



- (51) International Patent Classification:
A47L 9/04 (2006.01)
- (21) International Application Number:
PCT/US2013/033824
- (22) International Filing Date:
26 March 2013 (26.03.2013)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
13/441,051 6 April 2012 (06.04.2012) US
- (71) Applicant: RUG DOCTOR, INC. [US/US]; 4701 Old Shepard Place, Plano, Texas 75093 (US).
- (72) Inventors: HILL, Jason. E.; 8014 Teasdale Avenue, St. Louis, Missouri 63130 (US). OSTENDORF, Charles; 858 Ivy Drive, St. Clair, Missouri 63077 (US). LAU, Vincent; 11 Hollow Tree Court, St. Peters, Missouri 63376 (US).
- (74) Agents: SMITH, Clyde, L. et al.; Thompson Coburn LLP, One US Bank Plaza, St. Louis, Missouri 63101 (US).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— with international search report (Art. 21(3))

(54) Title: HANDHELD VACUUM CLEANER TOOL COMPRISING A VACUUM DRIVEN MOTORIZED BRUSH

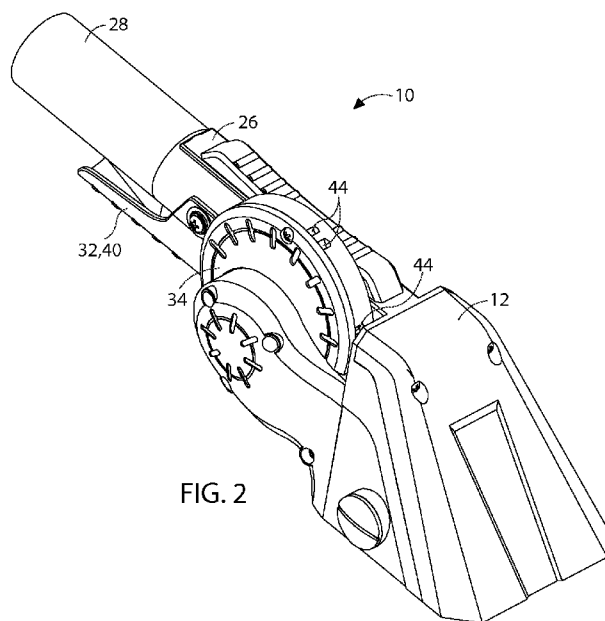


FIG. 2

(57) Abstract: A vacuum cleaner device comprises a main body, a brush device, and a vacuum driven motor. The main body has a primary vacuum inlet, a secondary vacuum inlet, and a vacuum outlet. The secondary vacuum inlet is operatively connected to the vacuum outlet. The brush device is configured and adapted to reciprocate relative to the main body. The vacuum driven motor is adapted and configured to be rotationally driven by air passing through the secondary vacuum inlet to the vacuum outlet. The vacuum driven motor is operatively connected to the brush device in a manner such that rotation of vacuum driven motor causes the brush device to reciprocate relative to the main body.

HANDHELD VACUUM CLEANER TOOL COMPRISING A VACUUM DRIVEN MOTORIZED BRUSH

Cross-Reference to Related Applications

[0001] Not Applicable

Statement Regarding Federally Sponsored Research or Development

[0002] Not Applicable.

Appendix

[0003] Not Applicable.

BACKGROUND OF THE INVENTION

Field of the Invention

[0004] This invention pertains to a handheld vacuum cleaner tool of the type that is attachable to the end of a flexible vacuum hose. More particularly, the invention pertains to a handheld vacuum cleaning tool having a vacuum driven motorized brush.

General Background

[0005] Vacuum cleaner hoses are typically provided with handheld vacuum cleaning tools at their vacuum inlets. Such vacuum tools are typically configured to serve specific purposes. For example, crevice or corner vacuum tools are typically long

and thin wands and hardwood floor vacuum tools typically comprise a brush. Additionally, some vacuum tools comprise motorized brushes that facilitate the cleaning of carpets, rugs, and upholstery. Such motorized brushes are often driven by an electric motor. A drawback to providing an electrically driven brush in a handheld vacuum tool is that electric motors tend to weigh an appreciable amount, which can lead to user fatigue. Additionally, the electric motors typically require a relative large amount of power and are therefore typically electrically connected to the main vacuum unit that is at the opposite end of the flexible vacuum hose.

[0006] In view of the forgoing, some handheld vacuum cleaner tools comprise vacuum driven motors to drive a motorized brush. For example, Dyson, Inc. manufactures and sells a handheld vacuum cleaner tool that comprises a vacuum driven motor that rotationally drives a motorized brush, which Dyson, Inc. refers to as the “Mini turbine head.” The Mini turbine head includes a secondary vacuum inlet that allows bleed air (i.e., air from an inlet other than the primary vacuum inlet) to drive a turbine/rotor. The rotor rotationally drives a brush that extends slightly from the primary vacuum inlet. In use, the brush revolves as non-bleed air is drawn in through the primary vacuum inlet in a manner such that the brush beats the surface of whatever fabric is being vacuumed. Unfortunately, the brush of the Mini turbine head tool is relatively underpowered and therefore frequently stops revolving. Additionally, the brush of the Mini turbine head only operates when air is also allowed to be sucked into the primary inlet. While this is advantageous for removing debris from fabric, it can be a disadvantage as explained herein below.

SUMMARY OF THE INVENTION

[0007] A handheld vacuum cleaner tool in accordance with the invention is configured to be attached to a flexible vacuum hose and is particularly suited for scrubbing carpet and upholstery that has been dampened with cleaning solution and thereafter for sucking the cleaning solution from the carpet or upholstery.

[0008] In one aspect of the invention, a vacuum cleaner device comprises a main body, a brush device, and a vacuum driven motor. The main body has a primary vacuum inlet, a secondary vacuum inlet, and a vacuum outlet. The secondary vacuum inlet is operatively connected to the vacuum outlet. The brush device is configured and adapted to reciprocate relative to the main body. The vacuum driven motor is adapted and configured to be rotationally driven by air passing through the secondary vacuum inlet to the vacuum outlet. The vacuum driven motor is operatively connected to the brush device in a manner such that rotation of the vacuum driven motor causes the brush device to reciprocate relative to the main body.

[0009] In another aspect of the invention, a vacuum cleaner device comprises a main body, a brush device, a vacuum driven motor, and a valve gate. The main body has a primary vacuum inlet, a secondary vacuum inlet, and a vacuum outlet. The secondary vacuum inlet is operatively connected to the vacuum outlet. The brush device is configured and adapted to move relative to the main body. The vacuum driven motor is adapted and configured to be driven by air passing through the secondary vacuum inlet to the vacuum outlet. The vacuum driven motor is

operatively connected to the brush device in a manner such that the vacuum driven motor causes the brush device to move relative to the main body when the vacuum driven motor is driven. The valve gate is moveable between a first position and a second position relative to the main body. The valve gate allows more air to flow through the primary vacuum inlet than through the secondary vacuum inlet when the valve gate is in the first position. Conversely, the valve gate allows more air to flow through the secondary vacuum inlet than through the primary vacuum inlet when the valve gate is in the second position. More preferably, the valve gate completely prevents air from flowing into the tool from the secondary vacuum inlet when the valve gate is in the first position, and completely prevents air from flowing into the tool from the primary vacuum inlet when the valve gate is in the second position.

[0010] Further features and advantages of the present invention, as well as the operation of the invention, are described in detail below with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] Figure 1 depicts a perspective view of a vacuum cleaner device in accordance with the invention.

[0012] Figure 2 depicts another perspective view of the vacuum cleaner device shown in Figure 1, showing the other side of the device.

[0013] Figure 3 depicts a perspective view of the air driven motor and brush device of the vacuum cleaner device shown in Figures 1 and 2.

[0014] Figure 4 depicts a perspective view of the brush device and the geared transmission of the vacuum cleaner device shown in Figures 1 and 2.

[0015] Figure 5 depicts a cross-sectional perspective of the vacuum cleaner device shown in Figures 1 and 2.

[0016] Figure 6 depicts a cross-section of the vacuum cleaner device shown in Figures 1 and 2, and is shown with the valve gate in its first position and with a flexible vacuum hose attached to the device.

[0017] Figure 7 depicts a cross-section of the vacuum cleaner device shown in Figures 1 and 2, and is shown with the valve gate in its second position and with a flexible vacuum hose attached to the device.

[0018] Reference numerals in the written specification and in the drawing figures indicate corresponding items.

DETAILED DESCRIPTION

[0019] Perspective views of the preferred embodiment of a vacuum cleaner device in accordance with the invention are shown in Figures 1 and 2. The vacuum cleaner device 10 comprises a main body 12, a drive mechanism 14 (Figures 3 and 4), and a brush device 16.

[0020] The main body 12 comprises a primary vacuum inlet 18, a secondary vacuum inlet 20, and a vacuum outlet 22. The main body 12 also comprises a moveable valve gate 24 that is linearly moveable between first and second positions. When the valve gate 24 is in the first position (as shown in Figure 6) the valve gate operatively disconnects the secondary vacuum inlet 20 from the vacuum outlet 22

and operatively connects the primary vacuum inlet 18 to the vacuum outlet. Conversely, when the valve gate 24 is in the second position (as shown in Figure 7) the valve gate operatively connects the secondary vacuum inlet 20 to the vacuum outlet 22 and operatively disconnects the primary vacuum inlet 18 from the vacuum outlet. It should be appreciated that between those first and second positions, the valve gate 24 operatively connects both the primary vacuum inlet 18 and the secondary vacuum inlet 20 to the vacuum outlet 22 to varying degrees. A manually operable slide switch 26 is fixed to the valve gate 24 and is positioned on the exterior of the main body 12. A portion of the main body 12 aft of the slide switch 26 serves as a handgrip 28 for holding the vacuum cleaner device 10. The main body 12 further comprises a recess 30, a liquid sprayer 32, and a motor housing 34. The majority of the brush device 16 is located in the recess 30 of the main body 12. The liquid sprayer 32 comprises a nozzle 36, a spring-loaded valve 38, a manually operable trigger 40, and a liquid inlet port 42. The motor housing 34 comprises a plurality of openings 44 that are operatively connected to the secondary vacuum inlet 20. Preferably there are four pairs of openings 44 spaced evenly about the circumference of the motor housing 34.

[0021] The drive mechanism 14 is shown attached to the brush device 16 in Figure 3. The drive mechanism 14 comprises a vacuum driven motor 46, a geared transmission 48, and a connecting rod 50. The vacuum driven motor 46 comprises a plurality of vanes 52 that cause the vacuum driven motor 46 to rotate when air passes through the openings 44 of the motor housing 34 and the secondary vacuum inlet 20 to the vacuum outlet 22. The geared transmission 48 comprises a crank 54

and is geared such that rotation of the vacuum driven motor 46 causes slower rotation of the crank 54 (albeit with an increase in torque). The connecting rod 50 connects the crank 54 to the brush device 16. The brush comprises a plurality of bristles 56 and a lever-arm 58, and is pivotally mounted to the main body 12 about an axis 60. The connecting rod 50 is pivotally connected to the lever arm 58 in a manner such that rotation of the crank 54 causes the brush device 16 to pivotally reciprocate about the axis 60.

[0022] The vacuum cleaner device 10 is attached to a flexible vacuum hose 62 (as shown in figures 6 and 7) by threading the vacuum hose into the vacuum outlet 22. Preferably the vacuum cleaner device 10 is permanently secured to the vacuum hose 62. A flexible liquid supply line 64 is channeled inside the vacuum hose 62 and is attached to the liquid inlet port 42 of the liquid sprayer 32 (before attaching the vacuum hose 62 to the vacuum cleaner device 10). The opposite ends of the vacuum hose 62 and the liquid supply line 64 are attached to a conventional wet and dry carpet cleaner vacuum unit (not shown). When the vacuum unit is operated, suction is supplied to the vacuum hose 62 and the liquid supply line 64 is pressurized with liquid cleaning solution. A person holding the vacuum cleaner device 10 can then activate the brush device 16 by moving the slide switch 26 on main body 12 of the vacuum cleaner device to its second position. This causes air to be drawn in through the openings 44 of the motor housing 34, through the vacuum driven motor 46 and through the secondary vacuum inlet 20, and out of the vacuum cleaner device 10 via the vacuum outlet 22. Such air passing between the vanes 52 of the vacuum driven motor 46 causes the vacuum driven motor to rotate, which in

turn causes the brush device 16 to pivotally reciprocate. During this, the valve gate 24 prevents the suction from reaching the primary vacuum inlet 18. The person can also operate the trigger 40 of the liquid sprayer 32, which opens the spring-loaded valve 38 in a manner causing the pressurized liquid cleaning solution to spray from the nozzle 36 of the liquid sprayer. As such, when the valve gate 24 is in its second position, the vacuum cleaner device 10 can be used to dampen and scrub carpet or upholstery. Unlike a rotary brush device, the reciprocating brush device 10 will not brush the cleaning solution out of the fabric during the scrubbing process.

[0023] After dampening and scrubbing the carpet or upholstery, the person operating the vacuum cleaner device 10 can activate the slide switch 26 to move the valve gate 24 to its first position. Doing so closes the secondary vacuum inlet 20, thereby shutting off the vacuum driven motor 46, and allows suction to reach the primary vacuum inlet 18. The suction at the primary vacuum inlet 18 sucks the liquid cleaning solution out of the fabric and draws air through the fabric to facilitate drying.

[0024] In view of the foregoing, it should be appreciated that the invention achieves the several advantages over the prior art.

[0025] As various modifications could be made in the constructions and methods herein described and illustrated without departing from the scope of the invention, it is intended that all matter contained in the foregoing description or shown in the accompanying drawings shall be interpreted as illustrative rather than limiting. Thus, the breadth and scope of the present invention should not be limited by any of the above-described exemplary embodiments, but should be defined only in accordance with the following claims appended hereto and their equivalents.

[0026] It should also be understood that when introducing elements of the present invention in the claims or in the above description of exemplary embodiments of the invention, the terms “comprising,” “including,” and “having” are intended to be open-ended and mean that there may be additional elements other than the listed elements. Additionally, the term “portion” should be construed as meaning some or all of the item or element that it qualifies. Moreover, use of identifiers such as first, second, and third should not be construed in a manner imposing any relative position or time sequence between limitations. Still further, the order in which the steps of any method claim that follows are presented should not be construed in a manner limiting the order in which such steps must be performed.

What is claimed is:

1. A vacuum cleaner device comprising:
 - a main body, the main body having a primary vacuum inlet, a secondary vacuum inlet, and a vacuum outlet, the secondary vacuum inlet being operatively connected to the vacuum outlet;
 - a brush device, the brush device being configured and adapted to reciprocate relative to the main body;
 - a vacuum driven motor, the vacuum driven motor being adapted and configured to be rotationally driven by air passing through the secondary vacuum inlet to the vacuum outlet, the vacuum driven motor being operatively connected to the brush device in a manner such that rotation of the vacuum driven motor causes the brush device to reciprocate relative to the main body.
2. A vacuum cleaner device in accordance with claim 1 wherein the brush device is configured and adapted to pivotally reciprocate.
3. A vacuum cleaner device in accordance with claim 1 further comprising a flexible hose having a vacuum passageway that is adapted and configured to operatively connect the vacuum outlet and the primary vacuum inlet to a vacuum source.
4. A vacuum cleaner device in accordance with claim 3 further comprising a valve gate that is moveable between a first position and a second position relative to the main body, the valve gate allowing more air to flow through the primary vacuum

inlet and into the vacuum passageway of the flexible hose than through the secondary vacuum inlet and into the fluid passageway of the flexible hose when the valve gate is in the first position, the valve gate allowing more air to flow through the secondary vacuum inlet and into the fluid passageway of the flexible hose than through the primary vacuum inlet and into the fluid passageway of the flexible hose when the valve gate is in the second position.

5. A vacuum cleaner device in accordance with claim 4 wherein the valve gate operatively disconnects the primary vacuum inlet from the fluid passageway of the flexible hose when the valve gate is in the second position.

6. A vacuum cleaner device in accordance with claim 5 wherein the valve gate operatively disconnects the secondary vacuum inlet from the fluid passageway of the flexible hose when the valve gate is in the first position.

7. A vacuum cleaner device in accordance with claim 1 wherein the primary vacuum inlet is operatively connected to the vacuum outlet.

8. A vacuum cleaner device in accordance with claim 1 comprising a geared transmission, the geared transmission operatively connecting the vacuum driven motor to the brush device.

9. A vacuum cleaner device in accordance with claim 8 wherein the geared transmission comprises a plurality of operatively connected toothed gears.

10. A vacuum cleaner device in accordance with claim 1 further comprising a liquid sprayer and a spray trigger, the spray trigger being operatively connected to the liquid sprayer in a manner such that the spray trigger can control whether or not liquid is sprayed from the liquid sprayer.

11. A vacuum cleaner device comprising:

a main body, the main body having a primary vacuum inlet, a secondary vacuum inlet, and a vacuum outlet, the secondary vacuum inlet being operatively connected to the vacuum outlet;

a brush device, the brush device being configured and adapted to move relative to the main body;

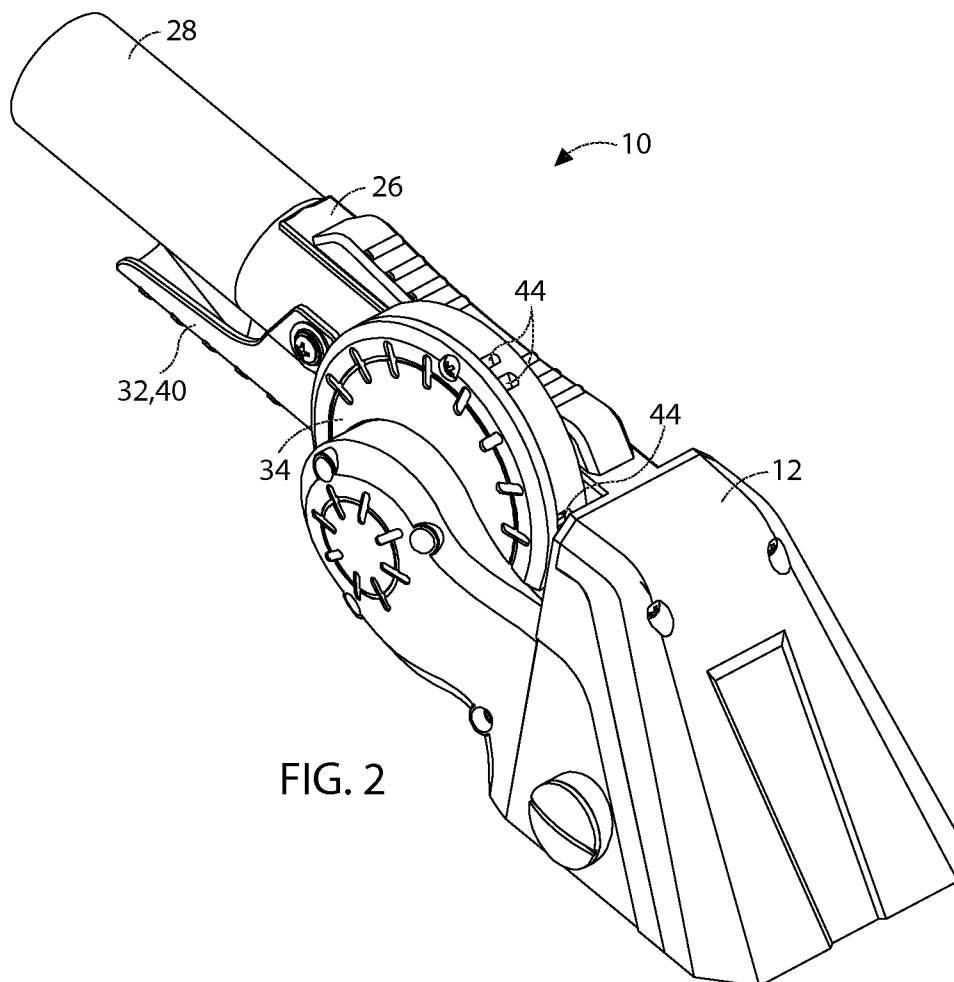
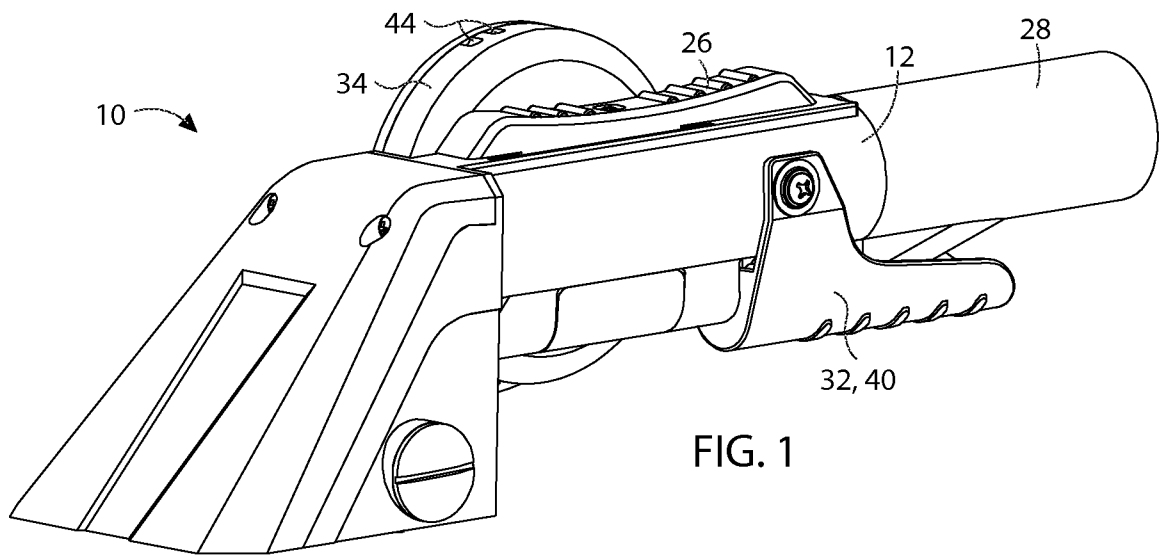
a vacuum driven motor, the vacuum driven motor being adapted and configured to be driven by air passing through the secondary vacuum inlet to the vacuum outlet, the vacuum driven motor being operatively connected to the brush device in a manner such that the vacuum driven motor causes the brush device to move relative to the main body when the vacuum driven motor is driven;

a valve gate moveable between a first position and a second position relative to the main body, the valve gate allowing more air to flow through the primary vacuum inlet than through the secondary vacuum inlet when the valve gate is in the first position, the valve gate allowing more air to flow through the secondary vacuum inlet than through the primary vacuum inlet when the valve gate is in the second position.

12. A vacuum cleaner device in accordance with claim 11 wherein the valve gate operatively disconnects the secondary vacuum inlet from the vacuum outlet when the valve gate is in the first position.

13. A vacuum cleaner device in accordance with claim 12 wherein the primary vacuum inlet is operatively connected to the vacuum outlet and the valve gate operatively disconnects the primary vacuum inlet from the vacuum outlet when the valve gate is in the second position.

14. A vacuum cleaner device in accordance with claim 11 further comprising a liquid sprayer and a spray trigger, the spray trigger being operatively connected to the liquid sprayer in a manner such that the spray trigger can control whether or not liquid is sprayed from the liquid sprayer.



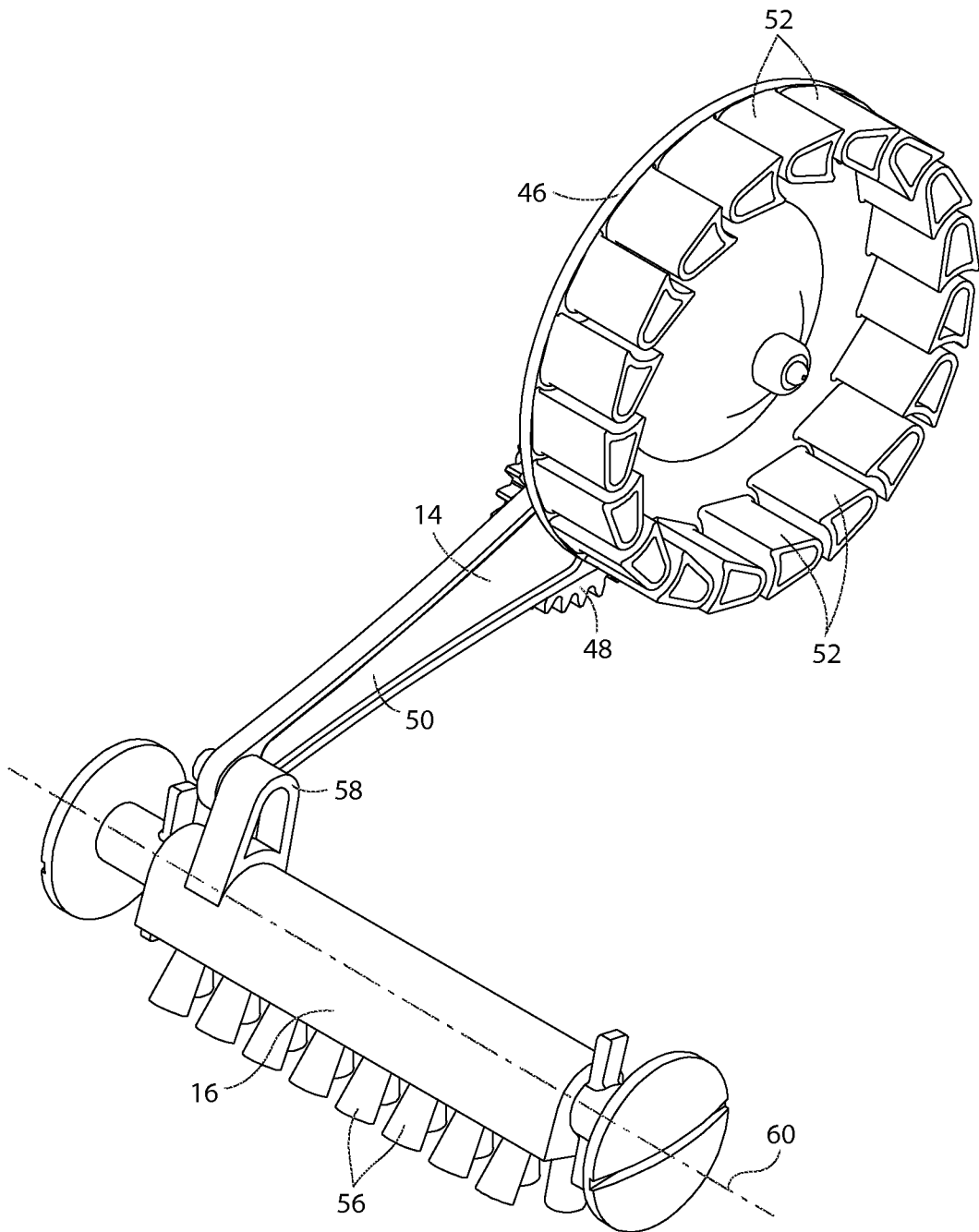


FIG. 3

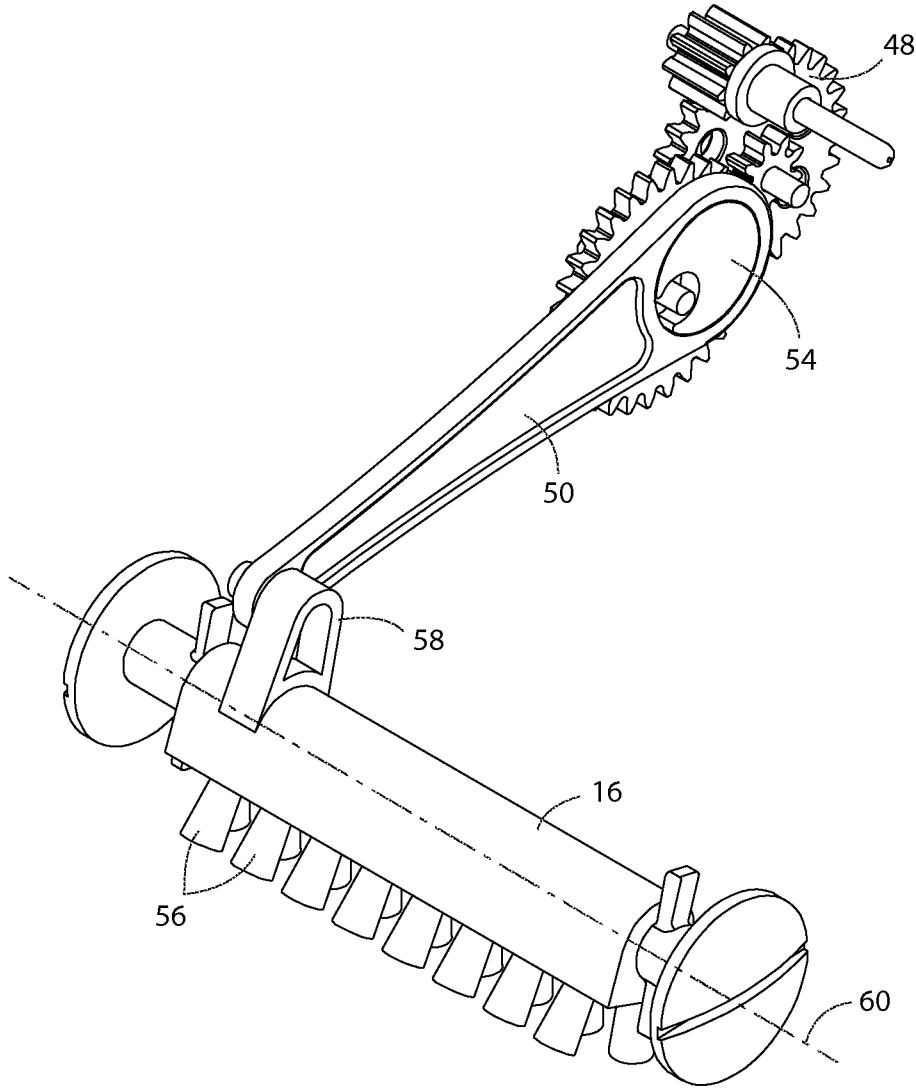


FIG. 4

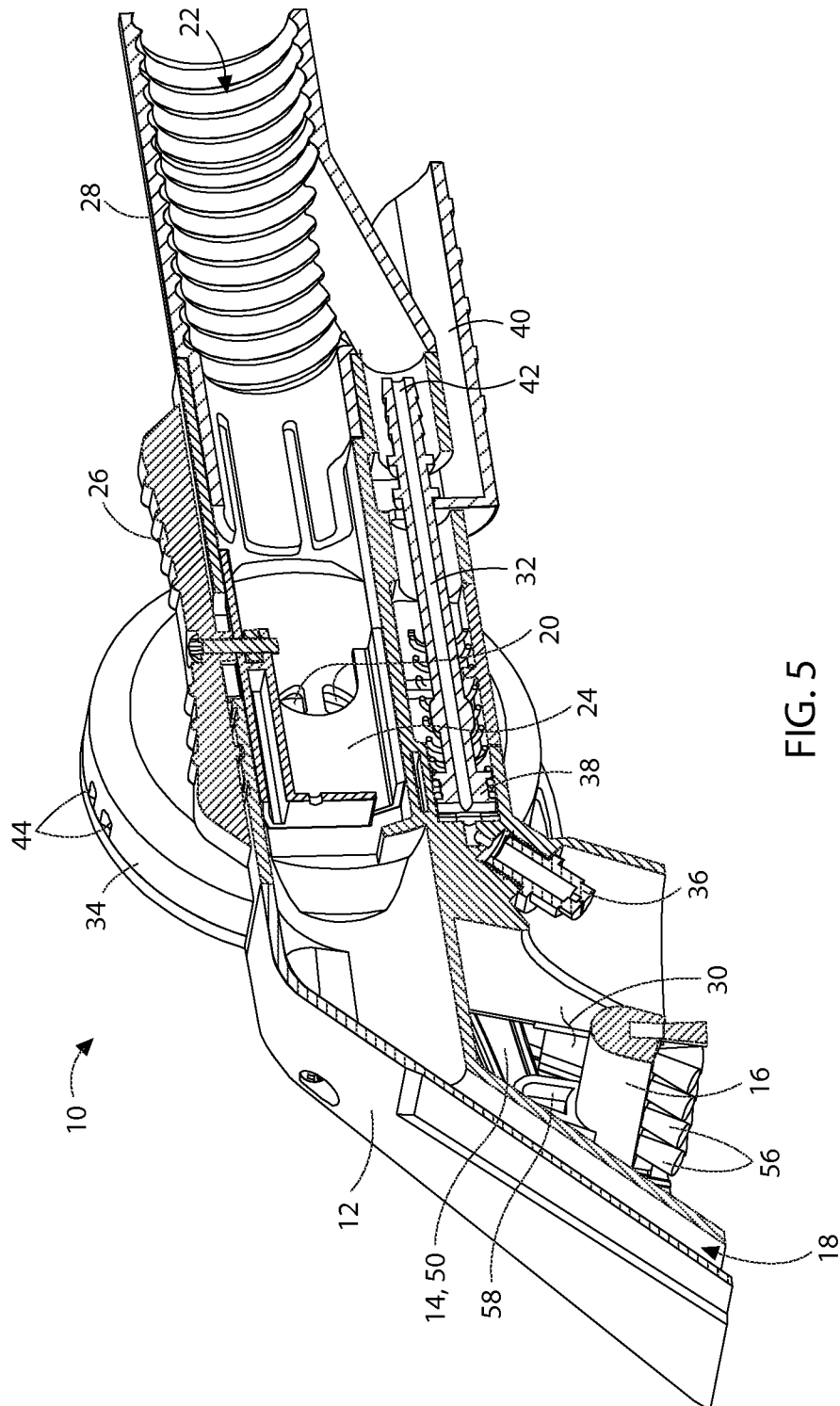
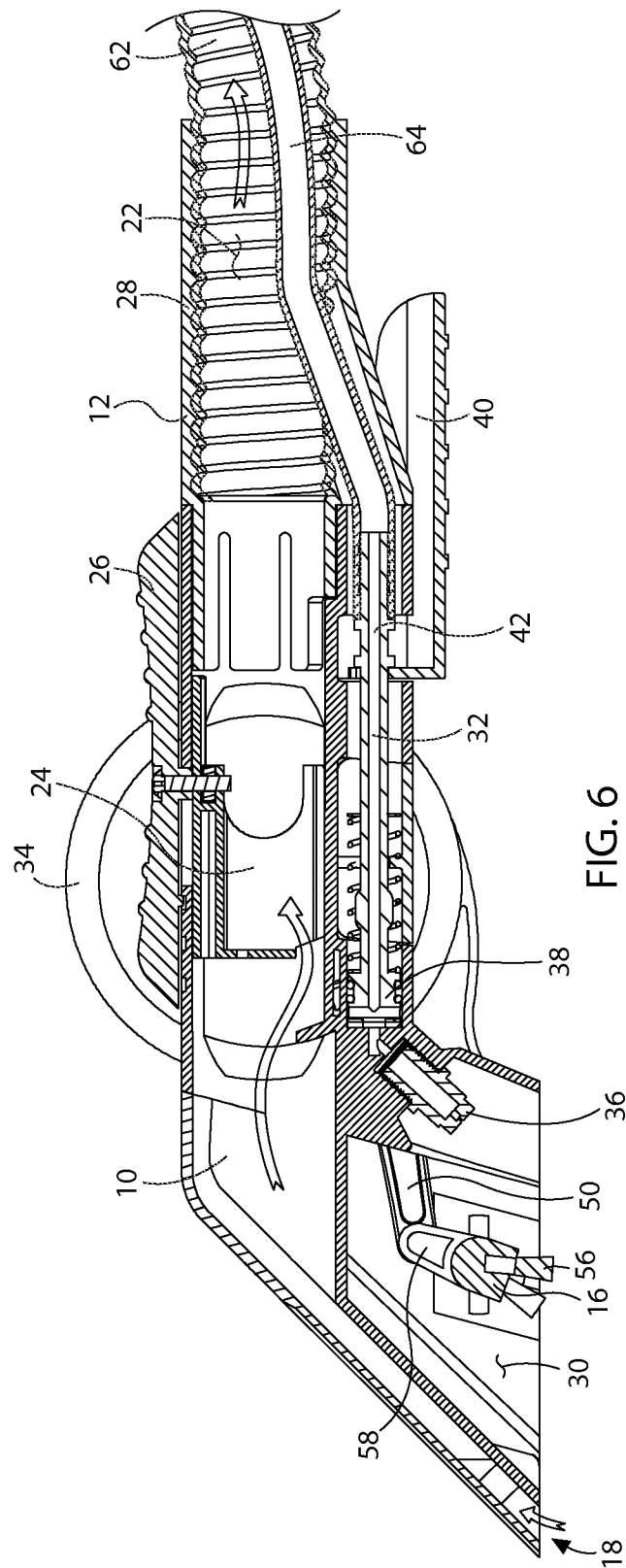


FIG. 5



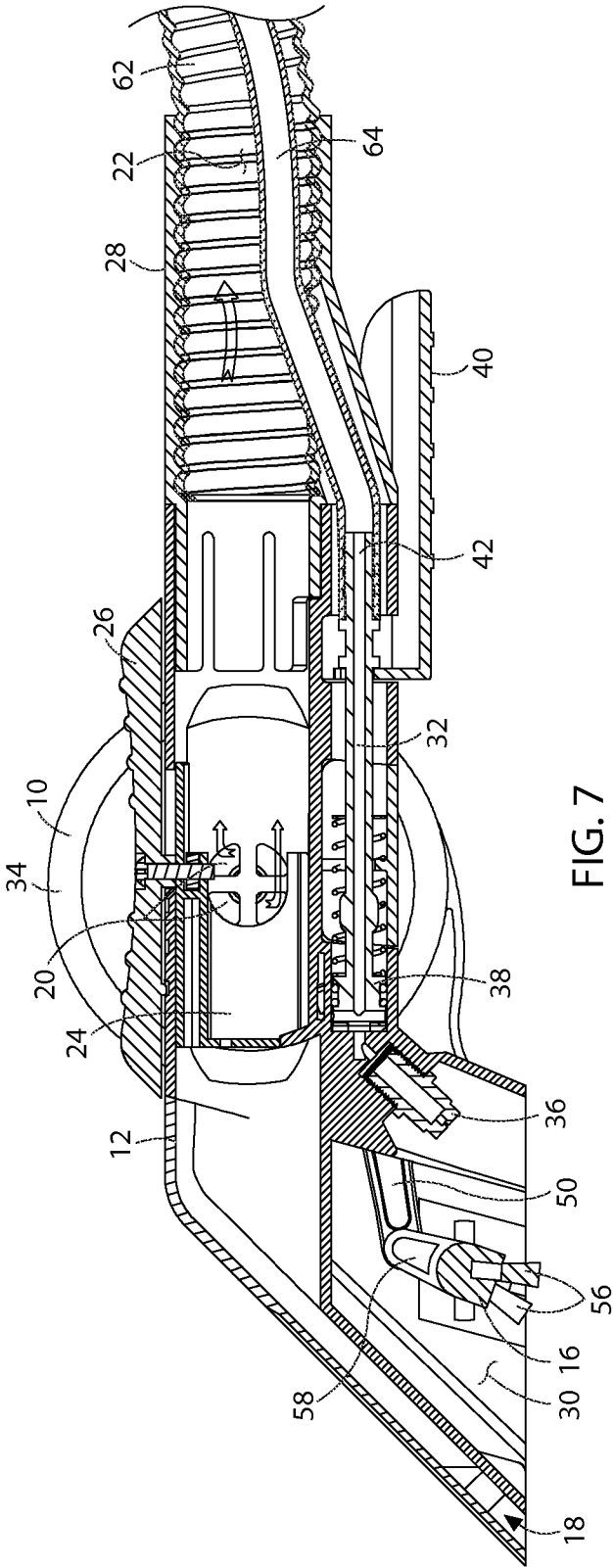


FIG. 7

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2013/033824

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - A47L 9/04 (2013.01)

USPC - 15/387

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC(8) - A47L 5/22, 5/24, 5/32, 7/00, 7/02, 9/00, 9/02, 9/04, 11/29, 11/34, 11/204 (2013.01)

USPC - 15/21.1, 300.1, 320, 321, 344, 363, 383, 387, 389, 401; 134/6, 198

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
CPC- A47L 5/22, 5/24, 5/32, 7/0004, 9/0405, 9/0416, 11/00, 11/34, 11/4016, 11/4036 (2013.01)

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

PatBase, Google Patents, Google, ProQuest

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2001/0054214 A1 (KALMAN et al) 27 December 2001 (27.12.2001) entire document	1-3, 7-10
Y	US 4,272,861 A (NOTTA et al) 16 June 1981 (16.06.1981) entire document	1-3, 7-10
Y	US 6,658,693 B1 (REED, JR.) 09 December 2003 (09.12.2003) entire document	10
A	US 6,134,746 A (MILLER et al) 24 October 2000 (24.10.2000) entire document	1-14
A	US 5,088,149 A (BERG et al) 18 February 1992 (18.02.1992) entire document	1-14
A	US 6,189,180 B1 (HATO et al) 20 February 2001 (20.02.2001) entire document	1-14

☐ Further documents are listed in the continuation of Box C.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

07 June 2013

Date of mailing of the international search report

18 JUN 2013

Name and mailing address of the ISA/US

Mail Stop PCT, Attn: ISA/US, Commissioner for Patents

P.O. Box 1450, Alexandria, Virginia 22313-1450

Facsimile No. 571-273-3201

Authorized officer:

Blaine R. Copenheaver

PCT Helpdesk: 571-272-4300

PCT OSP: 571-272-7774