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**Luebbering et al.**(10) **Pub. No.: US 2007/0245514 A1**(43) **Pub. Date: Oct. 25, 2007**(54) **VACUUM CLEANER FILTER****Related U.S. Application Data**(75) Inventors: **Greg Luebbering**, Heyworth, IL (US);  
**Arnie Sepke**, Hudson, IL (US); **Vince**  
**Bobrosky**, Normal, IL (US)(63) Continuation of application No. 11/084,513, filed on  
Mar. 21, 2005, now abandoned.(60) Provisional application No. 60/554,406, filed on Mar.  
19, 2004.

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**A47L 9/32** (2006.01)(52) **U.S. Cl.** ..... **15/410**(57) **ABSTRACT**(73) Assignee: **Electrolux Home Care Products North**  
**America**

A vacuum cleaner having a base adapted for movement on a surface to be cleaned, a rear housing pivotally attached at a first end to the base, a vacuum source, a dirt collection container, and a handle attached to a second end of the rear housing. The handle has a grip structure having a substantially circular opening through it. The opening is adapted to receive a hand of a user for use in directing the vacuum cleaner.

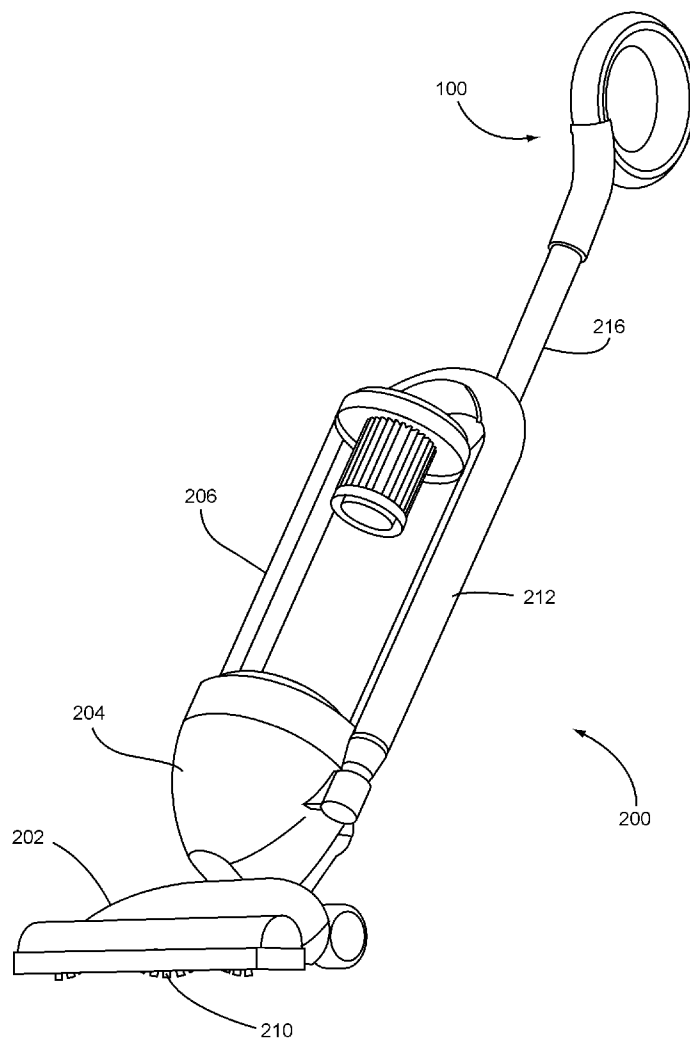
(21) Appl. No.: **11/692,483**(22) Filed: **Mar. 28, 2007**

FIG. 1

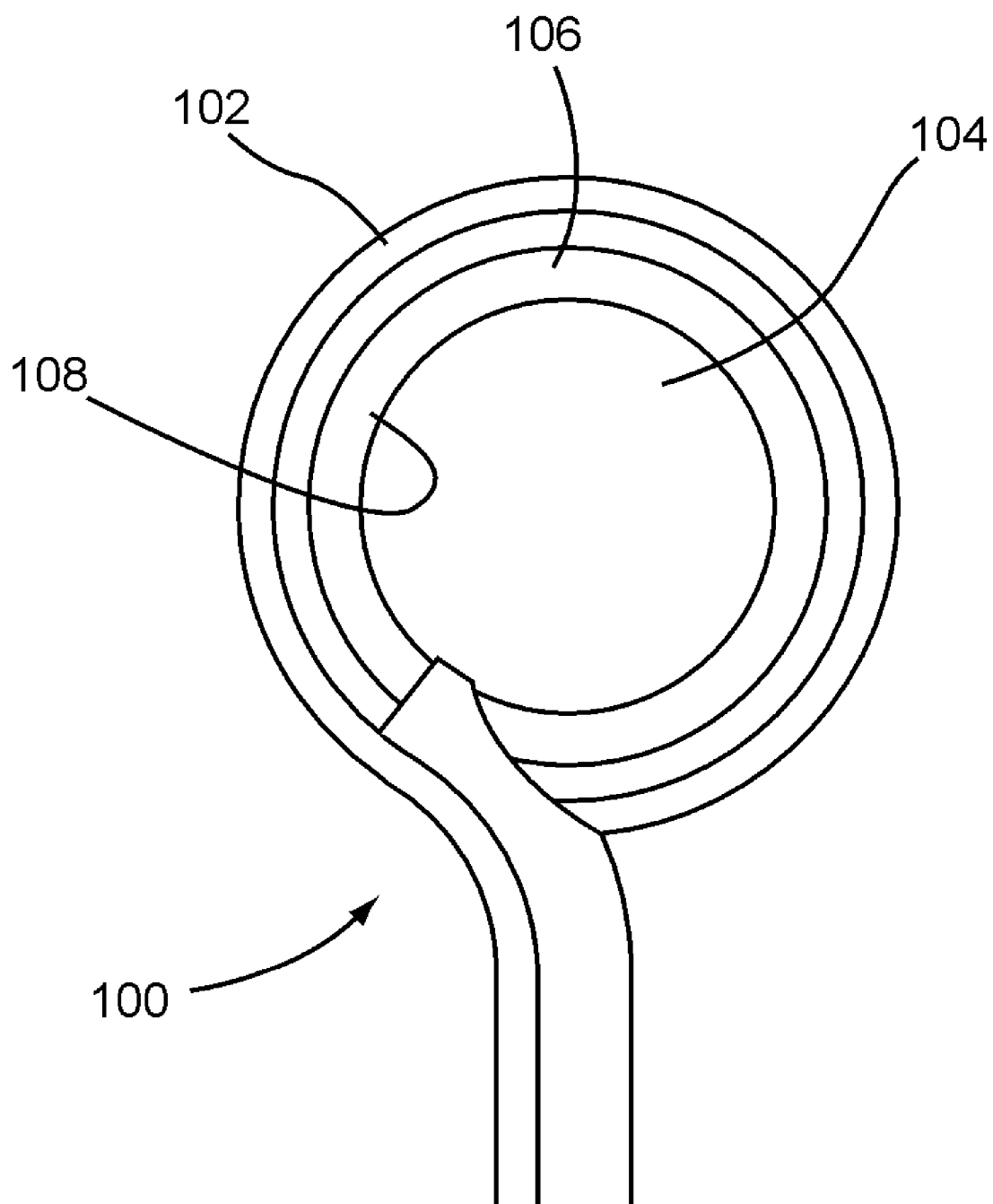


FIG. 2

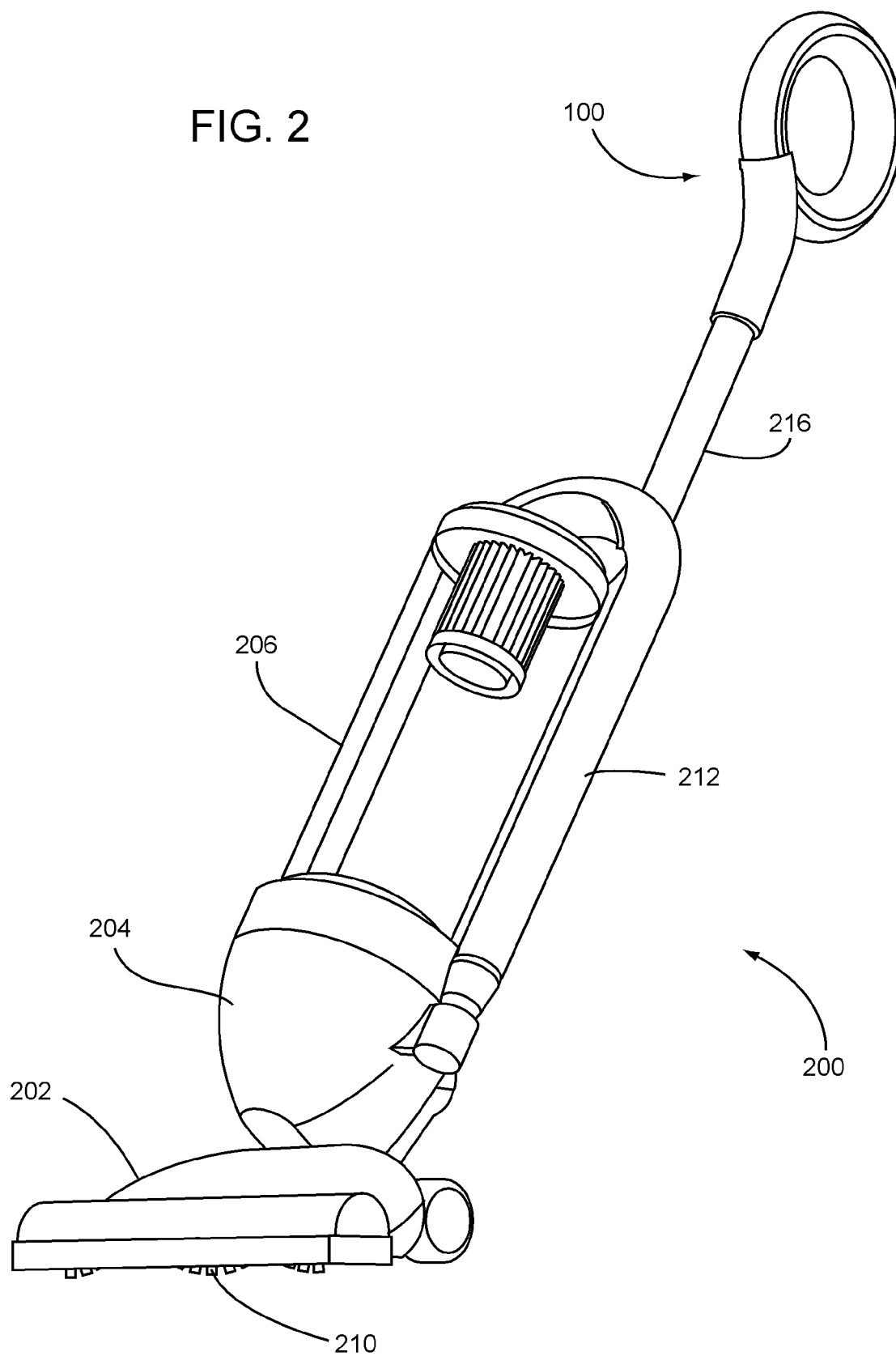


FIG. 3

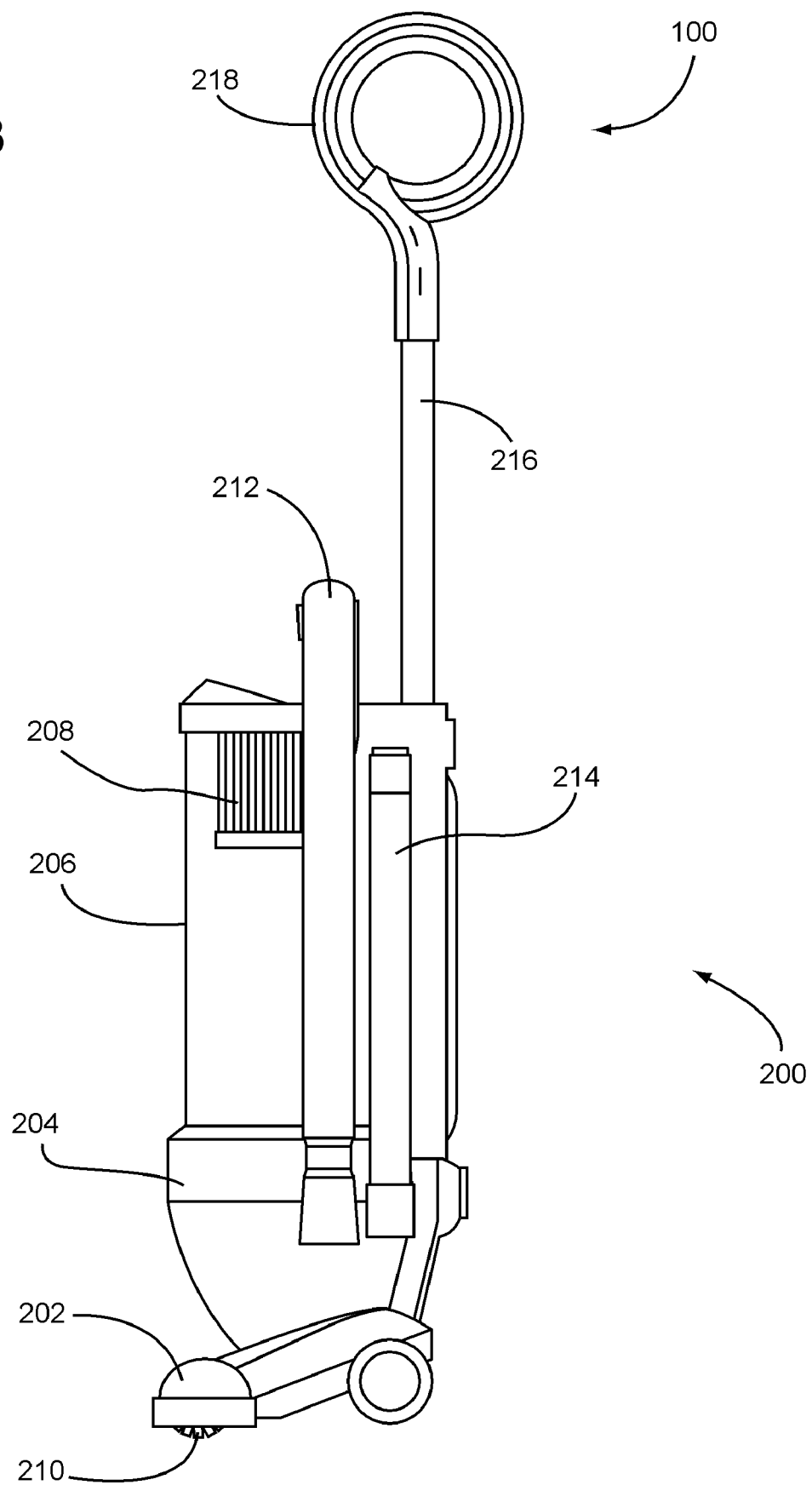


FIG. 4

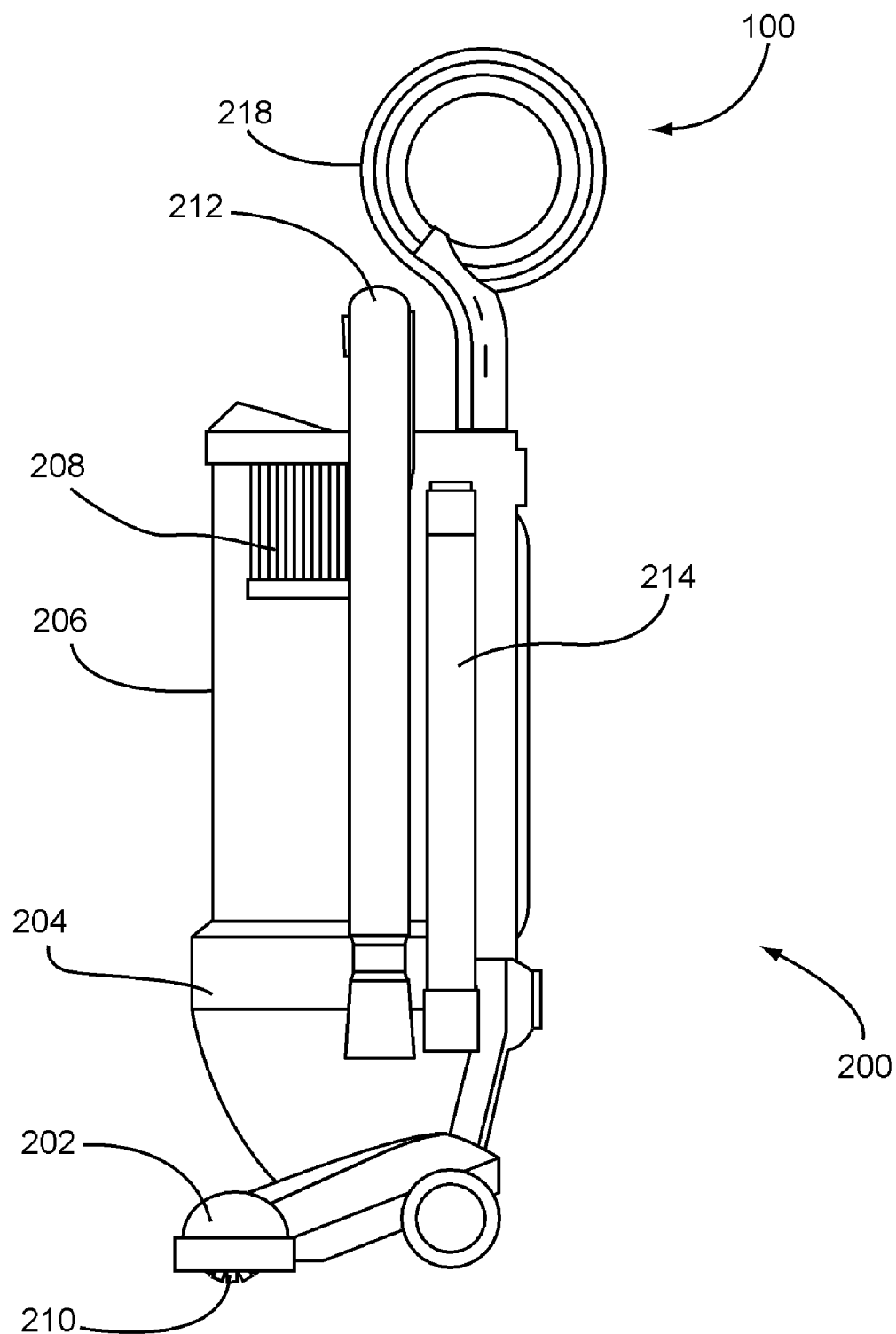


FIG. 5

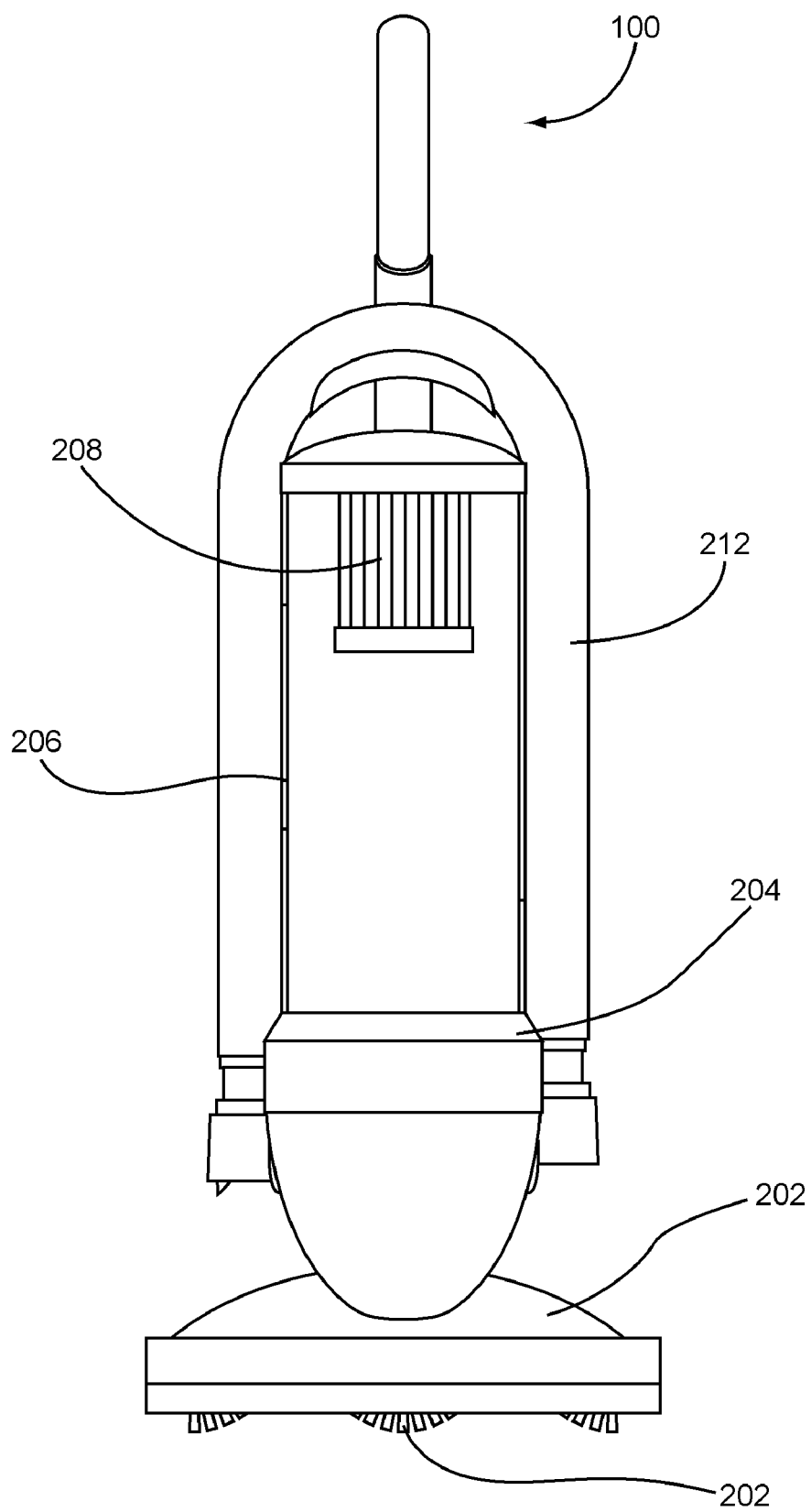


FIG. 6

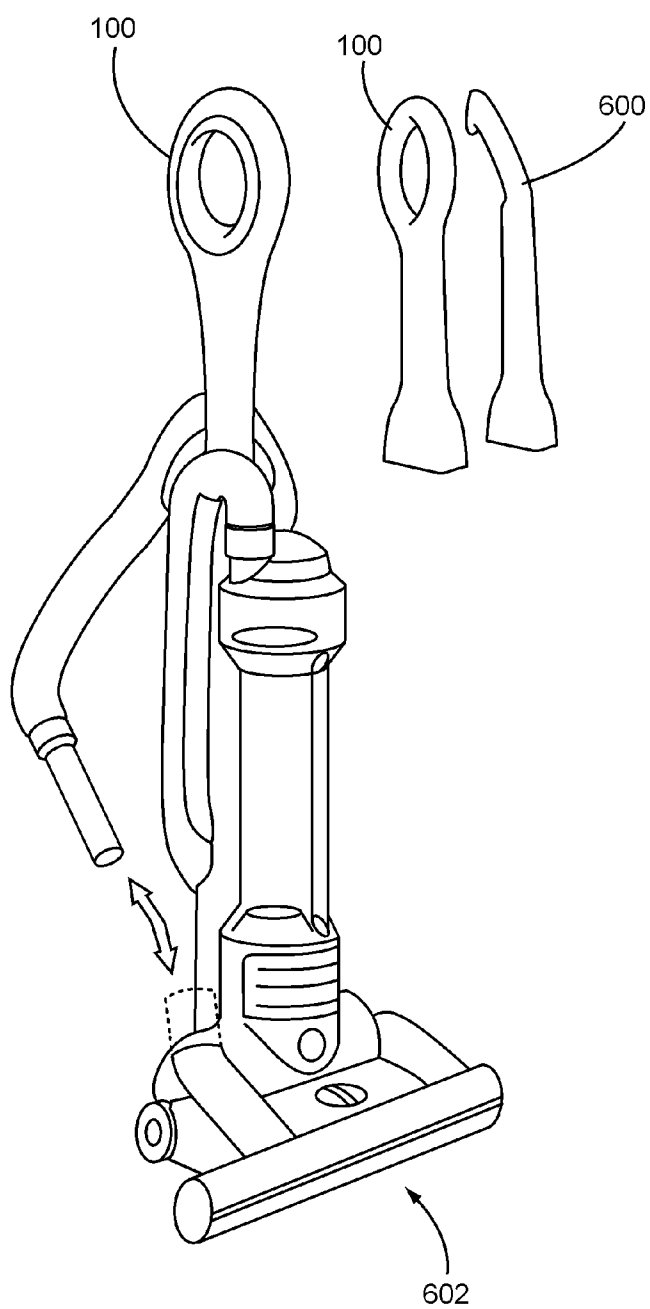


FIG. 7

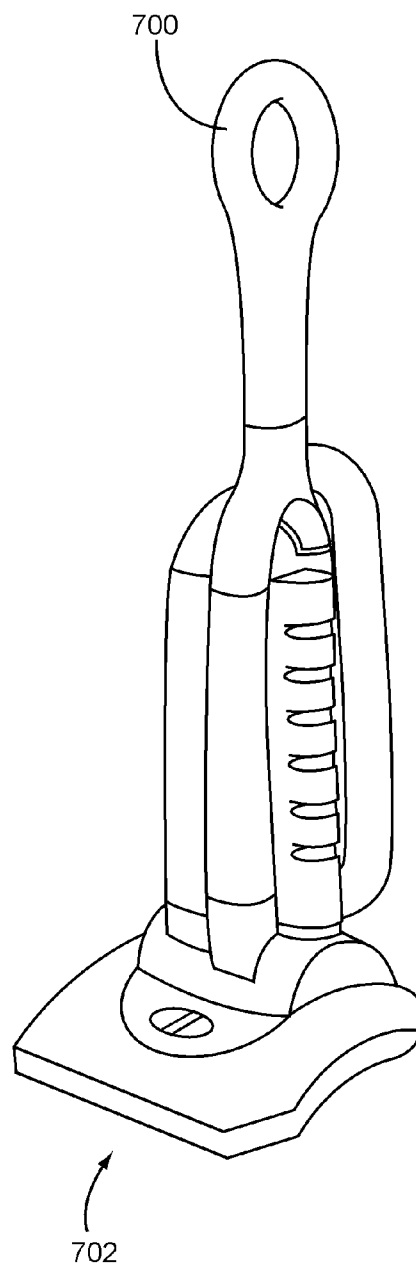


FIG. 8

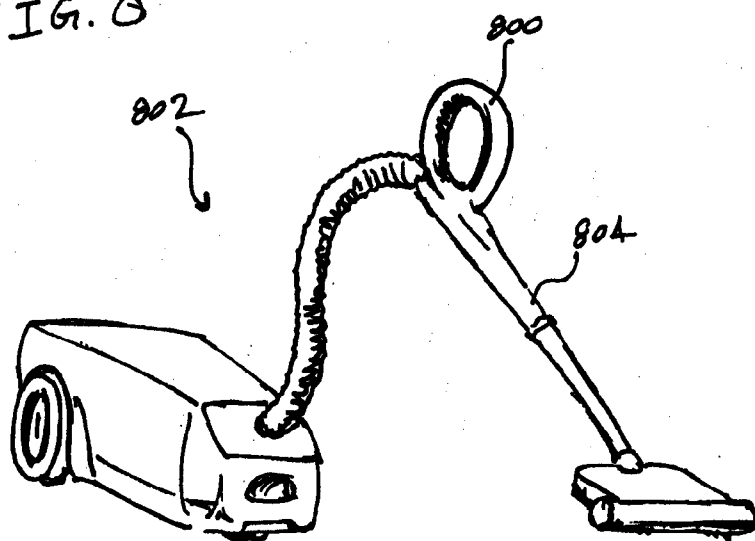


FIG. 9

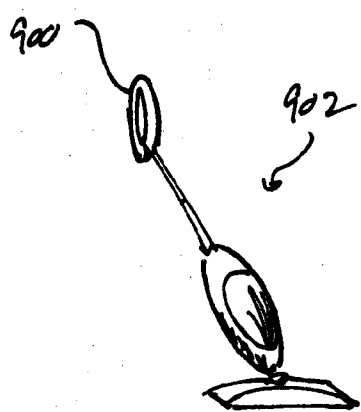


FIG. 10

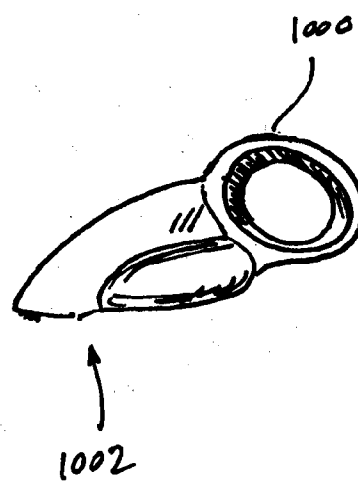
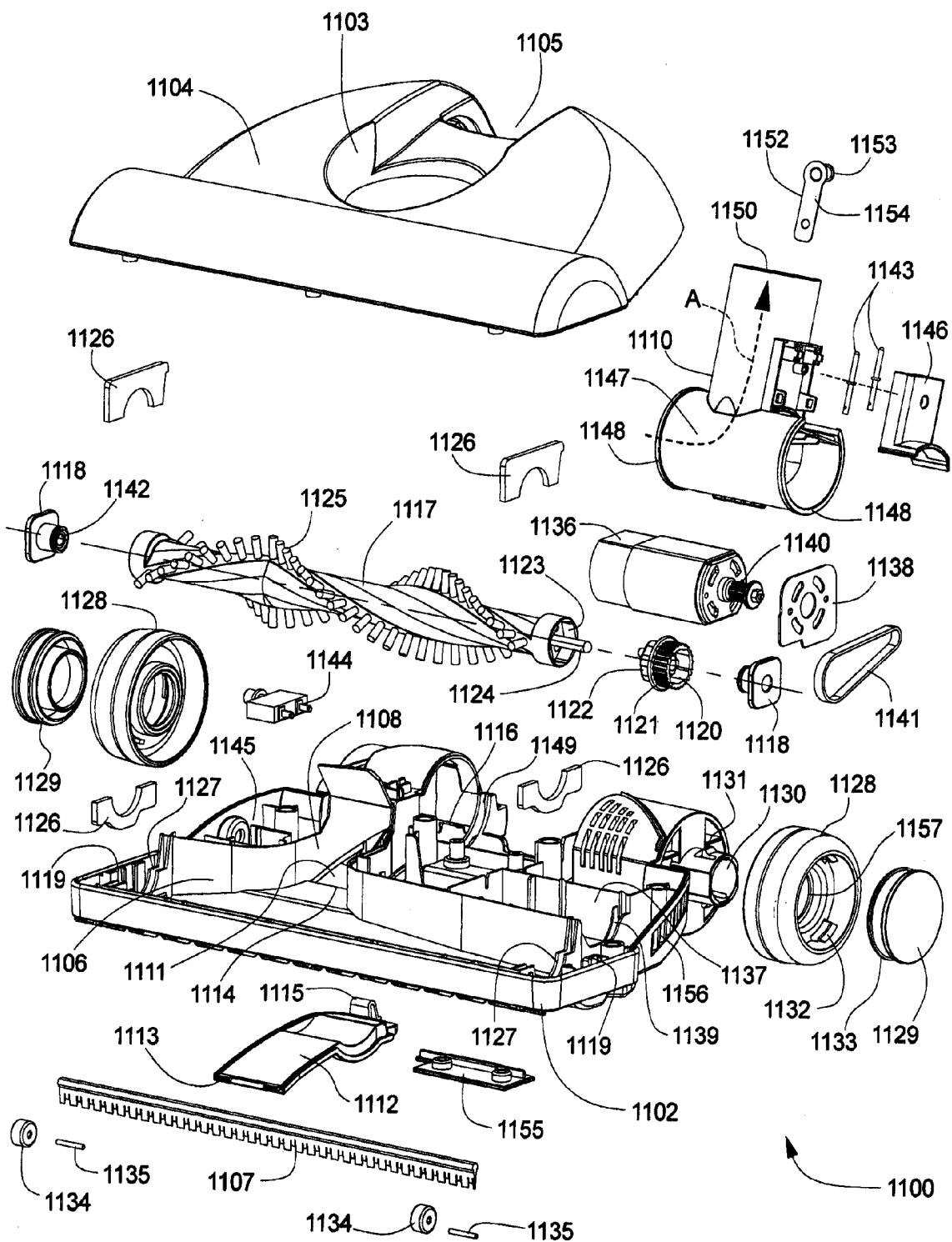




FIG. 11



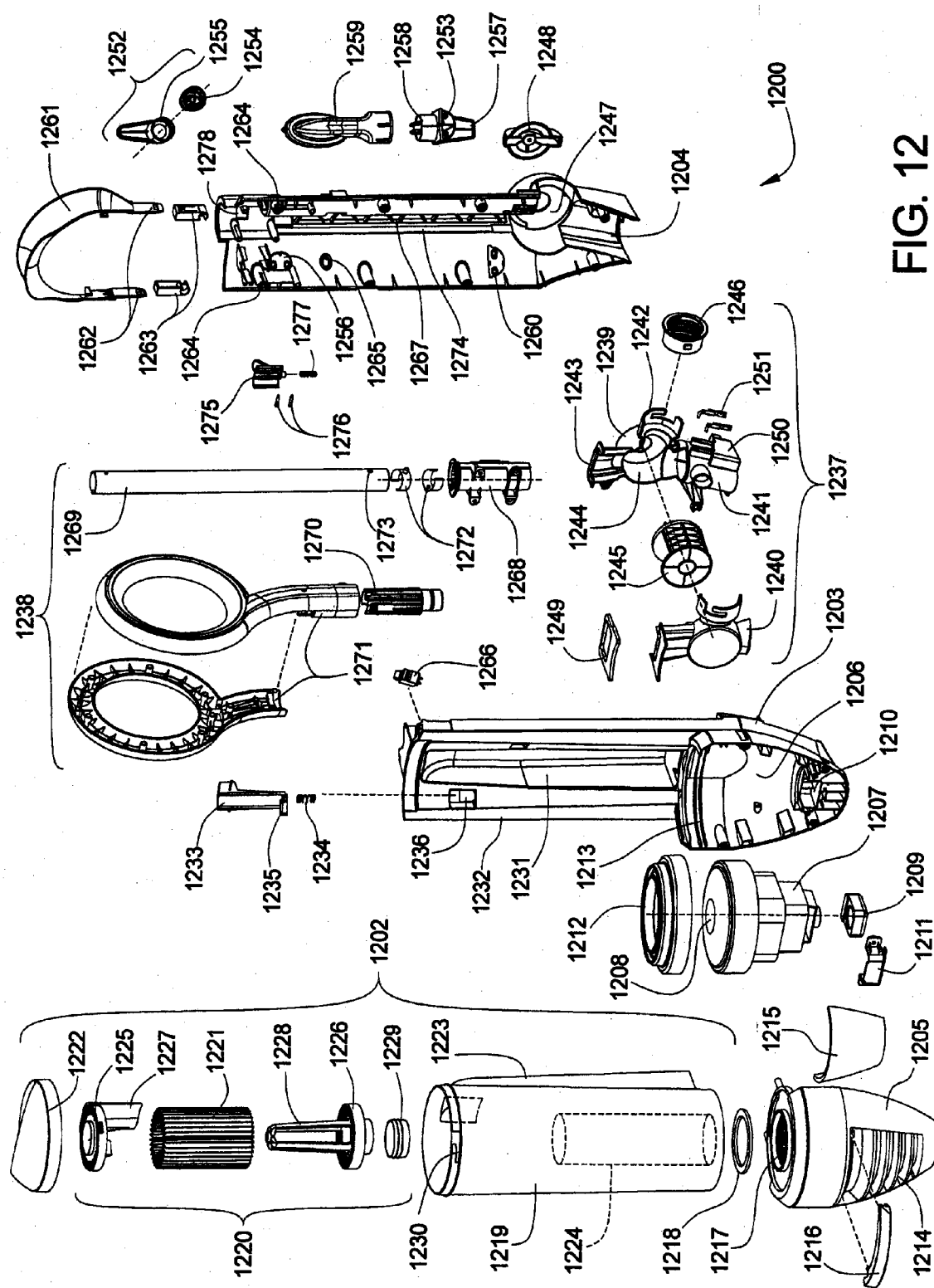


FIG. 12

# FIG. 13

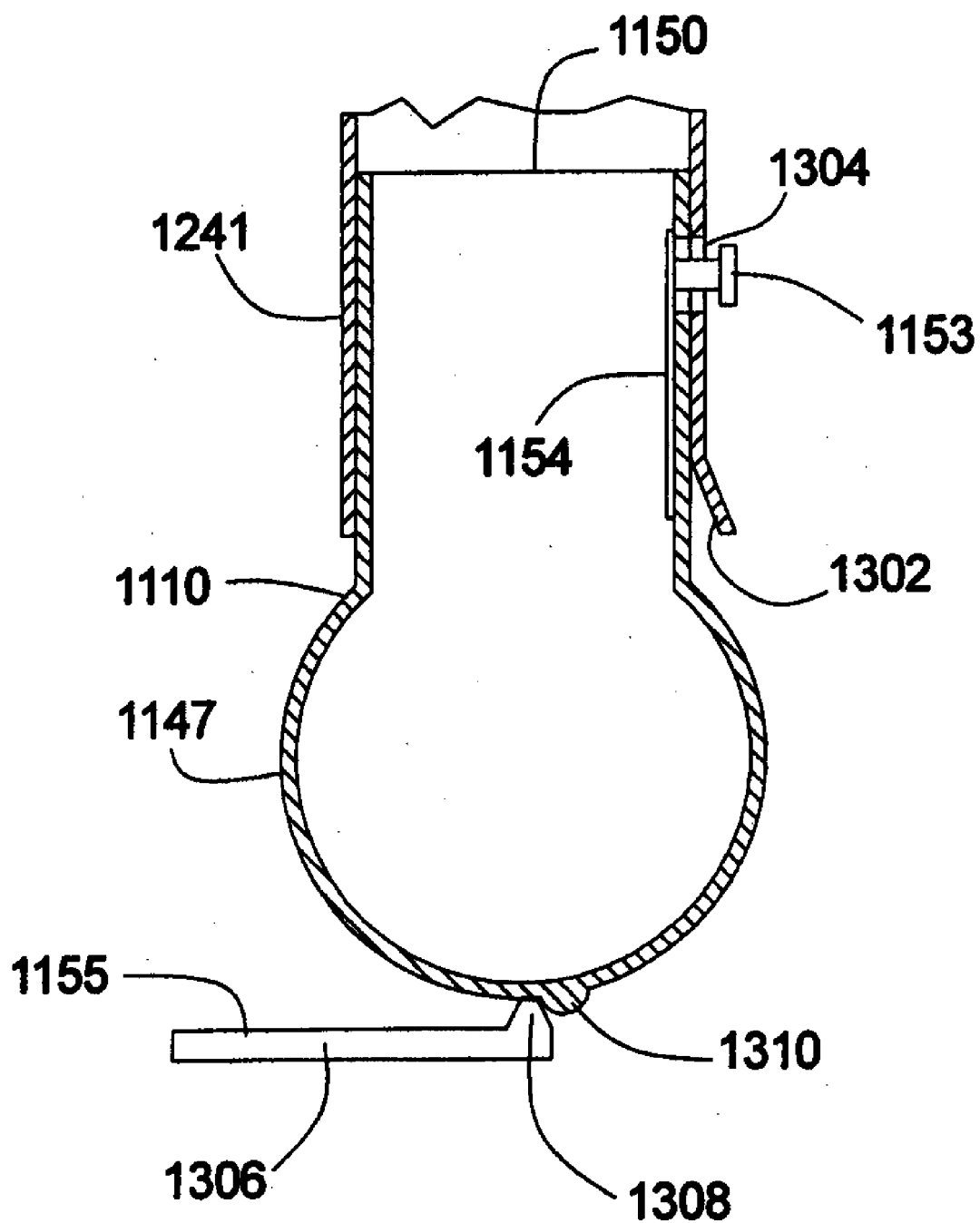


FIG. 14

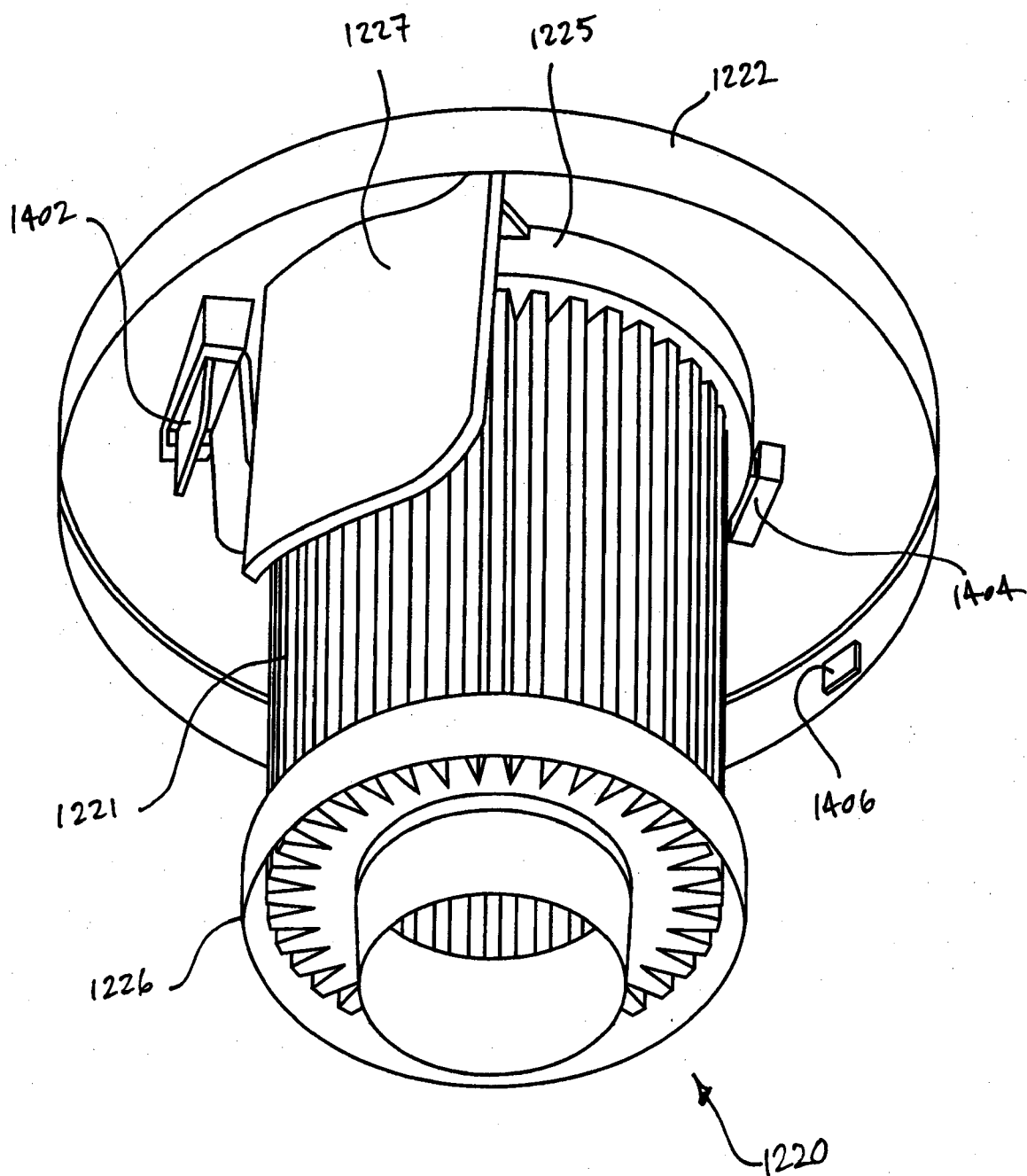


FIG. 15

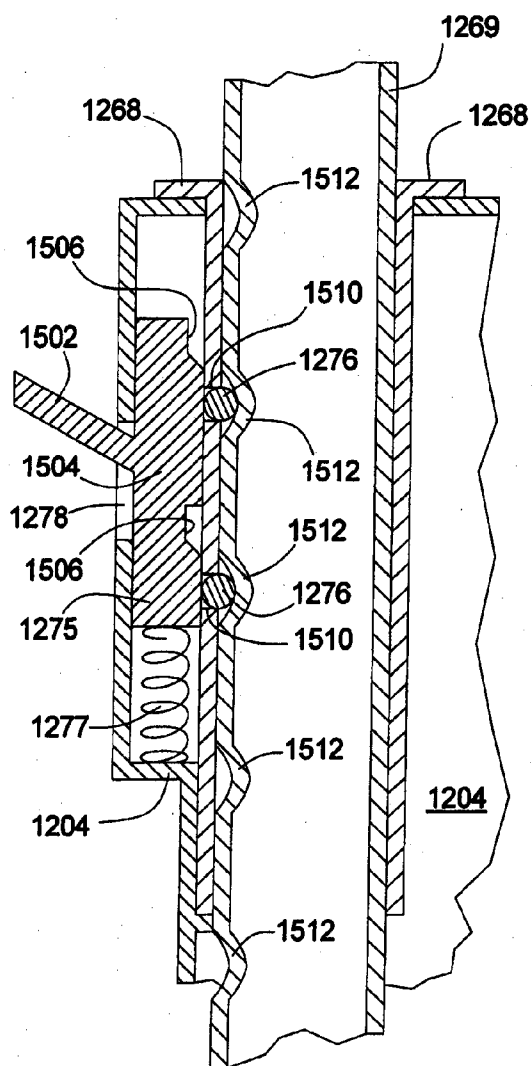


FIG. 16

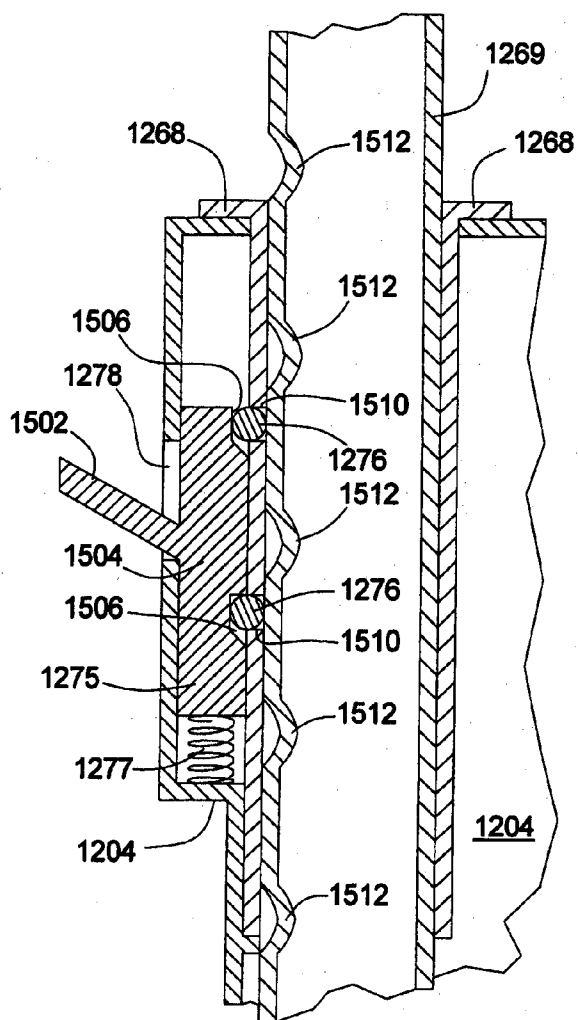
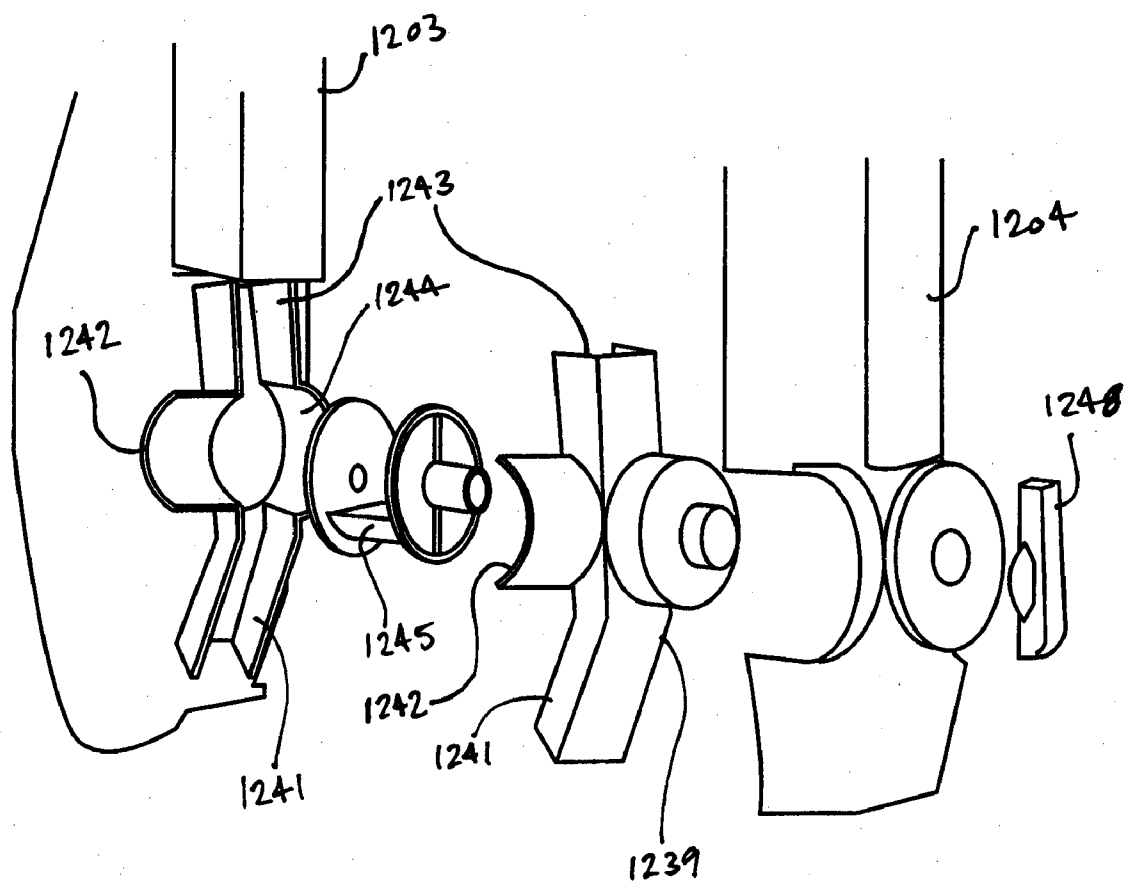


FIG. 17



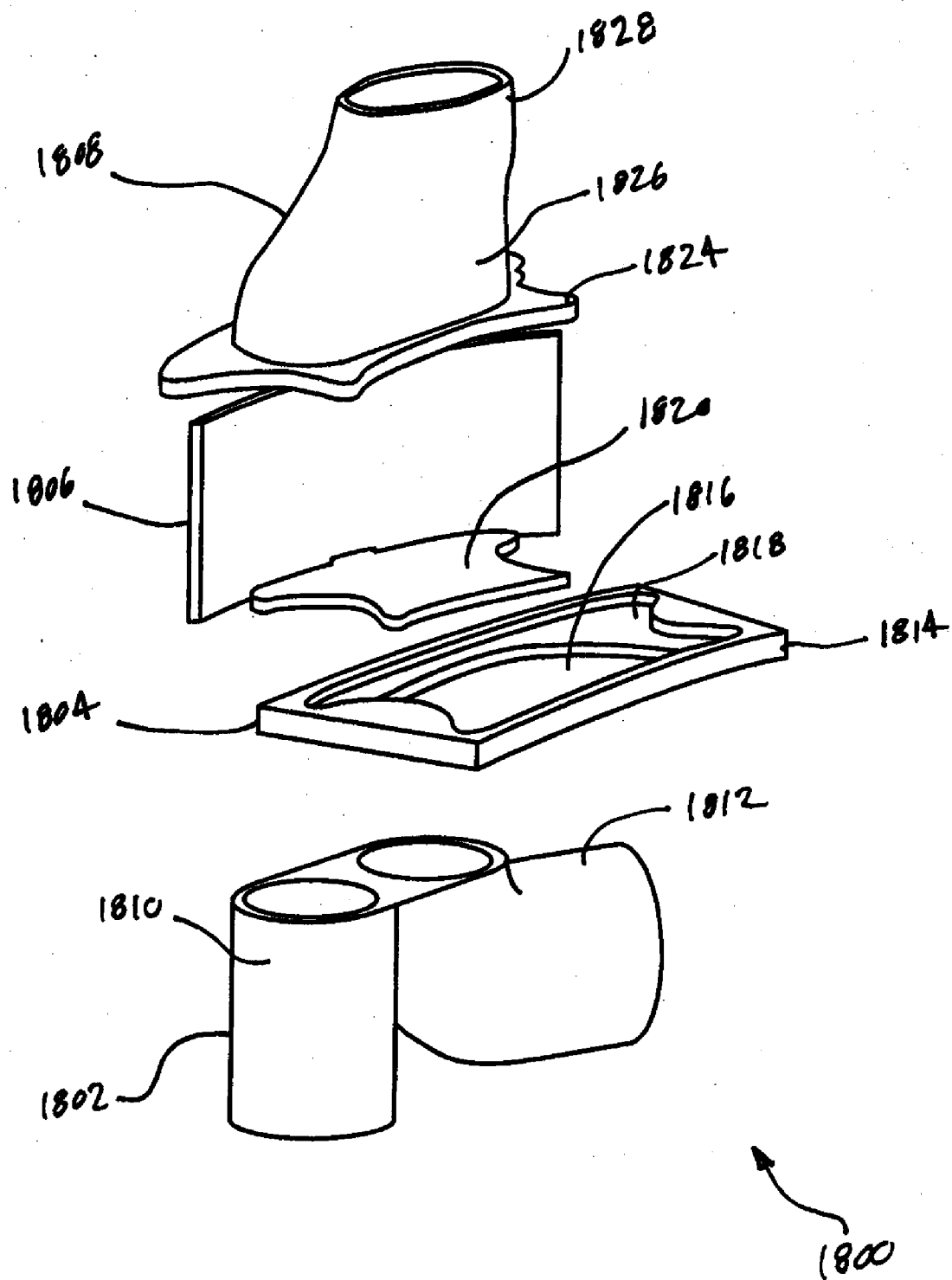


FIG. 18

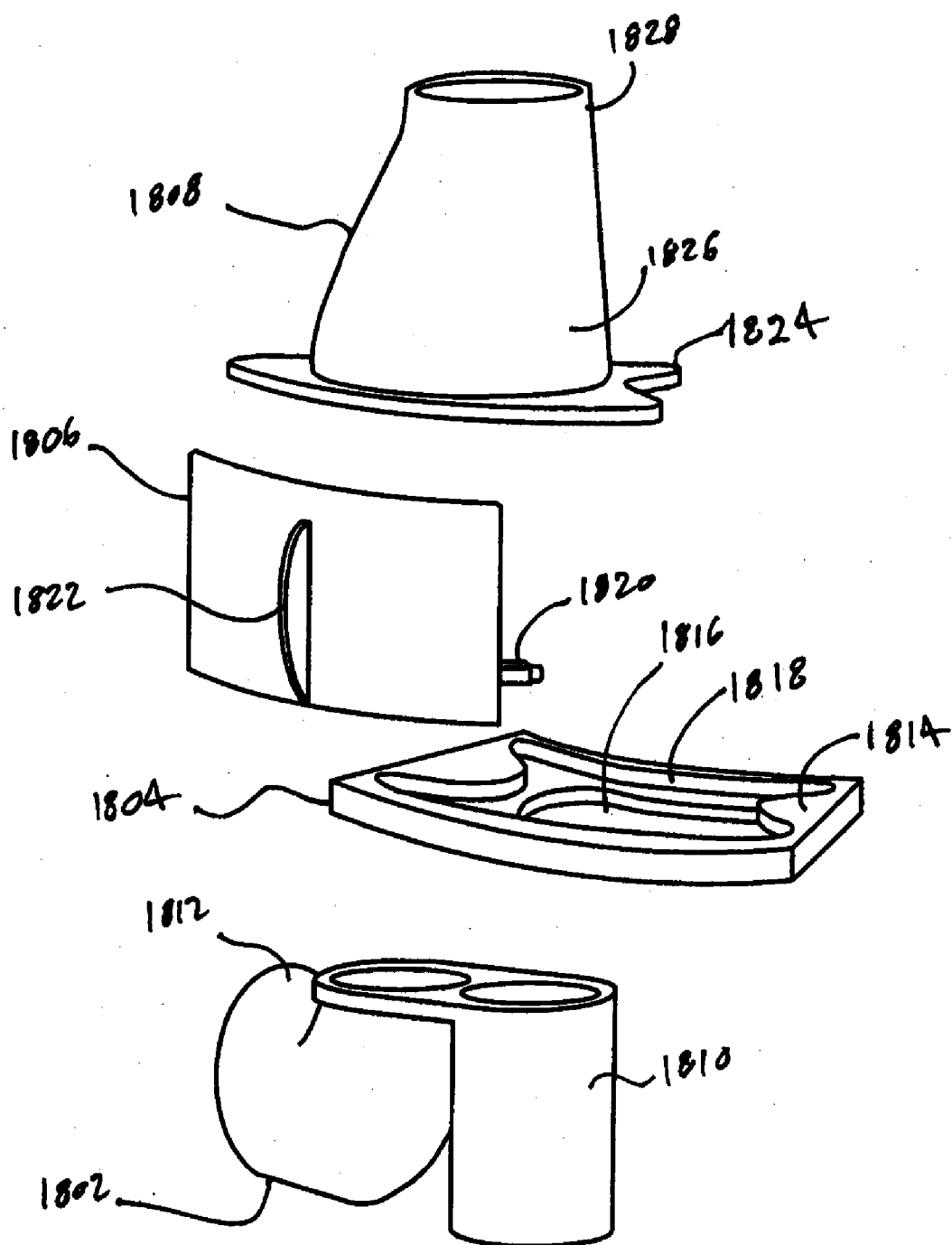


FIG. 19



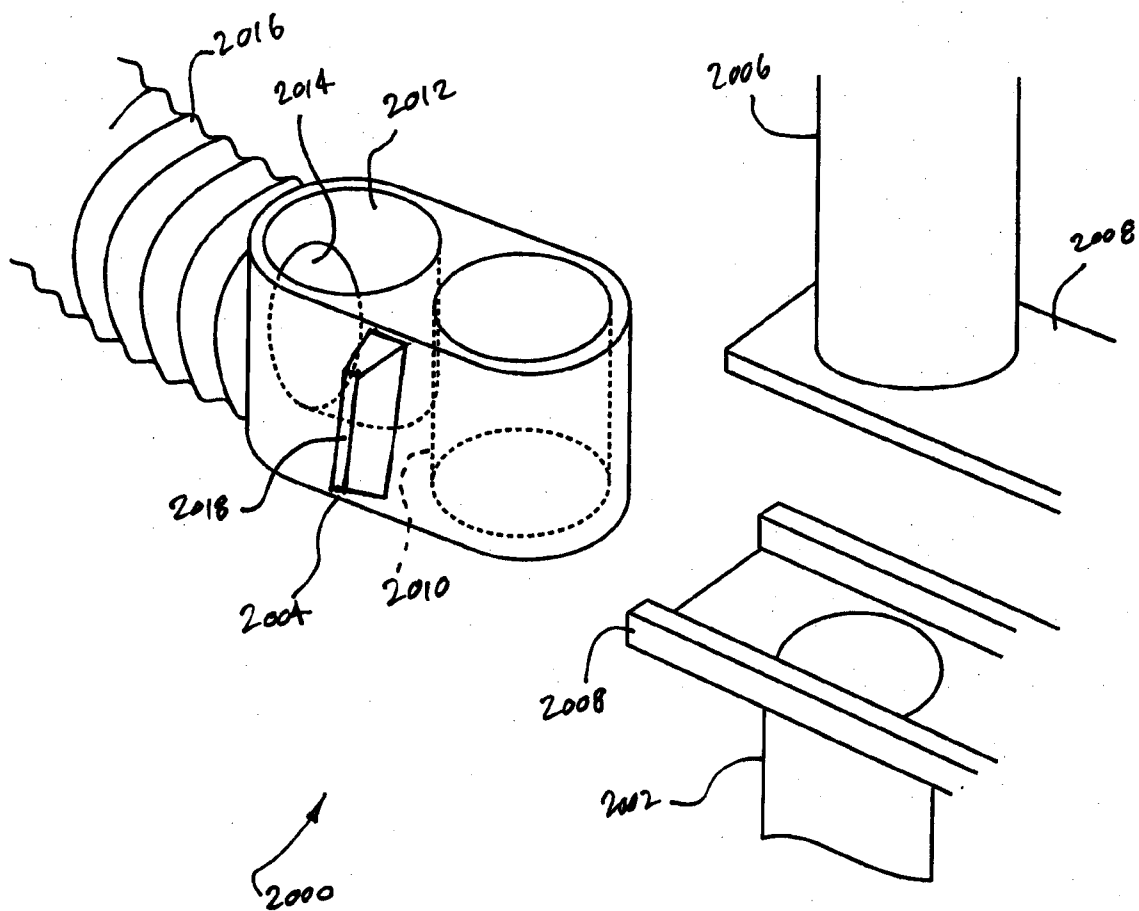


FIG. 20

## VACUUM CLEANER FILTER

### RELATED APPLICATIONS

[0001] The present invention claims priority to U.S. Provisional Application No. 60/554,406, filed Mar. 19, 2004, and is a continuation of U.S. patent application Ser. No. 11/084,513. Both of these applications are incorporated herein by reference.

[0002] The following applications are related by subject matter and are incorporated herein by reference in their entirety: Design Application No. 29/225,780, which issued as U.S. Design Pat. No. D525,400; Design Application No. 29/225,781, filed Mar. 21, 2005; Design Application No. 29/225,783, which issued as U.S. Design Pat. No. D524,498; and Design Application No. 29/225,753, which issued as U.S. Design Pat. No. D533,976.

### FIELD OF THE INVENTION

[0003] The present invention relates generally to cleaning systems, and more specifically to devices for cleaning floors, fabrics, carpets, clothing, upholstery, curtains, fabric and various other hard and soft surfaces.

### BACKGROUND OF THE INVENTION

[0004] Various floor cleaning devices, such as mops, brooms, vacuums, steam cleaners, wet extractors, and the like have been produced in the prior art. These prior art devices are typically provided in canister, upright, hand-held and other portable configurations, and may be powered by an electrical cord or by batteries. In many cases, the device is provided with a handle to facilitate movement and/or use. These handles include, for example, simple straight shaft designs such as the wooden handles on most brooms, somewhat more ergonomic curved handles, pistol-grip type handles, and space-saving molded-in handles such as those formed directly in the housing of many hand-held devices. Examples of various handles are shown in U.S. Pat. Nos. 5,884,358; D334,447; 6,108,862; and D431,335. All of the aforementioned patents are incorporated herein by reference.

[0005] While these handles are somewhat useful for manipulating their associated cleaning devices, they suffer from various shortcomings. For example, such handles are generally shaped to provide only one distinct operating position for the user's hand. Such handles are also oftentimes deficient when it comes to manipulating the device during transportation and storage. Still further, these handles may consume excess storage space. As such, there remains a need to provide an improved handle design for cleaning devices.

### SUMMARY OF THE INVENTION

[0006] The present invention provides a multi-position circular handle for cleaning devices. In a first embodiment, the invention provides a vacuum cleaner having a base adapted for movement on a surface to be cleaned, a rear housing, pivotally attached at a first end thereof to the base, a vacuum source, a dirt collection container, and a handle attached to a second end of the rear housing. The handle has a grip structure having a substantially circular opening through it. The opening is adapted to receive a hand of a user for use in directing the vacuum cleaner.

[0007] In one variation of this first embodiment, the handle further has a telescoping handle post joining the rear housing to the grip structure. The telescoping handle post is telescopically affixed to the rear housing and adapted to be adjustable between at least a collapsed position and an extended position.

[0008] In another variation of the first embodiment, the grip structure has a grip surface disposed on at least a portion of an inner side of the grip structure. Such a grip surface may be an overmolded rubber or synthetic material. In various other embodiments, the grip structure may have one or more controls for controlling the operation of the vacuum cleaner, may have a toroid shape, may have a substantially circular outer perimeter, and may be pivotable about an axis generally aligned with the longitudinal axis of the rear housing.

[0009] The dirt collection chamber of the vacuum cleaner may be a bag or a removable canister, and may have one or more filters through which air moving through the vacuum cleaner passes to remove particles from the air. The vacuum cleaner may also be a wet extractor having a fluid delivery system associated with it.

[0010] In a second embodiment, the present invention provides a vacuum cleaner having a canister with a vacuum source and a dirt collection chamber, a hose connected to the canister, a wand connected to the hose, a floor-engaging cleaning head attached to an end of the wand opposite the hose, and a handle attached to the wand. The handle has a grip structure having a substantially circular opening through it. The opening is adapted to receive a hand of a user for use in directing the wand.

[0011] In a variation of this second embodiment, the grip structure may have a grip surface disposed on at least a portion of an inner side of the grip structure. Such a grip surface may be an overmolded rubber or synthetic material. In various other embodiments, the grip structure may have one or more controls for controlling the operation of the vacuum cleaner, may have a toroid shape, may have a substantially circular outer perimeter, and may be pivotable about an axis generally aligned with the longitudinal axis of the rear housing.

[0012] The dirt collection chamber of the vacuum cleaner of this second embodiment may be a bag or a removable canister, and may have one or more filters through which air moving through the vacuum cleaner passes to remove particles from the air. The vacuum cleaner may also be a wet extractor having a fluid delivery system associated with it.

[0013] Further embodiments and variations are described herein and encompassed within the scope of the claims.

### BRIEF DESCRIPTION OF THE DRAWINGS

[0014] FIG. 1 is a side view of a first exemplary embodiment of the invention.

[0015] FIG. 2 is an angled view of the embodiment of FIG. 1, shown attached to a vacuum cleaner, which is depicted in a partially-reclined usage position.

[0016] FIG. 3 is a side view of the embodiment of FIG. 1, shown attached to a vacuum cleaner, which is depicted in the upright storage position with the handle extended.

[0017] FIG. 4 is a side view of the embodiment of FIG. 1, shown attached to a vacuum cleaner, which is depicted in the upright storage position with the handle collapsed.

[0018] FIG. 5 is a front view of the embodiment of FIG. 1, shown attached to a vacuum cleaner, which is depicted in the upright storage position with the handle collapsed.

[0019] FIG. 6 is a perspective view of a second exemplary embodiment of the invention shown as part of an interchangeable handle set for a vacuum cleaner.

[0020] FIG. 7 is a perspective view of a third exemplary embodiment of the invention shown attached to yet another vacuum cleaner, which is depicted in the upright position.

[0021] FIG. 8 is a perspective view of a fourth exemplary embodiment of the invention shown as the handle of a wand of a canister-type wet extractor.

[0022] FIG. 9 is a perspective view of a fifth exemplary embodiment of the invention shown as a handle of an "electric broom" style vacuum.

[0023] FIG. 10 is a perspective view of a sixth exemplary embodiment of the invention shown as the handle of a hand-held cleaner.

[0024] FIG. 11 is an exploded view of the base assembly of the embodiment of FIGS. 1-5.

[0025] FIG. 12 is an exploded view of the rear housing and cyclone container assemblies of the embodiment of FIGS. 1-5.

[0026] FIG. 13 is a side view of the T-joint assembly of FIGS. 11 and 12.

[0027] FIG. 14 is an isometric view of the filter assembly and dirt cup lid of FIG. 12.

[0028] FIG. 15 is a cross-sectional side view of the handle lock system of the embodiment of FIG. 12, shown in the locked position.

[0029] FIG. 16 is a cross-sectional side view of the handle lock system of the embodiment of FIG. 12, shown in the unlocked position.

[0030] FIG. 17 is a fragmented, partially assembled view of the valve assembly and rear housing of FIG. 12.

[0031] FIG. 18 is an exploded front isometric view of an alternative embodiment of a valve assembly of the present invention.

[0032] FIG. 19 is an exploded rear isometric view of the valve assembly of FIG. 18.

[0033] FIG. 20 is an exploded isometric view of another alternative embodiment of a valve assembly of the present invention.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0034] The present invention provides an improved handle for cleaning devices. The handle generally comprises a grip having multiple gripping positions for handling the device to which the handle is attached. Such a multi-position grip facilitates operating, transporting, storing and otherwise manipulating the device. The handle may be used with any type of cleaning device, such as bag or bagless vacuums, wet extractors, mops, brooms, canister-type cleaners, wet/dry vacuums, accessory tools, and hand-held and other types of portable cleaners. Examples of such devices are shown in

U.S. Pat. Nos. 6,558,453; 6,481,048; 6,311,366; 6,308,374; and 5,933,912, which are incorporated herein by reference.

[0035] A first exemplary embodiment of a handle 100 of the present invention is shown in FIG. 1. The handle 100 generally comprises a grip structure 102 having an opening 104 therethrough. The opening 104 is preferably circular or approximately circular, but also may be somewhat elliptical or ovoid in shape, and is sized to allow a user's digits to pass comfortably therethrough in multiple different holding positions. As shown in FIGS. 1-5, in a preferred embodiment, the grip structure 102 has a circular cross-sectional profile and forms a toroidal shape (that is, the grip structure 102 comprises a shape having a circular cross section that is swept through a circular path to form a donut-like shape). While this circular cross-sectional profile is useful for providing a grip that is easily grasped in a human hand, the grip structure 102 may have other cross-sectional profiles, such as semi-circular, ovoid, elliptical, or partly or wholly rectangular profiles. In addition to having a substantially circular opening 104, the grip structure 102 may also have a substantially circular outer perimeter, as shown in FIG. 1. The grip structure 102 preferably completely surrounds the opening 104, but a small gap (not shown) may be provided so that the opening 104 is not completely surrounded. The grip structure 102 is formed from plastic, metal, wood, or any other useful structural material, and may be integrated directly into a molded body of the device to which it is attached, or may be produced separately.

[0036] The handle also may be provided with a grip surface 106 that extends partially or entirely around the inner side 108 of the grip structure 102. Any suitable grip surface, such as an overmolded rubber or synthetic material, may be used. The grip surface 106 may include finger indentations and other shapes to improve comfort and grip or add cosmetic value. The grip surface provides a region of greater grip for the user's hand. While it is within the scope of the invention to provide the entire grip structure with a region of highly-tactile material, such as rubber, in one embodiment only the inner side 108 of the grip structure 102 has such a material, while the remainder is constructed of material having a less tactile material, such as hard plastic. In another embodiment, the inner side 108 and the outer side are both covered, in part, by a relatively tactile material. This dual-material grip is expected to allow the user's hand to slide somewhat on the handle 100 to assist with changing hand positions and to prevent chafing. The grip surface 106 may also comprise a system of interchangeable grips that can be removed and replaced so that the user can customize the shape, texture, appearance or diameter of the grip. The handle 100 also may have one or more controls (not shown) integrated therein or attached thereto for controlling the operation of the vacuum or other device to which the handle 100 is attached. Such controls may include vacuum motor power switches, brushroll power switches, fluid deposition system controls (in the case of extractors), and so on.

[0037] Referring now to FIGS. 2 through 5, the handle 100 may be attached to any suitable cleaning device. In the exemplary embodiment of FIGS. 2 through 5, the cleaning device 200 comprises a conventional bagless vacuum cleaner having a base, shown as foot 202, adapted to move along a floor, and an upright rear housing, shown as canister portion 204, that is pivotally attached to the foot 202 such that it can be held in an upright storage position (as shown

in FIGS. 3 through 5), or pivoted to lean back to facilitate operation of the device 200 (as shown in FIG. 2). In the shown embodiment, the canister portion 204 includes a removable, cleanable canister 206 for receiving vacuumed dirt and debris, which has a filter 208 through which the cleaning air is conveyed to remove particles therefrom. A vacuum source (not shown) is provided to create a flow of air through the device 200. A brushroll 210 is preferably provided in the foot 202 to agitate the surface being cleaned. In addition, an auxiliary hose 212 and nozzle(s) 214 or other tools may be mounted to the device 200 for storage and use thereof. These and other features of cleaning devices are understood by those of ordinary skill in the art, and any variations thereof may be used with the present invention. For example, the canister portion 204 may be replaced by a conventional bag vacuum dirt collection system or any other type of dirt collection container, rather than being a cyclonic collection chamber as shown.

[0038] Another feature of the embodiment of FIGS. 2 through 5 is the provision of a telescoping handle post 216. The telescoping handle post 216 may have any cross-sectional shape, and may be adjustable between an extended position (FIGS. 2 and 3) and a collapsed position (FIGS. 4 and 5), and optionally to various intermediate positions to accommodate user preferences. Any type of telescoping handle may be used with the invention, such as those shown in U.S. Pat. Nos. 4,968,174; 6,158,089; 6,311,366; and 6,766,559, which are incorporated herein by reference. Of course, any other type of telescoping mechanism could instead be used with the invention, and the telescoping handle post 216 may be replaced by a rigid handle or a folding handle.

[0039] The telescoping handle post 216 may also have a circular cross-section so that it can pivot about its axis. Alternatively, the handle 100 may be attached to the handle post 216 such that it can rotate approximately about the axis of the handle post 216. In these configurations, or other equivalent configurations, it will be seen that the handle 100 can be pivoted relative to the rest of the device 200 about an axis generally aligned with the long axis of the rear housing 204, which provides even greater flexibility and comfort during use. Such a rotating handle may also be lockable in one or more angular orientations. This also allows the handle 100 to be rotated 90 degrees relative to the device 200 so that the handle is parallel with the back surface of the device 200 and the opening 104 faces forward, so that the handle 100 can be used to hang the device 200 on a hook while the back side of the device remain approximately flush against a wall. This configuration may also reduce the amount of floor space required to store the device 200. In still another variation (not shown), the handle 100 may also be pivotable so that it can fold downward and overlie the canister portion 204 somewhat like a halo, to further reduce storage space requirements. The handle 100 and handle post 216 may also be made to be completely removable from the rest of the device 200, which can assist with packing the device 200 into as small a space as possible for cost savings for shipping and boxed storage.

[0040] It will be appreciated that the handle 100 may be gripped from a variety of directions and in a variety of ways, such as by grasping it overhand, underhand, or as a pistol-type grip. This increased flexibility provides ergonomic and technical advantages over known handle configurations. For

example, in typical prior art designs, the handle provides a limited grip area that the user is obliged to hold at a certain angle and in a certain way to operate the device. One problem with this typical prior art design is that the user may not find the handle position to be comfortable in the first instance, particularly if the user is taller or shorter than the size of the user that the handle is meant to accommodate, or has a larger or smaller hand size. Another problem with this typical prior art design is that, even if the user finds the handle to be comfortable initially, during use, fatigue may cause the user to experience discomfort caused by keeping his or her hand in the same position for an extended time, but no alternative positions are available for the operator to grasp the device. Unlike the prior art, the handle of the present invention allows the user to firmly grasp it in multiple different positions and at different angles to provide better initial comfort and the option to change grips during use to a virtually unlimited number of alternative positions to help reduce fatigue.

[0041] The handle 100 of the present invention may also provide the additional advantage that it can be used to easily grasp and lift the device 200 from the front of the device 200 by gripping the forward portion of the handle 218 (FIGS. 3 and 4). This facilitates storing the device 200 with its back against a wall, and is particularly useful when the handle 100 is arranged such that its forward portion 218 is located approximately above the device's center of gravity, so that the device 200 hangs approximately upright when grasped from the front and does not tend to swing into the wall against which it is placed.

[0042] Other variations may also be used with the present invention. For example, the grip structure 102 may include an inner ring that forms the grip surface 106 that can rotate relative to the grip structure 102. In this embodiment, the grip surface 106 may include finger detents or operating controls that can be pivoted to the user's desired location. Furthermore, in another embodiment, all or a portion of the entire grip structure may rotate around the center of the opening 104 so that the user does not have move his or her hand to change his or her angle of grip. In still another embodiment, shown in FIG. 6, the handle 100 may be provided as a kit including an interchangeable conventional handle 600 that both fit on a common device 602. The handle 100 may also be provided as a replacement handle adapted to be attached to existing commercial products.

[0043] Additional embodiments of the invention may be used with other cleaning devices. Non-limiting examples of such devices are shown in FIGS. 7 through 10. FIG. 7 shows an embodiment of the invention as a handle 700 used on another vacuum 702. FIG. 8 shows an embodiment of the invention as a handle 800 used on a canister-type wet extractor 802, in which the handle 800 forms part of the device's wand 804, and may have vacuum and/or fluid passages, valves and operating controls integrated therein. FIG. 9 shows an embodiment of the invention as a handle 900 used on an "electric broom" style vacuum 902 or dust mop. Finally, FIG. 10 shows another embodiment of the invention as a handle 1000 for a hand-held vacuum cleaner 1002.

[0044] While the shown embodiments have all generally depicted a circular, elliptical or ovoid handle, it will be appreciated that the present invention also includes other

multi-position grips. For example, a handle having a somewhat geometrically-shaped (e.g., triangular, squared, pentagonal, etc.) grip structure would also provide some of the benefits of the invention. Such geometric shapes, however, are expected to provide significantly fewer comfortable gripping positions, and therefore are not favored. However, a grip structure having a mostly circular shape with one or more flat portions is also contemplated by the invention. Other variations will also be readily apparent to those of ordinary skill in the art in light of the disclosures provided herein.

[0045] The embodiment of FIGS. 1-5 will now be described in more detail with reference to FIGS. 11 and 12. FIG. 11 is an exploded view of the base assembly, and FIG. 12 is an exploded view of the rear housing and cyclone container assemblies.

[0046] The base assembly 1100 comprises a lower base housing 1102 and an upper base housing 1104 that form "clamshell" halves to hold the other parts of the base assembly 1100. These parts are preferably formed of a plastic material, but may be formed from metal or other materials. The base housings 1102, 1104 also join to form the working air passage therebetween. More specifically, the base housings 1102, 1104 form a brushroll chamber 1106 at a front end thereof, which extends rearward by way of an air passage 1108 to a hollow T-joint 1110. The lower portion of the brushroll chamber 1106 is open to form an inlet nozzle (not visible), as are known in the art. A rubber wiper skirt 1107 may also be provided in a corresponding laterally-extending slot behind the inlet nozzle to help capture dirt that might otherwise escape from the air rushing into the inlet nozzle. The skirt 1107 comprises a notched, flexible rubber strip that extends downward to contact or nearly contact the surface being cleaned.

[0047] As shown in FIG. 11, the upper base housing 1104 has a recessed portion 1103 formed in an upper surface thereof and positioned forward of the rear housing pivot axis. This recessed portion 1103 receives (with or without actual contact) a lower portion of the rear housing 1200 (FIG. 12), as shown in FIGS. 3-5, which makes the device more compact vertically. The use of this recessed portion 1103 also prevents cords and other objects from being caught between the rear housing 1200 and the base assembly 1100 when the device is in the upright position. These benefits are obtained without having to locate a substantial portion of the lower portion of the rear housing in a large opening between the rear housing pivot points in the base housing, as is typically done in the prior art and in the embodiments of FIGS. 6 and 7. The upper base housing 1104 also has a notched portion 1105 at its back. The notched portion 1105 acts as an opening to allow the T-joint 1110, described later herein, to rise to an upright position. The use of this construction allows the pivot axis of the T-joint 1110 to remain within the profile of the base assembly 1100, thereby making a more compact device.

[0048] A portion of the lower base housing 1102 is open to provide access to the air passage 1108 from the exterior of the base assembly 1100. This access port 1111 is covered by a removable cover 1112. Should the air passage 1108 become obstructed, an operator can remove the cover 1112 to clean out the obstruction. The cover can be held in place by tabs 1113 that fit over a corresponding lip 1114 in the

access port, and a resilient tab 1115 that fits into a corresponding notch 1116, but other user-removable constructions may be used. The cover 1112 is also preferably made from a transparent material, such as ABS plastic, to allow a user to visually check for obstructions.

[0049] A brushroll 1117 is located in the brushroll chamber 1106, and held in place between the base housings 1102, 1104 by bearing mounts 1118. The bearing mounts 1118 fit into slots 1119 in the lower base housing 1102 to hold them in place, and rotatably hold each end of the brushroll 1117. The bearing mounts 1118 may include typical roller or ball bearing sets to hold the brushroll axle 1124, but more preferably comprise plastic outer casings into which are pressed brass bushings 1142. The inner surfaces of the brass bushings 1142 are cylindrical to receive the brushroll axle 1124, but the outer surfaces of the brass bushings 1142 are spherical so that they can pivot within the plastic casings of the bearing mounts 1118. The use of such bushings accommodates for manufacturing tolerance variations in the straightness of the brushroll 1117 or brushroll axle 1124, or in the alignment of the bearing mount slots 1119, that would otherwise result in premature wear on the bearing mounts 1118. This design also allows some brushroll 1117 flex without the bearings binding.

[0050] The brushroll 1117 has a corresponding drive pulley 1120. In the shown embodiment, the drive pulley comprises a toothed pulley 1121 having a hexagonal protrusion 1122 extending axially therefrom. The hexagonal protrusion slidably fits within a corresponding hexagonal opening 1123 in the end of the brushroll 1117, and the drive pulley 1120 is captured in place when the bearing mounts are attached to the brushroll's axle 1124. One or more screws (not shown) may also be used to affix the drive pulley 1120 to the brushroll 1117. The brushroll includes two helical rows of bristles 1125. The helices reverse direction at or near the center of the air passage 1108, which is offset from the centerline of the base assembly 1100, to help direct debris towards the air passage. The brushroll 1117 is sealed at each end by a pair of wool felt seals 1126, which are fitted into corresponding slots 1127 in the upper and lower base housings 1102, 1104. These seals 1126 help seal the brushroll chamber 1106 from air communication with other interior regions of the base assembly 1100.

[0051] The base assembly 1100 also includes a pair of rear wheels 1128 and wheel hubs 1129. The wheels 1128 fit over corresponding stub axles 1130 that protrude laterally from opposite rear sides of the lower base housing 1102. Clips 1131 on the stub axles 1130 snap over a corresponding lip 1157 of each wheel 1128 to hold the wheels 1128 on. A second set of clips 1132, located within a recessed hub portion of each wheel 1128, snap over corresponding lips 1133 on each wheel hub 1129 to hold them in place. The base assembly 1100 also has a pair of front wheels 1134, which are each provided with an axle 1135 that passes through the corresponding wheel and extends from both sides thereof. The front wheels 1134 and axles 1135 are held in the lower base housing 1102 by snapping the protruding ends of the axles 1135 into corresponding slots (not visible) in the lower surface of a front portion of the lower base housing 1102, as is known in the art.

[0052] A brushroll motor 1136 is mounted in a motor chamber 1137 located behind the brushroll chamber 1106.

The brushroll motor **1136** is mounted by way of a metal motor mounting plate **1138**, which fits into a corresponding slot **1139**, to more rigidly locate the drive end of the brushroll motor and prevent it from shifting during use and to minimize misalignment that may occur as a result of plastic deformation of the base housings **1102**, **1104**. The brushroll motor includes a toothed drive pinion **1140**, which drives the brushroll drive pulley **1120** by way of a belt **1141**. Of course, non-toothed drive pulleys and/or belts may be used instead, or the belt drive arrangement may be replaced by any other suitable drive system, such as a gear drive system. Heat generated by the brushroll motor **1136** is dissipated through one or more vents **1156** through the lower and/or upper base housing **1102**, **1104**. Although the base assembly **1100** is described herein as having a brushroll and motor, it will be appreciated that these parts may be omitted to provide a more economical or lighter device.

[0053] The brushroll motor **1136** receives power from a main power cord or batteries (not shown) by way of electrical contacts **1143**. The electrical contacts **1143** are mounted to the T-joint **1110** under a cover **1146**. As described below, these contacts **1143** connect with corresponding electrical contacts **1251** (FIG. 12) in the rear housing **1200** (FIG. 12) when the T-joint **1110** is attached thereto. One electrical contact **1143** is connected directly to the motor **1136**, but the other is connected to the motor **1136** by way of a reset switch **1144**. The reset switch **1144** includes a breaker that protects the motor **1136** by cutting off the electrical supply if it stops turning or experiences an overcurrent condition, such as may happen if the brushroll **1117** becomes obstructed. The reset switch **1144** is mounted in a corresponding slot having a hole **1145** to the exterior of the base assembly **1100**, so that when it is tripped, a user can reset it by pressing the reset switch **1144**.

[0054] The T-joint **1110** is pivotally mounted between the lower and upper base housings **1102**, **1104**. To this end, the T-joint has a lower portion **1147** formed by a cylindrical shape turned with its axis generally parallel to the floor and perpendicular to a fore-aft direction of the device (preferably parallel to the brushroll **1117**). This lower cylindrical portion **1147** has a lip **1148** at or near each end. These lips **1148** fit into corresponding slots **1149** in the base housings **1102**, **1104** to capture the T-joint **1110** in place but still allow relative pivotal movement between the T-joint **1110** and the rest of the base assembly **1100**. Of course, other pivotal arrangements may be used instead. The lower base housing **1102** is also provided with a T-joint lock **1155**, which is a separate plate-like part having a leaf-spring like cantilevered extension **1306** (FIG. 13) with a protrusion **1308** (FIG. 13) on it. The protrusion **1308** engages with a corresponding protrusion **1310** (FIG. 13) on the T-joint **1110** to retain the T-joint **1110** (and the rest of the rear housing assembly **1200**) in the upright position. To lean the rear housing back, the user pulls backward on the rear housing, which forces the protrusions **1308**, **1310** against one another and causes the cantilevered extension **1306** to flex away from the T-joint **1110** until the protrusions **1308**, **1310** are disengaged from one another. The T-joint lock **1155** is attached to the lower base housing **1102** by screws or other fasteners, or is simply integrally formed with the lower base housing **1102**.

[0055] The T-joint **1100** has a hollow passage there-through, and receives the working air flow passing through air passage **1108**, and conveys it to an opening through the

upper end **1150** of the T-joint **1100**, as shown by broken arrow A. The side of the lower T-joint portion **1147** opposite the air passage **1108** is closed off to prevent air from passing therethrough.

[0056] The T-joint **1100** is also provided with a push lock **1152**, which is riveted or otherwise affixed to an inner surface of the hollow passage through the T-joint **1110**. The push lock **1152** comprises a leaf spring **1154** to which a button **1153** is attached. When installed, the button **1153** protrudes through a hole in the T-joint **1110**, and extends outward past the side wall of the T-joint **1110** by some distance. The button **1153** can be pushed back so that it is flush or nearly flush with the side wall of the T-joint **1110**, but returns to its extended position under the influence of the leaf spring **1154**. The use of these parts and the attachment of the T-joint **1110** to the remainder of the vacuum is shown in FIG. 13.

[0057] Referring, for the moment, to FIG. 13, the T-joint **1110** shaped to fit within a corresponding passage **1241** in the lower portion of the rear housing assembly **1200** by sliding it therein. This passage **1241** forms a portion of the working air flow path. To attach the T-joint **1110**, the button **1153** must be depressed, which can be done either manually or by engagement with a ramp surface **1302**. When the T-joint **1110** is fully installed, the button is aligned with a hole **1304** in the rear housing assembly **1200** and snaps back outward under the force of the leaf spring **1154**. Furthermore, as the T-joint **1110** is being inserted, the electrical contacts **1143** are brought into contact with their corresponding contacts **1251** (FIG. 12) in the rear housing **1200**. This or other types of detachable or non-detachable attachment may be used with the present invention.

[0058] Referring now to FIG. 12, the rear housing assembly **1200** and cyclone container assembly **1202** are now described in more detail. The rear housing assembly **1200** comprises a first rear housing shell **1203**, a second rear housing shell **1204**, and a motor cover **1205**. The housing shells **1203**, **1204** and motor cover **1205** are assembled together to hold or contain the remaining parts of the rear housing assembly **1200**, similar to the manner in which the upper and lower base housings **1102**, **1104** are joined together to construct the base assembly **1100**. As with the base assembly **1100**, and the various other parts of the device, any types of fasteners or adhesives can be used to assemble these parts. For example, screws or snap fittings can be used for virtually all of the assembly requirements for the device, as will be appreciated by those of ordinary skill in the art.

[0059] The first rear housing shell **1203** and motor cover **1205** form a motor chamber **1206** when they are installed together. The motor chamber **1206** contains a fan/motor **1207**, which is an electric motor having an air-moving impeller (fan) attached to and driven by the motor. Such devices are well-known in the art, and any suitable fan and motor may be used. The fan and motor may also be provided as separate devices, rather than being conjoined as an assembled unit. The fan/motor **1207** is preferably installed with the fan inlet **1208** directed upwards. In order to isolate vibrations created by the fan/motor **1207**, the lower end of the fan/motor **1207** is inserted into a rubber or elastomeric bushing **1209**, which is installed in a corresponding bushing slot **1210** in the first rear housing shell **1203** and held in

place with a bracket 1211. The upper end of the fan/motor 1207 is surrounded by a rubber or elastomeric ring seal 1212, which abuts a corresponding lip 1213 in the first rear housing shell 1203 and motor cover 1205 to provide an air-tight fit.

[0060] Air exhausting from the fan/motor 1207 exits the motor chamber 1206 through vents 1214, which may be located on the motor cover 1205 or the first rear housing shell 1203. A post-motor filter 1215 may also be provided between the fan/motor 1207 and the vents 1214 to reduce emissions from the device or to simply screen the fan/motor 1207 from view. The fan/motor 1207 may also be partially or wholly wrapped in a foam sound and/or vibration reducing material. The motor cover 1205 is also optionally provided with a handle 1216, which can be used to help lift the device. In the embodiment of FIG. 12, the handle 1216 is shaped to generally conform with the shape of the vents 1214. A headlight (not shown) may also be located on the motor cover 1205 (or on the base assembly 1100, or elsewhere). The motor cover 1205 also includes a fan inlet opening 1217 that provides a fluid communication path to the fan inlet 1208. A foam, rubber, or other type of seal 1218 is provided to fit around the fan inlet opening 1217 to seal against the bottom of the removable cyclone container assembly 1202. The seal 1218 may be attached to the opening 1217 or the cyclone assembly 1202, or provided separately.

[0061] The cyclone container assembly 1202 generally comprises a dirt cup 1219, a filter assembly 1220, and a lid 1222. The dirt cup 1219 has an inlet passage 1223 for receiving a dirt-laden working air flow, and an outlet passage 1224 for fluidly connecting to the fan inlet 1208 to receive the vacuum generated by the fan/motor 1207. The inlet and outlet passages 1223, 1224 may be integrally formed with the dirt cup 1219, as shown in U.S. Pat. Nos. 5,779,745 and 5,935,279, which are incorporated herein by reference, or formed separately and joined thereto.

[0062] The filter assembly 1220 is positioned within the dirt cup 1219 to help remove dirt, dust and other particles from the working air flow. In the shown embodiment, the filter assembly 1220 comprises a pleated filter element 1221 that is affixed between an upper cap 1225 and a lower cap 1226 by any conventional filter manufacturing method. The upper cap 1225 has a vane 1227 that prevents air entering the dirt cup 1219 through the inlet passage 1223 from directly striking the filter element 1221, and may also contribute to generating a cyclonic airflow within the dirt cup 1219. The lower cap 1226 has an upwardly-extending cage 1228 that prevents the filter element 1221 from collapsing inward, and has an opening through it to allow air passing through the filter element 1221 to pass into the outlet passage 1224. A seal 1229 is provided at the bottom of the lower cap 1226 to seal the filter assembly 1220 against the outlet passage 1224. The filter assembly 1220 can be held in place in any suitable manner. In a preferred embodiment, shown in FIG. 14, the filter assembly 1220 is held in place by a resilient, releasable locking tab 1402 on one side, an a locator tab 1404 on the other side. (The seal 1229 is omitted from FIG. 14.) The filter assembly 1220 may instead be attached to dirt cup lid 1222 by a screw, by a bayonet-type fitting, by a friction fit or by other means.

[0063] The lid 1222 is attached to the top of the dirt cup 1219 by a conventional bayonet fitting. One slot 1230 of the

bayonet fitting is visible in FIG. 12, and a pin 1406 that fits into the slot 1230 is shown in FIG. 14. The lid 1222 is preferably made so that it only fits on the dirt cup 1219 in one orientation, so that the filter vane 1227 is properly oriented relative to the dirt cup inlet passage 1223.

[0064] The dirt cup 1219 is preferably adapted to generate a cyclonic airflow to assist with separating dirt from the working air flow. One way of doing this is to use a filter vane 1227 that redirects the air entering the cup through the inlet passage 1223 in a tangential manner. Alternatively, or in addition, the inlet passage 1223 may be shaped to impart a tangential component to the entering air. Of course, other devices and methods of imparting cyclonic flow may be used instead. It is also envisioned that the cyclonic dirt cup 1219 can be replaced by a conventional bag filter. It will also be appreciated that, while the present invention shows a "clean air" system in which the dirt-laden air flow is cleaned before it enters the fan/motor 1207, it can instead be replaced by a system in which the dirt-laden air flow enters the fan/motor 1207 and is then pressurized and pushed into the dirt receptacle.

[0065] In use, the filter assembly 1220 and lid 1222 are assembled to the dirt cup 1219 to form the cyclone container assembly 1202. The container assembly 1202 is removably positioned in the device so that it rests on the motor cover 1205 with the dirt cup outlet passage 1224 positioned adjacent the fan inlet opening 1217, and the seal 1218 providing a fluid tight airflow passage therebetween. The dirt cup inlet passage 1223 nests within a recess 1231 formed in an upright portion 1232 of the first rear housing shell 1203 that extends above the motor chamber 1206. The upright portion 1232 also includes a dirt cup latch 1233, which is mounted in the upright portion 1232 such that it can be moved downward and biased upward by an associated spring 1234. The dirt cup latch 1233 includes a hook 1235 that protrudes through an opening 1236 through the upright portion 1232 of the first rear housing shell 1203. This hook engages a corresponding protrusion or recess (not shown) in the dirt cup 1219 or lid 1222 to hold the container assembly 1202 in place. The container assembly is released by depressing the dirt cup latch 1233.

[0066] The second rear housing shell 1204 is affixed to the back of the first rear housing shell 1203 by way of screws or other fastening devices. The first and second rear housing shells 1203, 1204 contain a valve assembly 1237 and a handle assembly 1238.

[0067] The valve assembly 1237 is located at the bottom end of the rear housing 1200, and provides a working air flow path between the base assembly 1100 and the dirt cup inlet passage 1223. The valve assembly 1237 comprises a rear valve housing 1239 and a front valve housing 1240 that are assembled together to form a base assembly inlet 1241, an auxiliary inlet 1242 and a valve outlet 1243. These parts are shown in a partially assembled rear view in FIG. 17. The upper end 1150 of the T-joint 1110 is installed directly into the base assembly inlet 1241 of the valve assembly 1237, or to an intermediate tube or hose, to join the base assembly 1100 to the rear housing 1200, as shown somewhat schematically in FIG. 13. The rear valve housing 1239 also includes a mounting point 1250 that holds electrical contacts 1251 that contact the electrical contacts 1143 in the base housing 1100, when the parts are assembled, to power the brushroll motor 1136.

[0068] The valve housings 1239, 1240 form a valve chamber 1244 in which a barrel valve 1245 is located such that it can rotate about its cylindrical axis. In a first position, shown in FIG. 12, the barrel valve 1245 provides a fluid communication path between the base assembly inlet 1241 and the valve outlet 1243. When rotated approximately 90 degrees (clockwise in FIG. 12, and counterclockwise in FIG. 17), the barrel valve 1245 provides a fluid communication path between the auxiliary inlet 1242 and the valve outlet 1243, as shown in FIG. 17.

[0069] An accessory hose 212 (FIG. 2) is attached to the auxiliary inlet 1242 by an appropriate cuff 1246, which may be removable by a user to facilitate cleaning of the accessory hose 212 and the valve assembly 1237. The second rear housing shell 1204 has a recess 1247 that receives the valve assembly 1237, and a valve control knob 1248 is located outside the second rear housing shell 1204 and attached to the barrel valve 1245 to operate it. When assembled, the valve outlet 1243 is positioned at the bottom of the recess 1231 in the upright portion 1232 of the first rear housing shell 1203 such that it is adjacent the dirt cup inlet passage 1223 when the dirt cup 1219 is installed. A foam seal 1249 is attached to the valve outlet 1243 to help provide an air-tight working air passage between the dirt cup inlet passage 1223 and the valve outlet 1243.

[0070] A pair of electrical cord mounting hooks 1252, 1253 are also attached to the second rear housing shell 1204. The upper cord hook 1252 comprises a conventional cord reel hook having a fixed base 1254 and a rotatable hook portion 1255 that can be turned 180 degrees to quickly release a power cord (not shown) wound thereon. The fixed base 1254 is attached to an upper mounting point 1256 located near an upper end of the second rear housing shell 1204. The lower cord hook 1253 comprises a downwardly-projecting hook portion 1257 and an upwardly-projecting tool holder 1258 that is adapted insert into the bore of an optional accessory cleaning tool 1259 and thereby hold the tool 1259 in place for storage on the device. The lower cord hook 1253 is rigidly mounted to a lower mounting point 1260 located near the lower end of the second rear housing shell 1204. The power cord enters through a hole 1265 in the second rear housing shell 1204, and connects with a main power switch 1266 to provide electricity to the device. In a preferred embodiment, the main power switch 1266 comprises a three-position rocker switch having a first position in which the device is not operating, a second position in which only the fan/motor 1207 is operating, and a third position in which the fan/motor 1207 and the brushroll motor 1136 are operating.

[0071] A loop-like handle 1261 is attached to the upper end of the rear housing 1200. The handle 1261 has a curved contour that provides an ergonomic handgrip on its bottom surface and a cupped surface on its top side. The cupped surface provides the added benefit of acting as a hose retainer to hold the accessory hose 212 (FIG. 2) in place when it is not in use. The handle 1261 is attached to the rear housing 1200 by pushing its lower ends downward through two openings (not shown) in the rear housing 1200 until slots 1262 on each end of the loop engage corresponding tabs 1263, which are rigidly mounted below the slots in the rear housing 1200 at corresponding mounting points 1264 on the second rear housing shell 1204. The tabs 1263 are not accessible unless the first and second rear housing shells

1203, 1204 are disassembled. Using this construction, the handle 1261 may be provided disassembled from the rear housing 1200 to minimize the size of the container required to ship the device, but can not be accidentally disassembled in regular use.

[0072] The handle assembly 1238 is also housed within the first and second rear housing shells 1203, 1204, and generally fits within a handle recess 1267 in the second rear housing shell 1204. The handle assembly 1238 comprises a handle support bushing 1268 into which a handle post 1269 slidably fits. The handle support bushing is mounted in the second rear housing shell near the top of the handle recess 1267. Attached to the top end of the handle post 1269 are a grip adaptor 1270 and a grip 1271. The grip adaptor 1270 is preferably riveted or bonded to the handle post 1269, but may be releasably attached thereto. The grip 1271, which is shaped as described previously herein, is preferably formed of two halves, as shown, that are attached to one another by screws, snap engagement, or other fasteners. The grip 1271 and grip adaptor 1270 may be attached, either permanently or removably, by any type of fastening method. For example, these parts may be detachably engaged by a pushbutton release, such as described with respect to the attachment between the base assembly 1100 and the rear housing 1200, and shown in FIG. 13.

[0073] The handle post 1269 is provided with a pair of pins 1272 that, when assembled, protrude out of corresponding holes 1273 on either side of the handle post 1269 (only one hole 1273 is visible). Each pin 1272 comprises a pin attached to a semi-circular leaf spring that fits within the bore of the handle post 1269. The leaf spring biases the pin 1272 out through the respective hole 1273, but allows it to be pushed back so that it is flush or nearly flush with the outer surface of the handle post 1269 to allow the handle post 1269 to be inserted into the handle support bushing 1268. When the first and second rear housing shells 1203, 1204 are assembled, they form a pair of channels 1274 on either side of the handle recess 1267 (only one half of one channel 1274 is visible). The pins 1272 protrude into these channels and thereby prevent the handle post 1269 from rotating about its axis. In other embodiments, the handle post 1269 may be made to rotate about its axis, either freely or only when desired. Alternatively, the handle post 1269 and handle support bushing 1268 may be made with corresponding non-circular profiles that do not allow relative rotation when the handle post 1269 is inserted in the handle support bushing 1268.

[0074] In a preferred embodiment, the handle post 1269 is a telescoping post that may be moved from a collapsed position to an extended position, and optionally to various intermediate positions. A preferred telescoping lock arrangement is shown in FIGS. 12, 15 and 16. In this embodiment, the device includes a handle lock 1275 that is located in the second rear housing shell 1204 adjacent the handle support bushing 1268. The handle lock 1275 has a lever portion 1502 (FIGS. 15 & 16) that is integrally formed with a slider 1504. The slider 1504 is slidably captured between the second rear housing shell 1204 and the handle support bushing 1268, and has two recessed portions 1506 that face the handle support bushing 1268. The lever 1502 protrudes to be accessible from the exterior of the device through an opening 1278. The handle support bushing 1268 has two slots 1510 that are sized to receive a pair of pins 1276 aligned



perpendicular to the axis of the handle posts **1269**. A spring **1277** is provided to press against the bottom of the slider **1504** portion of the handle lock **1275** and bias it upwards.

[0075] As shown in FIGS. **15** and **16**, the handle post **1269** has a number of detents **1512**, which are spaced from one another by the same distance as the distances between the pins **1276** and slots **1510**. When the handle lock **1275** is in the upward position under the bias of the spring **1277**, as shown in FIG. **15**, the slider **1504** presses the pins into the slots **1510**, and into the detents **1512** on the handle post **1269**. In this position, the handle post **1269** is prevented from moving upwards or downwards by the engagement between the pins **1276**, slots **1510** and detents **1512**. When the handle lock **1275** is pushed downward by pushing on the lever **1502**, however, the recessed portions **1506** of the slider **1504** align with the slots **1510**, thus allowing the pins **1276** to move out of the detents **1512**. In this position, the handle post **1269** can now be moved telescopically relative to the rest of the rear housing assembly **1200**. The spring **1277** returns the handle lock **1275** to the upper, locked position when the lever **1502** is released.

[0076] While the foregoing telescoping lock mechanism is preferred, other devices may be used instead. Examples of other telescoping devices that may be used with the present invention are shown in U.S. Pat. Nos. 5,332,266; 5,941,575; and 6,474,696, which are incorporated herein by reference.

[0077] Referring now to FIGS. **18** and **19**, a first alternative embodiment of a valve assembly **1800** is shown removed from the device. In this embodiment, the valve assembly **1800** comprises an inlet tube set **1802**, a switch plate **1804**, a switch **1806**, and an outlet tube **1808**. The inlet tube set **1802** has a base assembly inlet tube **1810**, which is fluidly attached to a base assembly (not shown) and its corresponding suction inlet nozzle. The inlet tube set **1802** also has an auxiliary inlet tube **1812** that is fluidly connected to a corresponding auxiliary cleaning hose.

[0078] The switch plate **1804** is attached to or positioned immediately above the inlet tube set **1802** when they are assembled. The switch plate **1804** comprises a plate **1814** or block having a hole **1816** formed therein. The hole **1816** is shaped and sized to fit over and provide fluid communication to both the base assembly inlet tube **1810** and the auxiliary inlet tube **1812**. Alternatively, two separate holes may be formed, with one hole corresponding to each of the inlet tubes **1810**, **1812**. When assembled, the hole **1816** or holes are positioned adjacent the inlet tube set **1802**, and may be provided with a seal (not shown) to help prevent air leaks between the plate **1814** and the inlet tube set **1802**.

[0079] The switch plate **1804** also has a recessed track **1818** formed therein to receive a corresponding flow diverter **1820** on the switch **1806**. The flow diverter **1820** comprises a plate-like structure that fits within the track **1818** such that it can be slid into a first position to block the auxiliary inlet tube **1812**, and a second position to block the base assembly inlet tube **1810**. These positions correspond to the floor cleaning and auxiliary cleaning positions, respectively. The switch plate **1804**, switch **1806** and/or the vacuum housing in which the parts are contained may also include detents or other movement inhibitors to firmly hold the switch **1806** in each of the two positions to prevent the switch **1806** from sliding out of place when it is not desired to change the

cleaning mode. A switch handle **1822** (FIG. **19**) is provided on the switch **1806** and accessible to a user from outside the vacuum body.

[0080] The outlet tube **1808** is positioned immediately above the flow diverter **1820**. The lower portion **1824** of the outlet tube **1808** is adapted to fit against the top of the switch plate **1804** and provide a fluid-tight fit to prevent vacuum leaks at this junction. A seal (not shown) may be provided to help seal the parts together, or a seal may be provided by simply abutting the parts. The outlet tube **1808** comprises a relatively large bell mouth **1826** that is shaped to cover both the base assembly inlet tube **1810** and the auxiliary inlet tube **1812**, and thus can receive the working air from either of the inlet tubes **1810**, **1812**, depending on which is exposed by the flow diverter **1820**. The outlet tube **1808** narrows to a smaller diameter portion **1828** above the bell mouth **1826**, which is fluidly connected to the dirt receptacle (not shown).

[0081] Referring now to FIG. **20**, still another embodiment of a valve assembly **2000** that may be used with the present invention is shown. In this embodiment, the valve assembly **2000** comprises a base assembly inlet tube **2002** that is connected or connectable to a base assembly (not shown) and its corresponding suction nozzle, a switch member **2004**, and an outlet tube **2006** that is connected to the device's dirt receptacle (not shown). The inlet tube **2002** and outlet tube **2006** are mounted in a spaced-apart relationship, such as shown, and the switch member **2004** is adapted to slide on one or more tracks **2008** located between the tubes **2002**, **2006**. Like the switch plate **1804** described above with reference to FIGS. **18** and **19**, the tracks **2008** are adjacent the respective tubes **2002**, **2006** to provide a tight seal, and may be integrally formed therewith.

[0082] The switch member **2004** comprises a block-like structure having a first passage **2010** that extends entirely through the switch member **2004** in the vertical direction (note that the use of directional indications is used solely for clarity of explanation, and it will be appreciated that the device can be reoriented in any direction). A second passage **2012**, located next to the first passage **2010**, extends vertically through the top of the switch member **2004**, but turns laterally through a side opening **2014** through the end of the switch member **2004**. The bottom of the second passage **2012** is blocked. An auxiliary hose **2016** (or auxiliary hose mounting cuff) is attached to switch member **2004** to communicate with the side opening **2014**.

[0083] When assembled, the switch member **2004** slides on the tracks **2008** between the inlet and outlet tubes **2002**, **2006** and is provided with a switch handle **2018** that can be actuated by a user. The switch member **2004** can be placed in a first position in which the first passage **2010** is located to provide a fluid communication path between the tubes **2002**, **2006**, thereby placing the device in the floor cleaning mode of operation. The switch member **2004** can also be slid into a second position in which the second passage **2012** is located below, and in fluid communication with, the outlet tube **2006**, to thereby place the device in the auxiliary cleaning mode. Like the switch assemblies described with reference to FIGS. **12** and **18**, the switch member **2004** may be provided with detents or other travel inhibitors to help hold it in the two positions and prevent accidental movement. To prevent the user from pulling the switch member **2004** out of position by pulling on the auxiliary hose **2016**,

the auxiliary hose **2016** may be firmly attached to a portion of the housing at some point between the switch member **2004** and the working end, or a separate intermediate hose or telescoping tube can be provided between the switch member **2004** and the device's housing to isolate the switch member **2004** from the auxiliary hose. The switch member **2004** and/or tracks **2008** may also be constructed such that a user can easily slide the entire switch member out of the device housing to facilitate cleaning and removal of obstructions.

[0084] While the embodiments of the invention described above are preferred, it will be recognized and understood that these embodiments are not intended to limit the invention, which is limited only by the appended claims. Various modifications may be made to these embodiments without departing from the spirit of the invention and the scope of the claims.

**1-24.** (canceled)

**25.** A vacuum cleaner comprising:

a base having an inlet nozzle, the base being adapted for movement on a surface to be cleaned;

a rear housing pivotally attached at a first end of the rear housing to the base;

a directing handle attached to a second end of the rear housing, the directing handle having a grip structure adapted to receive a hand of a user for use in directing the vacuum cleaner;

a carrying handle attached to the second end of the rear housing, the carrying handle comprising an open loop shape adapted to store a vacuum hose on an upper surface thereof and receive a hand of a user for use in carrying the vacuum cleaner;

a dirt collection container located on one of the base and the rear housing; and

a vacuum source located in one of the base and the rear housing, the vacuum source being adapted to convey dirt-laden air from the inlet nozzle to the dirt collection container.

**26.** The vacuum cleaner of claim 25, wherein the directing handle further comprises a telescoping handle post joining the rear housing to the grip structure, the telescoping handle post being telescopically affixed to the rear housing and adapted to be adjustable between at least a collapsed position and an extended position.

**27.** The vacuum cleaner of claim 25, wherein the dirt collection container comprises a vacuum bag or a dirt cup.

**28.** The vacuum cleaner of claim 25, wherein the dirt collection container comprises:

a dirt cup having an open top, the dirt cup being adapted to receive and store dirt collected from the surface to be cleaned; and

a lid adapted to be attached to the open top of the dirt cup to close the dirt cup;

wherein the cyclone container assembly is adapted to generate a cyclonic airflow to assist with separating dirt from the dirt-laden air.

**29.** The vacuum cleaner of claim 28, wherein the dirt collection container is adapted to be attached to and removed from the rear housing without removing the lid from the dirt cup.

**30.** The vacuum cleaner of claim 28, further comprising a filter adapted to be positioned in the dirt cup to assist with removing dirt from the dirt-laden air.

**31.** The vacuum cleaner of claim 30, wherein the filter is removably attached to the lid.

**32.** The vacuum cleaner of claim 31, wherein the filter comprises a filter vane **1227** adapted to at least partially direct the dirt-laden air in a cyclonic pattern within the dirt cup.

**33.** The vacuum cleaner of claim 30, wherein the dirt collection container comprises an inlet passage in fluid communication with the inlet nozzle, the inlet passage comprising an opening in a side of the dirt cup.

**34.** The vacuum cleaner of claim 33, wherein the inlet passage is adapted to direct the dirt-laden air into the dirt cup in a tangential manner.

**35.** The vacuum cleaner of claim 33, wherein the dirt collection container comprises an outlet passage positioned below the inlet passage.

**36.** The vacuum cleaner of claim 35, further comprising a filter adapted to be positioned in the dirt cup and forming a permeable barrier between the inlet passage and the outlet passage to assist with removing dirt from the dirt-laden air.

**37.** The vacuum cleaner of claim 36, wherein the outlet passage comprises a conduit extending into the dirt cup, and the filter is adapted to be positioned on an end of the conduit.

**38.** The vacuum cleaner of claim 25, wherein the vacuum source is located in the rear housing and positioned generally below the dirt collection chamber when the rear housing is pivoted to an upright position relative to the base.

**39.** The vacuum cleaner of claim 25, wherein the carrying handle extends laterally across the rear housing.

**40.** The vacuum cleaner of claim 25, wherein the dirt collection chamber is selectively attachable to the rear housing and the carrying handle is positioned generally above the dirt collection container when the rear housing is pivoted to an upright position relative to the base and the dirt collection chamber is attached to the rear housing.

**41.** The vacuum cleaner of claim 25, wherein the dirt collection chamber is selectively attachable to the rear housing and the carrying handle is attached to the rear housing separately from the dirt collection chamber such that the carrying handle remains on the rear housing when the dirt collection chamber is removed from the rear housing.

**42.** The vacuum cleaner of claim 25, wherein the carrying handle is positioned in front of the directing handle.

**43.** A vacuum cleaner comprising:

a base having an inlet nozzle, the base being adapted for movement on a surface to be cleaned;

a rear housing pivotally attached at a first end of the rear housing to the base;

a directing handle telescopically attached to a second end of the rear housing and adapted to be adjustable between at least a collapsed position and an extended position, the directing handle having a grip structure adapted to receive a hand of a user for use in directing the vacuum cleaner;

a carrying handle attached to the second end of the rear housing, the carrying handle being positioned in front of the directing handle and comprising an open loop shape extending laterally from one side of the rear housing to an opposite side of the rear housing;

a dirt collection container located on one of the base and the rear housing; and

a vacuum source located in one of the base and the rear housing, the vacuum source being adapted to convey dirt-laden air from the inlet nozzle to the dirt collection container.

**44.** The vacuum cleaner of claim 43, wherein the carrying handle is adapted to store a vacuum hose on an upper surface thereof.

**45.** The vacuum cleaner of claim 43, wherein the dirt collection container comprises:

a dirt cup having an open top, the dirt cup being adapted to receive and store dirt collected from the surface to be cleaned; and

a lid adapted to be attached to the open top of the dirt cup to close the dirt cup;

wherein the cyclone container assembly is adapted to generate a cyclonic airflow to assist with separating dirt from the dirt-laden air.

**46.** A vacuum cleaner comprising:

a base having an inlet nozzle, the base being adapted for movement on a surface to be cleaned;

a rear housing pivotally attached at a first end of the rear housing to the base;

a directing handle attached to a second end of the rear housing, the directing handle having a grip structure adapted to receive a hand of a user for use in directing the vacuum cleaner;

a carrying handle attached to the second end of the rear housing, the carrying handle being positioned in front of the directing handle and comprising an open loop shape;

a dirt collection container selectively attachable to the rear housing; and

a vacuum source located in one of the base and the rear housing, the vacuum source being adapted to convey dirt-laden air from the inlet nozzle to the dirt collection container;

wherein the carrying handle is attached to the rear housing separately from the dirt collection chamber such that the carrying handle remains on the rear housing when the dirt collection chamber is removed from the rear housing.

**47.** The vacuum cleaner of claim 46, wherein the carrying handle is adapted to store a vacuum hose on an upper surface thereof.

**48.** The vacuum cleaner of claim 46, wherein the dirt collection container comprises:

a dirt cup having an open top, the dirt cup being adapted to receive and store dirt collected from the surface to be cleaned; and

a lid adapted to be attached to the open top of the dirt cup to close the dirt cup;

wherein the cyclone container assembly is adapted to generate a cyclonic airflow to assist with separating dirt from the dirt-laden air.

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