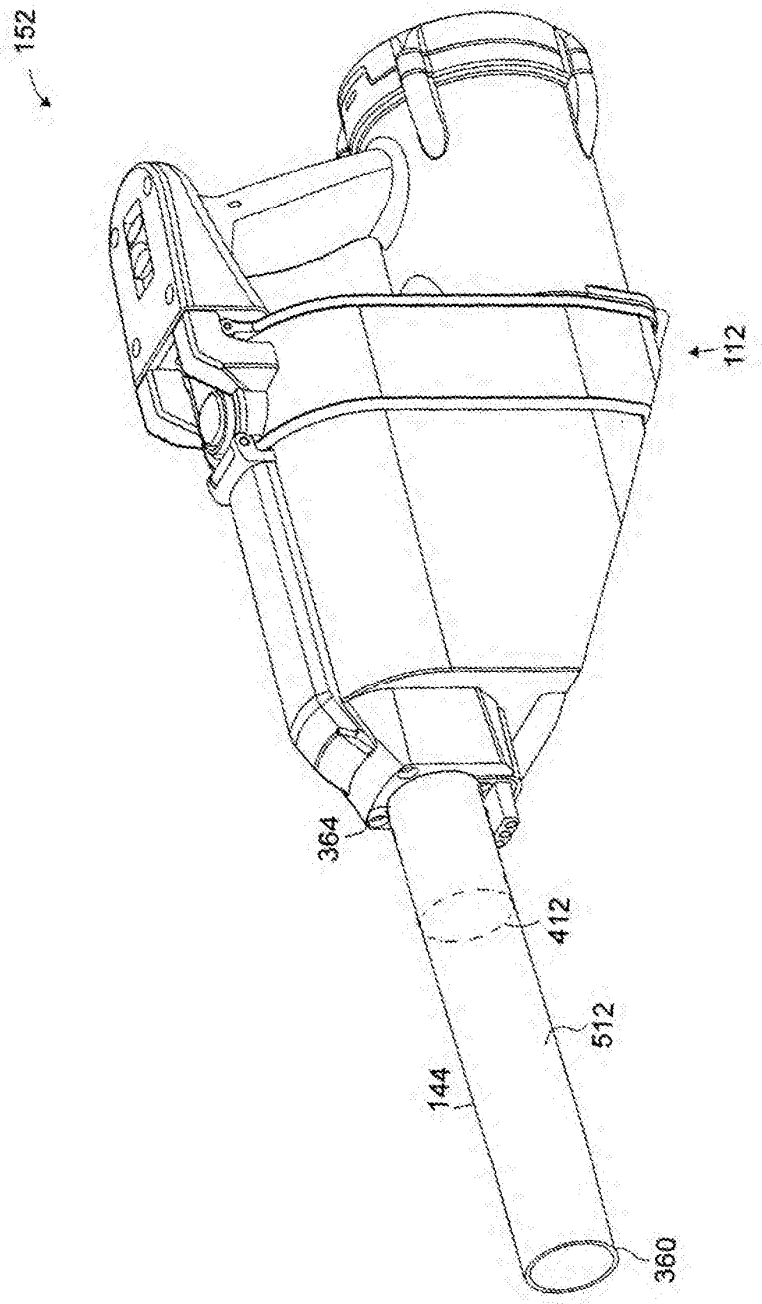


FIG. 36a

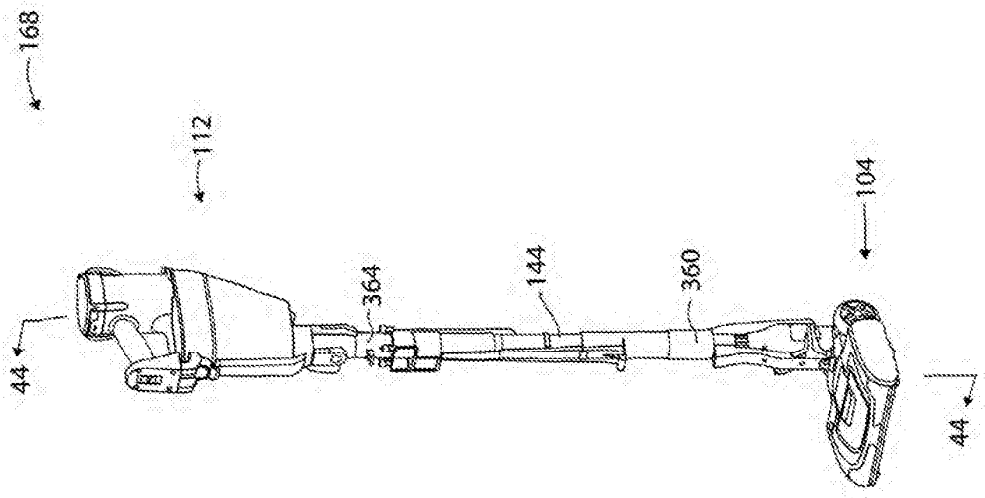


FIG. 37

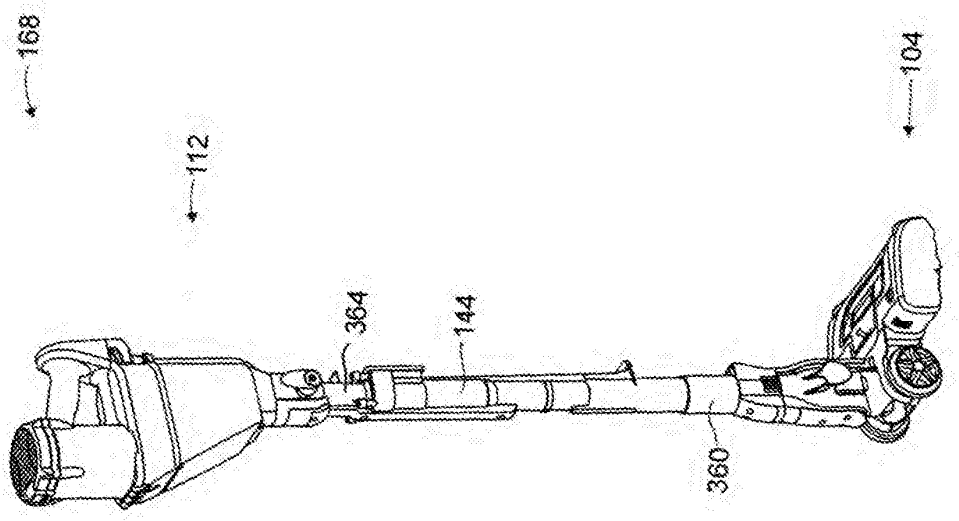


FIG. 38

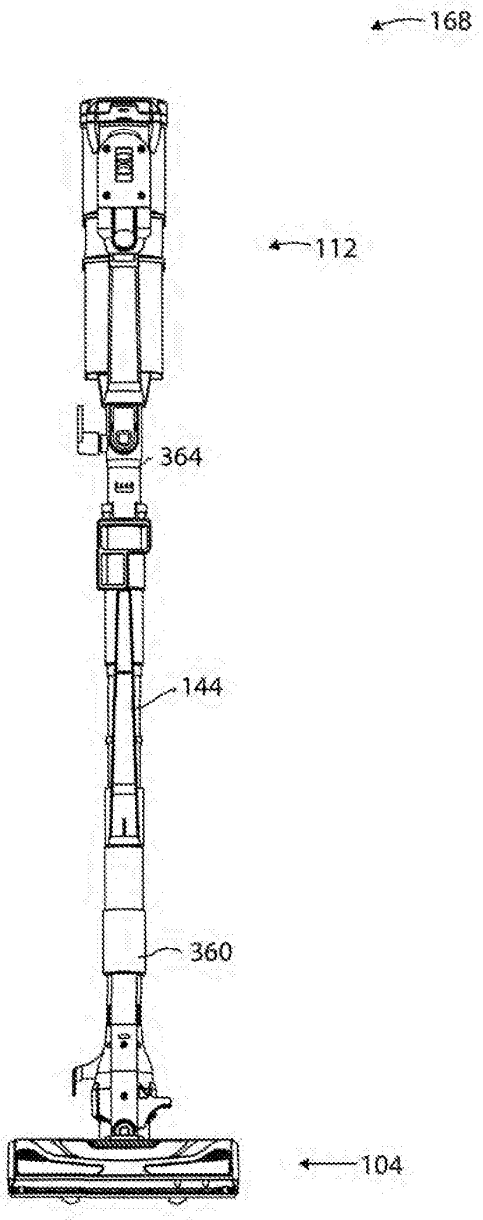


FIG. 39

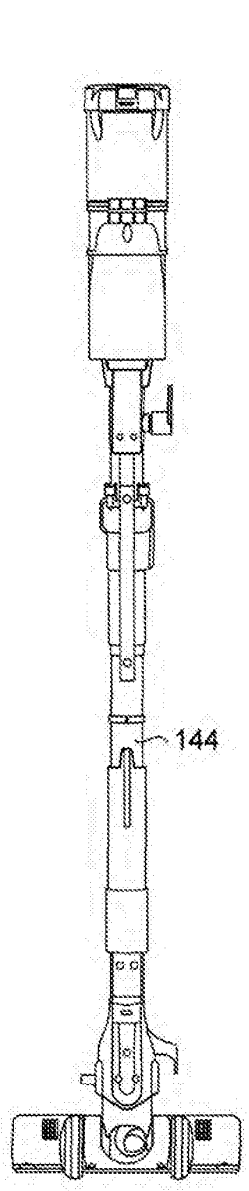


FIG. 40

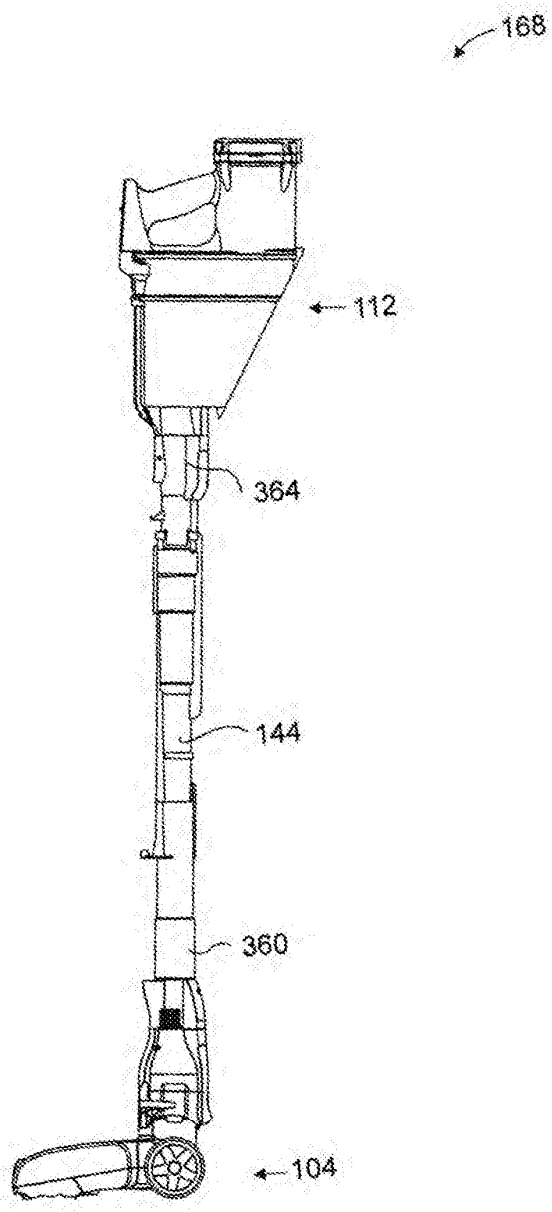


FIG. 41

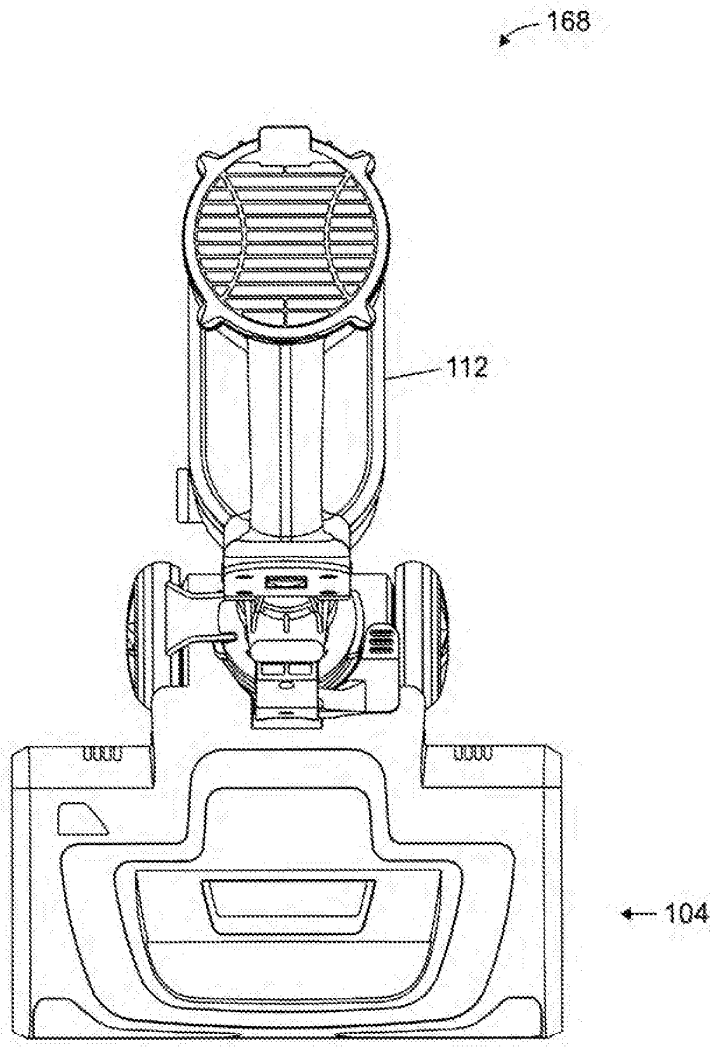


FIG. 42

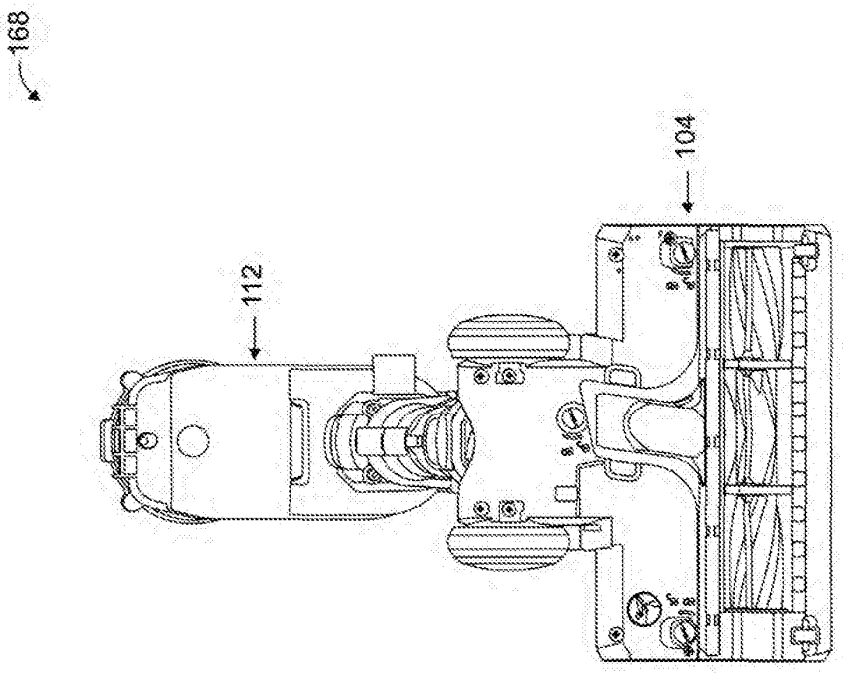


FIG. 43

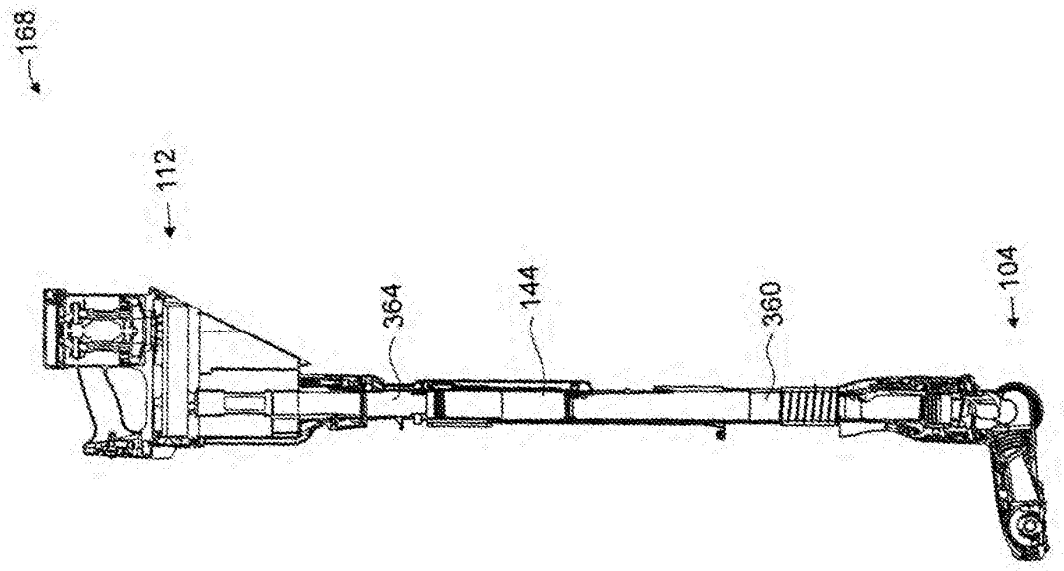


FIG. 44

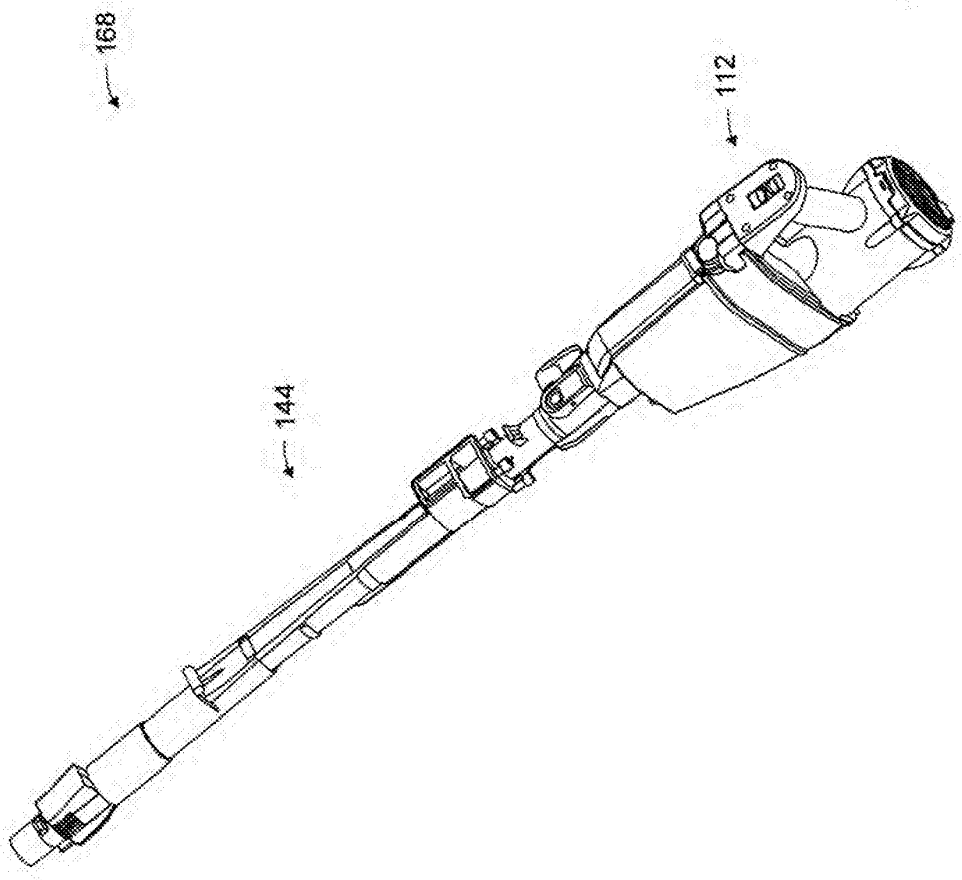


FIG. 44a

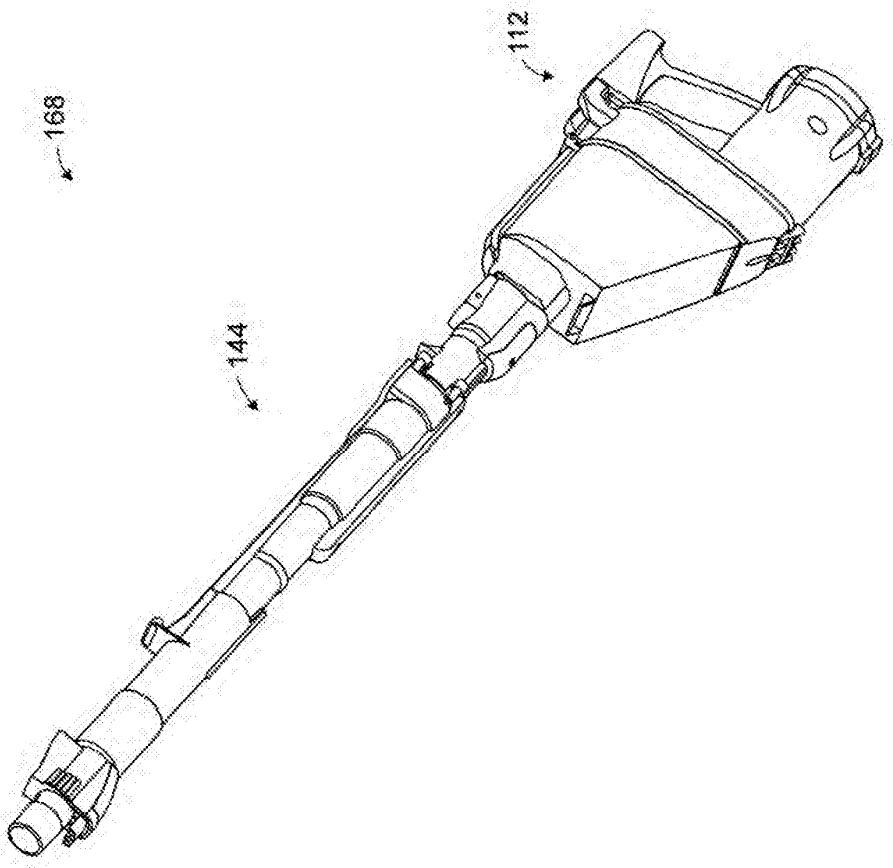


FIG. 44b

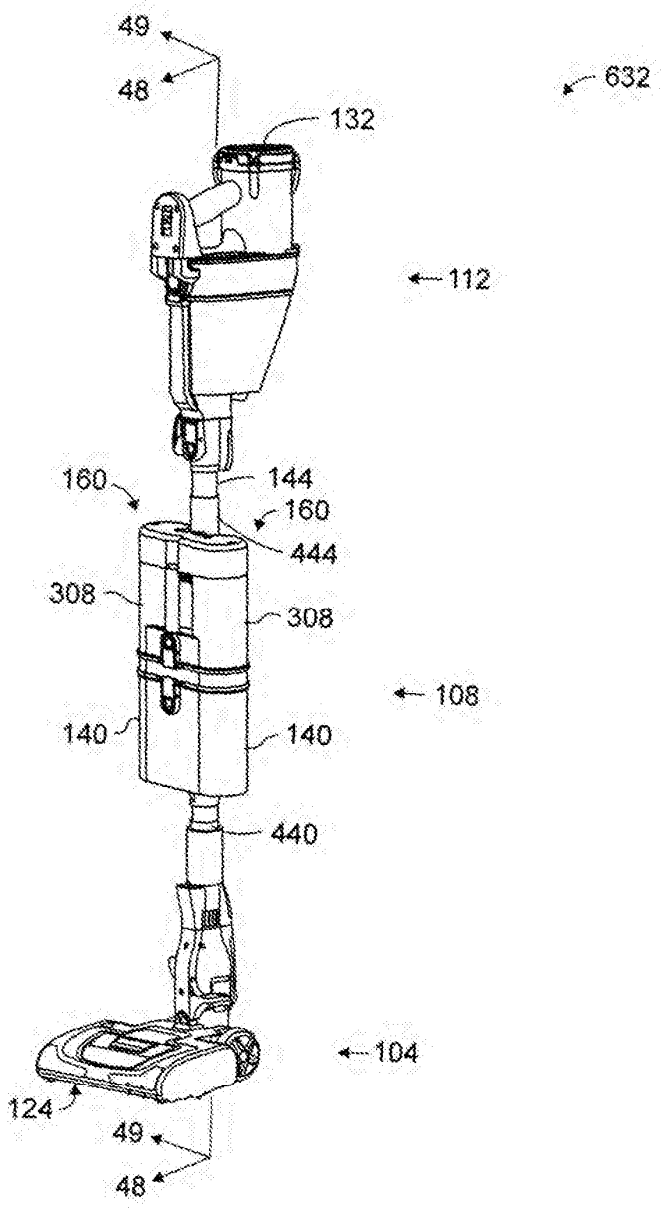

49
48
632
132
112
160
144
160
444
308
308
108
140
140
440
104
124
49
48

FIG. 47

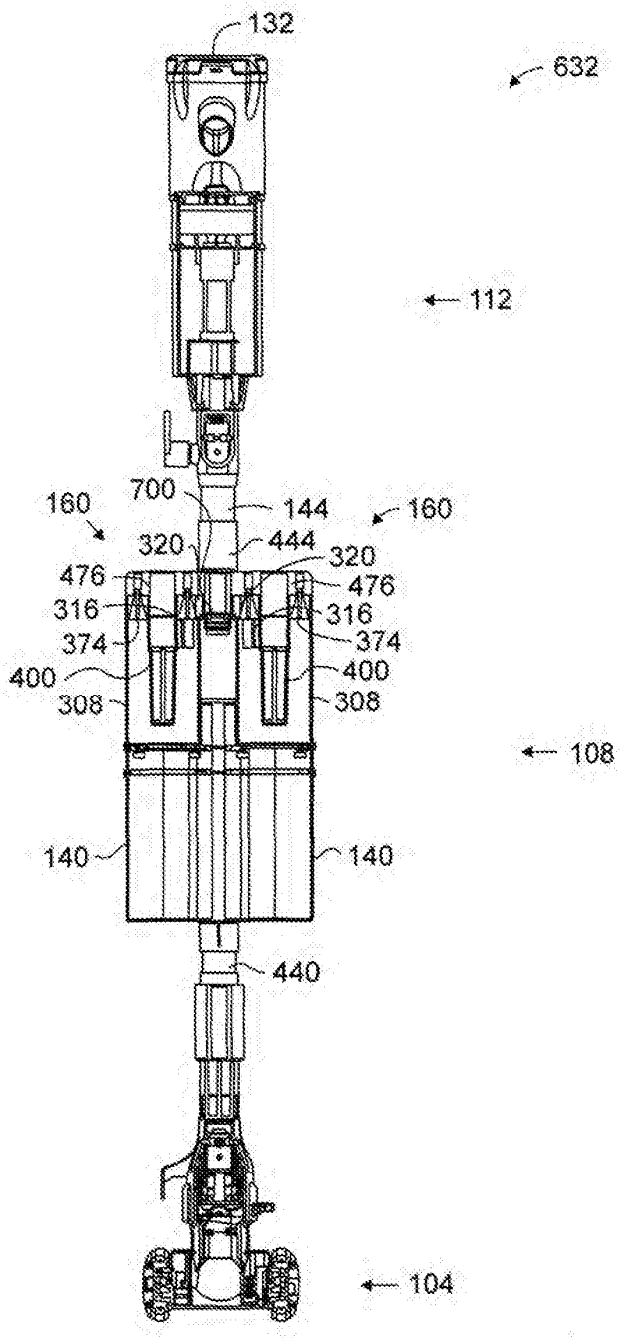

132
632
112
160
700
144
160
320
444
320
476
476
316
316
374
374
400
400
308
308
108
140
140
440
104

FIG. 48

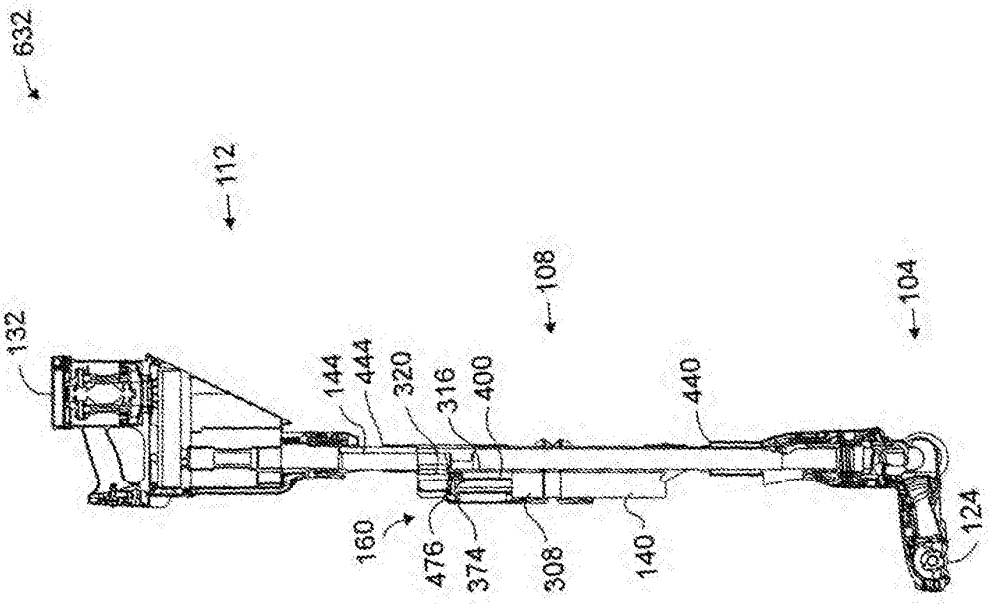

632
112
108
104
132
144
444
320
316
400
440
160
476
374
308
140
124

FIG. 49

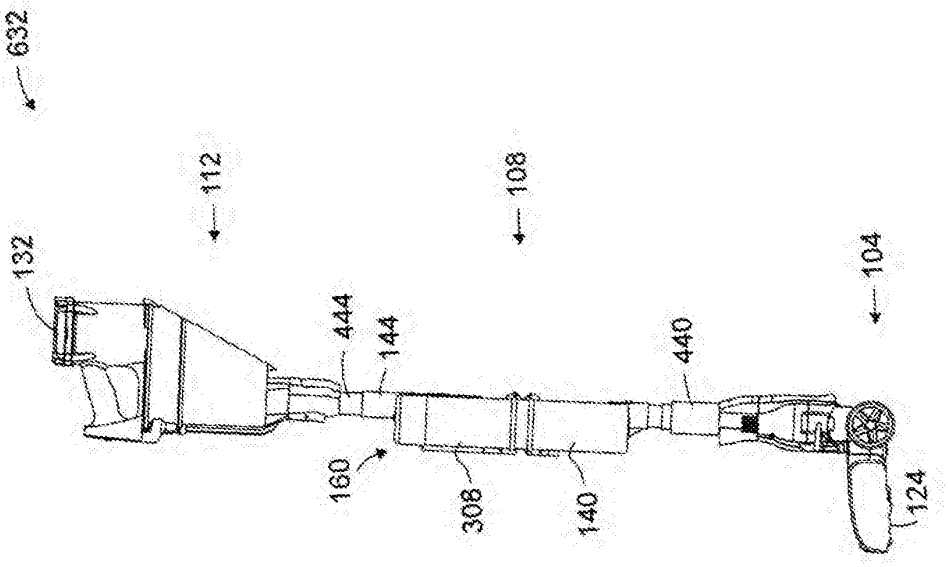


FIG. 50

FIG. 51

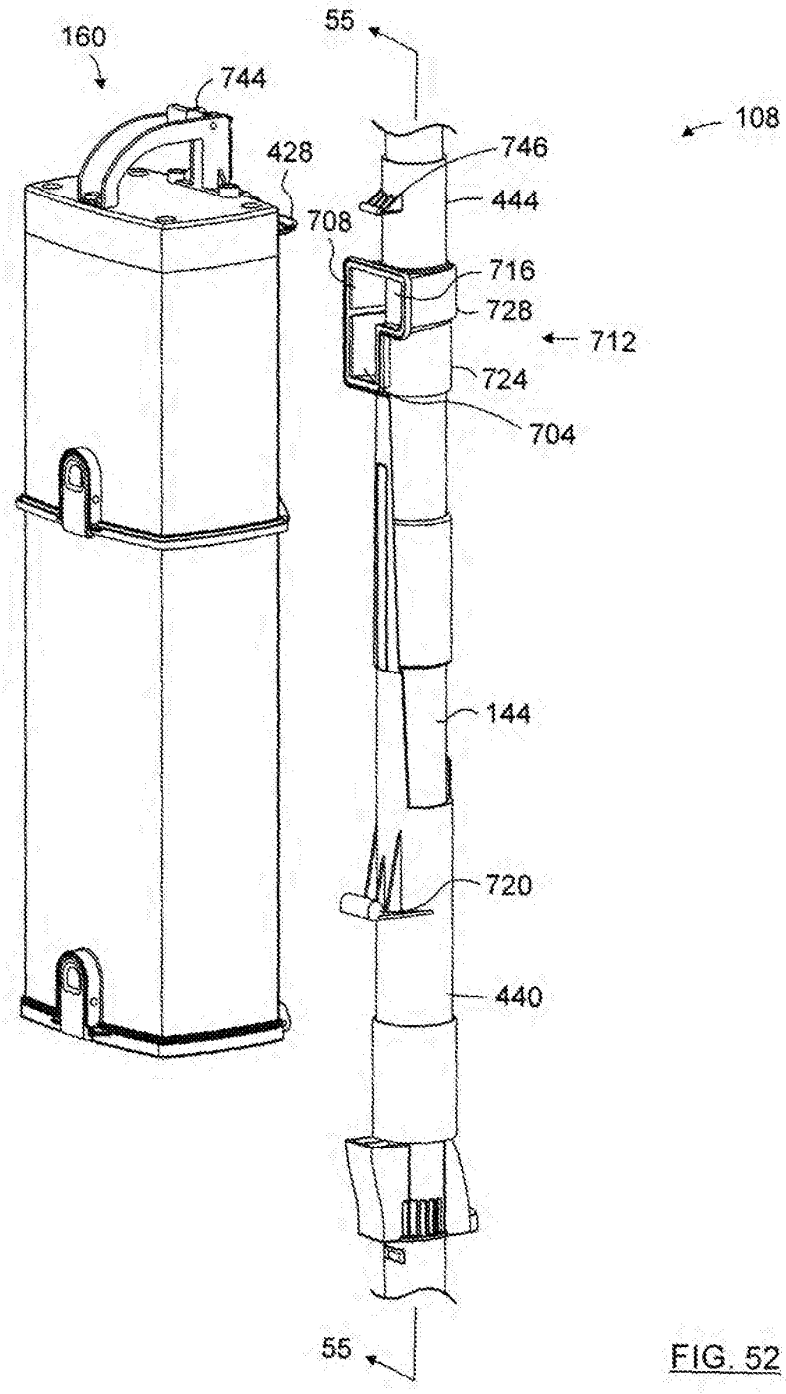


FIG. 52

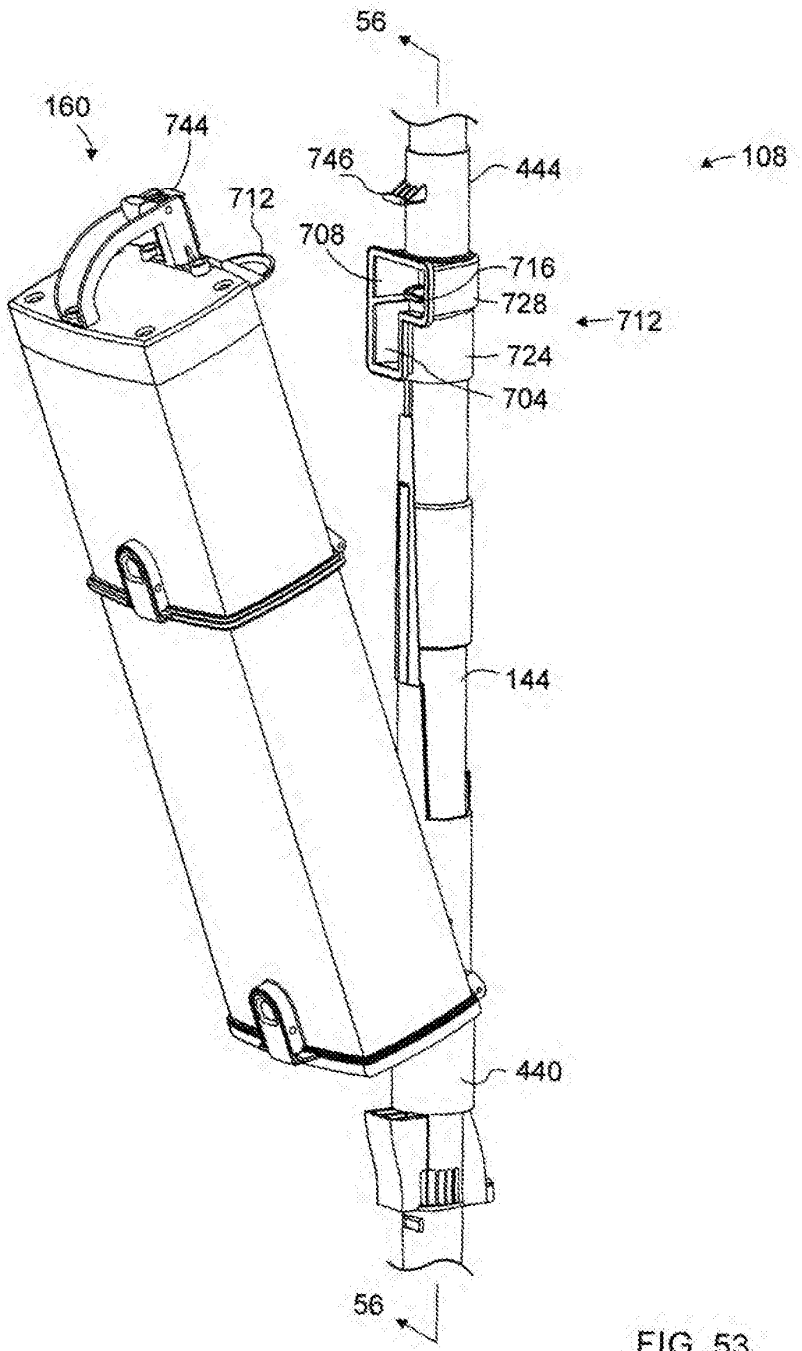


FIG. 53

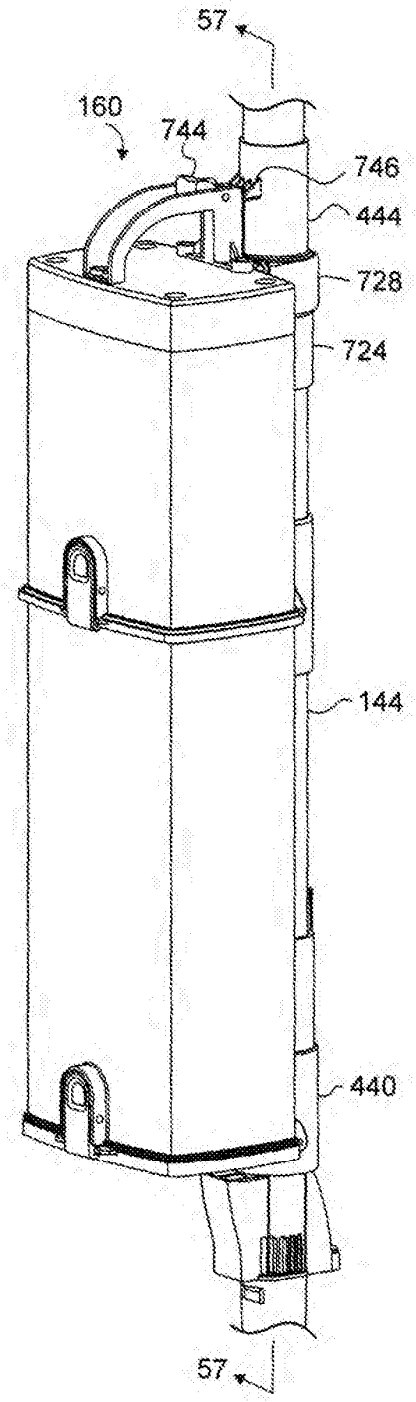


FIG. 54

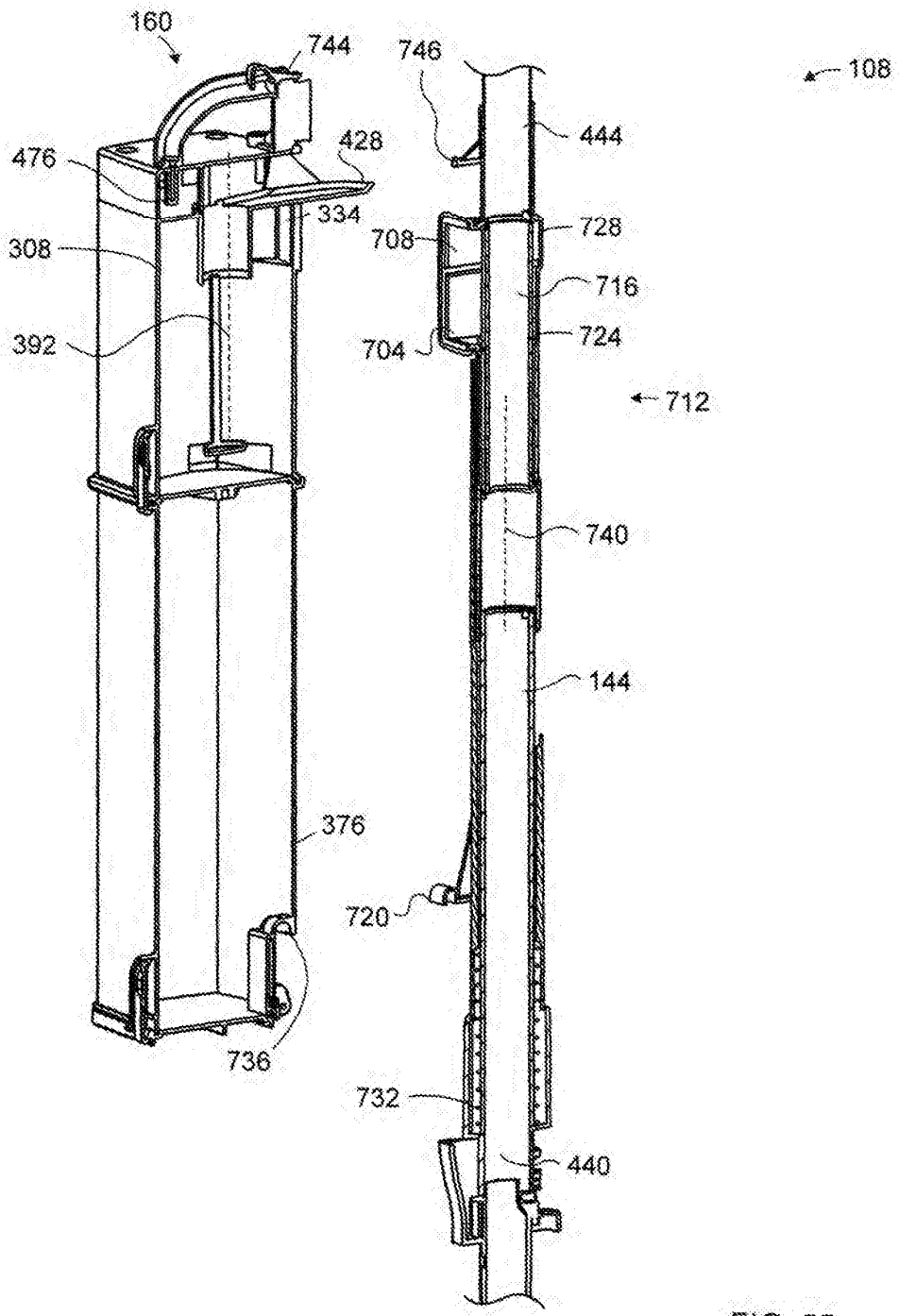

160
744
746
108
476
428
444
334
728
308
708
716
392
704
724
712
740
144
376
720
736
732
440

FIG. 55

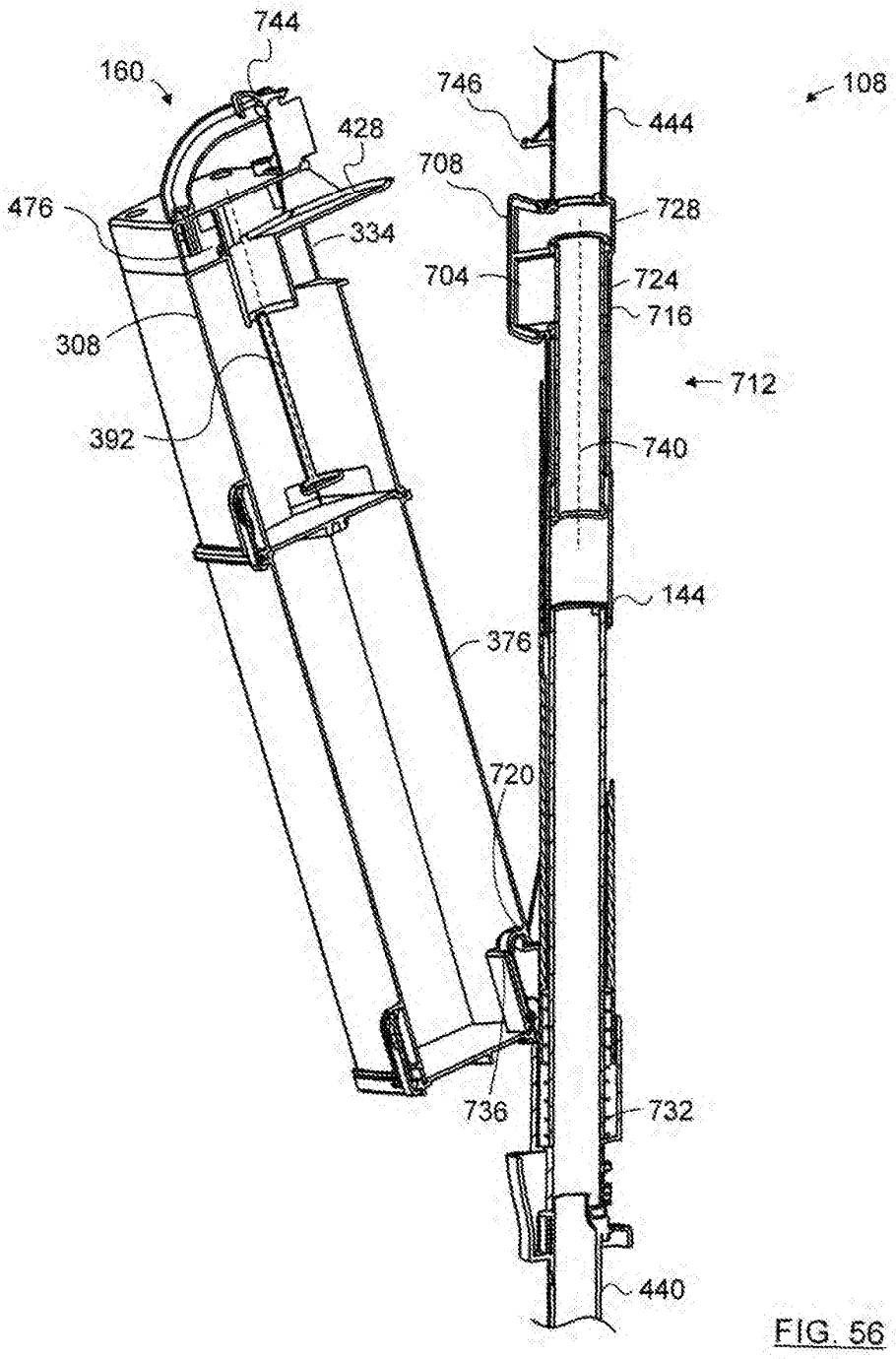

744
160
746
108
444
428
708
476
728
334
704
724
716
308
712
392
740
144
376
720
736
732
440

FIG. 56

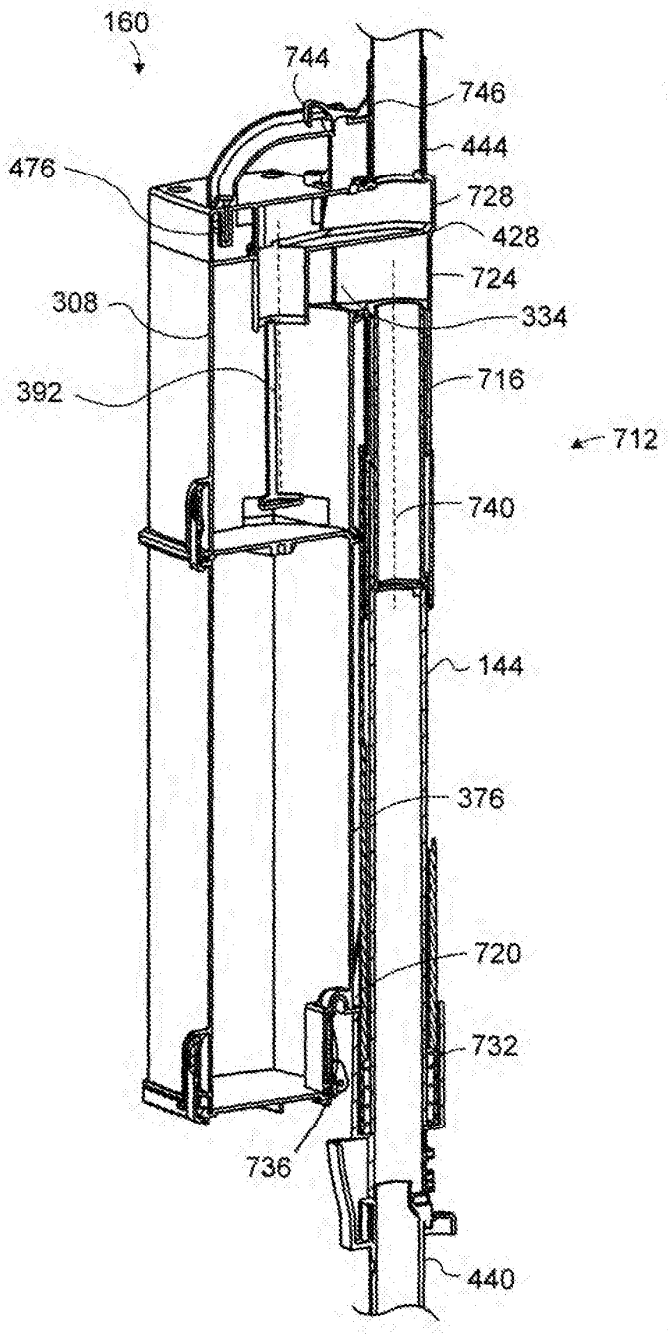

160
744
746
108
476
444
728
428
724
308
334
392
716
712
740
144
376
720
732
736
440

FIG. 57

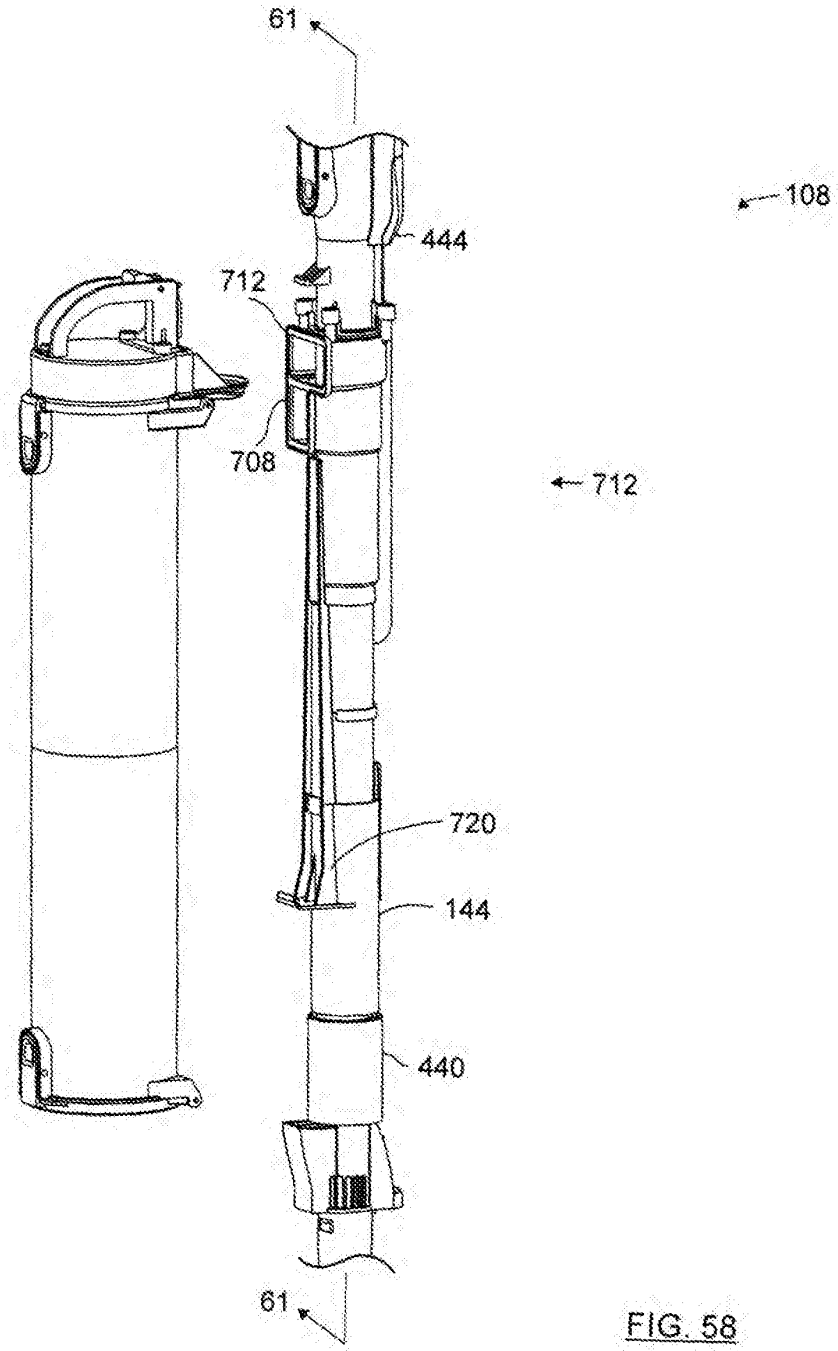


FIG. 58

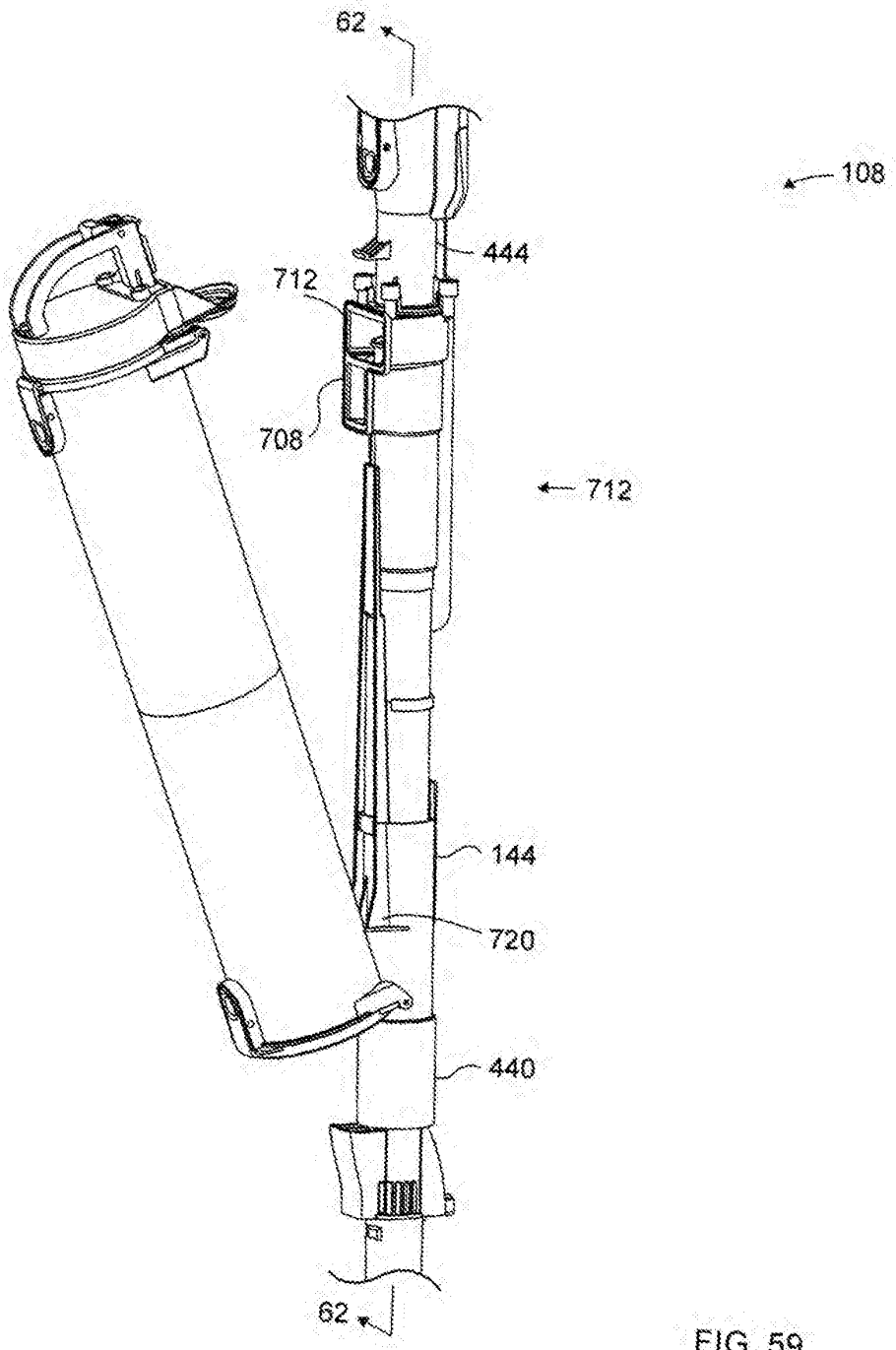


FIG. 59

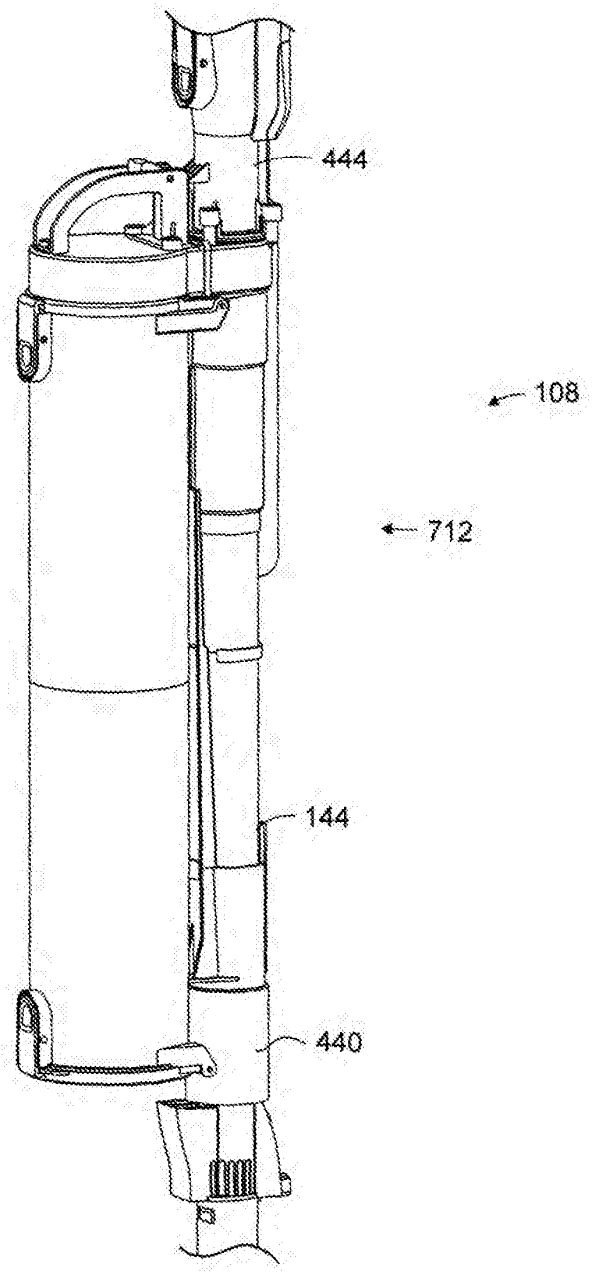


FIG. 60

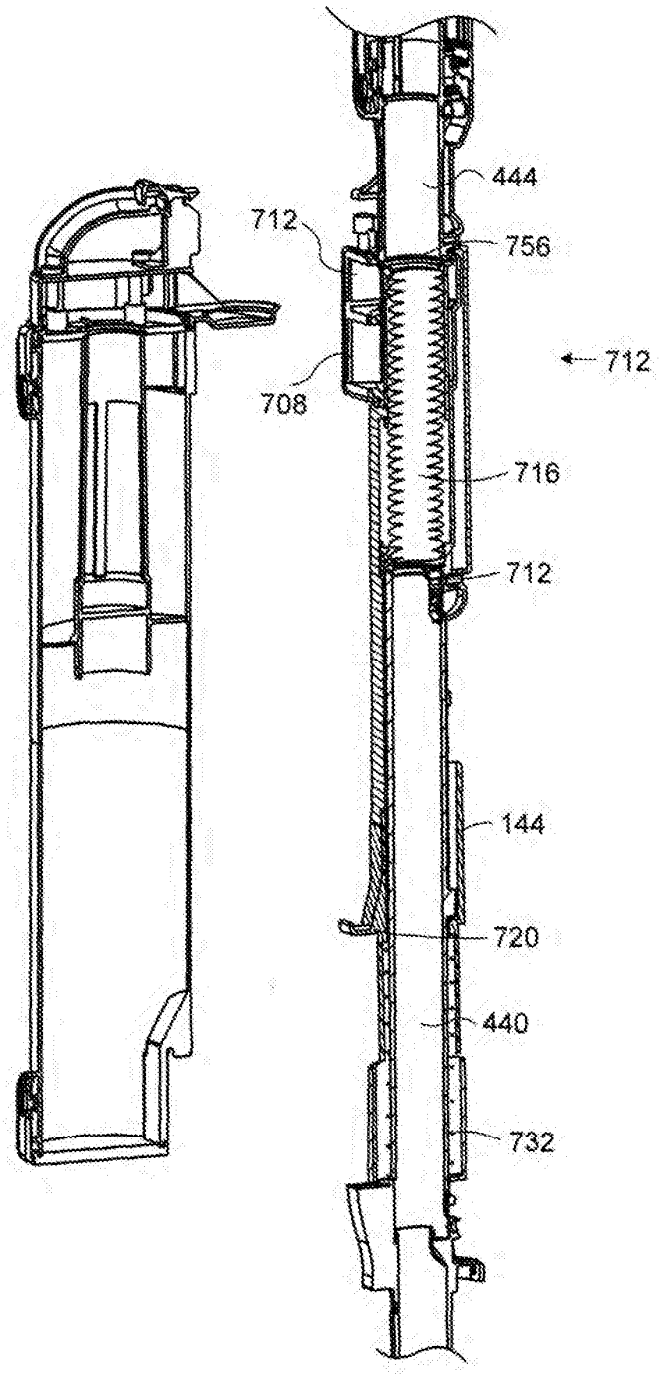


FIG. 61

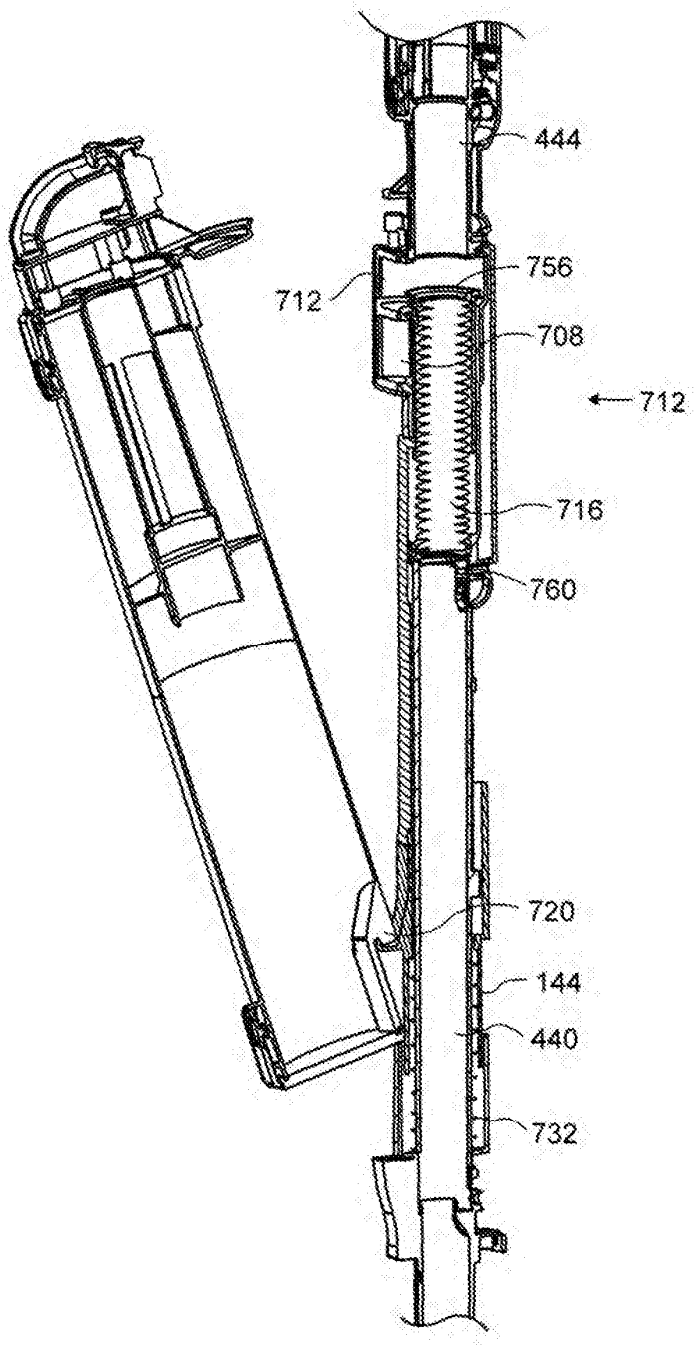


FIG. 62

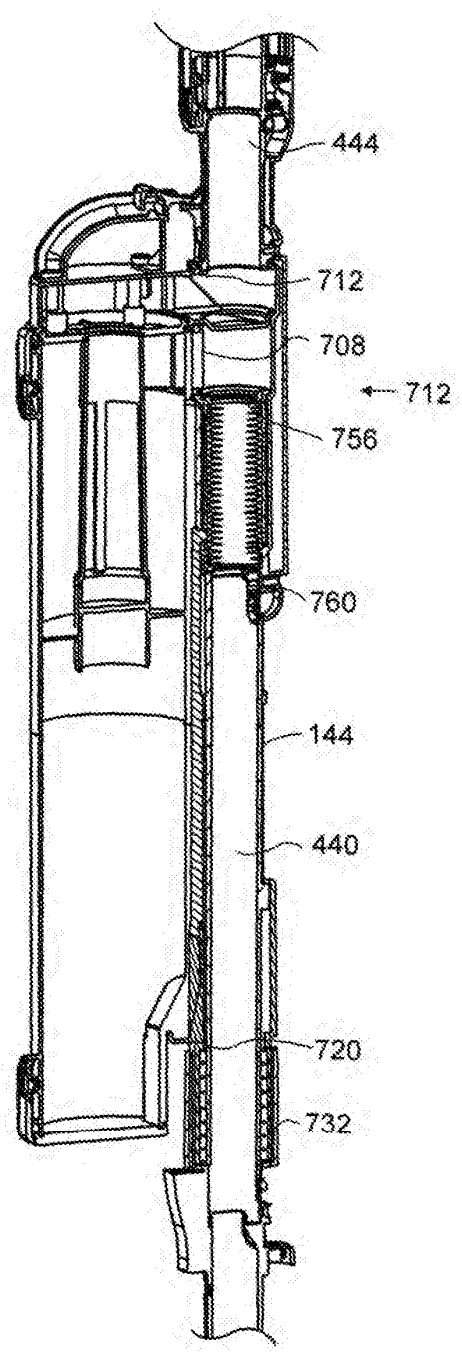


FIG. 63

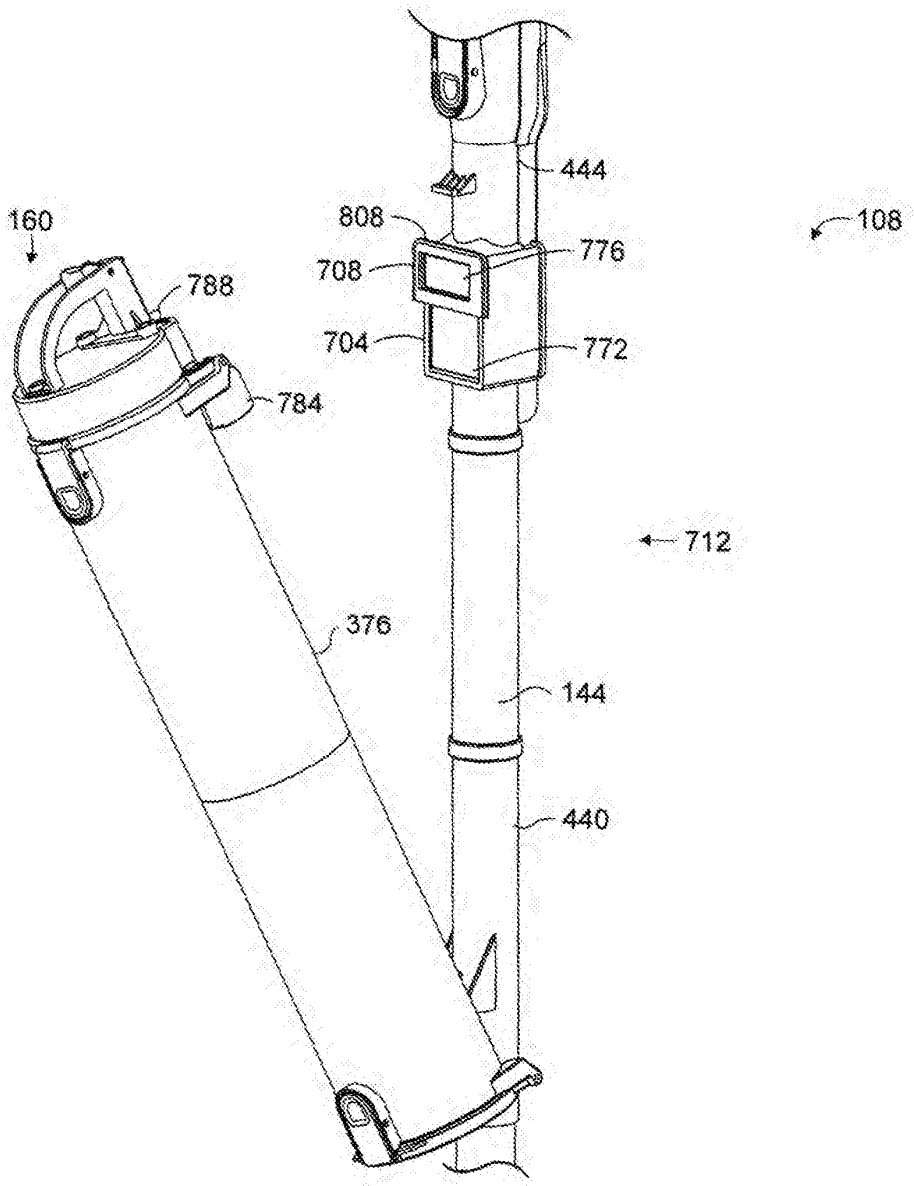


FIG. 64

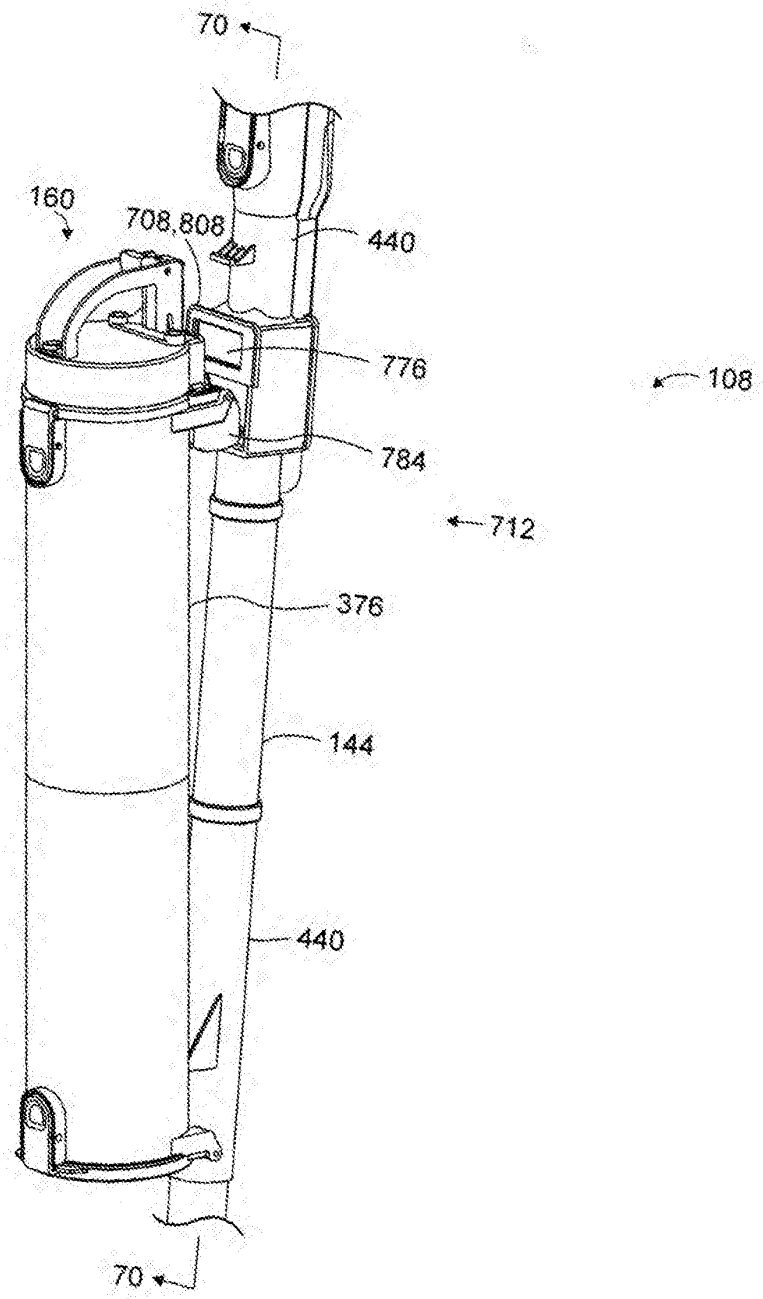


FIG. 65

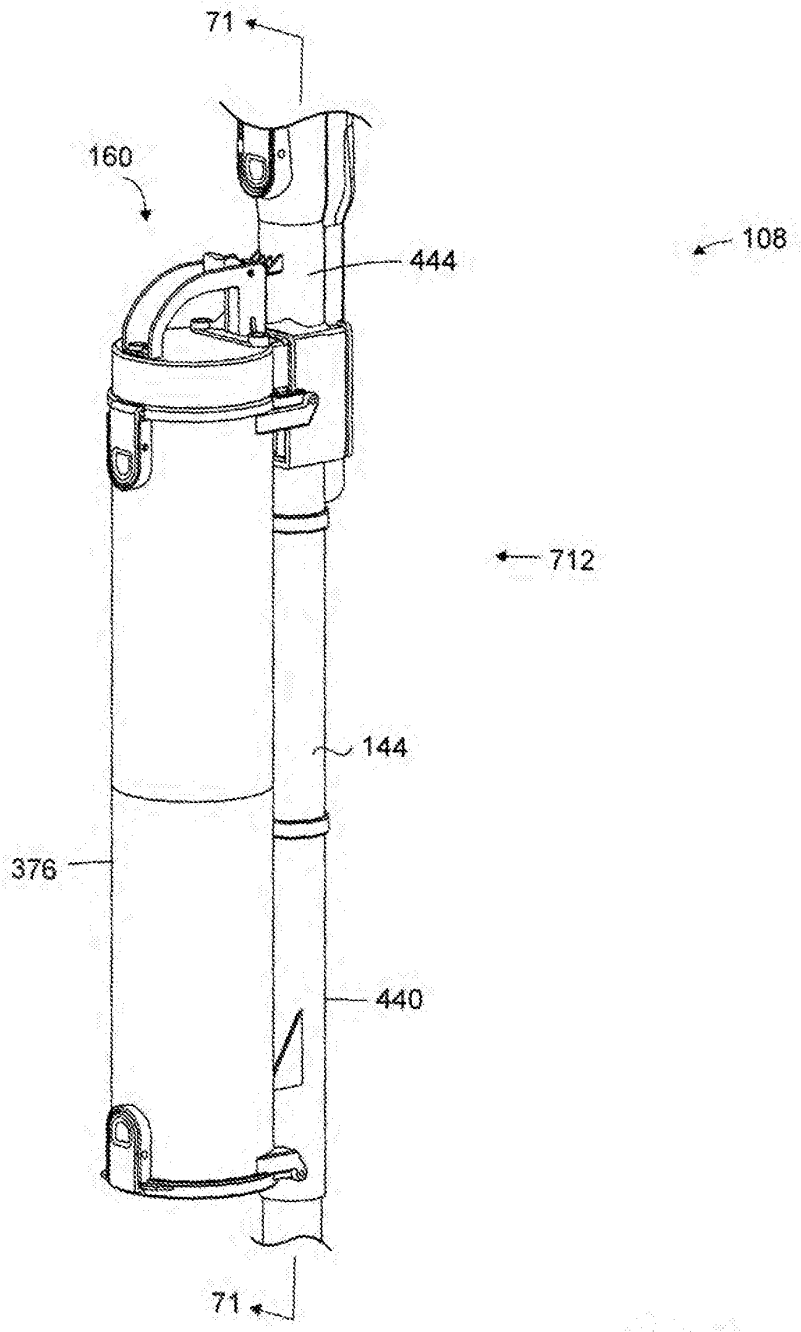


FIG. 66

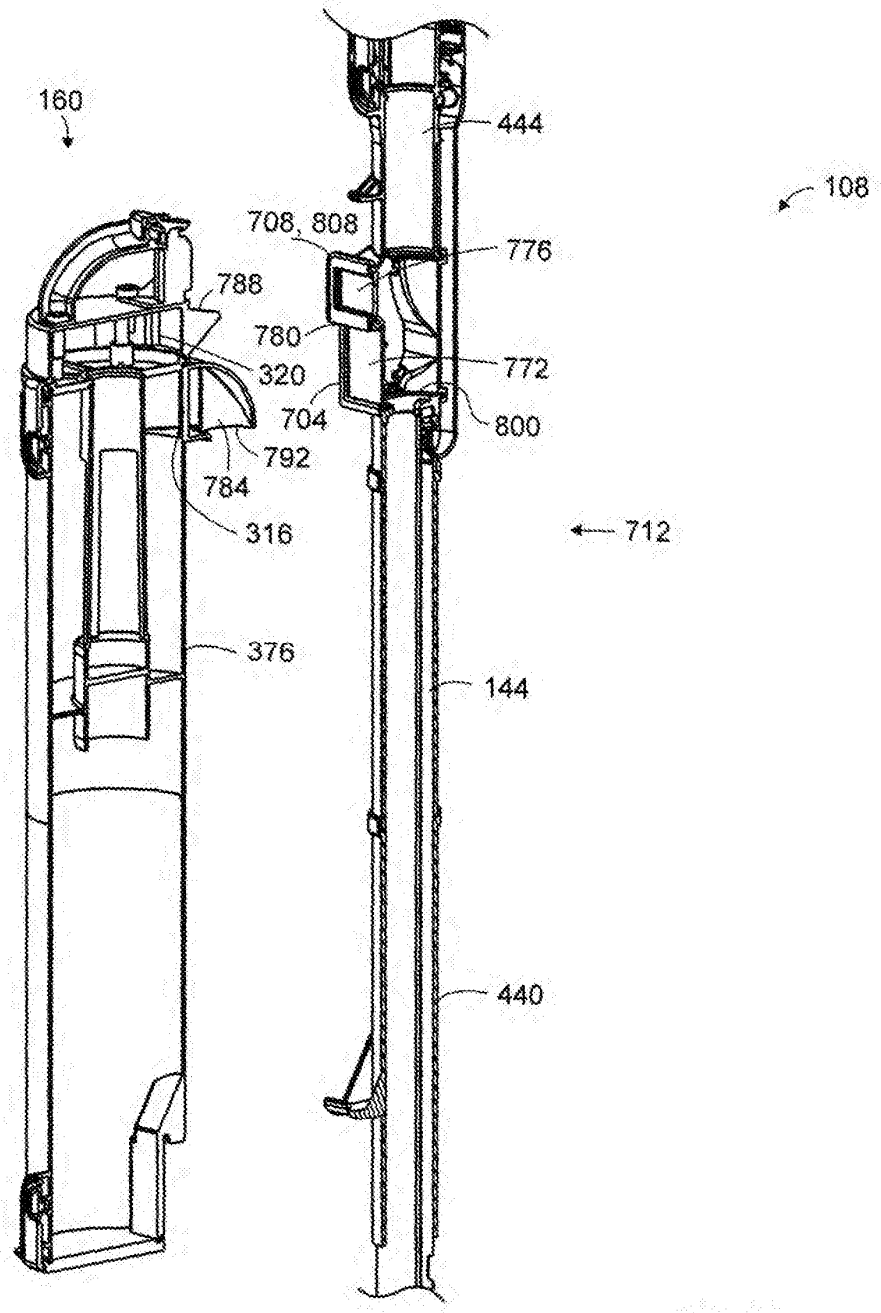

160
444
108
708, 808
776
788
780
772
320
704
800
792
784
316
712
376
144
440

FIG. 67

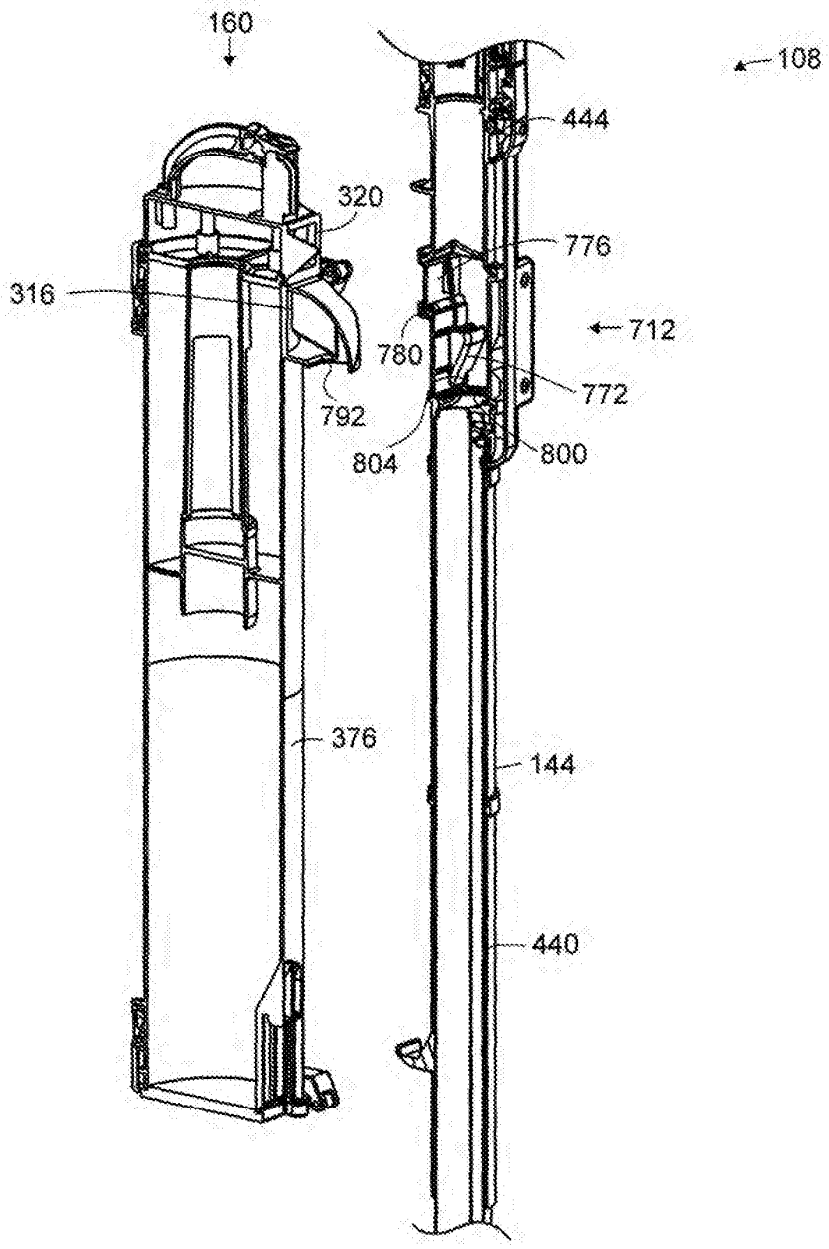


FIG. 68

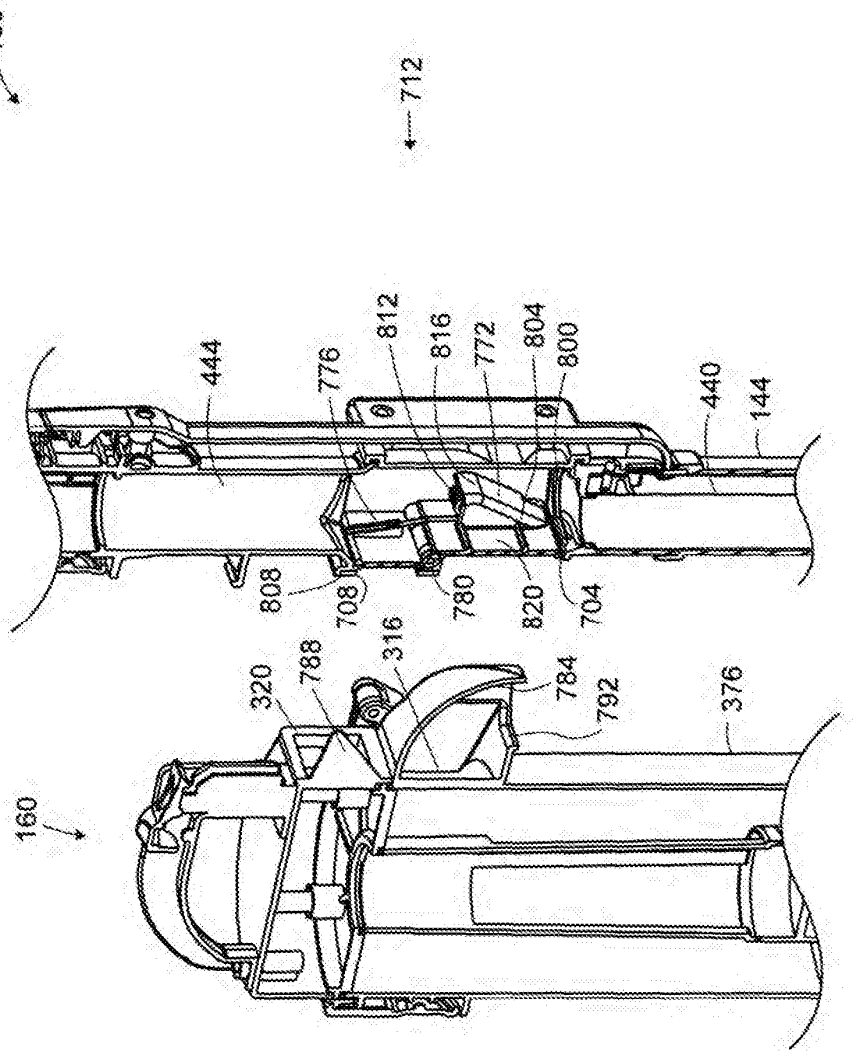

108
712
444
776
812
816
772
804
800
440
144
808
708
780
820
704
316
788
320
784
792
376
160

FIG. 69

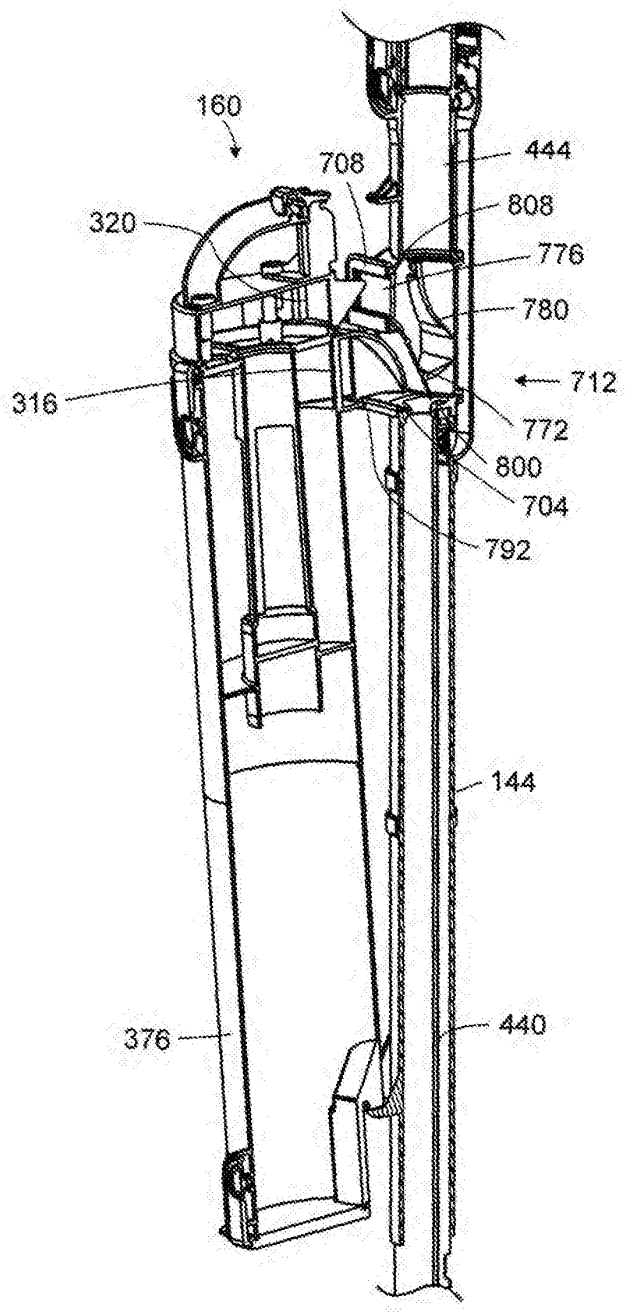

108
160
708
444
320
808
776
780
712
316
772
800
704
792
144
376
440

FIG. 70

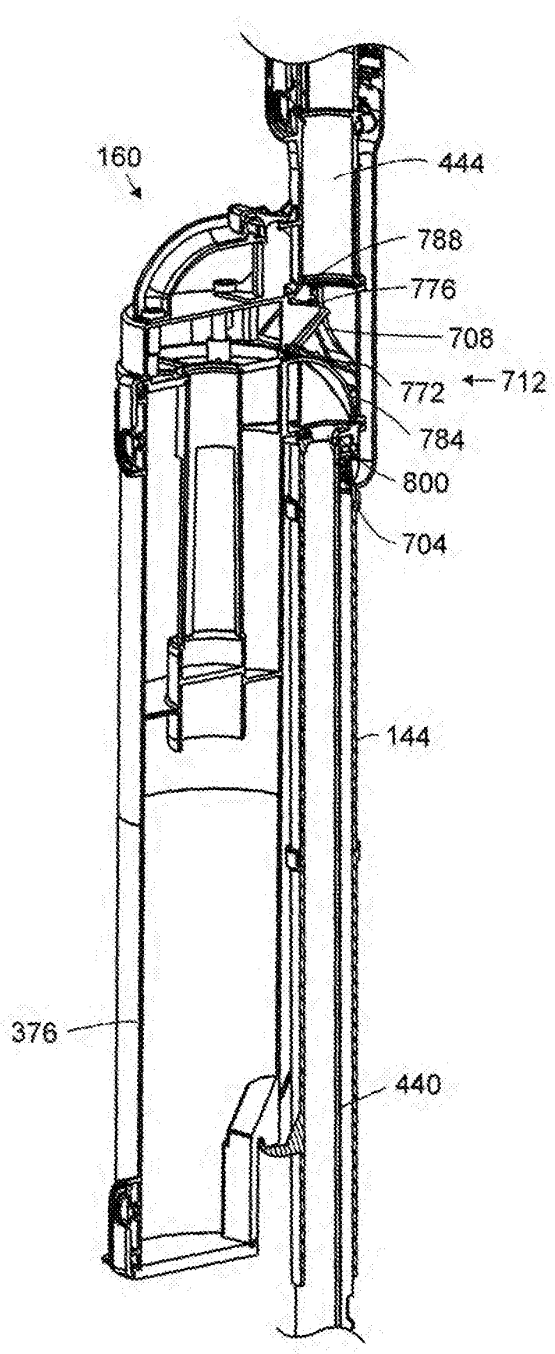


FIG. 71

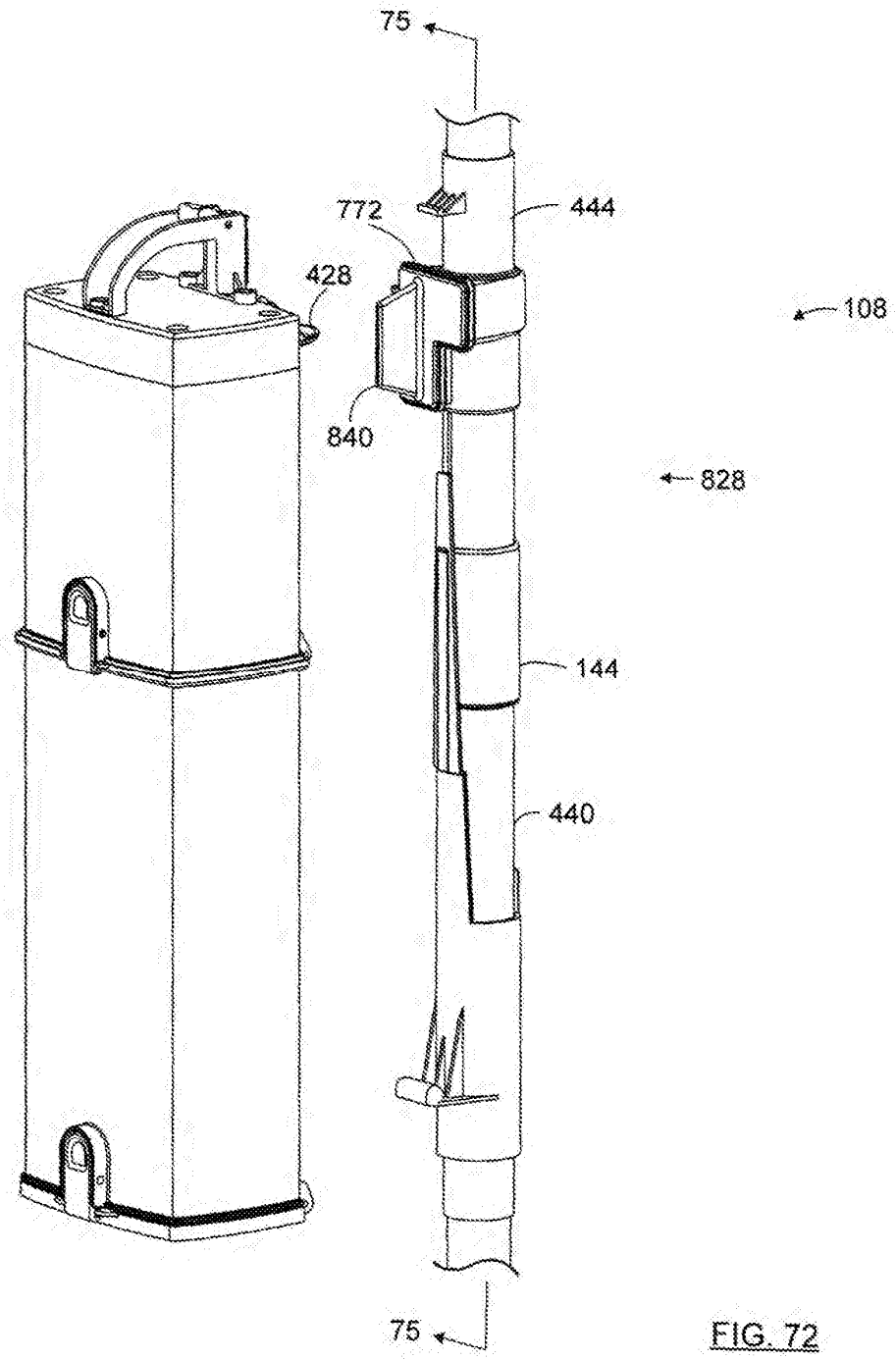


FIG. 72

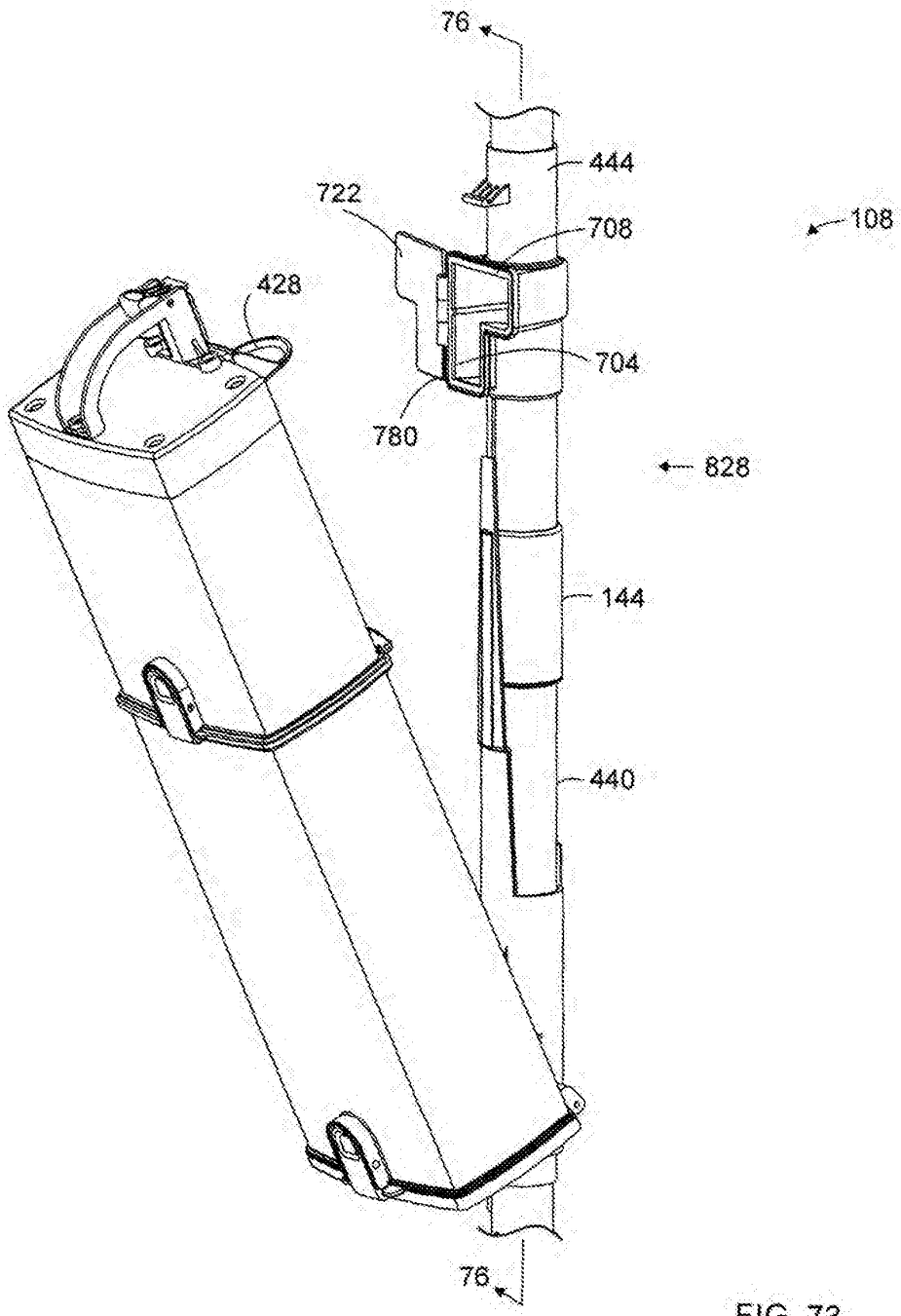


FIG. 73

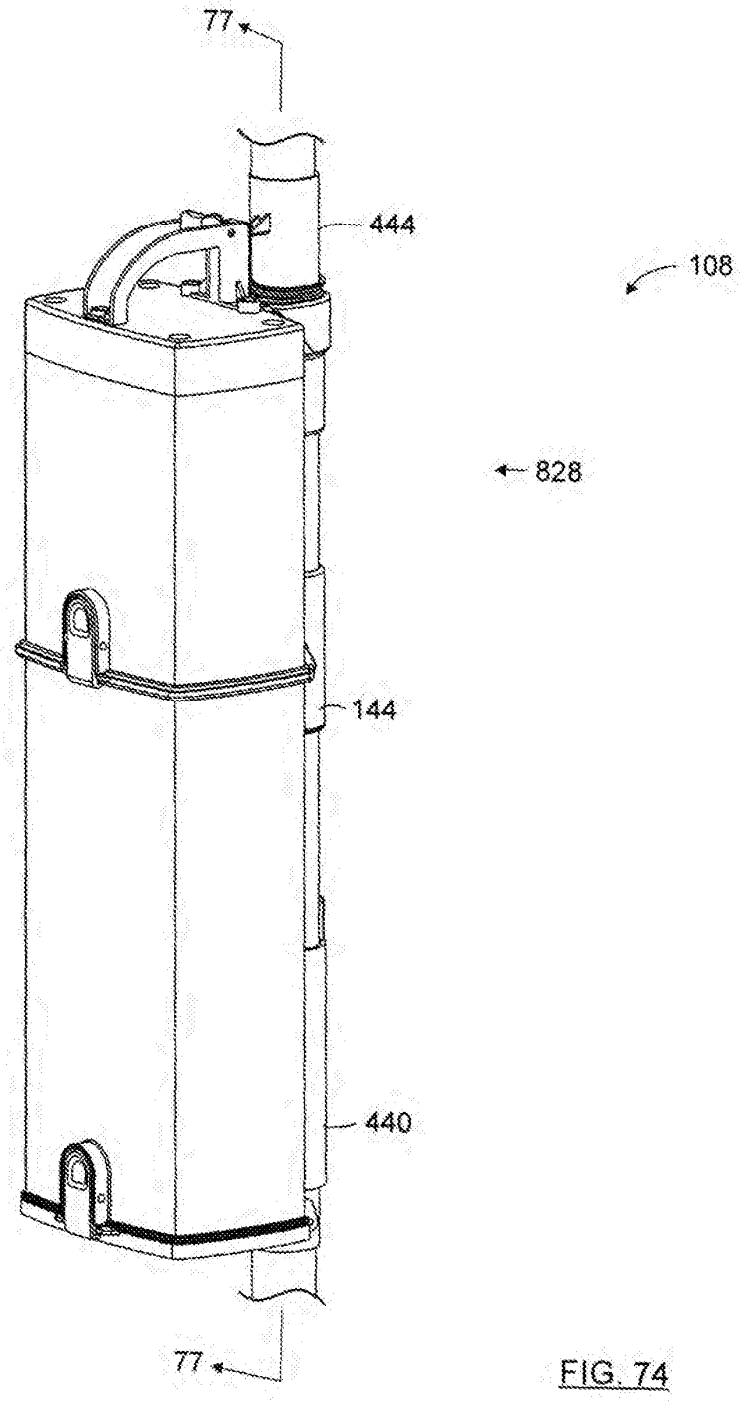


FIG. 74

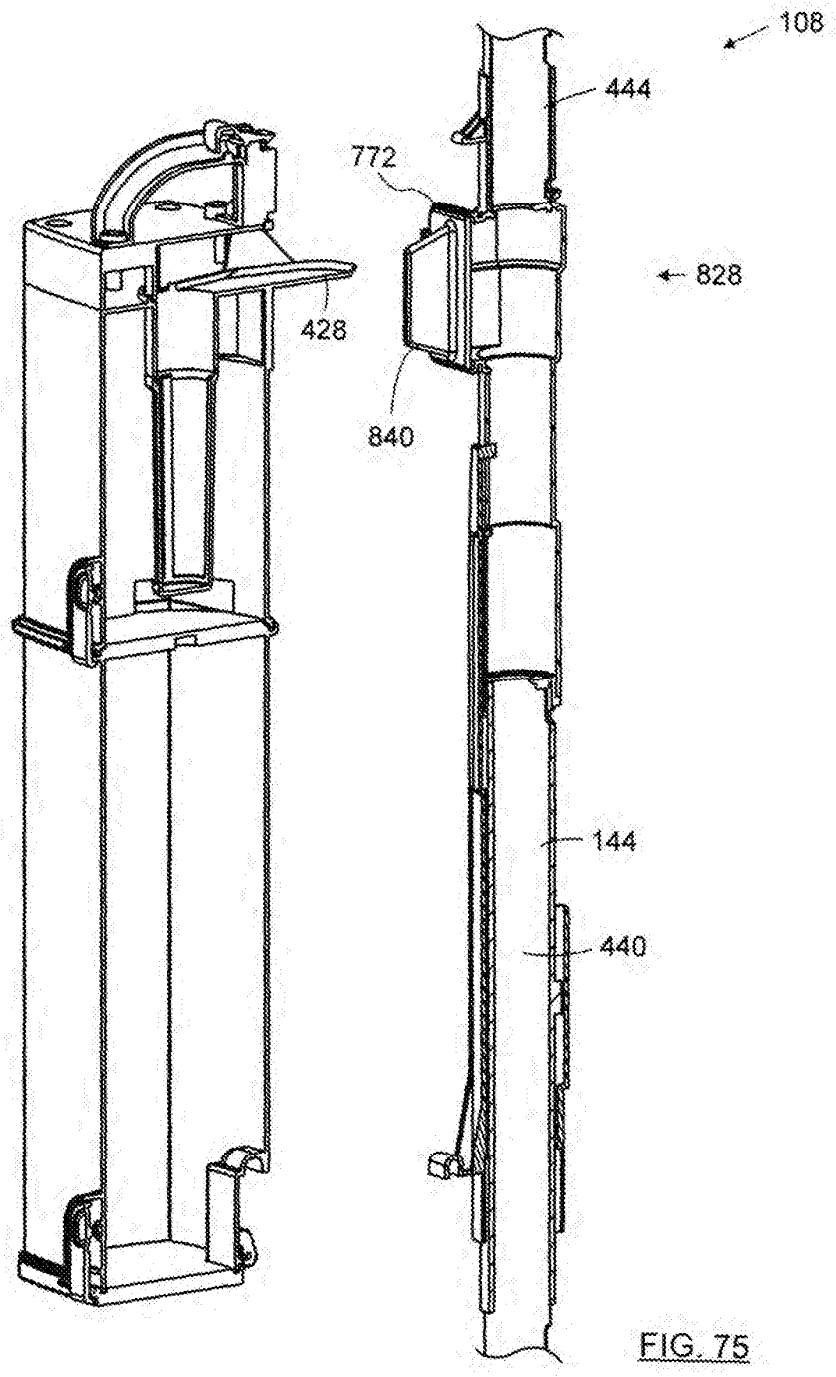


FIG. 75

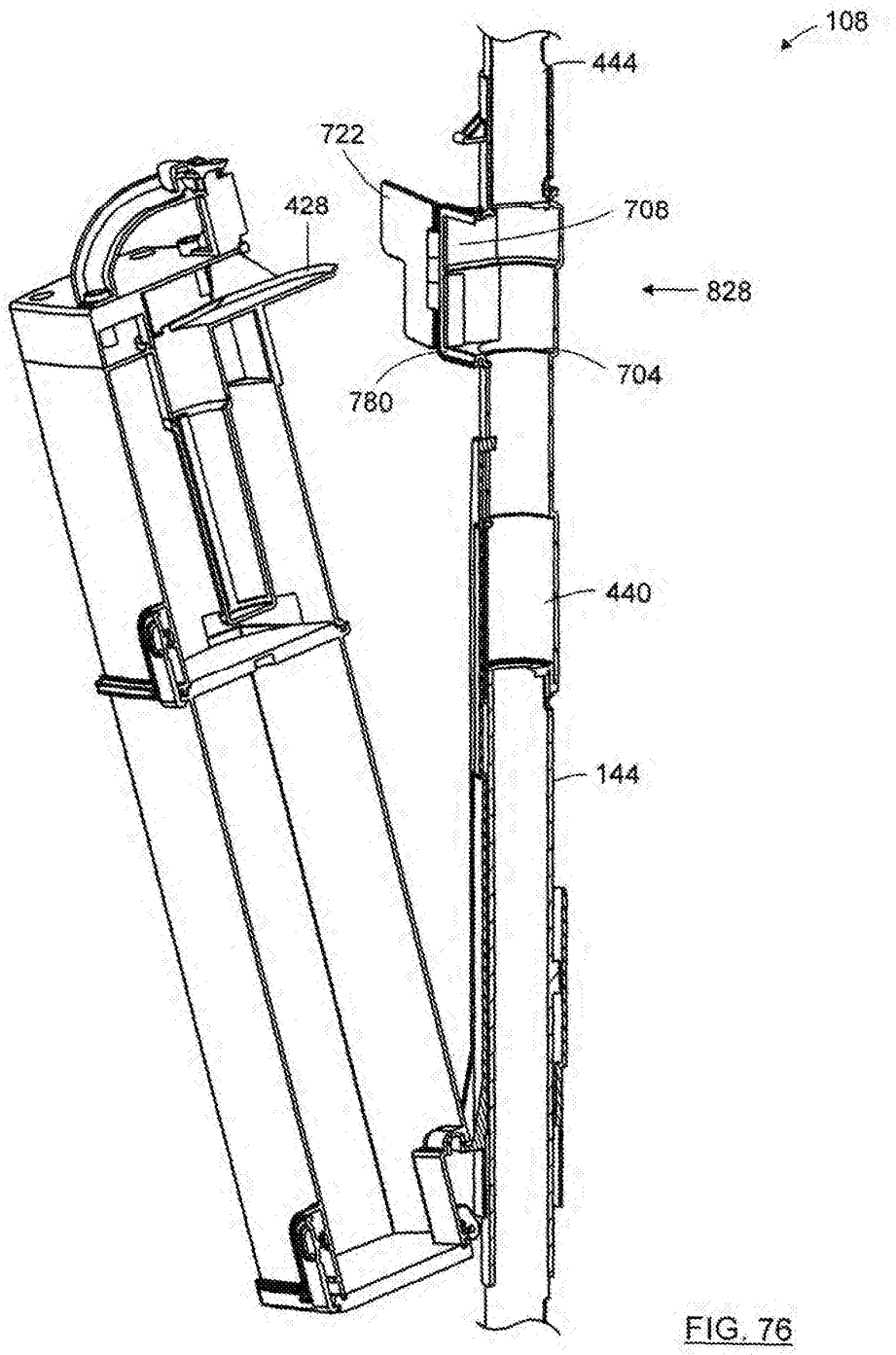


FIG. 76

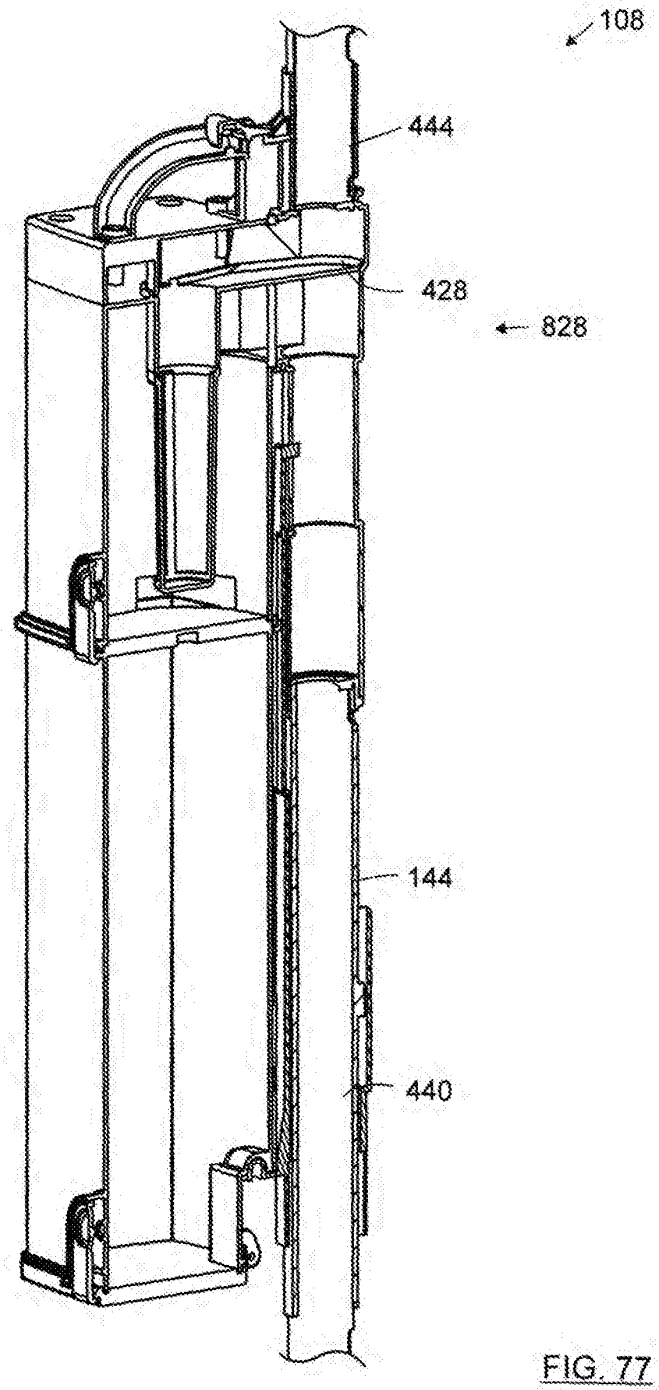


FIG. 77

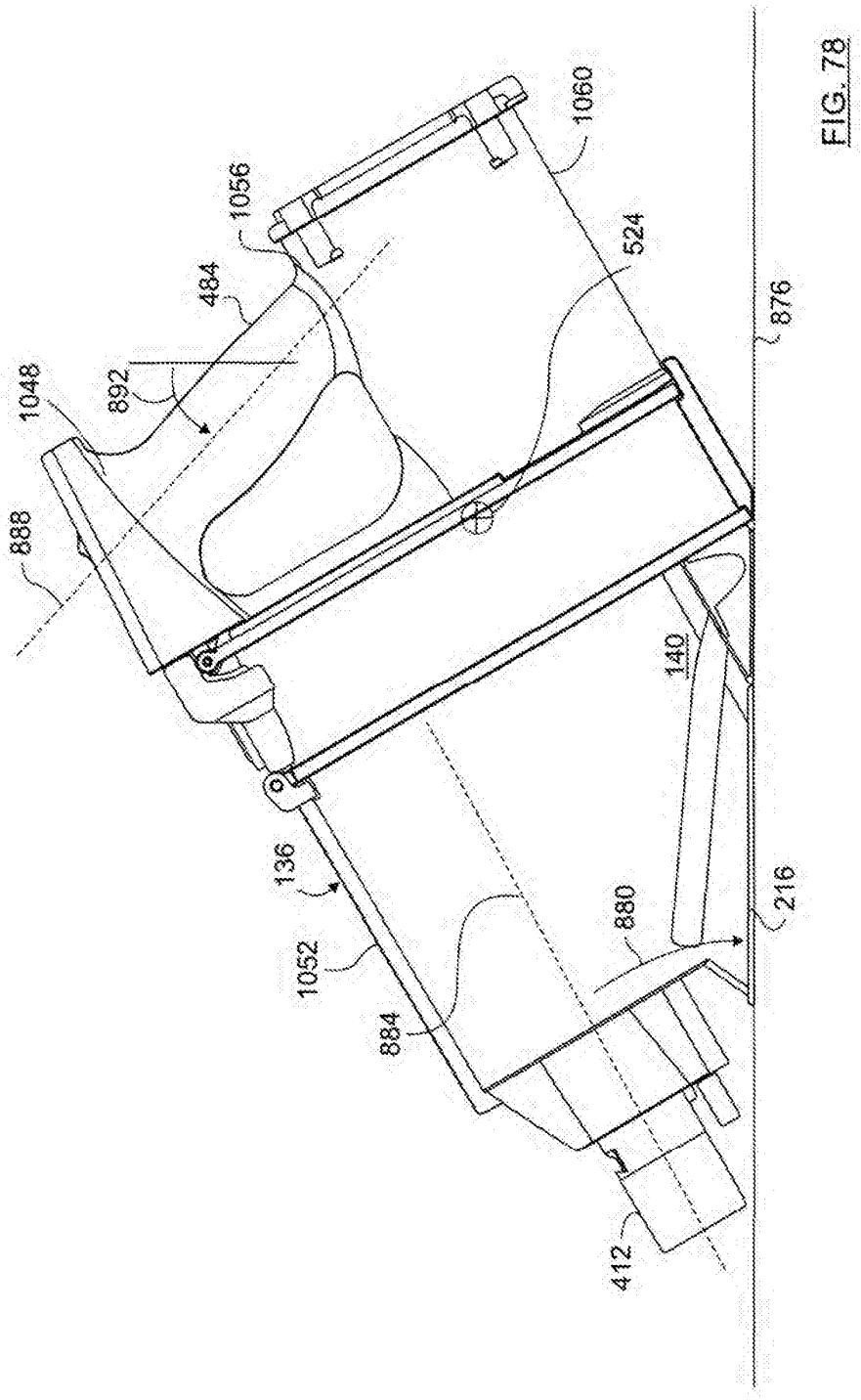

112
1060
1056
524
484
876
1048
892
888
140
136
216
880
1052
884
412

FIG. 78

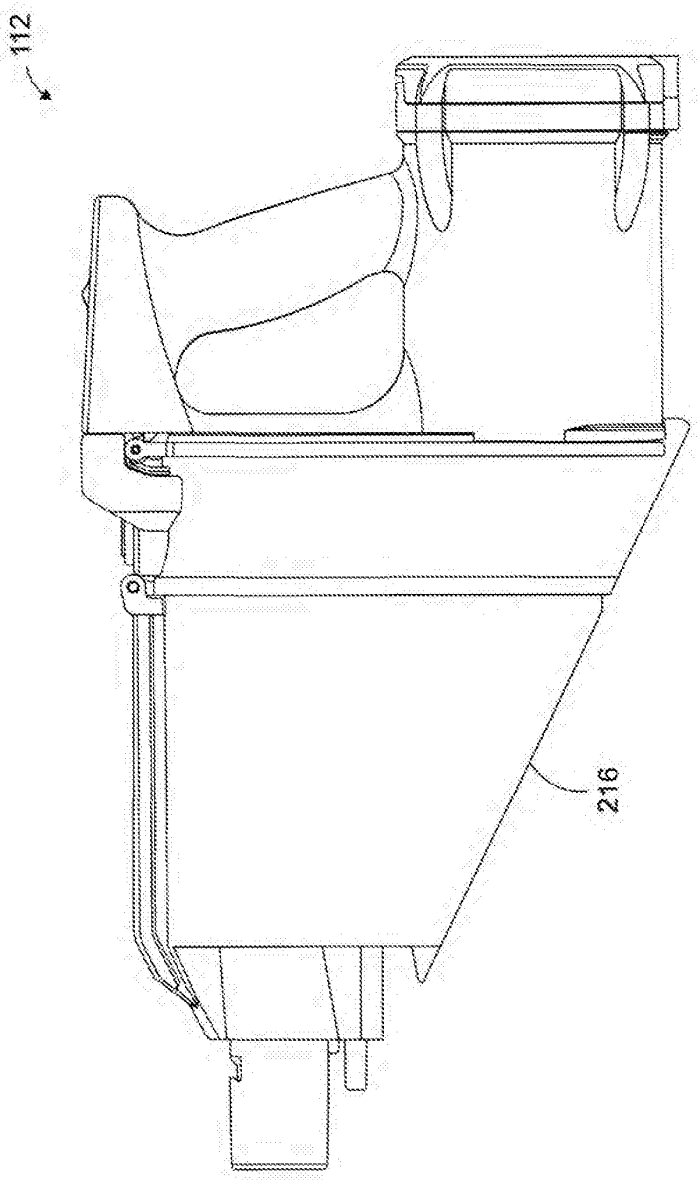


FIG. 79

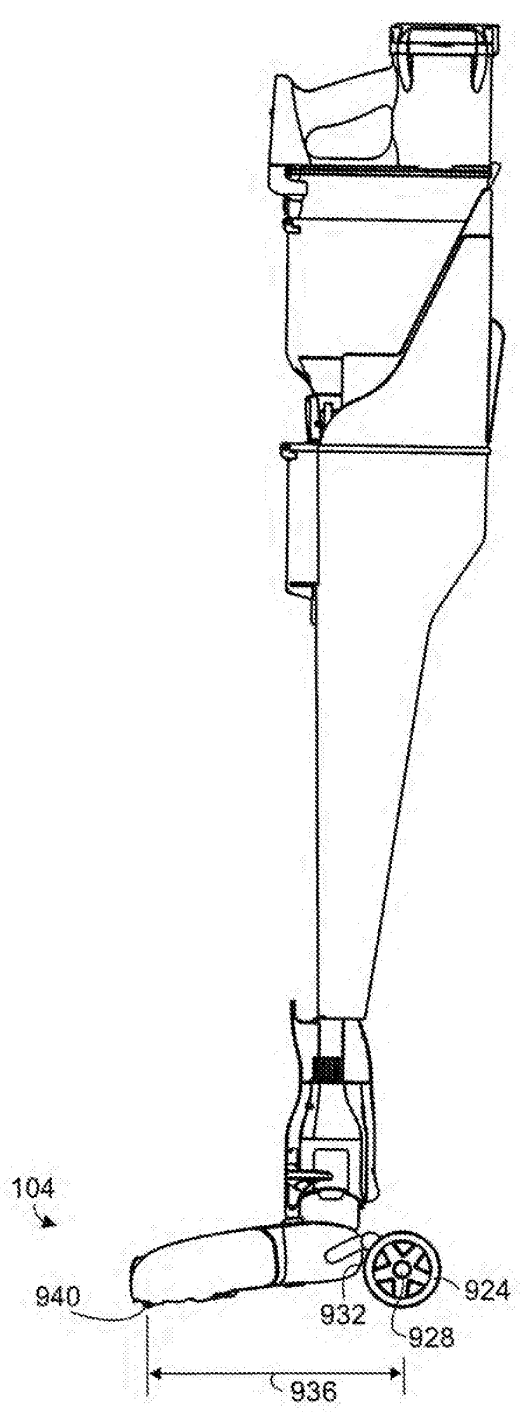


FIG. 80

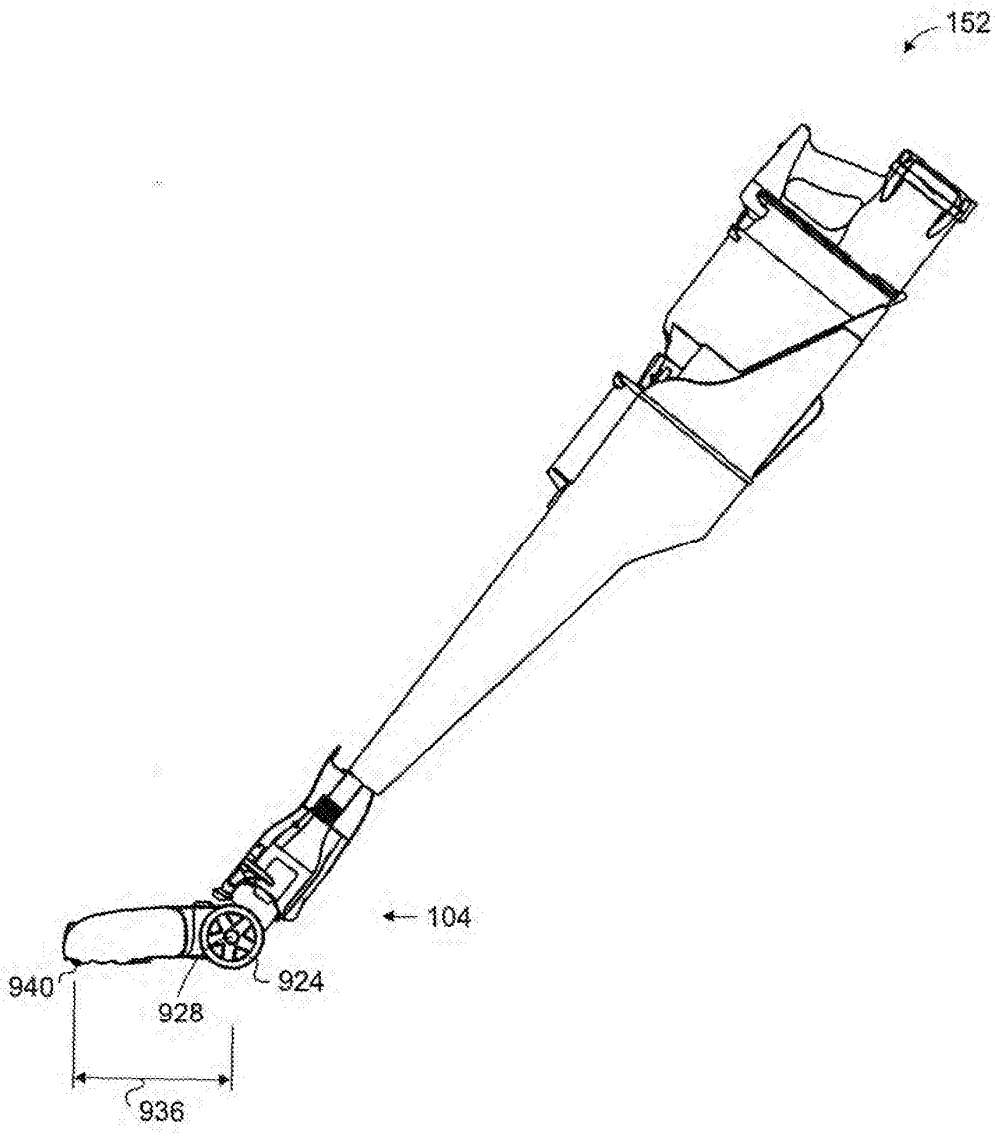


FIG. 81

FIG. 82

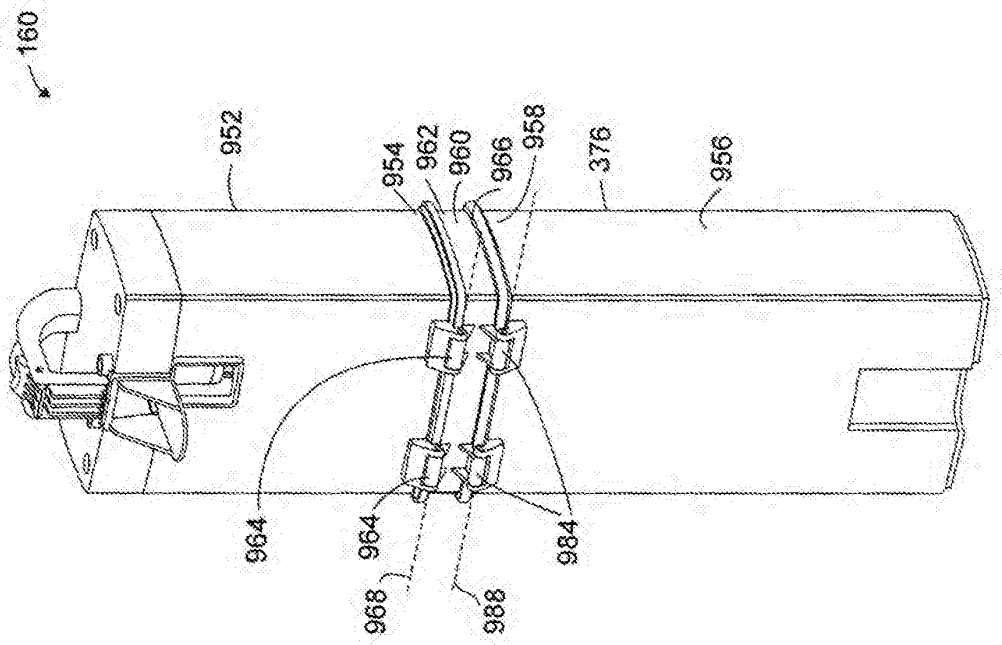


FIG. 83

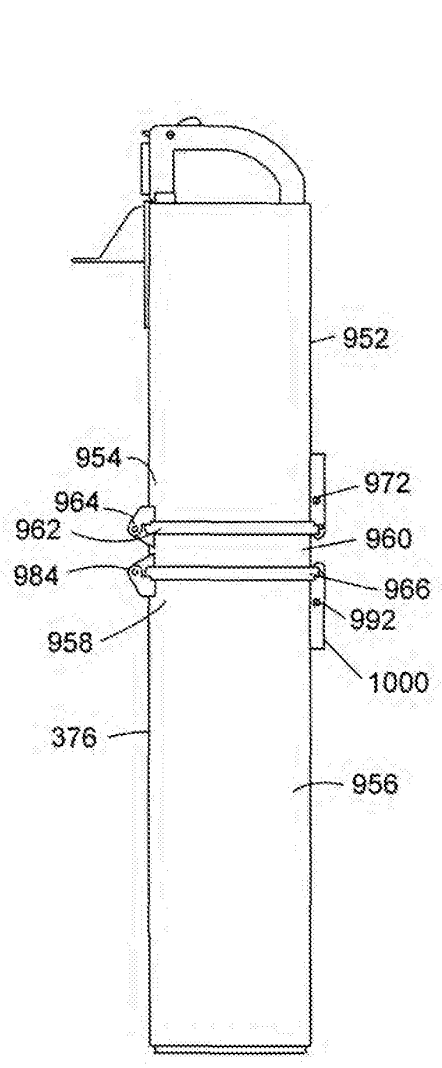


FIG. 84

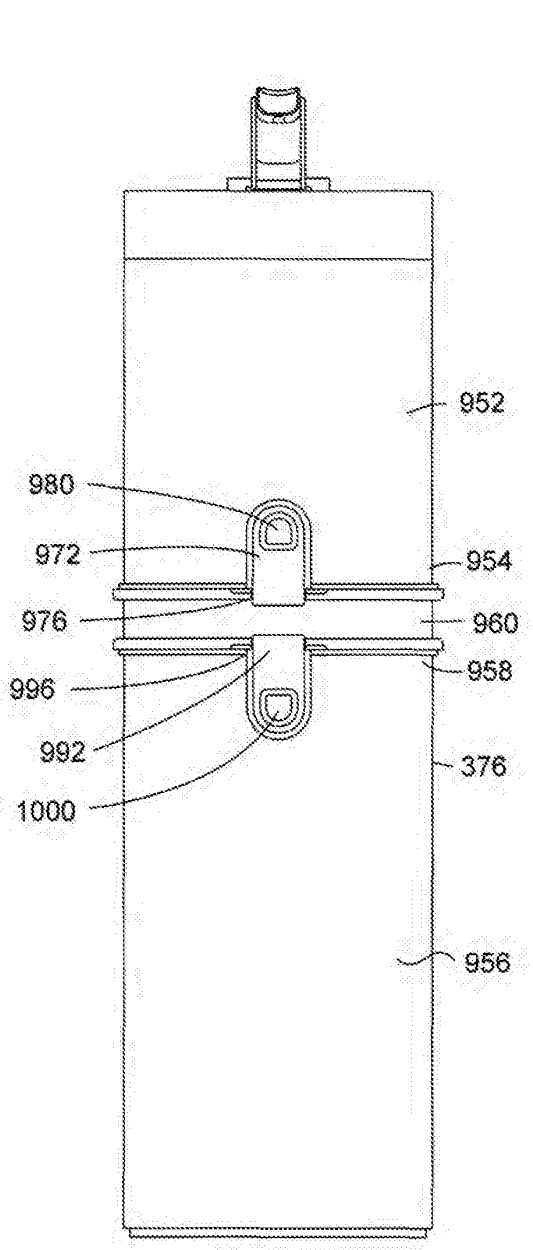


FIG. 85

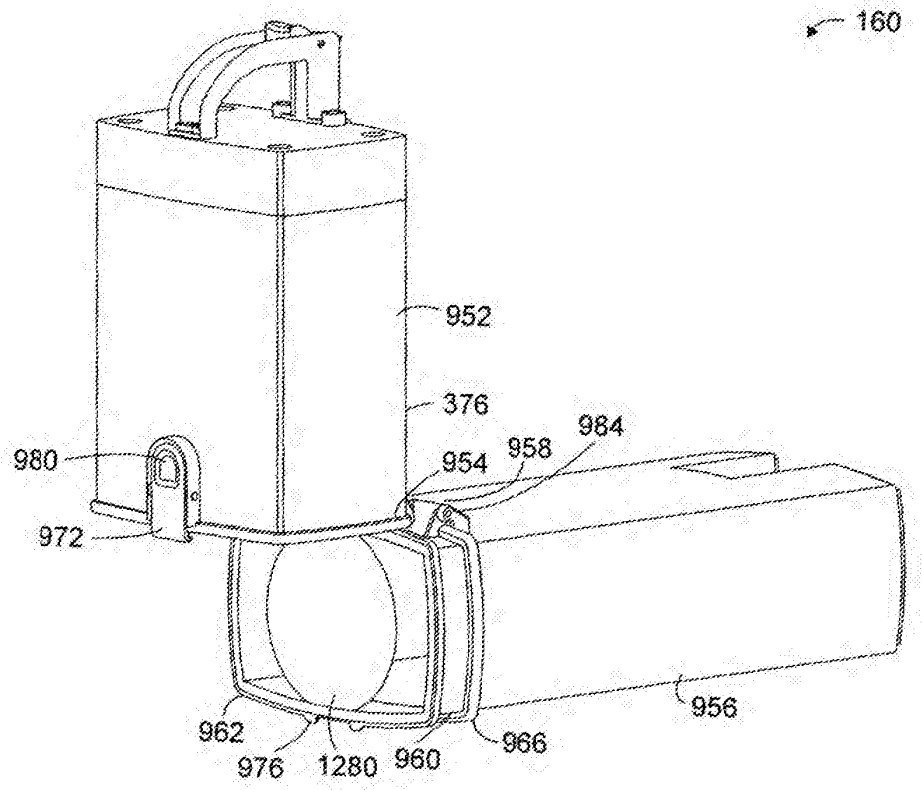


FIG. 86

Dyson Ex1004
Page 186

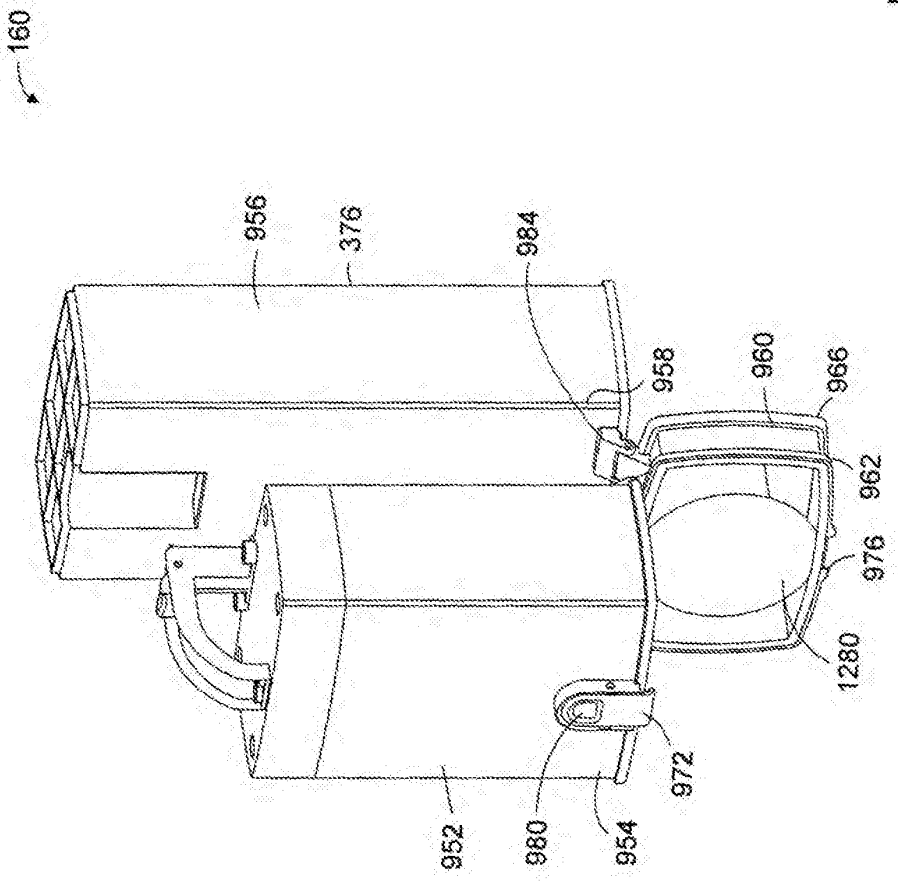


FIG. 87

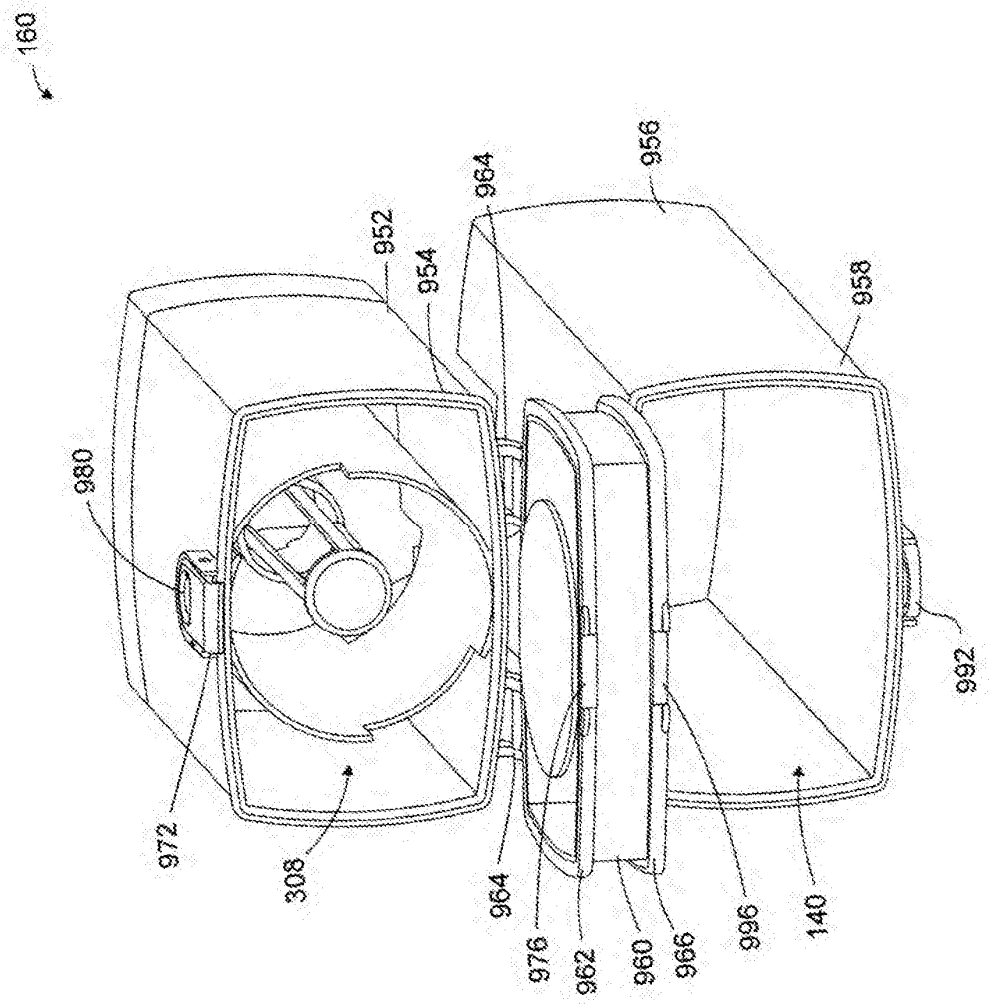

160
980
952
954
964
956
958
992
972
308
964
976
962
960
966
996
140

FIG. 88

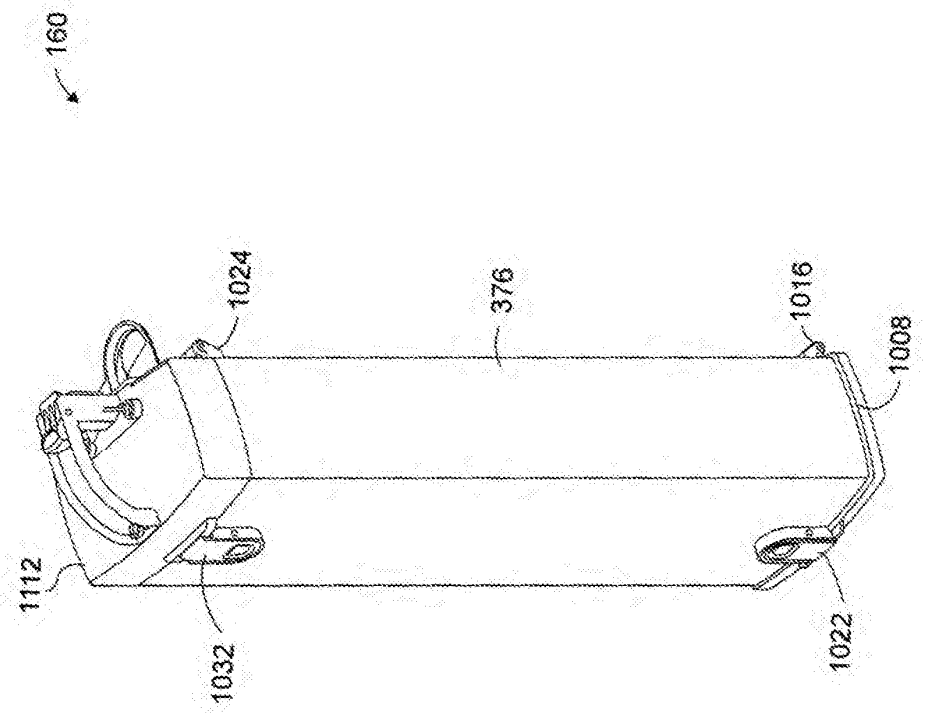


FIG. 89

FIG. 90

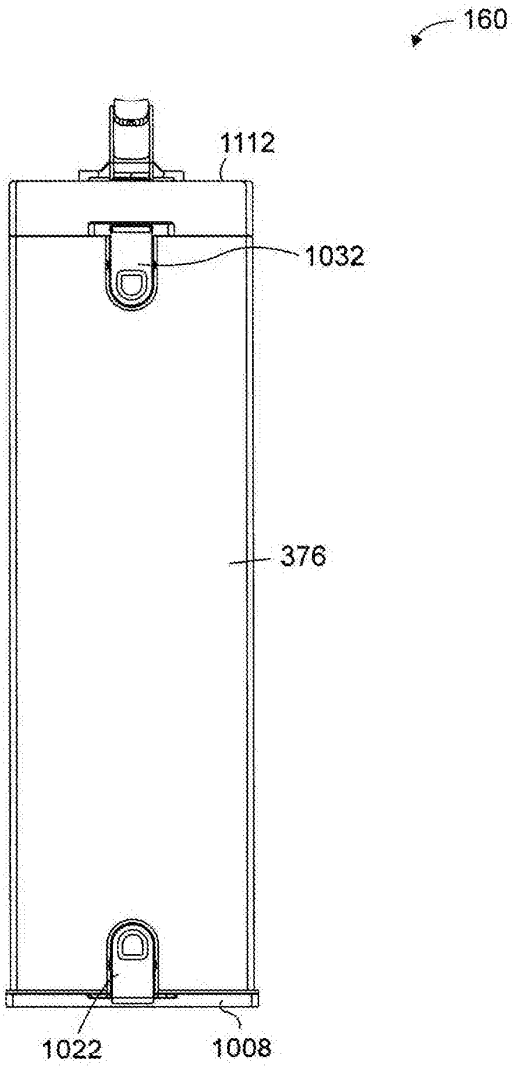


FIG. 91

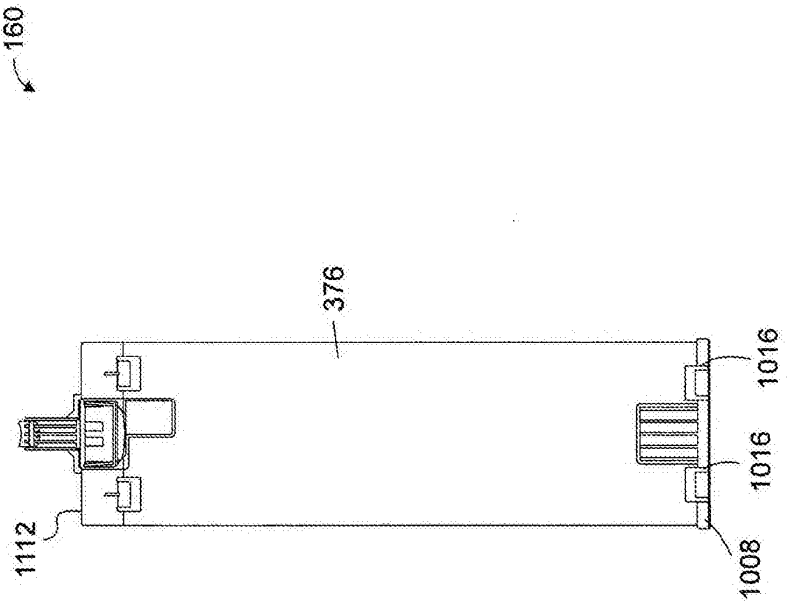


FIG. 92

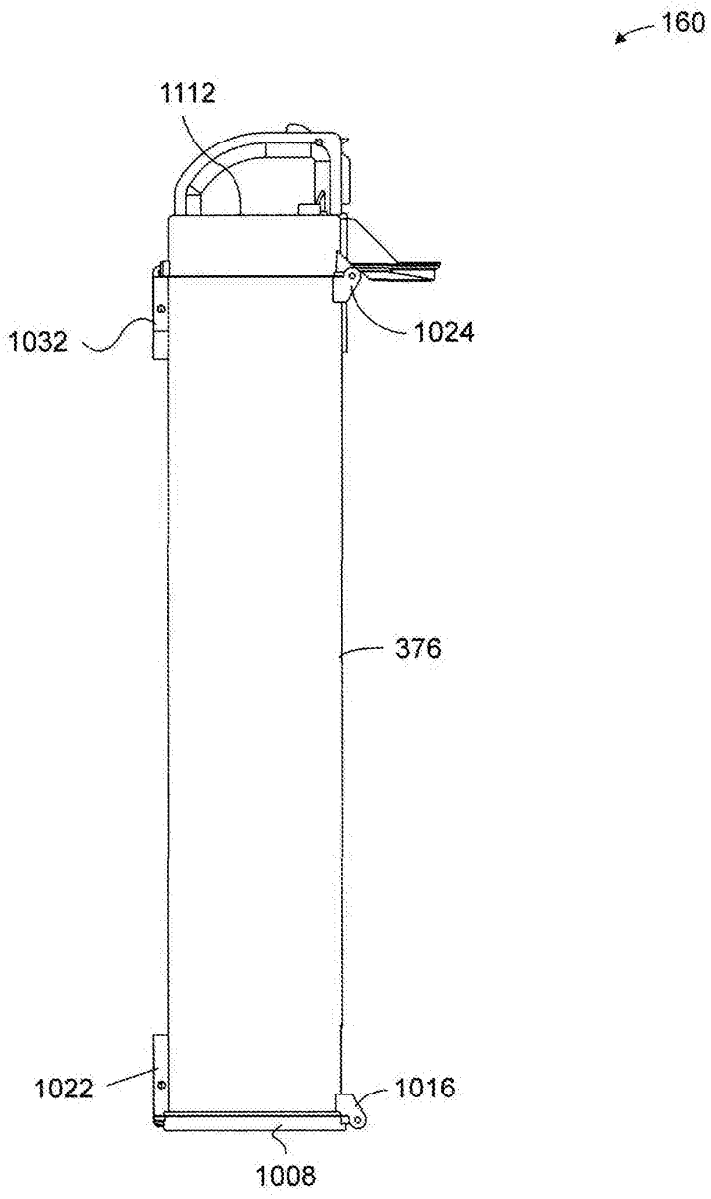


FIG. 93

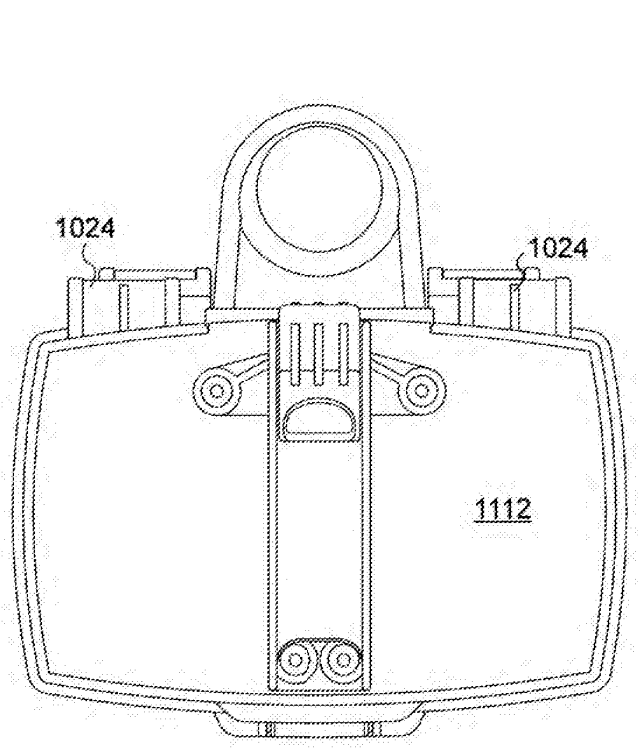


FIG. 94

FIG. 95

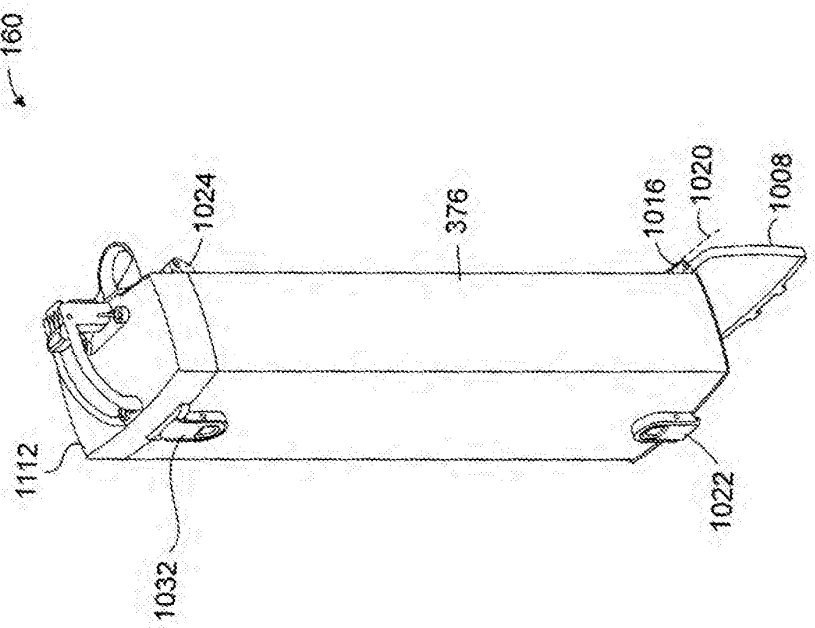


FIG. 95b

FIG. 95c

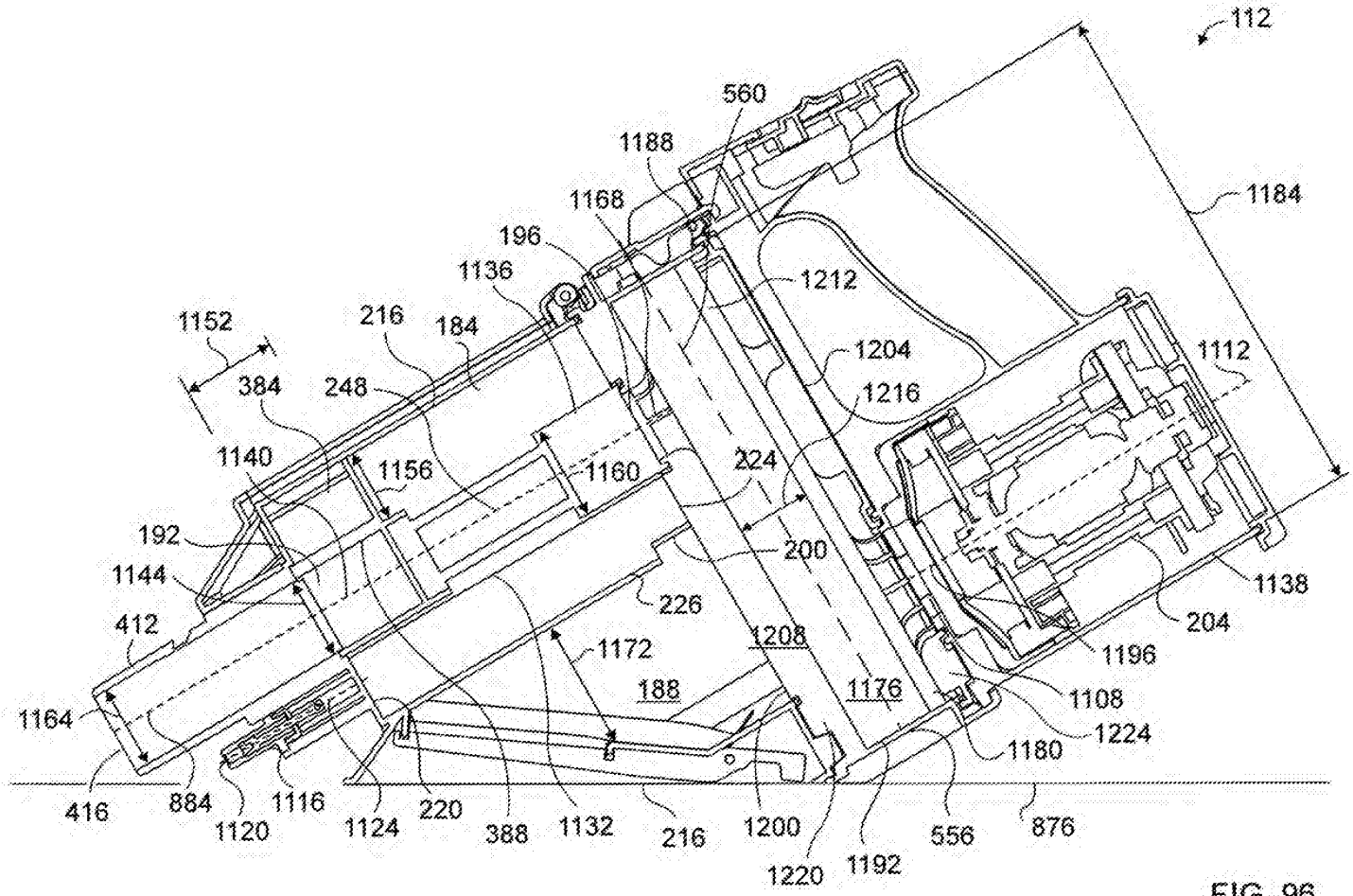


FIG. 96

Dyson Ex1004
Page 198

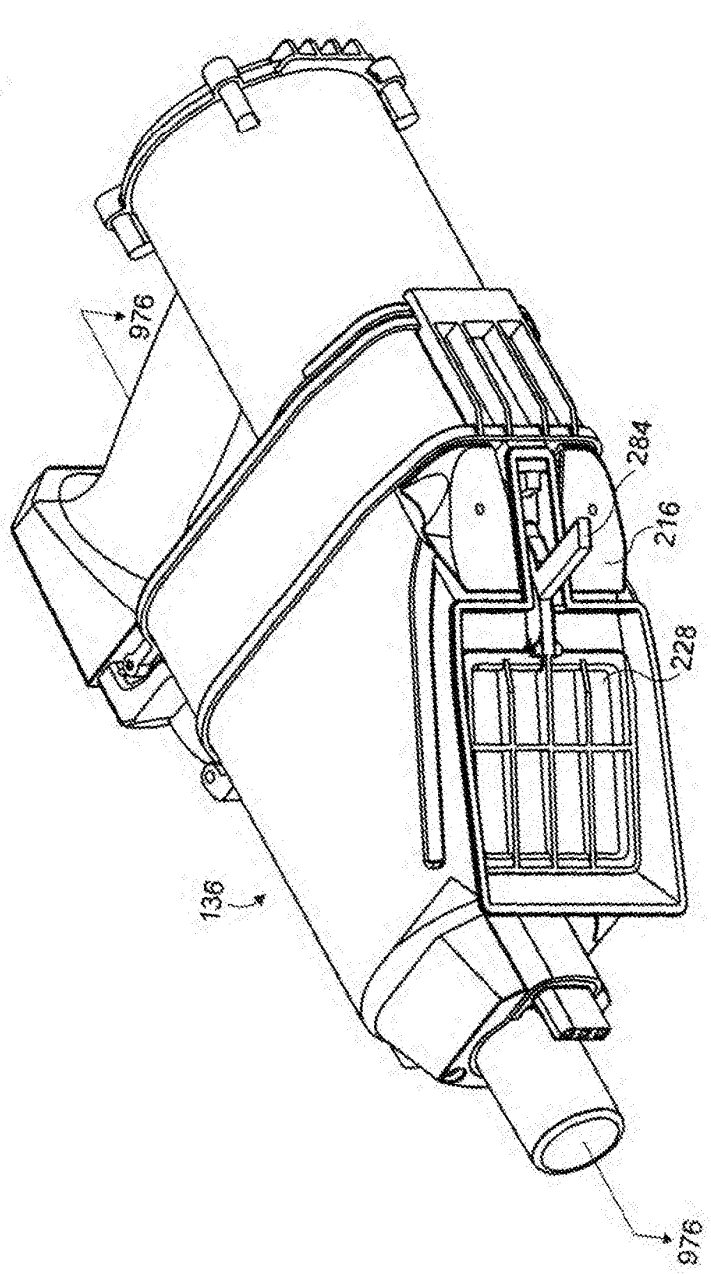


FIG. 97a

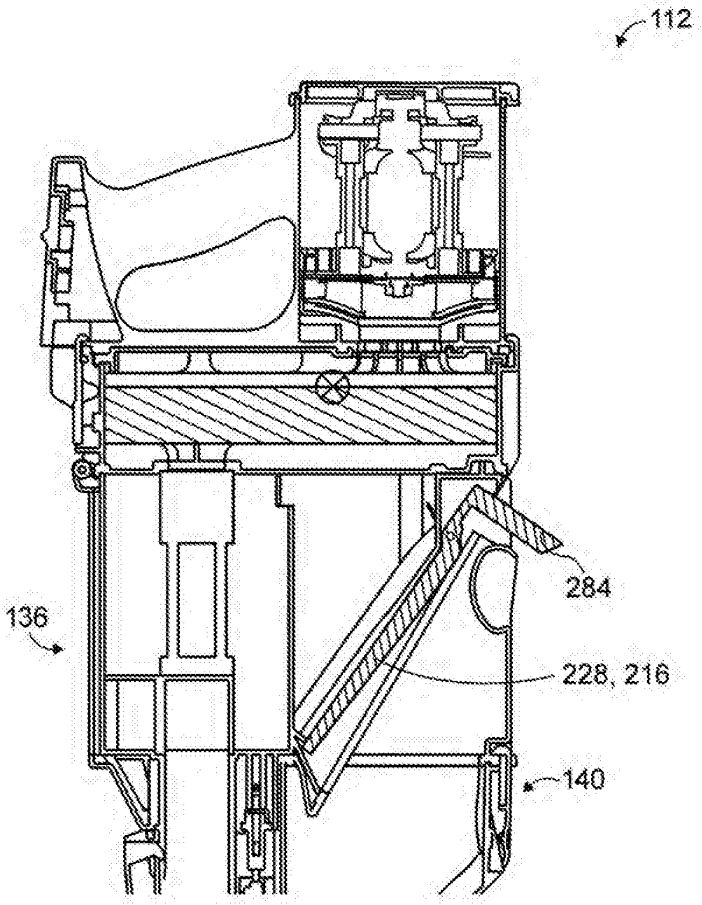


FIG. 97b

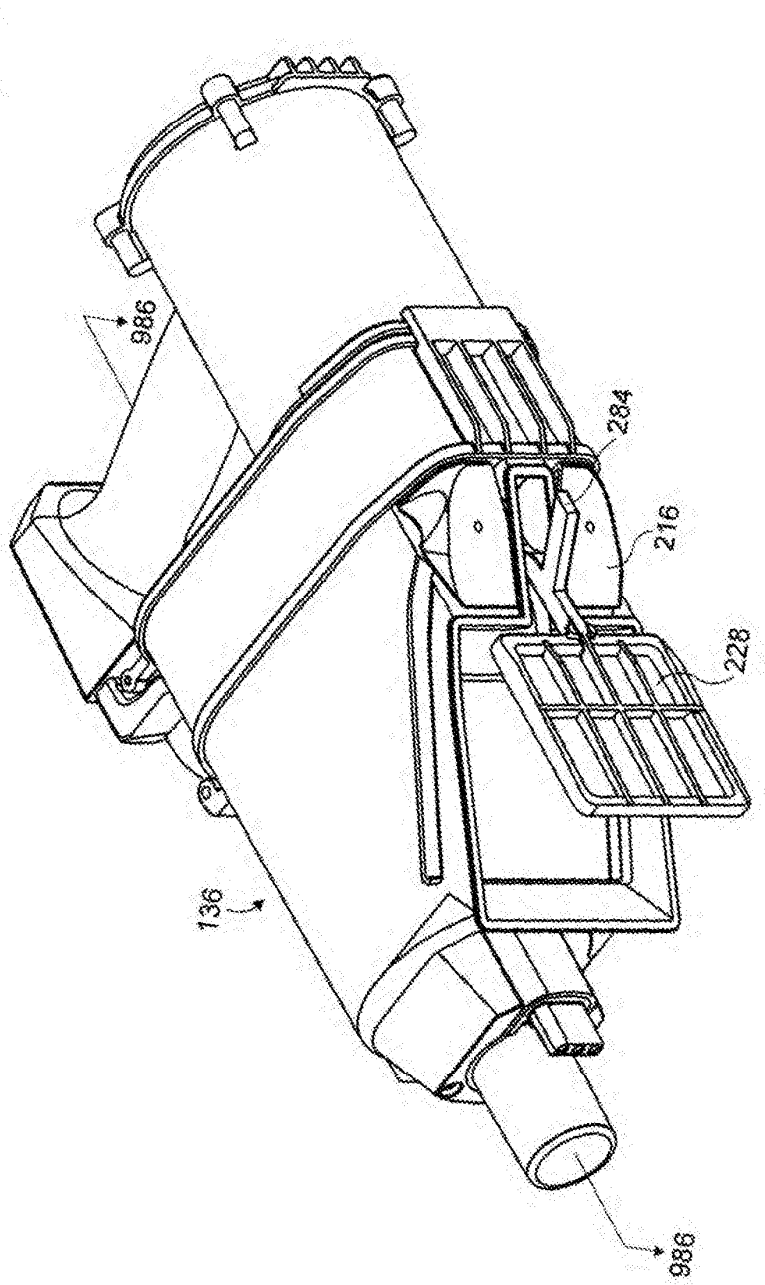


FIG. 98a

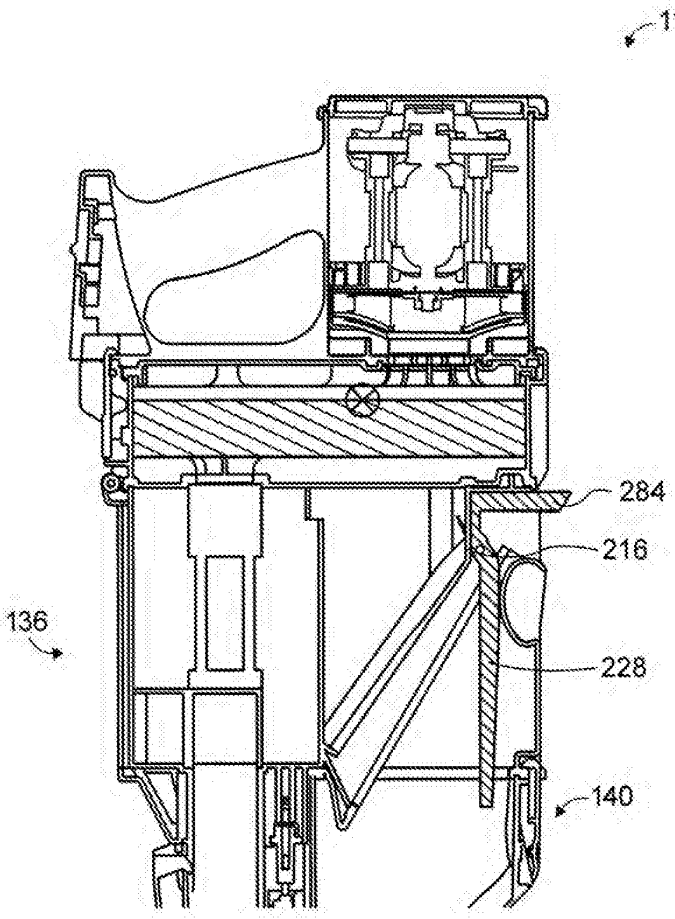


FIG. 98b

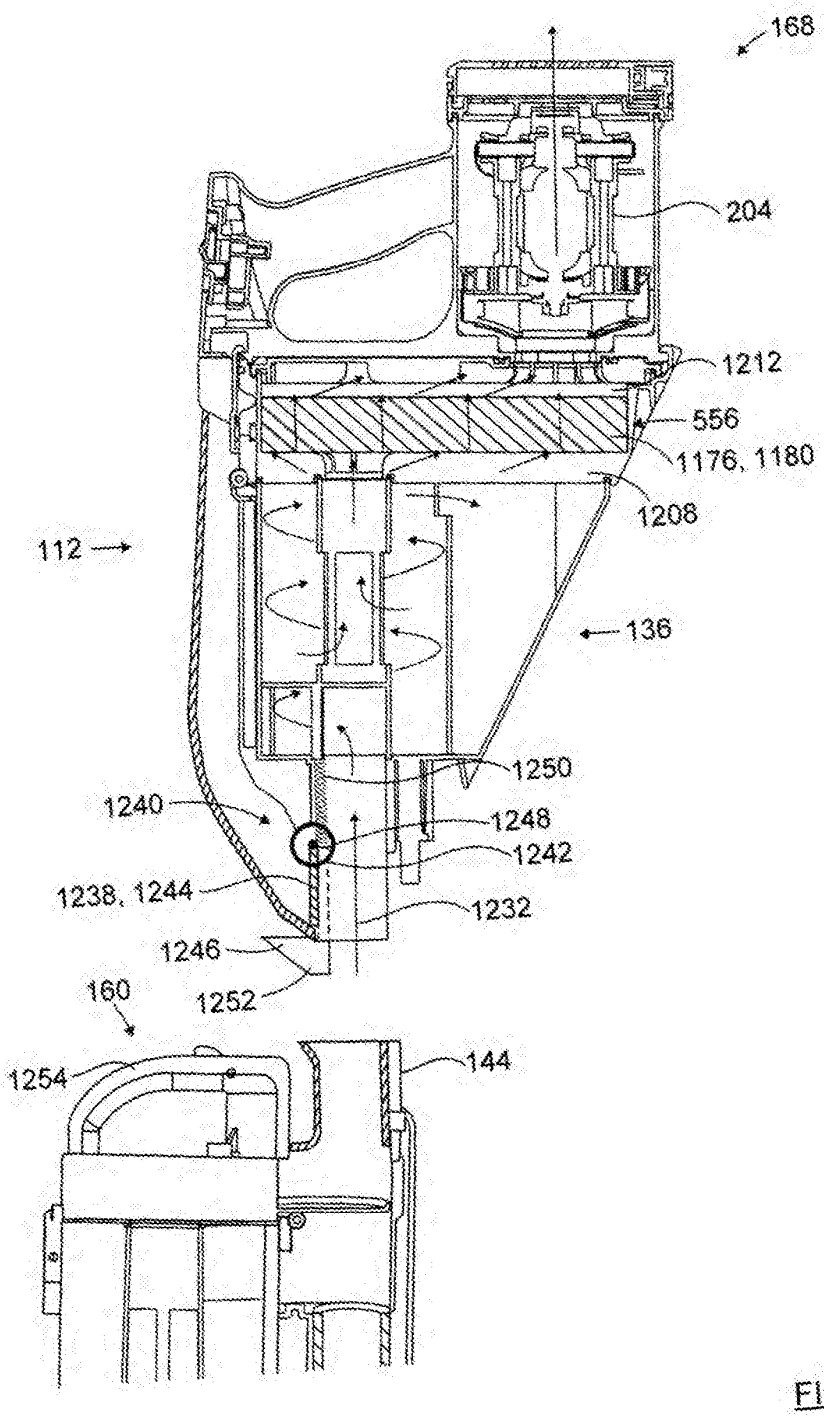

168
204
1212
556
1176, 1180
1208
112
136
1250
1240
1248
1242
1238, 1244
1232
1246
1252
160
1254
144

FIG. 99

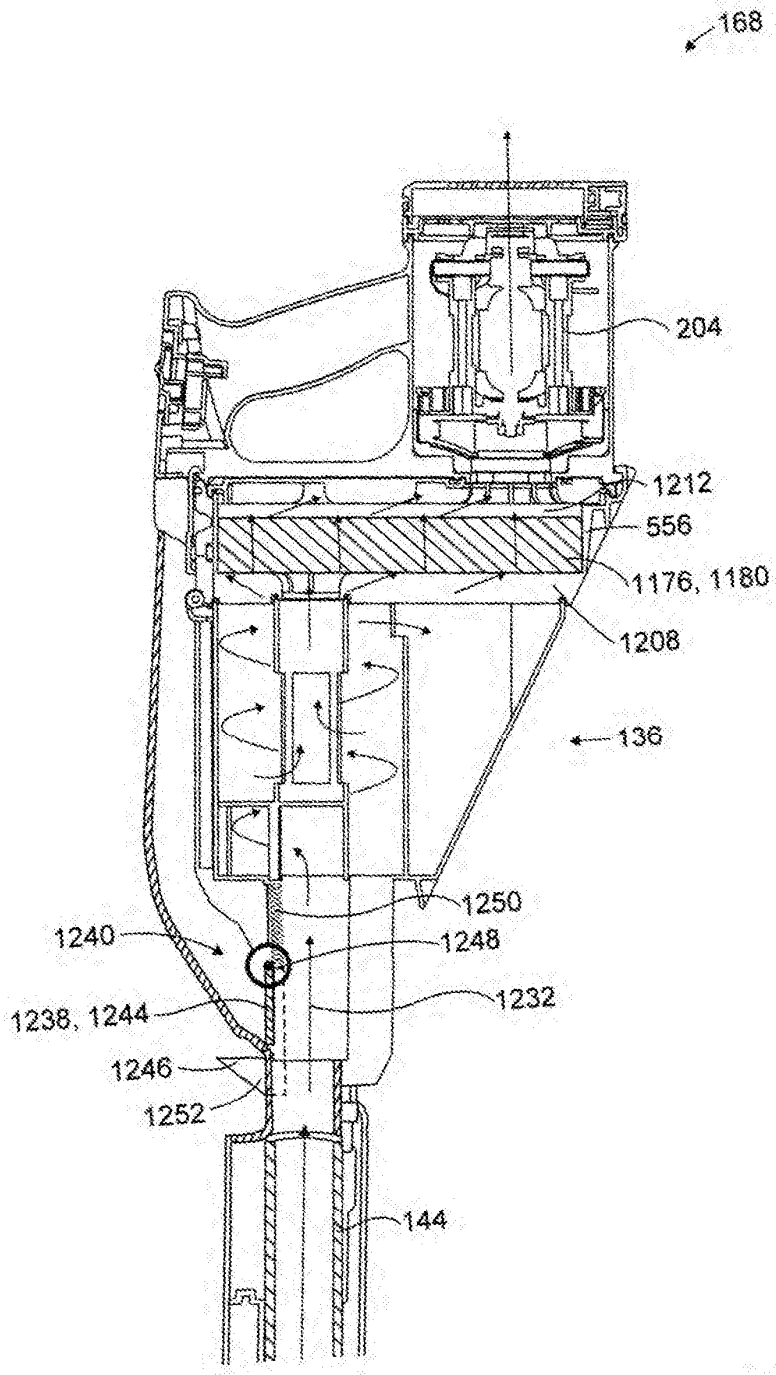

168
204
1212
556
1176, 1180
1208
136
1250
1240
1248
1232
1238, 1244
1246
1252
144

FIG. 100

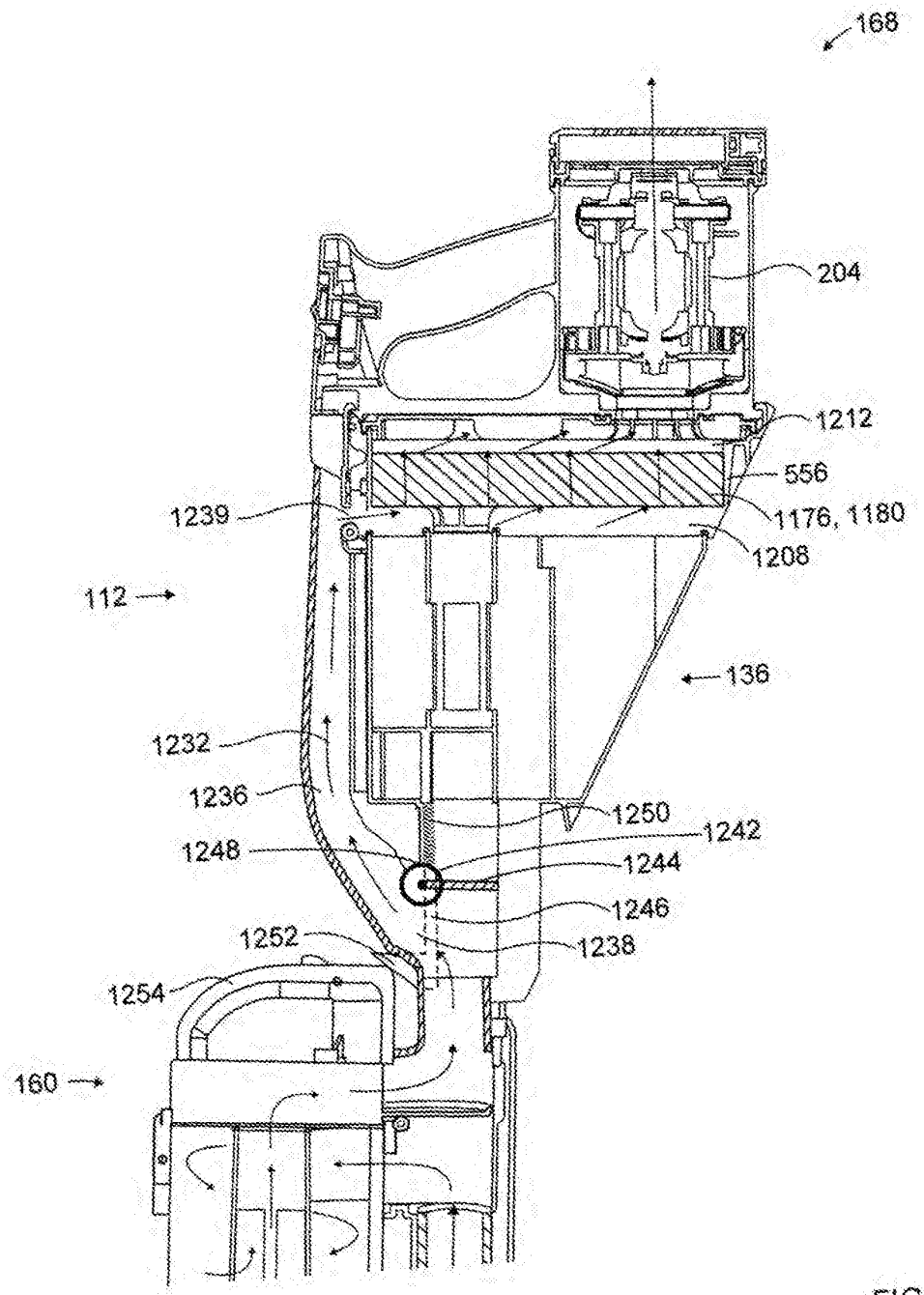

168
204
1212
556
1176, 1180
1208
1239
112
136
1232
1236
1250
1242
1248
1244
1246
1252
1238
1254
160

FIG. 101

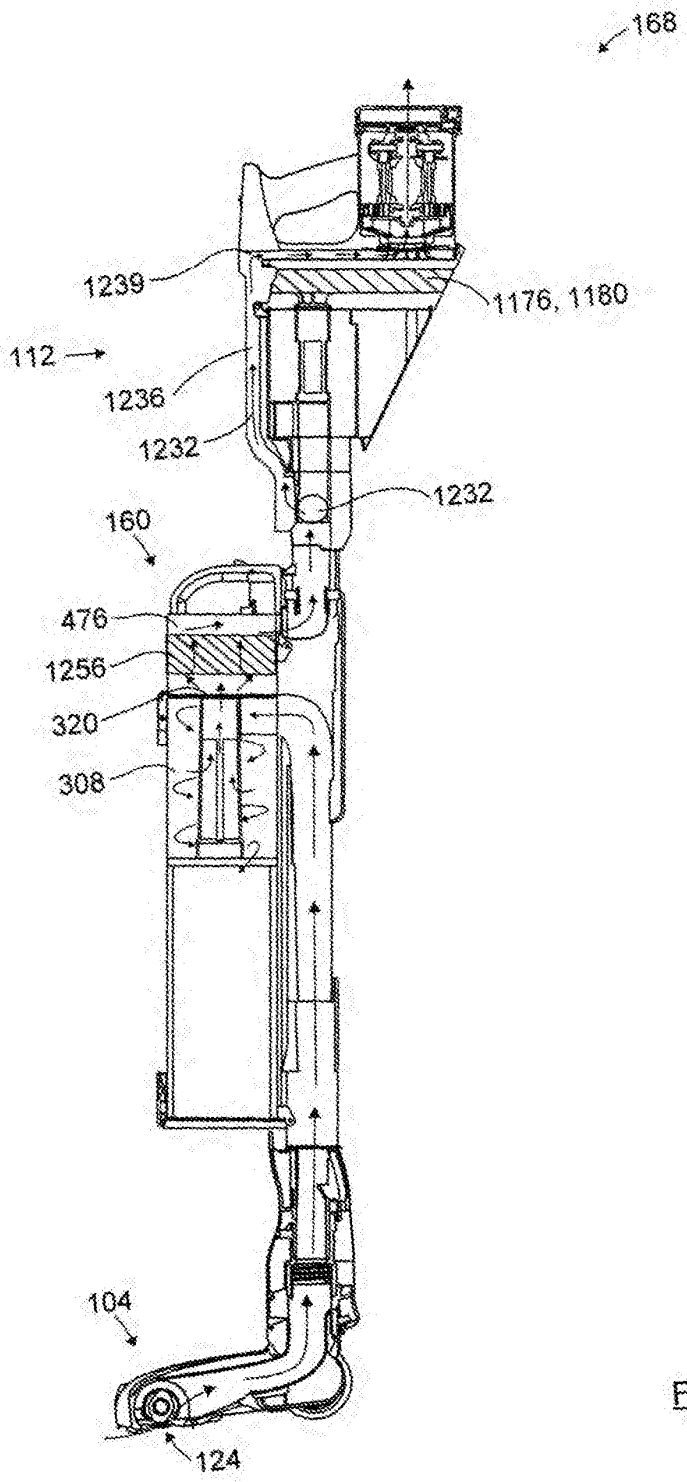

168
1239
1176, 1180
112
1236
1232
1232
160
476
1256
320
308
104
124

FIG. 102

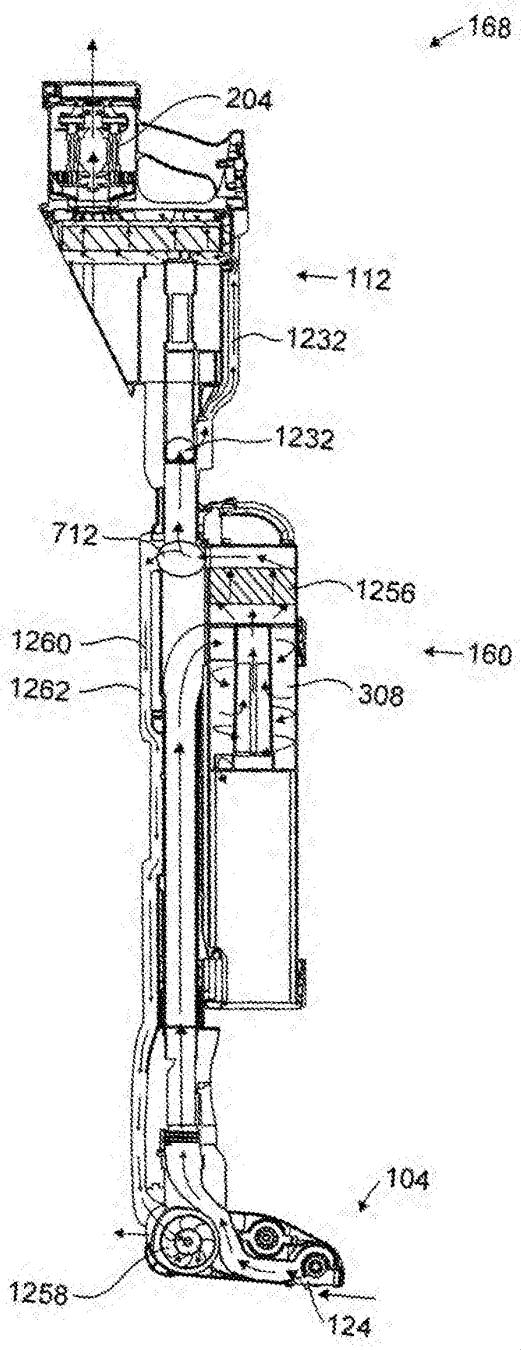


FIG. 103

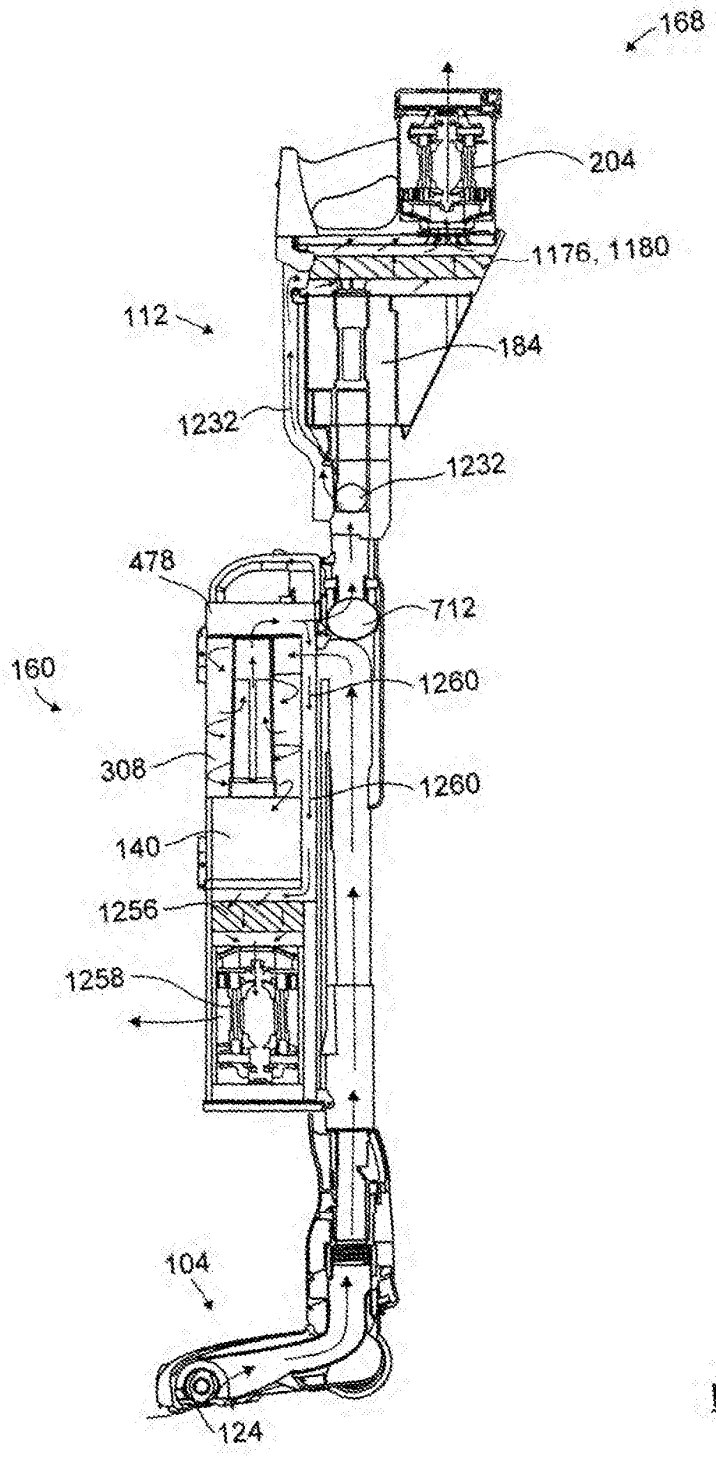

168
204
1176, 1180
112
184
1232
1232
478
712
160
1260
308
1260
140
1256
1258
104
124

FIG. 104a

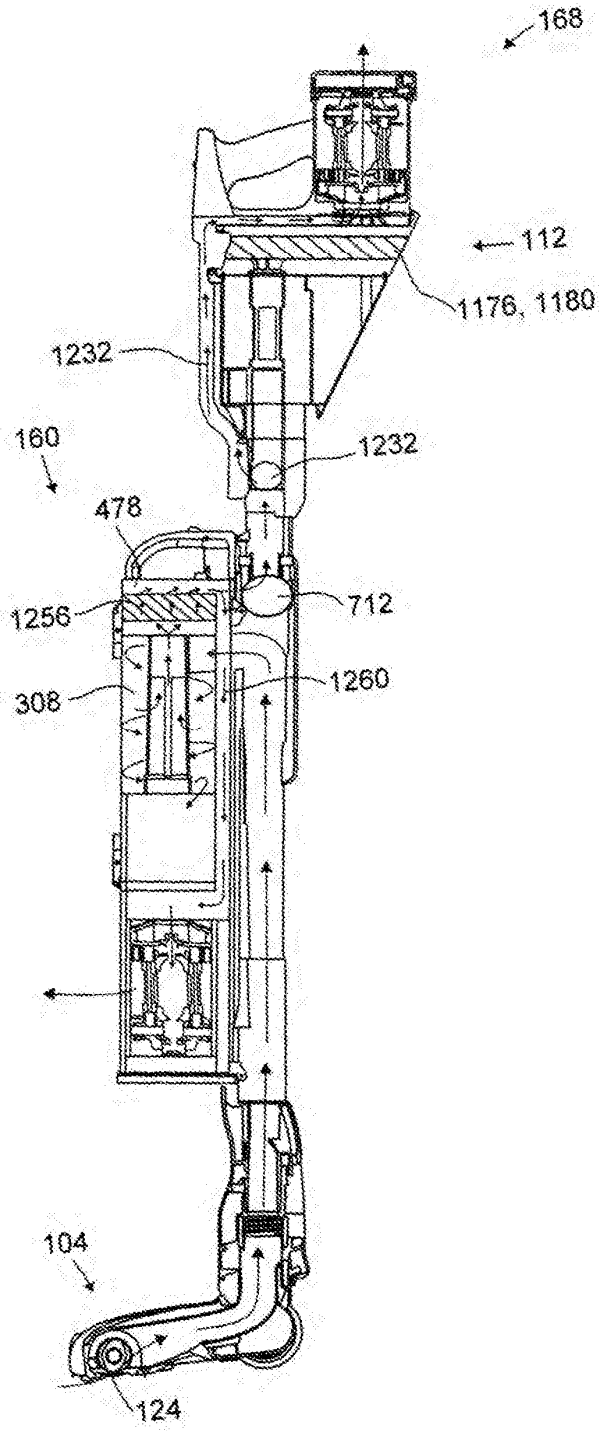


FIG. 104b

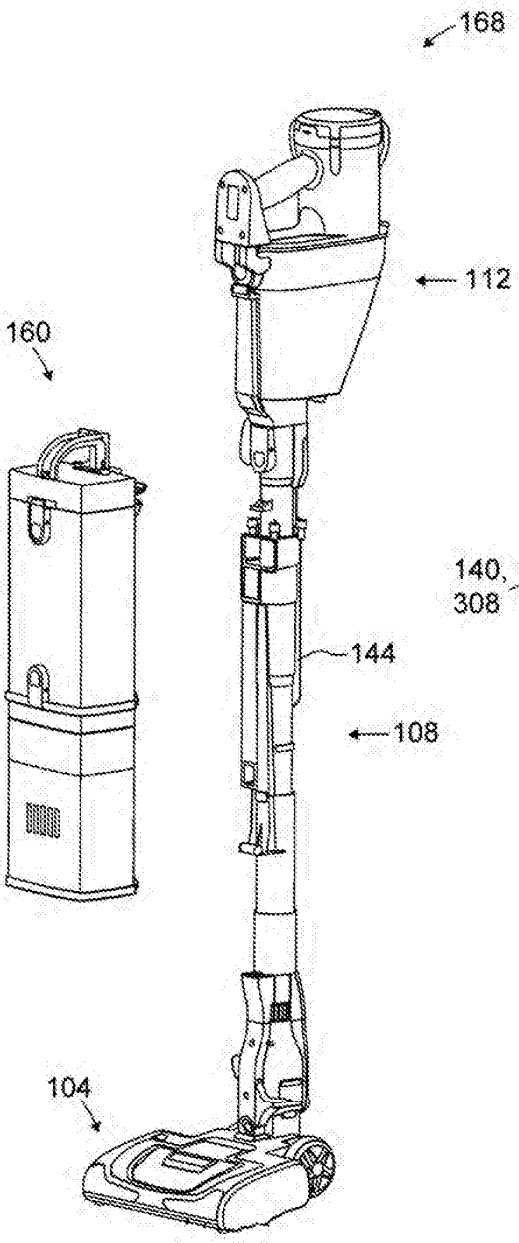


FIG. 105a

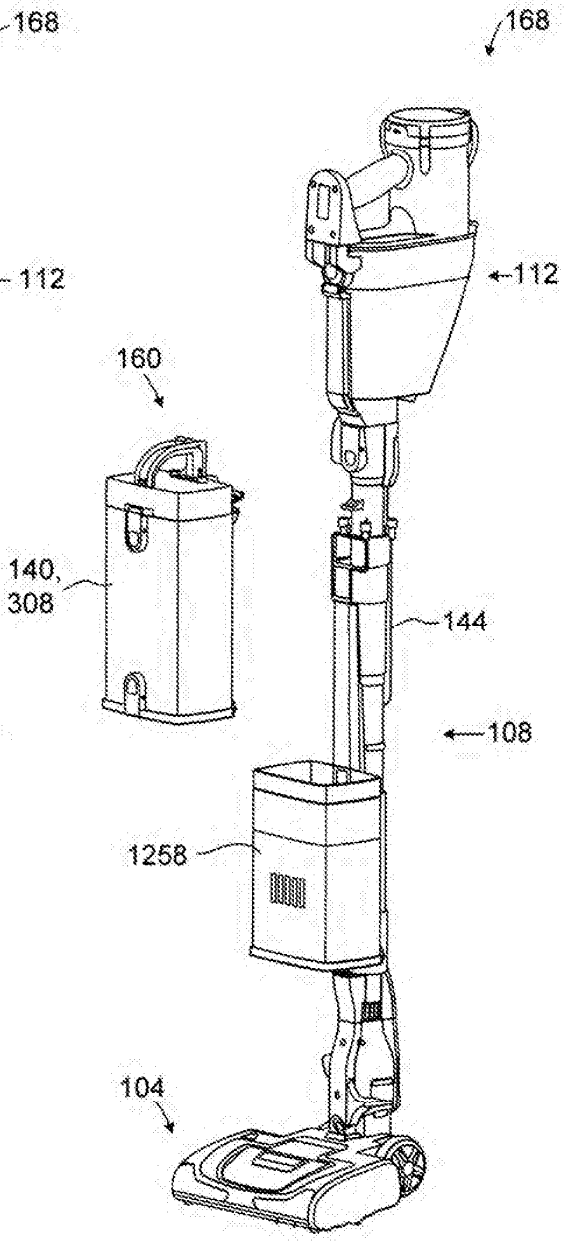


FIG. 105b

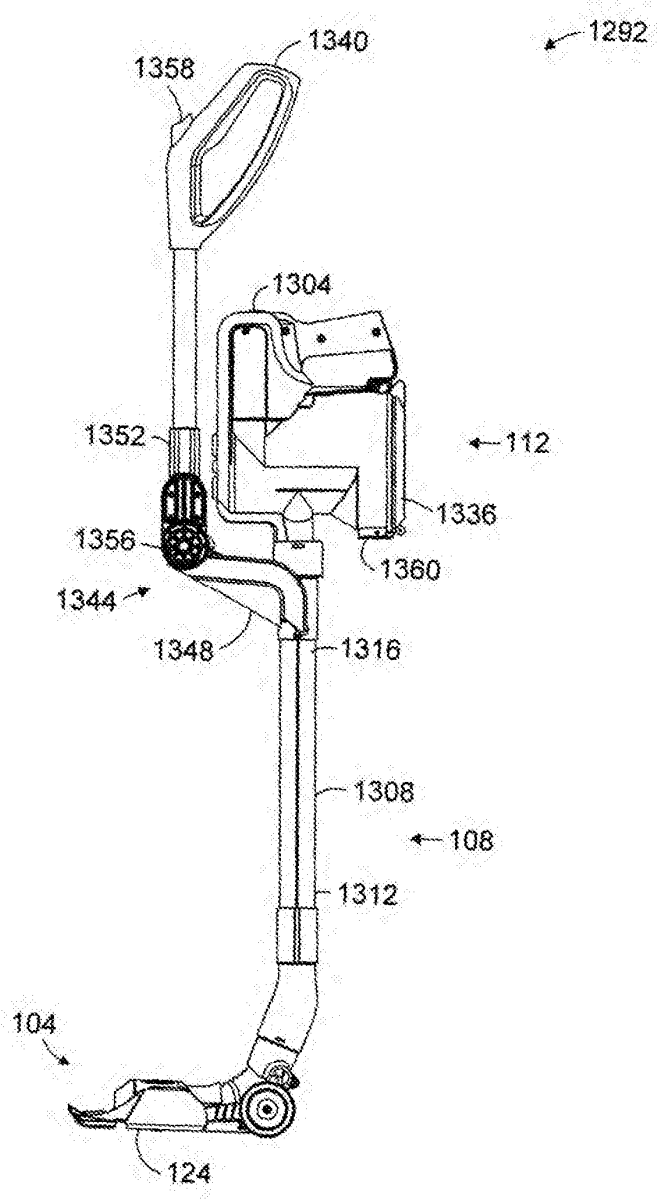

1292
1340
1358
1304
1352
112
1336
1356
1360
1344
1348
1316
1308
108
1312
104
124

FIG. 106

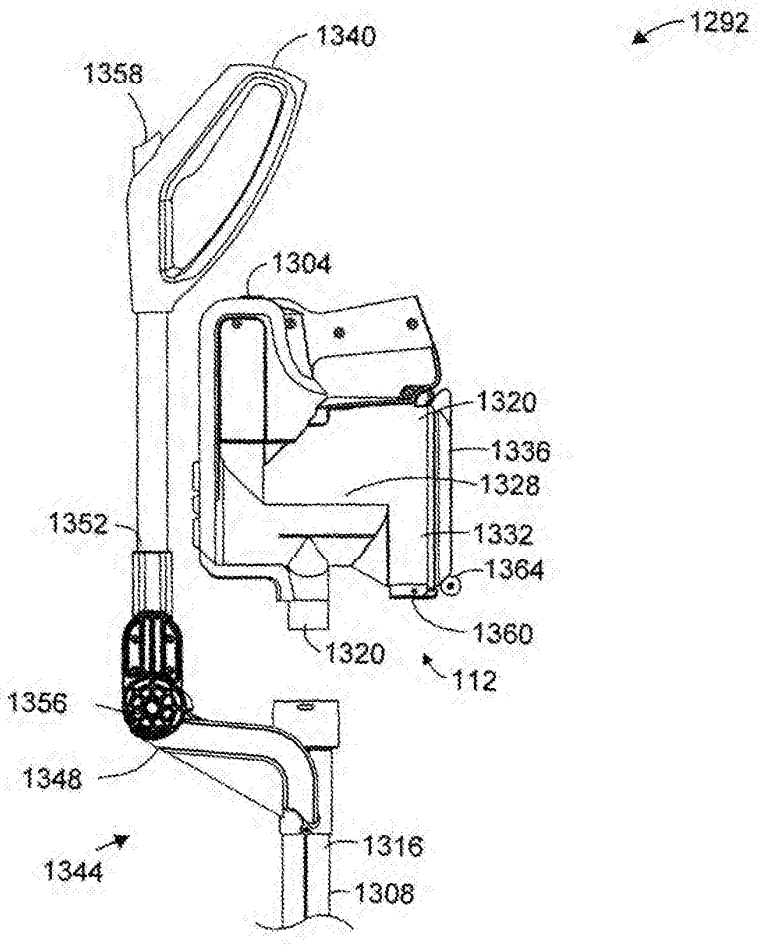

1292
1340
1358
1304
1320
1336
1328
1352
1332
1364
1360
1320
112
1356
1348
1316
1344
1308

FIG. 107

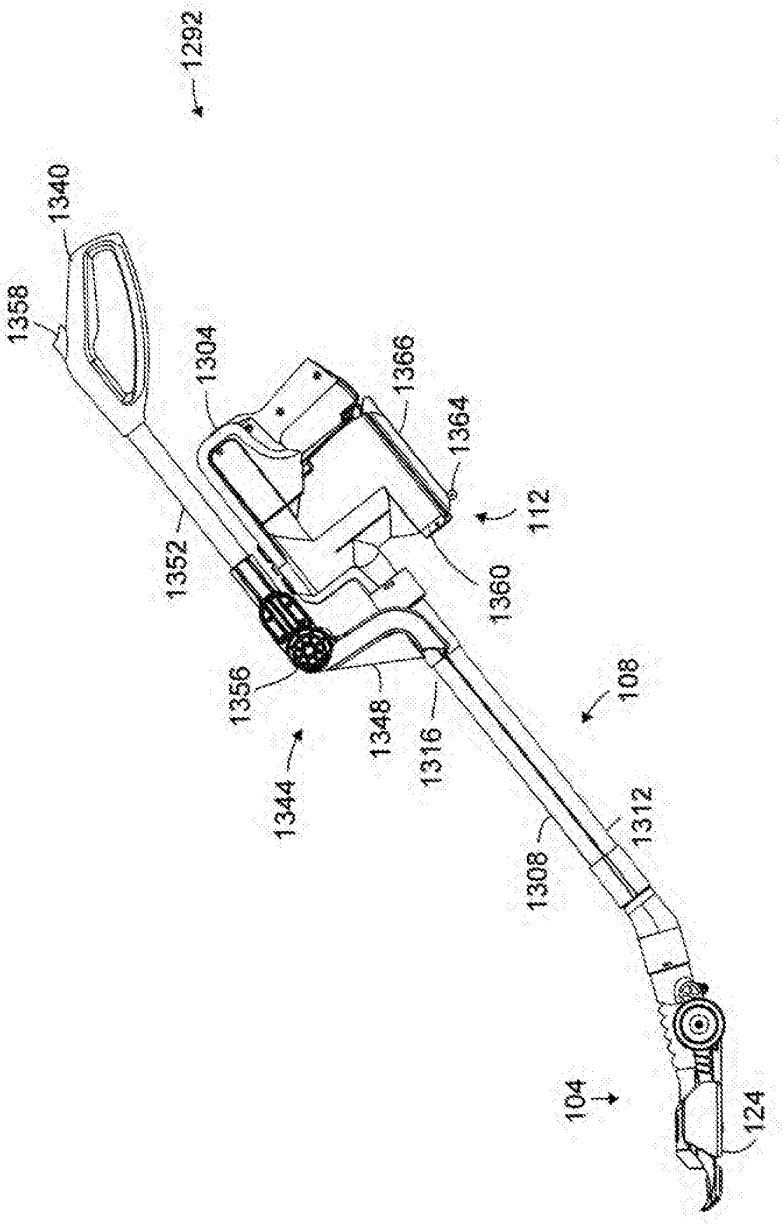

1292
1340
1358
1304
1366
1364
112
1352
1360
1356
1348
1316
1344
108
1312
1308
104
124

FIG. 108

1292
1340
1358
1352
1344
1356
1348
1316
1304
112
1336
1364
1360
108
1308
1312
104
124

FIG. 109

FIG. 110a

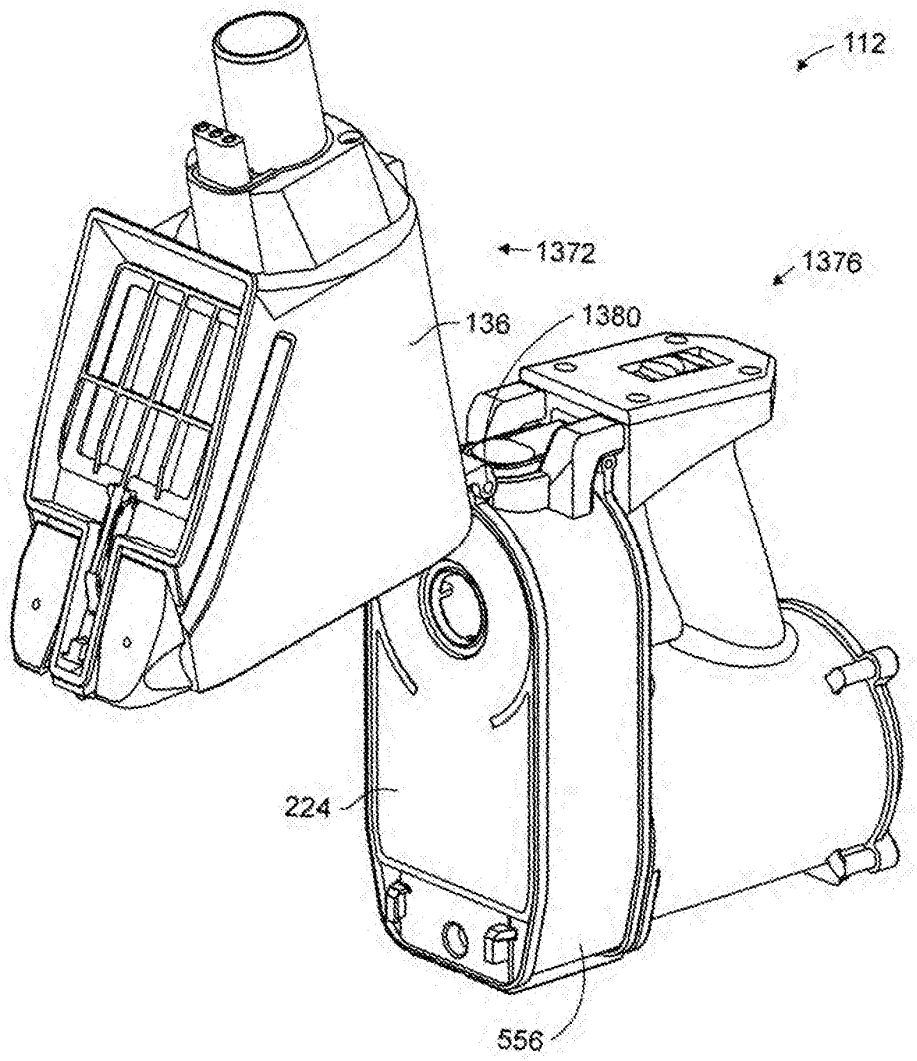


FIG. 110b

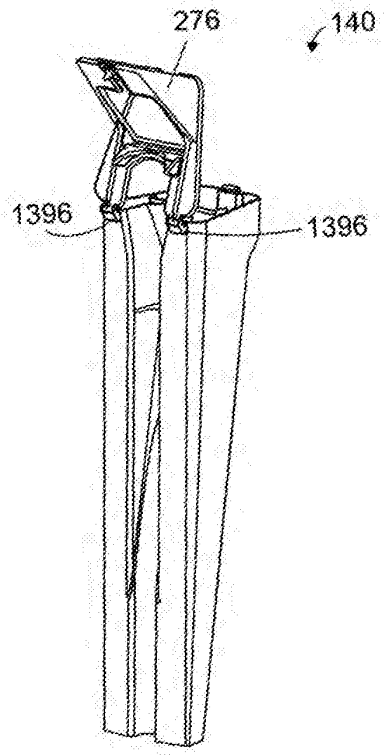


FIG. 111

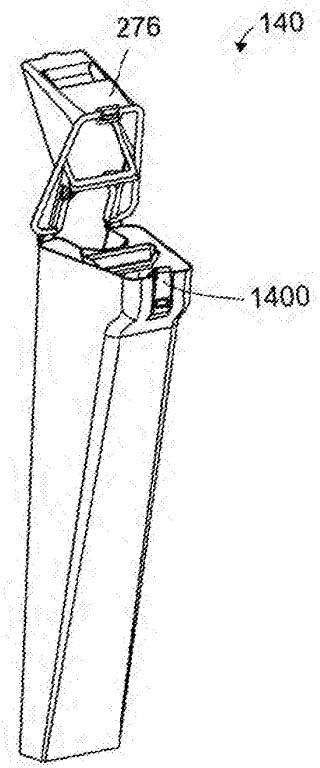


FIG. 112

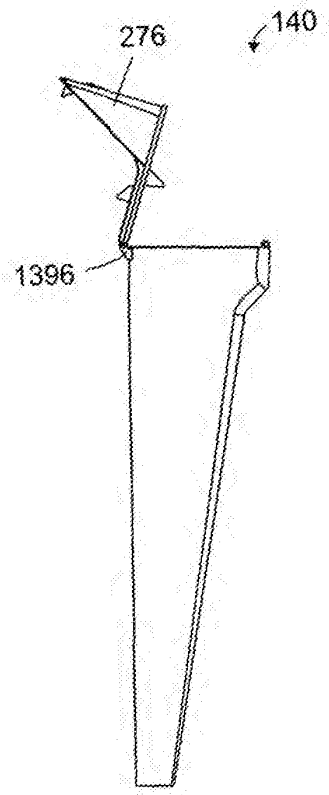


FIG. 113

Dyson Ex1004
Page 217

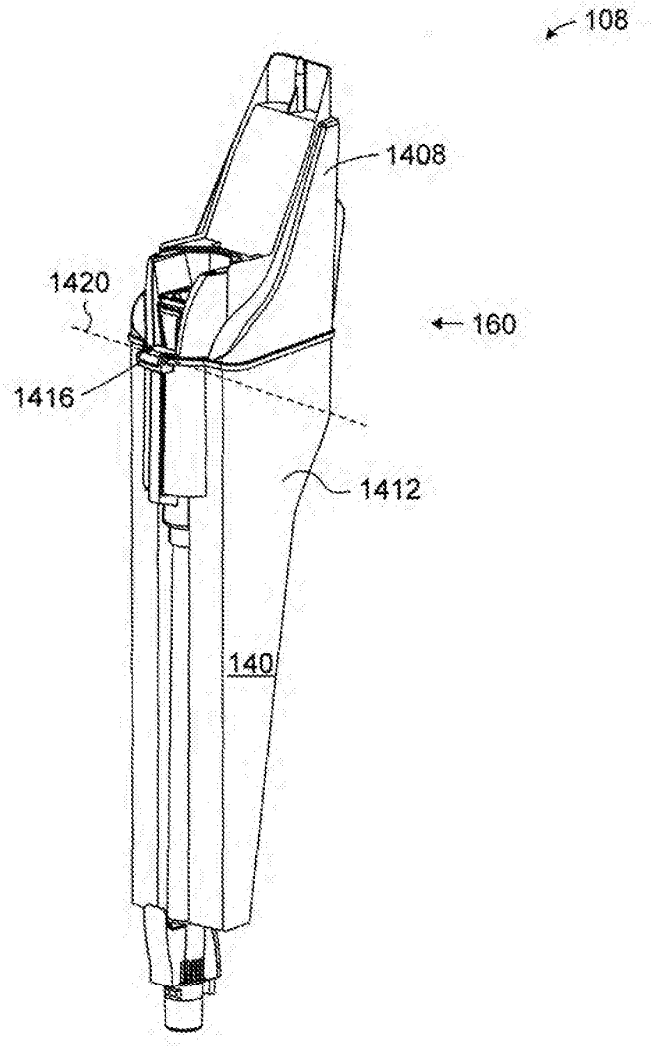


FIG. 114

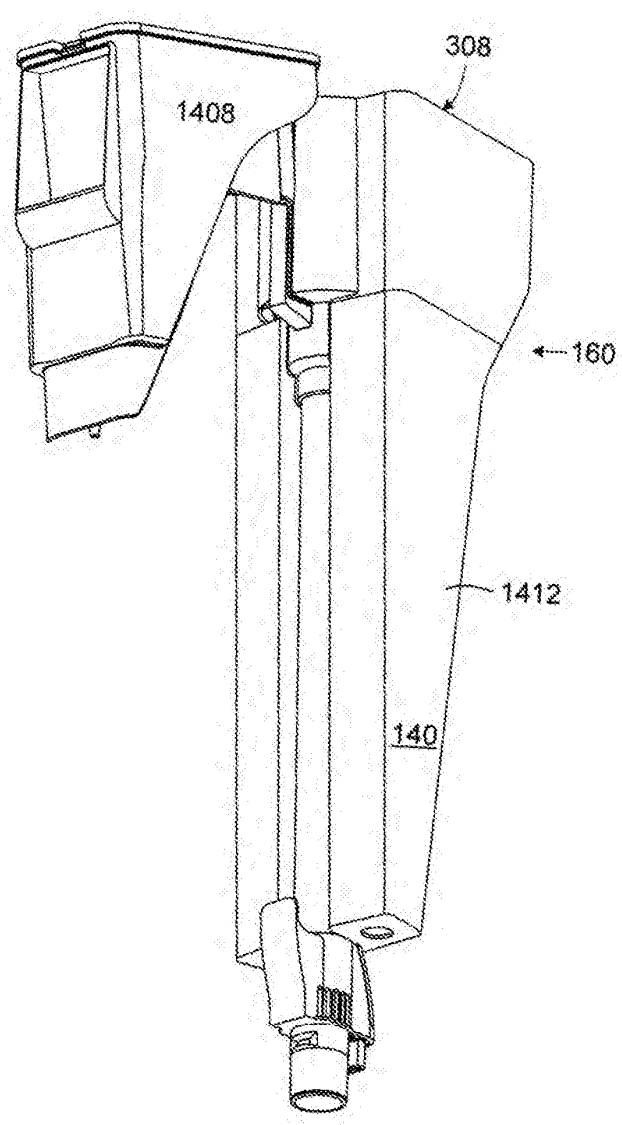


FIG. 115

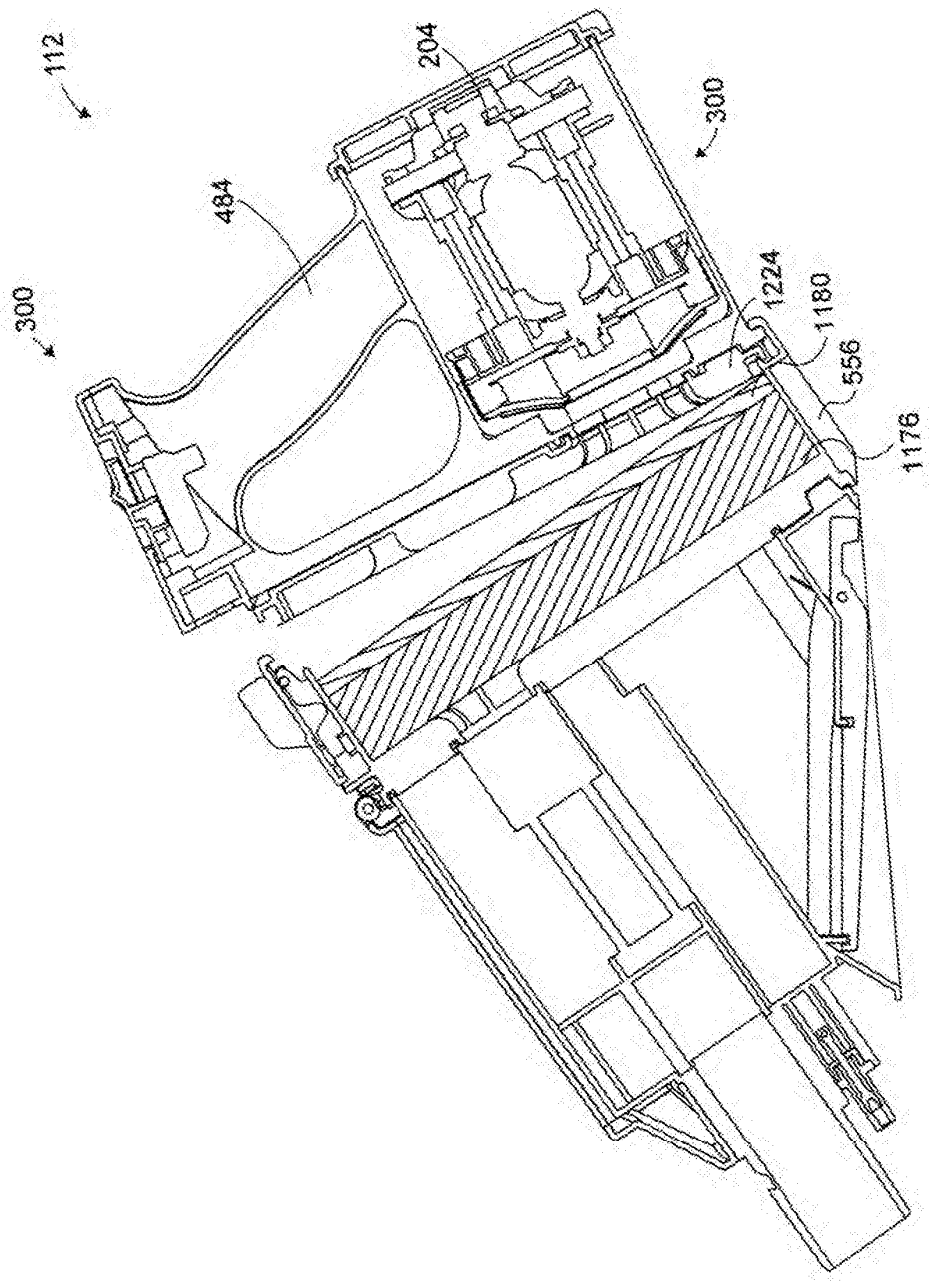


FIG. 116

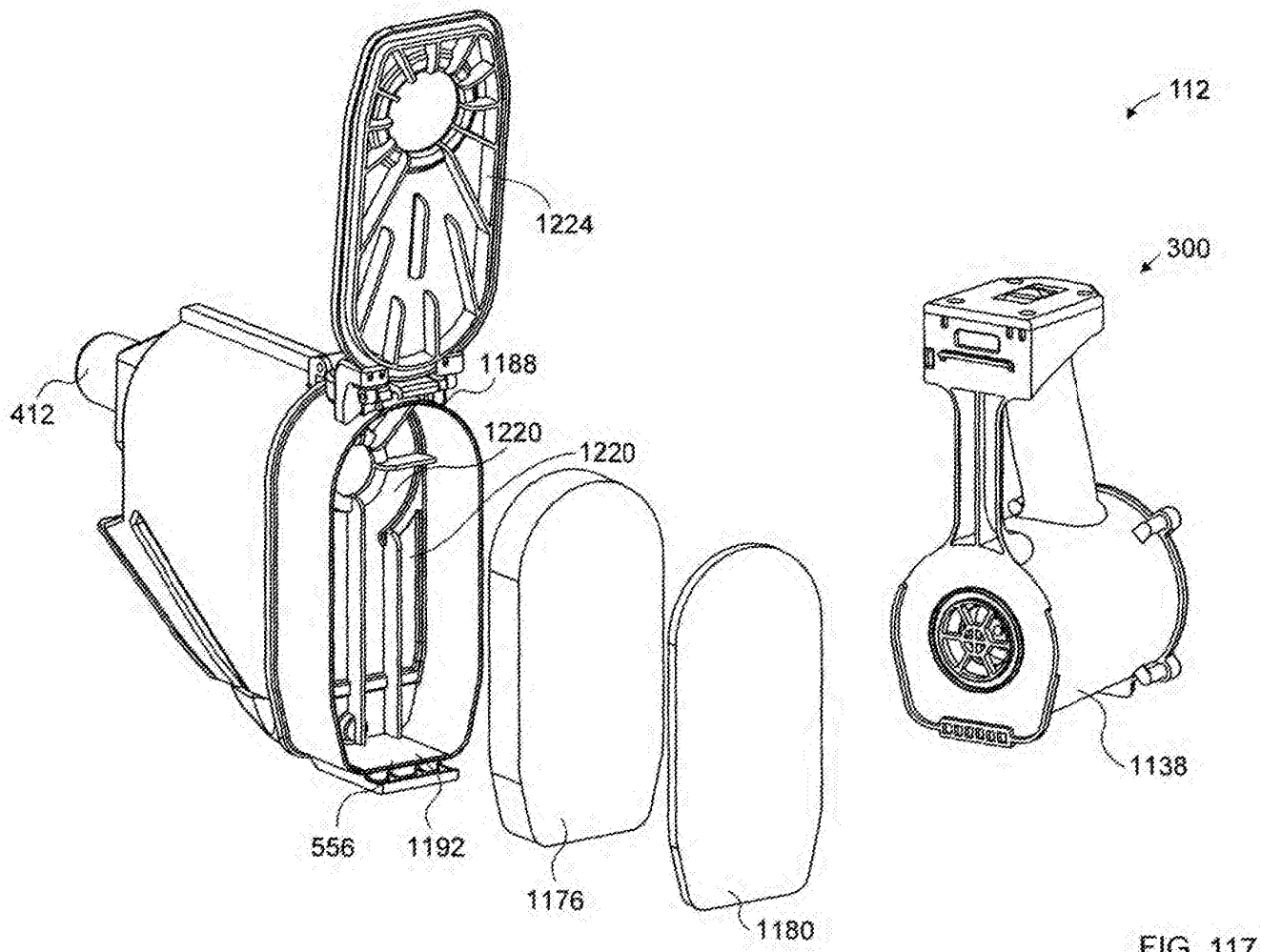


FIG. 117

Dyson Ex1004
Page 221

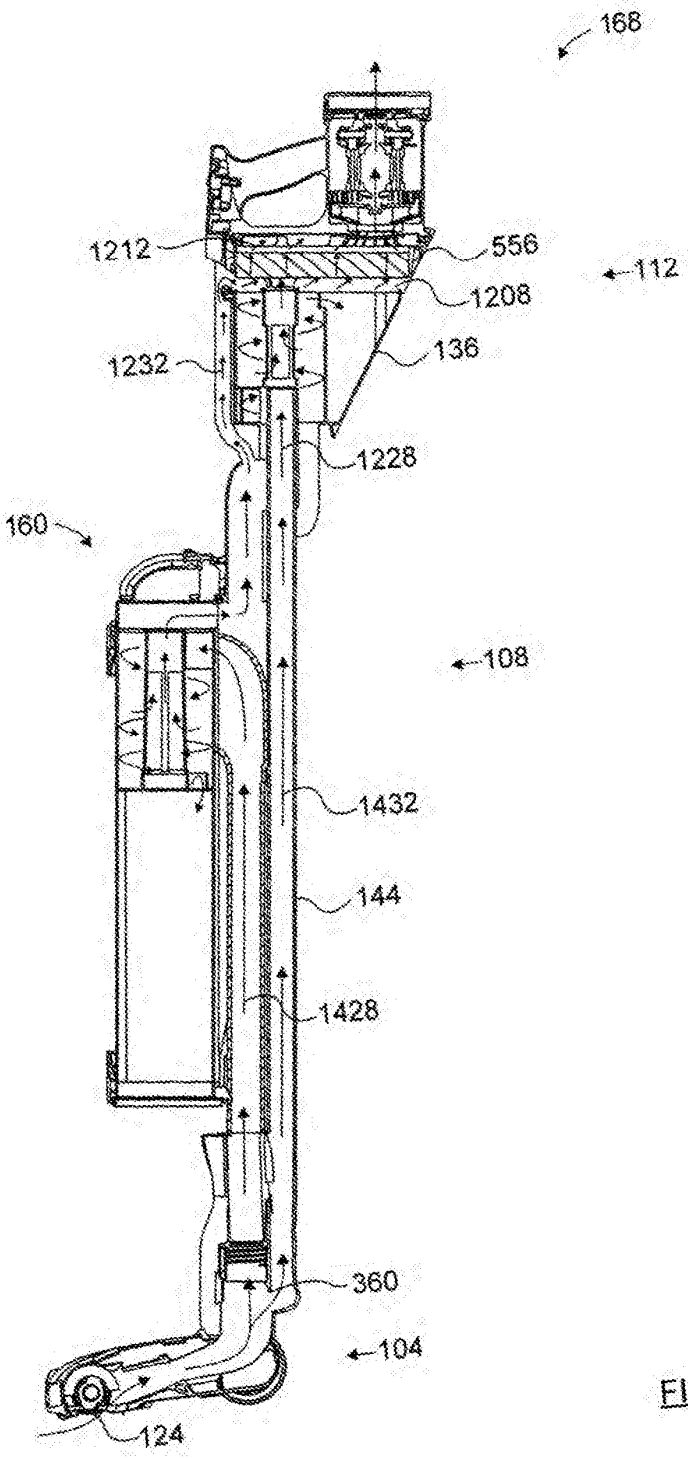

168
1212
556
112
1208
136
1232
1228
160
108
1432
144
1428
360
104
124

FIG. 118

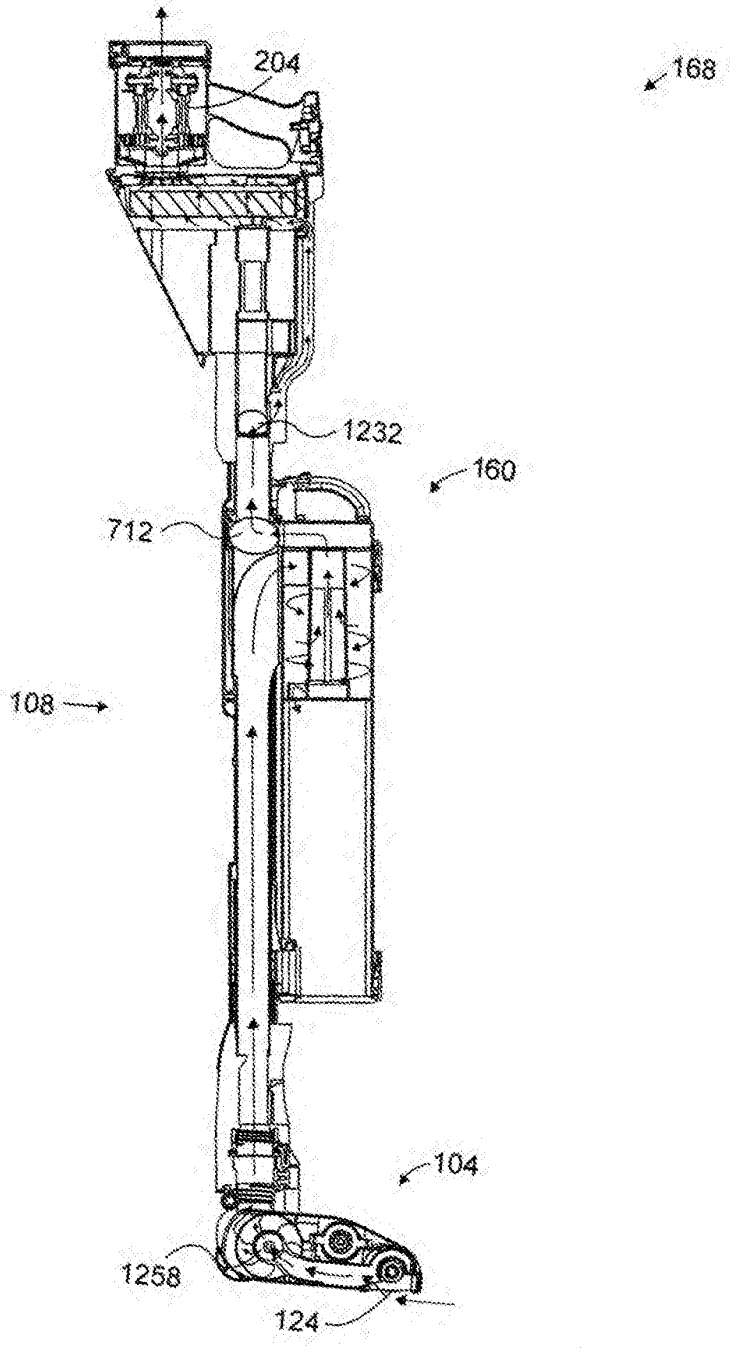


FIG. 119a

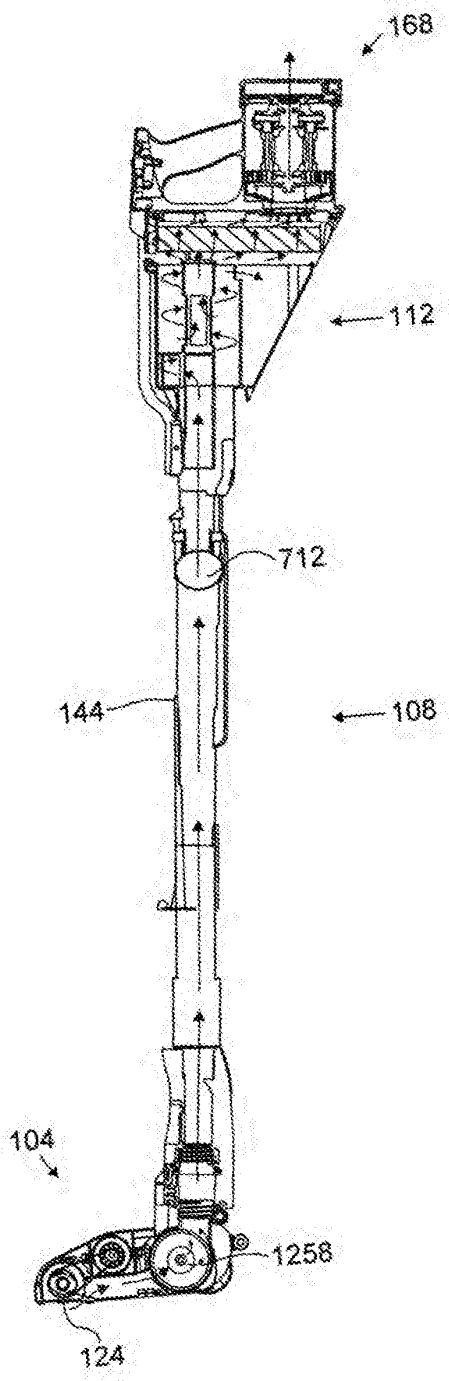


FIG. 119b

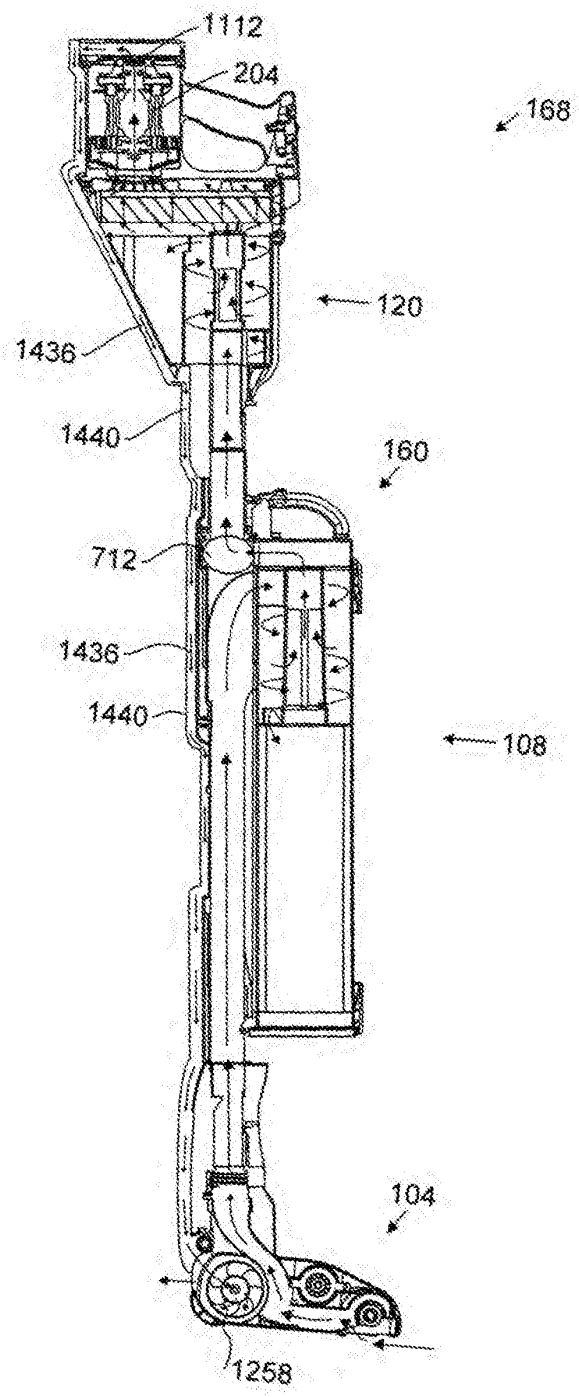


FIG. 120

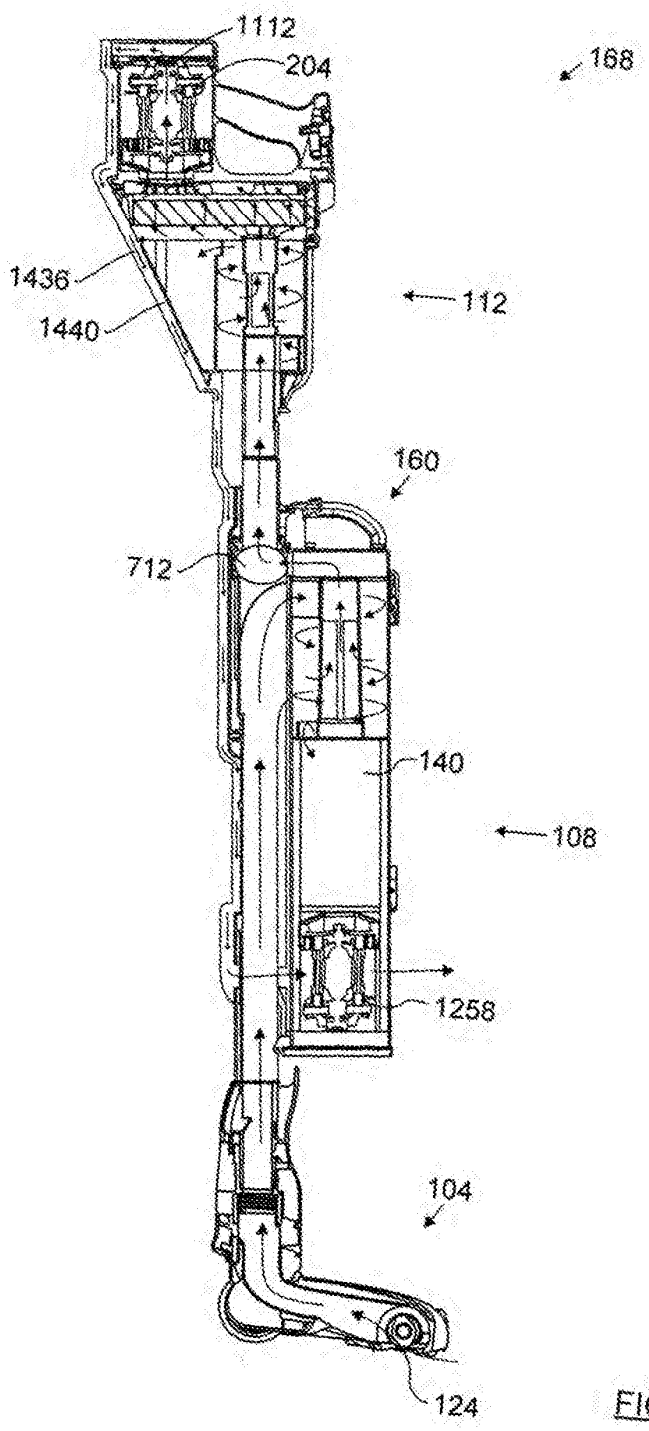


FIG. 121a

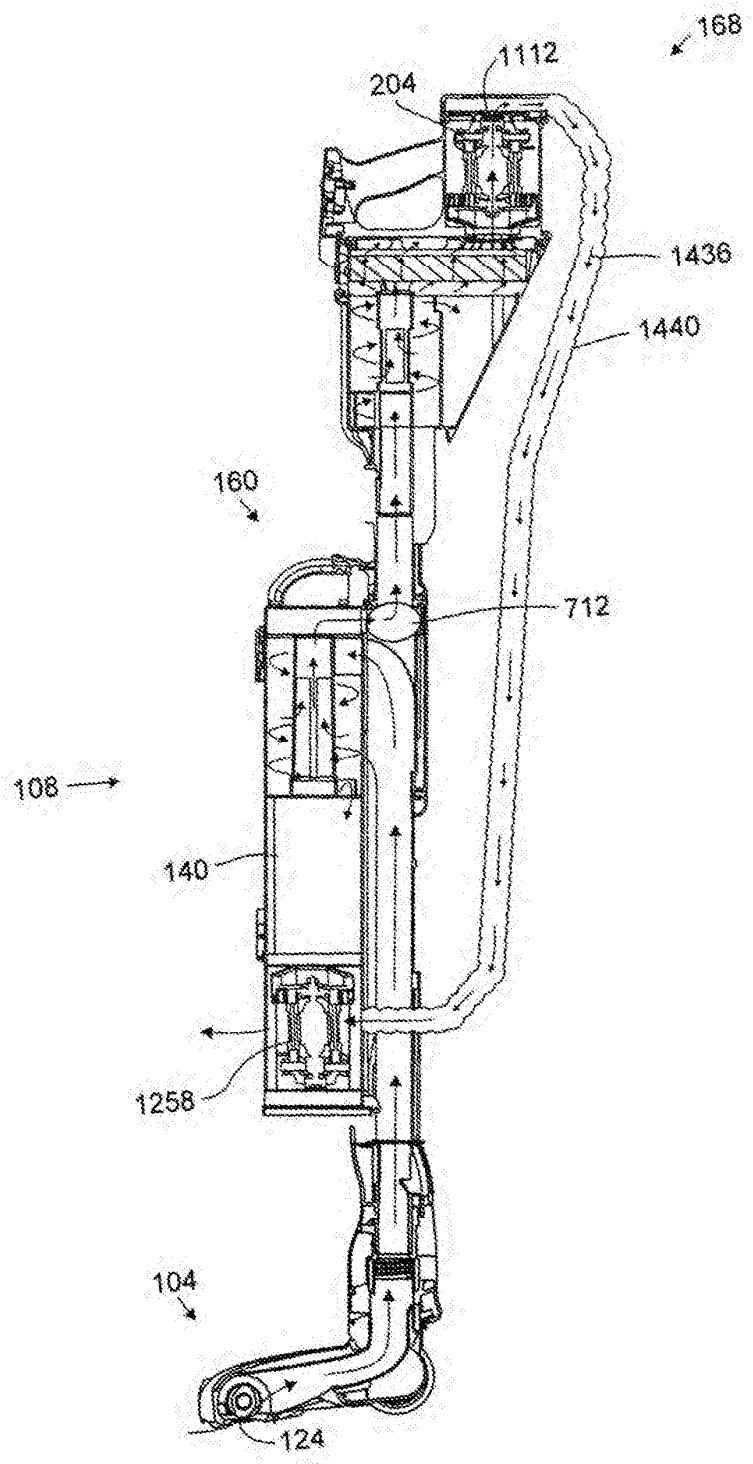


FIG. 121b

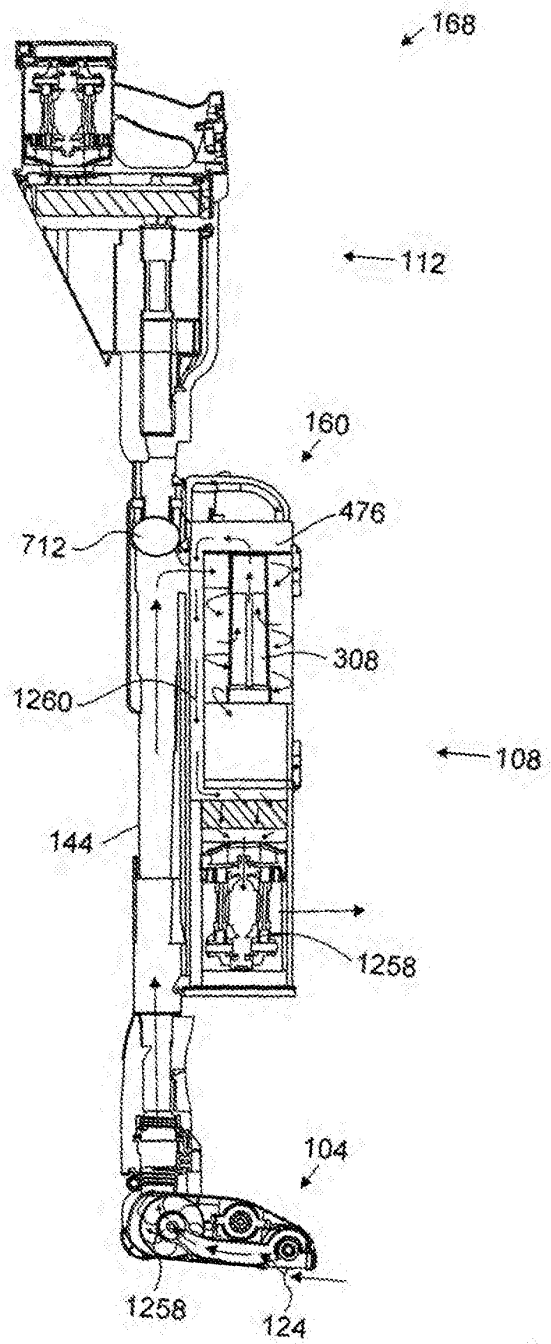


FIG. 122

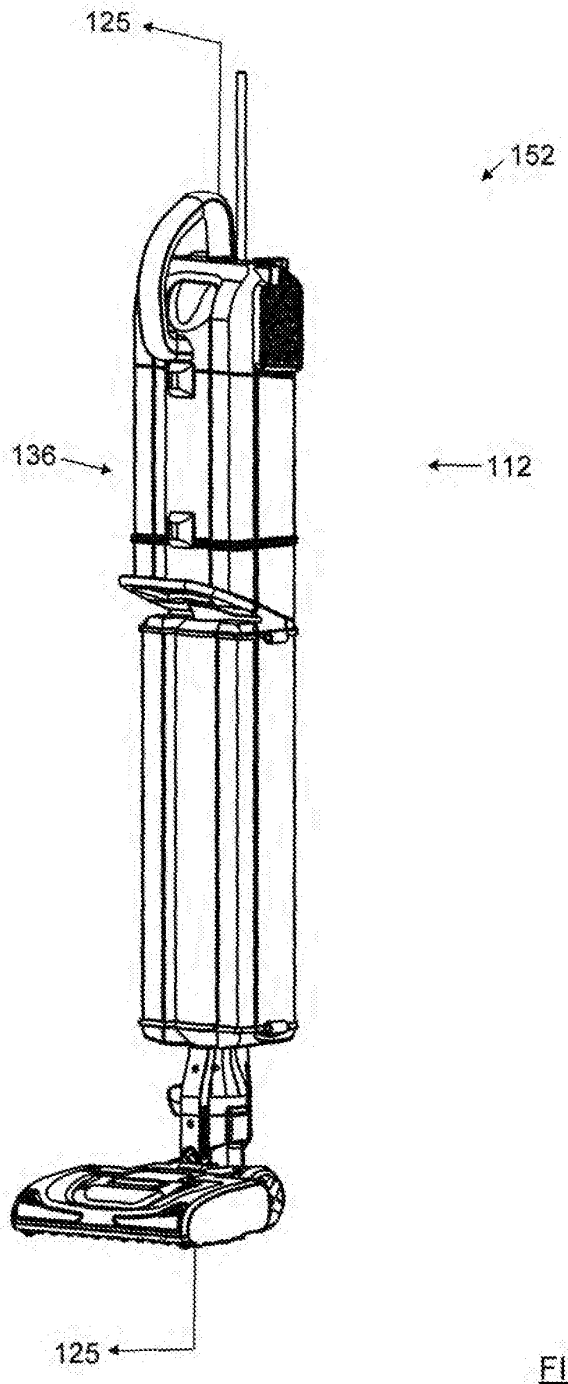


FIG. 123

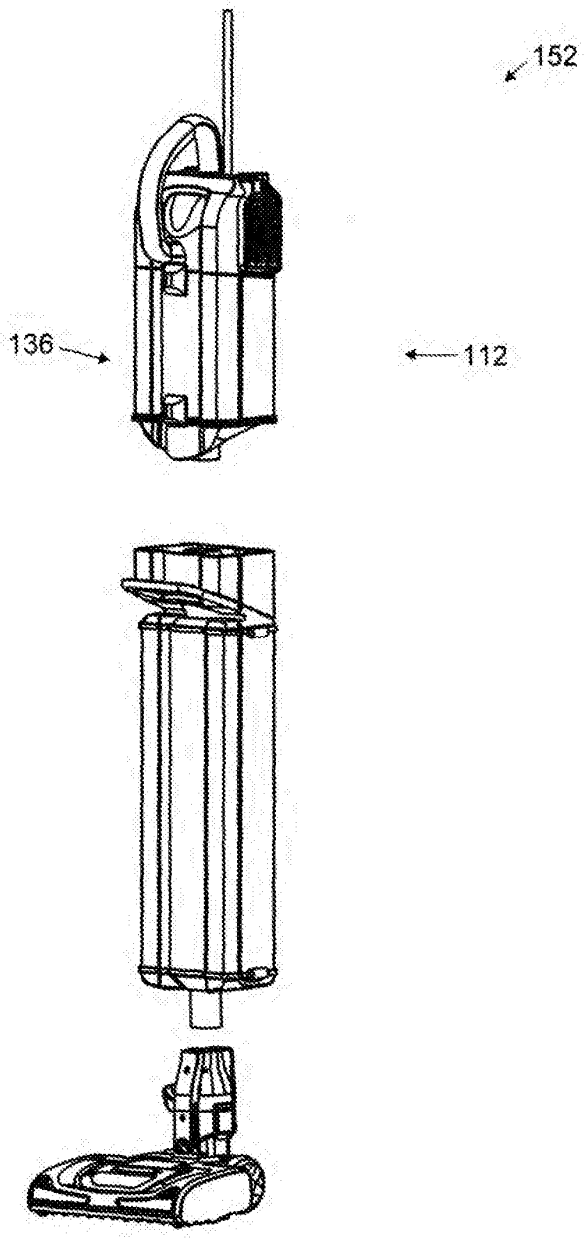


FIG. 124

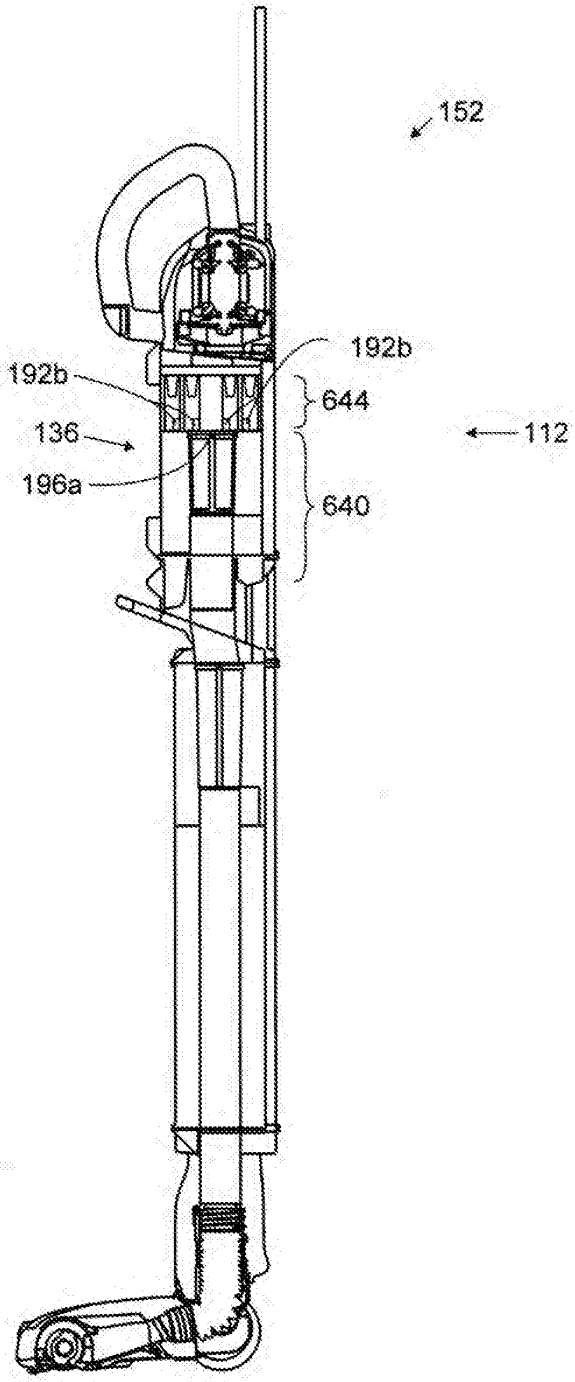


FIG. 125

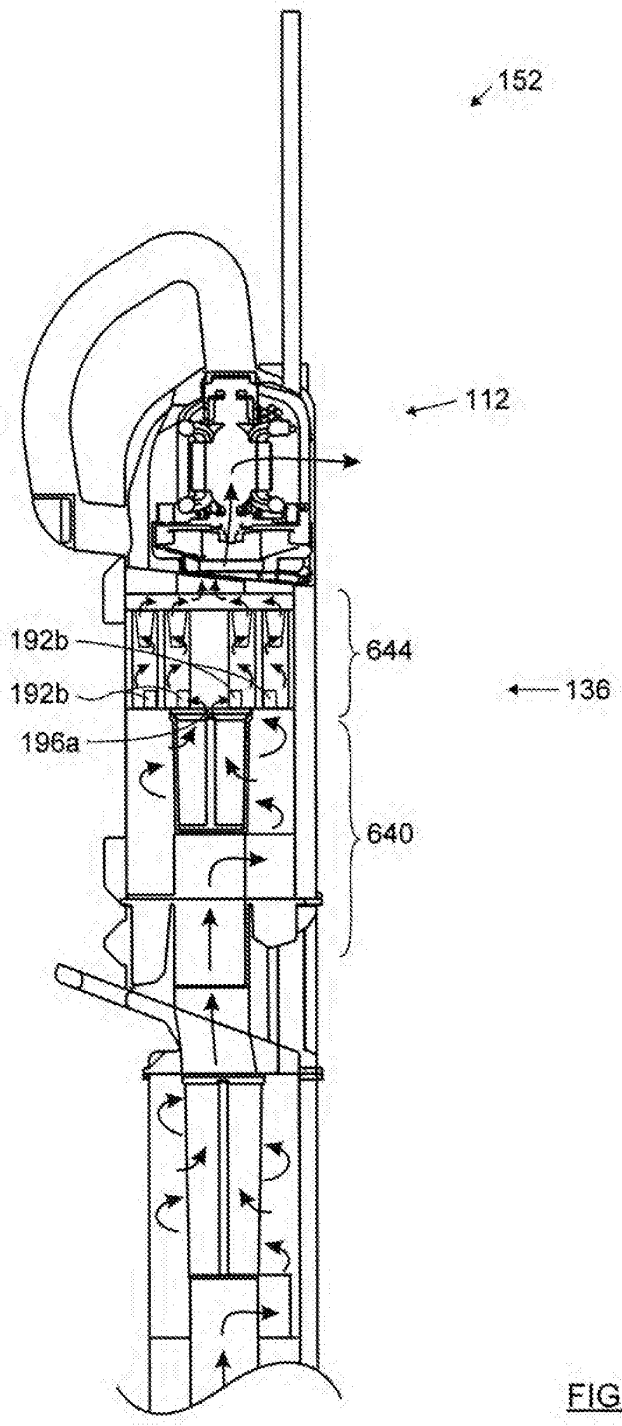


FIG. 126

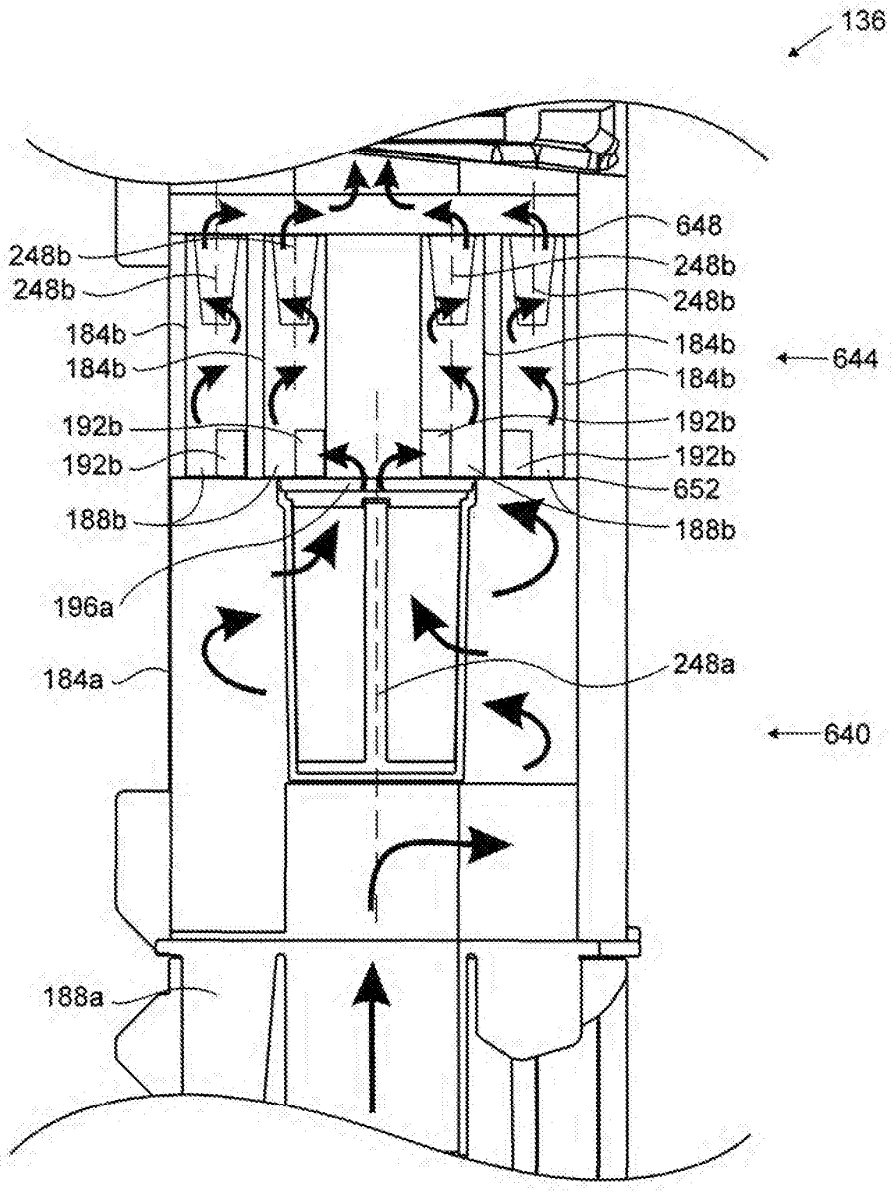

136
648
248b
248b
248b
248b
184b
184b
184b
184b
644
192b
192b
192b
192b
652
188b
188b
196a
184a
248a
640
188a

FIG. 127

PTO/AIA/14 (02-18)
Approved for use through 11/30/2020. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	10452-P46958US13
	Application Number	
Title of Invention	SURFACE CLEANING APPARATUS	

The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.
This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.

Secrecy Order 37 CFR 5.2:

☐ Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)

Inventor Information:

Inventor 1 — Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Wayne	Ernest	Conrad	

Residence Information (Select One) US Residency ● Non US Residency Active US Military Service

City	Hampton	Country of Residence [i]	CA

Mailing Address of Inventor:

Address 1	9 King Lane		
Address 2			
City	Hampton	**State/Province**	ON
Postal Code	L0B 1J0	**Country** [i]	CA

All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the **Add** button. Add

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below.
For further information see 37 CFR 1.33(a).

☐ **An Address is being provided for the correspondence Information of this application.**

Customer Number	01059		
Email Address	pmdcosta@bereskinparr.com	Add Email	Remove Email

Application Information:

Title of the Invention	SURFACE CLEANING APPARATUS		
Attorney Docket Number	10452-P46958US13	**Small Entity Status Claimed**	☐
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	130	**Suggested Figure for Publication (if any)**	125

PTO/AIA/14 (02-18)
Approved for use through 11/30/2020. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	10452-P46958US13
	Application Number	
Title of Invention	SURFACE CLEANING APPARATUS	

Filing By Reference:

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32).
Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Please Select One:	● Customer Number	US Patent Practitioner	○ Limited Recognition (37 CFR 11.9)
Customer Number	01059		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, 365(c), or 386(c) or indicate National Stage entry from a PCT application. Providing benefit claim information in the Application Data Sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.
When referring to the current application, please leave the "Application Number" field blank.

Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
	Division of	16/156006	2018-10-10

PTO/AIA/14 (02-18)
Approved for use through 11/30/2020. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	10452-P46958US13
	Application Number	
Title of Invention	SURFACE CLEANING APPARATUS	

Prior Application Status	Patented				Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
16/156006	Continuation of	15/088876	2016-04-01	10219662	2019-03-05
Prior Application Status	Patented				Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
15/088876	Continuation of	14/822211	2015-08-10	9888817	2018-02-13
Prior Application Status	Expired				Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)		
14/822211	Claims benefit of provisional	62/093189	2014-12-17		

Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the **Add** button. Add

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55. When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)[i] the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(i)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

Remove

Application Number	Country[i]	Filing Date (YYYY-MM-DD)	Access Code[i] (if applicable)

Additional Foreign Priority Data may be generated within this form by selecting the **Add** button. Add

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.
NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

PTO/AIA/14 (02-18)
Approved for use through 11/30/2020. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	10452-P46958US13
	Application Number	
Title of Invention	SURFACE CLEANING APPARATUS	

Authorization or Opt-Out of Authorization to Permit Access:

When this Application Data Sheet is properly signed and filed with the application, applicant has provided written authority to permit a participating foreign intellectual property (IP) office access to the instant application-as-filed (see paragraph A in subsection 1 below) and the European Patent Office (EPO) access to any search results from the instant application (see paragraph B in subsection 1 below).

Should applicant choose not to provide an authorization identified in subsection 1 below, applicant **must opt-out** of the authorization by checking the corresponding box A or B or both in subsection 2 below.

NOTE: This section of the Application Data Sheet is **ONLY** reviewed and processed with the **INITIAL** filing of an application. After the initial filing of an application, an Application Data Sheet cannot be used to provide or rescind authorization for access by a foreign IP office(s). Instead, Form PTO/SB/39 or PTO/SB/69 must be used as appropriate.

1. Authorization to Permit Access by a Foreign Intellectual Property Office(s)

A. Priority Document Exchange (PDX) - Unless box A in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the State Intellectual Property Office of the People's Republic of China (SIPO), the World Intellectual Property Organization (WIPO), and any other foreign intellectual property office participating with the USPTO in a bilateral or multilateral priority document exchange agreement in which a foreign application claiming priority to the instant patent application is filed, access to: (1) the instant patent application-as-filed and its related bibliographic data, (2) any foreign or domestic application to which priority or benefit is claimed by the instant application and its related bibliographic data, and (3) the date of filing of this Authorization. See 37 CFR 1.14(h)(1).

B. Search Results from U.S. Application to EPO - Unless box B in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the EPO access to the bibliographic data and search results from the instant patent application when a European patent application claiming priority to the instant patent application is filed. See 37 CFR 1.14(h)(2).

The applicant is reminded that the EPO's Rule 141(1) EPC (European Patent Convention) requires applicants to submit a copy of search results from the instant application without delay in a European patent application that claims priority to the instant application.

2. Opt-Out of Authorizations to Permit Access by a Foreign Intellectual Property Office(s)

☐ A. Applicant **DOES NOT** authorize the USPTO to permit a participating foreign IP office access to the instant application-as-filed. If this box is checked, the USPTO will not be providing a participating foreign IP office with any documents and information identified in subsection 1A above.

☐ B. Applicant **DOES NOT** authorize the USPTO to transmit to the EPO any search results from the instant patent application. If this box is checked, the USPTO will not be providing the EPO with search results from the instant application.

NOTE: Once the application has published or is otherwise publicly available, the USPTO may provide access to the application in accordance with 37 CFR 1.14.

PTO/AIA/14 (02-18)
Approved for use through 11/30/2020. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	10452-P46958US13
	Application Number	
Title of Invention	SURFACE CLEANING APPARATUS	

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Applicant 1 Remove

If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.

Clear

● Assignee	Legal Representative under 35 U.S.C. 117	Joint Inventor
Person to whom the inventor is obligated to assign.	Person who shows sufficient proprietary interest	

If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:

Name of the Deceased or Legally Incapacitated Inventor:

If the Applicant is an Organization check here. ☒

Organization Name	Omachron Intellectual Property Inc.

Mailing Address Information For Applicant:

Address 1	9 King Lane		
Address 2			
City	Hampton	**State/Province**	ON
Country	CA	Postal Code	L0B 1J0
Phone Number		Fax Number	
Email Address			

Additional Applicant Data may be generated within this form by selecting the Add button. Add

Assignee Information including Non-Applicant Assignee Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

PTO/AIA/14 (02-18)
Approved for use through 11/30/2020. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	10452-P46958US13
	Application Number	
Title of Invention	SURFACE CLEANING APPARATUS	

Assignee 1

Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.

Remove

If the Assignee or Non-Applicant Assignee is an Organization check here. ☐

Prefix	**Given Name**	Middle Name	**Family Name**	Suffix

Mailing Address Information For Assignee including Non-Applicant Assignee:

Address 1			
Address 2			
City		**State/Province**	
Country i		Postal Code	
Phone Number		Fax Number	
Email Address			

Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button. Add

Signature:

Remove

NOTE: This Application Data Sheet must be signed in accordance with 37 CFR 1.33(b). **However, if this Application Data Sheet is submitted with the INITIAL filing of the application and either box A or B is not checked in subsection 2 of the "Authorization or Opt-Out of Authorization to Permit Access" section, then this form must also be signed in accordance with 37 CFR 1.14(c).**

This Application Data Sheet **must** be signed by a patent practitioner if one or more of the applicants is a **juristic entity** (e.g., corporation or association). If the applicant is two or more joint inventors, this form must be signed by a patent practitioner, **all** joint inventors who are the applicant, or one or more joint inventor-applicants who have been given power of attorney (e.g., see USPTO Form PTO/AIA/81) on behalf of **all** joint inventor-applicants.

See 37 CFR 1.4(d) for the manner of making signatures and certifications.

Signature	/Philip C. Mendes da Costa/			Date (YYYY-MM-DD)	2019-10-02
First Name	Philip	Last Name	Mendes da Costa	Registration Number	33106

Additional Signature may be generated within this form by selecting the Add button. Add

PTO/AIA/14 (02-18)
Approved for use through 11/30/2020. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	10452-P46958US13
	Application Number	
Title of Invention	SURFACE CLEANING APPARATUS	

This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1 The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3 A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent CooperationTreaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

PTO/AIA/01 (06-12)
Approved for use through 01/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of Invention	SURFACE CLEANING APPARATUS

As the below named inventor, I hereby declare that.

This declaration is directed to:

☒ The attached application, or

☐ United States application or PCT international application number _____

filed on _____.

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

WARNING:

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

LEGAL NAME OF INVENTOR

Inventor: Wayne Ernest Conrad Date (Optional) : _____

Signature: _____

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 1 minute to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 16/590,972

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	300
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	660
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	760
TOTAL CLAIMS (37 CFR 1.16(i))	15 minus 20 =	*			OR	x 100 =	0.00
INDEPENDENT CLAIMS (37 CFR 1.16(h))	1 minus 3 =	*				x 460 =	0.00
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						800
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							0.00
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	2520

APPLICATION AS AMENDED - PART II

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
AMENDMENT A	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE($)	ADDITIONAL FEE($)		RATE($)	ADDITIONAL FEE($)
AMENDMENT B	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
16/590,972	10/02/2019	3723	2520	10452-P46958US13	15	1

CONFIRMATION NO. 3958

1059
BERESKIN & PARR LLP/S.E.N.C.R.L., s.r.l.
40 KING STREET WEST
40th Floor
TORONTO, ON M5H 3Y2
CANADA

FILING RECEIPT

OC000000111978979

Date Mailed: 10/21/2019

Receipt is acknowledged of this non-provisional utility patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF FIRST INVENTOR, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection.

Please verify the accuracy of the data presented on this receipt. If an error is noted on this Filing Receipt, please submit a written request for a corrected Filing Receipt, including a properly marked-up ADS showing the changes with strike-through for deletions and underlining for additions. If you received a "Notice to File Missing Parts" or other Notice requiring a response for this application, please submit any request for correction to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections provided that the request is grantable.

Inventor(s)

Wayne Ernest Conrad, Hampton, CANADA;

Applicant(s)

Omachron Intellectual Property Inc., Hampton, CANADA;

Power of Attorney: The patent practitioners associated with Customer Number 01059

Domestic Priority data as claimed by applicant

This application is a DIV of 16/156,006 10/10/2018
which is a CON of 15/088,876 04/01/2016 PAT 10219662
which is a CON of 14/822,211 08/10/2015 PAT 9888817
which claims benefit of 62/093,189 12/17/2014

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.) - None.
Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

If Required, Foreign Filing License Granted: 10/17/2019

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 16/590,972**

Projected Publication Date: 01/30/2020

Non-Publication Request: No

Early Publication Request: No

Title

SURFACE CLEANING APPARATUS

Preliminary Class

015

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at http://www.uspto.gov/web/offices/pac/doc/general/index.html.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, http://www.stopfakes.gov. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific

countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

LICENSE FOR FOREIGN FILING UNDER

Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign AssetsControl, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

SelectUSA

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The U.S. offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to promote and facilitate business investment. SelectUSA provides information assistance to the international investor community; serves as an ombudsman for existing and potential investors; advocates on behalf of U.S. cities, states, and regions competing for global investment; and counsels U.S. economic development organizations on investment attraction best practices. To learn more about why the United States is the best country in the world to develop

technology, manufacture products, deliver services, and grow your business, visit http://www.SelectUSA.gov or call +1-202-482-6800.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

1059 7590 03/21/2022

BERESKIN & PARR LLP/S.E.N.C.R.L., s.r.l.
40 KING STREET WEST
40TH FLOOR
TORONTO, ONTARIO M5H 3Y2
CANADA

EXAMINER
REDDING, DAVID A

ART UNIT	PAPER NUMBER
3723	

DATE MAILED: 03/21/2022

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/590,972	10/02/2019	Wayne Ernest Conrad	10452-P46958US13	3958

TITLE OF INVENTION: SURFACE CLEANING APPARATUS

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1200	$0.00	$0.00	$1200	06/21/2022

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Maintenance fees are due in utility patents issuing on applications filed on or after Dec. 12, 1980. It is patentee's responsibility to ensure timely payment of maintenance fees when due. More information is available at www.uspto.gov/PatentMaintenanceFees.

PTOL-85 (Rev. 02/11)

Dyson Ex1004
Page 248

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

1059 7590 03/21/2022

BERESKIN & PARR LLP/S.E.N.C.R.L., s.r.l.
40 KING STREET WEST
40TH FLOOR
TORONTO, ONTARIO M5H 3Y2
CANADA

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via EFS-Web or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/590,972	10/02/2019	Wayne Ernest Conrad	10452-P46958US13	3958

TITLE OF INVENTION: SURFACE CLEANING APPARATUS

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1200	$0.00	$0.00	$1200	06/21/2022

EXAMINER	ART UNIT	CLASS-SUBCLASS
REDDING. DAVID A	3723	015-344000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

❑ Change of correspondence address (or Change of Correspondence Address form PTO/AIA/122 or PTO/SB/122) attached.

❑ "Fee Address" indication (or "Fee Address" Indication form PTO/AIA/47 or PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1_____
2_____
3_____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ❑ Corporation or other private group entity ❑ Government

4a. Fees submitted: ❑Issue Fee ❑Publication Fee (if required) ❑Advance Order - # of Copies _____

4b. Method of Payment: *(Please first reapply any previously paid fee shown above)*

❑ Electronic Payment via EFS-Web ❑ Enclosed check ❑ Non-electronic payment by credit card (Attach form PTO-2038)

❑ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. _____

5. **Change in Entity Status** (from status indicated above)

❑ Applicant certifying micro entity status. See 37 CFR 1.29

❑ Applicant asserting small entity status. See 37 CFR 1.27

❑ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

Dyson Ex1004
Page 249

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/590,972	10/02/2019	Wayne Ernest Conrad	10452-P46958US13	3958

1059 7590 03/21/2022

BERESKIN & PARR LLP/S.E.N.C.R.L., s.r.l.
40 KING STREET WEST
40TH FLOOR
TORONTO, ONTARIO M5H 3Y2
CANADA

EXAMINER	
REDDING, DAVID A	
ART UNIT	PAPER NUMBER
3723	

DATE MAILED: 03/21/2022

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

PTOL-85 (Rev. 02/11)

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 30 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Notice of Allowability	Application No. 16/590,972	Applicant(s) Conrad, Wayne Ernest	
	Examiner DAVID A REDDING	Art Unit 3723	AIA (FITF) Status Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☐ This communication is responsive to _____.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

3. ☑ The allowed claim(s) is/are 1-15 . As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see **http://www.uspto.gov/patents/init_events/pph/index.jsp** or send an inquiry to **PPHfeedback@uspto.gov.**

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   Certified copies:

   a) ☐ All b) ☐ Some* c) ☐ None of the:

   1. ☐ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____ .

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____ .

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☑ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____.
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____.
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date. _____.
5. ☐ Examiner's Amendment/Comment
6. ☑ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/David Redding/
Primary Examiner, Art Unit 3723

REASONS FOR ALLOWANCE

The following is an examiner's statement of reasons for allowance: USP 6,782,585 and US 2014/0137363 are representative of the closest prior art. The prior art of record fails to teach or suggest a surface cleaning apparatus comprising: a hand vacuum cleaner removably mountable to the rigid wand outlet end, the hand vacuum cleaner having a front end, a rear end, an upper end, a lower end and a hand vacuum cleaner air inlet, the hand vacuum cleaner comprising: (i) a main body comprising a handle and a suction motor and fan assembly, the suction motor and fan assembly having a suction motor axis of rotation, the handle having a hand grip portion, a first handle portion and a second handle portion, the first handle portion is mounted to the main body rearward of the suction motor and fan assembly;

(ii) a first cyclonic stage provided at the front end of the hand vacuum cleaner, the first cyclonic stage having a front end, a rear end and a cyclone axis of rotation extends between the front and rear ends of the first cyclonic stage; and,

(ill) a Second cyclonic stage having a front end, a rear end and at least one second stage cyclone having a cyclone axis of rotation that extends between the front and rear ends of the second cyclonic stage and the rear end of the second cyclonic stage is rearward of the rear end of the first cyclonic stage, wherein the suction motor is positioned rearward of the first cyclonic stage, and wherein, when the hand vacuum cleaner is mounted to the rigid wand outlet end, handle is drivingly connected to the surface cleaning head, in combination with the other elements of claim 1.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DAVID A REDDING whose telephone number is (571)272-1276. The examiner can normally be reached M-F 6:00-2:00 est.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Joseph Hail can be reached on 571-272-4485. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of published or unpublished applications may be obtained from Patent Center. Unpublished application information in Patent Center is available to registered users. To file and manage patent submissions in Patent Center, visit: https://patentcenter.uspto.gov. Visit https://www.uspto.gov/patents/apply/patent-center for more information about Patent Center and https://www.uspto.gov/patents/docx for information about filing in DOCX format.

For additional questions, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/David Redding/
Primary Examiner, Art Unit 3723

Bereskin & Parr

Appl. No	:	16/590,972
Applicant	:	Omachron Intellectual Property Inc.
Filed	:	October 2, 2019
Title	:	SURFACE CLEANING APPARATUS
TC./A.U.	:	3723
Confirmation No.:		3958
Docket No.	:	10452-P46958US13
Customer No.	:	01059

Mail Stop Issue Fees
Honorable Commissioner for Patents
P. O. Box 1450
Alexandria, Virginia 22313–1450

RESPONSE TO NOTICE TO FILE CORRECTED APPLICATION PAPERS

Sir:

Further to Notice of Allowance of March 21, 2022, please amend the application as follows:

Amendments to the Claims begin on page 2 of this paper.

Remarks/Arguments begin on page 5 of this paper.

Bereskin & Parr LLP
Scotia Plaza, 40 King Street West, 40th Floor, Toronto, ON M5H 3Y2 Canada
Tel: 416.364.7311 Fax: 416.361.1398 bereskinparr.com

Amendments to the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Currently Amended) A surface cleaning apparatus comprising:

(a) a surface cleaning head having a front end, a rear end, a dirt air inlet and a cleaning head air outlet;

(b) a rigid air flow conduit having a rigid wand inlet end having an air inlet in communicable with the cleaning head air outlet, a rigid wand outlet end and a longitudinally extending conduit axis, the rigid air flow conduit is moveably mountable to the surface cleaning head between an upper position and an in-use floor cleaning position in which the rigid air flow conduit extends at an angle to the vertical, the rigid wand outlet end having an air outlet; and,

(c) a hand vacuum cleaner removably mountable to the rigid wand outlet end, the hand vacuum cleaner having a front end, a rear end, an upper end, a lower end and a hand vacuum cleaner air inlet, the hand vacuum cleaner comprising:

(i) a main body comprising a handle and a suction motor and fan assembly, the suction motor and fan assembly having a suction motor axis of rotation, the handle having a hand grip portion, a first handle portion and a second handle portion, the first handle portion is mounted to the main body at the location ~~rearward of~~ of the suction motor and fan assembly;

(ii) a first cyclonic stage provided at the front end of the hand vacuum cleaner, the first cyclonic stage having a front end, a rear end and a cyclone axis of rotation extends between the front and rear ends of the first cyclonic stage; and,

(iii) a second cyclonic stage having a front end, a rear end and at least one second stage cyclone having a cyclone axis of rotation that extends between the front and rear ends of the second cyclonic stage and the rear end of the second cyclonic stage is rearward of the rear end of the first cyclonic stage,

wherein the suction motor is positioned rearward of the first cyclonic stage, and

wherein, when the hand vacuum cleaner is mounted to the rigid wand outlet end, handle is drivingly connected to the surface cleaning head.

2. (Original) The surface cleaning apparatus of claim 1 wherein the suction motor and fan assembly axis of rotation intersects the handle.

3. (Original) The surface cleaning apparatus of claim 1 further comprising a finger receiving area positioned between the handle and the main body and a first portion of the finger receiving area is positioned rearward of the suction motor.

4. (Original) The surface cleaning apparatus of claim 3 wherein a second portion of the finger receiving area is positioned above an upper end of the main body.

5. (Original) The surface cleaning apparatus of claim 3 wherein the suction motor and fan assembly axis of rotation intersects the handle.

6. (Original) The surface cleaning apparatus of claim 5 wherein when the hand vacuum cleaner is oriented such that the cyclone axis of rotation extends horizontally and the upper end of the hand vacuum cleaner above the lower end of the hand vacuum cleaner, the second handle portion is positioned above the suction motor.

7. (Original) The surface cleaning apparatus of claim 1 wherein when the hand vacuum cleaner is oriented such that the cyclone axis of rotation extends horizontally and the upper end of the hand vacuum cleaner above the lower end of the hand vacuum cleaner, the second handle portion is positioned above the suction motor.

8. (Original) The surface cleaning apparatus of claim 6 wherein the first portion of the handle is mounted to a rear end of the main body.

9. (Original) The surface cleaning apparatus of claim 1 wherein the first portion of the handle is mounted to a rear end of the main body.

10. (Original) The surface cleaning apparatus of claim 1 wherein the handle is also attached to a sidewall of the main body.

11. (Original) The surface cleaning apparatus of claim 1 wherein handle is attached to the main body at two locations.

12. (Original) The surface cleaning apparatus of claim 1 wherein the rigid wand outlet end has an outlet end electrical connector, the hand vacuum cleaner further comprises a hand vacuum cleaner electrical connector provided adjacent the hand vacuum cleaner air inlet, and the hand vacuum cleaner electrical connector is releaseably engageable with the outlet end electrical connector.

13. (Original) The surface cleaning apparatus of claim 1 wherein when the hand vacuum cleaner is mounted to the rigid wand outlet end, the longitudinally extending conduit axis extends in a same direction as the suction motor axis of rotation.

14. (Original) The surface cleaning apparatus of claim 1 wherein the front end of the second cyclonic stage is rearward of the rear end of the first cyclonic stage.

15. (Original) The surface cleaning apparatus of claim 1 wherein the front face has the hand vacuum cleaner air inlet.

REMARKS/ARGUMENTS

In response to the Notice of Allowance of March 21, 2022, the Applicant submits herewith an amendment under 37 CFR 1.312 to make a minor amendment to the claims.

The Applicant thanks the Examiner for allowing the instant application.

The Applicant desires to implement a minor amendment to claims for clarity and consistency with the drawing disclosure. Specifically, by this amendment, the Applicant desires to amend claim 1(c)(i) to replace the term “rearward of the suction motor” with the term “at the location of the suction motor”. No new matter has been introduced by this amendment.

In view of the above, favourable consideration of the noted amendment is respectfully requested.

Date: March 22, 2022

Respectfully submitted,

BERESKIN & PARR LLP/
S.E.N.C.R.L., s.r.l.

By /Philip C. Mendes da Costa/
Philip C. Mendes da Costa
Reg. No. 33,106
Tel: 416-957-1695

Electronic Acknowledgement Receipt

EFS ID:	45284032
Application Number:	16590972
International Application Number:	
Confirmation Number:	3958
Title of Invention:	SURFACE CLEANING APPARATUS
First Named Inventor/Applicant Name:	Wayne Ernest Conrad
Customer Number:	1059
Filer:	Philip C. Mendes da Costa/Snezana Lisowsky
Filer Authorized By:	Philip C. Mendes da Costa
Attorney Docket Number:	10452-P46958US13
Receipt Date:	22-MAR-2022
Filing Date:	02-OCT-2019
Time Stamp:	10:17:37
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		USPTO_Amendment1312_2022-03-22_P46958US13.PDF	158411 7aae786eb993a2cced6dee82ade8526cd363e360	yes	5

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Amendment after Notice of Allowance (Rule 312)	1	1
	Claims	2	4
	Applicant Arguments/Remarks Made in an Amendment	5	5
Warnings:			
Information:			
	Total Files Size (in bytes):	158411	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/590,972	10/02/2019	Wayne Ernest Conrad	10452-P46958US13	3958

1059 7590 04/01/2022

BERESKIN & PARR LLP/S.E.N.C.R.L., s.r.l.
40 KING STREET WEST
40TH FLOOR
TORONTO, ONTARIO M5H 3Y2
CANADA

EXAMINER	
REDDING, DAVID A	

ART UNIT	PAPER NUMBER
3723	

NOTIFICATION DATE	DELIVERY MODE
04/01/2022	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

ipprocessingcentre@bereskinparr.com

Response to Rule 312 Communication	Application No.	Applicant(s)	
	16/590,972	Conrad, Wayne Ernest	
	Examiner	Art Unit	AIA (FITF) Status
	DAVID A REDDING	3723	Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

1. ☑ The amendment filed on 22 March 2022 under 37 CFR 1.312 has been considered, and has been:

a) ☐ entered.

b) ☐ entered as directed to matters of form not affecting the scope of the invention.

c) ☐ disapproved because the amendment was filed after the payment of the issue fee.
Any amendment filed after the date the issue fee is paid must be accompanied by a petition under 37 CFR 1.313(c)(1) and the required fee to withdraw the application from issue.

d) ☑ disapproved. See explanation below.

e) ☐ entered in part. See explanation below.

f) ☐ not entered because the supplemental or corrected Application Data sheet (ADS)

- ☐ was not accompanied by a petition to accept an unintentionally delayed claim under 37 CFR 1.55 or 27 CFR 1.78;
- ☐ did not identify the information being changed in accordance with 37 CFR 1.76(c)(2);
- ☐ was not properly signed in accordance with 37 CFR 1.76(e) (or 37 CFR 1.33(b) for applications filed prior to September 16, 2012).

The amendment expands the scope of the claimed invention.

/David Redding/ Primary Examiner, Art Unit 3723	

Bereskin & Parr

Appl. No	:	16/590,972
Applicant	:	Omachron Intellectual Property Inc.
Filed	:	October 2, 2019
Title	:	SURFACE CLEANING APPARATUS
TC./A.U.	:	3723
Confirmation No.:		3958

Docket No.	:	10452-P46958US13
Customer No.	:	01059

Do not enter
DAR
3/24/2022

Mail Stop Issue Fees
Honorable Commissioner for Patents
P. O. Box 1450
Alexandria, Virginia 22313–1450

RESPONSE TO NOTICE TO FILE CORRECTED APPLICATION PAPERS

Sir:

Further to Notice of Allowance of March 21, 2022, please amend the application as follows:

Amendments to the Claims begin on page 2 of this paper.

Remarks/Arguments begin on page 5 of this paper.

Bereskin & Parr LLP
Scotia Plaza, 40 King Street West, 40th Floor, Toronto, ON M5H 3Y2 Canada
Tel: 416.364.7311 Fax: 416.361.1398 bereskinparr.com

Bereskin & Parr

Appl. No	:	16/590,972	Confirmation No.:	3958
Applicant	:	Omachron Intellectual Property Inc.		
Filed	:	October 2, 2019		
Title	:	SURFACE CLEANING APPARATUS		
TC./A.U.	:	3723		
Examiner	:	REDDING, David A.		
Docket No.	:	10452_P46958US13		
Customer No.	:	01059		

Mail Stop Issue Fee
Honorable Commissioner for Patents
P. O. Box 1450
Alexandria, Virginia 22313–1450

June 3, 2022

ISSUE FEES

This correspondence is responsive to the Notice of Allowance and Issue Fee Due dated March 21, 2022, which issued in the above-identified patent application. As required, we enclose herewith the Issue Fee transmittal form.

The government fee of $1200 is included. Please charge any deficiency or credit any overpayment to our deposit account no. 02-2095.

Respectfully submitted,

BERESKIN & PARR LLP/ S.E.N.C.R.L., s.r.l.

/Philip C. Mendes da Costa/

Philip C. Mendes da Costa
Registration No. 33,106
416. 957.1695

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

1059 7590 03/21/2022

BERESKIN & PARR LLP/S.E.N.C.R.L., s.r.l.
40 KING STREET WEST
40TH FLOOR
TORONTO, ONTARIO M5H 3Y2
CANADA

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via EFS-Web or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)

(Signature)

(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/590,972	10/02/2019	Wayne Ernest Conrad	10452-P46958US13	3958

TITLE OF INVENTION: SURFACE CLEANING APPARATUS

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1200	$0.00	$0.00	$1200	06/21/2022

EXAMINER	ART UNIT	CLASS-SUBCLASS
REDDING, DAVID A	3723	015-344000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

☐ Change of correspondence address (or Change of Correspondence Address form PTO/AIA/122 or PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/AIA/47 or PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 Philip C. Mendes da Costa
2 BERESKIN & PARR LLP/ S.E.N.C.R.L., s.r.l.
3

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE: Omachron Intellectual Property Inc.

(B) RESIDENCE: (CITY and STATE OR COUNTRY): Hampton, Ontario, Canada

Please check the appropriate assignee category or categories (will not be printed on the patent) : ☐ Individual ☒ Corporation or other private group entity ☐ Government

4a. Fees submitted: ☒ Issue Fee ☒ Publication Fee (if required) ☐ Advance Order - # of Copies _____

4b. Method of Payment: *(Please first reapply any previously paid fee shown above)*

☒ Electronic Payment via EFS-Web ☐ Enclosed check ☐ Non-electronic payment by credit card (Attach form PTO-2038)

☒ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. 022095

5. **Change in Entity Status** (from status indicated above)

☐ Applicant certifying micro entity status. See 37 CFR 1.29

☐ Applicant asserting small entity status. See 37 CFR 1.27

☐ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature /Philip C. Mendes da Costa/ Date June 3, 2022

Typed or printed name Philip C. Mendes da Costa Registration No. 33,106

Dyson Ex1004
Page 267

Electronic Patent Application Fee Transmittal

Application Number:	16590972
Filing Date:	02-Oct-2019
Title of Invention:	SURFACE CLEANING APPARATUS
First Named Inventor/Applicant Name:	Wayne Ernest Conrad
Filer:	Philip C. Mendes da Costa/Snezana Lisowsky
Attorney Docket Number:	10452-P46958US13

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
PUBL. FEE- EARLY, VOLUNTARY, OR NORMAL	1504	1	0	0
UTILITY APPL ISSUE FEE	1501	1	1200	1200
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**1200**

Electronic Acknowledgement Receipt

EFS ID:	45873486
Application Number:	16590972
International Application Number:	
Confirmation Number:	3958
Title of Invention:	SURFACE CLEANING APPARATUS
First Named Inventor/Applicant Name:	Wayne Ernest Conrad
Customer Number:	1059
Filer:	Philip C. Mendes da Costa/Snezana Lisowsky
Filer Authorized By:	Philip C. Mendes da Costa
Attorney Docket Number:	10452-P46958US13
Receipt Date:	03-JUN-2022
Filing Date:	02-OCT-2019
Time Stamp:	16:04:05
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$1200
RAM confirmation Number	E202263G04341790
Deposit Account	022095
Authorized User	Snezana Lisowsky
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: 37 CFR 1.16 (National application filing, search, and examination fees) 37 CFR 1.17 (Patent application and reexamination processing fees)	

37 CFR 1.19 (Document supply fees)

37 CFR 1.20 (Post Issuance fees)

37 CFR 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	USPTO_Commissioner_IssueFee_2022-06-03_P46958US13.PDF	128281 b22aca65bf5ab156dcdcc2d0ad49e555f0344a1b	no	1
Warnings:					
Information:					
2	Issue Fee Payment (PTO-85B)	USPTO_IssueFeeTransmittal_2022-06-03_P46958US13.pdf	1148026 fd00b25183582a75fc7c52889906e03becee6d6b	no	1
Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	40373 d96fec81fb2c47fb5540ec98ab9e4bfbe7a58430	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	1316680		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/590,972	07/19/2022	11389038	10452-P46958US13	3958

1059 7590 06/29/2022

BERESKIN & PARR LLP/S.E.N.C.R.L., s.r.l.
40 KING STREET WEST
40TH FLOOR
TORONTO, ONTARIO M5H 3Y2
CANADA

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment is 463 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Patents Stakeholder Experience (OPSE), Stakeholder Support Division (SSD) at (571)-272-4200.

INVENTOR(s) (Please see PAIR WEB site http://pair.uspto.gov for additional inventors):

Wayne Ernest Conrad, Hampton, CANADA;

APPLICANT(s) (Please see PAIR WEB site http://pair.uspto.gov for additional applicants):

Omachron Intellectual Property Inc., Hampton, CANADA;

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The USA offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to encourage and facilitate business investment. To learn more about why the USA is the best country in the world to develop technology, manufacture products, and grow your business, visit SelectUSA.gov.