ABSTRACT

A hand vacuum cleaner has an air flow path extending from a dirty air inlet to a clean air outlet and a suction motor positioned in the air flow path. A cyclone chamber positioned in the air flow path has a cyclone air inlet and a cyclone air outlet. At least one energy storage member is positioned in an energy storage chamber having an energy storage chamber wall. The cyclone air outlet faces the energy storage chamber wall whereby air exiting the cyclone chamber impinges on the energy storage chamber wall.

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Title of Invention	HANDHELD SURFACE CLEANING APPARATUS

As the below named inventor, I hereby declare that:

This declaration is directed to:

- [■] The attached application, or
- [ ] United States application or PCT international application number _____

filed on _____.

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

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

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HANDHELD SURFACE CLEANING APPARATUS

INVENTOR: WAYNE ERNEST CONRAD

FIELD

[0001] This disclosure relates generally to surface cleaning apparatus. In a preferred embodiment, the surface cleaning apparatus comprises a portable surface cleaning apparatus, such as a hand vacuum cleaner.

INTRODUCTION

[0002] The following is not an admission that anything discussed below is part of the prior art or part of the common general knowledge of a person skilled in the art.

[0003] Various types of surface cleaning apparatus are known, including upright surface cleaning apparatus, canister surface cleaning apparatus, stick surface cleaning apparatus, central vacuum systems, and hand carriable surface cleaning apparatus such as hand vacuums. Further, various designs for cyclonic hand vacuum cleaners, including battery operated cyclonic hand vacuum cleaners, are known in the art.

SUMMARY

[0004] The following introduction is provided to introduce the reader to the more detailed discussion to follow. The introduction is not intended to limit or define any claimed or as yet unclaimed invention. One or more inventions may reside in any combination or sub-combination of the elements or process steps disclosed in any part of this document including its claims and figures.

[0005] In accordance with one aspect of this disclosure, which may be used alone or in combination with any other aspect, a hand vacuum cleaner may be powered by an onboard energy source, such as a battery pack or other energy storage member. The energy storage member may include a chemical battery, such as a rechargeable battery. Some chemical batteries, such as

lithium-ion batteries, may produce heat while being discharged (e.g. while supplying power to an electric motor). As disclosed herein, a hand vacuum cleaner may have an airflow path in which air exiting a cyclone chamber impinges on a wall of an energy storage chamber in which one or more energy storage devices are located. By directing relatively high-velocity airflow directly against a wall of such a chamber, cooling of an energy storage member (e.g. battery) located in the chamber may be promoted, particularly during discharge of the battery.

[0006] In accordance with this broad aspect, there is provided a hand vacuum cleaner having a front end, a rear end, an upper end, a lower end, and first and second laterally spaced apart sides, and comprising:

(a) an air flow path extending from a dirty air inlet to a clean air outlet;

(b) a cyclone chamber positioned in the air flow path and having a cyclone air inlet, a cyclone air outlet, and a cyclone axis of rotation;

(c) a suction motor positioned in the air flow path upstream of the clean air outlet; and,

(d) at least one energy storage member positioned in an energy storage chamber having an energy storage chamber wall wherein the cyclone air outlet faces the energy storage chamber wall whereby air exiting the cyclone chamber impinges on the energy storage chamber wall.

[0007] In some embodiments, the cyclone axis of rotation may extend generally in a forward/rearward direction.

[0008] In some embodiments, the at least one energy storage member may comprise a plurality of energy storage members wherein at least some of the plurality of energy storage members are arranged one above another in a

generally upwardly extending configuration when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner.

[0009] In some embodiments, the energy storage members may be arranged one above another comprise longitudinally extending members each having a longitudinal axis which that extends laterally.

[0010] In some embodiments, the cyclone axis of rotation may intersect a volume defined by the generally upwardly extending configuration of energy storage members.

[0011] In some embodiments, the cyclone axis of rotation may extend generally in a forward/rearward direction.

[0012] In some embodiments, the at least one energy storage member may be removably receivable in the energy storage chamber.

[0013] In some embodiments, the at least one energy storage member may comprise a battery pack that is removably receivable in the energy storage chamber.

[0014] In some embodiments, the air flow path may comprise a portion that extends from the cyclone air outlet to the suction motor and is defined in part by the energy storage chamber wall.

[0015] In some embodiments, the portion of the air flow path may extend generally upwardly from the cyclone air outlet to the suction motor when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner.

[0016] In some embodiments, the suction motor may be positioned above the cyclone axis of rotation when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner.

[0017] In some embodiments, the portion of the air flow path may extend generally downwardly from the cyclone air outlet to the suction motor when the

upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner.

[0018] In some embodiments, the suction motor may be positioned below the cyclone axis of rotation when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner.

[0019] In some embodiments, the hand vacuum cleaner may further comprise a handle having a hand grip portion that extends upwardly and forwardly when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner wherein the handle is positioned rearward of the at least one energy storage member.

[0020] In some embodiments, the at least one energy storage member may comprise a plurality of energy storage members wherein at least some of the plurality of energy storage members are arranged one above another in a generally upwardly extending configuration when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner.

[0021] In some embodiments, the hand vacuum cleaner may further comprise a finger gap positioned between the handle and the energy storage chamber.

[0022] In accordance with another aspect of this disclosure, which may be used alone or in combination with any other aspect, a hand vacuum cleaner may have a cyclone chamber, a suction motor, and pre-motor filter positioned downstream of the cyclone chamber and upstream of the suction motor. The pre-motor filter may be vertically spaced from the cyclone chamber, and air may travel generally rearwardly from the pre-motor filter to the suction motor. Promoting air to travel in this manner may help reduce or eliminate the need for additional bends or air flow direction changes between an air outlet of the pre-motor filter and the suction motor, thereby reducing backpressure and/or air flow

losses through this portion of the hand vacuum cleaner due to a reduction in the number of bends in the air flow path.

[0023] In accordance with this broad aspect, there is provided a hand vacuum cleaner having a front end, a rear end, an upper end, a lower end, and first and second laterally spaced apart sides, and comprising:

(a) an air flow path extending from a dirty air inlet to a clean air outlet;

(b) a cyclone assembly comprising a cyclone chamber positioned in the air flow path and having a cyclone air inlet, a cyclone air outlet, and a cyclone axis of rotation, wherein the cyclone axis of rotation extends generally in a forward/rearward direction;

(c) a pre-motor filter positioned downstream of the cyclone air outlet; and,

(d) a suction motor positioned in the air flow path downstream of the pre-motor filter and upstream of the clean air outlet and having a suction motor axis of rotation;

wherein the pre-motor filter is vertically spaced from the cyclone axis of rotation when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner, and

wherein air travels generally rearwardly from the pre-motor filter to the suction motor.

[0024] In some embodiments, the pre-motor filter may be vertically spaced from the cyclone chamber when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner.

[0025] In some embodiments, the cyclone assembly may comprise a sidewall that extends generally parallel to the cyclone axis of rotation and the pre-motor filter may have an upstream surface that extends generally parallel to the sidewall of the cyclone assembly.

[0026] In some embodiments, the pre-motor filter may have a downstream surface that is opposed to the upstream surface, and air may exit the downstream surface in a generally vertical direction when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner.

[0027] In some embodiments, the pre-motor filter may at least partially overlie the cyclone chamber.

[0028] In some embodiments, the suction motor axis of rotation may be generally parallel to the cyclone axis of rotation.

[0029] In some embodiments, the suction motor may be positioned rearward of the cyclone chamber and the suction motor axis of rotation may be generally parallel to the cyclone axis of rotation.

[0030] In some embodiments, the pre-motor filter may comprise a generally cylindrical filter having a hollow interior wherein the suction motor has an inlet end that faces towards the hollow interior.

[0031] In some embodiments, the generally cylindrical filter may have an outer upstream surface and an inner downstream surface defining the hollow interior and the suction motor axis of rotation may intersect the hollow interior.

[0032] In some embodiments, the cyclone assembly may comprise a sidewall that extends generally parallel to the cyclone axis of rotation and the upstream surface of the pre-motor filter may extend generally parallel to the sidewall of the cyclone assembly.

[0033] In some embodiments, the pre-motor filter may at least partially overlie the cyclone chamber.

[0034] In some embodiments, the hand vacuum cleaner may further comprise a handle having a hand grip portion that extends upwardly and forwardly when the upper end of the hand vacuum cleaner is positioned above

the lower end of the hand vacuum cleaner wherein the suction motor is located at an upper end of the handle.

[0035] In some embodiments, the suction motor may be positioned rearward of the cyclone chamber.

[0036] In some embodiments, the suction motor may be located at an upper end of the hand grip portion.

[0037] Also in accordance with this broad aspect, there is provided a hand vacuum cleaner having a front end, a rear end, an upper end, a lower end, and first and second laterally spaced apart sides, and comprising:

(a) an air flow path extending from a dirty air inlet to a clean air outlet;

(b) a cyclone assembly comprising a cyclone chamber positioned in the air flow path and having a cyclone air inlet, a cyclone air outlet and a cyclone axis of rotation, wherein the cyclone axis of rotation extends generally in a forward/rearward direction;

(c) a generally cylindrical pre-motor filter positioned downstream of the cyclone air outlet and having a hollow interior; and,

(d) a suction motor positioned in the air flow path downstream of the pre-motor filter and upstream of the clean air outlet and having a suction motor axis of rotation that is generally parallel to the cyclone axis of rotation, wherein the suction motor has an inlet end that faces towards the hollow interior.

[0038] In some embodiments, the generally cylindrical filter may have an outer upstream surface and an inner downstream surface defining the hollow interior and the suction motor axis of rotation may intersect the hollow interior.

[0039] In some embodiments, the cyclone assembly may comprise a sidewall that extends generally parallel to the cyclone axis of rotation and the

upstream surface of the pre-motor filter may extend generally parallel to the sidewall of the cyclone assembly.

[0040] In some embodiments, the pre-motor filter may at least partially overlie the cyclone chamber.

[0041] In accordance with another aspect of this disclosure, which may be used alone or in combination with any other aspect, it may be desirable for a hand vacuum cleaner to have a compact overall form, for example so it can be maneuvered around and/or between objects when being carried by a user while cleaning one or more surfaces. A compact form may also improve the ergonomics of the hand vacuum (e.g. the perceived balance or 'hand feel' when carried by a user). Typically, the suction motor and energy storage members (e.g. one or more batteries) may be among the heavier (if not the heaviest) individual components of the hand vacuum cleaner. While positioning the suction motor and energy storage members adjacent to each other may promote a compact design, such an arrangement may promote an undesirable concentration of mass relative to a handle of the hand vacuum cleaner. Positioning the suction motor at an upper end of a forwardly-inclined handle and rearward of at least some of the energy storage members, particularly when some or all of the energy storage members are forward of the handle, may help distribute the weight of the motor and batteries, and may affect the hand feel and/or perceived balance of the hand vacuum.

[0042] In accordance with this broad aspect, there is provided a hand vacuum cleaner having a front end, a rear end, an upper end, a lower end, and first and second laterally spaced apart sides, and comprising:

(a) an air flow path extending from a dirty air inlet to a clean air outlet;

(b) a handle having a hand grip portion that extends upwardly and forwardly when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner;

(c) a cyclone chamber positioned in the air flow path and having a cyclone air inlet, a cyclone air outlet, and a cyclone axis of rotation;

(d) at least one energy storage member positioned in an energy storage chamber; and,

(e) a suction motor positioned in the air flow path upstream of the clean air outlet, wherein the suction motor is located at an upper end of the handle and rearward of the at least one energy storage member when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner.

[0043] In some embodiments, the suction motor may be located at an upper end of the hand grip portion.

[0044] In some embodiments, the at least one energy storage member may comprise a plurality of energy storage members wherein at least some of the plurality of energy storage members may be arranged one above another in a generally upwardly extending configuration when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner and the suction motor may be positioned rearward of at least some of the energy storage members when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner.

[0045] In some embodiments, the cyclone axis of rotation may intersect a volume defined by the generally upwardly extending configuration of energy storage members.

[0046] In some embodiments, the cyclone axis of rotation may extend generally in a forward/rearward direction.

[0047] In some embodiments, the at least one energy storage member may comprise a plurality of energy storage members wherein at least some of the plurality of energy storage members may be arranged one above another in a

generally upwardly extending configuration when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner and the suction motor may be positioned rearward of an upper end of the plurality of energy storage members when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner.

[0048] In some embodiments, the cyclone axis of rotation may extend generally in a forward/rearward direction.

[0049] In some embodiments, the suction motor may be positioned above the cyclone axis of rotation when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner.

[0050] In some embodiments, the hand vacuum may further comprise a pre-motor filter positioned in the air flow path downstream of the cyclone chamber, the pre-motor filter comprising a generally cylindrical filter having a hollow interior wherein the suction motor has an inlet end that faces towards the hollow interior.

[0051] In some embodiments, the generally cylindrical filter may have an outer upstream surface and an inner downstream surface defining the hollow interior and the suction motor axis of rotation may intersect the hollow interior.

[0052] In some embodiments, the cyclone chamber may comprise a sidewall that extends generally parallel to the cyclone axis of rotation and the upstream surface of the pre-motor filter may extend generally parallel to the sidewall of the cyclone chamber.

[0053] In some embodiments, the pre-motor filter may at least partially overlie the cyclone chamber.

[0054] In some embodiments, the dirty air inlet may have a dirty air inlet axis that extends generally rearwardly and may be positioned above the cyclone chamber.

[0055] In some embodiments, the dirty air inlet axis may intersect a volume defined by a pre-motor filter housing.

[0056] In some embodiments, the dirty air inlet axis may intersect the suction motor.

[0057] In some embodiments, the hand vacuum may further comprise a pre-motor filter positioned in the air flow path downstream of the cyclone chamber, the pre-motor filter comprising a generally cylindrical filter having a hollow interior wherein the dirty air inlet has a dirty air inlet axis that extends generally rearwardly and intersects the hollow interior.

[0058] In some embodiments, the dirty air inlet axis may intersect the suction motor.

[0059] In accordance with another aspect of this disclosure, which may be used alone or in combination with any other aspect, a hand vacuum cleaner may have an energy storage member (e.g. a battery pack that includes one or more battery cells) that is inclined so that a portion of a dirt collection region may be located below a portion of the energy storage member. Providing at least some vertical overlap between an energy storage member and a dirt collection region may help provide a relatively larger dirt chamber capacity while helping to reduce the overall size of the hand vacuum. Also, as the energy storage members (e.g. one or more batteries) may typically be among the heavier individual components of the hand vacuum cleaner, such a configuration may help provide a compact overall design, while distributing the weight of the batteries to promote a desirable hand feel and/or perceived balance of the hand vacuum.

[0060] In accordance with this broad aspect, there is provided a hand vacuum cleaner having a front end, a rear end, an upper end, a lower end, and first and second laterally spaced apart sides, and comprising:

(a) an air flow path extending from a dirty air inlet to a clean air outlet;

(b) a cyclone assembly positioned in the air flow path and having a cyclone assembly air inlet, a cyclone assembly air outlet, a dirt collection region, and a cyclone axis of rotation;

(c) a suction motor positioned in the air flow path upstream of the clean air outlet; and,

(d) a longitudinally extending battery pack wherein the battery pack extends upwardly and forwardly when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner,

wherein a portion of the dirt collection region is located below a portion of the battery pack.

[0061] In some embodiments, the dirt collection region may have an upper portion and a lower portion when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner and the lower portion of the dirt collection region may be positioned rearwardly of the upper portion of the dirt collection region.

[0062] In some embodiments, a rear wall of the dirt collection chamber may be at a first angle to a vertical axis.

[0063] In some embodiments, the battery pack may be located in a battery pack chamber, the battery pack chamber having a front wall that is at a second angle to a vertical axis.

[0064] In some embodiments, the first and second angles may be about the same.

[0065] In some embodiments, the battery pack may extend generally linearly.

[0066] In some embodiments, the battery pack may be removably receivable in the hand vacuum cleaner.

[0067] In some embodiments, the battery pack may be removably receivable in the hand vacuum cleaner, a rear wall of the dirt collection chamber may be at a first angle to a vertical axis and the battery pack may have a front wall that is at a second angle to a vertical axis, wherein the first and second angles may be about the same.

[0068] In some embodiments, the dirt collection region may be at a lower end of the hand vacuum cleaner and the battery pack may be slidably insertable into the lower end of the hand vacuum cleaner.

[0069] Also in accordance with this broad aspect, there is provided a hand vacuum cleaner having a front end, a rear end, an upper end, a lower end, and first and second laterally spaced apart sides, and comprising:

(a) an air flow path extending from a dirty air inlet to a clean air outlet;

(b) a cyclone assembly positioned in the air flow path and having a cyclone assembly air inlet, a cyclone assembly air outlet, a dirt collection region, and a cyclone axis of rotation;

(c) a suction motor positioned in the air flow path upstream of the clean air outlet; and,

(d) a plurality of energy storage members arranged one above another in a generally upwardly extending configuration when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner, the configuration having a forward side and a rearward side,

wherein a lower end of the forward side of the configuration of energy storage members is positioned rearward of an another portion of the forward side of the configuration when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner, and,

wherein a portion of the dirt collection region is located below at least a portion of one of the energy storage members.

[0070] In some embodiments, the dirt collection region may have an upper portion and a lower portion when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner and the lower portion of the dirt collection region may be positioned rearwardly of the upper portion of the dirt collection region.

[0071] In some embodiments, a rear wall of the dirt collection chamber may be at a first angle to a vertical axis.

[0072] In some embodiments, the energy storage members may be located in an energy storage member chamber, and the energy storage member chamber may have a front wall that is at a second angle to a vertical axis.

[0073] In some embodiments, the first and second angles may be about the same.

[0074] In some embodiments, the configuration of energy storage members may extend generally linearly.

[0075] In some embodiments, the energy storage members may be removably receivable in the hand vacuum cleaner.

[0076] In some embodiments, the energy storage members may be removably receivable in the hand vacuum cleaner, a rear wall of the dirt collection chamber may be at a first angle to a vertical axis and the configuration of energy storage members may have a front side that is at a second angle to a vertical axis, wherein the first and second angles may be about the same.

[0077] In some embodiments, the dirt collection region may be at a lower end of the hand vacuum cleaner and the energy storage members may be slidably insertable into the lower end of the hand vacuum cleaner.

[0078] Also in accordance with this broad aspect, there is provided a hand vacuum cleaner having a front end, a rear end, an upper end, a lower end, and first and second laterally spaced apart sides, and comprising:

(a) an air flow path extending from a dirty air inlet to a clean air outlet;

(b) a cyclone assembly positioned in the air flow path and having a cyclone assembly air inlet, a cyclone assembly air outlet, a dirt collection region, and a cyclone axis of rotation;

(c) a suction motor positioned in the air flow path upstream of the clean air outlet; and,

(d) a power pack that extends upwardly and forwardly when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner,

wherein the dirt collection region has a rear wall that extends upwardly and forwardly when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner whereby at least a portion of the dirt collection region is below at least a portion of the power pack.

[0079] In some embodiments, the dirt collection region may be at a lower end of the hand vacuum cleaner and the rear wall of the dirt collection chamber may be located proximate a front side of the power pack.

[0080] In accordance with another aspect of this disclosure, which may be used alone or in combination with any other aspect, a hand vacuum cleaner may have an energy storage member (e.g. a battery pack that includes one or more battery cells) that is positioned rearward of a dirt collection region and at least partially underlies at least a portion of one or both of a cyclone chamber and a pre-motor filter. Providing at least some vertical overlap between an energy storage member and a cyclone chamber and/or a pre-motor filter may help to

reduce the overall size (length front to back) of the hand vacuum and may therefore reduce the torque exerted on the hand of a user as the moment arm between the front of the hand vacuum cleaner and the handle may be reduced. Also, as the energy storage member (e.g. one or more batteries) may typically be among the heavier individual components of the hand vacuum cleaner, such a configuration may help provide a compact overall design without adversely affecting the hand feel and/or perceived balance of the hand vacuum.

[0081] In accordance with this broad aspect, there is provided hand vacuum cleaner having a front end, a rear end, an upper end, a lower end, and first and second laterally spaced apart sides, and comprising:

(a) an air flow path extending from a dirty air inlet to a clean air outlet;

(b) a cyclone assembly positioned in the air flow path and having a cyclone assembly air inlet, a cyclone assembly air outlet, a cyclone chamber, a dirt collection region, and a cyclone axis of rotation;

(c) a pre-motor filter downstream of the cyclone chamber;

(d) a suction motor positioned in the air flow path upstream of the clean air outlet; and,

(e) a battery pack wherein at least a portion of the battery pack is positioned rearward of the dirt collection region and at least a portion of the battery pack underlies at least a portion of one or both of the cyclone chamber and the pre-motor filter.

[0082] In some embodiments, the cyclone axis of rotation may extend generally in a forward/rearward direction.

[0083] In some embodiments, at least a portion of, or substantially all of, or the entire battery pack may underlie at least a portion of the cyclone chamber, substantially all of the cyclone chamber, or the entire cyclone chamber.

[0084] In some embodiments, at least a portion of, or substantially all of, or the entire battery pack may underlie at least a portion of the pre-motor filter, substantially all of the pre-motor filter, or the entire pre-motor filter.

[0085] In some embodiments, the battery pack may comprise at least a plurality of energy storage members wherein the energy storage members may be arranged in at least two columns in the forward/rearward direction.

[0086] In some embodiments, the dirt collection region may be at a lower end of the hand vacuum cleaner and the battery pack may be slidably insertable into the lower end of the hand vacuum cleaner.

[0087] In some embodiments, the hand vacuum may further comprise a handle and a finger gap positioned between the handle and the battery pack.

[0088] Also in accordance with this broad aspect, there is provided a hand vacuum cleaner having a front end, a rear end, an upper end, a lower end, and first and second laterally spaced apart sides, and comprising:

(a) an air flow path extending from a dirty air inlet to a clean air outlet;

(b) a cyclone assembly positioned in the air flow path and having a cyclone assembly air inlet, a cyclone assembly air outlet, a cyclone chamber, a dirt collection region, and a cyclone axis of rotation;

(c) a pre-motor filter downstream of the cyclone chamber;

(d) a suction motor positioned in the air flow path upstream of the clean air outlet; and,

(e) a plurality of energy storage members provided in a lower portion of the hand vacuum cleaner, wherein some of the energy storage members are arranged one above another and some are arranged one behind another and wherein at least some of the energy storage members underlie at least a portion of one or both of the cyclone chamber and the pre-motor filter.

[0089] In some embodiments, at least a portion of the energy storage members may be positioned rearward of the dirt collection region.

[0090] In some embodiments, the cyclone axis of rotation may extend generally in a forward/rearward direction.

[0091] In some embodiments, the at least a portion of, or substantially all of, or all of the energy storage members may underlie at least a portion of the cyclone chamber, substantially all of the cyclone chamber, or the entire cyclone chamber

[0092] In some embodiments, the at least a portion of, or substantially all of, or all of the energy storage members may underlie at least a portion of the pre-motor filter, substantially all of the pre-motor filter, or the entire pre-motor filter.

[0093] In some embodiments, the dirt collection region is at a lower end of the hand vacuum cleaner and the energy storage members are slidably insertable into the lower end of the hand vacuum cleaner.

[0094] In some embodiments, at least a portion of the energy storage members may be positioned rearward of the dirt collection region.

[0095] In some embodiments, the hand vacuum may further comprise a handle and a finger gap positioned between the handle and the energy storage members.

[0096] In accordance with another aspect of this disclosure, which may be used alone or in combination with any other aspect, a hand vacuum cleaner may have a cyclone chamber with a cyclone axis of rotation that extends in a forward/rearward direction, and a suction motor with a suction motor axis that also extends in a forward/rearward direction, where the suction motor is located at an upper end of a handle of the vacuum cleaner and the suction motor axis is vertically displaced from the cyclone axis of rotation. Such a configuration may

have one or more advantages. For example, it may facilitate the reduction of conduit bends and/or air flow direction changes between a dirty air inlet and a clean air outlet, thereby reducing backpressure and/or air flow losses through this portion of the hand vacuum cleaner due to a reduction in the number of bends in the air flow path. Additionally, or alternatively, such a configuration may help provide a compact overall design of the hand vacuum cleaner without adversely affecting the hand feel and/or perceived balance of the hand vacuum.

[0097] In accordance with this broad aspect, there is provided a hand vacuum cleaner having a front end, a rear end, an upper end, a lower end, and first and second laterally spaced apart sides, and comprising:

(a) an air flow path extending from a dirty air inlet to a clean air outlet;

(b) a handle having a hand grip portion that extends upwardly and forwardly when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner, the handle being positioned at the rear end of the hand vacuum cleaner;

(c) a cyclone chamber positioned in the air flow path and having a cyclone air inlet, a cyclone air outlet, and a cyclone axis of rotation that extends in a forward/rearward direction;

(d) a pre-motor filter positioned downstream of the cyclone chamber and upstream of the suction motor; and,

(e) a suction motor positioned in the air flow path upstream of the clean air outlet, wherein the suction motor has a suction motor axis of rotation that extends in a forward/rearward direction, wherein the suction motor is located at an upper end of the handle, and wherein the suction motor axis of rotation is vertically displaced from the cyclone axis of rotation when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner.

[0098] In some embodiments, the suction motor may be located at an upper end of the hand grip portion.

[0099] In some embodiments, the cyclone axis of rotation may intersect the hand grip portion.

[00100] In some embodiments, the suction motor may be located rearward of the cyclone chamber.

[00101] In some embodiments, the suction motor may have an inlet that faces towards the pre-motor filter.

[00102] In some embodiments, the suction motor axis of rotation may intersect a volume defined by a pre-motor filter housing.

[00103] In some embodiments, the suction motor axis of rotation may extend through a central portion of a volume containing the pre-motor filter.

[00104] In some embodiments, the pre-motor filter may be positioned above the cyclone axis of rotation when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner.

[00105] In some embodiments, the pre-motor filter may be positioned above the cyclone chamber when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner.

[00106] In some embodiments, the cyclone axis of rotation may intersect the hand grip portion, the pre-motor filter may be positioned above the cyclone axis of rotation when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner, and the suction motor axis of rotation may extend through a pre-motor filter housing.

[00107] In some embodiments, the pre-motor filter may comprise a generally cylindrical filter having a hollow interior wherein the suction motor axis of rotation intersects the hollow interior.

[00108] In some embodiments, after exiting a downstream side of the pre-motor filter, air travels generally linearly to the suction motor.

[00109] In some embodiments, the pre-motor filter may comprise a generally cylindrical filter having a hollow interior wherein the dirty air inlet has a dirty air inlet axis that extends generally rearwardly and intersects the hollow interior.

[00110] In some embodiments, the dirty air inlet axis may intersect the suction motor.

[00111] In some embodiments, the cyclone axis of rotation may intersect the hand grip portion.

[00112] In some embodiments, the hand vacuum may further comprise a plurality of energy storage members wherein at least some of the plurality of energy storage members are arranged one above another in a generally upwardly extending configuration when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner, and the suction motor may be positioned rearward of at least some of the energy storage members when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner.

[00113] In accordance with another aspect of this disclosure, which may be used alone or in combination with any other aspect, a surface cleaning apparatus may have a removable pre-motor filter assembly having an outlet conduit wherein a terminal end of the outlet conduit extends at a first angle to a direction of air flow through the outlet conduit. An advantage of this design is that the terminal end of the outlet conduit may be positioned substantially flush against another air conduit having a similarly angled terminal end without requiring lateral movement of the outlet conduit towards other conduit. Accordingly, a filter assembly may be removed and inserted by moving the filter assembly substantially perpendicular to the direction of airflow exiting the filter assembly.

Such an arrangement may, for example, facilitate the use of a gasket or other sealing member between the ends of the conduits to provide an improved seal between the conduits. Such an arrangement may also eliminate the need for a biasing or other retaining mechanism to exert a force on the filter assembly to maintain a seal between the conduits.

[00114] In accordance with this broad aspect, there is provided a surface cleaning apparatus comprising:

(a) an air flow path extending from a dirty air inlet to a clean air outlet;

(b) an air treatment member positioned in the air flow path; and

(c) a removable pre-motor filter assembly positioned downstream of the air treatment member and upstream of a suction motor, the pre-motor filter assembly comprising a pre-motor filter and a filter support member, the filter support member having an outlet conduit wherein a terminal end of the outlet conduit extends at a first angle to a direction of air flow through the outlet conduit.

[00115] In some embodiments, the pre-motor filter may comprise a generally cylindrical filter having a hollow interior positioned about a body portion of the filter support member having an internal filter conduit, wherein the outlet conduit is in air flow communication with the hollow interior via the internal filter conduit.

[00116] In some embodiments, the outlet conduit may be aligned with the hollow interior.

[00117] In some embodiments, the body portion of the filter support member may include a porous portion located in the hollow interior and positioned between a downstream surface of the pre-motor filter and the internal filter conduit.

[00118] In some embodiments, the hollow interior may comprise a longitudinally extending passage having an outlet end from which the outlet conduit extends away and an opposed end wherein the opposed end is sealed.

[00119] In some embodiments, the opposed end may be sealed by a sealing member that extends into the hollow interior, the sealing member having a solid wall extending inwardly and located between a downstream surface of the pre-motor filter and the passage.

[00120] In some embodiments, the filter support member may have a body portion having an internal filter conduit that may extend into a hollow interior of the pre-motor filter, the body portion may have a solid wall extending inwardly and located between a downstream surface of the pre-motor filter and the internal filter conduit.

[00121] In some embodiments, the body portion of the filter support member may include a porous portion located in the hollow interior and positioned between a downstream surface of the pre-motor filter and the internal filter conduit and is upstream of the outlet conduit.

[00122] In some embodiments, the internal filter conduit may comprise a longitudinally extending passage having an outlet end from which the outlet conduit extends away and a second end, wherein the second end is sealed.

[00123] In some embodiments, the second end may be sealed by a sealing member that extends into the hollow interior, the sealing member having a solid wall extending inwardly and located between a downstream surface of the pre-motor filter and the internal filter conduit.

[00124] In some embodiments, the sealing member and the body portion define a continuous member extending through the hollow interior.

[00125] In some embodiments, the surface cleaning apparatus may further comprise a treated air conduit extending from the outlet conduit towards the

suction motor, wherein an inlet end of the treated air conduit may also extend at about the first angle to a direction of air flow through the outlet conduit.

[00126] In some embodiments, the surface cleaning apparatus may further comprise a treated air conduit extending from the outlet conduit towards the suction motor, wherein an inlet end of the treated air conduit may also extend at a second angle to a direction of air flow through the outlet conduit and the terminal end of the outlet conduit may abut the inlet end of the treated air conduit when the filter assembly is positioned in the air flow path.

[00127] In some embodiments, the first and second angles may be about the same.

[00128] In some embodiments, the surface cleaning apparatus may further comprise a gasket provided at an interface of the terminal end of the outlet conduit and the inlet end of the treated air conduit.

[00129] In some embodiments, the filter assembly may be removable in a filter assembly removal direction that is at an angle to the direction of air flow through the outlet conduit.

[00130] In some embodiments, the filter assembly may be removable through an openable door and a side of the terminal end that is closest to the openable door may extend further in the direction of air flow though the outlet conduit than an opposed side of the terminal end that is further from the openable door.

[00131] In some embodiments, a side of the inlet end of the treated air conduit that is furthest from the openable door may extend further in the direction of air flow though the outlet conduit than an opposed side of the inlet end that is closest to the openable door.

[00132] It will be appreciated by a person skilled in the art that an apparatus or method disclosed herein may embody any one or more of the features

contained herein and that the features may be used in any particular combination or sub-combination.

[00133] These and other aspects and features of various embodiments will be described in greater detail below.

BRIEF DESCRIPTION OF THE DRAWINGS

[00134] For a better understanding of the described embodiments and to show more clearly how they may be carried into effect, reference will now be made, by way of example, to the accompanying drawings in which:

[00135] Figure 1 is a top perspective view of a hand vacuum cleaner in accordance with one embodiment;

[00136] Figure 2 is a bottom perspective view of the hand vacuum cleaner of Figure 1;

[00137] Figure 3 is a side perspective view of the hand vacuum cleaner of Figure 1;

[00138] Figure 4 is a rear perspective view of the hand vacuum cleaner of Figure 1;

[00139] Figure 5 is a front end view of the hand vacuum cleaner of Figure 1;

[00140] Figure 6 is a perspective view of the hand vacuum cleaner of Figure 1, with a front door or lid in an open position;

[00141] Figure 7 is a front end view of the hand vacuum cleaner of Figure 1, with a front door or lid in an open position;

[00142] Figure 8 is a perspective sectional view of the hand vacuum cleaner of Figure 1, taken along line 8-8 in Figure 1;

[00143] Figure 9 is a perspective sectional view of the hand vacuum cleaner of Figure 1, taken along line 9-9 in Figure 5;

[00144] Figure 10 is a cross-section view of the hand vacuum cleaner of Figure 1, taken along line 9-9 in Figure 5;

[00145] Figure 11 is an enlarged view of the upper left portion of Figure 10;

[00146] Figure 12 is an enlarged view of the upper left portion of Figure 10, with a pre-motor filter assembly removed;

[00147] Figure 13 is an enlarged view of the upper left portion of Figure 10, with a pre-motor filter assembly and an openable door removed;

[00148] Figure 14 is a top perspective view of the upper front portion of the hand vacuum cleaner of Figure 1, with an openable door removed to expose a pre-motor filter assembly;

[00149] Figure 15 is a top perspective view of the upper front portion of the hand vacuum cleaner of Figure 1, with a pre-motor filter assembly and an openable door removed;

[00150] Figure 16 is a top plan view of the upper front portion of the hand vacuum cleaner of Figure 1, with a pre-motor filter assembly and an openable door removed;

[00151] Figure 17 is a top perspective view of the upper portion of the hand vacuum cleaner of Figure 1, with a pre-motor filter assembly and an openable door removed;

[00152] Figure 18 is a bottom perspective view of an openable door of a pre-motor filter chamber of the hand vacuum cleaner of Figure 1;

[00153] Figure 19 is a perspective view of a removable pre-motor filter assembly of the hand vacuum cleaner of Figure 1;

[00154] Figure 20 is an end perspective view from the outlet end of the removable pre-motor filter assembly of the hand vacuum cleaner of Figure 19;

[00155] Figure 21 is a perspective section view of the removable pre-motor filter assembly of the hand vacuum cleaner of Figure 19, taken along line 21-21 in Figure 19;

[00156] Figure 22 is a cross section view of the removable pre-motor filter assembly of the hand vacuum cleaner of Figure 19, taken along line 21-21 in Figure 19;

[00157] Figure 23 is a bottom perspective view of the lower rear portion of the hand vacuum cleaner of Figure 1;

[00158] Figure 24 is a bottom perspective view of the lower rear portion of the hand vacuum cleaner of Figure 1, with a post-motor filter and a post-motor filter support removed;

[00159] Figure 25 is a rear perspective view of a post-motor filter support of the hand vacuum cleaner of Figure 1;

[00160] Figure 26 is a front perspective view of the post-motor filter support of Figure 25;

[00161] Figure 27 is a front perspective view of the post-motor filter support of Figure 26 and a post-motor filter;

[00162] Figure 28 is a side view of the hand vacuum cleaner of Figure 1, with an energy storage member partially removed;

[00163] Figure 29 is a bottom perspective view of the hand vacuum cleaner of Figure 1, with an energy storage member partially removed;

[00164] Figure 30 is a side view of the hand vacuum cleaner of Figure 1, with an energy storage member removed;

[00165] Figure 31 is a cross-section view of the hand vacuum cleaner of Figure 1, taken along line 9-9 in Figure 5, with an energy storage member removed;

[00166] Figure 32 is a perspective view of an energy storage member of the hand vacuum cleaner of Figure 1;

[00167] Figure 33 is a front perspective view of the energy storage member of Figure 32;

[00168] Figure 34 is a cross-section view of the energy storage member of Figure 32, taken along line 34-34 in Figure 32;

[00169] Figure 35 is a perspective view of a hand vacuum cleaner in accordance with another embodiment;

[00170] Figure 36 is a cross-section view of the hand vacuum cleaner of Figure 35, taken along line 36-36 in Figure 35;

[00171] Figure 37 is a cross-section view of the hand vacuum cleaner of Figure 35, taken along line 36-36 in Figure 35, with an energy storage member partially removed;

[00172] Figure 38 is a perspective section view of the hand vacuum cleaner of Figure 35, taken along line 36-36 in Figure 35, with a post-motor filter removed;

[00173] Figure 39 is a perspective view of a hand vacuum cleaner in accordance with another embodiment;

[00174] Figure 40 is a cross-section view of the hand vacuum cleaner of Figure 39, taken along line 40-40 in Figure 39;

[00175] Figure 41 is a perspective section view of the hand vacuum cleaner of Figure 39, taken along line 40-40 in Figure 39, with a post-motor filter removed;

[00176] Figure 42 is a perspective view of a hand vacuum cleaner in accordance with another embodiment;

[00177] Figure 43 is a cross-section view of the hand vacuum cleaner of Figure 42, taken along line 43-43 in Figure 42;

[00178] Figure 44 is a perspective section view of the hand vacuum cleaner of Figure 42, taken along line 43-43 in Figure 42;

[00179] Figure 45 is a perspective section view of the hand vacuum cleaner of Figure 42, taken along line 43-43 in Figure 42, with an energy storage member removed;

[00180] Figure 46 is a perspective view of a hand vacuum cleaner in accordance with another embodiment;

[00181] Figure 47 is a cross-section view of the hand vacuum cleaner of Figure 46, taken along line 47-47 in Figure 46;

[00182] Figure 48 is a perspective section view of the hand vacuum cleaner of Figure 46, taken along line 47-47 in Figure 46;

[00183] Figure 49 is a perspective section view of the hand vacuum cleaner of Figure 46, taken along line 47-47 in Figure 46, with an energy storage member removed; and

[00184] Figure 50 is a perspective view of the hand vacuum cleaner of Figure 46, with a front door or lid in an open position;

[00185] The drawings included herewith are for illustrating various examples of articles, methods, and apparatuses of the teaching of the present specification and are not intended to limit the scope of what is taught in any way.

DESCRIPTION OF EXAMPLE EMBODIMENTS

[00186] Various apparatuses, methods and compositions are described below to provide an example of an embodiment of each claimed invention. No embodiment described below limits any claimed invention and any claimed invention may cover apparatuses and methods that differ from those described below. The claimed inventions are not limited to apparatuses, methods and

compositions having all of the features of any one apparatus, method or composition described below or to features common to multiple or all of the apparatuses, methods or compositions described below. It is possible that an apparatus, method or composition described below is not an embodiment of any claimed invention. Any invention disclosed in an apparatus, method or composition described below that is not claimed in this document may be the subject matter of another protective instrument, for example, a continuing patent application, and the applicant(s), inventor(s) and/or owner(s) do not intend to abandon, disclaim, or dedicate to the public any such invention by its disclosure in this document.

[00187] The terms "an embodiment," "embodiment," "embodiments," "the embodiment," "the embodiments," "one or more embodiments," "some embodiments," and "one embodiment" mean "one or more (but not all) embodiments of the present invention(s)," unless expressly specified otherwise.

[00188] The terms "including," "comprising" and variations thereof mean "including but not limited to," unless expressly specified otherwise. A listing of items does not imply that any or all of the items are mutually exclusive, unless expressly specified otherwise. The terms "a," "an" and "the" mean "one or more," unless expressly specified otherwise.

[00189] As used herein and in the claims, two or more parts are said to be “coupled”, “connected”, “attached”, or “fastened” where the parts are joined or operate together either directly or indirectly (i.e., through one or more intermediate parts), so long as a link occurs. As used herein and in the claims, two or more parts are said to be “directly coupled”, “directly connected”, “directly attached”, or “directly fastened” where the parts are connected in physical contact with each other. None of the terms “coupled”, “connected”, “attached”, and “fastened” distinguish the manner in which two or more parts are joined together.

[00190] Furthermore, it will be appreciated that for simplicity and clarity of illustration, where considered appropriate, reference numerals may be repeated among the figures to indicate corresponding or analogous elements. In addition, numerous specific details are set forth in order to provide a thorough understanding of the example embodiments described herein. However, it will be understood by those of ordinary skill in the art that the example embodiments described herein may be practiced without these specific details. In other instances, well-known methods, procedures, and components have not been described in detail so as not to obscure the example embodiments described herein. Also, the description is not to be considered as limiting the scope of the example embodiments described herein.

General description of a hand vacuum cleaner

[00191] Referring to Figures 1 to 34, an exemplary embodiment of a surface cleaning apparatus is shown generally as 1000. The following is a general discussion of this embodiment which provides a basis for understanding several of the features which are discussed herein. As discussed subsequently, each of the features may be used individually or in any particular combination or sub-combination in this or in other embodiments disclosed herein.

[00192] In the illustrated embodiment, the surface cleaning apparatus is a hand vacuum cleaner, which may also be referred to as a "handvac" or "hand-held vacuum cleaner". As used herein, a hand vacuum cleaner is a vacuum cleaner that can be operated to clean a surface generally one-handedly. That is, the entire weight of the vacuum may be held by the same one hand used to direct a dirty air inlet of the vacuum cleaner with respect to a surface to be cleaned. For example, the handle and a clean air inlet may be rigidly coupled to each other (directly or indirectly) so as to move as one while maintaining a constant orientation relative to each other. This is to be contrasted with canister and upright vacuum cleaners, whose weight is typically supported by a surface (e.g. a floor) during use.

[00193] As exemplified in Figures 1 to 7, surface cleaning apparatus 1000 includes a main body 1010 having a housing 1011 and a handle 1020, an air treatment member 1100 connected to the main body 1010, a dirty air inlet 1030, a clean air outlet 1040, and an air flow path extending between the dirty air inlet and the clean air outlet.

[00194] Surface cleaning apparatus 1000 has a front end 1002, a rear end 1004, an upper end or top 1006, and a lower end or bottom 1008. In the embodiment shown, dirty air inlet 1030 is at an upper portion of the front end 1102 and clean air outlet 1040 is at rearward portion of the lower end 1008. It will be appreciated that the dirty air inlet 1030 and the clean air outlet 1040 may be provided in different locations.

[00195] A suction motor 1200 (see e.g. Figure 10) is provided to generate vacuum suction through the air flow path, and is positioned within a motor housing 1210. In the illustrated embodiment, the suction motor is positioned downstream from the air treatment member, although it may be positioned upstream of the air treatment member (e.g., a dirty air motor) in alternative embodiments.

[00196] Air treatment member 1100 is configured to remove particles of dirt and other debris from the air flow and/or otherwise treat the air flow. In the illustrated example, air treatment member 1100 includes a cyclone assembly having a single cyclonic cleaning stage with a single cyclone chamber 1110 and a dirt collection region 1122 external to the cyclone chamber. The cyclone chamber 1110 and dirt collection region 1122 may be of any configuration suitable for separating dirt from an air stream and collecting the separated dirt, respectively.

[00197] The cyclone chamber 1110 may be oriented in any direction. For example, when surface cleaning apparatus 1000 is oriented with the upper end 1106 above the lower end 1108, e.g. positioned generally parallel to a horizontal

surface, a central axis or axis of rotation 1115 of the cyclone chamber 1110 may be oriented horizontally, as exemplified in Figure 10. In alternative embodiments, the cyclone chamber may be oriented vertically, or at any angle between horizontal and vertical.

[00198] In alternative embodiments, the cyclone assembly may include two or more cyclonic cleaning stages arranged in series with each other. Each cyclonic cleaning stage may include one or more cyclone chambers (arranged in parallel or series with each other) and one or more dirt collection chambers, of any suitable configuration. The dirt collection chamber or chambers may be external to the cyclone chambers, or may be internal the cyclone chamber and configured as a dirt collection area or region within the cyclone chamber. Alternatively, the air treatment member need not include a cyclonic cleaning stage, and can incorporate a bag, a porous physical filter media (such as foam or felt), or other air treating means.

[00199] As exemplified in Figure 10, hand vacuum cleaner 1000 may include a pre-motor filter housing 1310 provided in the air flow path downstream of the air treatment member 1100 and upstream of the suction motor 1200. Pre-motor filter housing 1310 may be of any suitable construction, including any of those exemplified herein. A pre-motor filter 1320 is positioned within the pre-motor filter housing 1310. Pre-motor filter 1320 may be formed from any suitable physical, porous filter media and having any suitable shape, including the examples disclosed herein with respect to a removable pre-motor filter assembly. For example, the pre-motor filter may be one or more of a foam filter, felt filter, HEPA filter, other physical filter media, electrostatic filter, and the like.

[00200] Optionally, the pre-motor filter housing 1310 may be openable (as described herein), and at least a portion of the sidewall 1316 (e.g. removable or otherwise openable door 1330) and/or one of the end walls 1312 or 1314 may be removable, openable, or otherwise re-configurable to provide access to the interior of the pre-motor filter housing 1310.

[00201] Positioning the pre-motor filter housing 1310 toward the top 1006 of the main body 1010 may help facilitate access to the pre-motor filter 1320 while the hand vacuum is resting on its base. For example, if the hand vacuum cleaner 1000 is rested upon a table or other such surface, an openable door 1330 of the pre-motor filter housing 1310 is provided at the upper end of the housing and is accessible to a user. A user could then open the pre-motor filter housing 1310 by removing or otherwise opening door 1330 while the hand vacuum 1000 rests on the table, to inspect or replace the pre-motor filter 1320, without having to use one hand to grasp the handle 1020 or otherwise support the hand vacuum.

[00202] As exemplified, hand vacuum cleaner 1000 may also include a post-motor filter 1420 provided in the air flow path downstream of the suction motor 1200 and upstream of the clean air outlet 1040. Post-motor filter 1420 may be formed from any suitable physical, porous filter media and having any suitable shape, including the examples disclosed herein. In alternative embodiments, the post-motor filter may be any suitable type of filter such as one or more of a foam filter, felt filter, HEPA filter, other physical filter media, electrostatic filter, and the like.

[00203] In the illustrated embodiment, the dirty air inlet 1030 of the hand vacuum cleaner 1000 is the inlet end 1032 of an inlet conduit 1036. Optionally, inlet end 1032 of the conduit 1036 can be used as a nozzle to directly clean a surface. The air inlet conduit 1036 is, in this example, a generally linear hollow member that extends along an inlet conduit axis 1035 that is oriented in a longitudinal forward/backward direction and is generally horizontal when hand vacuum cleaner 1000 is oriented with the upper end 1006 above the lower end 1008. Alternatively, or in addition to functioning as a nozzle, inlet conduit 1036 may be connected or directly connected to the downstream end of any suitable accessory tool such as a rigid air flow conduit (e.g., an above floor cleaning wand), a crevice tool, a mini brush, and the like. As shown, dirty air inlet 1030 is positioned forward of the air treatment member 1100, although this need not be

the case. As exemplified, the dirty air inlet 1030 is positioned above the cyclone chamber. Optionally, the dirty air inlet 1030 may be provided at an alternative location, such as in the front end wall 1160.

[00204] As exemplified in Figures 1, 2, 5, 6, and 7, an optional accessory power coupler 1050 may be provided adjacent to the inlet conduit 1036. Accessory power coupler 1050 includes a set of electrical connectors 1056 that can inter-engage with compatible electrical connectors on an accessory tool in order to provide an electrical connection between e.g. a power source of the hand vacuum and a motor or other electrical device of an accessory tool (e.g. a powered brush roller, a light source, and the like). While the illustrated accessory power coupler 1050 is a male connector (i.e. projecting outwardly from the main body 1010 of the hand vacuum cleaner 1000), in alternative embodiments it may be a female connector (i.e. recessed inwardly) or any other shape suitable for cooperatively engaging with corresponding connectors on an accessory tool or other attachment. As exemplified, the accessory power coupler 1050 may be positioned laterally to one side of the inlet conduit 1036. In other examples, the accessory power coupler 1050 may be located above or below the inlet conduit 1036.

[00205] As exemplified, power may be supplied to the suction motor and other electrical components of the hand vacuum cleaner from an onboard energy storage member which may include, for example, one or more batteries or other energy storage device. In the illustrated embodiment, the hand vacuum cleaner 1000 includes a removable battery pack 1500 provided between the handle 1020 and the air treatment member 1100. Battery pack 1500 is described in further detail herein. In alternative embodiments, a battery pack may not be provided and power may be supplied to the hand vacuum cleaner by an electrical cord connected to the hand vacuum cleaner (not shown) that can be connected to a standard wall electrical outlet.

[00206] Optionally, a forward surface of the handle 1020 and a rearward surface of the battery pack 1500 may cooperatively define a finger gap 1028 therebetween (see e.g. Figure 10). An advantage of this design is that the absence of an intervening portion of main housing 1010 between the handle and the energy storage member may facilitate a more compact overall size of hand vacuum 1000.

[00207] As exemplified, a power switch 1060 may be provided to selectively control the operation of the suction motor (e.g. either on/off or variable power levels or both), for example by establishing a power connection between the batteries and the suction motor. The power switch may be provided in any suitable configuration and location, including a button, rotary switch, sliding switch, trigger-type actuator and the like. As illustrated in Figure 4, power switch 1060 is in the form of a button located toward upper end of the rear end 1004 of the hand vacuum cleaner, above a hand grip portion 1026 of the handle 1020. In this position, a user may be able to access the button 1060 while holding the hand vacuum via the hand grip, e.g. with the thumb of the hand holding the handle, and/or with a digit of their other hand.

[00208] The power switch or an alternative controller may also be configured to control other aspects of the hand vacuum (brush motor on/off, etc.). Optionally, instead of being provided at an upper end of the handle, the power switch may be provided on the main body (such as on the motor housing or other suitable location).

[00209] As exemplified in Figure 4, an optional information display device 1070 may be provided to display one or more visual indications to a user. For example, the display device 1070 may provide a visual indication of: when suction motor is on; the current power level of the suction motor (if applicable); the current battery charge level; an estimated time until the battery charge will be depleted, and/or similar information. The display device 1070 may include one or more light sources (e.g. light emitting diodes (LEDs)), display screens (e.g. a

liquid crystal, an LED screen, an organic light emitting diode (OLED) screen, and the like. The screen, and associated electronics, may be used to display status information of one or more electrical components of the hand vacuum cleaner.

[00210] In the illustrated embodiment, the information display device is in the form of a display screen 1070 that is provided at the upper end 1022 of the handle 1020. A first display portion 1072 is configured to display an indication of whether the hand vacuum cleaner is in a floor cleaning mode or in a carpet cleaning mode (e.g. where power is being supplied to a brush roller of an accessory tool via electrical connectors 1056), and a second portion 1074 is configured to display an indication of a power mode of the suction motor (e.g. a regular power mode, a higher power mode, and/or a higher power 'burst' mode).

Air flow path through a hand vacuum cleaner

[00211] The following is a description of different features of an air flow path through a hand vacuum cleaner. These features may be used by themselves in any surface cleaning apparatus or in any combination or sub-combination with any other feature or features described herein. For example, any of the airflow configurations described herein may be used with any of the pre-motor filter assemblies, relative positioning of the suction motor and energy storage members, inclined battery packs, battery pack configurations, airflow cooling configurations, and other features described herein.

[00212] As exemplified, the air treatment member 1100 of the hand vacuum cleaner 1000 may optionally be a single cyclonic cleaning stage with unidirectional air flow or a 'uniflow' cyclone chamber 1110 (i.e. where the cyclone air inlet and cyclone air outlet are at opposite ends of the cyclone chamber). Referring primarily to Figures 9 and 10, hand vacuum cleaner 1000 includes a single cyclonic cleaning stage with a cyclone chamber 1110 that has a cyclone air inlet 1120 in fluid communication with the inlet conduit 1036, a cyclone air

outlet 1130, and a dirt outlet 1140 that is in communication with a dirt collection chamber 1122.

[00213] Optionally, the cyclone chamber 1110 may be generally horizontally oriented so that the cyclone air inlet 1120 is located toward the front end 1002 of the hand vacuum cleaner 1000, and the cyclone air outlet 1130 is spaced rearwardly behind the cyclone air inlet 1120, at a rear end 1114 of the cyclone chamber 1110. From the cyclone air outlet 1130, an upflow duct or conduit 1230 directs the airflow upwards to a pre-motor filter chamber 1318 that is vertically spaced from the cyclone chamber 1110. After passing through the pre-motor filter 1320, air may travel generally rearwardly from the pre-motor filter 1320 to an inlet end 1202 of the suction motor 1200. An advantage of this arrangement is that, by promoting air to travel in this manner, the need for air flow direction changes between an air outlet of the pre-motor filter and the suction motor may be reduced or eliminated, thereby reducing backpressure and/or air flow losses through this portion of the hand vacuum cleaner. An additional, or alternative, advantage of providing a pre-motor filter chamber 1318 that is vertically spaced from the cyclone chamber 1110 is that the need for air flow direction changes between a cyclone air outlet and the suction motor may be reduced, thereby reducing backpressure and/or air flow losses through this portion of the hand vacuum cleaner. For example, any airflow in a forward direction may take place within the pre-motor filter chamber or header 1318, as opposed to taking place in a (typically narrower) conduit that directs airflow in a direction opposite to the airflow through the dirty air inlet. An additional, or alternative, advantage of providing a pre-motor filter chamber 1318 that is vertically spaced from the cyclone chamber 1110, and optionally above the cyclone chamber 1110, is that the length (front to back) of the hand vacuum cleaner may be reduced, providing a more compact configuration.

[00214] Figures 1 to 34 exemplify one embodiment of a hand vacuum cleaner 1000 having a cyclone unit that includes a uniflow cyclone chamber 1110

and a dirt collection chamber 1122 that is positioned exterior to the cyclone chamber 1110 and is in communication with the dirt outlet 1140 to receive dirt and debris dis-entrained from a dirty air flow by the cyclone chamber 1110. In the illustrated example, the cyclone air inlet 1120 and dirt outlet 1140 are positioned toward opposing ends of the cyclone chamber 1110, and the cyclone air outlet 1130 is provided toward the same end as the dirt outlet 1140 (the rear end as illustrated). In this configuration, dirty air can enter at the front end of the cyclone chamber, while cleaner air and the separated dirt particles both exit the cyclone chamber at the opposing rear end.

[00215] In this embodiment, the cyclone chamber 1110 has a front end wall 1160 and an opposing rear end wall 1170 that is spaced apart from the front end wall along the cyclone axis 1115 about which air circulates within the cyclone chamber 1110 during operation of the hand vacuum cleaner. A cyclone chamber sidewall 1180 extends between the front and rear end walls 1160, 1170. In the illustrated example, when the hand vacuum is oriented with the upper end above the lower end, the cyclone axis 1115 is generally horizontal, and is closer to horizontal than vertical, e.g., ±20°, ±15°, ±10°, or ±5° from the horizontal. As exemplified, the cyclone axis 1115 is substantially parallel to, e.g. within ±20°, ±15°, ±10°, or ±5°, and vertically offset below the conduit axis 1035 of the air inlet conduit 1036, and the cyclone chamber 1110 and dirt collection chamber 1122 are both below the inlet conduit axis 1035. As illustrated in Figure 10, when the hand vacuum 1000 is horizontal (as illustrated), the pre-motor filter 1320 is vertically spaced from (e.g. above) the cyclone axis 1115, and the suction motor 1200 is positioned rearward of the pre-motor filter 1320, so that air travels generally rearwardly from the pre-motor filter to the suction motor.

[00216] In this embodiment, the cyclone air inlet 1120 is a tangential air inlet that, as exemplified, terminates at an aperture or port that is formed in cyclone sidewall 1180, optionally an upper portion 1182 of the cyclone sidewall

1180, adjacent the front end wall 1160. Optionally, the cyclone air inlet 1120 may be provided at an alternative location, such as in the front end wall 1160.

[00217] The cyclone air inlet 1120 is fluidly connected with the outlet end of the conduit 1036 via a corresponding air outlet aperture or port 1038 that may be provided in a lower portion of the air inlet conduit 1036. The cyclone air inlet 1120 may have any suitable arrangement and/or configuration, and in the illustrated example is configured as a tangential air inlet that is directly connected to the air outlet aperture 1038. Connecting the air inlet 1120 to the air outlet aperture 1038 in this manner may help reduce the need for additional conduits to fluidly connect the dirty air inlet 1030 to the cyclone chamber 1110, and may reduce or eliminate the need for additional bends or air flow direction changes between the dirty air inlet 1030 and the cyclone chamber 1110. Reducing the conduit length and number of bends may help reduce the backpressure and air flow losses within the air flow path.

[00218] Positioning the cyclone air inlet 1120 toward the front of the cyclone chamber 1110 may help facilitate a desired air flow configuration within the cyclone chamber 1110. For example, in this configuration the cyclone chamber 1110 itself functions as part of the air flow path that conveys air rearwardly from the front 1002 of the hand vacuum 1000, without the need for a separate fluid conduit.

[00219] In the illustrated example, cyclone air inlet 1120 is directly adjacent the front wall 1160. Alternatively, cyclone air inlet 1120 may be axially spaced from the front end wall 1160, and may be located at another location along the length of the cyclone chamber 1110. Preferably, cyclone air inlet 1120 is provided in the front half of the cyclone chamber 1110 (i.e. forward of the axial mid-point of the cyclone chamber sidewall 1080) in order to help reduce the distance between the dirty air inlet 1030 and the cyclone air inlet 1120.

[00220] As shown in Figure 10, the cyclone air outlet 1130 is provided in the rear end wall 1170 of the cyclone chamber 1110, and an axially extending vortex finder conduit 1136 extends from the rear end wall 1170 and is aligned with the cyclone air outlet 1130. Optionally, a mesh screen (not shown) may be positioned over some or all of the inlet apertures 1138 of the vortex finder conduit 1136 to help inhibit lint, hair, and other such debris from entering the vortex finder conduit 1136. Positioning the air outlet 1130 toward the rear end (and optionally in the rear end wall 1170) may help facilitate the desired air flow through the cyclone chamber 1110, such that air, while swirling, travels generally axially though the cyclone chamber 1110 from the front end wall 1160 toward the rear end wall 1170.

[00221] Positioning the air outlet 1130 in the rear end wall 1170 of the cyclone chamber 1110 may also help facilitate the air flow connection between the cyclone chamber 1110 and other downstream components in the hand vacuum, such as the pre-motor filter housing 1310 and suction motor housing 1210 described herein. In the illustrated embodiment the air outlet 1130 is provided in the rear end wall 1170 and is connected to the pre-motor filter housing 1310 through an upflow duct or conduit 1230. This may help simplify the air flow path and construction of the hand vacuum. Alternatively, the air flow path may include one or more additional conduits connected downstream from the cyclone air outlet.

[00222] In this arrangement, air travelling through the hand vacuum 1000 will travel generally rearwardly along the air inlet conduit 1036 (i.e. parallel to the conduit axis 1035 and then enter a tangential air inlet which essentially changes the direction of the air to travel generally downwardly through the cyclone air inlet 1120 (i.e. generally orthogonal to the cyclone axis 1115). The air can then circulate within the cyclone chamber 1110, and travel generally rearwardly toward the cyclone air outlet 1130, and ultimately exit the cyclone chamber 1110 via the cyclone air outlet 1130 while travelling through the vortex finder conduit

1136 in a rearward direction (i.e. generally parallel to the cyclone axis 1115). In this configuration, the air flow changes direction only once (and by only approximately 90° which may be accomplished by a tangential air inlet), between entering the dirty air inlet 1030 and exiting the cyclone air outlet 1130.

[00223] The cyclone dirt outlet 1140 may be of any suitable configuration, and in the illustrated embodiment is a slot 1140 that is provided in the cyclone chamber side wall 1180, toward the rear end wall 1170. The slot 1140 may extend around at least a portion of the perimeter of the cyclone side wall 1180, and may have any suitable length 1186 in the axial direction (see e.g. Figure 10). As exemplified, the slot may be provided only in a lower portion of the sidewall. Accordingly, when dirty air inlet 1030 faces downwardly during use, dirt will exit into an upper end of an external dirt collection chamber. Positioning the dirt collection chamber below the cyclone chamber, and not surrounding the cyclone chamber, reduces the width of the hand vacuum. While shown directly adjacent the rear end wall 1170, such that the slot 1140 is partially bounded by the cyclone side wall 1180 and the rear end wall 1170, the slot 1140 may be located at another location along the length of the cyclone side wall 1180, and need not be directly adjacent the rear end wall 1170. Alternatively, the dirt outlet 1140 may be provided toward the mid-point of the cyclone chamber sidewall 1180, or may be provided toward the front end wall 1160. While illustrated with a single dirt outlet 1140, the cyclone chamber 1110 may include two or more dirt outlets that are in communication with the same dirt collection chamber, or optionally with different dirt collection chambers.

[00224] Preferably, at least a portion of the air treatment member may be openable for emptying. For example, at least one end, and optionally both ends of the dirt collection chamber 1122 may be openable for emptying. Optionally, at least one end, and optionally both ends of the cyclone chamber 1110 may also be openable for emptying.

[00225] Referring primarily to Figures 9 and 10, the front end wall 1160 of the cyclone chamber 1110 and the front end wall 1126 of the dirt collection chamber 1122 are both provided by portions of an openable front door 1190 that covers the front end of the cyclone assembly. In this arrangement, opening the front door 1190 will concurrently open the front end walls 1160 and 1126 of the cyclone and dirt collection chambers 1110, 1122. In the illustrated example, a user may hold the hand vacuum 1000 via the handle 1020 with one hand and open the front door 1190 with the other hand. The front end wall 1160 of the cyclone chamber 1110 and the front end wall 1126 of the dirt collection chamber 1122 may be concurrently openable and may cover all of a substantial portion of the front end of the cyclone chamber and the dirt collection chamber. For example, the front end wall 1160 of the cyclone chamber 1110 and the front end wall 1126 of the dirt collection chamber 1122 may be a one piece assembly (i.e. they may be integrally formed).

[00226] The front door 1190 may be openably connected (e.g., pivotally openable or removably mounted) to the rest of the cyclone assembly using any suitable mechanism, including a hinge or other suitable device. Optionally, the front door 1190 may be secured in the closed position using any suitable type of locking mechanism, including a latch mechanism that may be released by a user. In the embodiment of Figures 1 to 34, the front door 1190 may be opened by pivoting it about a hinge assembly 1192 from a closed position (e.g. as shown in Figure 1) to an open position (e.g. as shown in Figure 6). The front door 1190 may be secured in the closed position by a friction fit when connected as illustrated in Figure 1, and/or by an assembly door lock 1194 or other suitable locking mechanism. Preferably, the assembly door lock may include at least one release actuator 1196 so that a user may unlock the assembly door lock, e.g. by depressing the actuator. The actuator for opening/ releasing the openable portion of the cyclone assembly may be provided on the cyclone assembly 1100 or on any other portion of the hand vacuum 1000 (such as the handle 1020).

[00227] In the embodiments described herein, the surface cleaning apparatus includes a pre-motor filter housing 1310 positioned in the air flow path between the cyclone chamber and the suction motor. It will be appreciated that in some embodiments, the pre-motor filter may be of any configuration and the direction of air flow through the pre-motor filter 1320 may be any particular direction.

[00228] Referring primarily to Figures 9 and 10, as exemplified, in some embodiments, the main body 1010 may be configured such that the suction motor housing 1210 is located rearward of the pre-motor filter housing 1310 and, preferably, axially aligned with the pre-motor filter housing 1310 such that air exiting the pre-motor filter may travel generally linearly to the suction motor. It will be appreciated that suction motor housing 1210 and pre-motor filter housing 1310 may be of any configuration.

[00229] As exemplified herein, the pre-motor filter 1320 may be configured as a generally cylindrical foam filter with a hollow, open interior, and is preferably part of a removable pre-motor filter assembly, as discussed elsewhere herein. The pre-motor filter 1320, which may be a foam filter, extends longitudinally along a filter axis 1325, which may be generally parallel with the suction motor axis of rotation and accordingly is exemplified as being generally horizontal in the illustrated embodiment. The interior, downstream surface of filter 1320 is in communication with the air outlet 1242 via an outlet conduit 1340 of the pre-motor filter assembly. An advantage of a cylindrical filter is that a relatively large upstream surface area may be provided in a small space. A further advantage of this configuration is that, if the suction motor housing 1210 is located rearward of, and generally axially aligned with, the pre-motor filter housing 1310, air exiting the pre-motor filter may travel rearwardly through the hollow interior and then travel rearwardly to the suction motor.

[00230] In the illustrated example, the pre-motor filter housing 1310 is positioned such that the pre-motor filter 1320 is vertically spaced from and

mostly, and optionally entirely, located above the cyclone axis 1115 and also above the cyclone chamber. Put another way, pre-motor filter 1320 mostly, and optionally entirely, overlies the cyclone chamber. In other embodiments, only a portion of the pre-motor filter may be above the cyclone axis 1115 and optionally also above the cyclone chamber.

[00231] Referring to Figure 10, in the illustrated example the pre-motor filter housing 1310 has forward and rear end walls 1312 and 1314, and a chamber sidewall 1316 defining a pre-motor filter chamber or plenum 1318. Optionally, the pre-motor filter is removable, such as proving a removable or otherwise openable door 1330. Door 1330 may extend between forward and rear end walls 1312 and 1314. The housing 1310 also has an air inlet 1234 that is connected downstream from the cyclone air outlet 1130 via upflow duct 1230, and an air outlet 1242 positioned in the rear end wall 1314. In the illustrated example, the housing air inlet 1234 is located toward the rear end of the housing 1310. To travel from the air inlet 1234 to the air outlet 1242, air passes through the pre-motor filter 1320 positioned within the chamber 1318.

[00232] As the pre-motor filter 1320 is positioned above the cyclone air outlet, air travels upwardly to the pre-motor filter chamber 1318. As exemplified herein, the pre-motor filter may be in the shape of a hollow cylinder which has a central axis that is generally parallel with the suction motor axis of rotation. An advantage of this configuration is that, after the air travels upwardly to the pre-motor filter chamber 1318, in order to try to balance the forces in the pre-motor filter chamber 1318, the air will tend to spread across the chamber. Therefore, without using a 90° bend to direct the air to the front part of the pre-motor filter, a plenum is used to distribute the air across the upstream surface of the pre-motor filter. In accordance with this configuration, air travels to the filter housing 1310 in a generally upward direction, where it disperses in the pre-motor filter chamber 1318 and circulates around and through the outer, upstream surface of filter

1320, and exits the housing air outlet 1242 in a generally rearward direction into the suction motor housing inlet end 1212.

[00233] In the illustrated example, the suction motor 1200 is generally horizontally oriented, such that the suction motor axis of rotation 1205 is generally horizontal (e.g., ±20°, ±15°, ±10°, or ±5° from horizontal) when the hand vacuum cleaner is positioned with the upper end above the lower end (as illustrated in Figure 10). In this arrangement, the suction motor axis 1205 is generally parallel to the cyclone axis 1115 and the pre-motor filter axis 1325.

[00234] In the example configuration illustrated in Figure 10, an inlet end 1202 of the suction motor 1200 faces towards a hollow interior of the pre-motor filter. In such a configuration, air may travel generally linearly from the pre-motor filter 1320 to the suction motor 1200. An absence of air flow direction changes between an air outlet of the pre-motor filter and the suction motor may reduce backpressure and/or air flow losses through this portion of the hand vacuum cleaner.

[00235] Also, positioning the suction motor at an upper end of a handle of the vacuum cleaner with the suction motor axis vertically displaced from the cyclone axis of rotation may facilitate the reduction of air flow conduit bends and/or air flow direction changes between a dirty air inlet and a clean air outlet, thereby reducing backpressure and/or air flow losses through the hand vacuum cleaner. Additionally, or alternatively, such a configuration may help provide a compact overall design of the hand vacuum cleaner without adversely affecting the hand feel and/or perceived balance of the hand vacuum.

[00236] It will be appreciated that the air may exit the hand vacuum cleaner via a grill located in an upper portion of the main body (e.g., via an air outlet provided in the rear end of the main body or a sidewall adjacent the rear end). Alternatively, air may exit through a lower portion of the main body. This may be achieved by conveying the air downwardly through the handle of the hand

vacuum cleaner. Accordingly, as exemplified, at least a portion of the air flow path between the dirty air inlet 1030 and the clean air outlet 1040 may flow through the handle 1020. This may help facilitate a variety of different air flow path configurations and clean air outlet 1040 locations. This may also allow at least some of the air being exhausted by the suction motor 1200 to flow over, and optionally help cool, operating components that are located in the handle. Examples of such components may include controllers, circuit boards, other internal electronics and the like. One example of such electronics can include a printed circuit board (PCB) provided to control optional information display device 1070 and/or power switch 1060.

[00237] In the illustrated embodiment, a handle air flow passage 1250 has an inlet end 1252 that is located toward the top 1022 of the handle downstream from the suction motor 1200, and an outlet end 1254 that is located toward the bottom 1024 of the handle. This may help channel the air through substantially the entire length of the hand grip portion 1026 of the handle 1020.

[00238] As exemplified, the air exhausted from the suction motor 1200 is routed through the handle, and the clean air outlet 1040 is provided in the form of a plurality of slots 1430 that are formed in the lower end 1024 of the handle. Air entering the inlet end 1252 is directed through the handle 1020 and exits via the slots 1430. In this example, the slots or grill 1430 are oriented such that air exiting the clear air outlet 1040 travels generally downwardly and rearwardly from the lower end 1024 of the handle 1020. It will be appreciated that the clean air outlet may be of any design and may be located anywhere in the lower portion of the hand vacuum cleaner.

[00239] Optionally, one or more post-motor filters may be placed in the air flow path between the suction motor 1200 and the clean air outlet 1040. The post-motor filter may be provided at the clean air outlet 1040. The post motor filter may be in an openable housing. For example, as exemplified, the clean air outlet 1040 may be an openable grill. Further, the openable access panel may

support the post-motor filter. For example, in the embodiment of Figures 1 to 34, a post-motor filter 1420 is supported by a removable tray 1410 that covers the lower end of the post-motor filter housing 1400 and provides the clean air outlet 1040 in the form of a grill. The illustrated post-motor filter 1420 is a physical foam media filter, but optionally the post-motor filters may be any suitable type of filter and may include one or more of foam filters, felt filters, HEPA filters, other physical filter media, electrostatic filters, and the like.

[00240] With references to Figures 23-27, removable tray 1410 includes a pair of rigid engaging projections 1440 provided on a front end 1412, and a pair of movable engaging projections 1450 extending upwardly from a rear end 1414 and resiliently biased towards the rear end. To separate the tray from the main body 1010, actuating (e.g. depressing) button 1460 results in forward movement of the movable engaging projections 1450, resulting in their disengagement from corresponding recesses 1455 in the main body, allowing the rearward end 1414 of tray 1410 to be pivoted downwardly from handle 1020. Once tray 1410 has been so pivoted, it may be translated rearwardly to remove engaging projections 1440 from corresponding recesses 1445 in the main body. To connect the tray 1410 to the main body 1010, the process may be generally reversed. That is, projections 1440 may be inserted into recesses 1445, and tray 1410 subsequently pivoted upwardly until engaging projections 1450 are secured in recesses 1455. It will be appreciated that any other constructions may be used to removably secure tray 1410 in position on the main body.

[00241] While the figures exemplify positioning the pre-motor filter and suction motor vertically spaced above the cyclone axis, it will be appreciated that the pre-motor filter and suction motor may alternatively be vertically spaced below the cyclone axis.

Removable pre-motor filter assembly

[00242] The following is a description of different features of a removable pre-motor filter assembly for a surface cleaning apparatus. These features may be used by themselves in any surface cleaning apparatus or in any combination or sub-combination with any other feature or features described herein. For example, any of the pre-motor filter configurations described herein may be used with any of the air flow paths, relative positioning of the suction motor and energy storage members, inclined battery packs, battery pack configurations, airflow cooling configurations, and other features described herein.

[00243] In accordance with this feature, the outlet conduit of the filter assembly may be inclined at an angle to the removal direction of the pre-motor filter assembly with the upper (or outermost) portion of the outlet conduit in the removal direction extending further in the downstream direction than the lower (or innermost) portion of the outlet conduit in the removal direction. The mating downstream conduit may be similarly oriented. An advantage of this configuration is that the downstream face of the pre-motor filter assembly (which may have a sealing gasket) may be placed on the upstream face of the downstream conduit (which may have a sealing gasket) instead of one face sliding across the other, which could damage one or both gaskets.

[00244] In accordance with this feature, as exemplified, the pre-motor filter 1320 of the hand vacuum cleaner 1000 is optionally part of a removable pre-motor filter assembly 1300. Figures 19 to 22 exemplify one embodiment of a removable pre-motor filter assembly 1300 that includes a generally cylindrical filter 1320 supported by a filter support member 1340. Filter support member 1340 has an outlet conduit 1342 for directing an air flow after it has passed through the filter 1320. In use, air flows from an outer or upstream side 1322 of the filter 1320, through the filter media and to an inner or downstream side 1324 of the filter 1320, and to the outlet conduit 1342.

[00245] Optionally, the outlet conduit 1342 generally faces an inlet end 1202 of suction motor 1200. Therefore, as exemplified, the filter support member 1340 may be generally horizontally oriented so that the pre-motor filter axis 1325 extends in a generally forwards/rearwards direction (from front end 1321 to rear end 1323 of the pre-motor filter assembly) when the hand vacuum cleaner 1000 is oriented with the upper end above the lower end, and the outlet conduit 1342 faces generally rearwardly, and optionally directly faces an inlet end 1202 of suction motor 1200. From the outlet conduit 1342, a treated air conduit 1246 directs the airflow rearwards to an inlet end 1202 of suction motor 1200 that is horizontally spaced from the pre-motor filter 1320.

[00246] As illustrated in Figures 19 to 22, filter support member 1340 has a main body portion 1350 that is located in a hollow interior of the generally cylindrical filter 1320. In the illustrated embodiment, an outer surface of main body portion 1350 is flush with a downstream or inner surface 1324 of filter 1320, and the downstream surface 1324 is in air flow communication with an internal filter conduit 1356. More specifically, in the illustrated example a plurality of apertures 1351 define a porous portion of the filter support member 1340 between a first end 1352 and a second end 1354 of the main body portion 1350. It will be appreciated that more or fewer apertures may be provided in alternative embodiments. Accordingly, if filter 1320 is sealed to or seats securely on body portion 1350, air will be inhibited from travelling between the outer surface of main body portion 1350 and the inner surface 1324 of filter 1320 and thereby inhibited from bypassing the filter media.

[00247] The outlet conduit 1342 extends from the second end 1354 of the main body portion 1350. The second or opposed end 1352 of the main body portion 1350 may be sealed to or may seat securely on the second end 1354 of the main body portion 1350 to inhibit and preferably prevent air from exiting the internal filter conduit 1356 from the second end, so that substantially and

preferably all of the air that exits the downstream side 1324 of the pre-motor filter 1320 is directed through outlet conduit 1342.

[00248] In order to inhibit or prevent air exiting through the front end of the internal filter conduit 1356, the front end of the main body portion 1350 may be closed. As exemplified, an end wall 1362 is provided to cap the opposed end 1352 of the main body portion 1350. Optionally, end wall 1362 has an outwardly projecting portion 1363 to facilitate positioning the pre-motor filter assembly 1300 in a surface cleaning apparatus, as discussed further below.

[00249] Optionally, flanges or other sealing members may be provided at one or both ends of the main body portion 1350 to inhibit or prevent airflow from flowing between pre-motor filter 1320 and filter support member 1340 and to the internal filter conduit 1356, e.g. effectively bypassing the pre-motor filter. In the illustrated example, a circumferential bypass flange 1358 is provided at the second end 1354 of the main body portion 1350.

[00250] The pre-motor filter assembly may be seated in position in the pre-motor filter housing by any means known in the art. As exemplified, one or more alignment or seating members may be provided on one or both of the front and rear ends 1321, 1323 of the pre-motor filter assembly.

[00251] In the illustrated example, a pair of alignment flanges 1370 extend from an axially longer (outermost) side of outlet conduit 1342. Flanges 1370 may facilitate in the seating and/or alignment of pre-motor filter assembly 1300 within a pre-motor filter chamber. For example, in the illustrated example the flanges 1370 may be configured to act as camming surfaces with one or more projections from an internal surface of the openable door 1330 of the pre-motor filter chamber. As shown in Figure 18, openable door 1330 has an inwardly extending projection 1338 that has a width approximately equal to a radial distance between flanges 1370. In this arrangement, as openable door 1330 is closed, projection 1338 is configured to come into contact with both flanges

1370, thereby promoting a predetermined orientation of pre-motor filter assembly 1300 relative to the pre-motor filter housing 1310 as well as locating the outlet conduit to be aligned with the downstream air flow conduit.

[00252] Additionally, or alternatively, flanges 1370 may allow a user to grip and/or manipulate pre-motor filter assembly 1300 without having to come into contact with pre-motor filter 1320, which may become dirty during use.

[00253] Optionally, one or more support projections may be provided on one or both ends of pre-motor filter assembly 1300. In the illustrated example, a pair of support flanges 1372 extend from opposite lateral sides of outlet conduit 1342. Flanges 1372 may facilitate the support and/or alignment of pre-motor filter assembly 1300 within a pre-motor filter chamber. For example, in the illustrated example the flanges 1372 may be configured to rest on corresponding support surfaces provided at the rearward end of the pre-motor filter chamber. As shown in Figures 15-17, surfaces 1313 are formed in end wall 1344 of the pre-motor filter chamber 1318. Also, a surface 1311 is formed in the opposing end wall 1312. In this arrangement, as pre-motor filter assembly 1300 is lowered into the pre-motor filter chamber 1318, surfaces 1313 are configured to come into contact with and support flanges 1372, and surface 1311 is configured to come into contact with and support outwardly projecting portion 1363 of filter support member 1340, thereby promoting a predetermined vertical position and/or angle of pre-motor filter assembly 1300 relative to the pre-motor filter housing 1310.

[00254] In the illustrated embodiment, filter support member 1340 (including outlet conduit 1342, main body portion 1350, and end wall 1362) is a one piece assembly (e.g. integrally formed). In alternative embodiments, filter support member 1340 may be constructed from two or more parts.

[00255] While in the illustrated example the pre-motor filter 1320 and the filter support member 1340 are co-axial, this may not be the case in alternative embodiments.

[00256] As illustrated in Figure 22, a downstream or terminal end 1344 of the outlet conduit 1342 is at an angle 1357 to a direction of air flow through the outlet conduit (e.g. generally parallel to a central pre-motor filter axis 1325 and/or a central filter support member axis 1355). Outlet conduit 1342 mates with air conduit 1246, which provides the air outlet 1242 from pre-motor filter chamber 1318. As discussed subsequently, the inlet end of outlet conduit 1342 may be similarly angled.

[00257] An advantage of the terminal end of the outlet conduit being at an angle of to a direction through the outlet conduit is that the removable filter assembly may be positioned substantially flush against a downstream air conduit (e.g. a conduit that leads to a suction motor) having a similarly angled terminal end without requiring lateral movement of the outlet conduit towards other conduit. For example, the filter assembly may be moved in a direction substantially perpendicular to the direction of airflow (e.g., vertically upwardly in the orientation of Figure 11). Such an arrangement may, for example, facilitate the use of a gasket or other sealing member between the ends of the conduits to provide an improved seal between the conduits. For example, if the terminal end of the outlet conduit were perpendicular to a direction of airflow through the conduit, moving the filter assembly in a direction substantially perpendicular to the direction of airflow may shear or otherwise damage a flexible or otherwise deformable gasket (e.g. an elastomeric gasket or the like) provided at the end of the conduit to which the outlet conduit is to be aligned.

[00258] Alternatively, or additionally, such an arrangement may eliminate the need for a biasing or other retaining mechanism to exert a force on the filter assembly to maintain a seal between the conduits. For example, if the terminal end of the outlet conduit were perpendicular to a direction of airflow through the conduit, to avoid damaging a gasket or other sealing member between the conduit ends, at least the final motion to align the conduit ends may be in a direction parallel to a direction of airflow through the conduit. In such a situation,

it may be necessary to maintain the application of an axial force to the pre-motor filter assembly in order to maintain an adequate seal.

[00259] As illustrated in Figures 11 to 17, a terminal end 1241 of the treated air conduit 1246 may also be optionally provided at an angle 1257 (see Figure 11) to a direction of air flow through the treated air conduit 1246 that leads to the suction motor 1200. In the illustrated example, the angle 1257 is about the same as the angle 1357 between the direction of air flow through the outlet conduit 1342 of the pre-motor filter assembly and the terminal end 1344 of the outlet conduit 1342. This arrangement allows the outlet conduit 1342 and the treated air conduit 1246 to cooperatively define a generally linear air flow passage despite the angled terminal ends of the respective conduits.

[00260] Optionally, a gasket 1247 or other sealing member may be provided to help provide a substantially air tight seal between the terminal end 1344 of the outlet conduit 1342 and the terminal end 1241 of the treated air conduit 1246. In the illustrated example, the gasket 1247 has a generally consistent axial length about its perimeter, e.g. to facilitate a seal between the ends 1344, 1241 that are generally parallel to each other due to angles 1357, 1257 being about the same. Alternatively, gasket 1247 may have a variable axial length about its perimeter, e.g. to facilitate a seal where angles 1357, 1257 are different from each other (e.g. where ends 1344, 1241 are not parallel.

[00261] Another advantage of the terminal end of the outlet conduit and the inlet end of conduit 1246 being at an angle to a direction through the outlet conduit is that the outlet face of the pre-motor filter assembly may be placed onto the inlet or upstream face of conduit 1246 during insertion of the pre-motor filter assembly. Further, when door 1330 is placed in the closed position, the engagement of inwardly extending projection 1338 and flanges 1370 may apply sufficient pressure to seal the end face and inhibit leakage out of the air flow conduits.

[00262] Another advantage of the terminal end of the outlet conduit being at an angle of to a direction through the outlet conduit is that the removable filter assembly may only be positionable within the surface cleaning apparatus in a single pre-determined orientation. In other words, a user may only be able to mount to the pre-motor filter assembly in a single orientation relative to the surface cleaning apparatus. This may prevent, for example, the pre-motor filter from being installed e.g. upside-down from its designed orientation, or otherwise mis-aligned. Accordingly, an asymmetric pre-motor filter media may be provided without the risk of a user improperly positioning the filter within a surface cleaning apparatus.

[00263] It will be appreciated that some of the embodiments disclosed herein may not use any of the features of the pre-motor filter assembly disclosed herein and that, in those embodiments, a pre-motor filter of any kind known in the art may be used, or a pre-motor filter may not be provided.

Inclined battery pack

[00264] The following is a description of different features of a hand vacuum cleaner with an inclined battery pack. These features may be used by themselves in any surface cleaning apparatus or in any combination or sub-combination with any other feature or features described herein. For example, any of the battery pack configurations described herein may be used with any of the air flow paths, pre-motor filter assemblies, relative positioning of the suction motor and energy storage members, battery pack configurations, airflow cooling configurations, and other features described herein.

[00265] In accordance with this feature, an upper end of the battery pack may be inclined in a forward direction. Accordingly, the lower end of the battery pack may extend further rearwardly. If the dirt collection region is located adjacent a forward face of the battery pack, then the dirt collection region may

extend further rearwardly, thereby enabling a larger dirt collection region to be provided.

[00266] It will be appreciated that, in many embodiments, power may be supplied to the hand vacuum cleaner 1000 by an electrical cord connected to the hand vacuum (not shown) that can be connected to a standard wall electrical outlet. In such embodiments, the suction motor 1200 and other electronics may run on AC power supplied from a wall socket. In accordance with this feature, alternatively, or in addition to being powered by an electrical cord, the hand vacuum cleaner may include one or more onboard power sources. The power sources may be any suitable device, including, for example one or more batteries. Optionally, the batteries and battery packs may be rechargeable or may be replaceable, non-rechargeable batteries.

[00267] Battery pack 1500 may include any suitable number of cells 1510, and may include, for example, lithium ion battery cells. Any number of cells may be used to create a power source having a desired voltage and current, and any type of battery may be used, including NiMH, alkaline, and the like. Battery pack 1500 may be of any known design and may be electrically connected to the hand vacuum cleaner by any means known in the art.

[00268] Figures 32 to 34 exemplify a battery pack 1500. As exemplified, battery pack 1500 has an upper end 1506, a lower end 1508, a front face 1502, and a rear face 1504. In the illustrated example, battery pack 1500 is generally rectangular, but alternative embodiments may have any suitable shape.

[00269] In the illustrated examples, battery pack 1500 has a power coupling 1540 for supplying power (e.g. charging) the cells 1510. Any suitable power coupling may be used, for example, a female coupling configured to receive a male coupling of an electrical cord that is connectable to a source of AC or DC power, such as a household power socket. Optionally, power coupling 1540 is accessible when the battery pack 1500 is electrically connected to hand vacuum

cleaner 1000. An advantage of such a configuration is that the battery pack may be charged without removing it from the hand vacuum cleaner 1000. Another advantage is that it may allow for corded operation of hand vacuum cleaner 1000 when the power cells 1510 are substantially or completely discharged, as power may be supplied to the suction motor via power coupling 1540 instead of (or while) charging the cells 1510.

[00270] Optionally, the battery pack 1500 may be removable from the rest of the hand vacuum using any mechanism known in the art. Referring to Figures 28 and 29, the illustrated example battery pack 1500 is configured to be removable by sliding the battery pack downward through an aperture 1590 (see Figure 31) provided in the lower end 1008 of hand vacuum 1000. Optionally, one or more guiding features may be provided on one or both of the hand vacuum 1000 and the battery pack 1500. As illustrated in Figure 33, a pair of longitudinal ridges 1520 is provided on the front face 1502 of battery pack 1500. Ridges 1520 are configured to be slidably received in corresponding grooves 1525 on an inner face of aperture 1590 (see Figure 29). Ridges 1520 and grooves 1525 thus cooperatively assist in aligning the battery pack as is it moved upwardly into and/or downwardly out of aperture 1590.

[00271] In the illustrated embodiment, the upper end 1506 of the battery pack 1500 is provided with a plurality of electrical connectors 1530 that can inter-engage with compatible electrical connectors 1580 on the main body 1010 (see e.g. Figure 29). Engagement between the electrical connectors 1530 and 1580 can provide an electrical connection between the batteries 1510 and the suction motor 1200, and optionally other electronics, such as display device 1070. In this arrangement, removing the battery pack 1500 interrupts the supply of power to the suction motor 1200, and the suction motor 1200 is not operable when the battery pack 1500 is detached. It will be appreciated that electrical connectors 1530 may be located elsewhere on the battery pack.

[00272] The battery pack 1500 can be secured to the rest of the main body 1010 using any suitable attachment mechanism, including mechanical latches, retention catches, or any other mechanism attachment structure capable of being released to disengage and remove the battery pack. Optionally, one or more actuators for releasing the attachment mechanism may be provided on the main body 1010 (and remain with the main body when the battery pack is removed), or alternatively may be provided on the battery pack 1500 such that the actuator is removable with the battery.

[00273] Referring to Figures 9 and 33, in the illustrated example battery pack 1500 is configured to be releasably secured to hand vacuum 1000 using a single latch at the lower end 1506. The latch can be released by pressing the release actuator that is provided in the form of button 1550. Pressing rearwardly on the button 1550 results in a disengagement of a tab 1552 from a corresponding retaining surface 1523 provided proximate to and facing towards aperture 1590. The button 1550 is mounted to the lower end 1506 of battery pack 1500, and is removable with the battery pack.

[00274] Alternatively, a release actuator may be provided on the main body 1010 of the hand vacuum cleaner, and a corresponding retaining surface may be provided on the battery pack 1500. For example, in the example illustrated in Figure 36, a retaining surface 1523 is provided on a rear face 1504 of battery pack 1500, and is removable with the battery pack. A release actuator that is provided in the form of button 1550 is positioned on the main body 1010 of hand vacuum 1000. Pressing forwardly on the button 1550 results in a pivoting and disengagement of a tab 1552 from retaining surface 1523.

[00275] Optionally, the battery pack 1500 may be configured so that it can be connected to one or more other devices/apparatuses, in addition to the hand vacuum 1000. For example, the same battery pack 1500 that is used with the hand vacuum could be connectable to another vacuum, power tool, cleaning device (such as a mop, steam cleaner, carpet extractor, etc.) or any other

suitable device to power the other device(s) that the battery pack can be connected to.

[00276] Optionally, the battery pack 1500 may have one or more output devices to e.g. provide an indication of a status of the battery pack and/or of one or more of the individual battery cells 1510. For example, one or more visual indicators such as LEDs and/or an audio output device such as a speaker may be provided. In the example illustrated in Figure 32, a number of LEDs 1560 are provided along an edge between a rear face 1504 and a side face of the battery pack 1500. An advantage of positioning the output devices along an edge of the battery pack is that the indicators may be visible from a greater range of relative orientations than if they were positioned on a single face of the battery pack.

[00277] As illustrated in Figure 4, another advantage of positioning the LEDs 1560a-1560c proximate a side edge of a rear face 1504 is that they may be more readily visible to a user holding the hand vacuum cleaner 1000 in front of them. Accordingly, a user may be able to see the LEDs 1560a-1560c while using the hand vacuum without having to re-orient the hand vacuum cleaner from a typical in-use position.

[00278] As discussed above, battery pack 1500 may include any suitable number of individual battery cells 1510. In example illustrated in Figure 34, battery pack 1500 contains 7 cells 1510a-1510g. Each cell 1510 is generally cylindrical, and the cells are arranged in a generally linear configuration (in a column) along the height of battery pack 1500. More specifically, cells 1510a to 1510f are arranged with their central longitudinal axes positioned along a battery pack axis 1505 that in the illustrated example is parallel to a front wall 1501 of the battery pack 1500, and cell 1510g is positioned with its central longitudinal axis offset rearwardly from axis 1505.

[00279] As shown in Figure 10, in the illustrated example battery pack 1500 extends upwardly and forwardly when the upper end of the hand vacuum cleaner

is positioned above the lower end of the hand vacuum cleaner. For example, battery pack axis 1505 is at an angle 1507 to the horizontal when the inlet conduit axis 1035, cyclone axis 1115, filter axis 1325, and/or suction motor axis 1205 is generally horizontally oriented. For example, battery pack axis 1505 may be generally parallel to a handle axis 1025 (see Figure 31).

[00280] Also, in the configuration shown in Figure 10, a portion 1123 of the dirt collection chamber 1122 adjacent the rear end wall 1124 of the chamber 1122 is located below a portion of the battery pack 1500. An advantage of this design (i.e. providing at least some vertical overlap between an energy storage member and a dirt collection region) is that it may help provide a relatively larger dirt chamber capacity while helping to reduce the overall size of the hand vacuum 1000.

[00281] In the illustrated example, the rear end wall 1124 of the dirt collection chamber 1122 is at an angle to the vertical. As shown, rear end wall 1124 is generally parallel to the front wall 1501 of the battery pack 1500 and to the battery pack axis 1505, although in alternative embodiments they may not be parallel.

[00282] Also, when the inlet conduit axis 1035, cyclone axis 1115, filter axis 1325, and/or suction motor axis 1205 is generally horizontally oriented, a lower end of the front face 1502 is positioned rearward of an upper portion of the front face 1502.

[00283] It will be appreciated that the dirt collection region may be of various shapes which occupies some or all of the additional volume created by orienting the battery pack 1500 such that the lower end extends further rearwardly.

[00284] It will be appreciated that some of the embodiments disclosed herein may not use the inclined energy storage members as disclosed herein

and that, in those embodiments, any suitable positioning of the energy storage members, if provided, may be used.

Positioning of suction motor and energy storage member

[00285] The following is a description of different features of a hand vacuum cleaner with a suction motor positioned an upper end of a forwardly-inclined handle and rearward of at least some of the energy storage members. These features may be used by themselves in any surface cleaning apparatus or in any combination or sub-combination with any other feature or features described herein. For example, any of the relative positioning of the suction motor and energy storage members described herein may be used with any of the air flow paths, pre-motor filter assemblies, inclined battery packs, battery pack configurations, airflow cooling configurations, and other features described herein.

[00286] In accordance with this feature, the batteries and the suction motor may be positioned so as to reduce the torque experienced by a user operating the hand vacuum cleaner. For example, by positioning a suction motor at or rearward of an upper end of a forwardly-inclined handle and rearward of at least some of the energy storage members, the weight of the suction motor may partially counterbalance the weight of the batteries.

[00287] As previously discussed, in some embodiments, batteries used to power the hand vacuum cleaner 1000 may be provided at a single location, for example as one large battery pack 1500 that may include any suitable number of cells 1510, and may include, for example, lithium ion battery cells.

[00288] Optionally, a battery pack 1500 may be positioned such that some or all of the battery cells 1510 are positioned forward of a suction motor. In this configuration, the distribution of the weight of the battery pack 1500 and the weight of the suction motor 1200 may affect the hand feel and/or perceived balance of the hand vacuum 1000.

[00289] In the example illustrated in Figure 10, suction motor 1200 is positioned rearward of cells 1510a, 1510b, 1510c, 1510d, and 1510e of battery pack 1500. In the example illustrated in Figure 43, suction motor 1200 is positioned rearward of cells 1510a, 1510b, 1510d, 1510e, and 1510g of battery pack 1500. In the examples illustrated in Figures 36, 40, and 47, all of cells 1510a-1510f are positioned forward of the suction motor 1200.

[00290] Suction motor 1200 is preferably positioned at the upper end of a forwardly inclined handle 1020, as shown in the illustrated embodiments, although it may alternatively be positioned rearward of the upper end of the handle or at the lower end or at a mid-point of a handle. Additionally, or alternatively, the handle 1020 may be generally vertical or may be rearwardly inclined.

[00291] Optionally, a battery pack 1500 may be positioned such that a volume defined by the battery cells 1510 is positioned such that an axis of rotation 1115 of a cyclone chamber 1110 may intersect such a volume when the battery pack is secured to the main body 1010. For example, the cyclone chamber 1110 may be oriented horizontally, and the battery pack 1500 may be positioned rearward of the cyclone chamber. An advantage of such a configuration is that it may facilitate a more compact design of hand vacuum 1000.

[00292] It will be appreciated that some of the embodiments disclosed herein may not use the relative positioning of the suction motor, handle, and energy storage members as disclosed herein and that, in those embodiments, any suitable design may be used.

Nested energy storage members

[00293] The following is a description of different features of a hand vacuum cleaner having an energy storage member (e.g. a battery pack that includes one or more battery cells) that is positioned rearward of a dirt collection region and at

least partially underlies at least a portion of one or both of a cyclone chamber and a pre-motor filter. These features may be used by themselves in any surface cleaning apparatus or in any combination or sub-combination with any other feature or features described herein. For example, any of the battery pack configurations described herein may be used with any of the air flow paths, pre-motor filter assemblies, relative positioning of the suction motor and energy storage members, inclined battery packs, airflow cooling configurations, and other features described herein.

[00294] In accordance with this feature, the some or all of a battery pack may be located beneath some or all of a cyclone chamber and/or a pre-motor filter. For example, the dirt collection region may be configured to enable the battery pack to nest or partially nest therein. Accordingly, the overall length of the hand vacuum cleaner (in the forward/rearward direction) may be reduced, thereby providing a more compact hand vacuum cleaner.

[00295] As previously discussed, in some embodiments, batteries used to power the hand vacuum cleaner 1000 may be provided at a single location, for example as one large battery pack 1500 that may include any suitable number of cells 1510, and may include, for example, lithium ion battery cells.

[00296] Optionally, a battery pack 1500 may be positioned such that at least a portion of the battery pack 1500 is nested vertically spaced from a dirt collection region 1122. For example, at least a portion of the battery pack 1500 may underlie at least a portion of one or both of a cyclone chamber 1110 and a pre-motor filter 1320. In such a configuration, the overall size or length of the hand vacuum 1000 may be reduced.

[00297] For example, as illustrated in the embodiment of Figures 36 and 40, as well as the embodiment of Figure 43, a battery pack 1500 is positioned rearward of a dirt collection region 1122, and the entire battery pack 1500 is below a rearward portion of a pre-motor filter 1320.

[00298] In the example illustrated in Figures 47, a battery pack 1500 is positioned rearward of a dirt collection region 1122, and below a rearward portion of the cyclone chamber and below the pre-motor filter.

[00299] As discussed previously, battery pack 1500 may include any suitable number of individual battery cells, and the individual cells may be arranged in any suitable configuration. For example, some of the energy storage members (i.e. individual battery cells 1510) may be arranged one above another and some may be arranged one behind another, e.g. within a single battery pack 1500. For example, the energy storage members within a battery pack may be arranged in at least two columns in the forward/rearward direction. Accordingly, the battery pack may have a reduced height so as to assist in nesting the battery pack under a pre-motor filter and/or a cyclone chamber. An advantage of such configurations is that they may help provide a compact overall design without adversely affecting the hand feel and/or perceived balance of the hand vacuum.

[00300] As illustrated in Figure 47, cells 1510a-1510g are arranged generally in two linear columns of cells. Specifically, cells 1510a, 1510c, 1510e, and 1510g are arranged in a first generally vertical column along a column axis 1505a that in the illustrated example is adjacent and generally parallel to a front wall 1501 of the battery pack 1500, and cells 1510b, 1510d, and 1510f are arranged in a second generally vertical column along a column axis 1505b that in the illustrated example is adjacent and generally parallel to a rear wall 1503 of the battery pack 1500.

[00301] As illustrated in Figure 43, cells 1510a-1510g are arranged generally in three linear columns of cells. Specifically, cells 1510b and 1510e are arranged in a first generally vertical column along a column axis 1505a that in the illustrated example is adjacent and generally parallel to a front wall of the battery pack 1500, cells 1510a, 1510d, and 1510g are arranged in a second generally vertical column along a column axis 1505b positioned rearward of and generally parallel to column axis 1505a, and cells 1510c and 1510f are arranged in a third

generally vertical column along a column axis 1505c positioned rearward of and generally parallel to column axis 1505b.

[00302] It will be appreciated that some of the embodiments disclosed herein may not use the nested energy storage members as disclosed herein and that, in those embodiments, any suitable positioning of the energy storage members, if provided, may be used.

Airflow cooling of an energy storage chamber

[00303] The following is a description of different features of a hand vacuum cleaner having an airflow path in which air exiting a cyclone chamber impinges on a wall of an energy storage chamber. These features may be used by themselves in any surface cleaning apparatus or in any combination or sub-combination with any other feature or features described herein. For example, any of the airflow configurations described herein may be used with any of the air flow paths, pre-motor filter assemblies, relative positioning of the suction motor and energy storage members, inclined battery packs, battery pack configurations, and other features described herein.

[00304] Optionally, at least a portion of an air flow path between the dirty air inlet 1030 and the clean air outlet 1040 may be directed against a wall of an energy storage chamber. For example, a cyclone air outlet may face a wall of an energy storage chamber, whereby air exiting the cyclone chamber impinges on the energy storage chamber wall. In such a configuration, an airflow generated by suction motor 1200 flowing against and/or over such a wall may help cool one or more energy storage members positioned within the energy storage chamber. For example, energy storage members may include chemical batteries, such as lithium-ion batteries, that produce heat while being discharged (e.g. while supplying power to the hand vacuum 1000). By directing a stream of air directly at, or at an angle to, a wall of a battery chamber, any boundary layer of air (which

may act as an insulator) or laminar flow along a wall of a battery chamber is disrupted, thereby enabling enhanced cooling.

[00305] It will be appreciated that the battery pack may be provided in a chamber that receives a battery pack. Accordingly, there may be two walls between the impinging air stream and the batteries, i.e., a wall of the battery pack and a wall of the chamber in which the batter pack is received. Provided the walls contact each other or are adjacent, the impinging air stream will provide a cooling effect.

[00306] For example, in the examples illustrated in Figures 36 and 40, cyclone air outlet 1130 faces a rear wall 1236 of the upflow duct or conduit 1230 that directs air upwardly towards a pre-motor filter 1320. In these embodiments, rear wall 1236 is also a front wall of a recess in which battery pack 1500 is positioned. That is, rear wall 1236 is a wall of an energy storage chamber in which one or more energy storage members (e.g. individual cells 1510 and/or a battery pack 1500 containing a plurality of cells 1510) are positioned.

[00307] It will be appreciated that some of the embodiments disclosed herein may not use the airflow cooling of an energy storage member as disclosed herein and that, in those embodiments, any suitable airflow design may be used.

[00308] As used herein, the wording “and/or” is intended to represent an inclusive - or. That is, “X and/or Y” is intended to mean X or Y or both, for example. As a further example, “X, Y, and/or Z” is intended to mean X or Y or Z or any combination thereof.

[00309] While the above description describes features of example embodiments, it will be appreciated that some features and/or functions of the described embodiments are susceptible to modification without departing from the spirit and principles of operation of the described embodiments. For example, the various characteristics which are described by means of the represented embodiments or examples may be selectively combined with each other.

Accordingly, what has been described above is intended to be illustrative of the claimed concept and non-limiting. It will be understood by persons skilled in the art that other variants and modifications may be made without departing from the scope of the invention as defined in the claims appended hereto. The scope of the claims should not be limited by the preferred embodiments and examples, but should be given the broadest interpretation consistent with the description as a whole.

CLAIMS:

1. A hand vacuum cleaner having a front end, a rear end, an upper end, a lower end, and first and second laterally spaced apart sides, and comprising:

(a) an air flow path extending from a dirty air inlet to a clean air outlet;

(b) a cyclone chamber positioned in the air flow path and having a cyclone air inlet, a cyclone air outlet, and a cyclone axis of rotation;

(c) a suction motor positioned in the air flow path upstream of the clean air outlet; and,

(d) at least one energy storage member positioned in an energy storage chamber having an energy storage chamber wall wherein the cyclone air outlet faces the energy storage chamber wall whereby air exiting the cyclone chamber impinges on the energy storage chamber wall.

2. The hand vacuum cleaner of claim 1 wherein the cyclone axis of rotation extends generally in a forward/rearward direction.

3. The hand vacuum cleaner of claim 1 wherein the at least one energy storage member comprises a plurality of energy storage members wherein at least some of the plurality of energy storage members are arranged one above another in a generally upwardly extending configuration when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner.

4. The hand vacuum cleaner of claim 3 wherein the energy storage members arranged one above another comprise longitudinally extending members each having a longitudinal axis that extends laterally.

5. The hand vacuum cleaner of claim 3 wherein the cyclone axis of rotation intersects a volume defined by the generally upwardly extending configuration of energy storage members.

6. The hand vacuum cleaner of claim 5 wherein the cyclone axis of rotation extends generally in a forward/rearward direction.

7. The hand vacuum cleaner of claim 1 wherein the at least one energy storage member is removably receivable in the energy storage chamber.

8. The hand vacuum cleaner of claim 7 wherein the at least one energy storage member comprises a battery pack that is removably receivable in the energy storage chamber.

9. The hand vacuum cleaner of claim 1 wherein the air flow path comprises a portion that extends from the cyclone air outlet to the suction motor and is defined in part by the energy storage chamber wall.

10 The hand vacuum cleaner of claim 9 wherein the portion of the air flow path extends generally upwardly from the cyclone air outlet to the suction motor when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner.

11. The hand vacuum cleaner of claim 10 wherein the suction motor is positioned above the cyclone axis of rotation when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner.

12. The hand vacuum cleaner of claim 9 wherein the portion of the air flow path extends generally downwardly from the cyclone air outlet to the suction motor when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner.

13. The hand vacuum cleaner of claim 12 wherein the suction motor is positioned below the cyclone axis of rotation when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner.

14. The hand vacuum cleaner of claim 1 further comprising a handle having a hand grip portion that extends upwardly and forwardly when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner wherein the handle is positioned rearward of the at least one energy storage member.

15. The hand vacuum cleaner of claim 14 wherein the at least one energy storage member comprises a plurality of energy storage members wherein at least some of the plurality of energy storage members are arranged one above another in a generally upwardly extending configuration when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner.

16. The hand vacuum cleaner of claim 15 further comprising a finger gap positioned between the handle and the energy storage chamber.

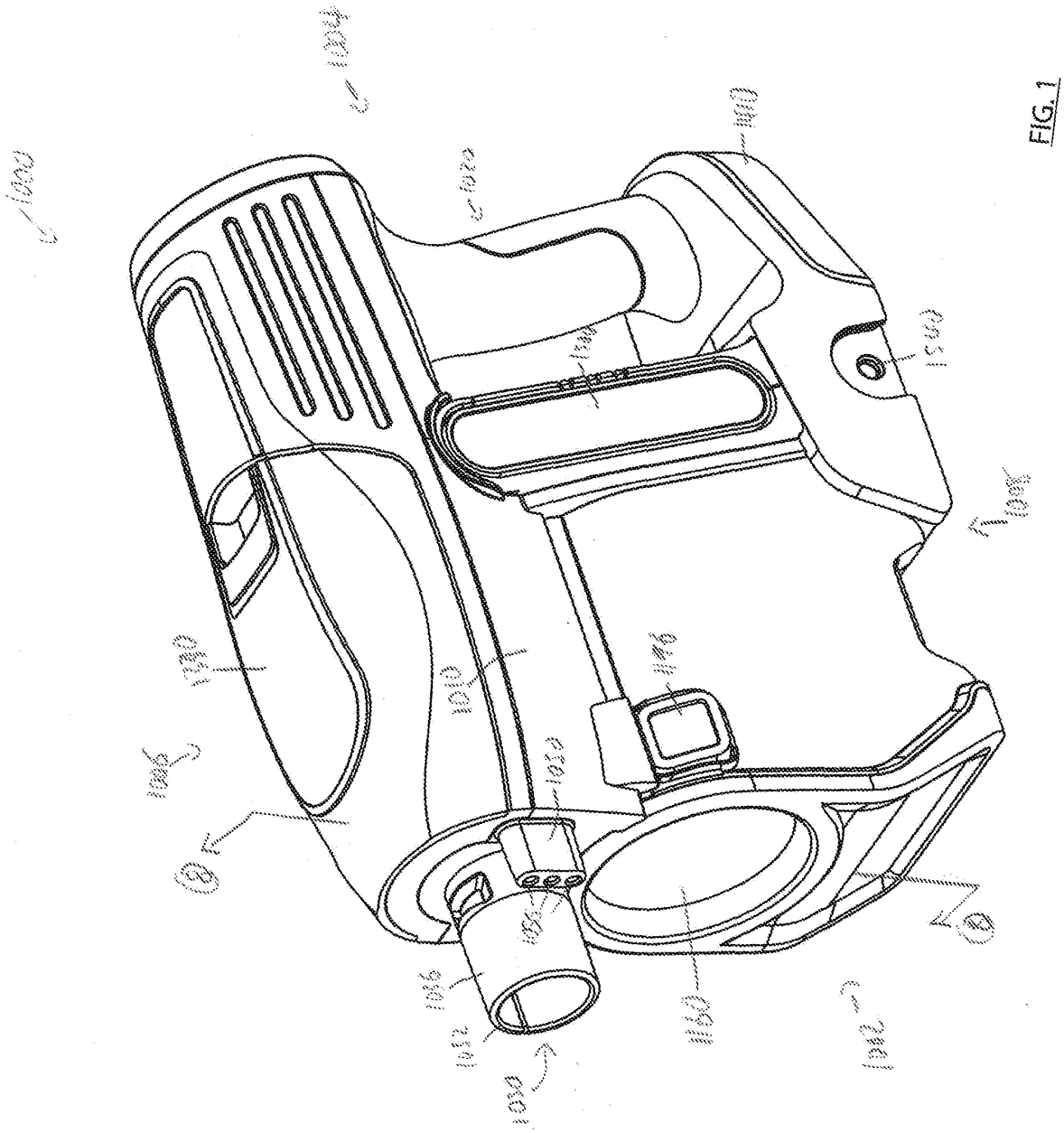

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FIG. 1

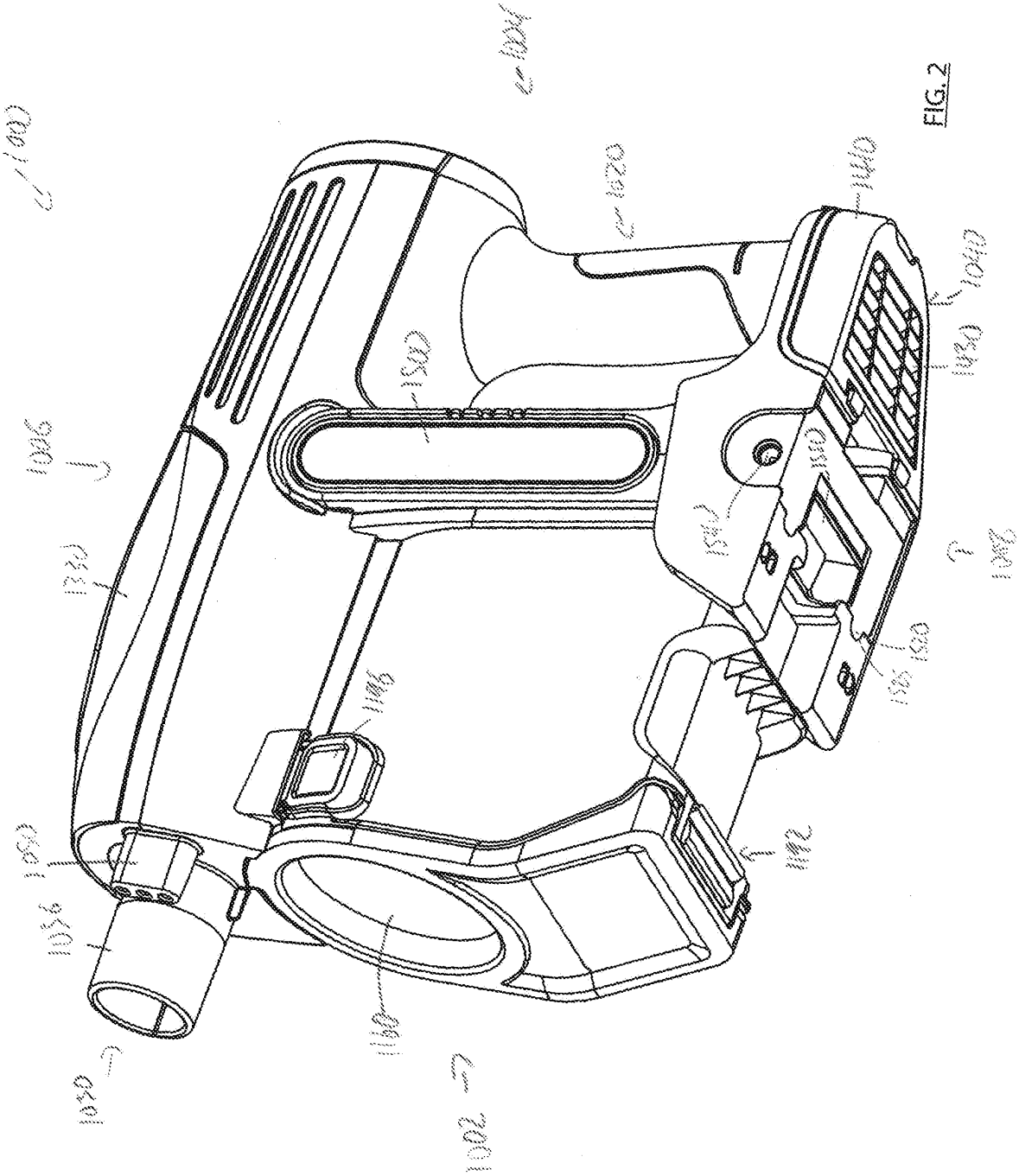

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FIG. 2

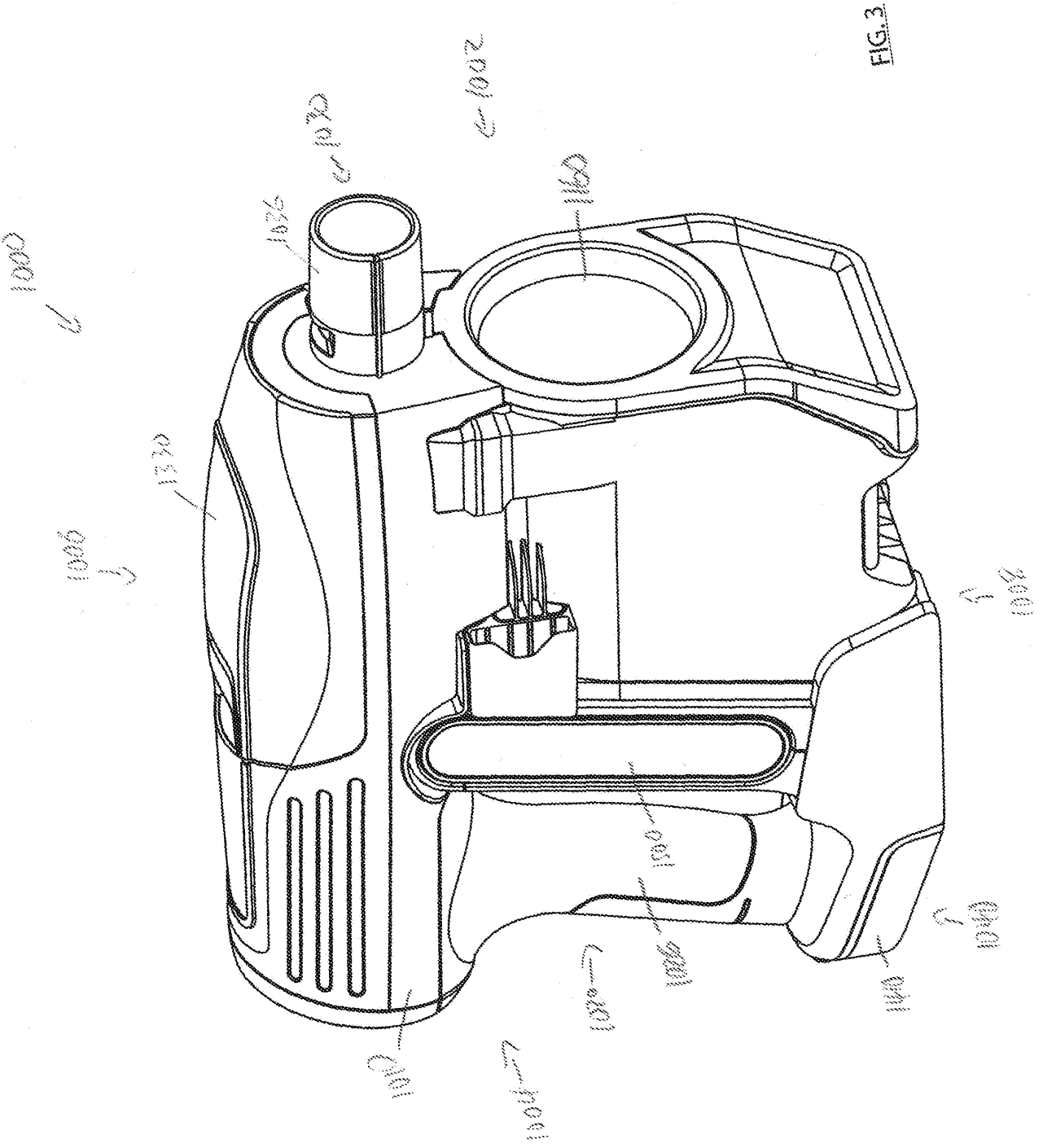

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FIG. 3

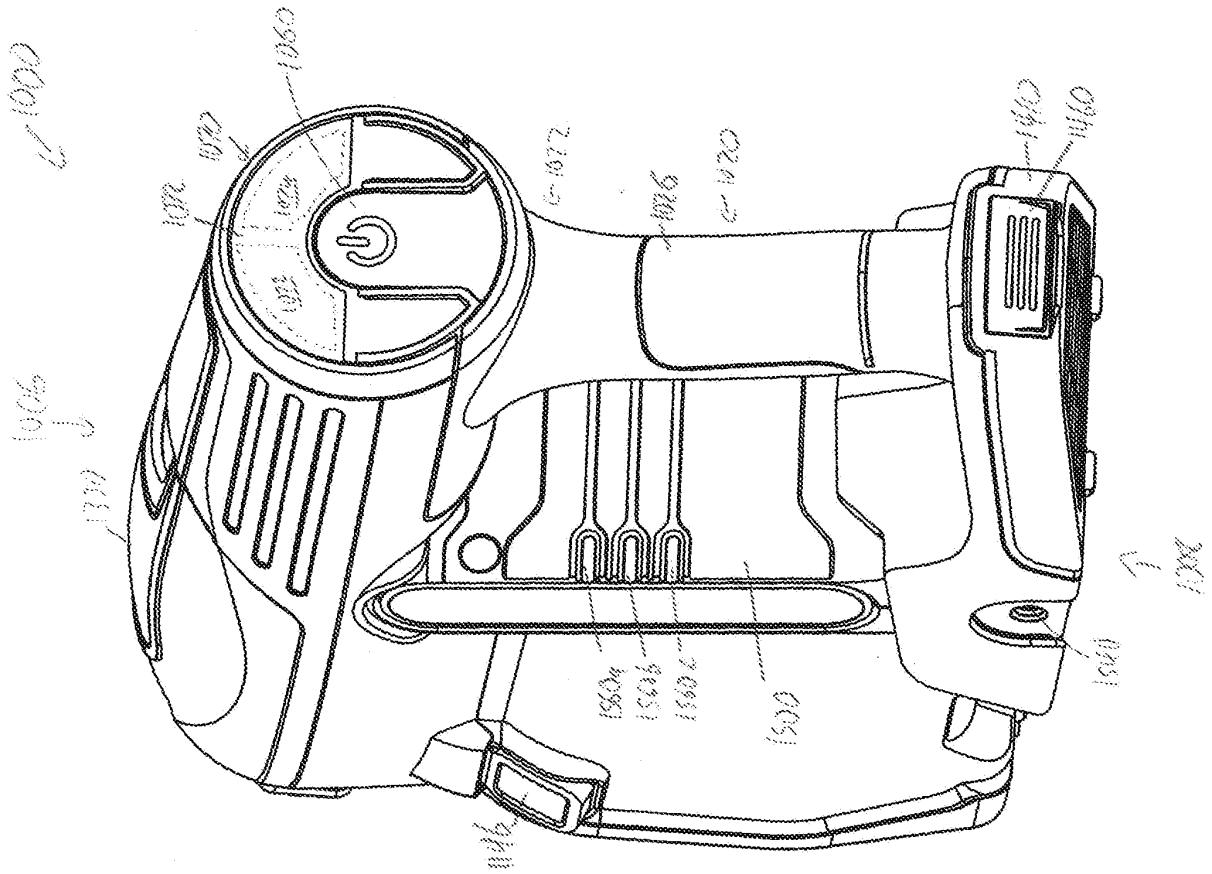

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FIG. 4

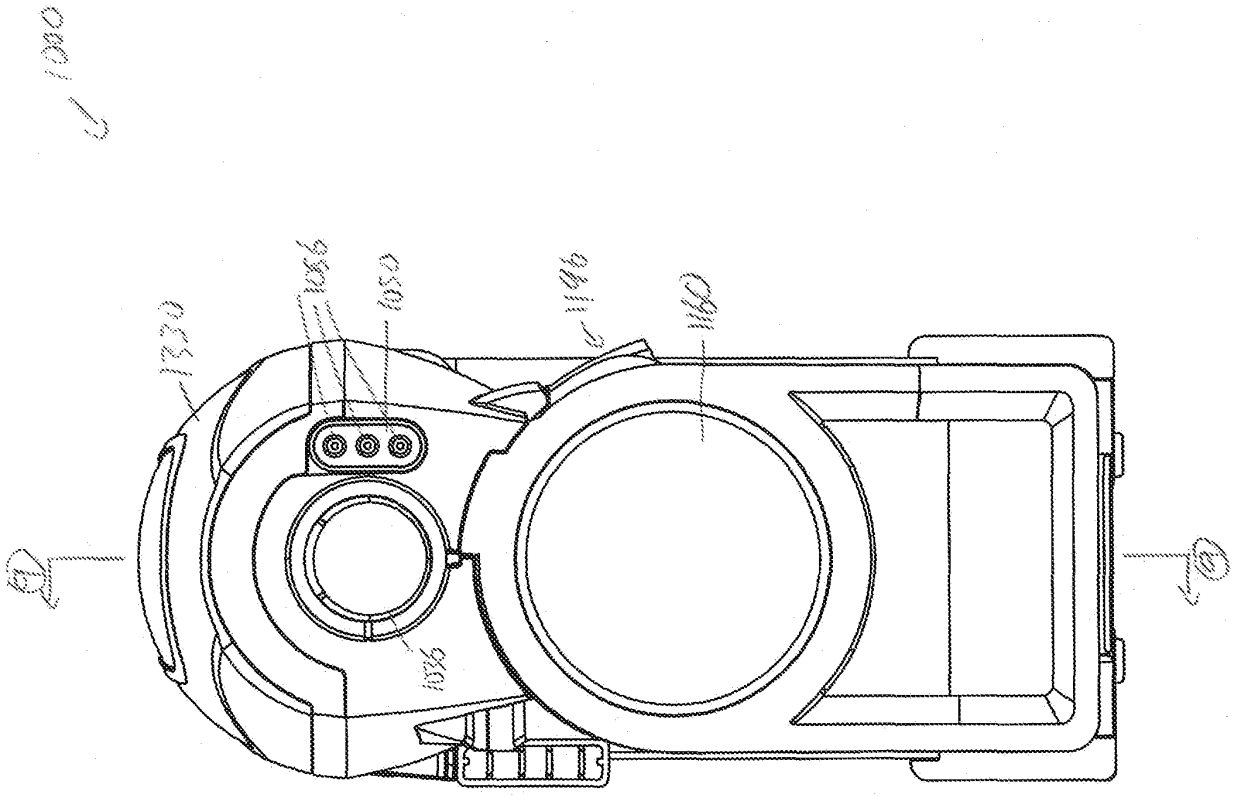


FIG. 5

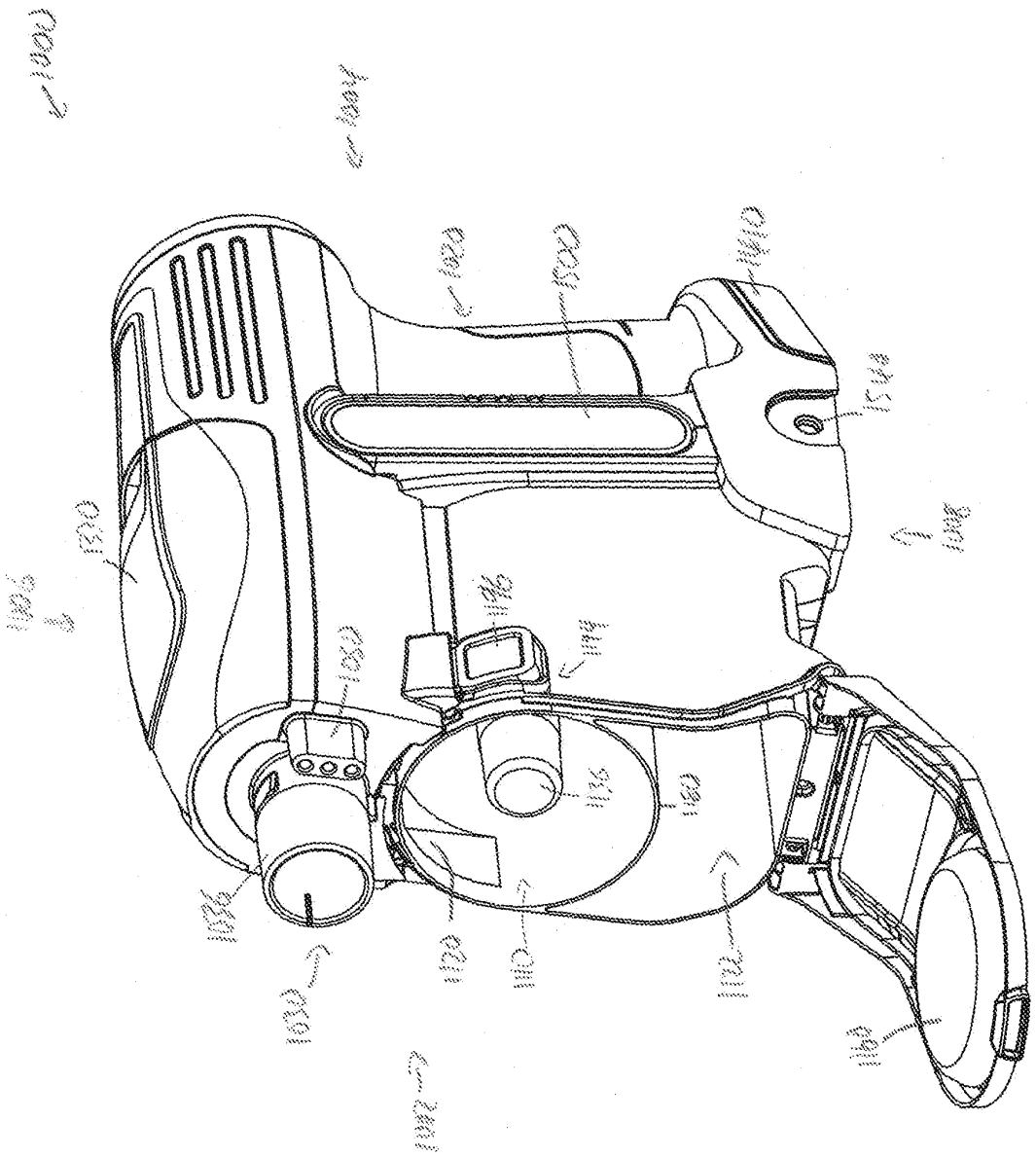

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FIG. 6

FIG. 7

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FIG. 8

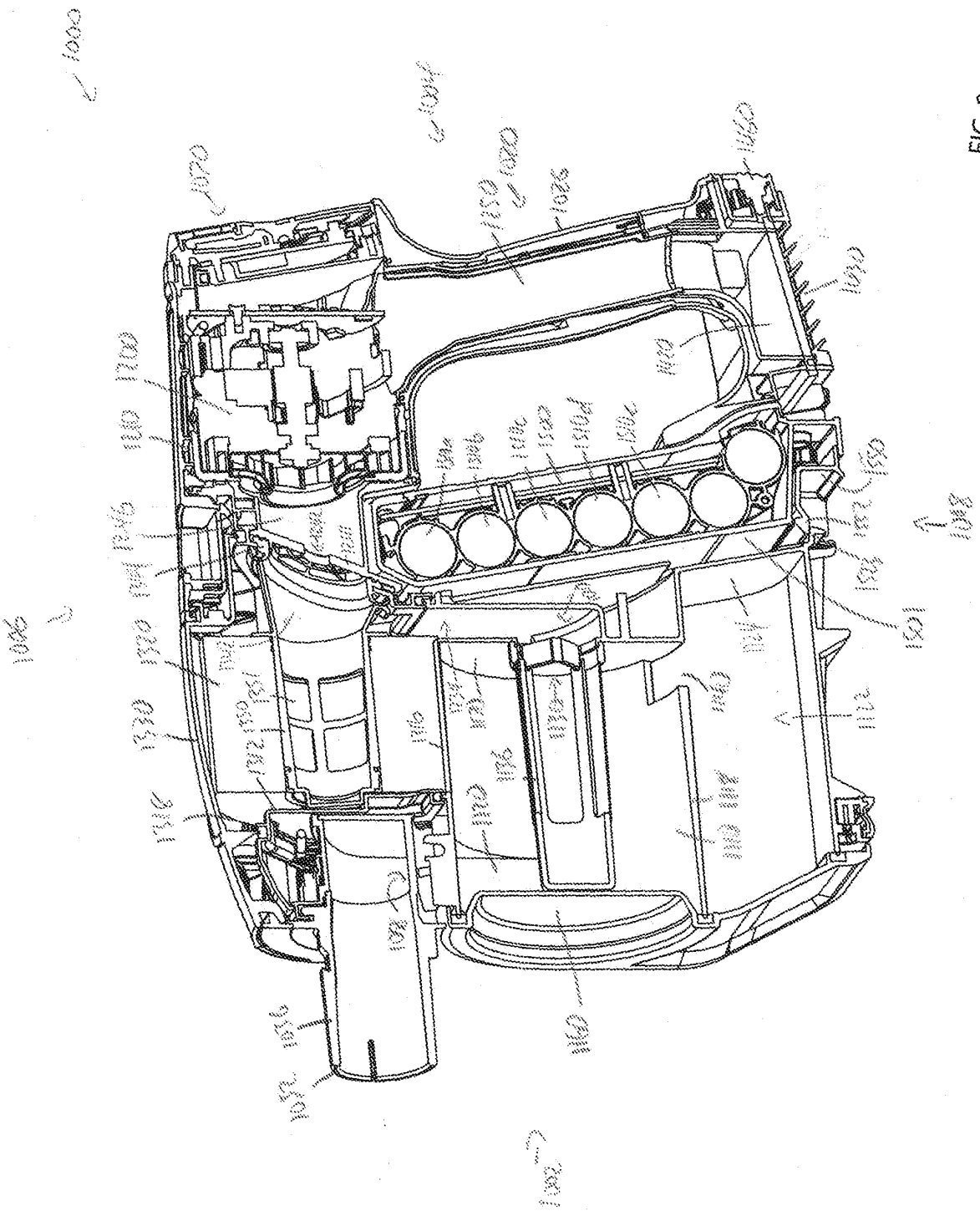


FIG. 9

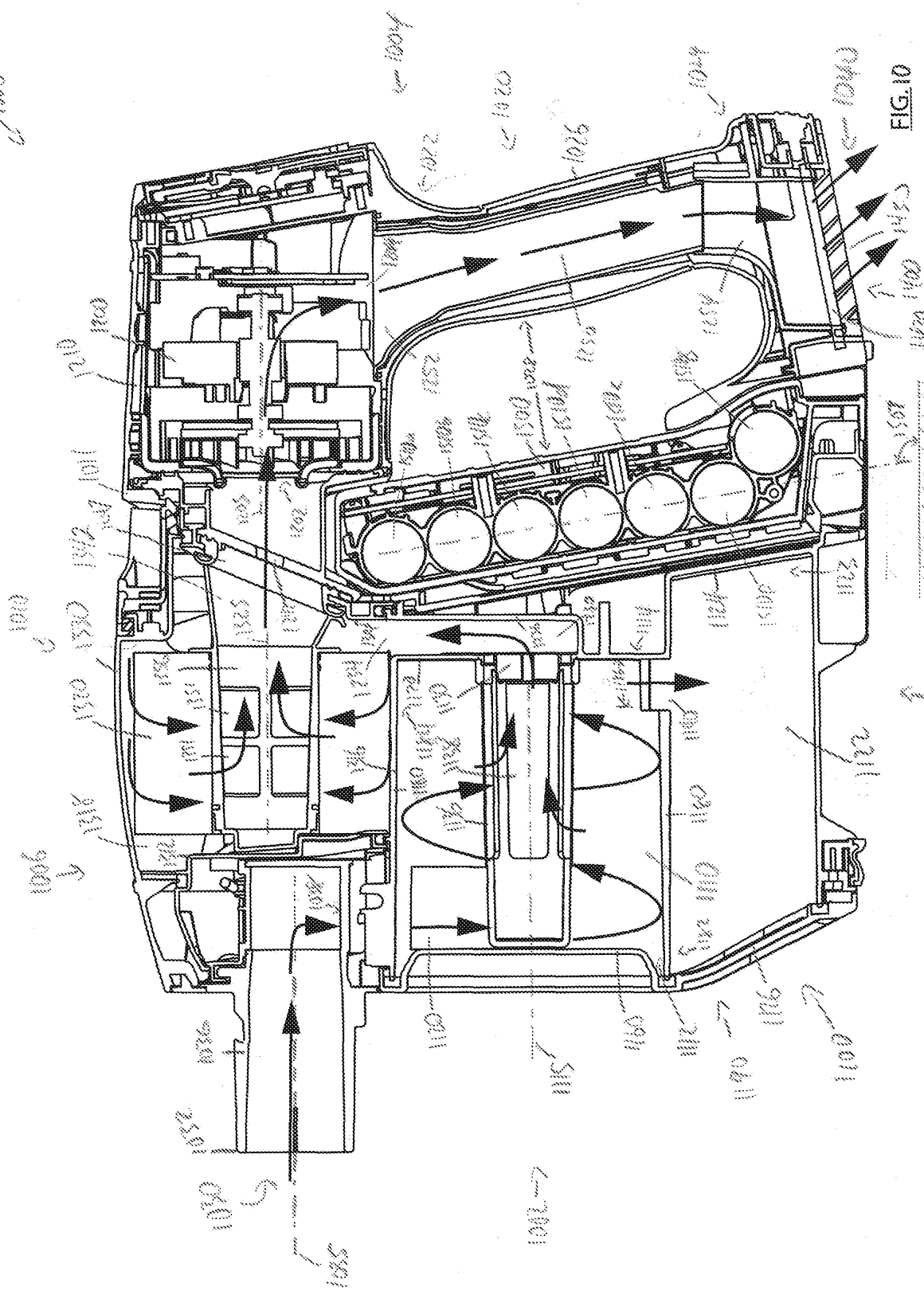


FIG. 10

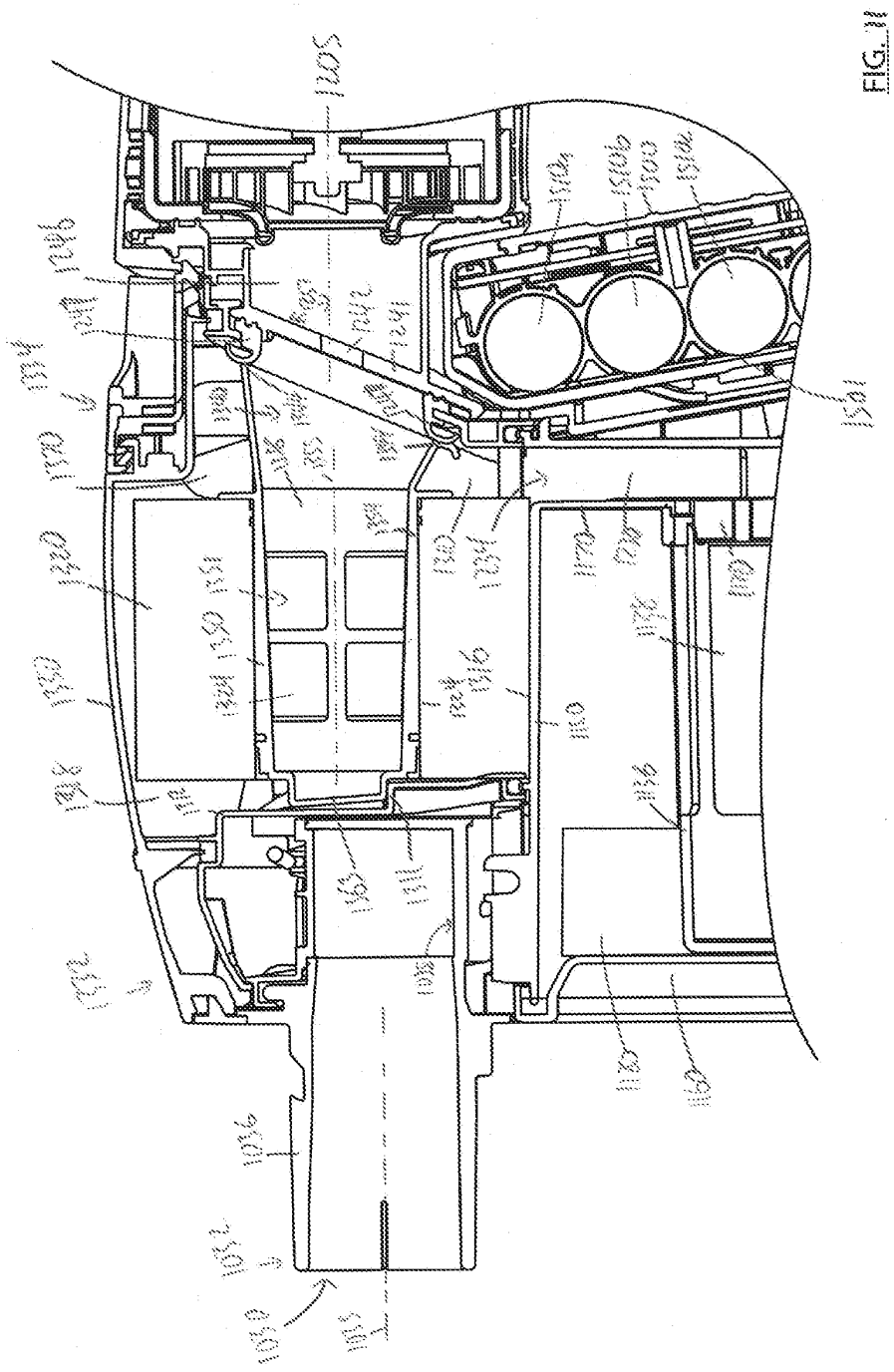


FIG_11

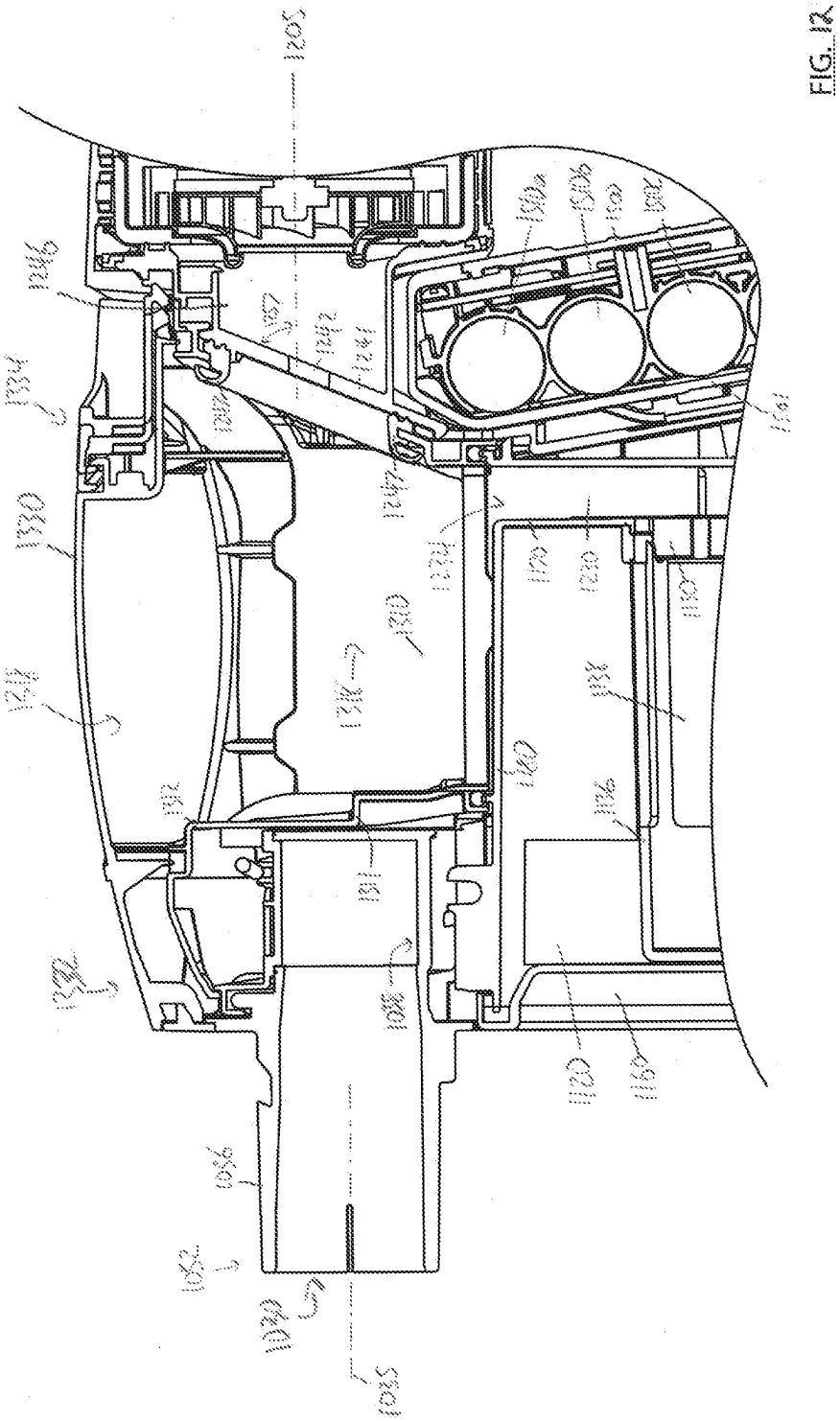

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FIG. 12

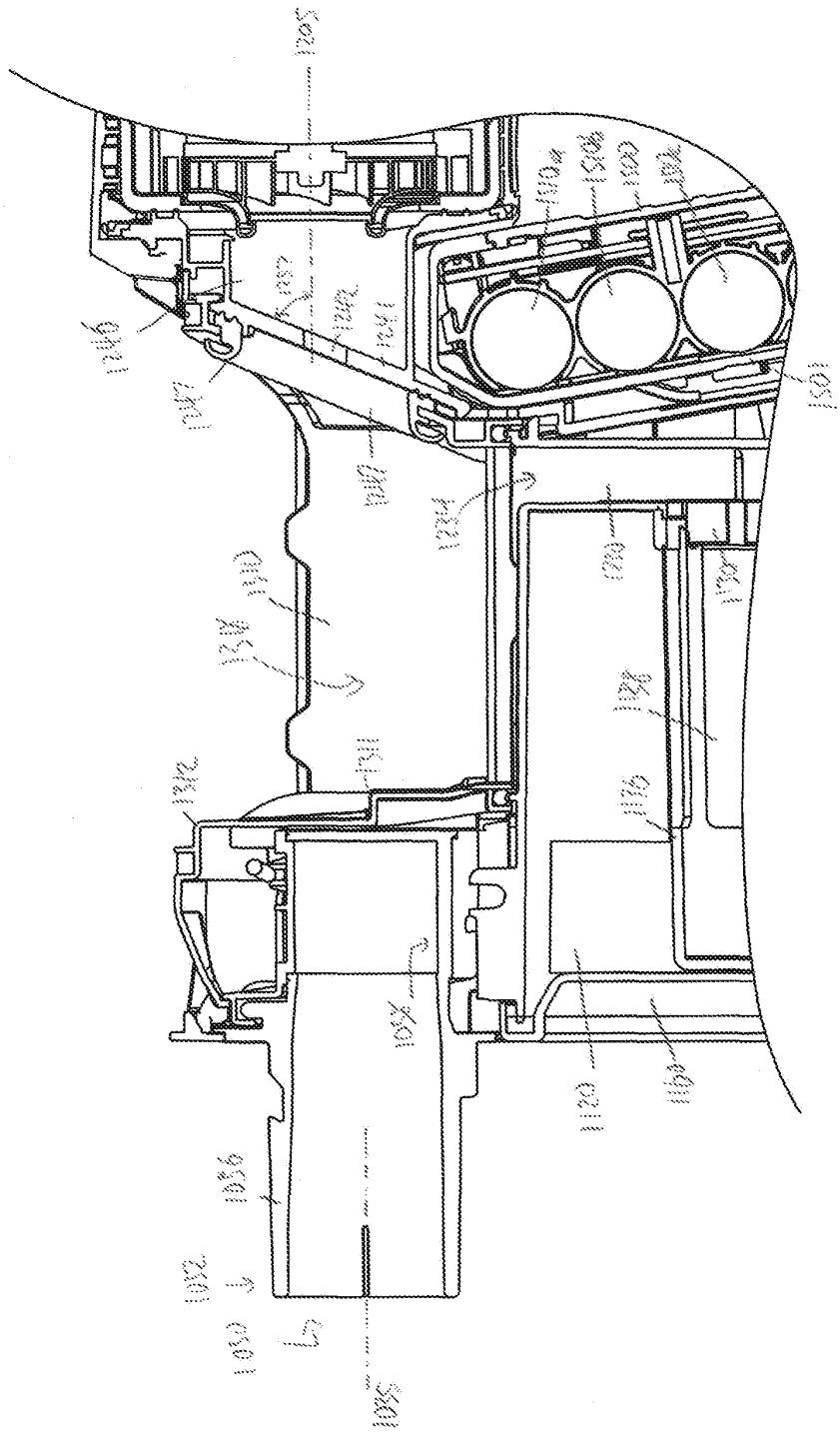
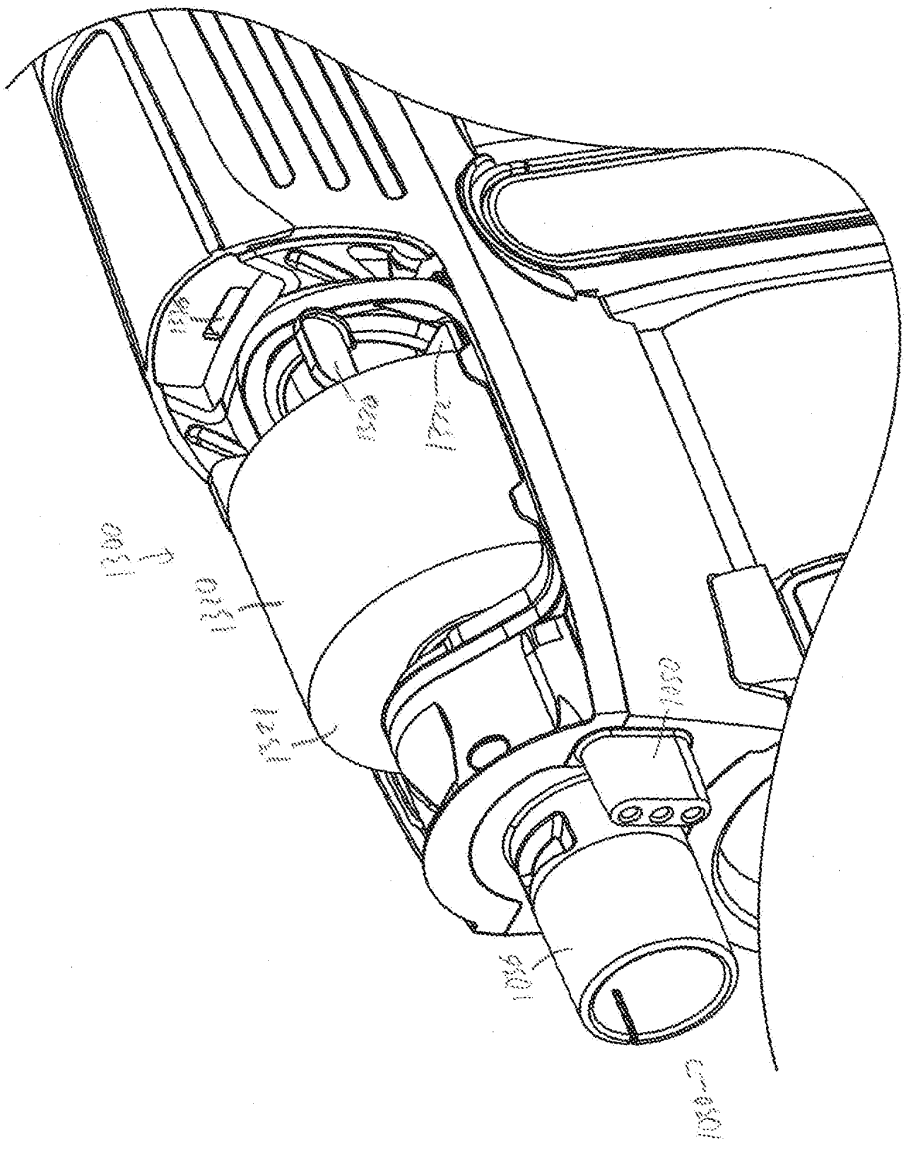


FIG. 13

FIG. 14



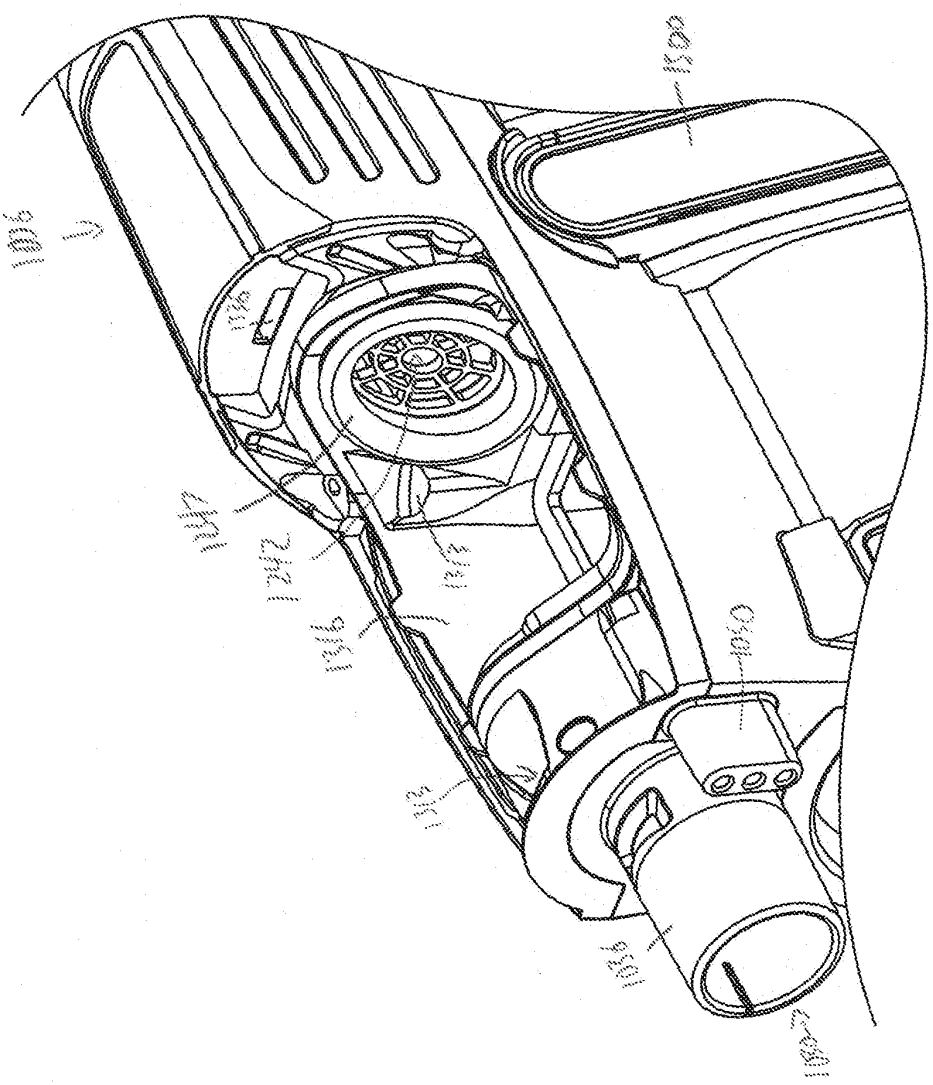


FIG. 15

FIG. 12

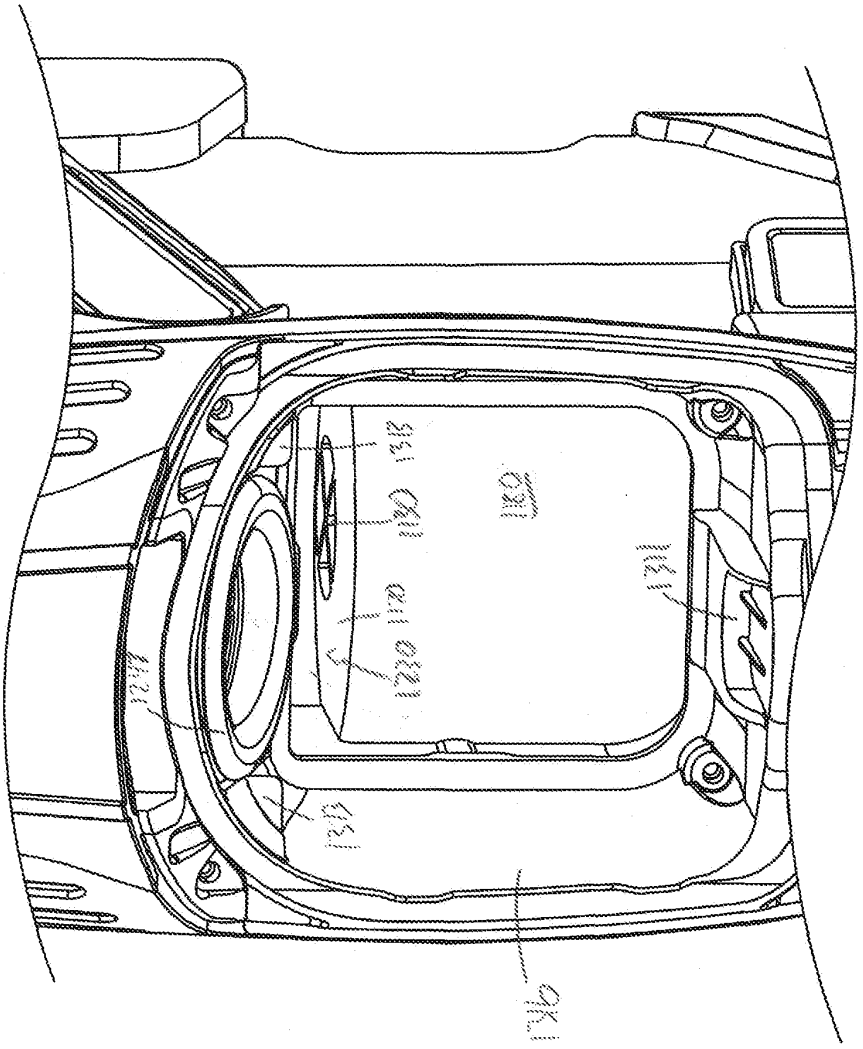
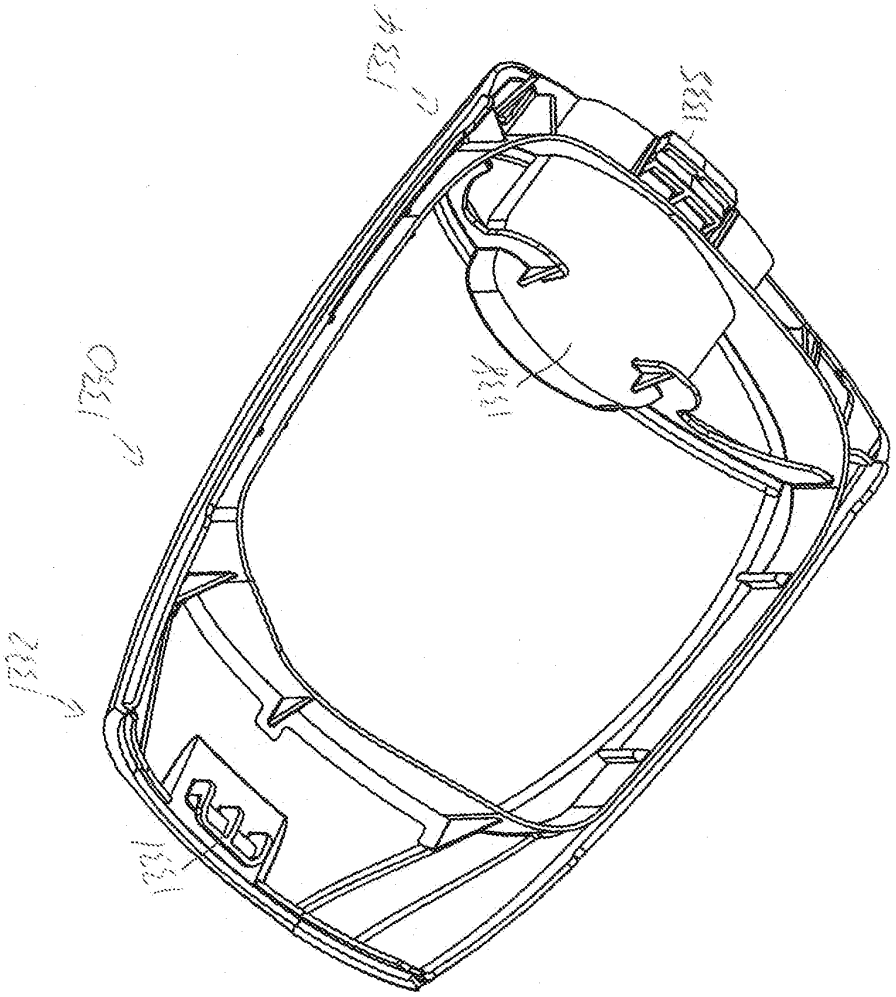


FIG. 17

FIG. 18



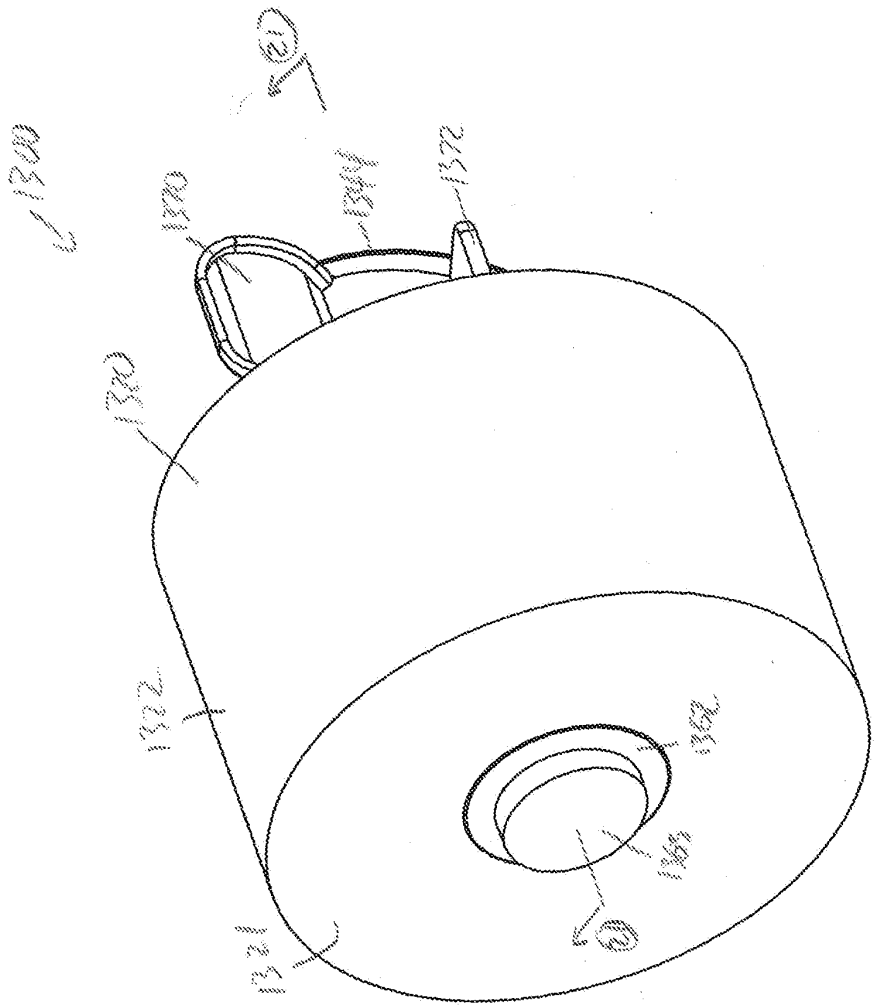


FIG. 19

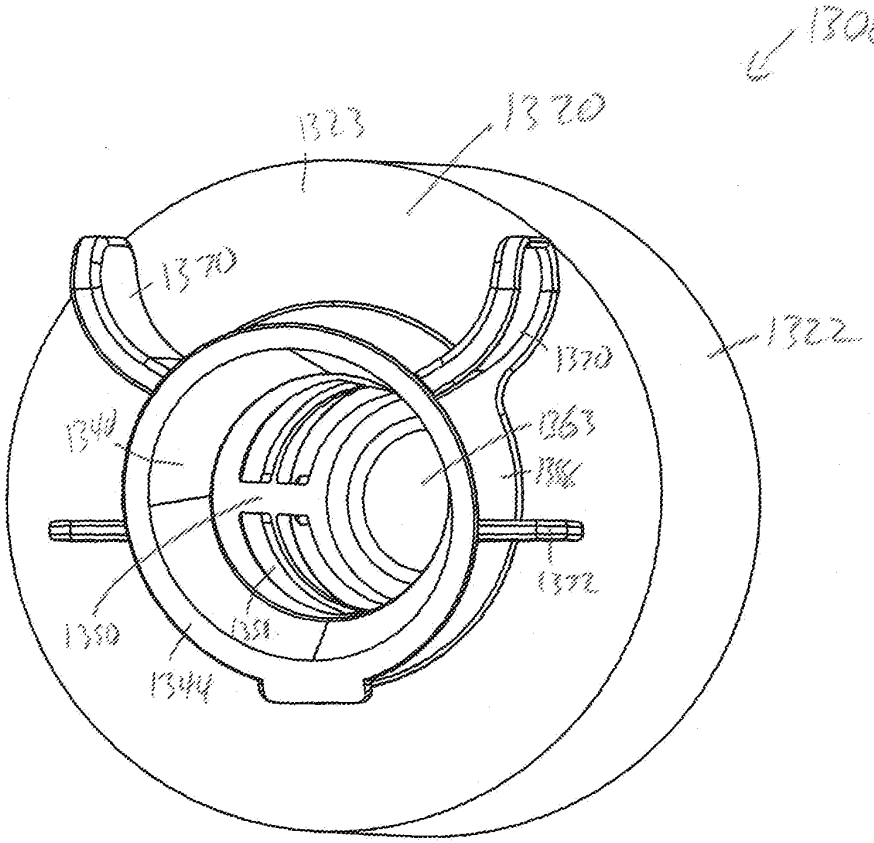


FIG. 20

Dyson Ex1026
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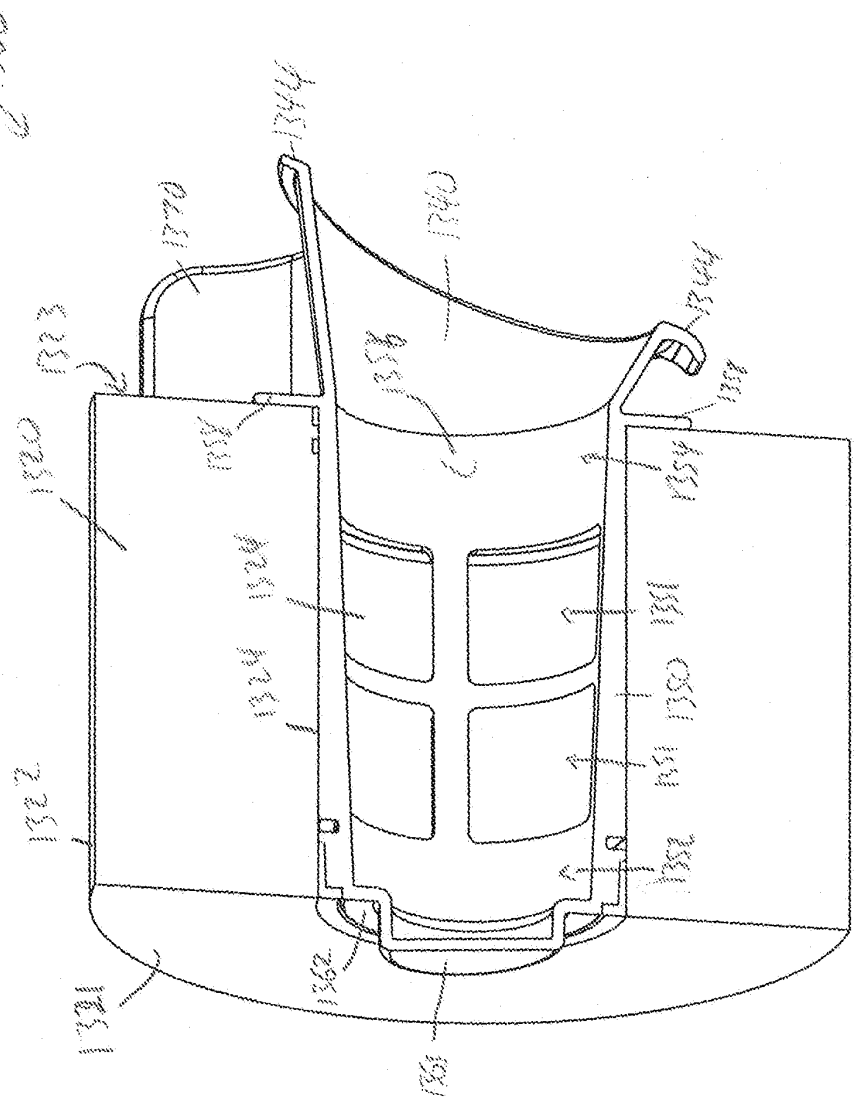

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FIG. 21

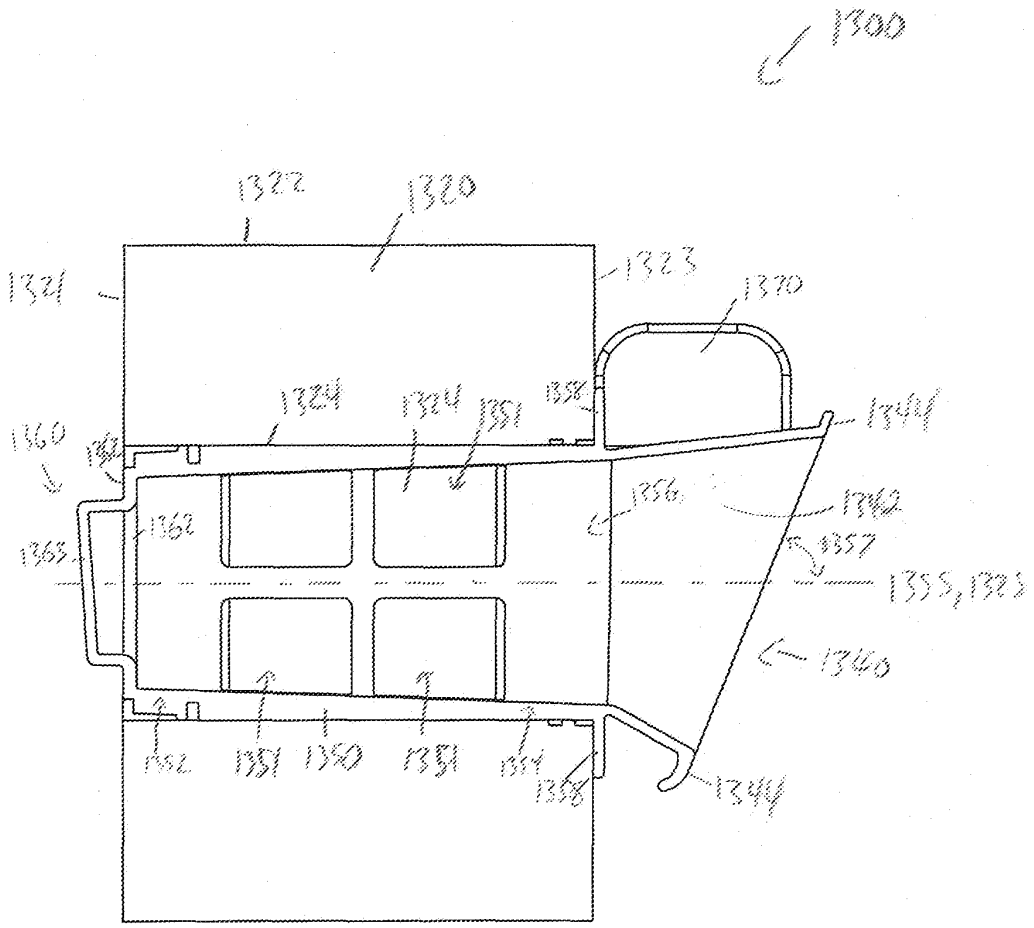


FIG. 22

Dyson Ex1026
Page 94

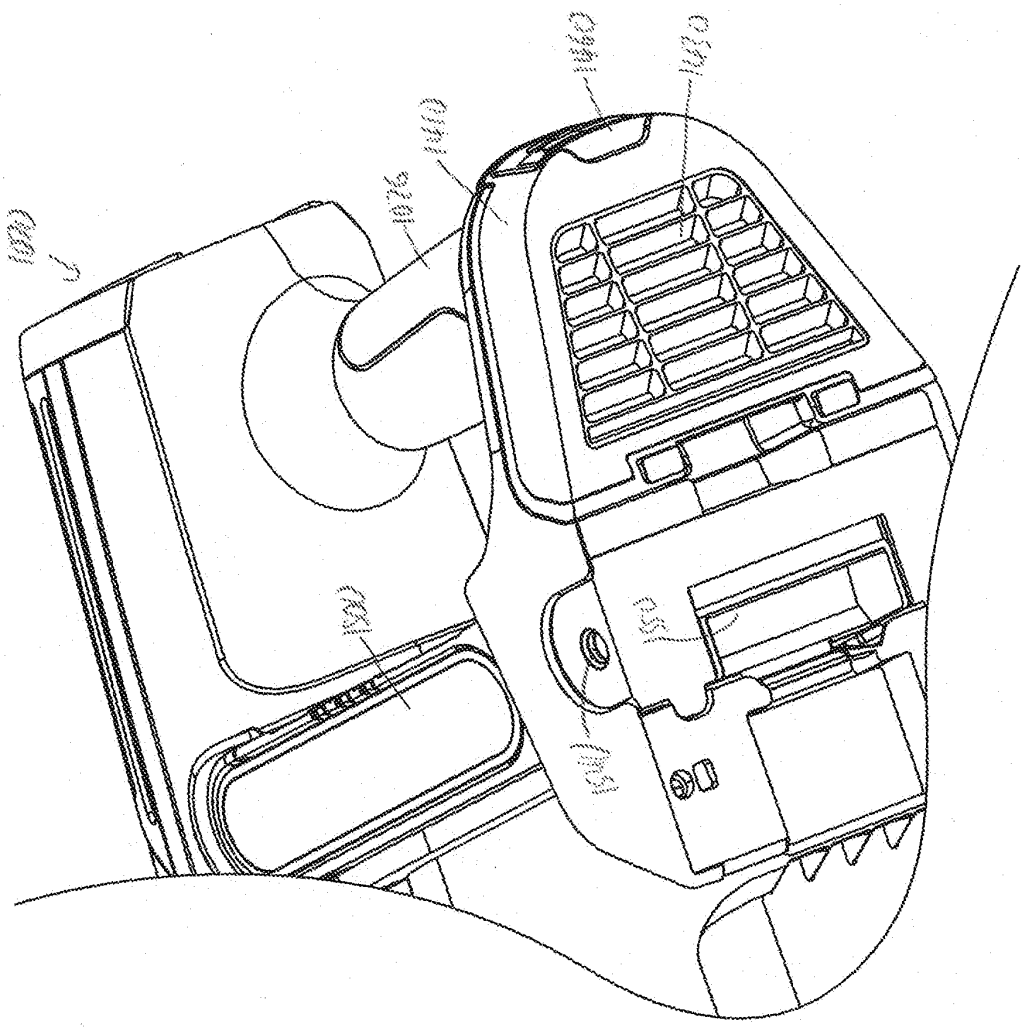


FIG. 23

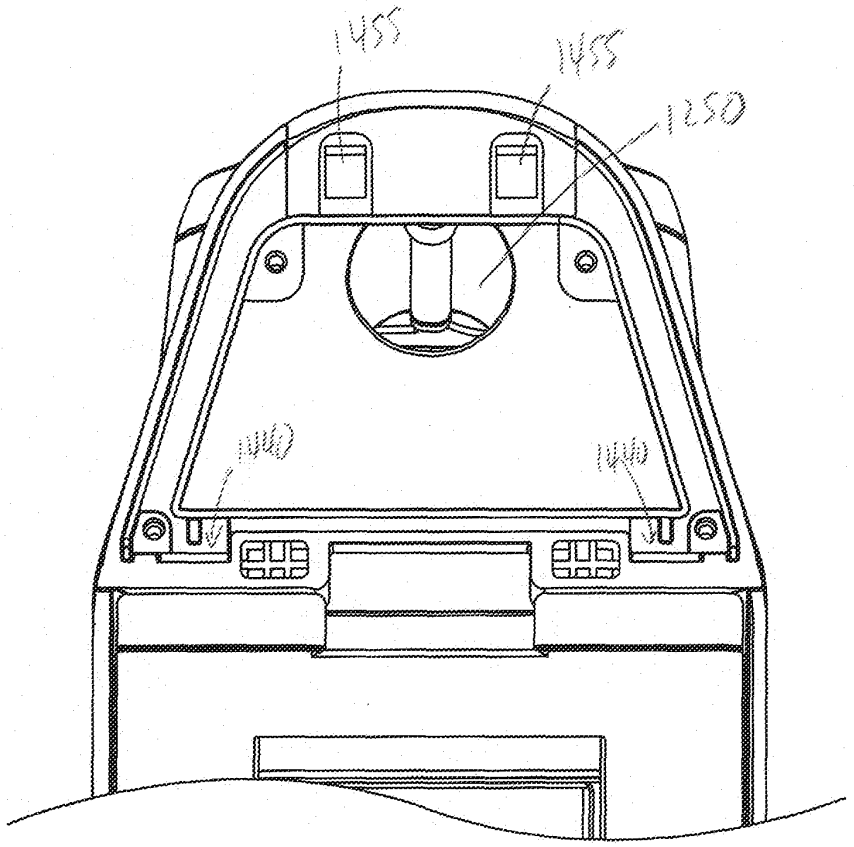


FIG. 24

Dyson Ex1026
Page 96

FIG. 25

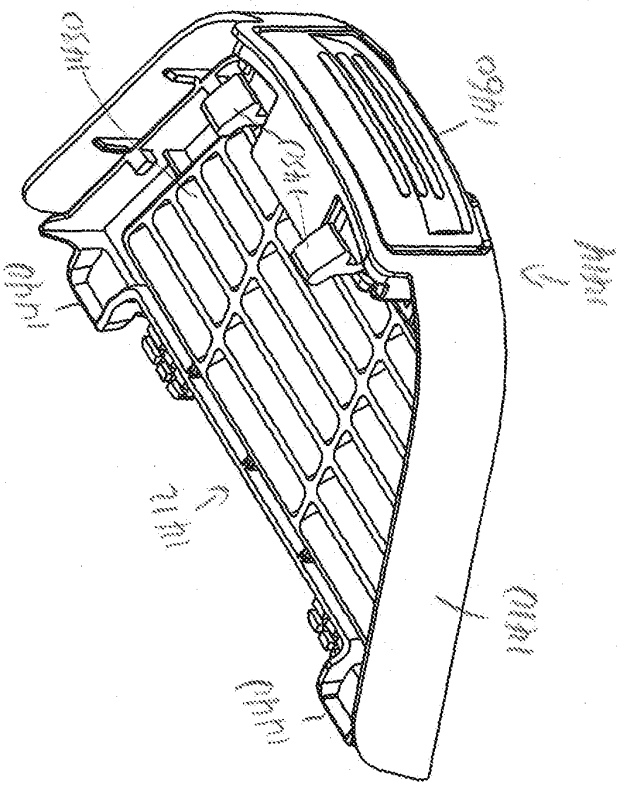


FIG. 26

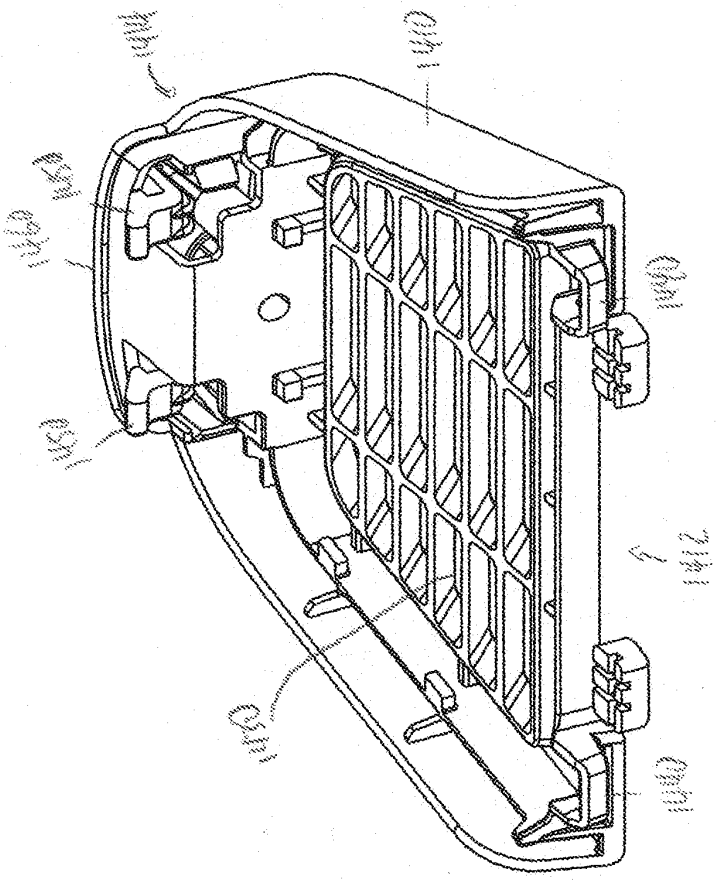
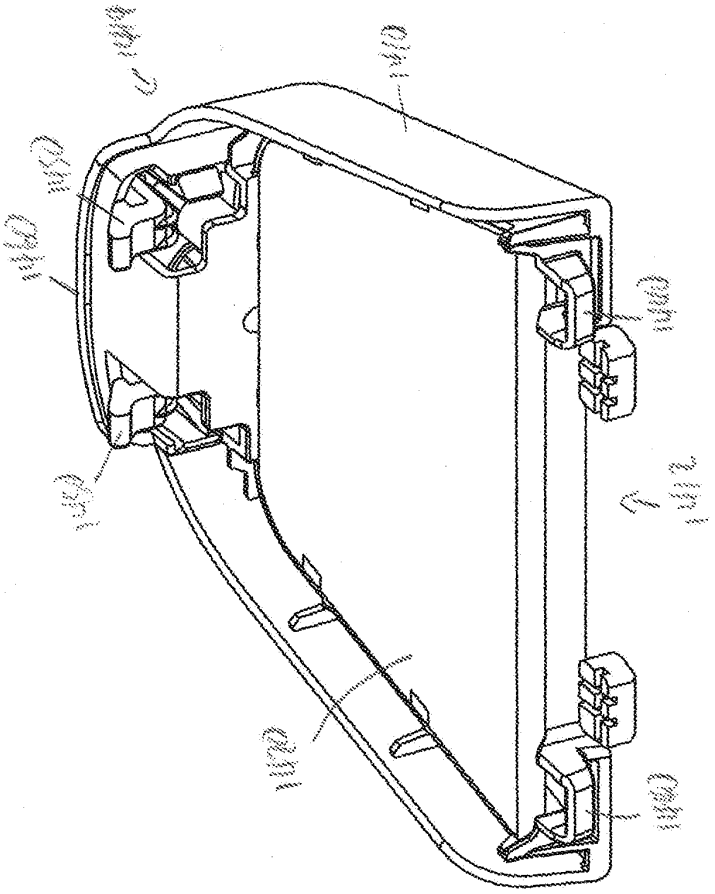


FIG. 27



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FIG. 28

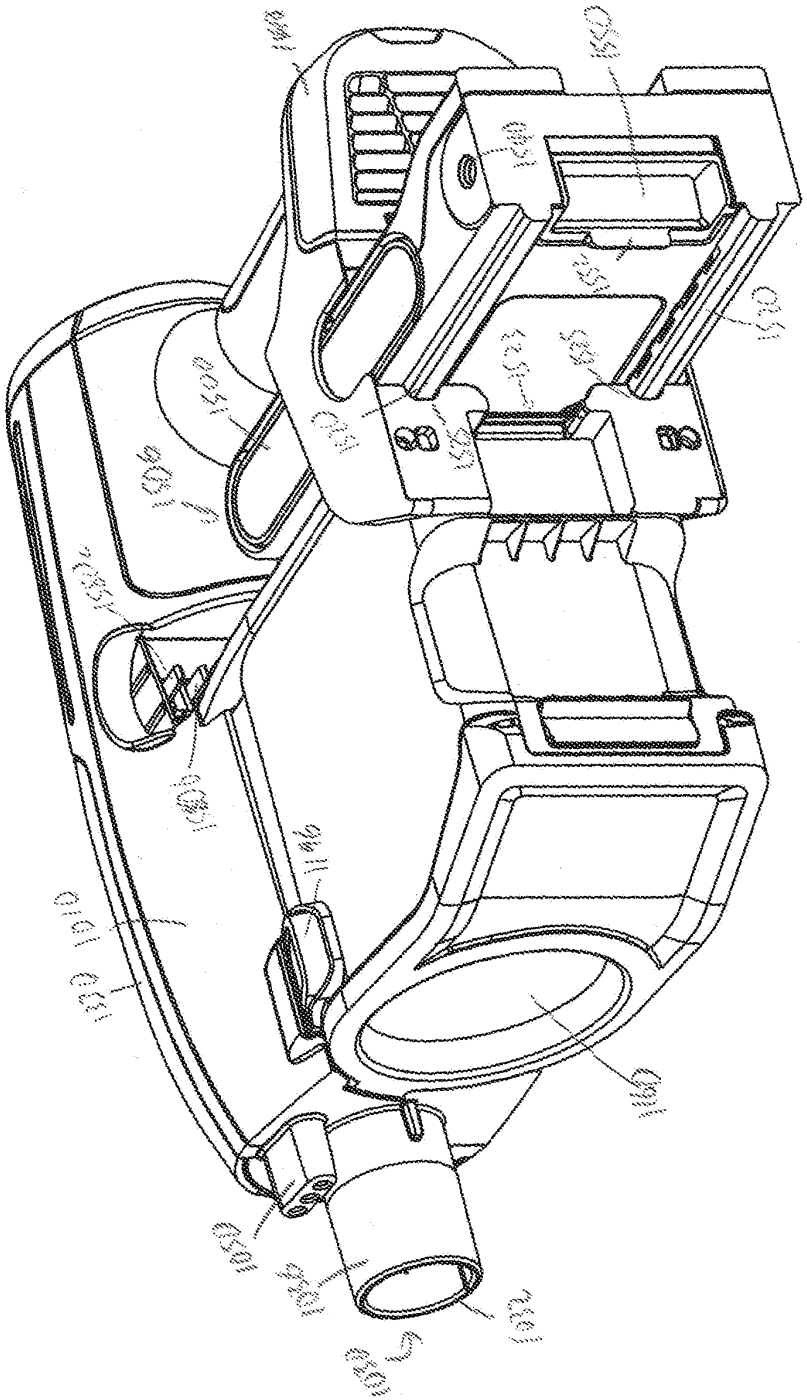


FIG. 29

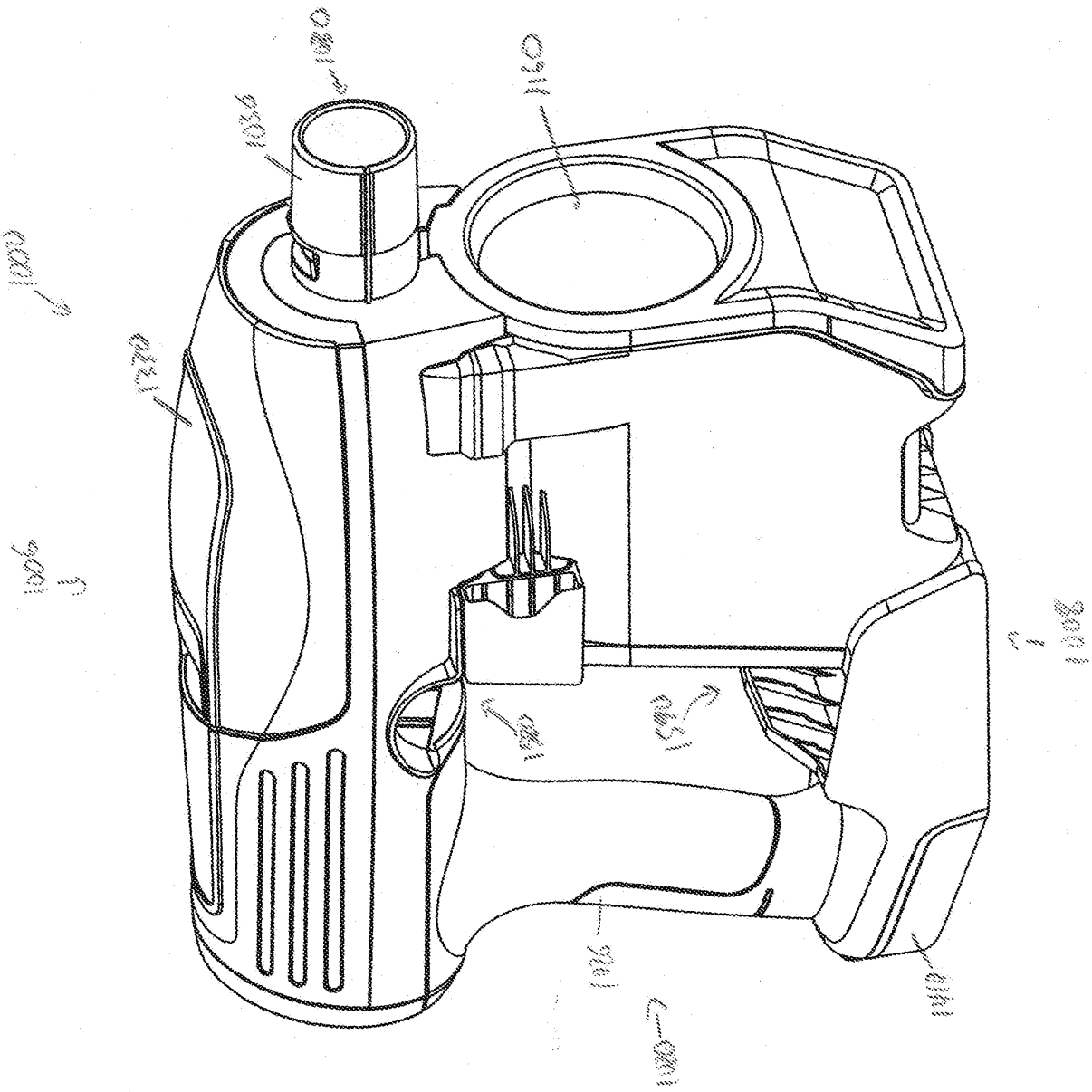


FIG. 10

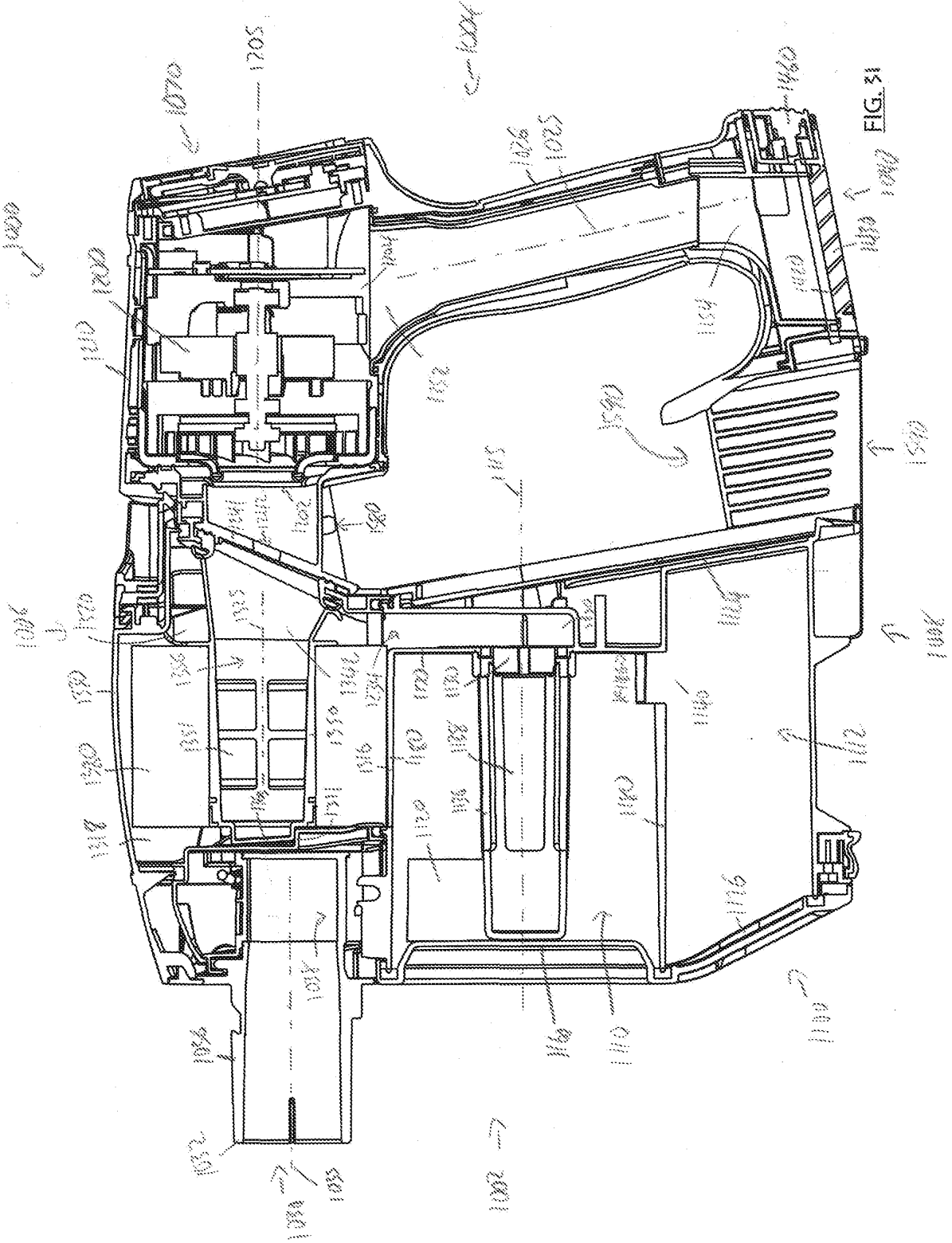


FIG. 31

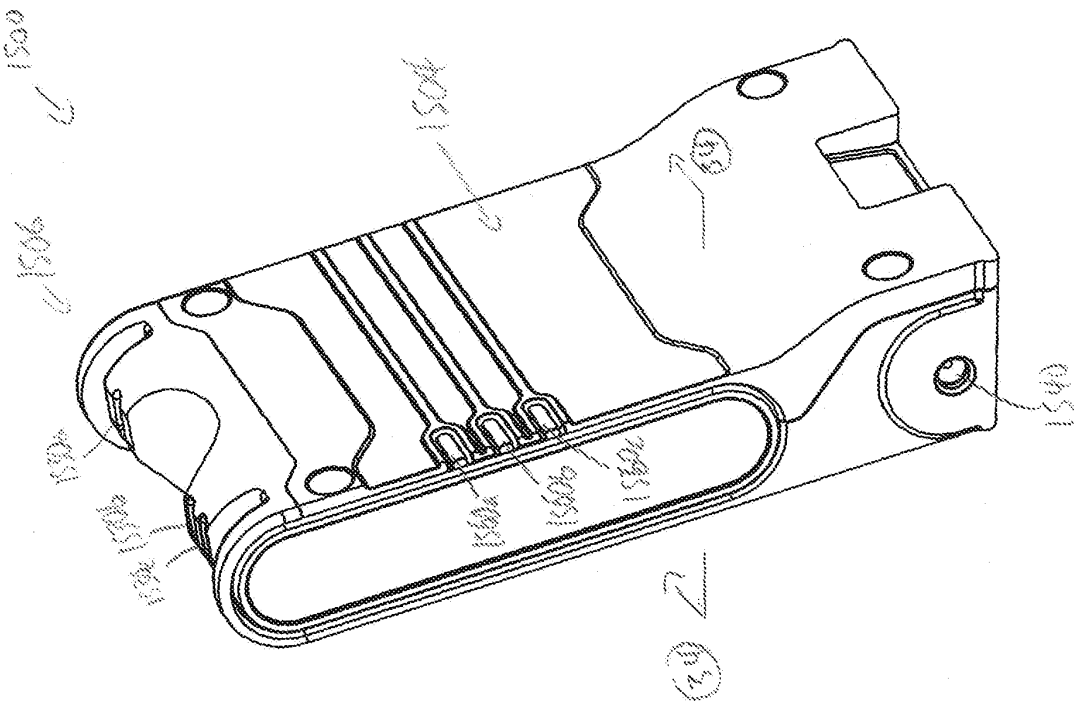

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FIG. 32

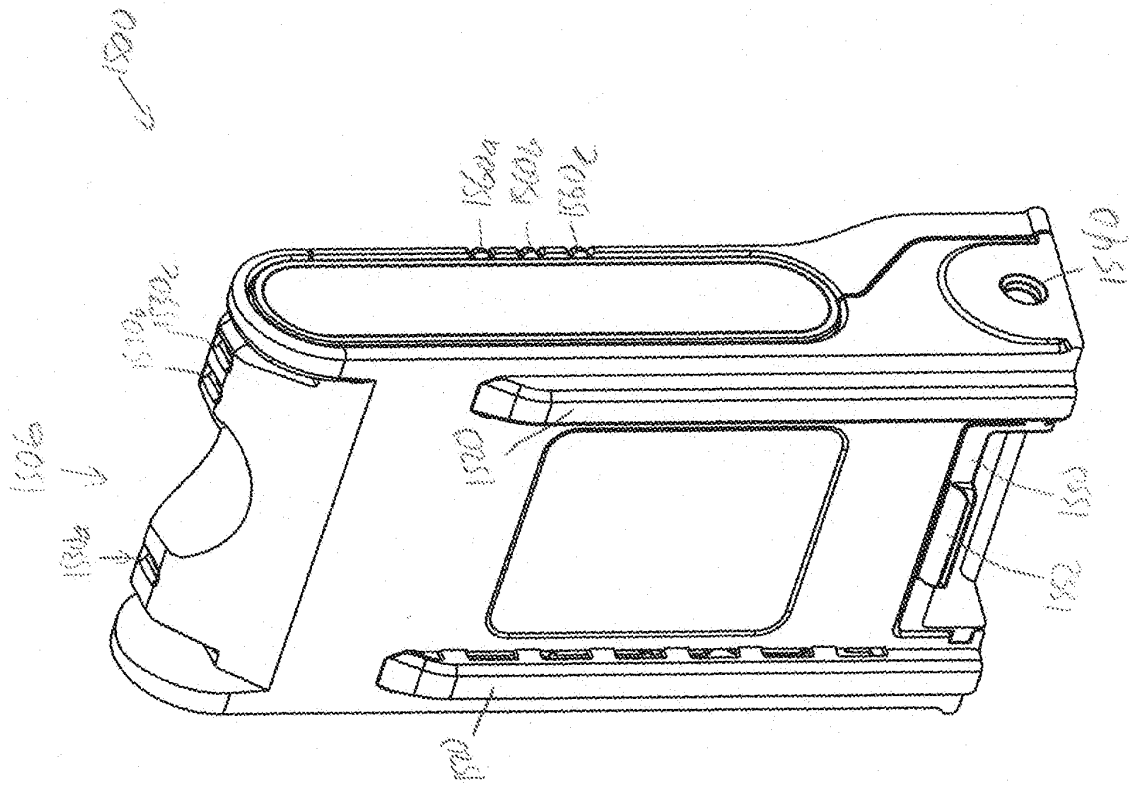


FIG. 33

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FIG. 34

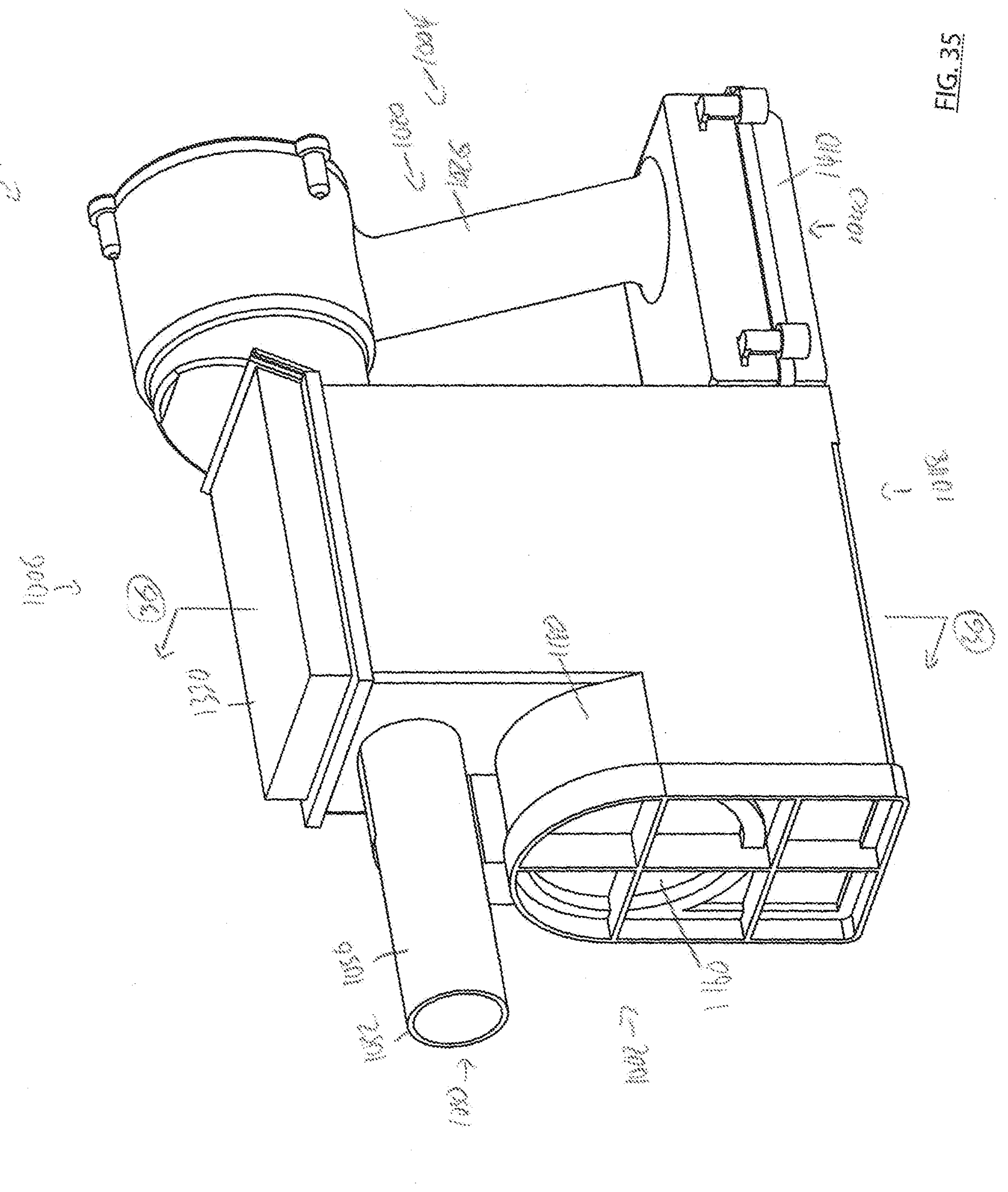


FIG. 35

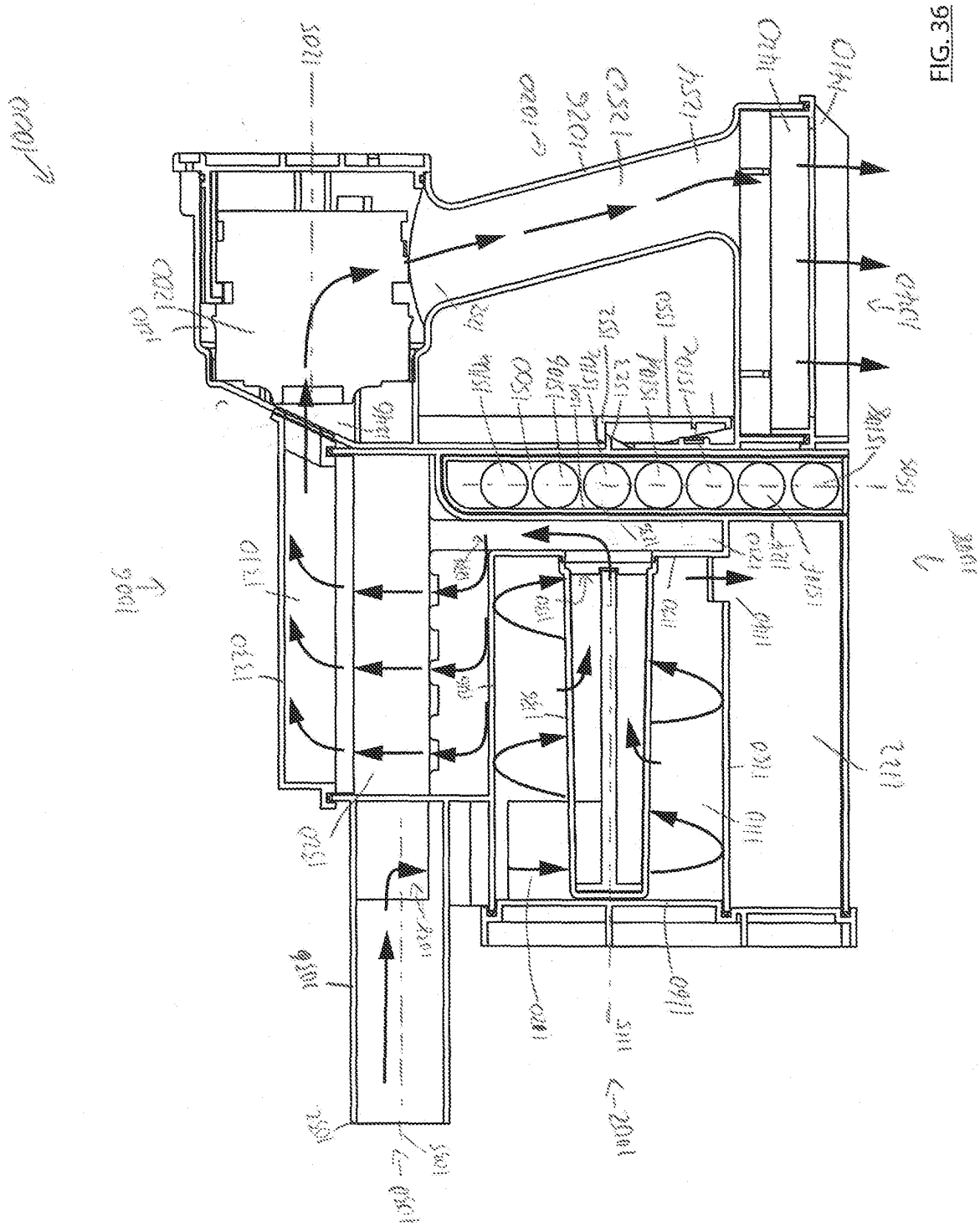


FIG. 36

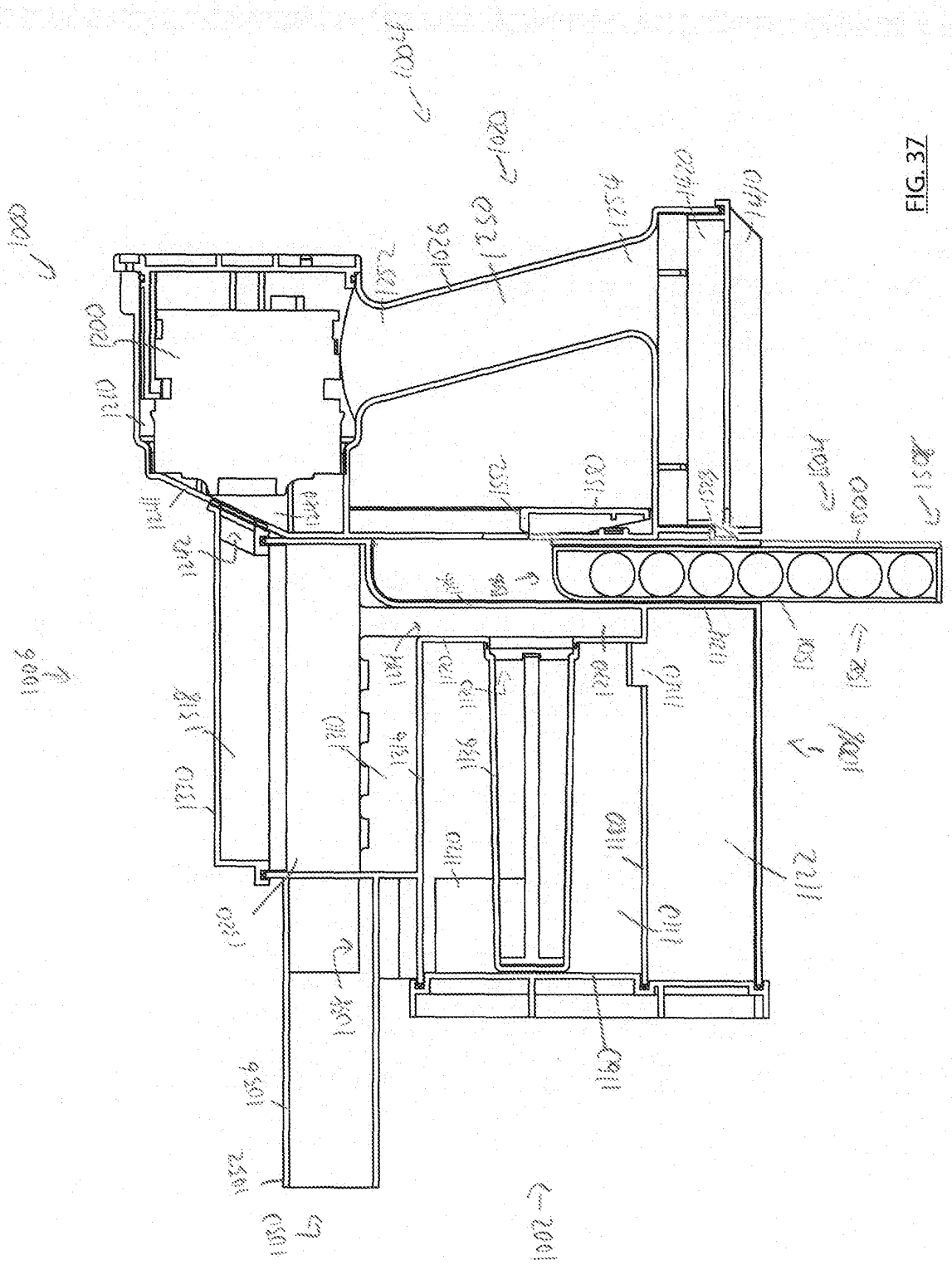


FIG. 37

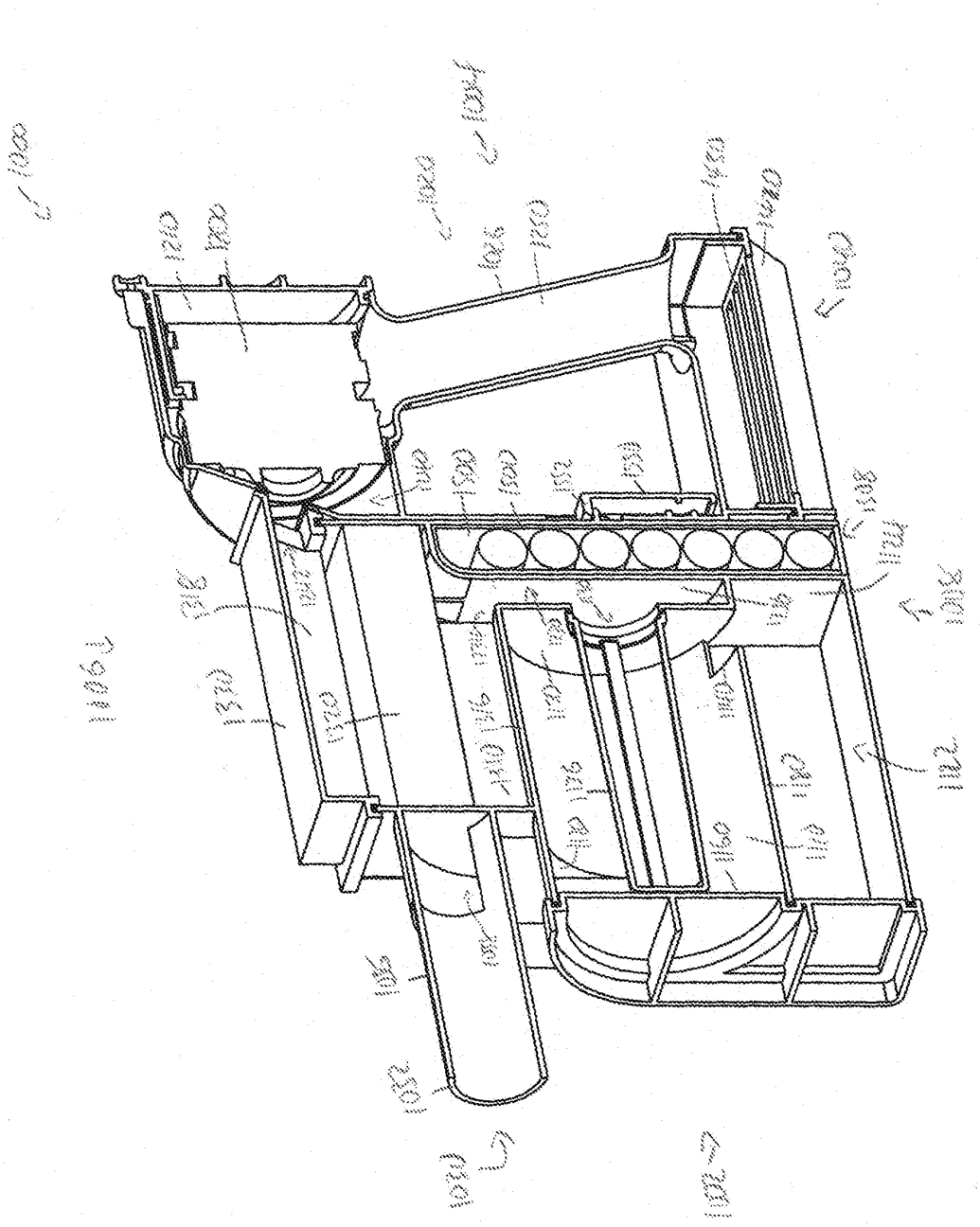


FIG. 38

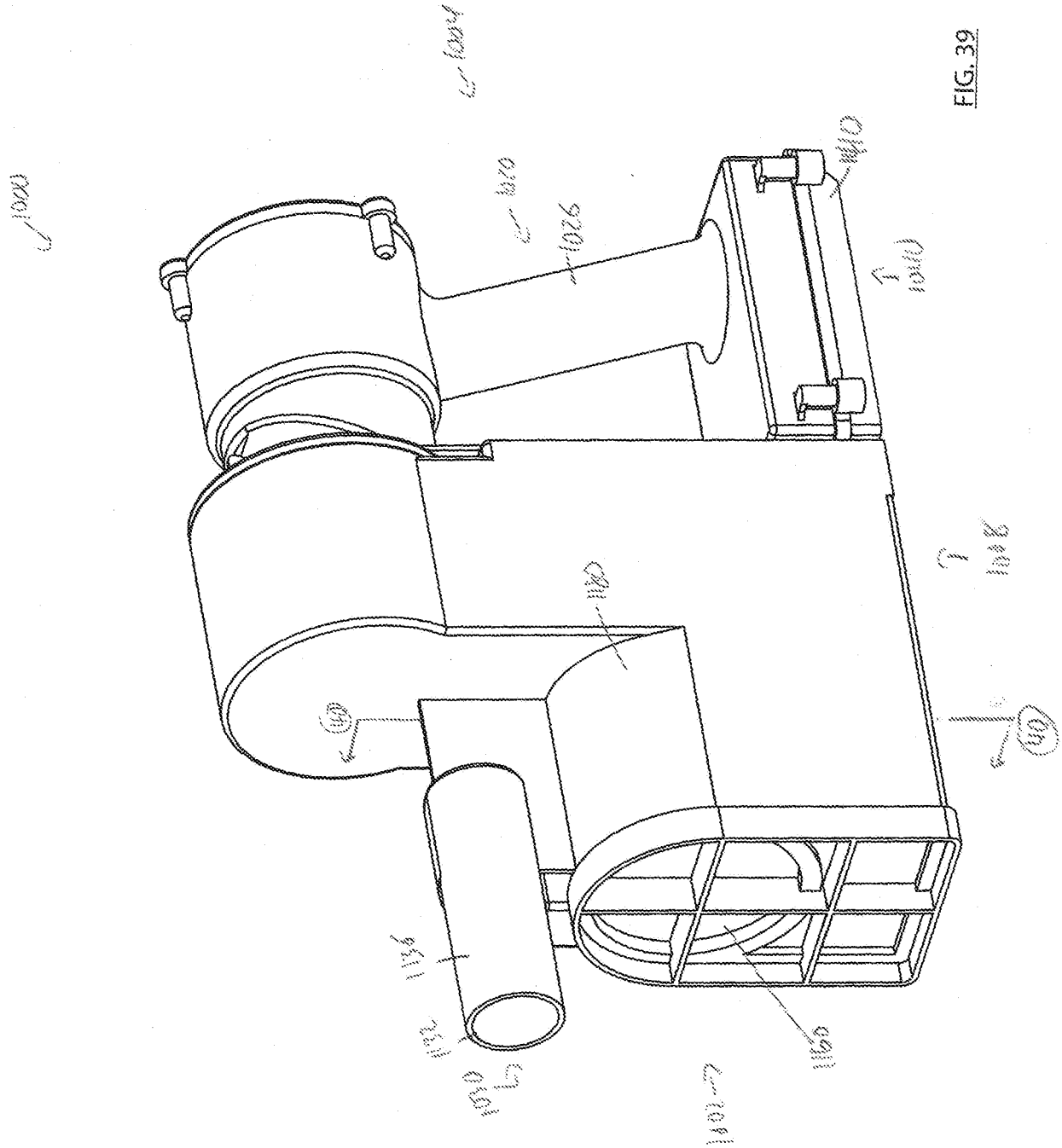

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FIG. 39

FIG. 40

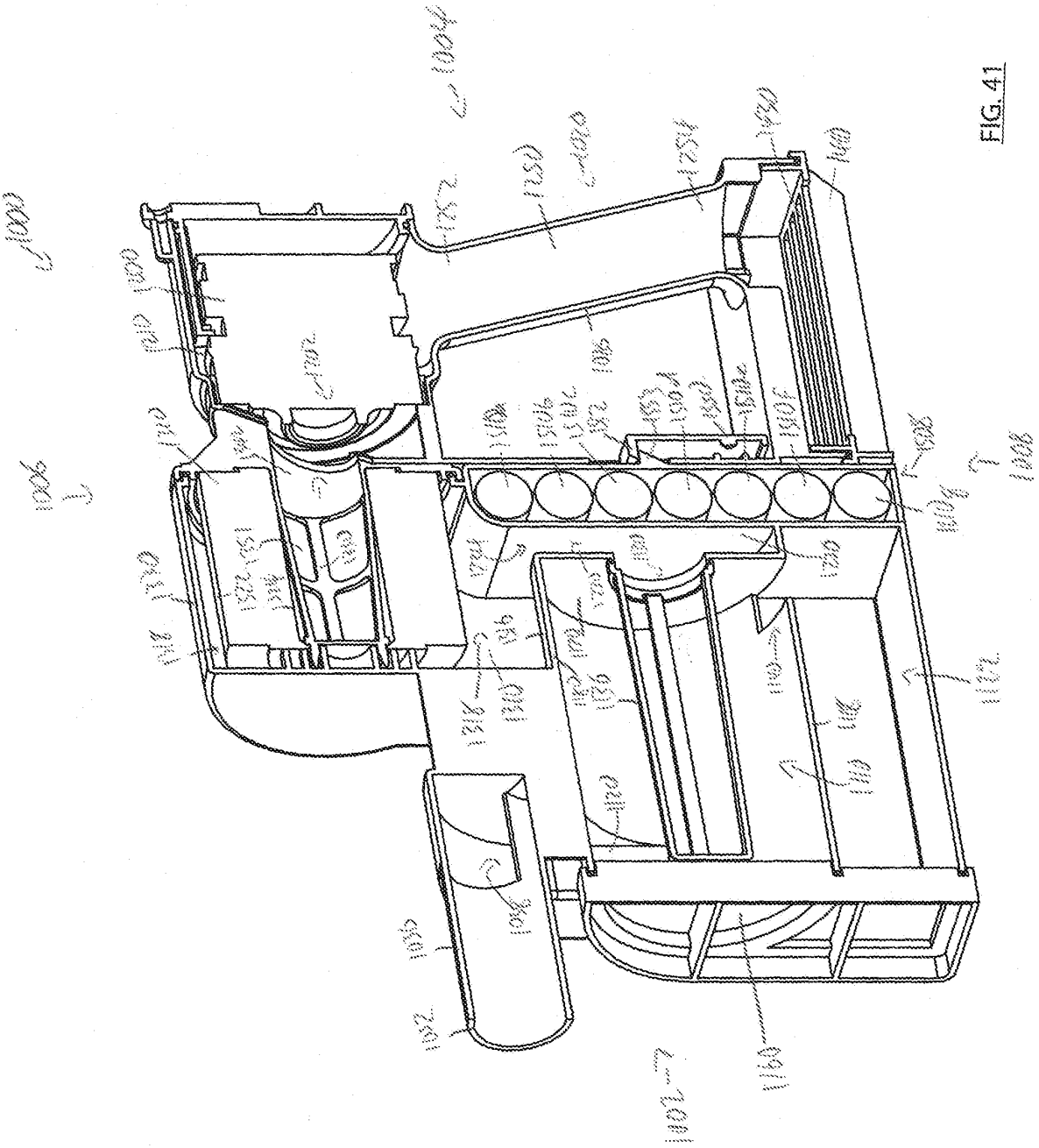


FIG. 41

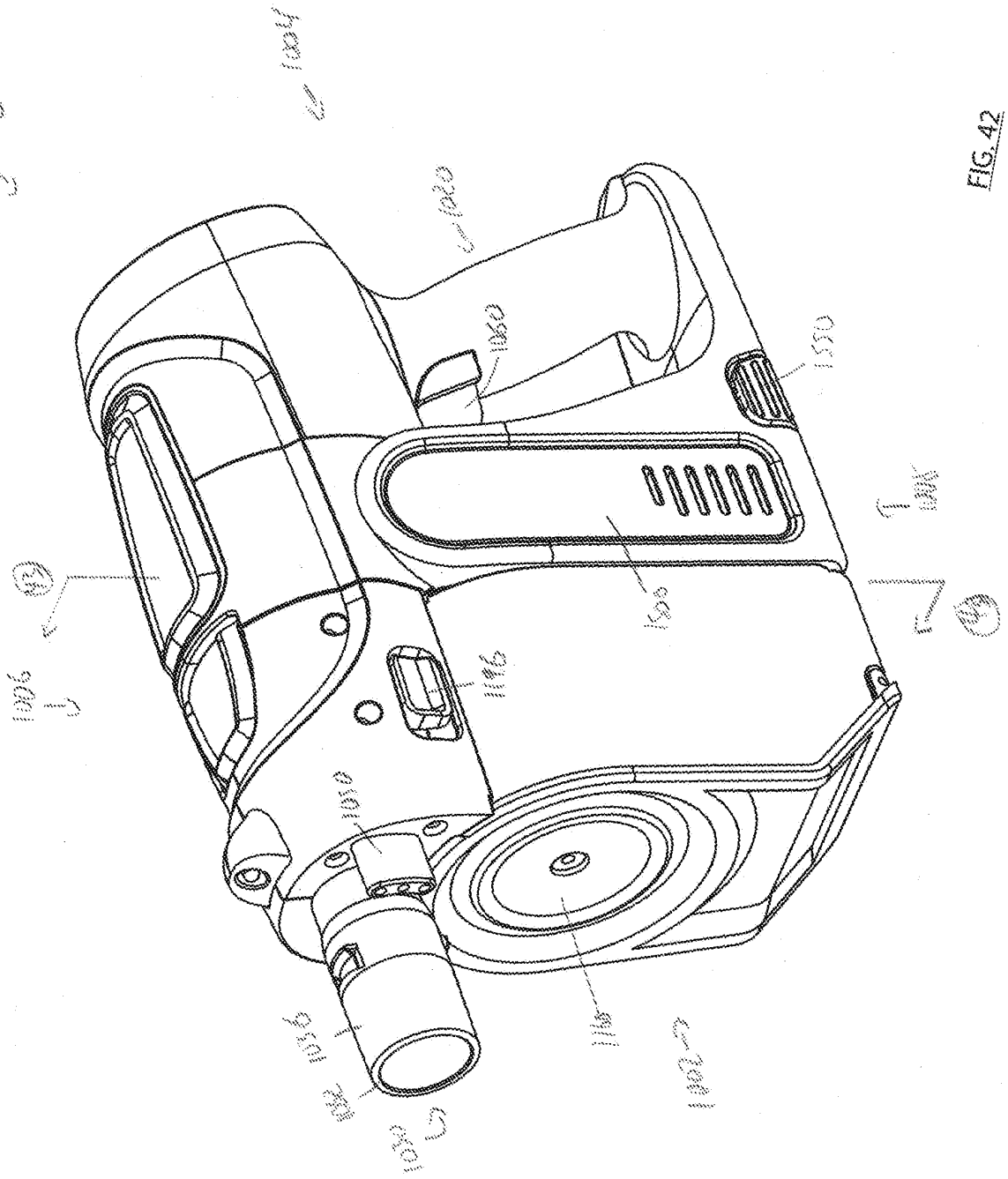


FIG. 42

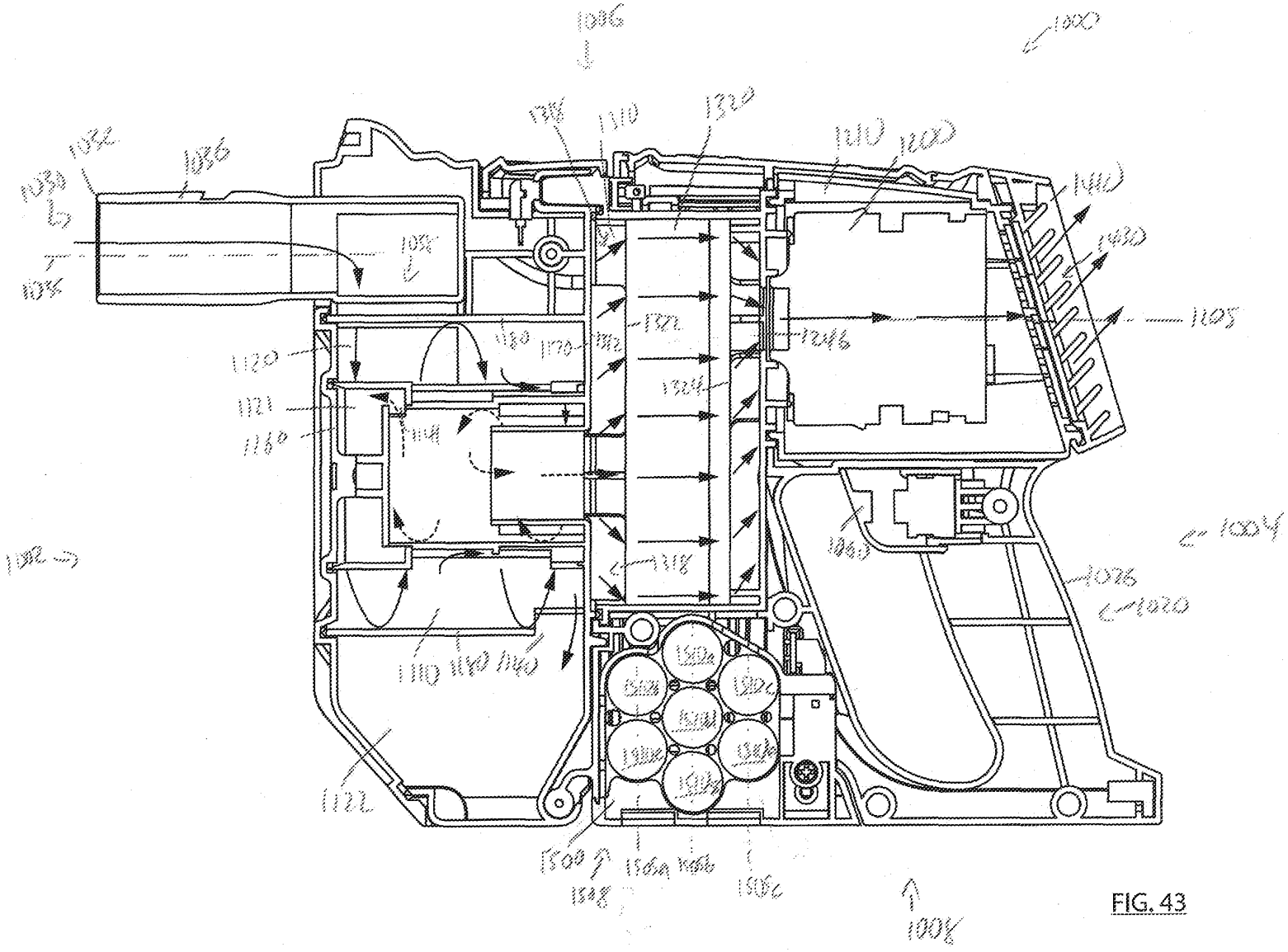


FIG. 43

Dyson Ex1026
Page 115

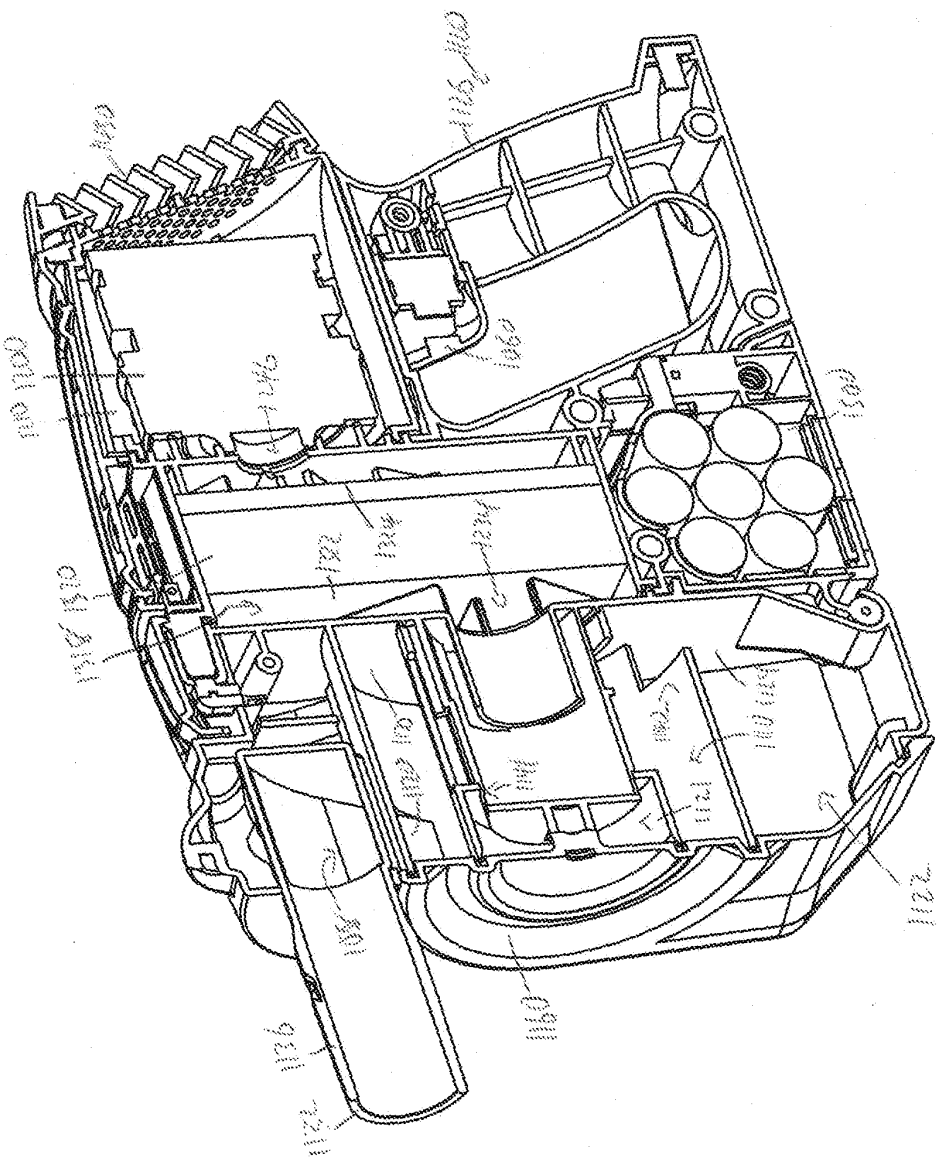


FIG. 44

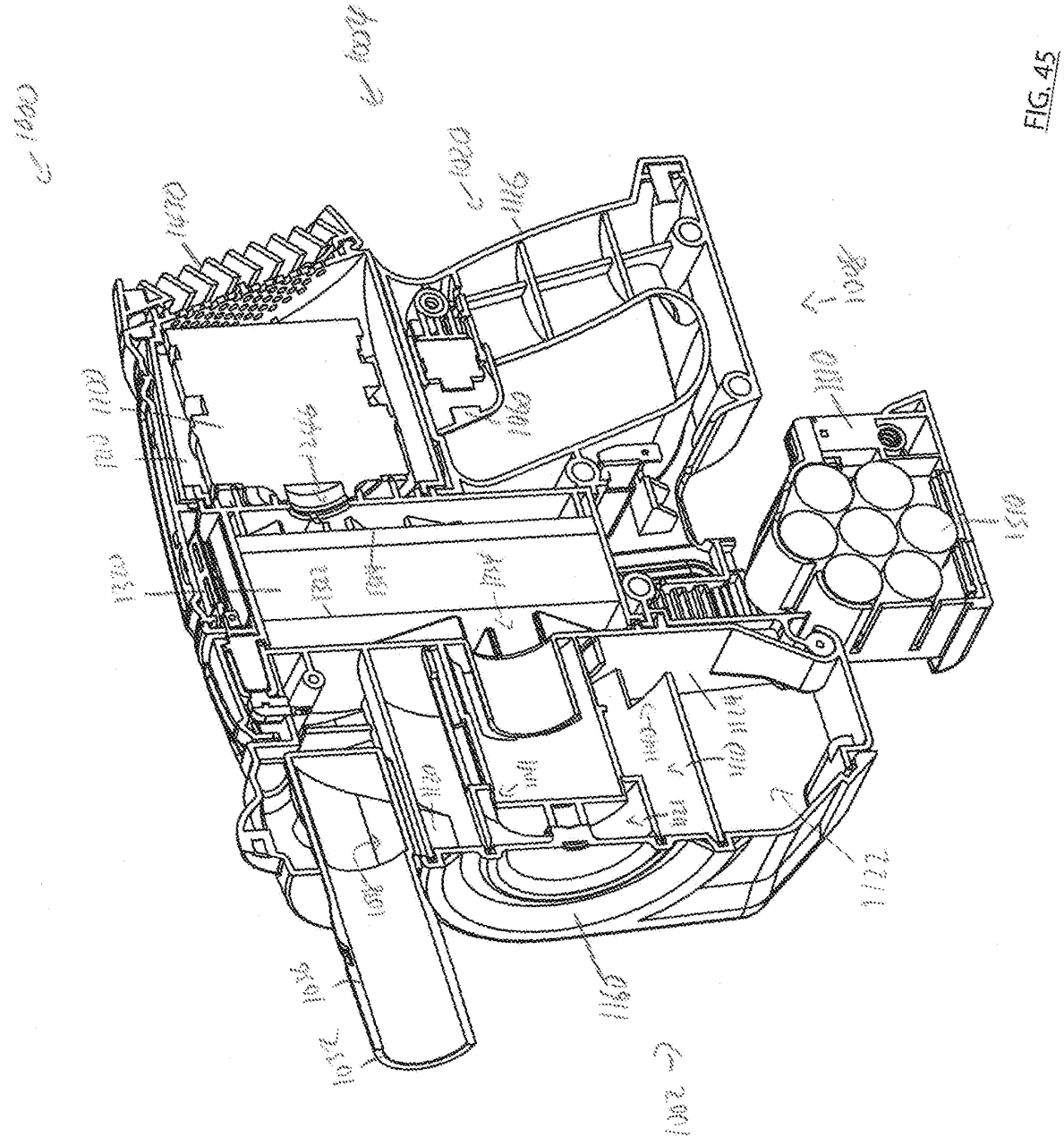


FIG. 45

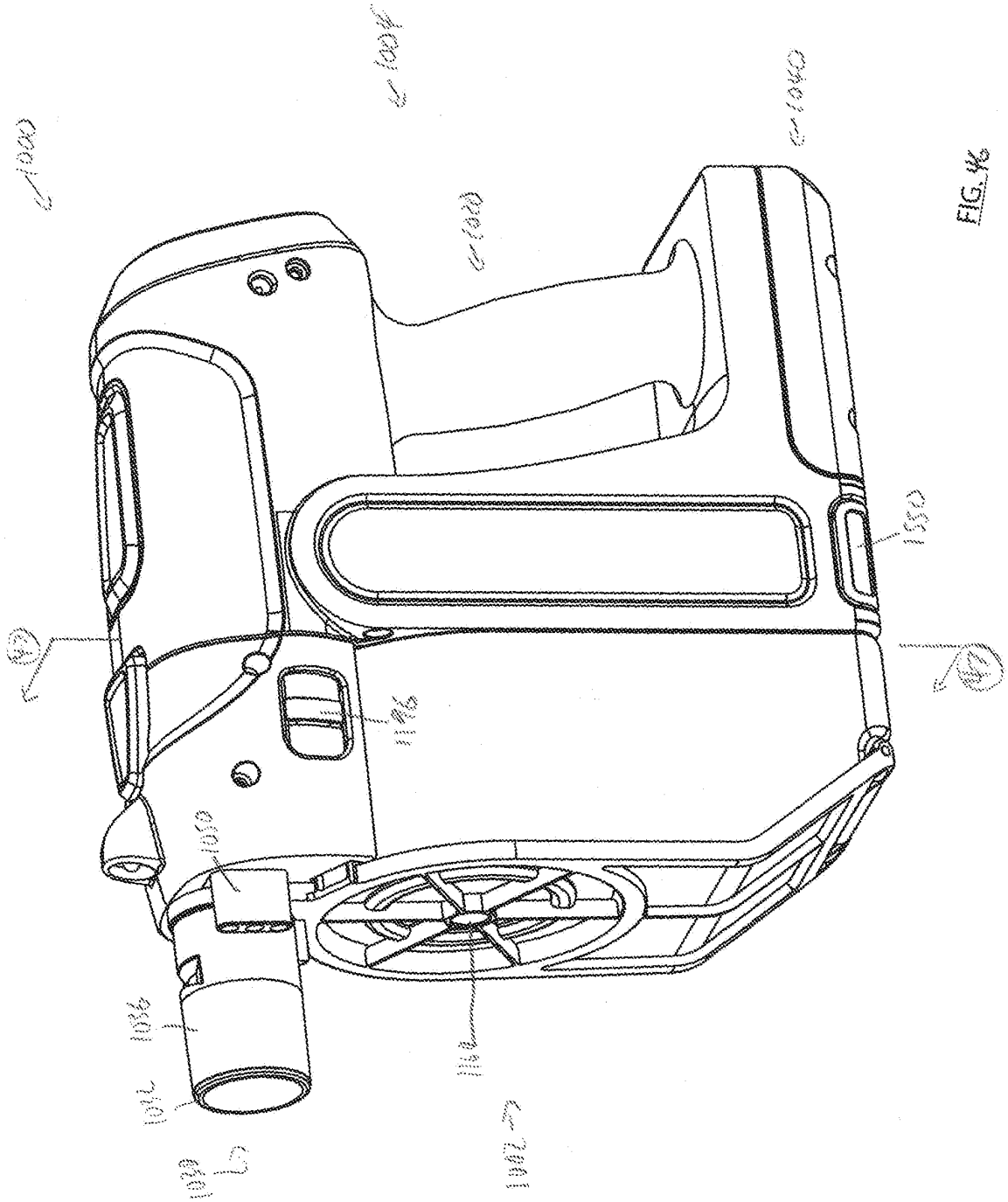


FIG. 4b

FIG. 47

FIG. 4B

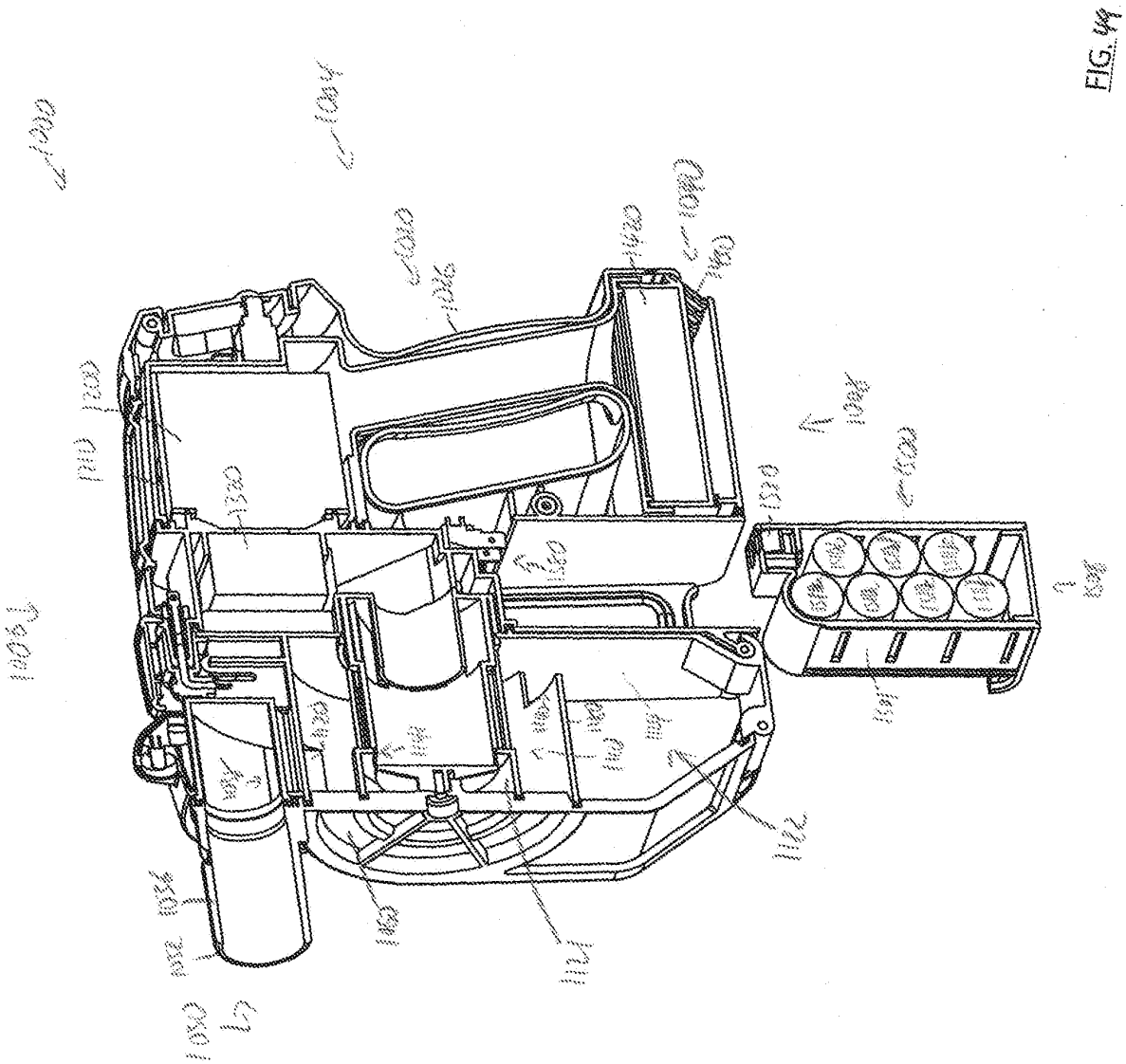


FIG. 44

FIG. 80

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

PTO/SB/439 (11-15)

AUTHORIZATION FOR INTERNET COMMUNICATIONS IN A PATENT APPLICATION OR REQUEST TO WITHDRAW AUTHORIZATION FOR INTERNET COMMUNICATIONS		
	Application No.	
	Filing Date	July 6, 2017
	First Named Inventor	Wayne Ernest Conrad
	Art Unit	n/a
	Examiner Name	n/a
	Practitioner Docket No.	10452-P52585US00

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

I. To authorize permission for Internet Communications.

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

II. To withdraw authorization for Internet Communications.

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

I am the

☐ applicant.

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

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

/Philip C. Mendes da Costa/ — Signature

July 6, 2017 — Date

Philip C. Mendes da Costa — Typed or printed name

416.957.1695 — Telephone Number

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

☐ * Total of _____ forms are submitted.

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

PTO/AIA/14 (11-15)
Approved for use through 04/30/2017. OMB 0651-0032
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	10452-P52585US00
	Application Number	
Title of Invention	HANDHELD SURFACE CLEANING APPARATUS	

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

Secrecy Order 37 CFR 5.2:

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

Inventor Information:

Inventor 1 — Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Wayne	Ernest	Conrad	

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

City	Hampton	Country of Residence [i]	CA

Mailing Address of Inventor:

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

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

Correspondence Information:

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

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

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

Application Information:

Title of the Invention	HANDHELD SURFACE CLEANING APPARATUS		
Attorney Docket Number	10452-P52585US00	**Small Entity Status Claimed**	☐
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	50	**Suggested Figure for Publication (if any)**	36

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	10452-P52585US00
	Application Number	
Title of Invention	HANDHELD SURFACE CLEANING APPARATUS	

Filing By Reference:

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

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

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

Publication Information:

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

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

Representative Information:

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

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

Domestic Benefit/National Stage Information:

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

Prior Application Status			Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)

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

EFS Web 2.2.12

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	10452-P52585US00
	Application Number	
Title of Invention	HANDHELD SURFACE CLEANING APPARATUS	

Foreign Priority Information:

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

Remove

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

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

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

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

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	10452-P52585US00
	Application Number	
Title of Invention	HANDHELD SURFACE CLEANING APPARATUS	

Authorization or Opt-Out of Authorization to Permit Access:

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

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

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

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

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

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

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

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

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

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

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

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	10452-P52585US00
	Application Number	
Title of Invention	HANDHELD SURFACE CLEANING APPARATUS	

Applicant Information:

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

Applicant 1 Remove

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

Clear

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

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

Name of the Deceased or Legally Incapacitated Inventor:

If the Applicant is an Organization check here. ☒

Organization Name	Omachron Intellectual Property Inc.		
Mailing Address Information For Applicant:			
Address 1	9 King Lane		
Address 2			
City	Hampton	**State/Province**	ON
Country	CA	Postal Code	L0B 1J0
Phone Number		Fax Number	
Email Address			

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

Assignee Information including Non-Applicant Assignee Information:

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

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	10452-P52585US00
	Application Number	
Title of Invention	HANDHELD SURFACE CLEANING APPARATUS	

Assignee 1

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

Remove

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

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

Mailing Address Information For Assignee including Non-Applicant Assignee:

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

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

Signature:

Remove

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

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

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

Signature	/Philip C. Mendes da Costa/			Date (YYYY-MM-DD)	2017-07-06
First Name	Philip	Last Name	Mendes da Costa	Registration Number	33106

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

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	10452-P52585US00
	Application Number	
Title of Invention	HANDHELD SURFACE CLEANING APPARATUS	

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

Privacy Act Statement

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

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

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

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

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

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

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

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

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

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

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

Electronic Patent Application Fee Transmittal

Application Number:	
Filing Date:	
Title of Invention:	HANDHELD SURFACE CLEANING APPARATUS
First Named Inventor/Applicant Name:	Wayne Ernest Conrad
Filer:	Philip C. Mendes da Costa/Weronika Debicki
Attorney Docket Number:	10452-P52585US00

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
UTILITY APPLICATION FILING	1011	1	280	280
UTILITY SEARCH FEE	1111	1	600	600
UTILITY EXAMINATION FEE	1311	1	720	720
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**1600**

Electronic Acknowledgement Receipt	
EFS ID:	29704301
Application Number:	15642781
International Application Number:	
Confirmation Number:	5834
Title of Invention:	HANDHELD SURFACE CLEANING APPARATUS
First Named Inventor/Applicant Name:	Wayne Ernest Conrad
Customer Number:	1059
Filer:	Philip C. Mendes da Costa/Weronika Debicki
Filer Authorized By:	Philip C. Mendes da Costa
Attorney Docket Number:	10452-P52585US00
Receipt Date:	06-JUL-2017
Filing Date:	
Time Stamp:	14:56:05
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	$1600
RAM confirmation Number	070717INTEFSW00001271022095
Deposit Account	022095
Authorized User	Karen Yu
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: 37 CFR 1.16 (National application filing, search, and examination fees) 37 CFR 1.17 (Patent application and reexamination processing fees)	

37 CFR 1.19 (Document supply fees)

37 CFR 1.20 (Post Issuance fees)

37 CFR 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Application Data Sheet	P52585US00_ADS_2017_07_06.pdf	1933699 71c9820390c53a96158ba7ef69ed009a73b1ec26	no	8
Warnings:					
Information:					
2	Specification	P52585US00_specification_2017_07_06.pdf	206299 87241506c654a43c13a011cf5dad03424a775137	no	67
Warnings:					
Information:					
3	Claims	P52585US00_claims_2017_07_06.pdf	37843 6144a3aa1a6d4c26473523566257b03d5cdeac86	no	3
Warnings:					
Information:					
4	Abstract	P52585US00_Abstract_2017_07_06.pdf	34090 81ed94ac65e8c2b1734d66ed78c69663777a74d4	no	1
Warnings:					
Information:					
5	Drawings-only black and white line drawings	P52585US00_Figures_1-25_2017_07_06.pdf	14309699 88bd9f863101b841a22c3975458cc199603ab27d	no	25
Warnings:					
The page size in the PDF is too large. The pages should be 8.5 x 11 or A4. If this PDF is submitted, the pages will be resized upon entry into the Image File Wrapper and may affect subsequent processing					
Information:					
6	Drawings-only black and white line drawings	P52585US00_Figures_26-50_2017_07_06.pdf	15737129 8d9a4bfdbfb10ee5db2a63d0feeffe048d3918ff	no	25
Warnings:					

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Information:					
7	Oath or Declaration filed	P52585US00_Declaration_Wayne_2017_07_06.pdf	314300 7e84aa81b4e32e7a6b614675e5a903321cc30fed	no	1
Warnings:					
Information:					
8	Power of Attorney	P52585US00_poa_2017_07_06.pdf	209552 e544e2db8800a170b7db0478ac1bd07751cacb91	no	2
Warnings:					
Information:					
9	Auth or Resc of Auth to Access Appl by DAS/PDX Office	P52585US00_DASPDX_2017_07_06.pdf	116047 10a7251eb27a267e776a49ae0b625c7a2e14d4db	no	2
Warnings:					
Information:					
10	Auth or Resc of Auth to Access Search Results	P52585US00_EPO_ASR_2017_07_06.pdf	113187 bbdf09f795fe38e4f54a1d48a1f90f9a79a5d6d9	no	2
Warnings:					
Information:					
11	Internet Communications Authorized	P52585US00_Internet_2017_07_06.pdf	74156 fb0c4ac066463e8e955bd8ab9b45bdd209ab220d	no	2
Warnings:					
Information:					
12	Fee Worksheet (SB06)	fee-info.pdf	35083 e10f6c425832e2bf21350a6f5fecf2be203244e7	no	2
Warnings:					
Information:					
			Total Files Size (in bytes):	33121084	

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New Applications Under 35 U.S.C. 111

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

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

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

New International Application Filed with the USPTO as a Receiving Office

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

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

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TRANSMITTAL FOR POWER OF ATTORNEY TO ONE OR MORE REGISTERED PRACTITIONERS

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

Application Number	n/a
Filing Date	July 6, 2017
First Named Inventor	Wayne Ernest Conrad
Title	HANDHELD SURFACE CELANING APPARATUS
Art Unit	N/A
Examiner Name	N/A
Attorney Docket Number	10452-P52585US00

SIGNATURE of Applicant or Patent Practitioner

Signature	/Philip C. Mendes da Costa/	Date (Optional)	July 6, 2017
Name	Philip C. Mendes da Costa	Registration Number	33106
Title (if Applicant is a juristic entity)	Vice President and Agent for Applicant		
Applicant Name (if Applicant is a juristic entity)	Omachron Intellectual Property Inc.		

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

☐ *Total of _____ forms are submitted.

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

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

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

PTO/AIA/82B (07-13)
Approved for use through 11/30/2014. OMB 0651-0051
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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POWER OF ATTORNEY BY APPLICANT

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

Application Number	Filing Date

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

☑ I hereby appoint the Patent Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above: 01059

OR

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

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

☑ The address associated with the above-mentioned Customer Number

OR

☐ The address associated with Customer Number:

OR

Firm or Individual Name					
Address					
City		State		Zip	
Country					
Telephone		Email			

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

Omachron Intellectual Property Inc.

☐ Inventor or Joint Inventor (title not required below)

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

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

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

SIGNATURE of Applicant for Patent

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

Signature		Date (Optional)	July 28, 2015
Name	Philip C Mendes da Costa		
Title	Vice President		

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

☐ Total of forms are submitted.

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

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

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

PTO/SB/39 (11-15)
Approved for use through 07/31/2016. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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AUTHORIZATION OR RESCISSION OF AUTHORIZATION TO PERMIT ACCESS TO APPLICATION-AS-FILED BY PARTICIPATING OFFICES

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

Application Number (if known):	Filing Date: July 6, 2017
First Named Inventor: Wayne Ernest Conrad	Attorney Docket Number: 10452-P52585US00

Title (Required)
HANDHELD SURFACE CLEANING APPARATUS

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

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

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

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

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

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

Signature /Philip C. Mendes da Costa/	Date July 6, 2017
Name (Print/Typed) Philip C. Mendes da Costa	Practitioner Registration Number (if applicable) 33106
Name of Assignee (if applicable)	Title (if applicable)

☐ *Total of _____ forms are submitted.

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

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

Privacy Act Statement

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

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

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

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 15/642,781

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	280
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	600
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	720
TOTAL CLAIMS (37 CFR 1.16(i))	16 minus 20 =	*			OR	x 80 =	0.00
INDEPENDENT CLAIMS (37 CFR 1.16(h))	1 minus 3 =	*				x 420 =	0.00
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						0.00
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							0.00
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	1600

APPLICATION AS AMENDED - PART II

AMENDMENT A

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

AMENDMENT B

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

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.

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

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
15/642,781	07/06/2017	3723	1600	10452-P52585US00	16	1

CONFIRMATION NO. 5834

FILING RECEIPT

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

OC000000092738987

Date Mailed: 07/13/2017

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Inventor(s)

Wayne Ernest Conrad, Hampton, CANADA;

Applicant(s)

Omachron Intellectual Property Inc., Hampton, CANADA;

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

Domestic Applications for which benefit is claimed - None.
A proper domestic benefit claim must be provided in an Application Data Sheet in order to constitute a claim for domestic benefit. See 37 CFR 1.76 and 1.78.

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

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

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

If Required, Foreign Filing License Granted: 07/12/2017
The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 15/642,781**

Projected Publication Date: 01/10/2019

Non-Publication Request: No

Early Publication Request: No
Title

HANDHELD SURFACE CLEANING APPARATUS

Preliminary Class

015

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

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

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

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

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

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

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, http://www.stopfakes.gov. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

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Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

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

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NOT GRANTED

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The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The U.S. offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to promote and facilitate business investment. SelectUSA provides information assistance to the international investor community; serves as an ombudsman for existing and potential investors; advocates on behalf of U.S. cities, states, and regions competing for global investment; and counsels U.S. economic development organizations on investment attraction best practices. To learn more about why the United States is the best country in the world to develop technology, manufacture products, deliver services, and grow your business, visit http://www.SelectUSA.gov or call +1-202-482-6800.

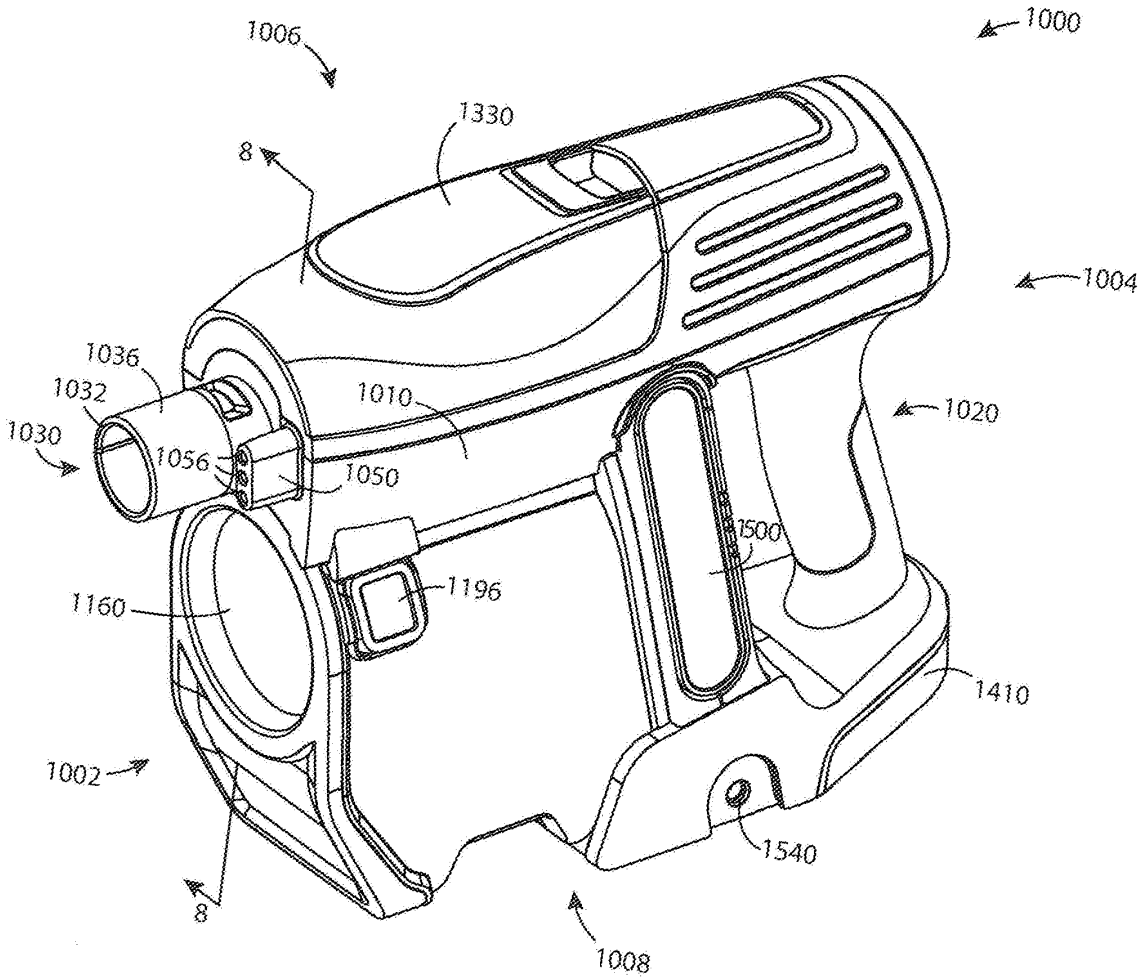

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FIG. 1

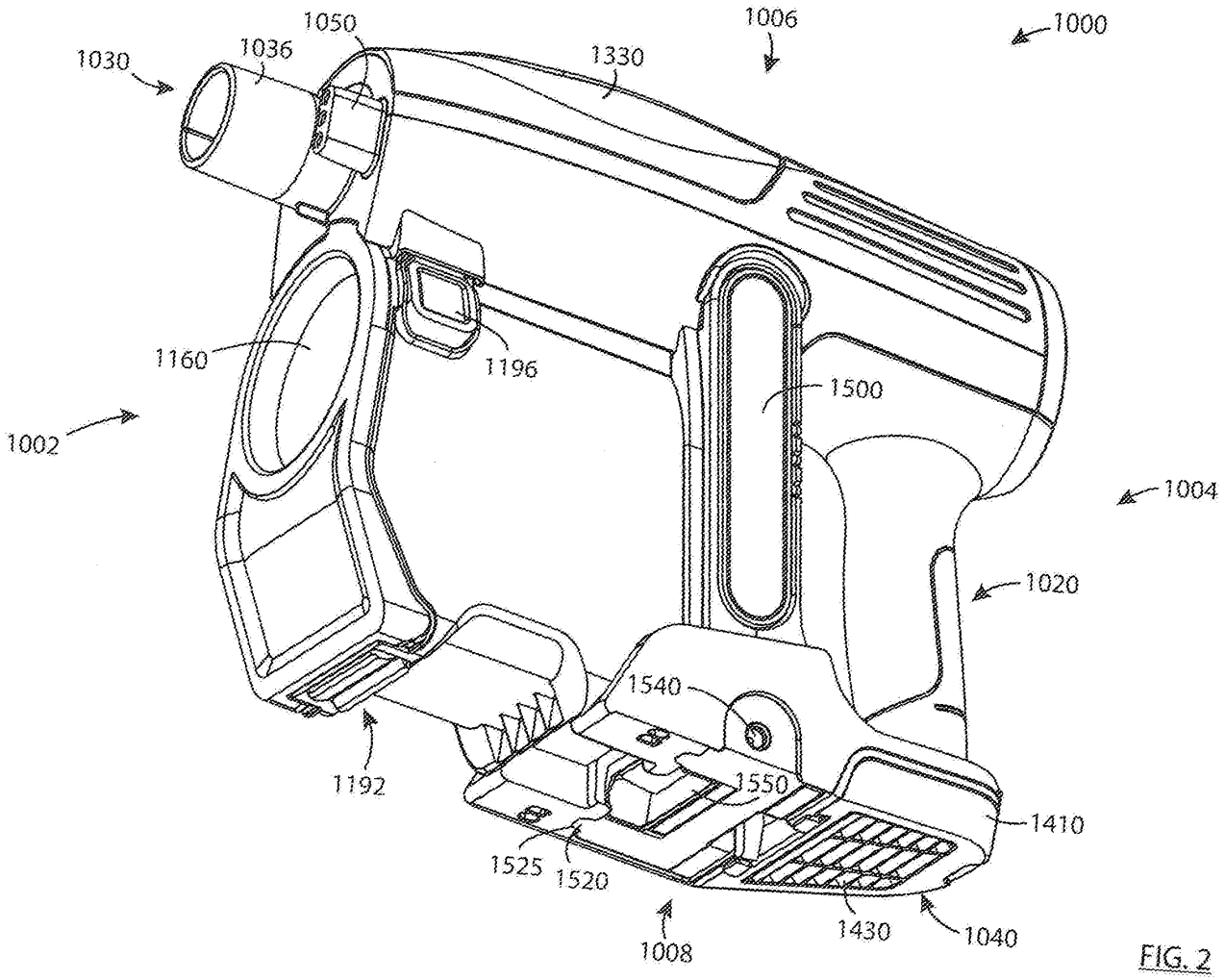

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FIG. 2

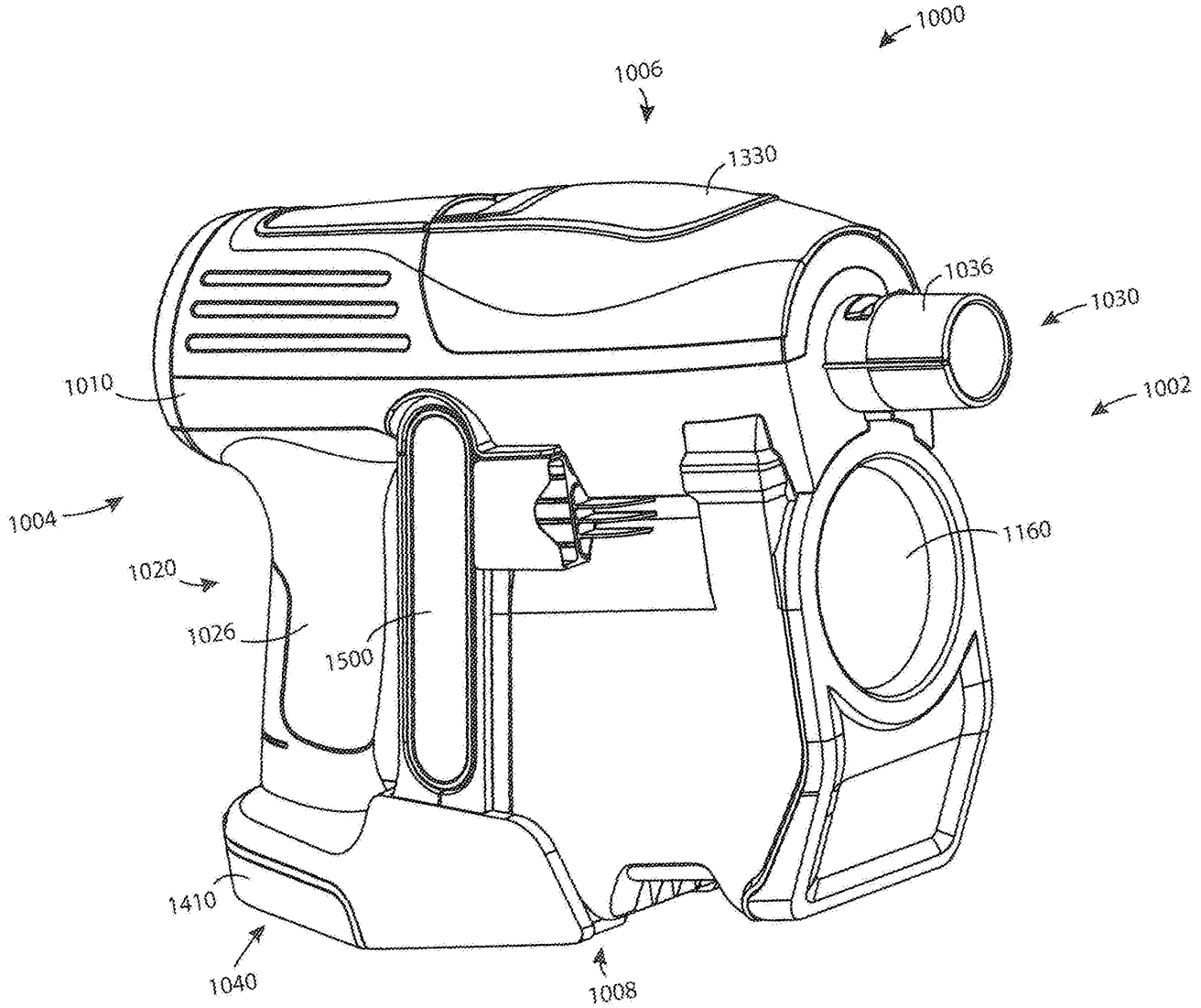

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FIG. 3

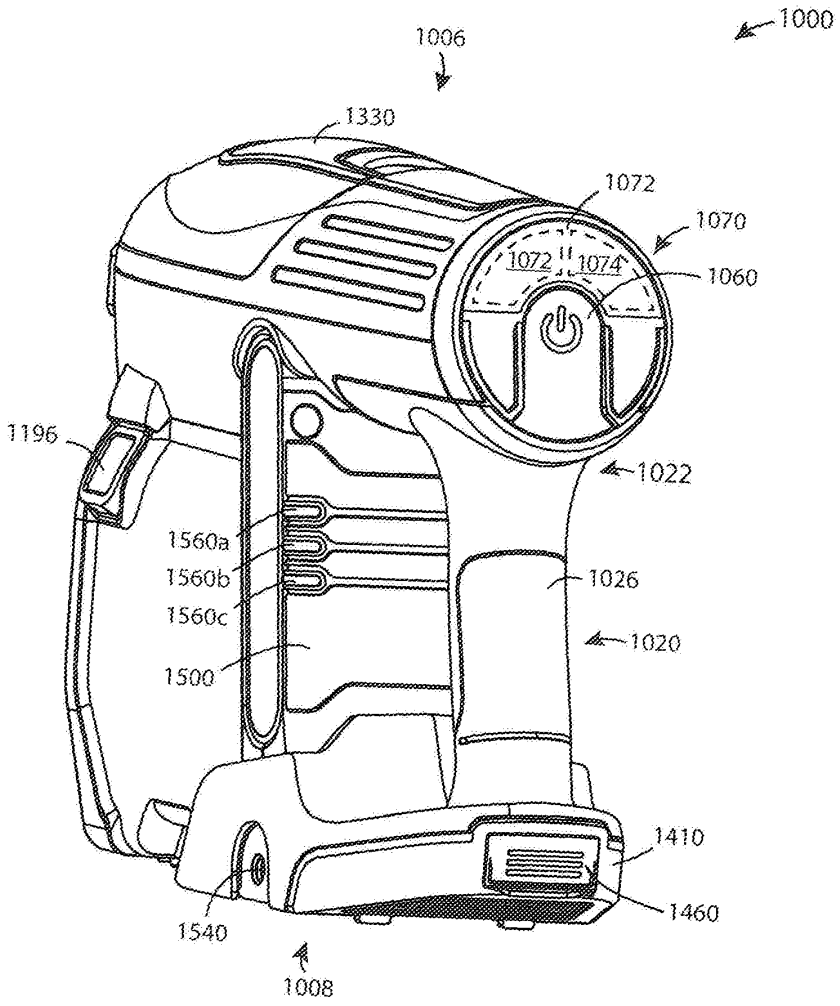

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FIG. 4

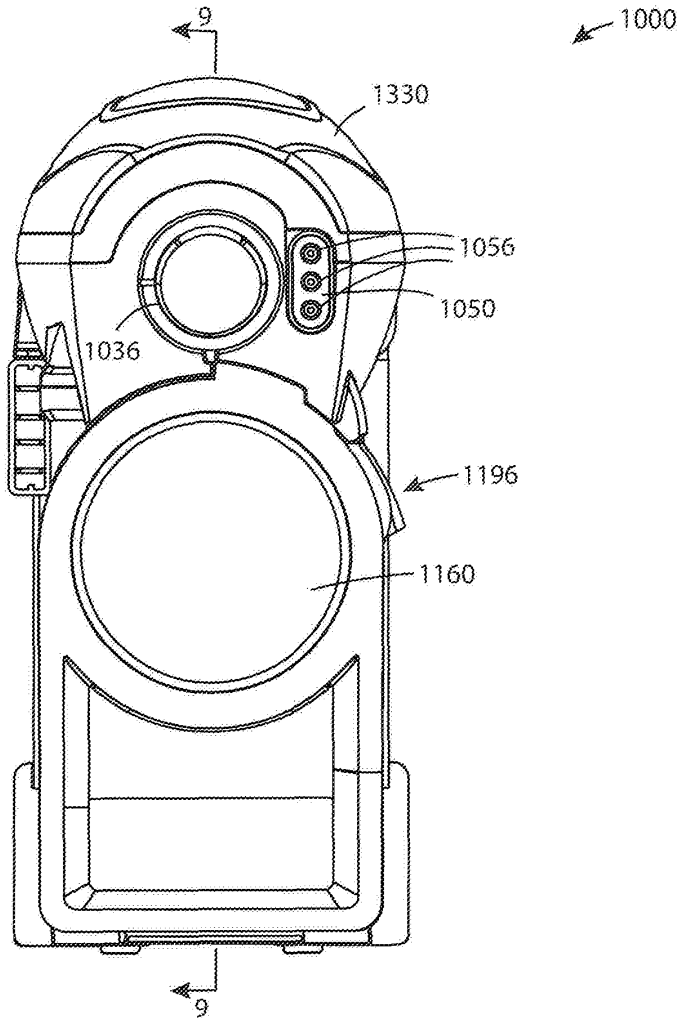


FIG. 5

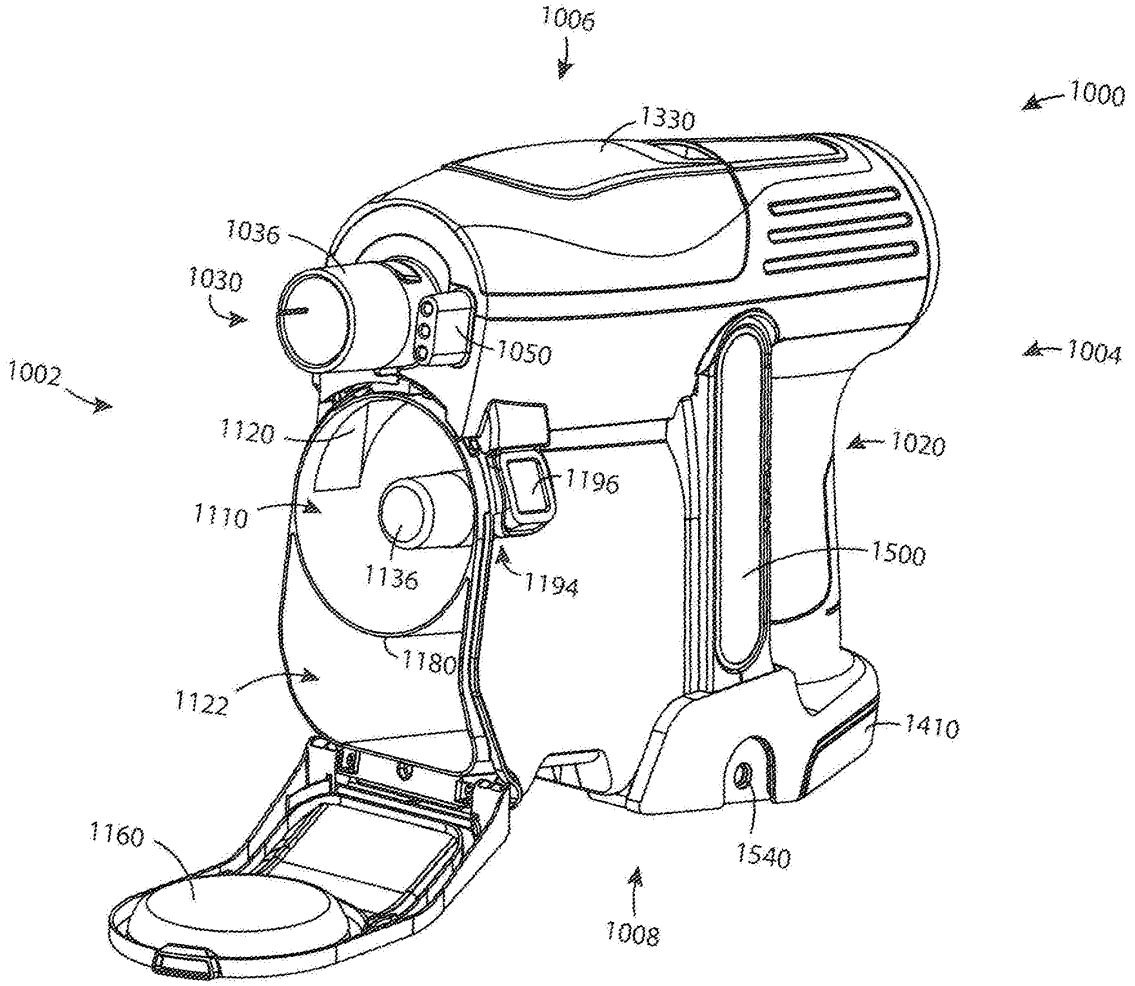

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FIG. 6

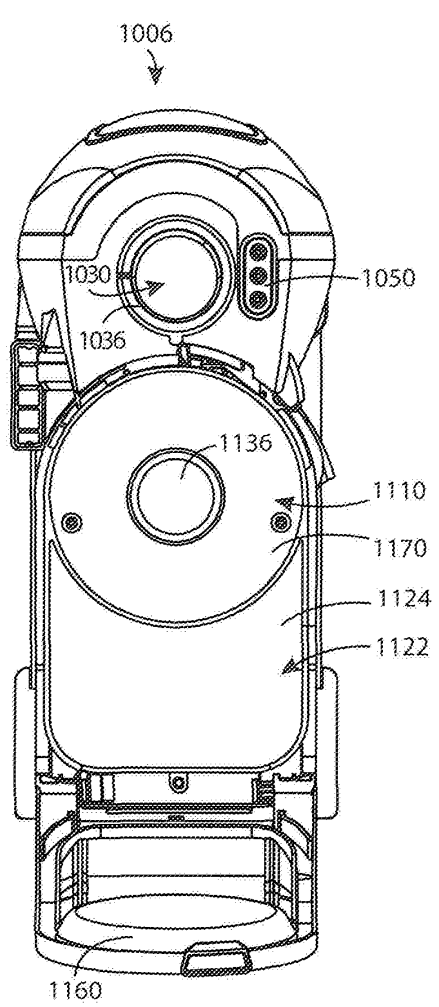


FIG. 7

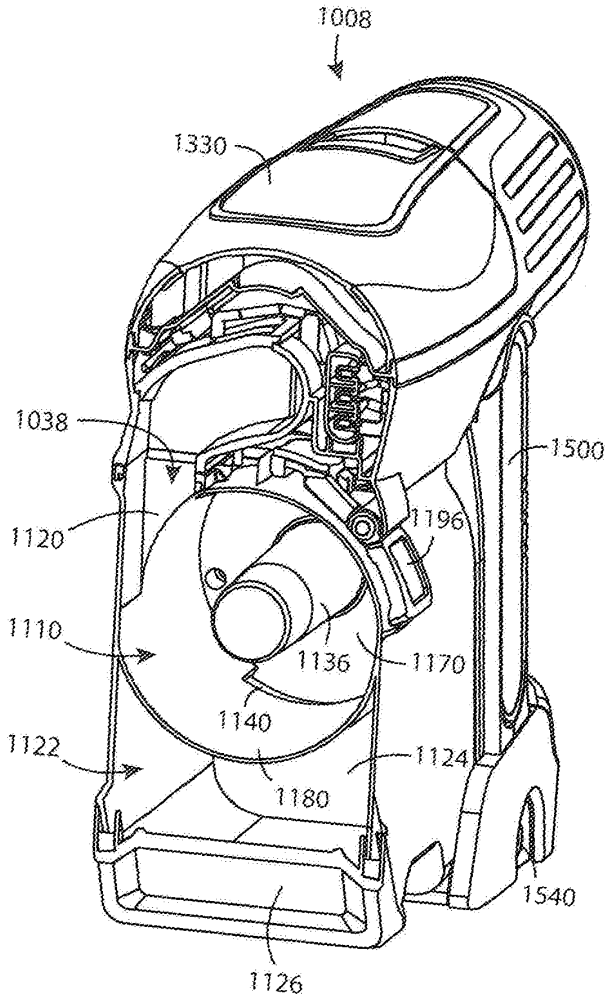

1008
1000
1330
1038
1500
1120
1196
1110
1136
1170
1140
1122
1124
1180
1540
1126

FIG. 8

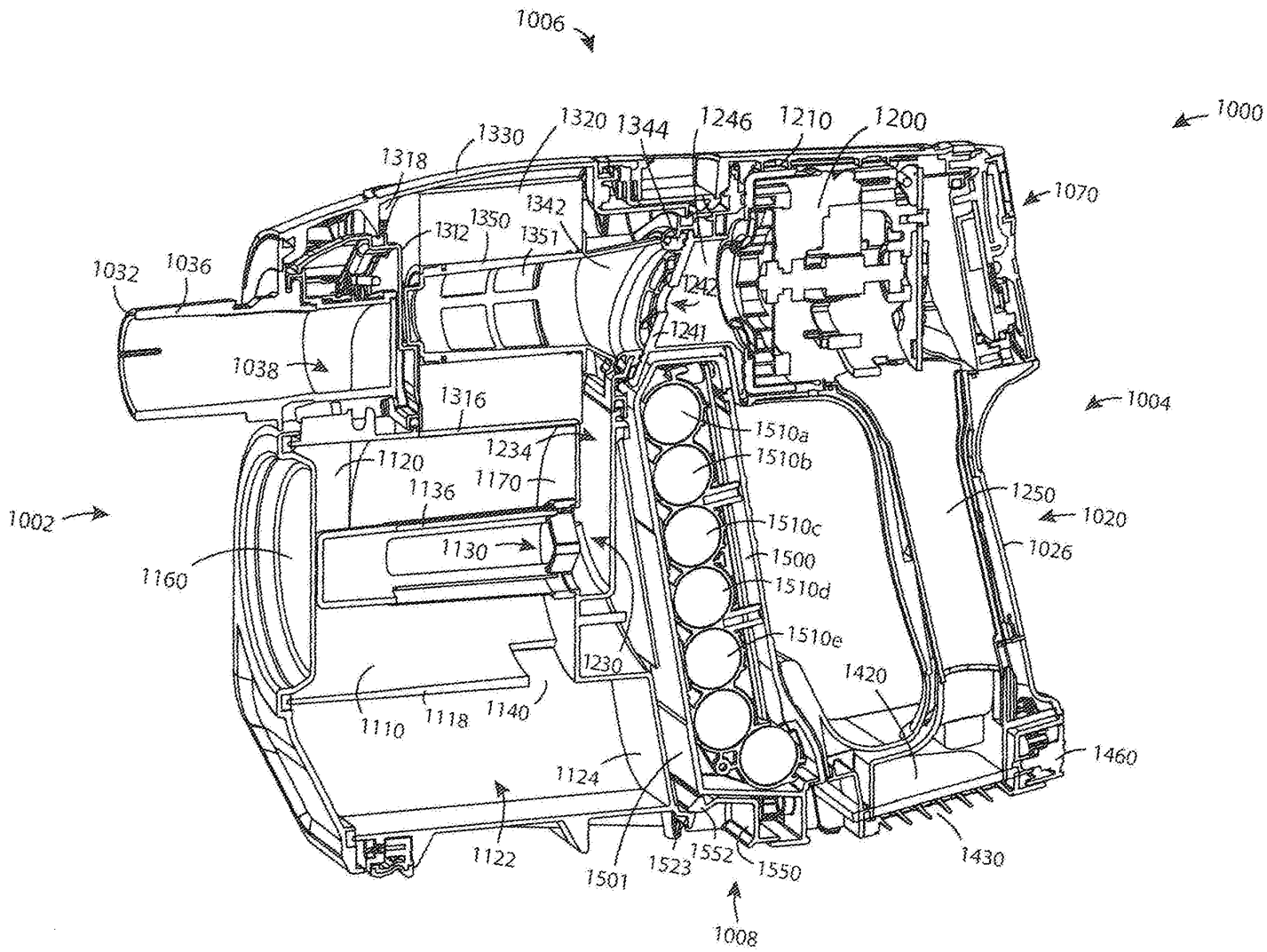

1006
1000
1330
1320
1344
1246
1210
1200
1318
1070
1342
1350
1312
1351
1032
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1242
1241
1038
1316
1004
1510a
1234
1120
1510b
1136
1170
1250
1002
1020
1510c
1130
1026
1500
1160
1510d
1510e
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1118
1140
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1124
1122
1501
1523
1552
1550
1430
1008

FIG. 9

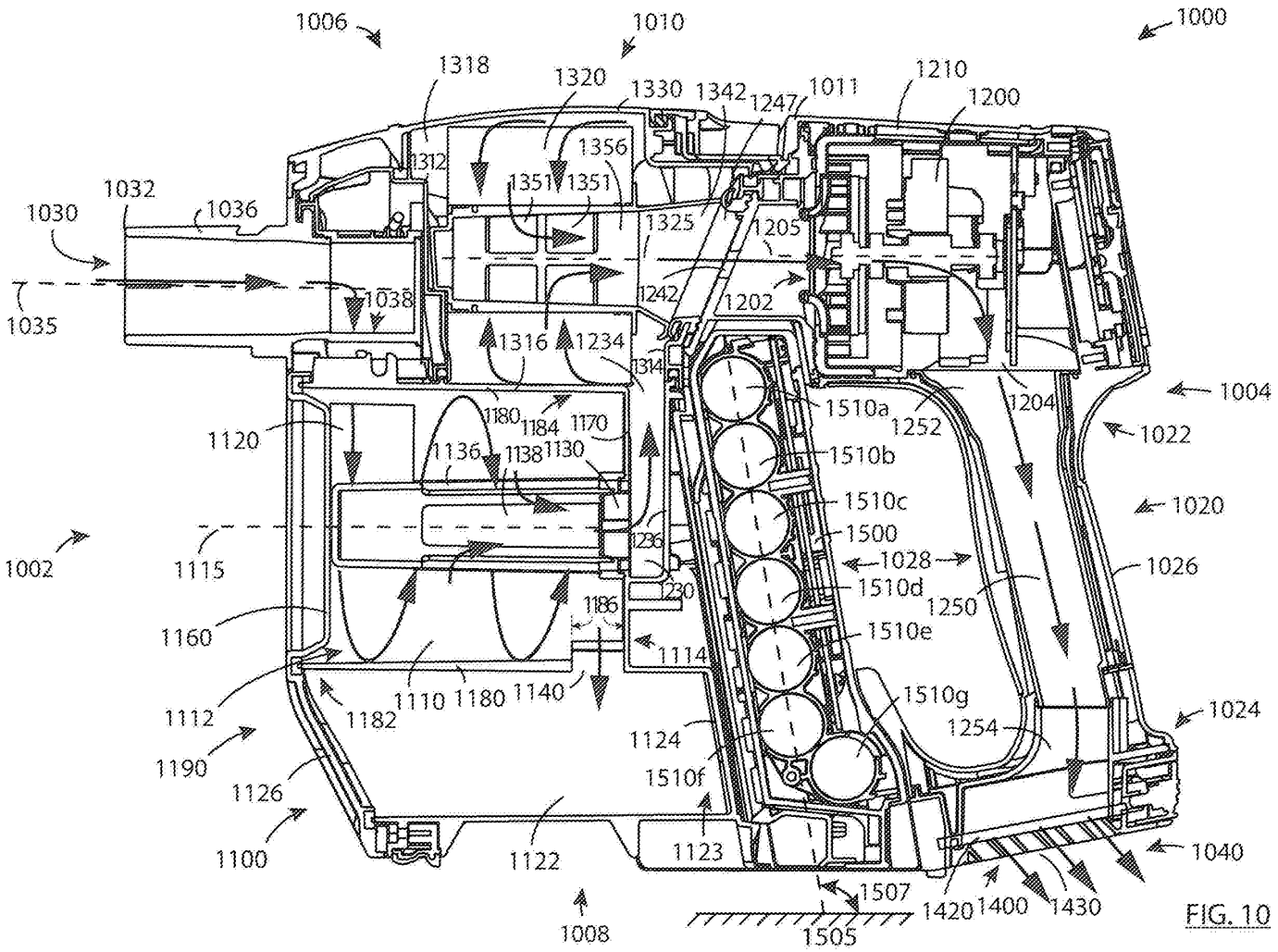

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1010
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1318
1320
1330
1342
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1011
1210
1200
1312
1356
1351
1351
1032
1030
1036
1325
1205
1035
1038
1242
1202
1316
1234
1314
1004
1510a
1252
1204
1180
1184
1170
1022
1120
1136
1138
1130
1510b
1510c
1020
1500
1002
1115
1028
1026
1510d
1250
1160
1186
1510e
1114
1112
1182
1110
1180
1140
1510g
1024
1254
1124
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1126
1100
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1123
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1507
1420
1400
1430
1008
1505

FIG. 10

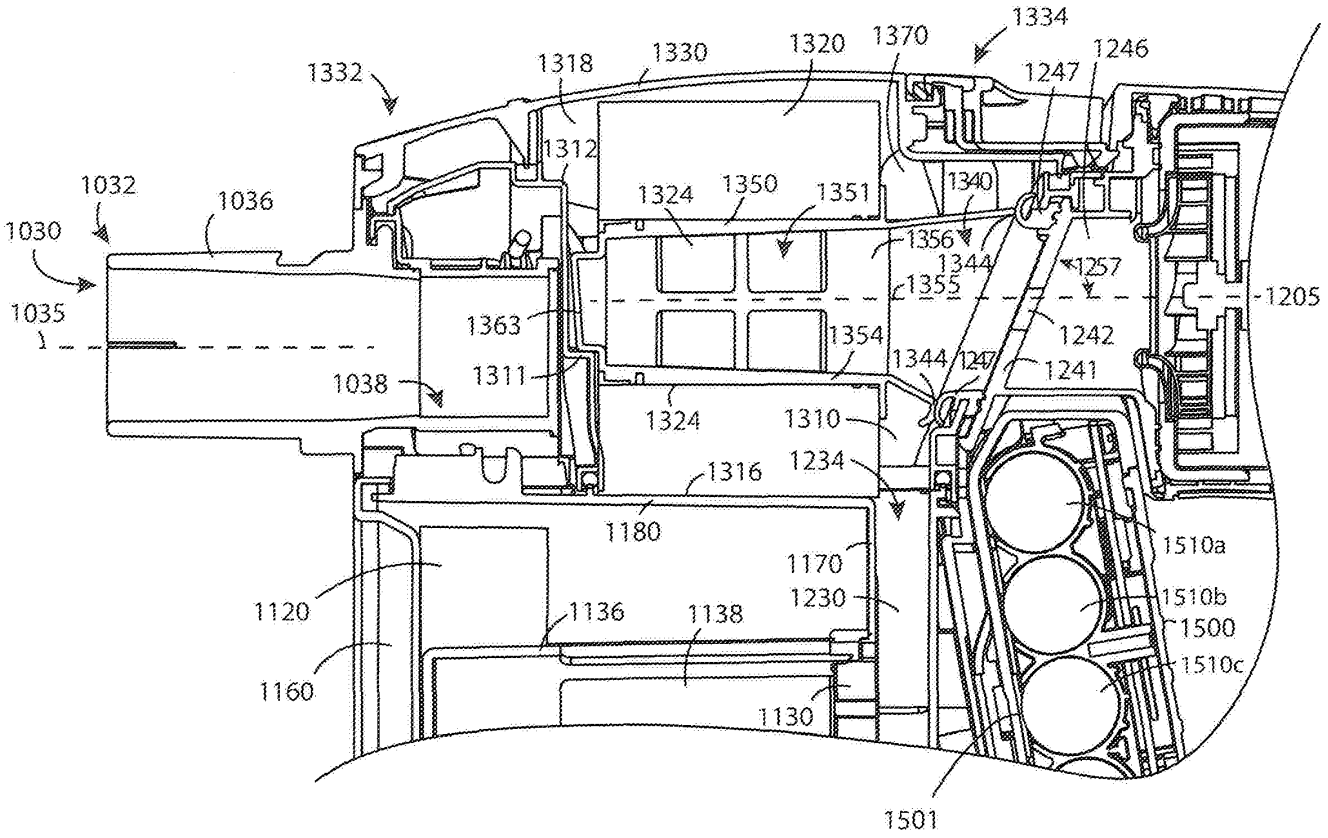

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1330
1320
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1247
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1032
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1324
1350
1351
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1030
1356
1344
1257
1355
1205
1035
1363
1354
1242
1344
1247
1241
1038
1311
1324
1310
1234
1316
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1510a
1170
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1510b
1120
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1138
1500
1510c
1160
1130
1501

FIG. 11

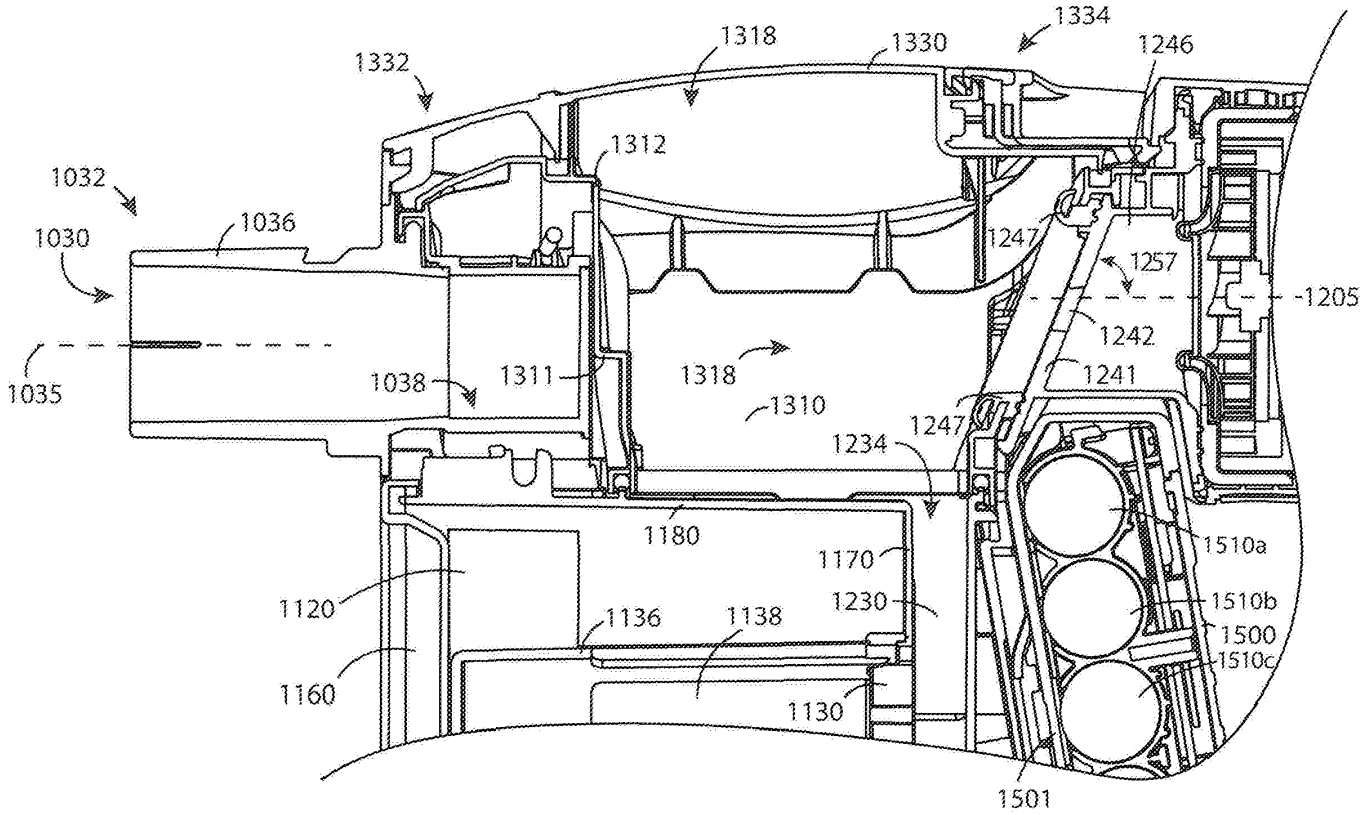

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1318
1330
1246
1332
1312
1032
1036
1030
1247
1257
1205
1242
1035
1038
1311
1318
1241
1310
1247
1234
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1120
1230
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FIG. 12

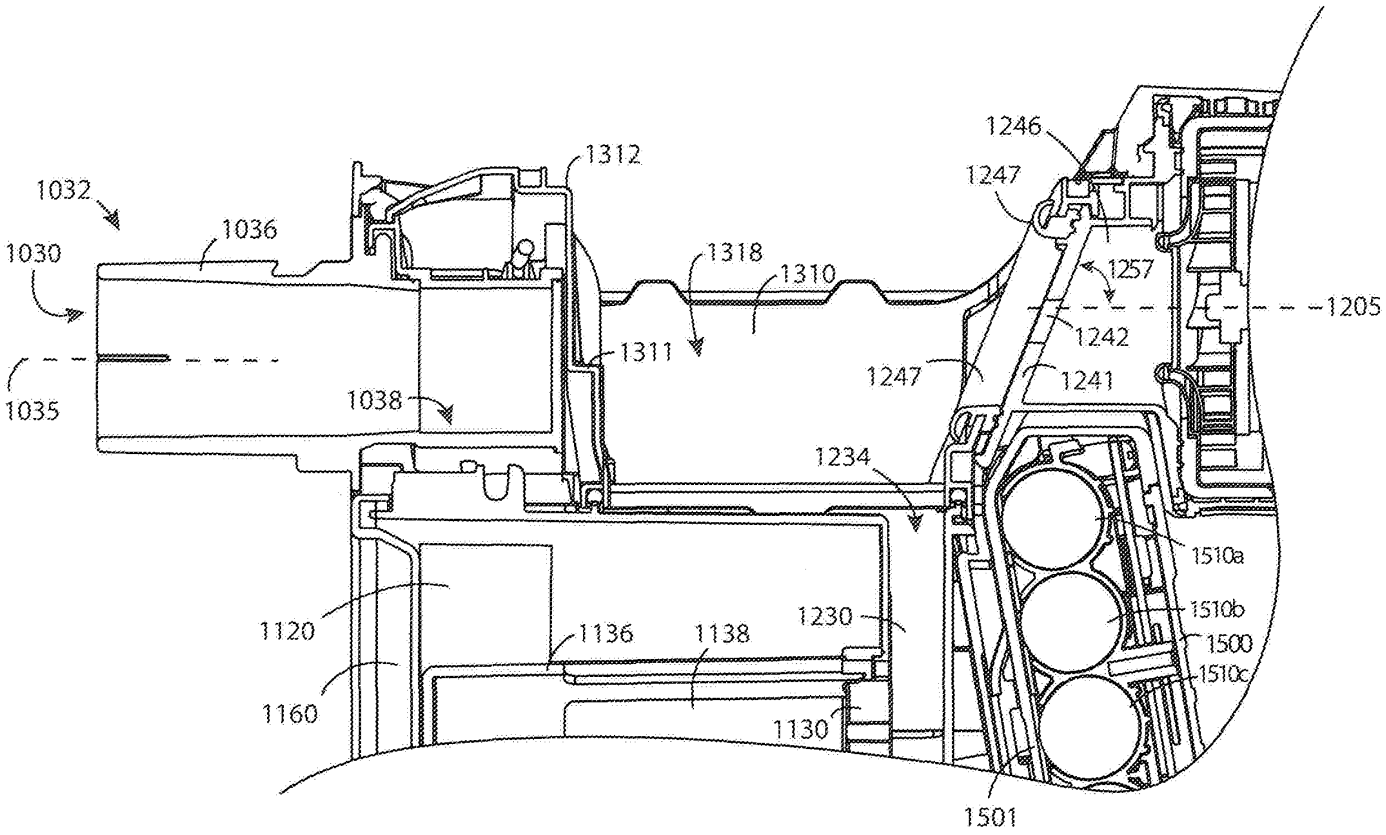

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1036
1030
1035
1038
1312
1318
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1311
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1247
1257
1205
1242
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1510c
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1120
1136
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1501

FIG. 13

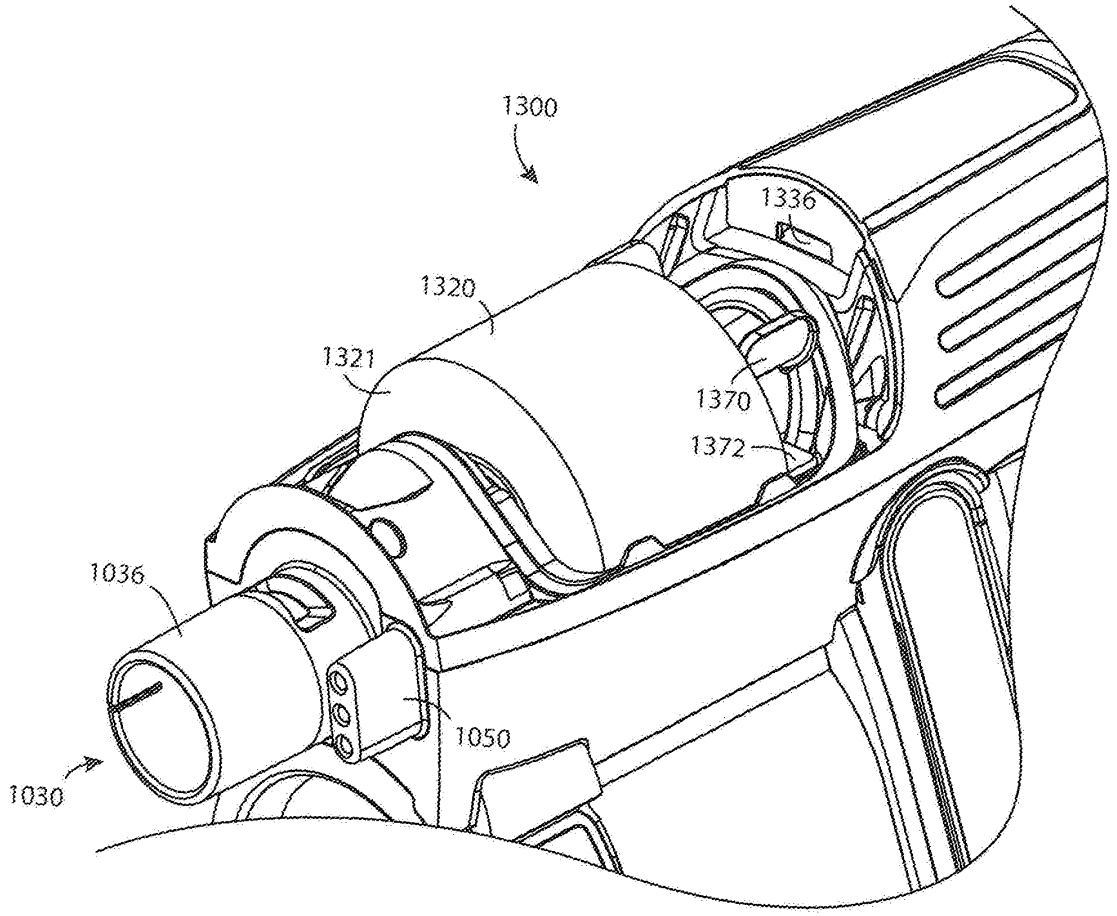


FIG. 14

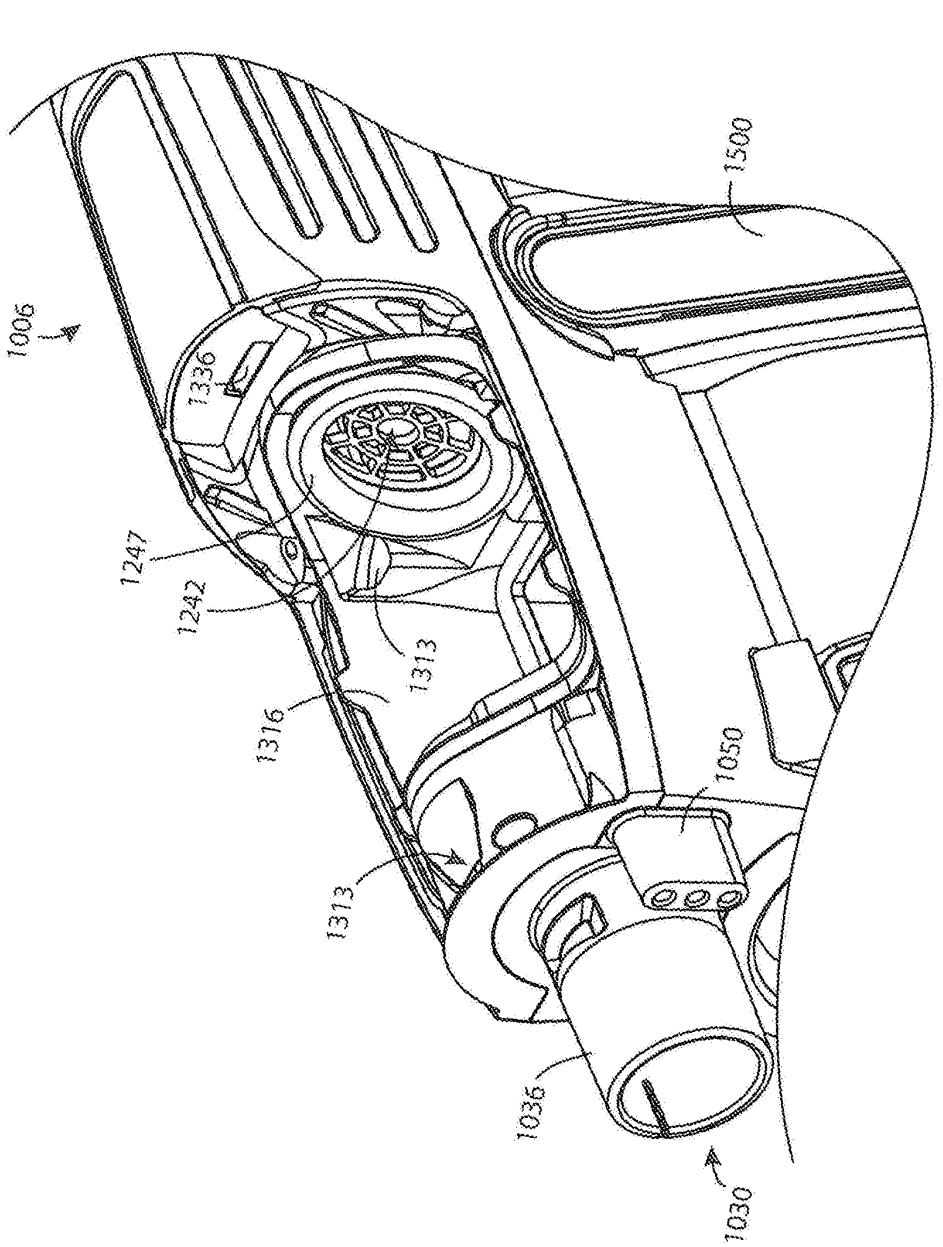


FIG. 15

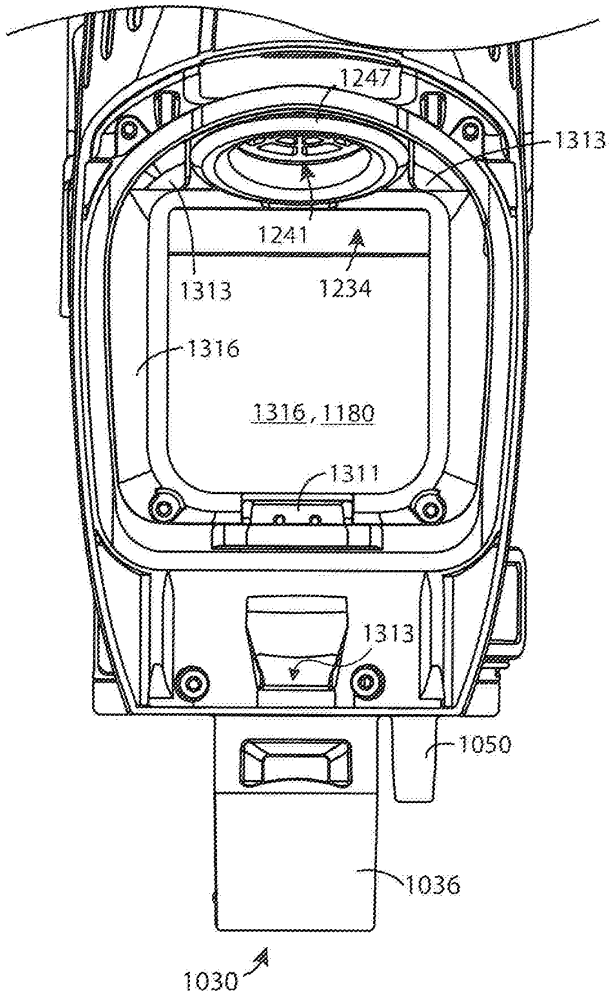

1247
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1241
1313
1234
1316
1316, 1180
1311
1313
1050
1036
1030

FIG. 16

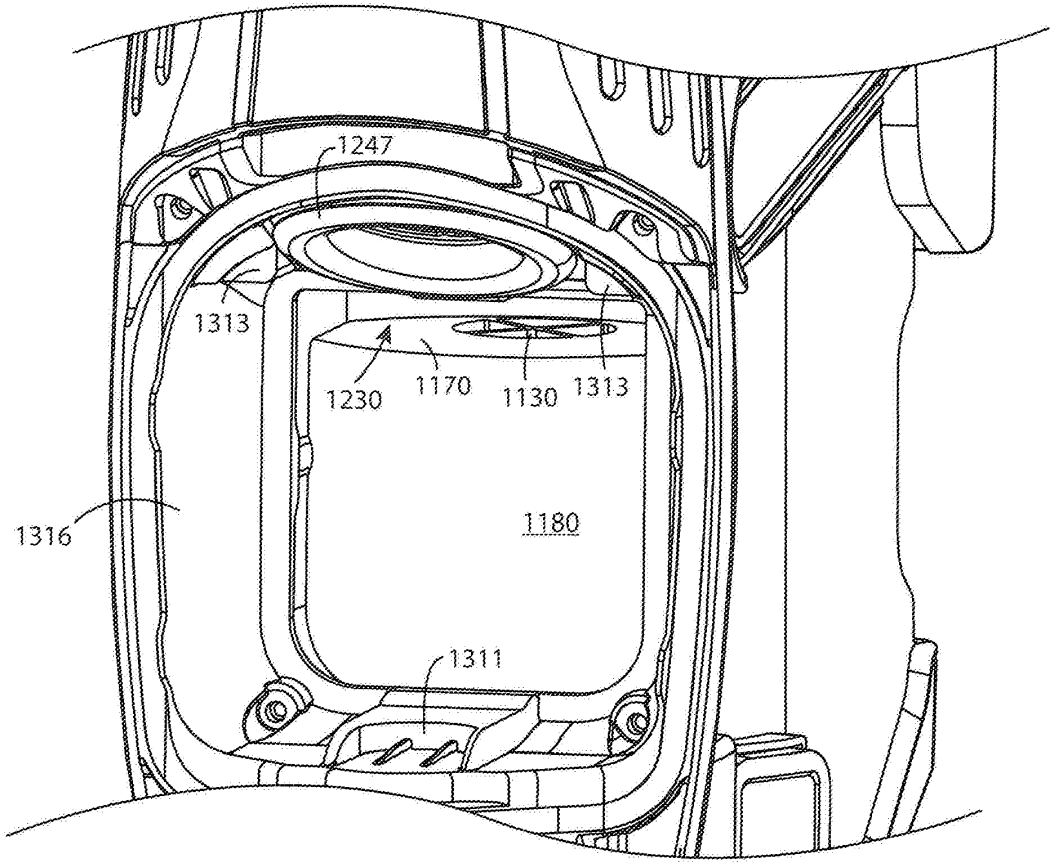


FIG. 17

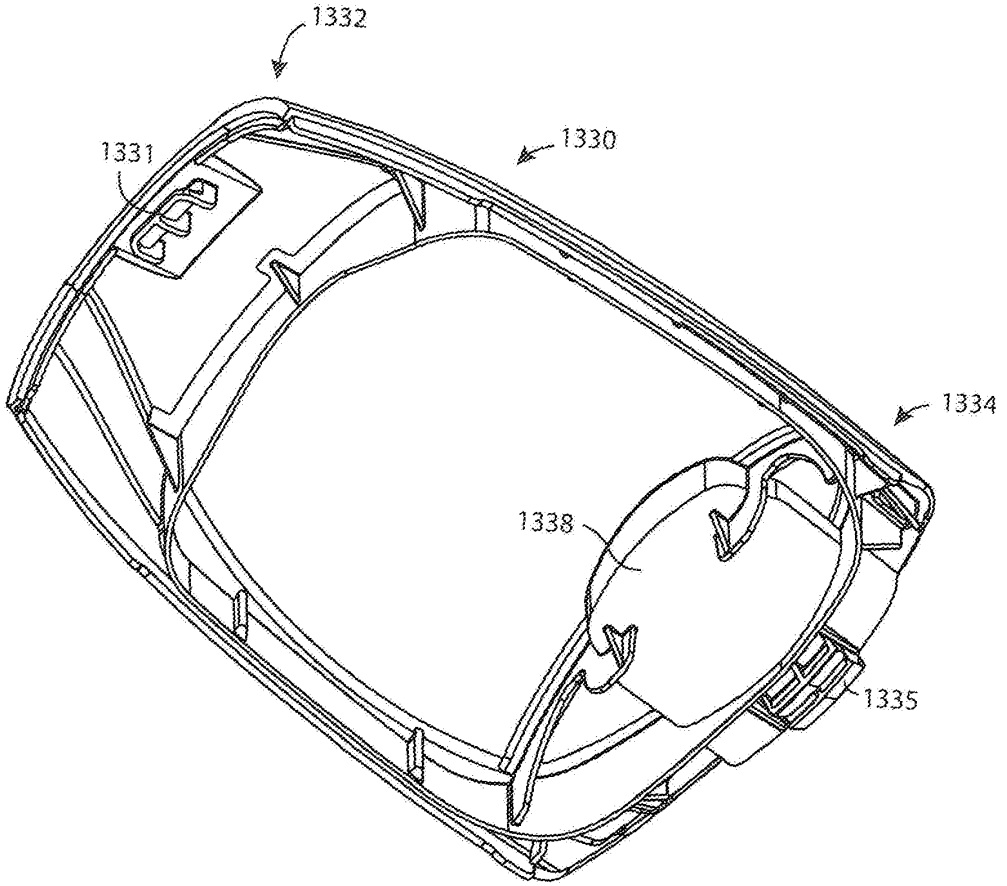


FIG. 18

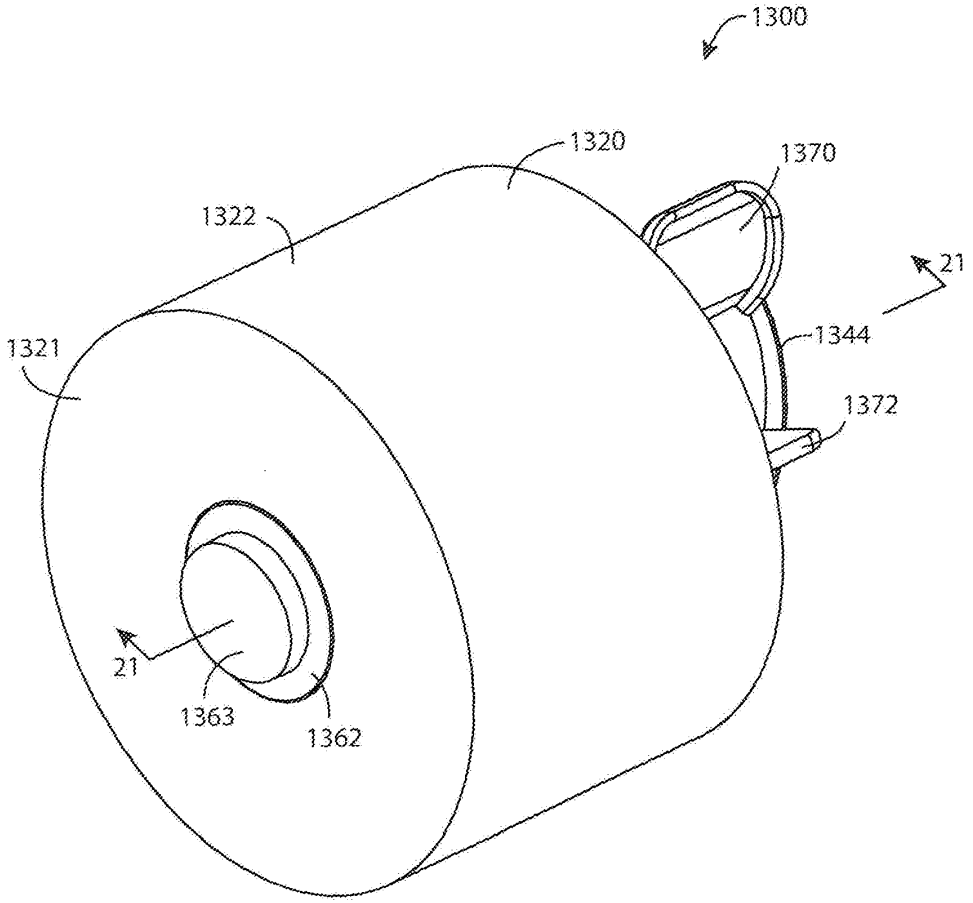


FIG. 19

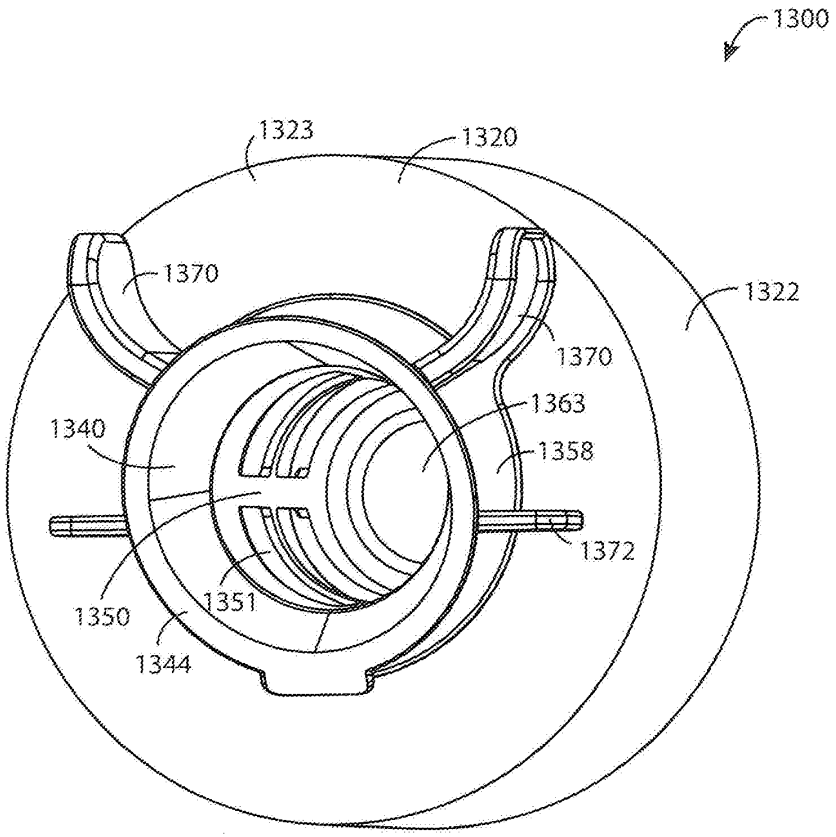

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1370
1363
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1358
1372
1350
1351
1344

FIG. 20

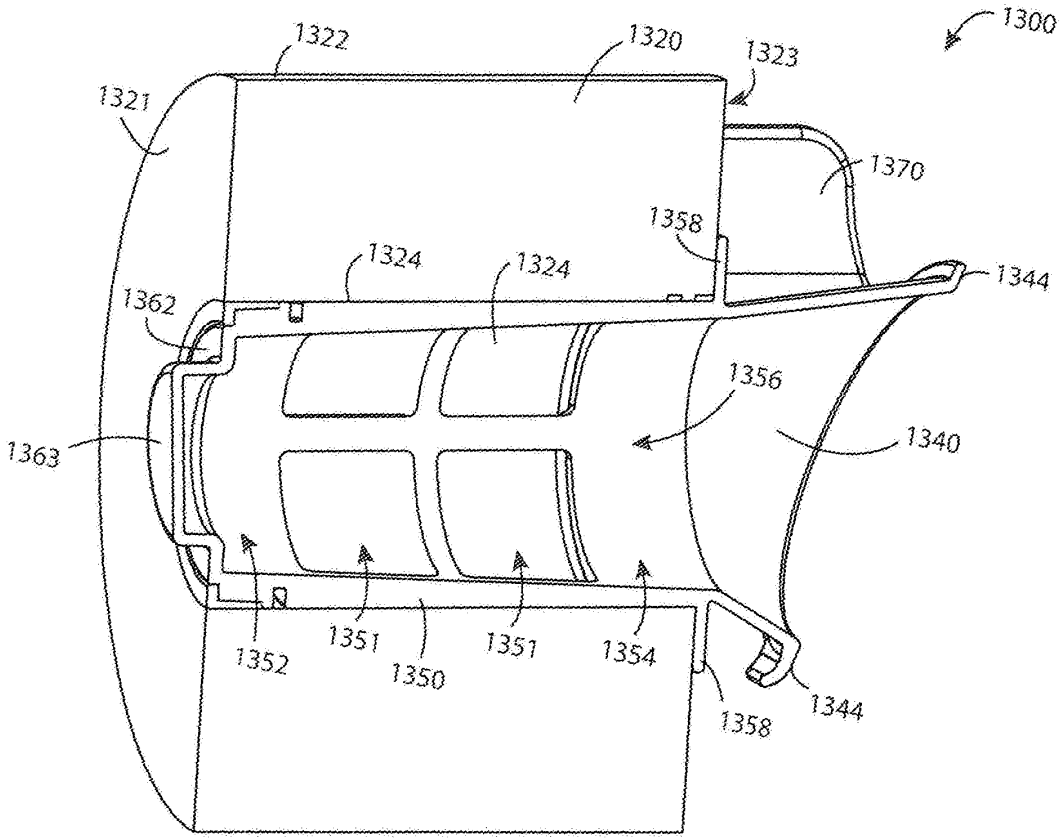

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1322
1320
1323
1321
1370
1358
1324
1324
1344
1362
1356
1363
1340
1352
1351
1350
1351
1354
1358
1344

FIG. 21

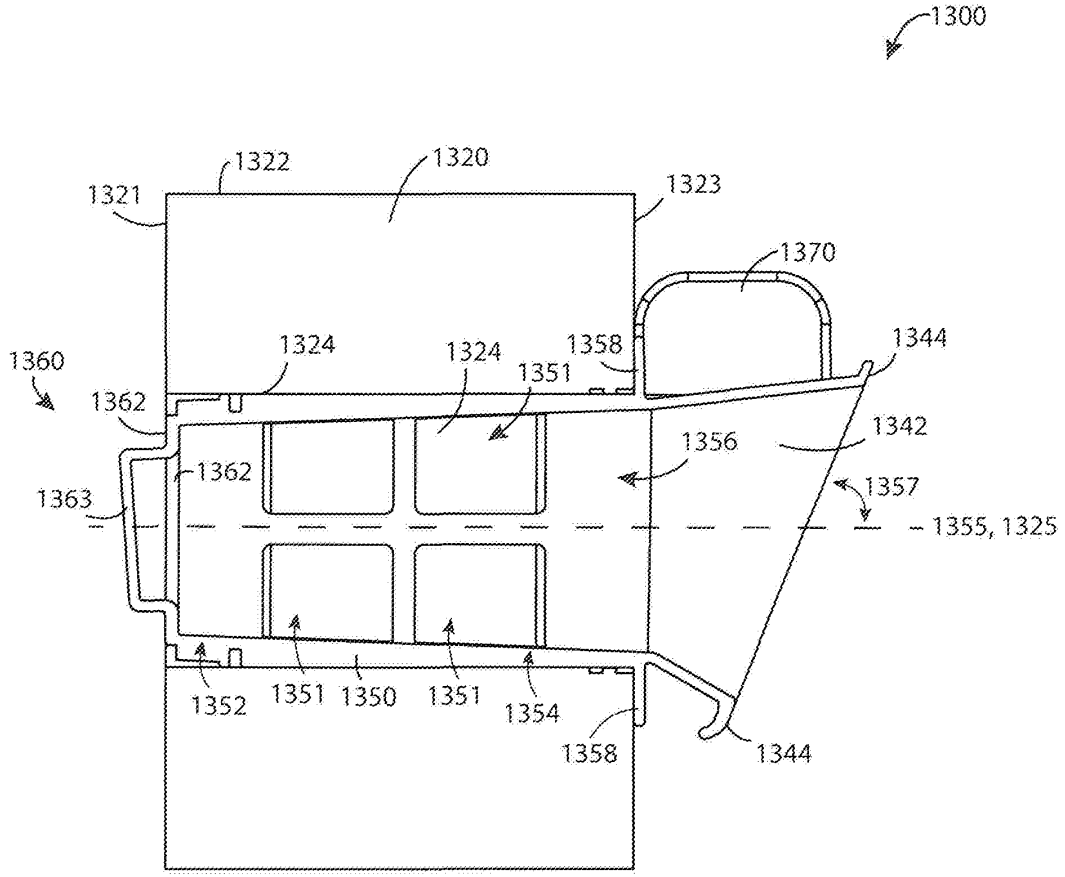

1300
1322
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1321
1323
1370
1360
1324
1324
1358
1344
1351
1362
1342
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1357
1363
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1351
1350
1351
1354
1358
1344

FIG. 22

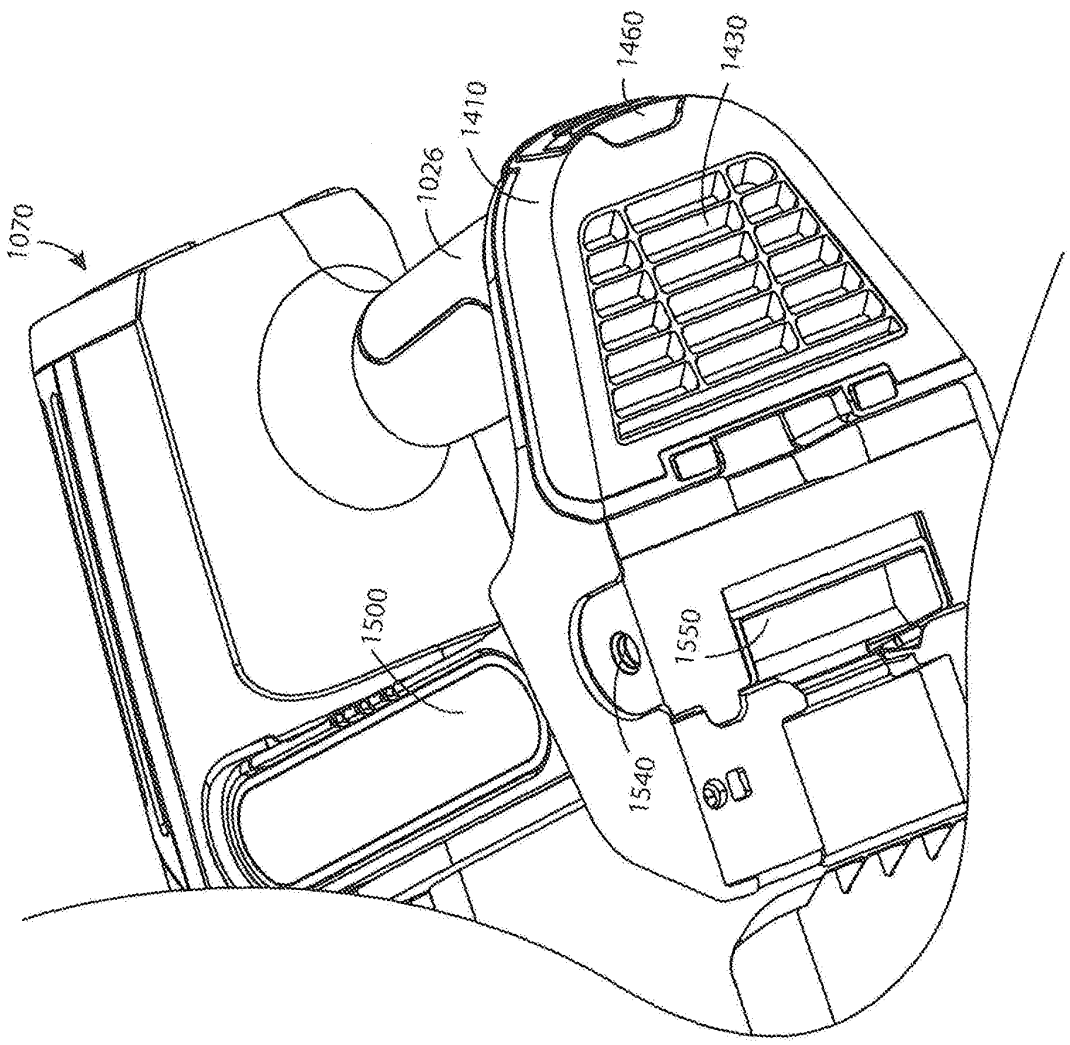


FIG. 23

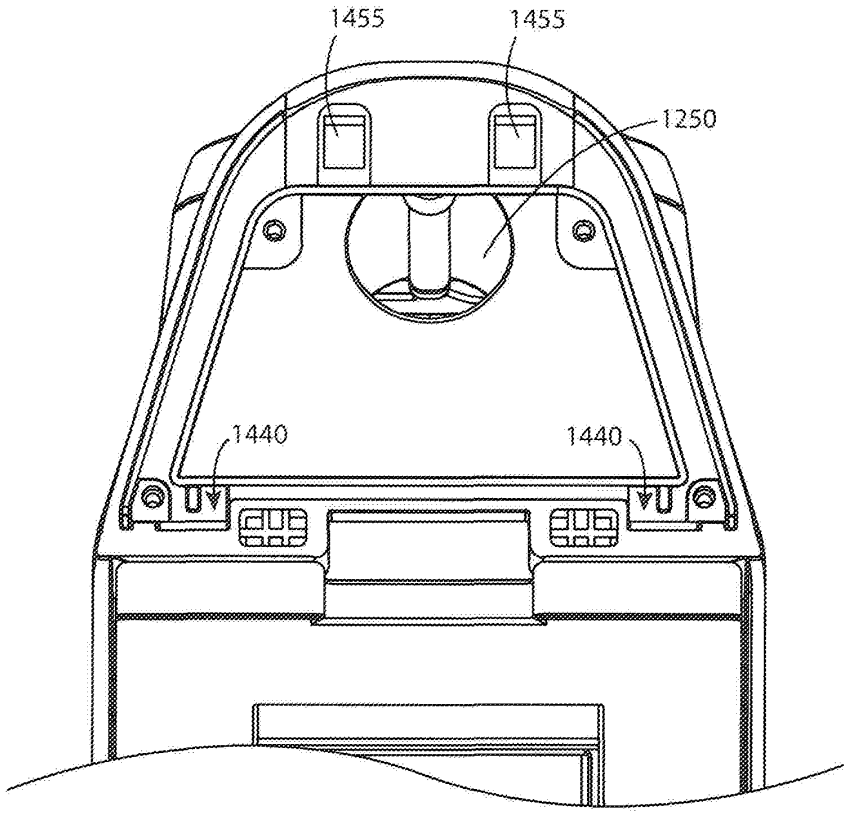


FIG. 24

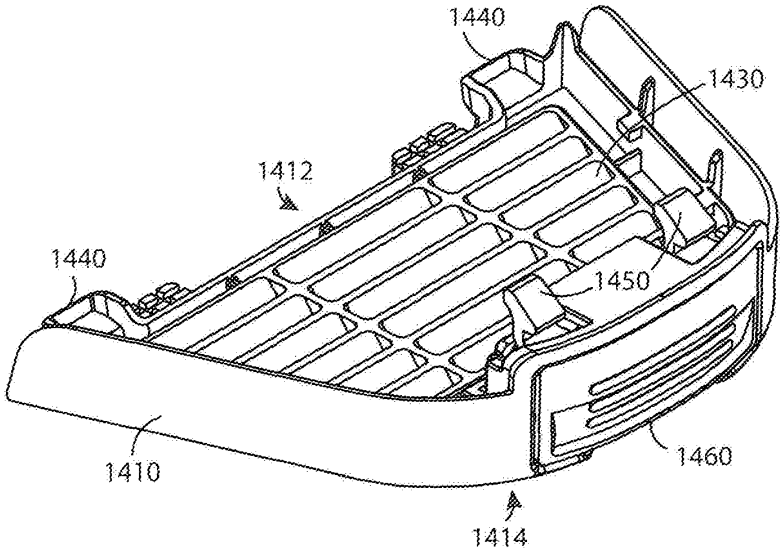
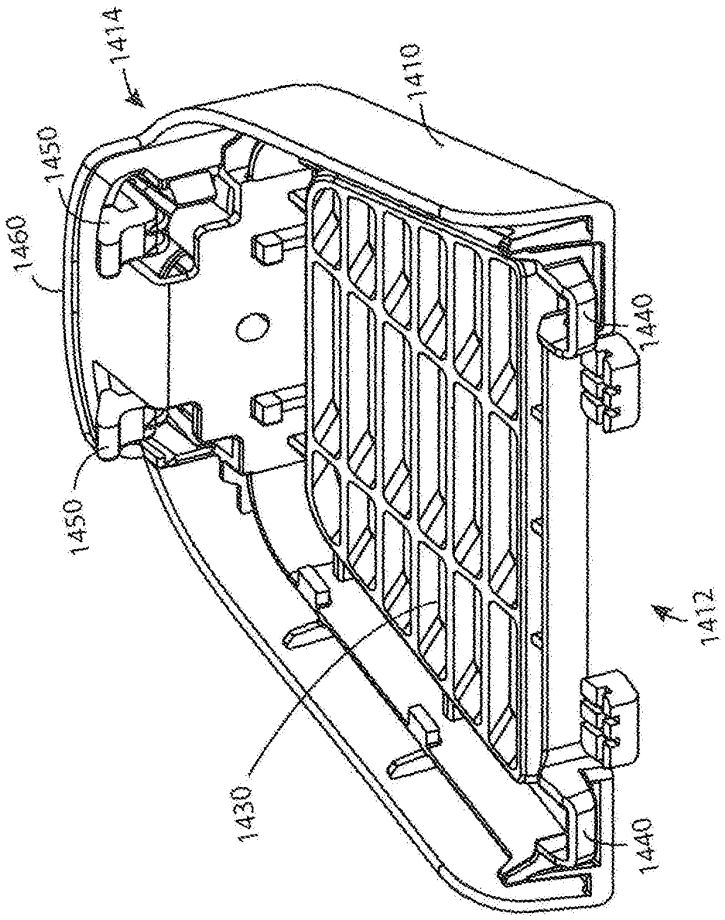


FIG. 25

FIG. 26



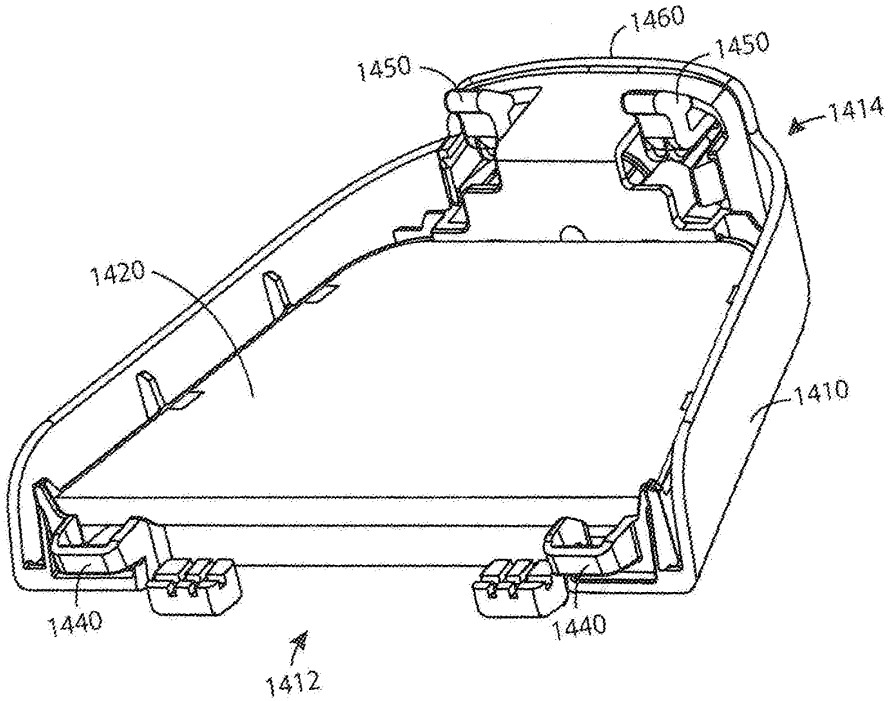


FIG. 27

REPLACEMENT SHEET

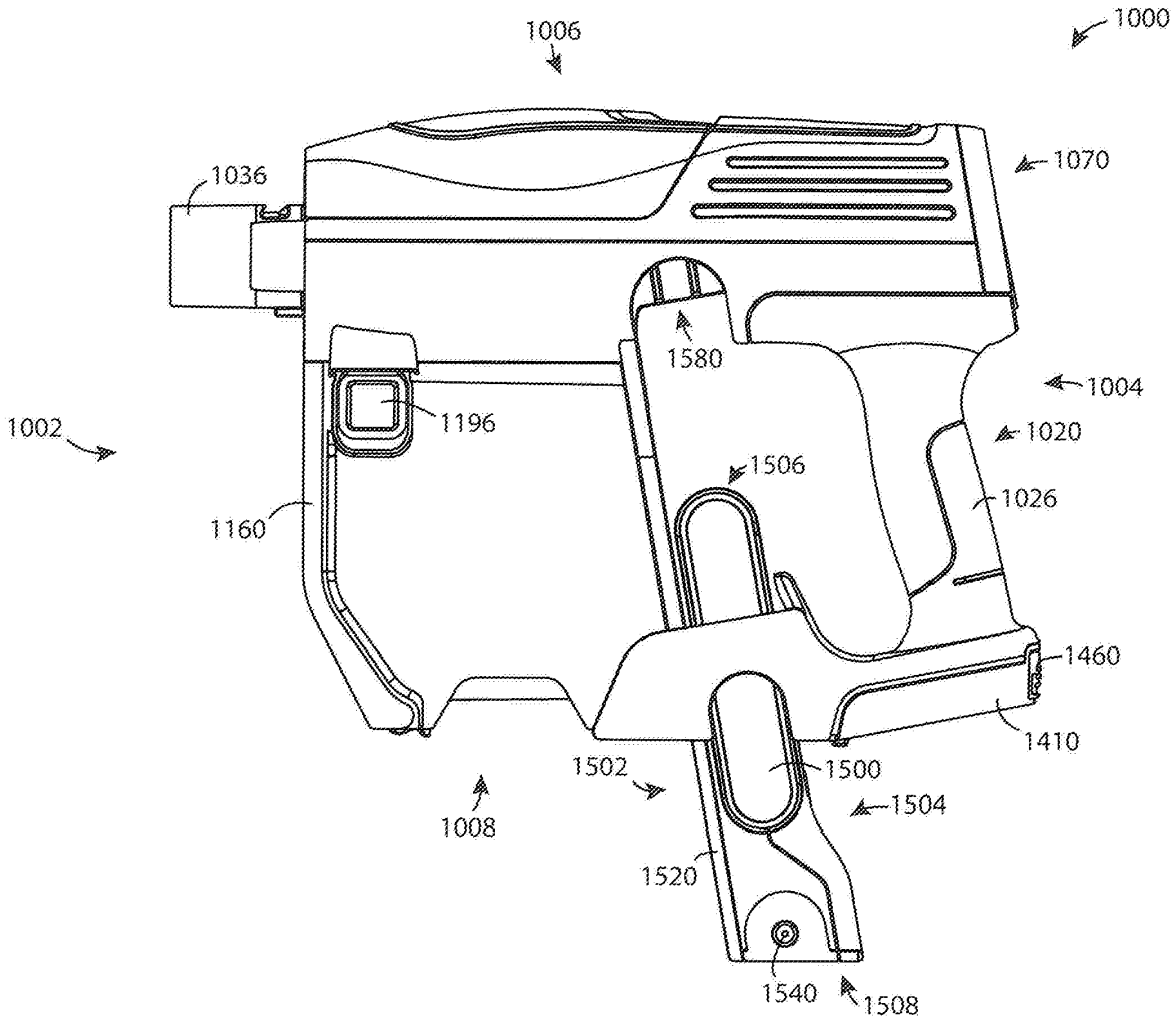


FIG. 28

REPLACEMENT SHEET

FIG. 29

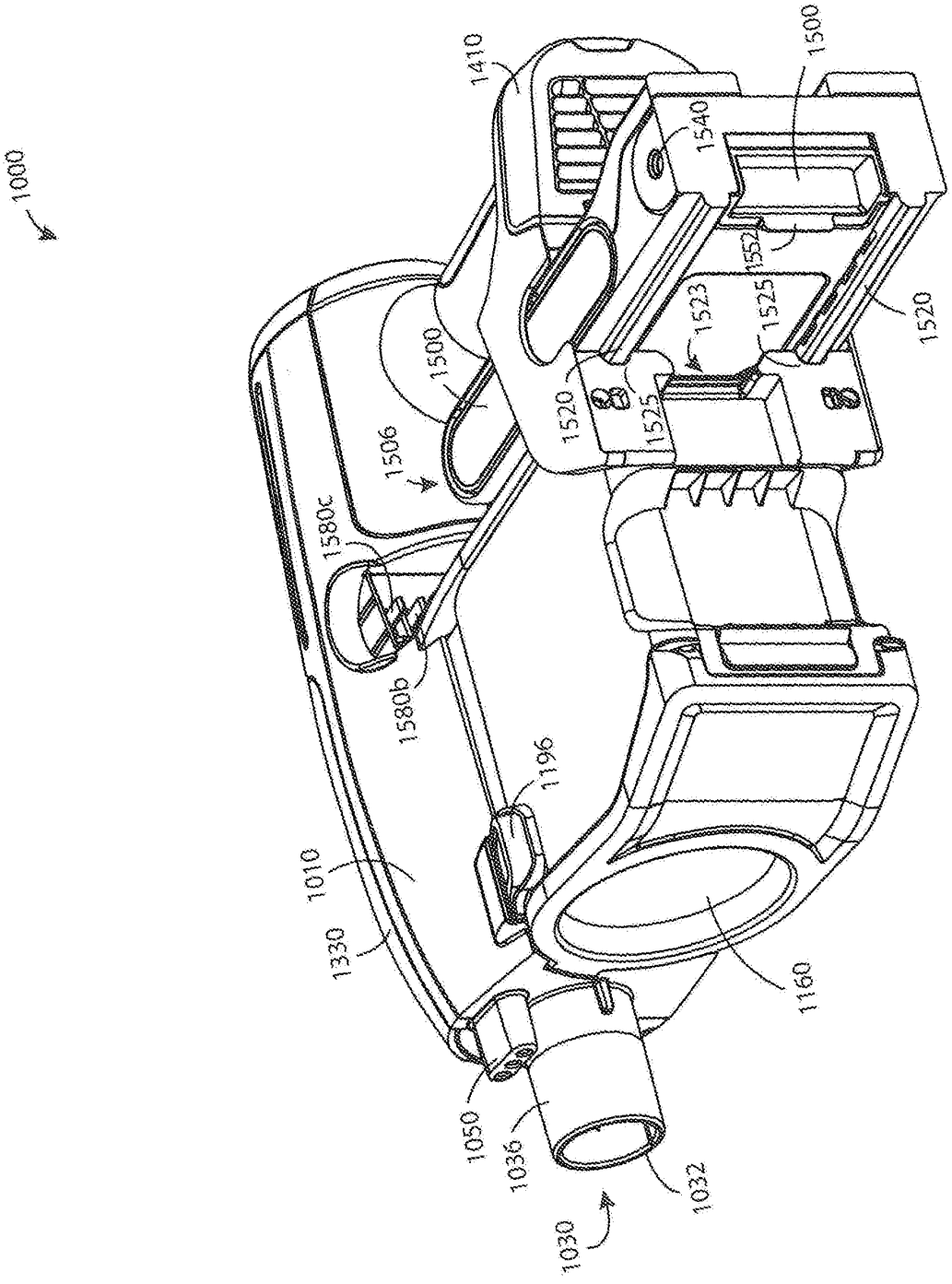
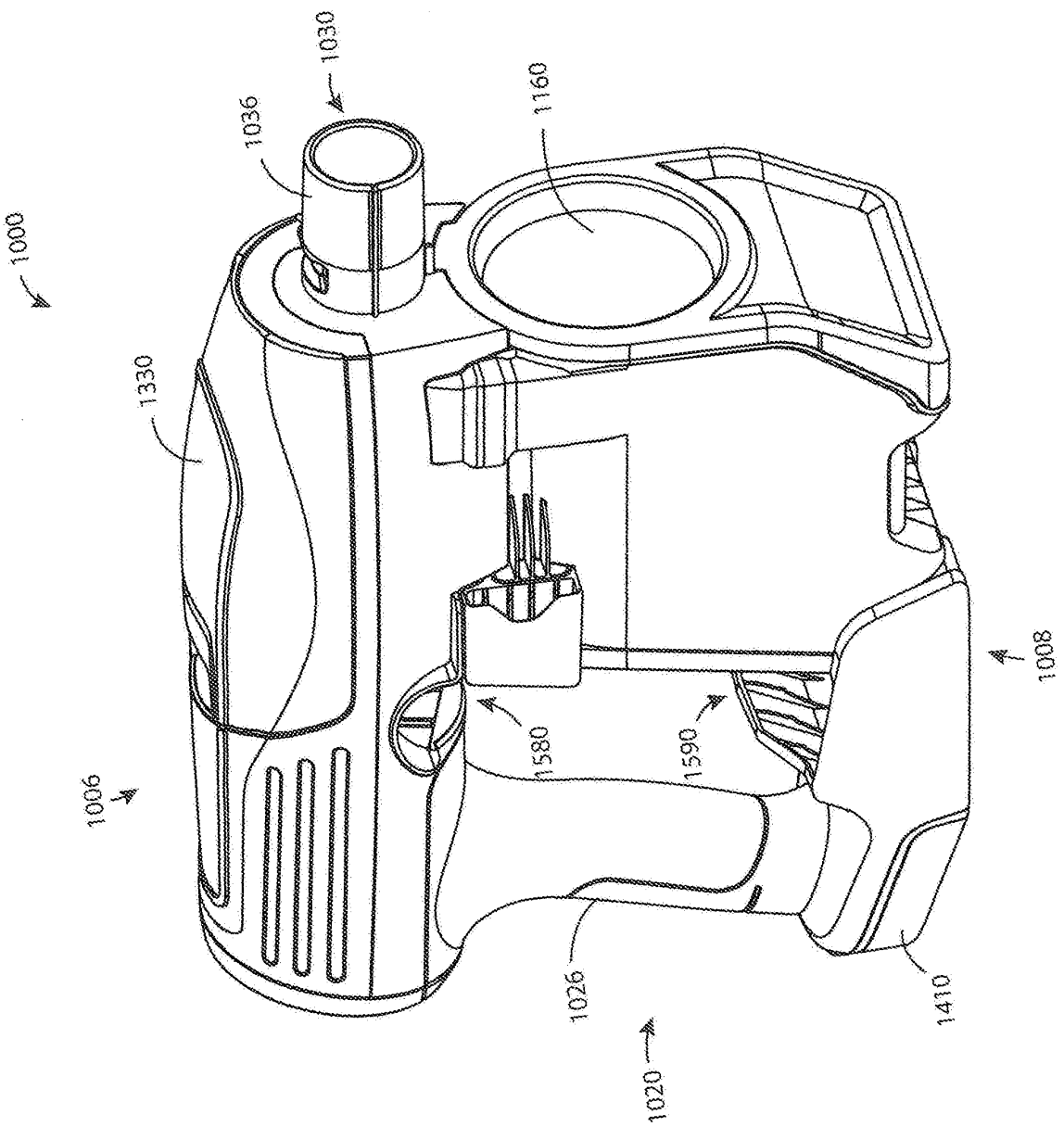

1000
1410
1500
1540
1552
1523
1525
1520
1500
1520
1525
1506
1580c
1580b
1196
1010
1330
1160
1050
1036
1032
1030

FIG. 30



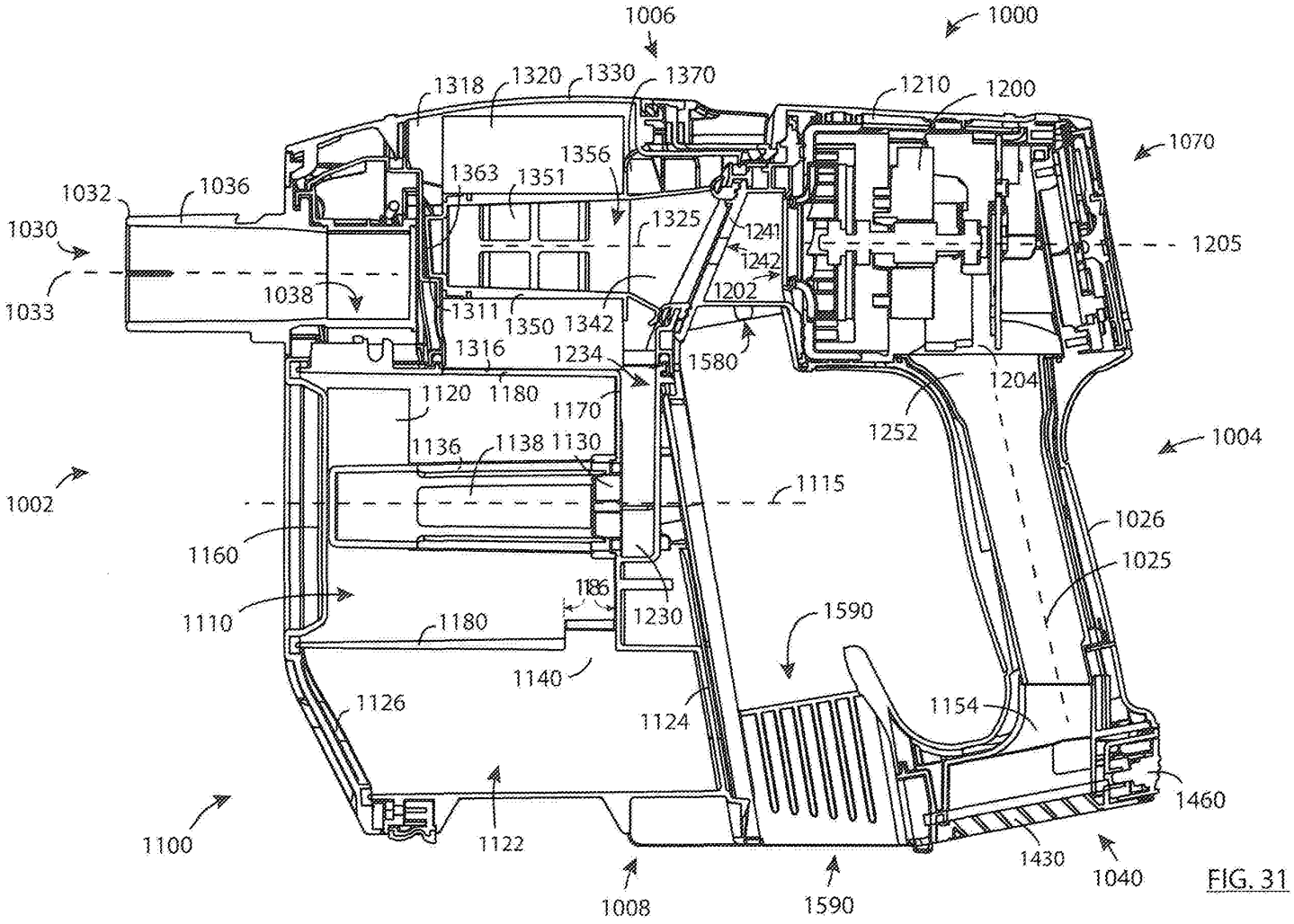


FIG. 31

REPLACEMENT SHEET

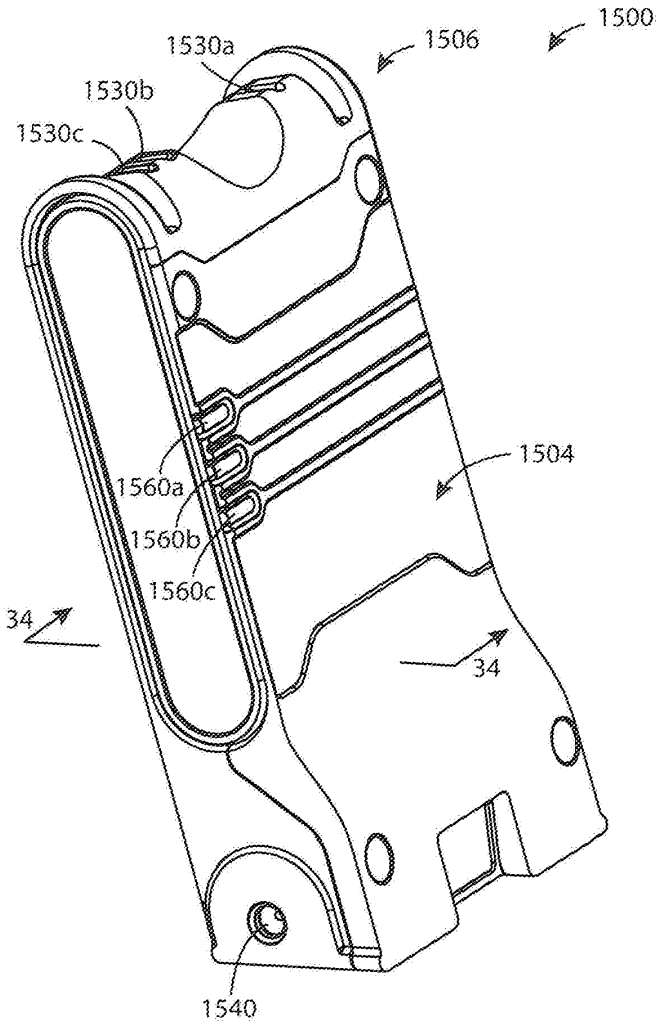
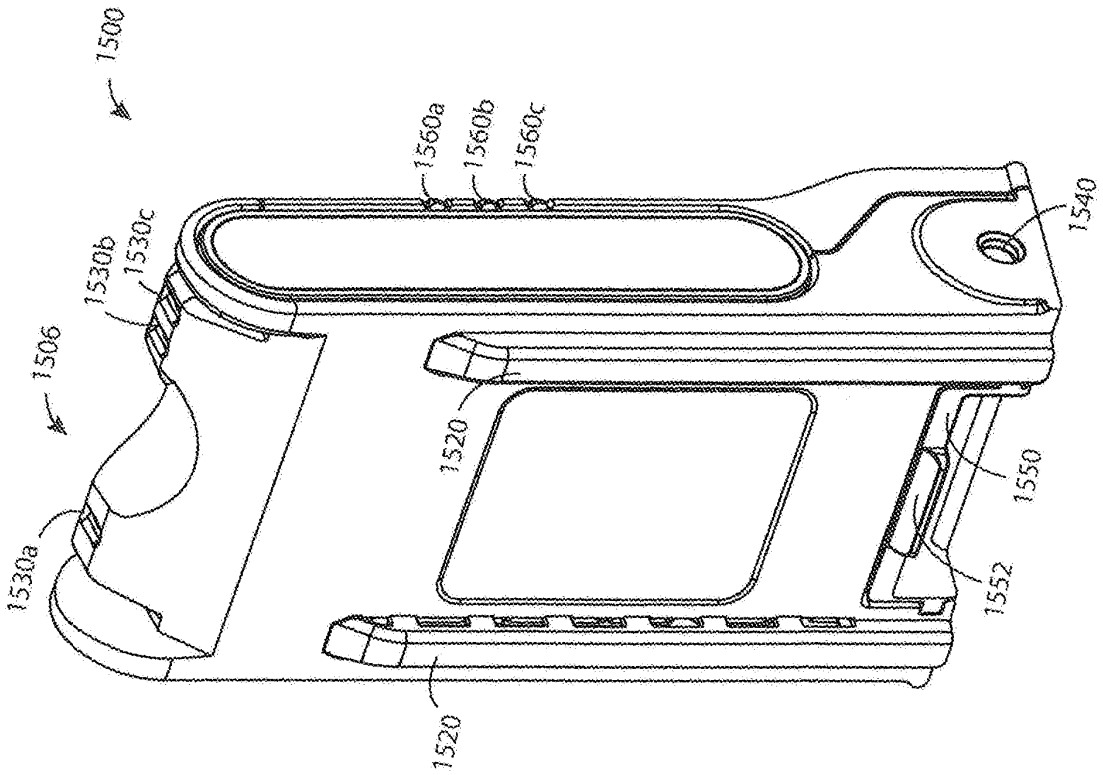


FIG. 32

REPLACEMENT SHEET

FIG. 33


1500
1560a
1560b
1560c
1530b
1530c
1506
1540
1520
1550
1530a
1552
1520

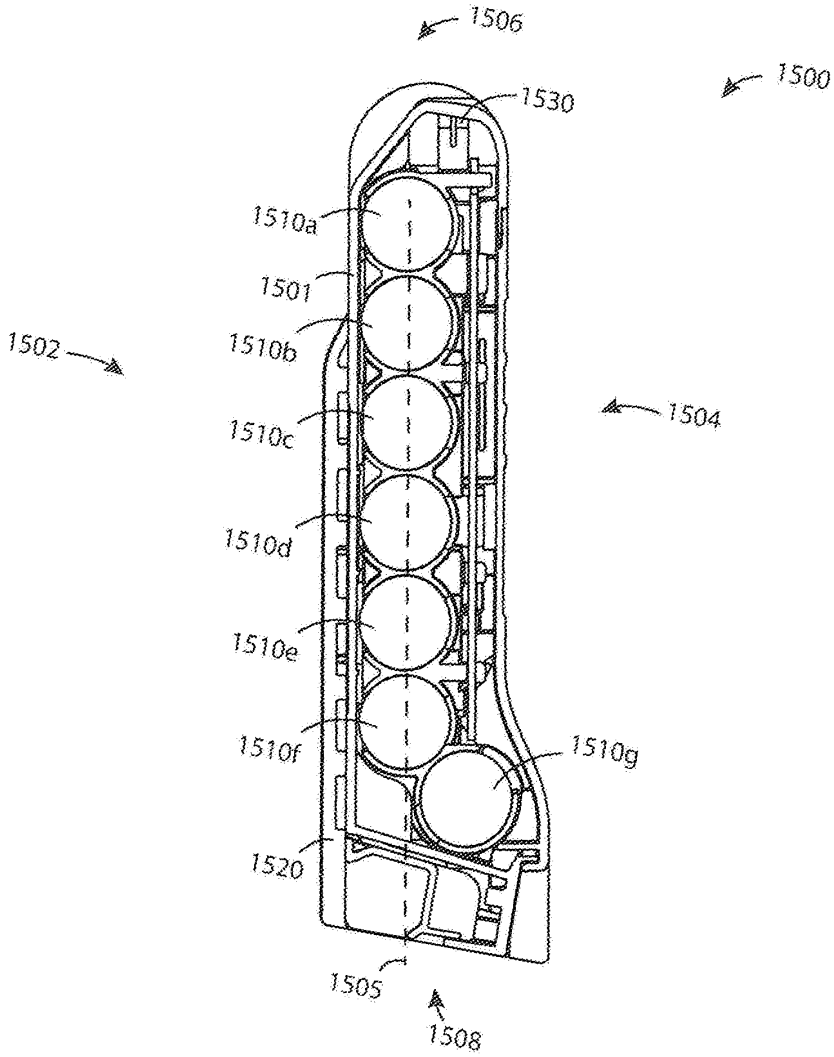


FIG. 34

REPLACEMENT SHEET

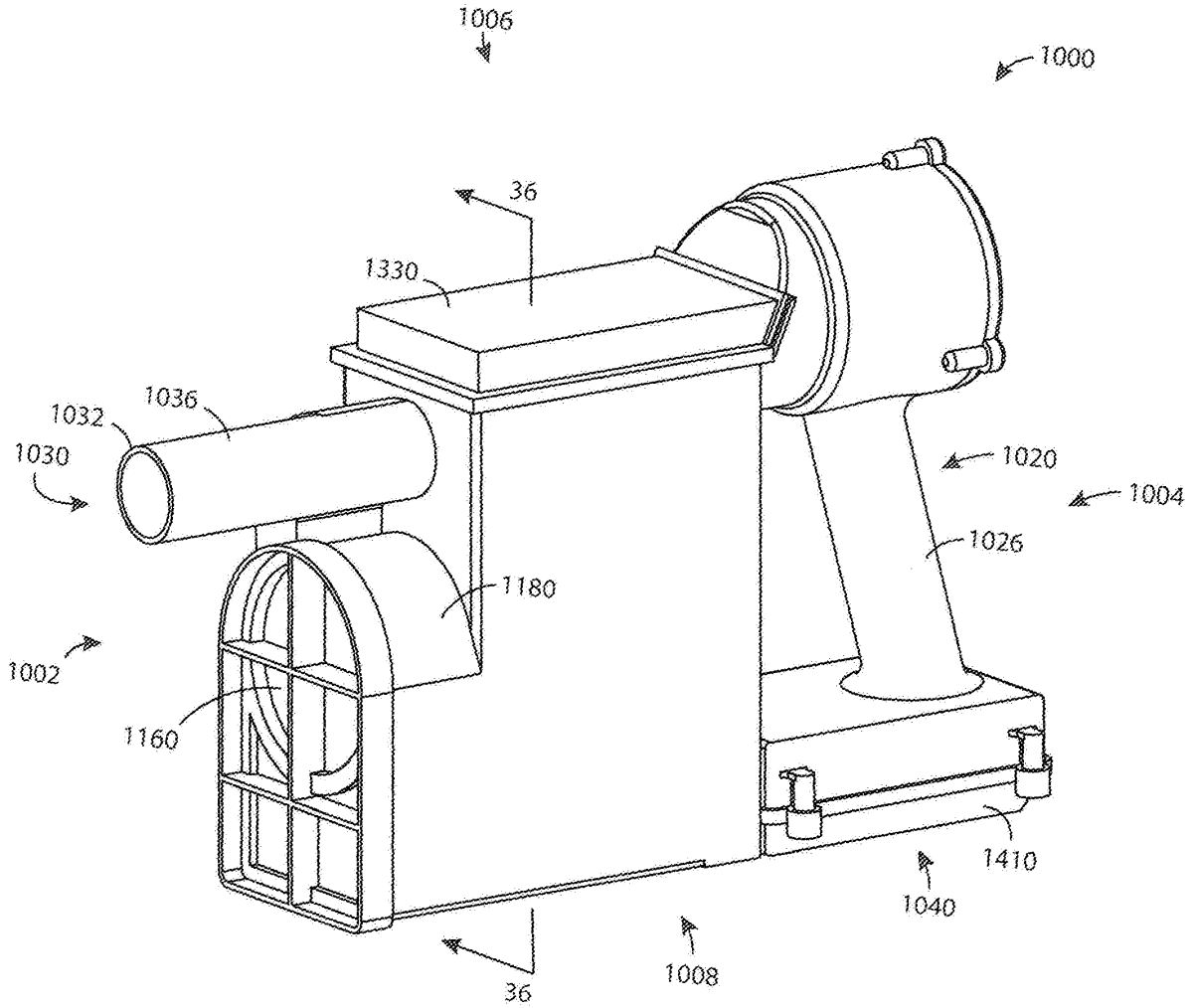


FIG. 35

REPLACEMENT SHEET

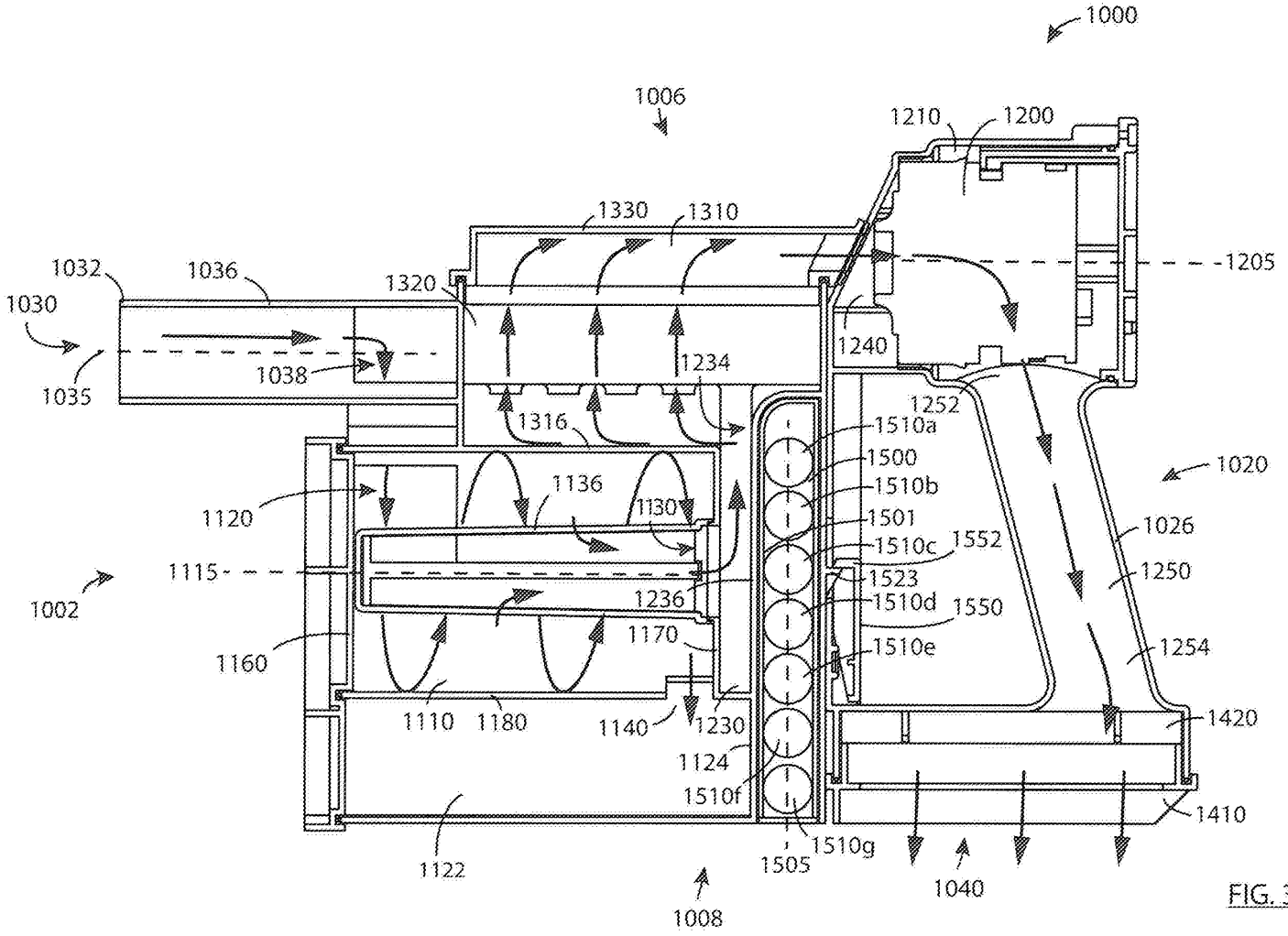


FIG. 36

REPLACEMENT SHEET

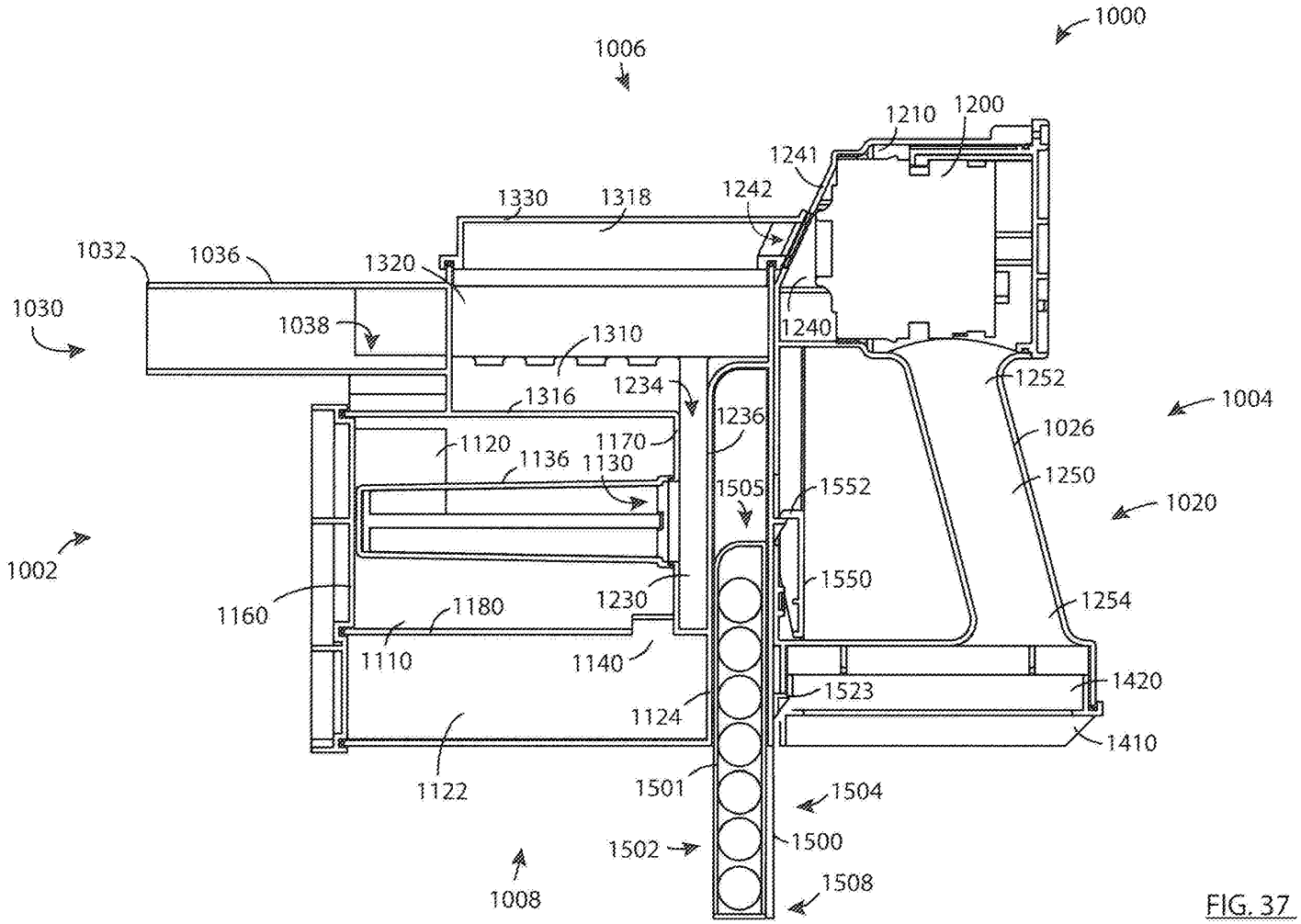


FIG. 37

REPLACEMENT SHEET

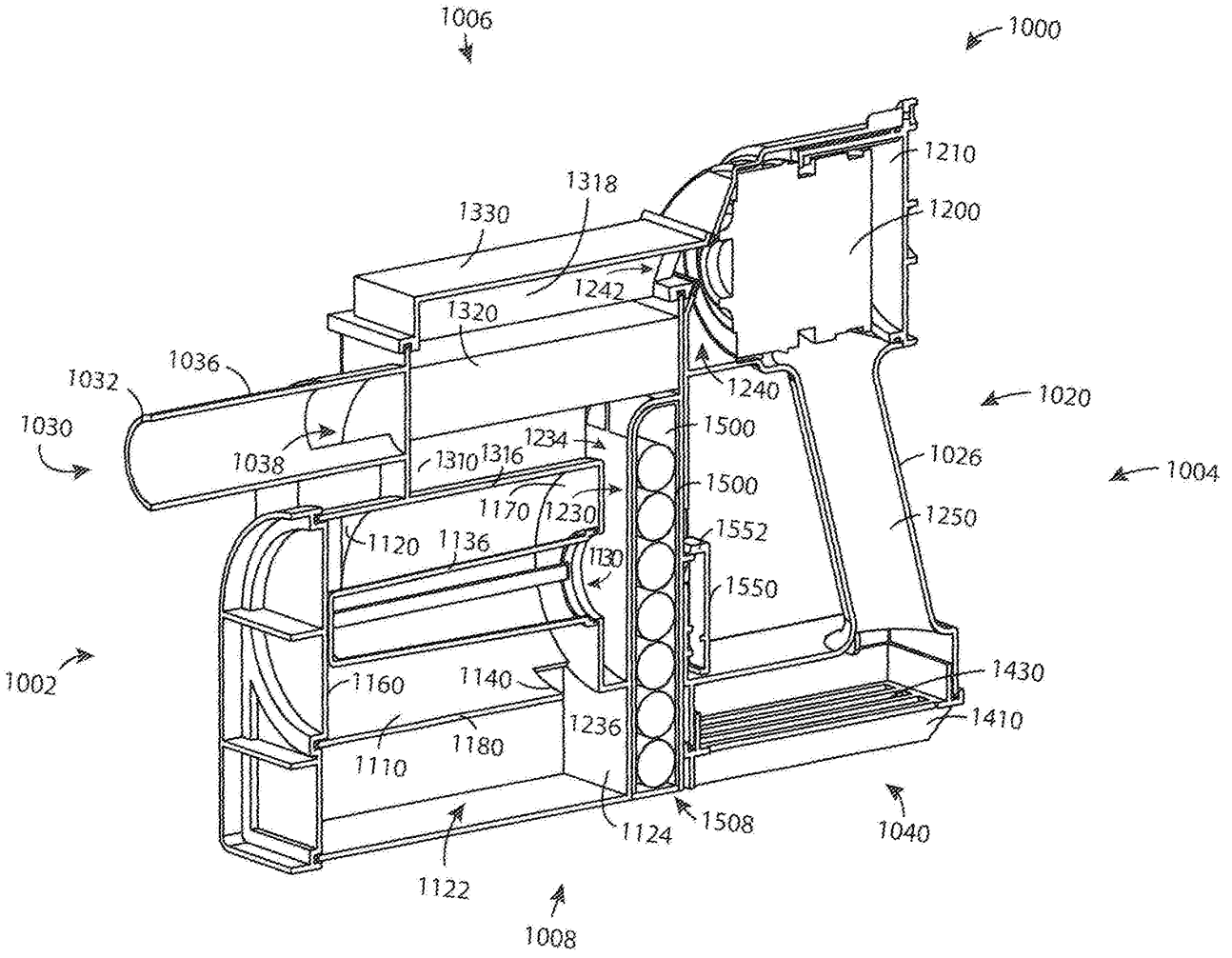


FIG. 38

REPLACEMENT SHEET

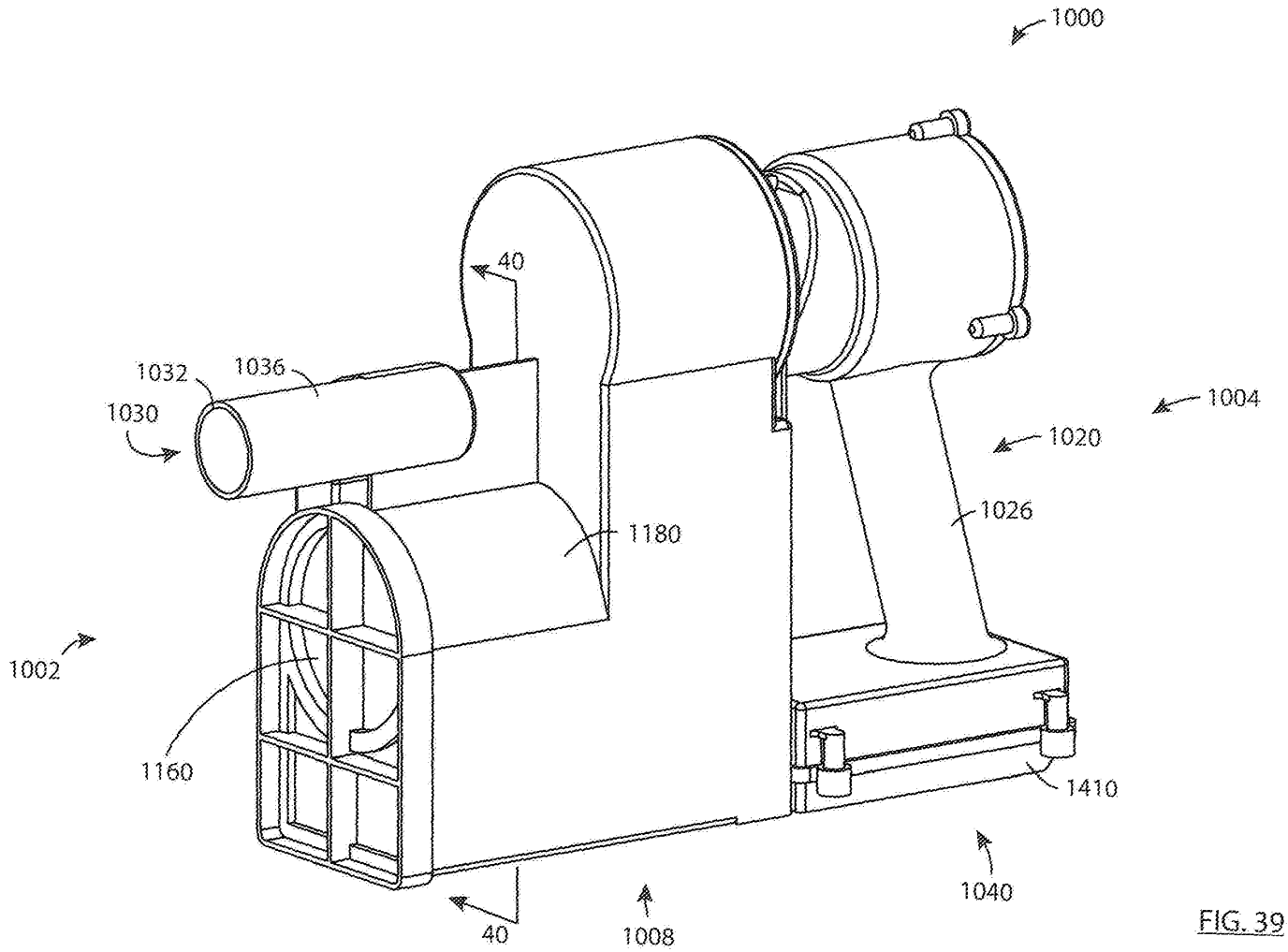


FIG. 39

REPLACEMENT SHEET

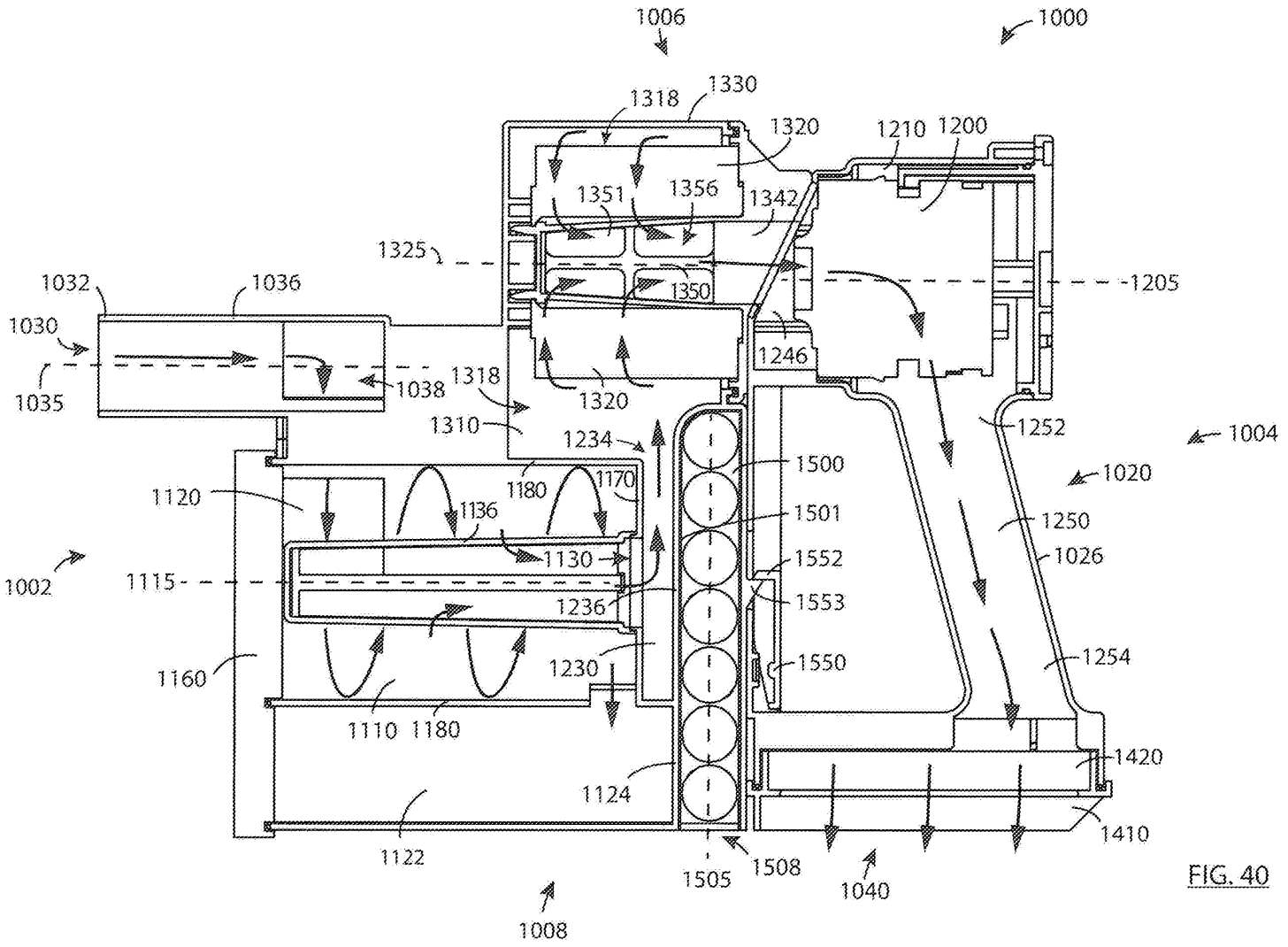


FIG. 40

REPLACEMENT SHEET

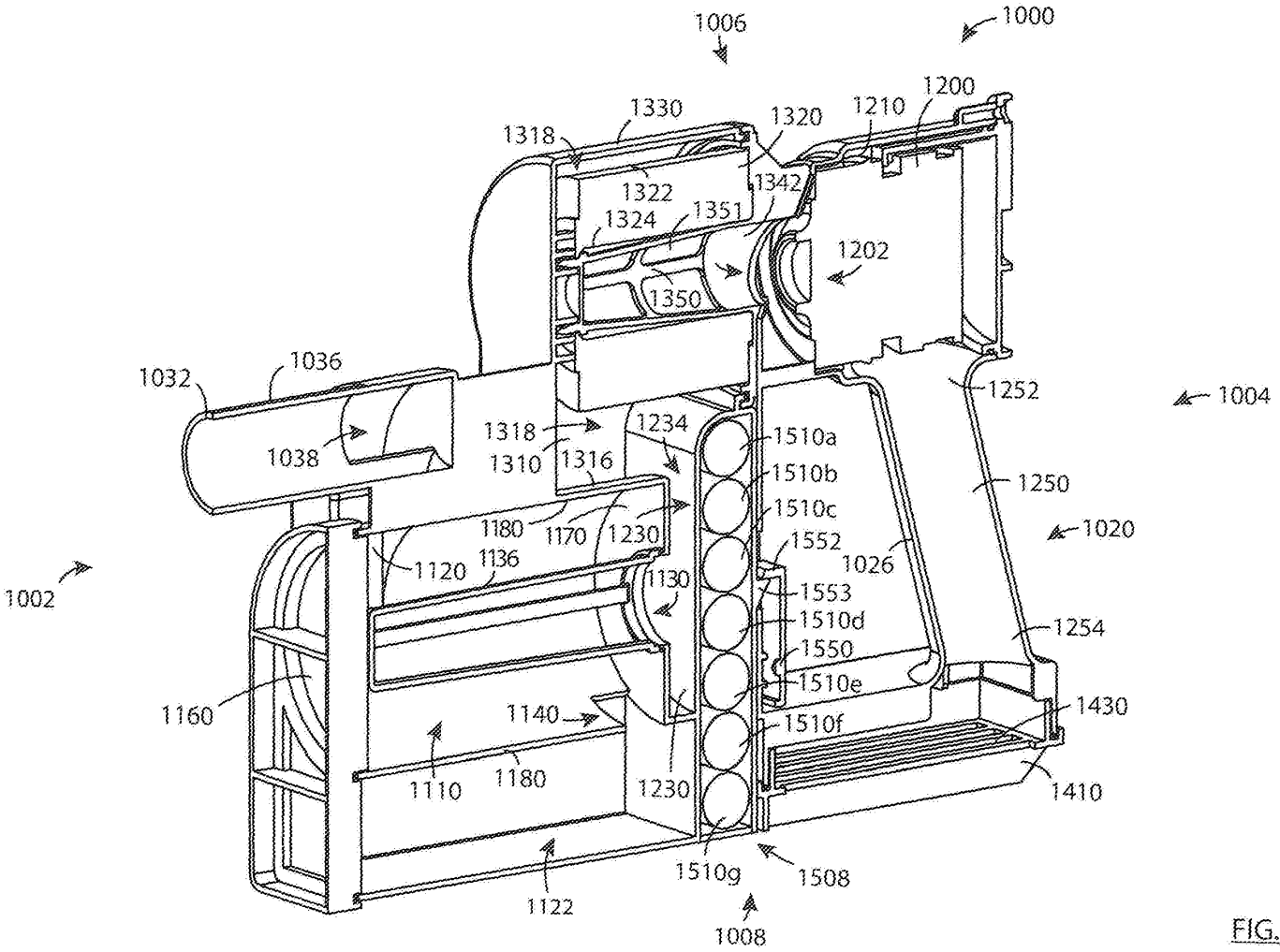


FIG. 41

REPLACEMENT SHEET

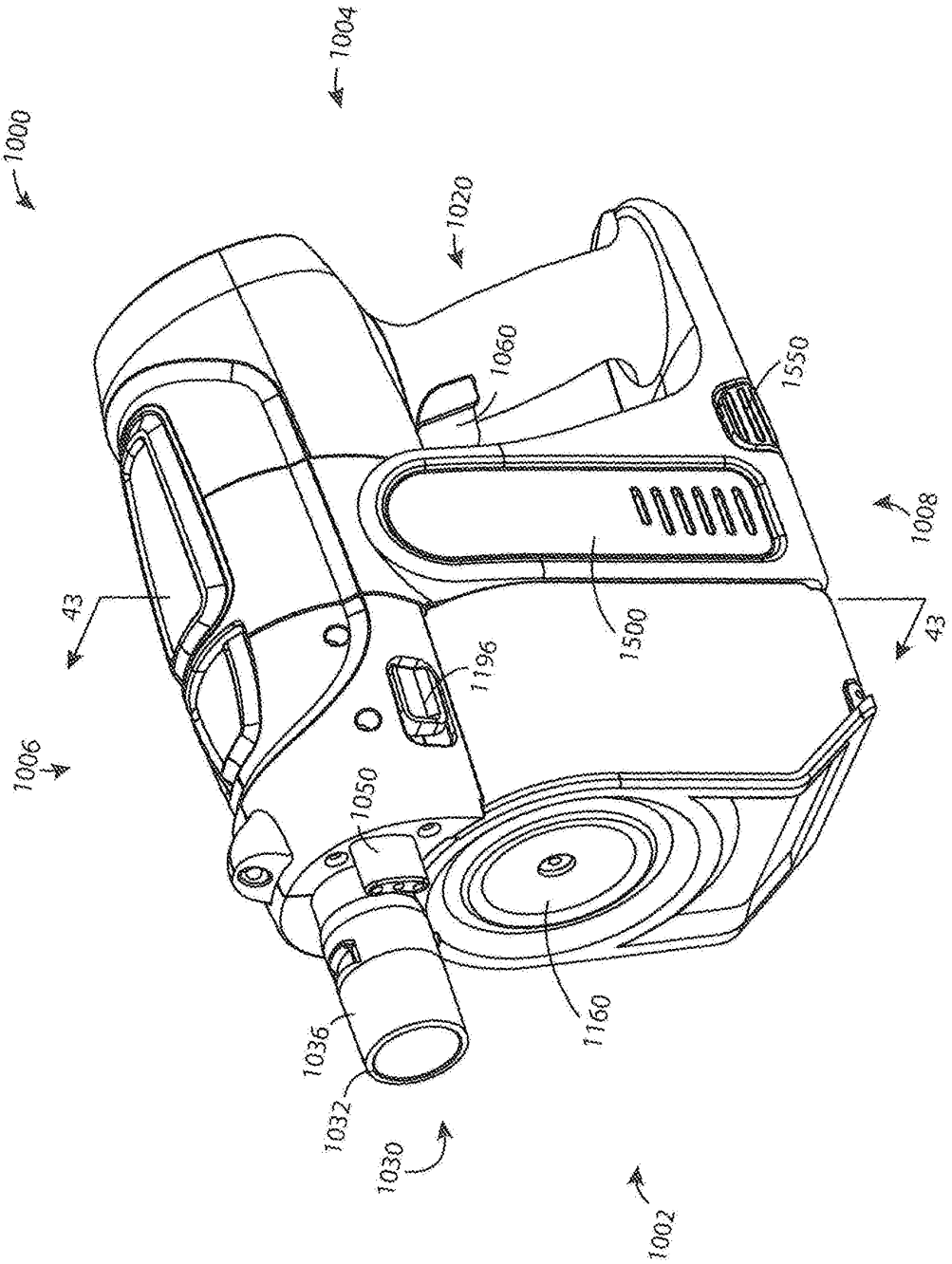

1000
1004
1020
1060
1550
1008
43
43
1500
1196
1006
1050
1036
1160
1032
1030
1002

FIG. 42

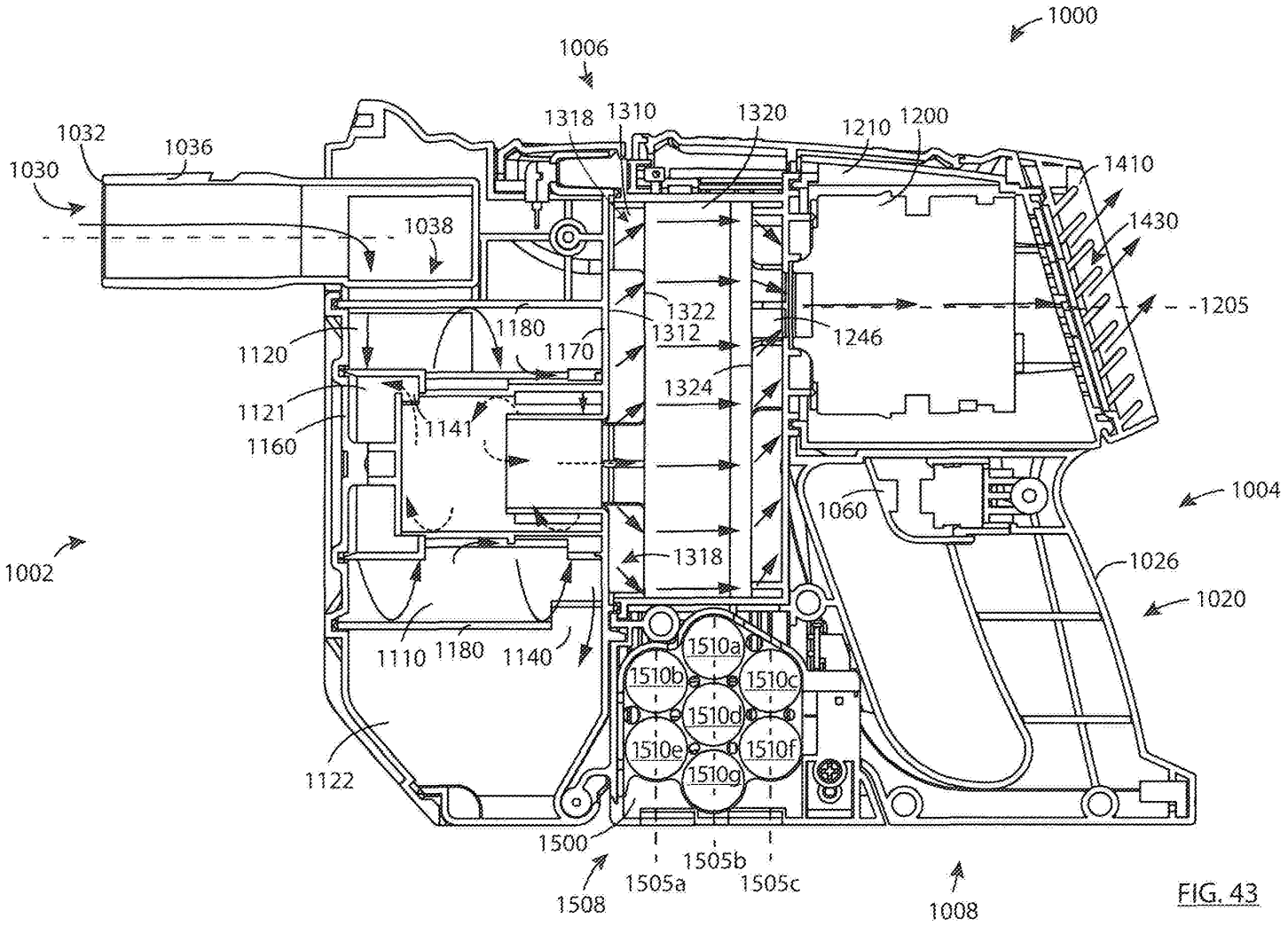


FIG. 43

REPLACEMENT SHEET

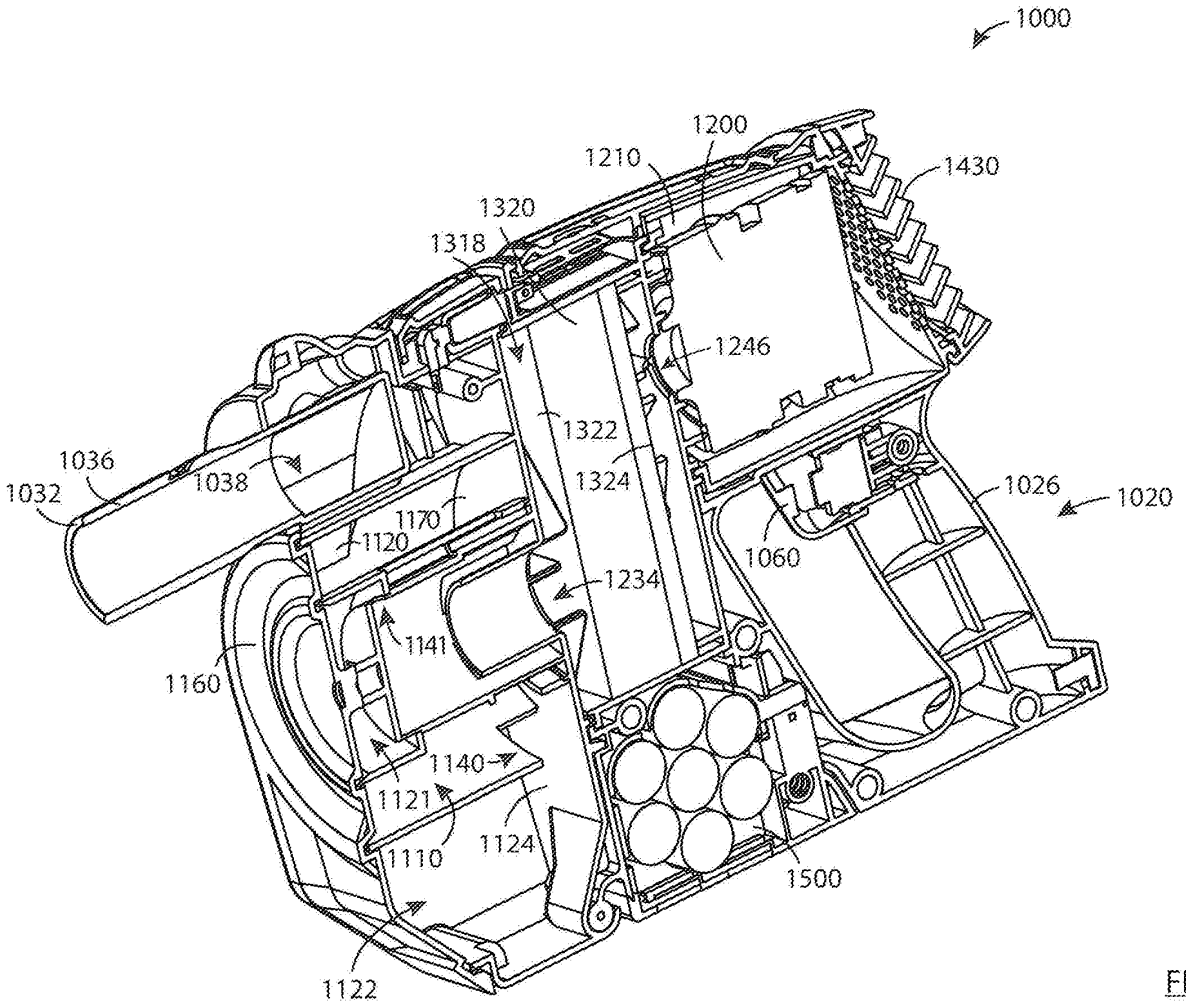


FIG. 44

REPLACEMENT SHEET

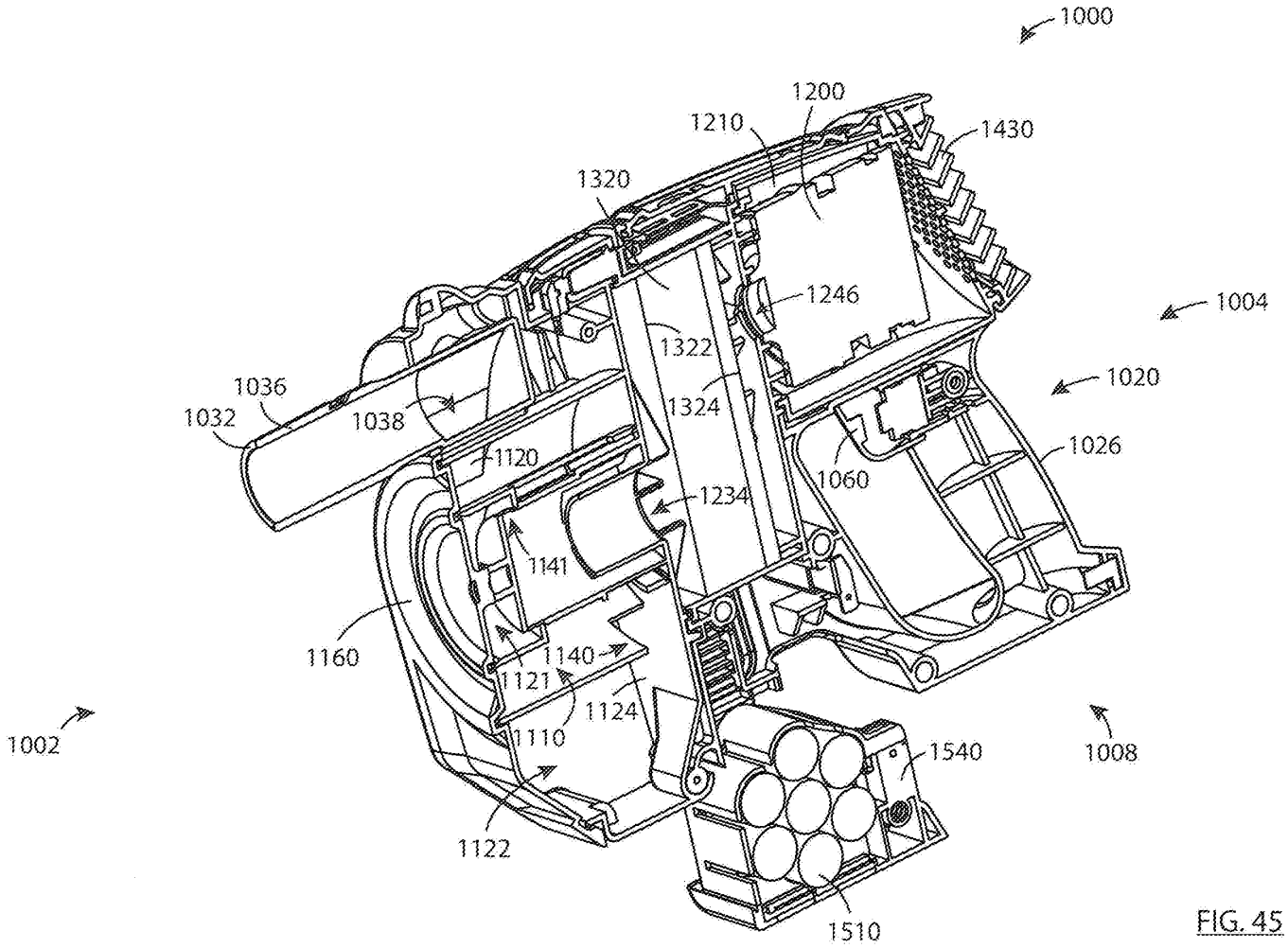


FIG. 45

REPLACEMENT SHEET

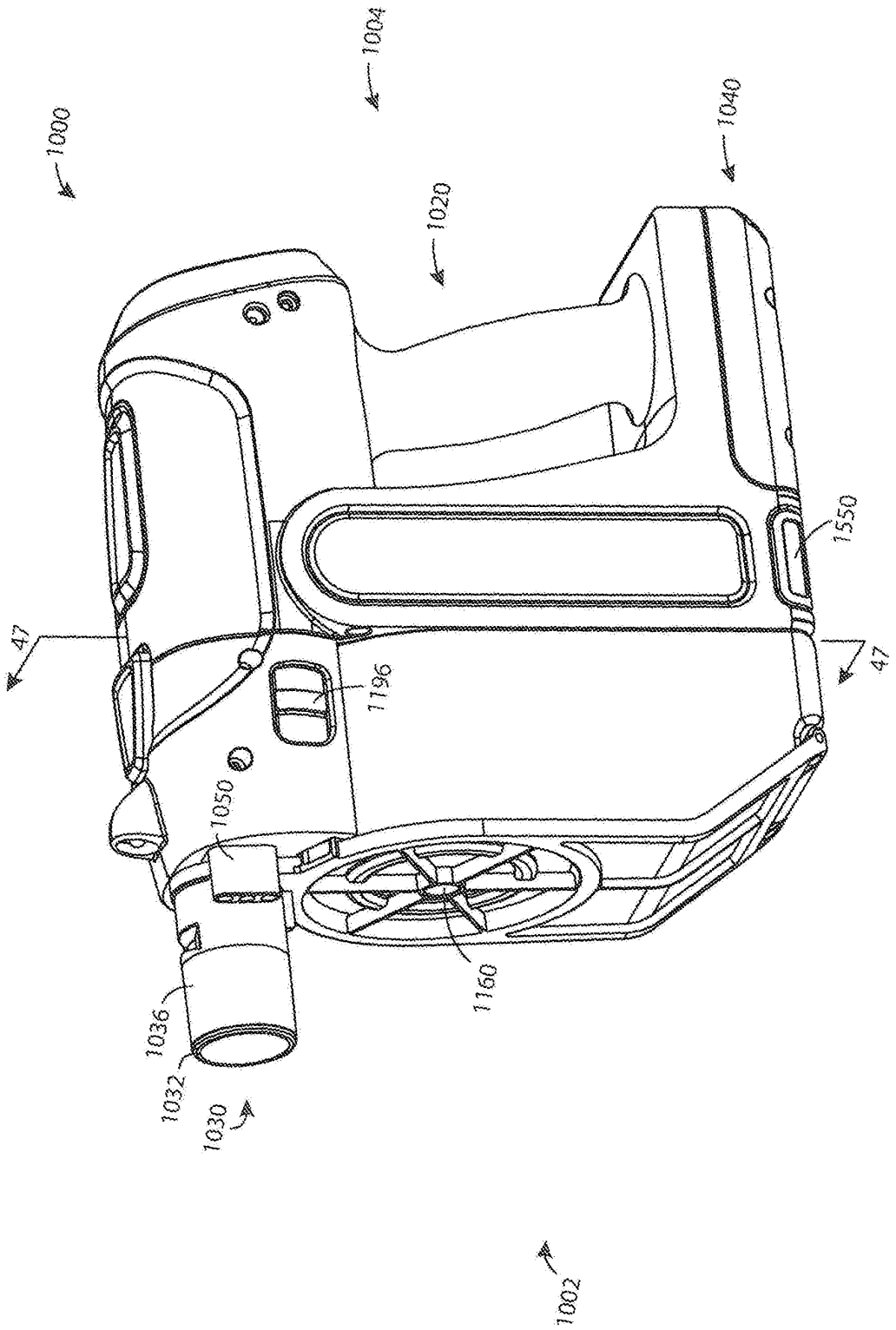

1000
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1040
1020
1550
47
47
1196
1050
1160
1036
1032
1030
1002

FIG. 46

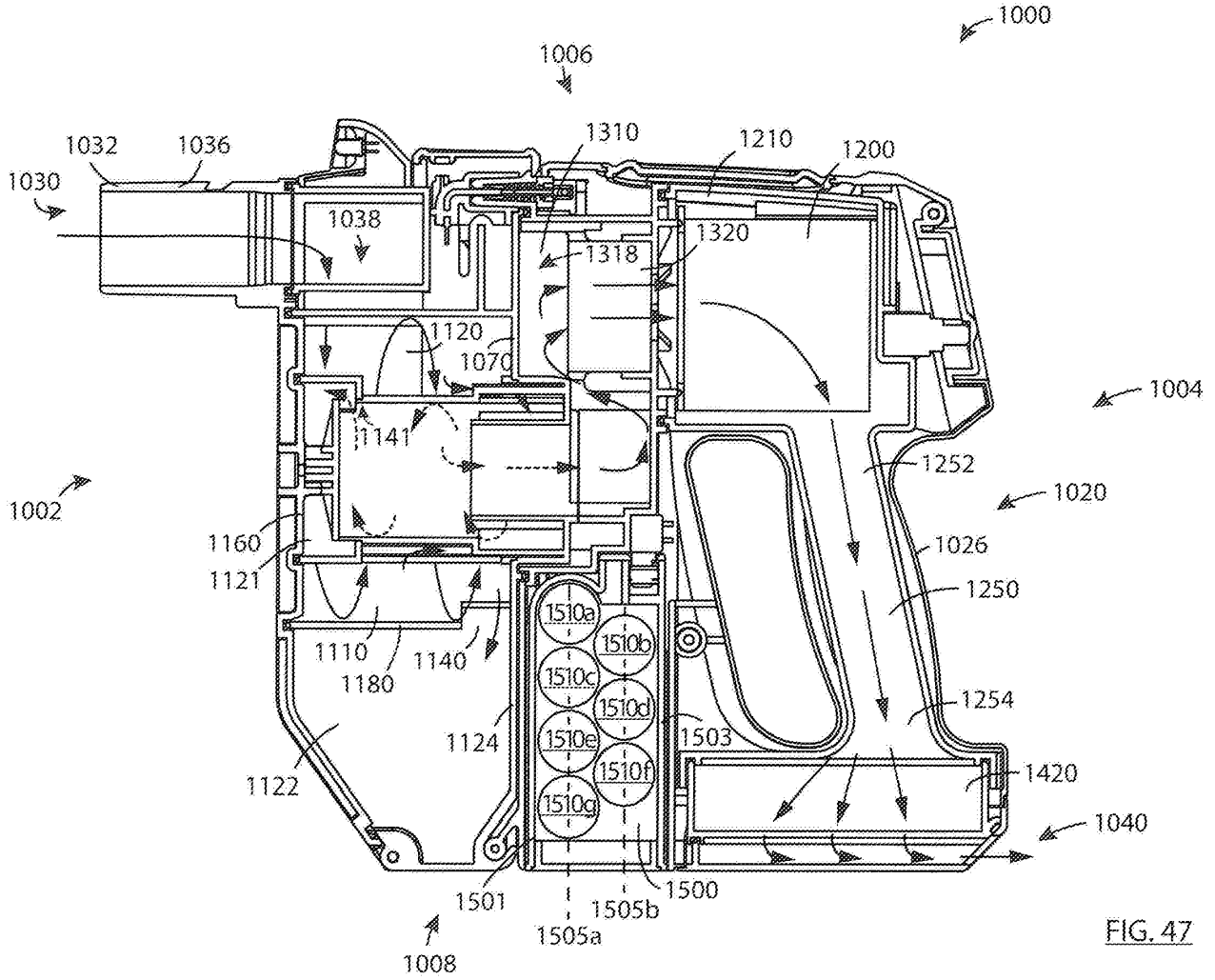


FIG. 47

REPLACEMENT SHEET

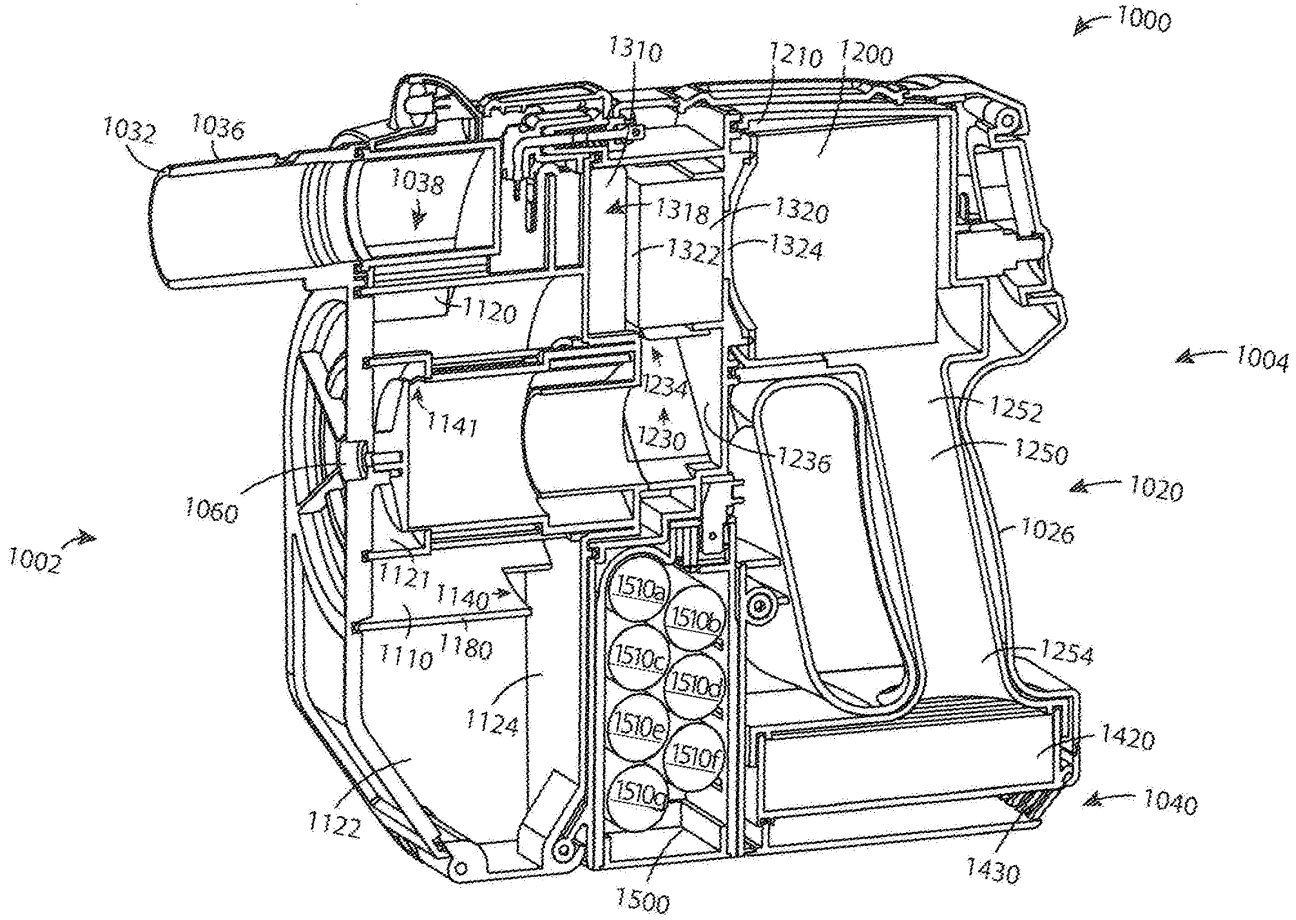


FIG. 48

REPLACEMENT SHEET

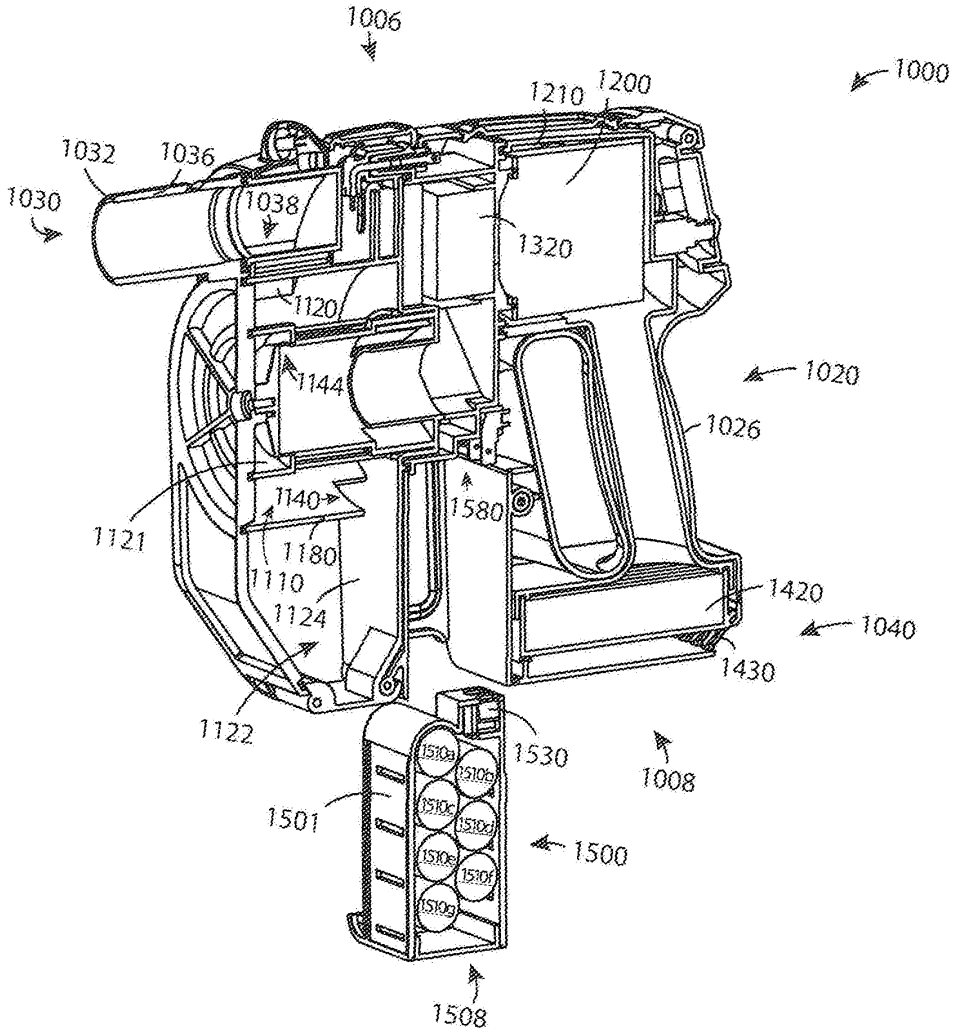


FIG. 49

REPLACEMENT SHEET

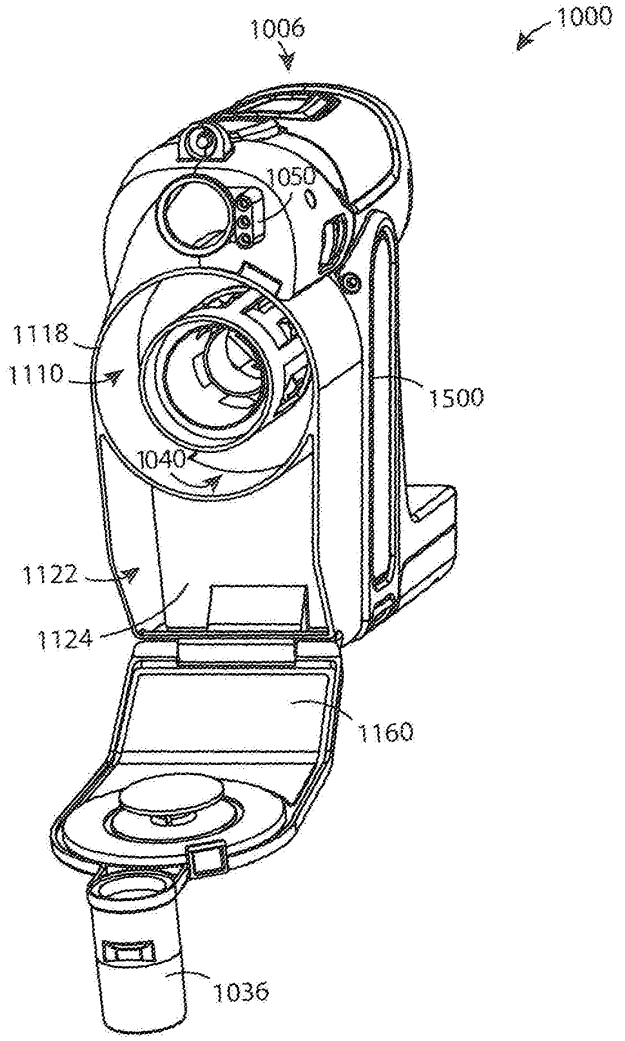


FIG. 50

REPLACEMENT SHEET

Electronic Acknowledgement Receipt	
EFS ID:	30350844
Application Number:	15642781
International Application Number:	
Confirmation Number:	5834
Title of Invention:	HANDHELD SURFACE CLEANING APPARATUS
First Named Inventor/Applicant Name:	Wayne Ernest Conrad
Customer Number:	1059
Filer:	Philip C. Mendes da Costa/Snezana Lisowsky
Filer Authorized By:	Philip C. Mendes da Costa
Attorney Docket Number:	10452-P52585US00
Receipt Date:	13-SEP-2017
Filing Date:	06-JUL-2017
Time Stamp:	14:09:18
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Preliminary Amendment	P52585US00_Preliminary_Amendment_2017_09_13.pdf	159254 b730b0c6282b4fa12ee01b16d5f1da716d30b345	no	6

Warnings:

Information:					
2	Drawings-only black and white line drawings	P52585US00_Drawings_2017_09_13.pdf	6100721 196d6871f8bad07e5fe75954ff2cf43568cf1699	no	50
Warnings:					
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3	Miscellaneous Incoming Letter	P52585US00_BLK_Substitute_Specification_2017_09-13.pdf	207647 554671c31c4f9e0d054ca1ad1f7e6bf36e9e2e48	no	67
Warnings:					
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4	Specification	P52585US00_CLN_Substitute_Specification_2017_09-13.pdf	207491 587343e74b26fc1200aa922663c7efa704d3561c	no	67
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HANDHELD SURFACE CLEANING APPARATUS

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FIELD

[0001] This disclosure relates generally to surface cleaning apparatus. In a preferred embodiment, the surface cleaning apparatus comprises a portable surface cleaning apparatus, such as a hand vacuum cleaner.

INTRODUCTION

[0002] The following is not an admission that anything discussed below is part of the prior art or part of the common general knowledge of a person skilled in the art.

[0003] Various types of surface cleaning apparatus are known, including upright surface cleaning apparatus, canister surface cleaning apparatus, stick surface cleaning apparatus, central vacuum systems, and hand carriable surface cleaning apparatus such as hand vacuums. Further, various designs for cyclonic hand vacuum cleaners, including battery operated cyclonic hand vacuum cleaners are known in the art.

SUMMARY

[0004] The following introduction is provided to introduce the reader to the more detailed discussion to follow. The introduction is not intended to limit or define any claimed or as yet unclaimed invention. One or more inventions may reside in any combination or sub-combination of the elements or process steps disclosed in any part of this document including its claims and figures.

[0005] In accordance with one aspect of this disclosure, which may be used alone or in combination with any other aspect, a hand vacuum cleaner may be powered by an onboard energy source, such as a battery pack or other energy storage member. The energy storage member may include a chemical battery, such as a rechargeable battery. Some chemical batteries, such as

lithium-ion batteries, may produce heat while being discharged (e.g. while supplying power to an electric motor). As disclosed herein, a hand vacuum cleaner may have an airflow path in which air exiting a cyclone chamber impinges on a wall of an energy storage chamber in which one or more energy storage devices are located. By directing relatively high-velocity airflow directly against a wall of such a chamber, cooling of an energy storage member (e.g. battery) located in the chamber may be promoted, particularly during discharge of the battery.

[0006] In accordance with this broad aspect, there is provided a hand vacuum cleaner having a front end, a rear end, an upper end, a lower end, and first and second laterally spaced apart sides, and comprising:

(a) an air flow path extending from a dirty air inlet to a clean air outlet;

(b) a cyclone chamber positioned in the air flow path and having a cyclone air inlet, a cyclone air outlet, and a cyclone axis of rotation;

(c) a suction motor positioned in the air flow path upstream of the clean air outlet; and,

(d) at least one energy storage member positioned in an energy storage chamber having an energy storage chamber wall wherein the cyclone air outlet faces the energy storage chamber wall whereby air exiting the cyclone chamber impinges on the energy storage chamber wall.

[0007] In some embodiments, the cyclone axis of rotation may extend generally in a forward/rearward direction.

[0008] In some embodiments, the at least one energy storage member may comprise a plurality of energy storage members wherein at least some of the plurality of energy storage members are arranged one above another in a

generally upwardly extending configuration when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner.

[0009] In some embodiments, the energy storage members may be arranged one above another comprise longitudinally extending members each having a longitudinal axis which that extends laterally.

[0010] In some embodiments, the cyclone axis of rotation may intersect a volume defined by the generally upwardly extending configuration of energy storage members.

[0011] In some embodiments, the cyclone axis of rotation may extend generally in a forward/rearward direction.

[0012] In some embodiments, the at least one energy storage member may be removably receivable in the energy storage chamber.

[0013] In some embodiments, the at least one energy storage member may comprise a battery pack that is removably receivable in the energy storage chamber.

[0014] In some embodiments, the air flow path may comprise a portion that extends from the cyclone air outlet to the suction motor and is defined in part by the energy storage chamber wall.

[0015] In some embodiments, the portion of the air flow path may extend generally upwardly from the cyclone air outlet to the suction motor when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner.

[0016] In some embodiments, the suction motor may be positioned above the cyclone axis of rotation when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner.

[0017] In some embodiments, the portion of the air flow path may extend generally downwardly from the cyclone air outlet to the suction motor when the

upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner.

[0018] In some embodiments, the suction motor may be positioned below the cyclone axis of rotation when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner.

[0019] In some embodiments, the hand vacuum cleaner may further comprise a handle having a hand grip portion that extends upwardly and forwardly when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner wherein the handle is positioned rearward of the at least one energy storage member.

[0020] In some embodiments, the at least one energy storage member may comprise a plurality of energy storage members wherein at least some of the plurality of energy storage members are arranged one above another in a generally upwardly extending configuration when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner.

[0021] In some embodiments, the hand vacuum cleaner may further comprise a finger gap positioned between the handle and the energy storage chamber.

[0022] In accordance with another aspect of this disclosure, which may be used alone or in combination with any other aspect, a hand vacuum cleaner may have a cyclone chamber, a suction motor, and pre-motor filter positioned downstream of the cyclone chamber and upstream of the suction motor. The pre-motor filter may be vertically spaced from the cyclone chamber, and air may travel generally rearwardly from the pre-motor filter to the suction motor. Promoting air to travel in this manner may help reduce or eliminate the need for additional bends or air flow direction changes between an air outlet of the pre-motor filter and the suction motor, thereby reducing backpressure and/or air flow

losses through this portion of the hand vacuum cleaner due to a reduction in the number of bends in the air flow path.

[0023] In accordance with this broad aspect, there is provided a hand vacuum cleaner having a front end, a rear end, an upper end, a lower end, and first and second laterally spaced apart sides, and comprising:

(a) an air flow path extending from a dirty air inlet to a clean air outlet;

(b) a cyclone assembly comprising a cyclone chamber positioned in the air flow path and having a cyclone air inlet, a cyclone air outlet, and a cyclone axis of rotation, wherein the cyclone axis of rotation extends generally in a forward/rearward direction;

(c) a pre-motor filter positioned downstream of the cyclone air outlet; and,

(d) a suction motor positioned in the air flow path downstream of the pre-motor filter and upstream of the clean air outlet and having a suction motor axis of rotation;

wherein the pre-motor filter is vertically spaced from the cyclone axis of rotation when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner, and

wherein air travels generally rearwardly from the pre-motor filter to the suction motor.

[0024] In some embodiments, the pre-motor filter may be vertically spaced from the cyclone chamber when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner.

[0025] In some embodiments, the cyclone assembly may comprise a sidewall that extends generally parallel to the cyclone axis of rotation and the pre-motor filter may have an upstream surface that extends generally parallel to the sidewall of the cyclone assembly.

[0026] In some embodiments, the pre-motor filter may have a downstream surface that is opposed to the upstream surface, and air may exit the downstream surface in a generally vertical direction when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner.

[0027] In some embodiments, the pre-motor filter may at least partially overlie the cyclone chamber.

[0028] In some embodiments, the suction motor axis of rotation may be generally parallel to the cyclone axis of rotation.

[0029] In some embodiments, the suction motor may be positioned rearward of the cyclone chamber and the suction motor axis of rotation may be generally parallel to the cyclone axis of rotation.

[0030] In some embodiments, the pre-motor filter may comprise a generally cylindrical filter having a hollow interior wherein the suction motor has an inlet end that faces towards the hollow interior.

[0031] In some embodiments, the generally cylindrical filter may have an outer upstream surface and an inner downstream surface defining the hollow interior and the suction motor axis of rotation may intersect the hollow interior.

[0032] In some embodiments, the cyclone assembly may comprise a sidewall that extends generally parallel to the cyclone axis of rotation and the upstream surface of the pre-motor filter may extend generally parallel to the sidewall of the cyclone assembly.

[0033] In some embodiments, the pre-motor filter may at least partially overlie the cyclone chamber.

[0034] In some embodiments, the hand vacuum cleaner may further comprise a handle having a hand grip portion that extends upwardly and forwardly when the upper end of the hand vacuum cleaner is positioned above

the lower end of the hand vacuum cleaner wherein the suction motor is located at an upper end of the handle.

[0035] In some embodiments, the suction motor may be positioned rearward of the cyclone chamber.

[0036] In some embodiments, the suction motor may be located at an upper end of the hand grip portion.

[0037] Also in accordance with this broad aspect, there is provided a hand vacuum cleaner having a front end, a rear end, an upper end, a lower end, and first and second laterally spaced apart sides, and comprising:

(a) an air flow path extending from a dirty air inlet to a clean air outlet;

(b) a cyclone assembly comprising a cyclone chamber positioned in the air flow path and having a cyclone air inlet, a cyclone air outlet and a cyclone axis of rotation, wherein the cyclone axis of rotation extends generally in a forward/rearward direction;

(c) a generally cylindrical pre-motor filter positioned downstream of the cyclone air outlet and having a hollow interior; and,

(d) a suction motor positioned in the air flow path downstream of the pre-motor filter and upstream of the clean air outlet and having a suction motor axis of rotation that is generally parallel to the cyclone axis of rotation, wherein the suction motor has an inlet end that faces towards the hollow interior.

[0038] In some embodiments, the generally cylindrical filter may have an outer upstream surface and an inner downstream surface defining the hollow interior and the suction motor axis of rotation may intersect the hollow interior.

[0039] In some embodiments, the cyclone assembly may comprise a sidewall that extends generally parallel to the cyclone axis of rotation and the

upstream surface of the pre-motor filter may extend generally parallel to the sidewall of the cyclone assembly.

[0040] In some embodiments, the pre-motor filter may at least partially overlie the cyclone chamber.

[0041] In accordance with another aspect of this disclosure, which may be used alone or in combination with any other aspect, it may be desirable for a hand vacuum cleaner to have a compact overall form, for example so it can be maneuvered around and/or between objects when being carried by a user while cleaning one or more surfaces. A compact form may also improve the ergonomics of the hand vacuum (e.g. the perceived balance or 'hand feel' when carried by a user). Typically, the suction motor and energy storage members (e.g. one or more batteries) may be among the heavier (if not the heaviest) individual components of the hand vacuum cleaner. While positioning the suction motor and energy storage members adjacent to each other may promote a compact design, such an arrangement may promote an undesirable concentration of mass relative to a handle of the hand vacuum cleaner. Positioning the suction motor at an upper end of a forwardly-inclined handle and rearward of at least some of the energy storage members, particularly when some or all of the energy storage members are forward of the handle, may help distribute the weight of the motor and batteries, and may affect the hand feel and/or perceived balance of the hand vacuum.

[0042] In accordance with this broad aspect, there is provided a hand vacuum cleaner having a front end, a rear end, an upper end, a lower end, and first and second laterally spaced apart sides, and comprising:

(a) an air flow path extending from a dirty air inlet to a clean air outlet;

(b) a handle having a hand grip portion that extends upwardly and forwardly when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner;

(c) a cyclone chamber positioned in the air flow path and having a cyclone air inlet, a cyclone air outlet, and a cyclone axis of rotation;

(d) at least one energy storage member positioned in an energy storage chamber; and,

(e) a suction motor positioned in the air flow path upstream of the clean air outlet, wherein the suction motor is located at an upper end of the handle and rearward of the at least one energy storage member when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner.

[0043] In some embodiments, the suction motor may be located at an upper end of the hand grip portion.

[0044] In some embodiments, the at least one energy storage member may comprise a plurality of energy storage members wherein at least some of the plurality of energy storage members may be arranged one above another in a generally upwardly extending configuration when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner and the suction motor may be positioned rearward of at least some of the energy storage members when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner.

[0045] In some embodiments, the cyclone axis of rotation may intersect a volume defined by the generally upwardly extending configuration of energy storage members.

[0046] In some embodiments, the cyclone axis of rotation may extend generally in a forward/rearward direction.

[0047] In some embodiments, the at least one energy storage member may comprise a plurality of energy storage members wherein at least some of the plurality of energy storage members may be arranged one above another in a

generally upwardly extending configuration when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner and the suction motor may be positioned rearward of an upper end of the plurality of energy storage members when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner.

[0048] In some embodiments, the cyclone axis of rotation may extend generally in a forward/rearward direction.

[0049] In some embodiments, the suction motor may be positioned above the cyclone axis of rotation when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner.

[0050] In some embodiments, the hand vacuum may further comprise a pre-motor filter positioned in the air flow path downstream of the cyclone chamber, the pre-motor filter comprising a generally cylindrical filter having a hollow interior wherein the suction motor has an inlet end that faces towards the hollow interior.

[0051] In some embodiments, the generally cylindrical filter may have an outer upstream surface and an inner downstream surface defining the hollow interior and the suction motor axis of rotation may intersect the hollow interior.

[0052] In some embodiments, the cyclone chamber may comprise a sidewall that extends generally parallel to the cyclone axis of rotation and the upstream surface of the pre-motor filter may extend generally parallel to the sidewall of the cyclone chamber.

[0053] In some embodiments, the pre-motor filter may at least partially overlie the cyclone chamber.

[0054] In some embodiments, the dirty air inlet may have a dirty air inlet axis that extends generally rearwardly and may be positioned above the cyclone chamber.

[0055] In some embodiments, the dirty air inlet axis may intersect a volume defined by a pre-motor filter housing.

[0056] In some embodiments, the dirty air inlet axis may intersect the suction motor.

[0057] In some embodiments, the hand vacuum may further comprise a pre-motor filter positioned in the air flow path downstream of the cyclone chamber, the pre-motor filter comprising a generally cylindrical filter having a hollow interior wherein the dirty air inlet has a dirty air inlet axis that extends generally rearwardly and intersects the hollow interior.

[0058] In some embodiments, the dirty air inlet axis may intersect the suction motor.

[0059] In accordance with another aspect of this disclosure, which may be used alone or in combination with any other aspect, a hand vacuum cleaner may have an energy storage member (e.g. a battery pack that includes one or more battery cells) that is inclined so that a portion of a dirt collection region may be located below a portion of the energy storage member. Providing at least some vertical overlap between an energy storage member and a dirt collection region may help provide a relatively larger dirt chamber capacity while helping to reduce the overall size of the hand vacuum. Also, as the energy storage members (e.g. one or more batteries) may typically be among the heavier individual components of the hand vacuum cleaner, such a configuration may help provide a compact overall design, while distributing the weight of the batteries to promote a desirable hand feel and/or perceived balance of the hand vacuum.

[0060] In accordance with this broad aspect, there is provided a hand vacuum cleaner having a front end, a rear end, an upper end, a lower end, and first and second laterally spaced apart sides, and comprising:

(a) an air flow path extending from a dirty air inlet to a clean air outlet;

(b) a cyclone assembly positioned in the air flow path and having a cyclone assembly air inlet, a cyclone assembly air outlet, a dirt collection region, and a cyclone axis of rotation;

(c) a suction motor positioned in the air flow path upstream of the clean air outlet; and,

(d) a longitudinally extending battery pack wherein the battery pack extends upwardly and forwardly when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner,

wherein a portion of the dirt collection region is located below a portion of the battery pack.

[0061] In some embodiments, the dirt collection region may have an upper portion and a lower portion when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner and the lower portion of the dirt collection region may be positioned rearwardly of the upper portion of the dirt collection region.

[0062] In some embodiments, a rear wall of the dirt collection chamber may be at a first angle to a vertical axis.

[0063] In some embodiments, the battery pack may be located in a battery pack chamber, the battery pack chamber having a front wall that is at a second angle to a vertical axis.

[0064] In some embodiments, the first and second angles may be about the same.

[0065] In some embodiments, the battery pack may extend generally linearly.

[0066] In some embodiments, the battery pack may be removably receivable in the hand vacuum cleaner.

[0067] In some embodiments, the battery pack may be removably receivable in the hand vacuum cleaner, a rear wall of the dirt collection chamber may be at a first angle to a vertical axis and the battery pack may have a front wall that is at a second angle to a vertical axis, wherein the first and second angles may be about the same.

[0068] In some embodiments, the dirt collection region may be at a lower end of the hand vacuum cleaner and the battery pack may be slidably insertable into the lower end of the hand vacuum cleaner.

[0069] Also in accordance with this broad aspect, there is provided a hand vacuum cleaner having a front end, a rear end, an upper end, a lower end, and first and second laterally spaced apart sides, and comprising:

(a) an air flow path extending from a dirty air inlet to a clean air outlet;

(b) a cyclone assembly positioned in the air flow path and having a cyclone assembly air inlet, a cyclone assembly air outlet, a dirt collection region, and a cyclone axis of rotation;

(c) a suction motor positioned in the air flow path upstream of the clean air outlet; and,

(d) a plurality of energy storage members arranged one above another in a generally upwardly extending configuration when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner, the configuration having a forward side and a rearward side,

wherein a lower end of the forward side of the configuration of energy storage members is positioned rearward of an another portion of the forward side of the configuration when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner, and,

wherein a portion of the dirt collection region is located below at least a portion of one of the energy storage members.

[0070] In some embodiments, the dirt collection region may have an upper portion and a lower portion when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner and the lower portion of the dirt collection region may be positioned rearwardly of the upper portion of the dirt collection region.

[0071] In some embodiments, a rear wall of the dirt collection chamber may be at a first angle to a vertical axis.

[0072] In some embodiments, the energy storage members may be located in an energy storage member chamber, and the energy storage member chamber may have a front wall that is at a second angle to a vertical axis.

[0073] In some embodiments, the first and second angles may be about the same.

[0074] In some embodiments, the configuration of energy storage members may extend generally linearly.

[0075] In some embodiments, the energy storage members may be removably receivable in the hand vacuum cleaner.

[0076] In some embodiments, the energy storage members may be removably receivable in the hand vacuum cleaner, a rear wall of the dirt collection chamber may be at a first angle to a vertical axis and the configuration of energy storage members may have a front side that is at a second angle to a vertical axis, wherein the first and second angles may be about the same.

[0077] In some embodiments, the dirt collection region may be at a lower end of the hand vacuum cleaner and the energy storage members may be slidably insertable into the lower end of the hand vacuum cleaner.

[0078] Also in accordance with this broad aspect, there is provided a hand vacuum cleaner having a front end, a rear end, an upper end, a lower end, and first and second laterally spaced apart sides, and comprising:

(a) an air flow path extending from a dirty air inlet to a clean air outlet;

(b) a cyclone assembly positioned in the air flow path and having a cyclone assembly air inlet, a cyclone assembly air outlet, a dirt collection region, and a cyclone axis of rotation;

(c) a suction motor positioned in the air flow path upstream of the clean air outlet; and,

(d) a power pack that extends upwardly and forwardly when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner,

wherein the dirt collection region has a rear wall that extends upwardly and forwardly when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner whereby at least a portion of the dirt collection region is below at least a portion of the power pack.

[0079] In some embodiments, the dirt collection region may be at a lower end of the hand vacuum cleaner and the rear wall of the dirt collection chamber may be located proximate a front side of the power pack.

[0080] In accordance with another aspect of this disclosure, which may be used alone or in combination with any other aspect, a hand vacuum cleaner may have an energy storage member (e.g. a battery pack that includes one or more battery cells) that is positioned rearward of a dirt collection region and at least partially underlies at least a portion of one or both of a cyclone chamber and a pre-motor filter. Providing at least some vertical overlap between an energy storage member and a cyclone chamber and/or a pre-motor filter may help to

reduce the overall size (length front to back) of the hand vacuum and may therefore reduce the torque exerted on the hand of a user as the moment arm between the front of the hand vacuum cleaner and the handle may be reduced. Also, as the energy storage member (e.g. one or more batteries) may typically be among the heavier individual components of the hand vacuum cleaner, such a configuration may help provide a compact overall design without adversely affecting the hand feel and/or perceived balance of the hand vacuum.

[0081] In accordance with this broad aspect, there is provided hand vacuum cleaner having a front end, a rear end, an upper end, a lower end, and first and second laterally spaced apart sides, and comprising:

(a) an air flow path extending from a dirty air inlet to a clean air outlet;

(b) a cyclone assembly positioned in the air flow path and having a cyclone assembly air inlet, a cyclone assembly air outlet, a cyclone chamber, a dirt collection region, and a cyclone axis of rotation;

(c) a pre-motor filter downstream of the cyclone chamber;

(d) a suction motor positioned in the air flow path upstream of the clean air outlet; and,

(e) a battery pack wherein at least a portion of the battery pack is positioned rearward of the dirt collection region and at least a portion of the battery pack underlies at least a portion of one or both of the cyclone chamber and the pre-motor filter.

[0082] In some embodiments, the cyclone axis of rotation may extend generally in a forward/rearward direction.

[0083] In some embodiments, at least a portion of, or substantially all of or the entire battery pack may underlie at least a portion of the cyclone chamber, substantially all of the cyclone chamber or the entire cyclone chamber.

[0084] In some embodiments, at least a portion of, or substantially all of or the entire battery pack may underlie at least a portion of the pre-motor filter, substantially all of the pre-motor filter or the entire pre-motor filter.

[0085] In some embodiments, the battery pack may comprise at least a plurality of energy storage members wherein the energy storage members may be arranged in at least two columns in the forward/rearward direction.

[0086] In some embodiments, the dirt collection region may be at a lower end of the hand vacuum cleaner and the battery pack may be slidably insertable into the lower end of the hand vacuum cleaner.

[0087] In some embodiments, the hand vacuum may further comprise a handle and a finger gap positioned between the handle and the battery pack.

[0088] Also in accordance with this broad aspect, there is provided a hand vacuum cleaner having a front end, a rear end, an upper end, a lower end, and first and second laterally spaced apart sides, and comprising:

(a) an air flow path extending from a dirty air inlet to a clean air outlet;

(b) a cyclone assembly positioned in the air flow path and having a cyclone assembly air inlet, a cyclone assembly air outlet, a cyclone chamber, a dirt collection region, and a cyclone axis of rotation;

(c) a pre-motor filter downstream of the cyclone chamber;

(d) a suction motor positioned in the air flow path upstream of the clean air outlet; and,

(e) a plurality of energy storage members provided in a lower portion of the hand vacuum cleaner, wherein some of the energy storage members are arranged one above another and some are arranged one behind another and wherein at least some of the energy storage members underlie at least a portion of one or both of the cyclone chamber and the pre-motor filter.

[0089] In some embodiments, at least a portion of the energy storage members may be positioned rearward of the dirt collection region.

[0090] In some embodiments, the cyclone axis of rotation may extend generally in a forward/rearward direction.

[0091] In some embodiments, the at least a portion of, or substantially all of or all of the energy storage members may underlie at least a portion of the cyclone chamber, substantially all of the cyclone chamber or the entire cyclone chamber

[0092] In some embodiments, the at least a portion of, or substantially all of or all of the energy storage members may underlie at least a portion of the pre-motor filter, substantially all of the pre-motor filter or the entire pre-motor filter.

[0093] In some embodiments, the dirt collection region is at a lower end of the hand vacuum cleaner and the energy storage members are slidably insertable into the lower end of the hand vacuum cleaner.

[0094] In some embodiments, at least a portion of the energy storage members may be positioned rearward of the dirt collection region.

[0095] In some embodiments, the hand vacuum may further comprise a handle and a finger gap positioned between the handle and the energy storage members.

[0096] In accordance with another aspect of this disclosure, which may be used alone or in combination with any other aspect, a hand vacuum cleaner may have a cyclone chamber with a cyclone axis of rotation that extends in a forward/rearward direction, and a suction motor with a suction motor axis that also extends in a forward/rearward direction, where the suction motor is located at an upper end of a handle of the vacuum cleaner and the suction motor axis is vertically displaced from the cyclone axis of rotation. Such a configuration may have one or more advantages. For example, it may facilitate the reduction of

conduit bends and/or air flow direction changes between a dirty air inlet and a clean air outlet, thereby reducing backpressure and/or air flow losses through this portion of the hand vacuum cleaner due to a reduction in the number of bends in the air flow path. Additionally, or alternatively, such a configuration may help provide a compact overall design of the hand vacuum cleaner without adversely affecting the hand feel and/or perceived balance of the hand vacuum.

[0097] In accordance with this broad aspect, there is provided a hand vacuum cleaner having a front end, a rear end, an upper end, a lower end, and first and second laterally spaced apart sides, and comprising:

(a) an air flow path extending from a dirty air inlet to a clean air outlet;

(b) a handle having a hand grip portion that extends upwardly and forwardly when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner, the handle being positioned at the rear end of the hand vacuum cleaner;

(c) a cyclone chamber positioned in the air flow path and having a cyclone air inlet, a cyclone air outlet, and a cyclone axis of rotation that extends in a forward/rearward direction;

(d) a pre-motor filter positioned downstream of the cyclone chamber and upstream of the suction motor; and,

(e) a suction motor positioned in the air flow path upstream of the clean air outlet, wherein the suction motor has a suction motor axis of rotation that extends in a forward/rearward direction, wherein the suction motor is located at an upper end of the handle, and wherein the suction motor axis of rotation is vertically displaced from the cyclone axis of rotation when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner.

[0098] In some embodiments, the suction motor may be located at an upper end of the hand grip portion.

[0099] In some embodiments, the cyclone axis of rotation may intersect the hand grip portion.

[00100] In some embodiments, the suction motor may be located rearward of the cyclone chamber.

[00101] In some embodiments, the suction motor may have an inlet that faces towards the pre-motor filter.

[00102] In some embodiments, the suction motor axis of rotation may intersect a volume defined by a pre-motor filter housing.

[00103] In some embodiments, the suction motor axis of rotation may extend through a central portion of a volume containing the pre-motor filter.

[00104] In some embodiments, the pre-motor filter may be positioned above the cyclone axis of rotation when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner.

[00105] In some embodiments, the pre-motor filter may be positioned above the cyclone chamber when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner.

[00106] In some embodiments, the cyclone axis of rotation may intersect the hand grip portion, the pre-motor filter may be positioned above the cyclone axis of rotation when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner, and the suction motor axis of rotation may extend through a pre-motor filter housing.

[00107] In some embodiments, the pre-motor filter may comprise a generally cylindrical filter having a hollow interior wherein the suction motor axis of rotation intersects the hollow interior.

[00108] In some embodiments, after exiting a downstream side of the pre-motor filter, air travels generally linearly to the suction motor.

[00109] In some embodiments, the pre-motor filter may comprise a generally cylindrical filter having a hollow interior wherein the dirty air inlet has a dirty air inlet axis that extends generally rearwardly and intersects the hollow interior.

[00110] In some embodiments, the dirty air inlet axis may intersect the suction motor.

[00111] In some embodiments, the cyclone axis of rotation may intersect the hand grip portion.

[00112] In some embodiments, the hand vacuum may further comprise a plurality of energy storage members wherein at least some of the plurality of energy storage members are arranged one above another in a generally upwardly extending configuration when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner, and the suction motor may be positioned rearward of at least some of the energy storage members when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner.

[00113] In accordance with another aspect of this disclosure, which may be used alone or in combination with any other aspect, a surface cleaning apparatus may have a removable pre-motor filter assembly having an outlet conduit wherein a terminal end of the outlet conduit extends at a first angle to a direction of air flow through the outlet conduit. An advantage of this design is that the terminal end of the outlet conduit may be positioned substantially flush against another air conduit having a similarly angled terminal end without requiring lateral movement of the outlet conduit towards other conduit. Accordingly, a filter assembly may be removed and inserted by moving the filter assembly substantially perpendicular to the direction of airflow exiting the filter assembly.

Such an arrangement may, for example, facilitate the use of a gasket or other sealing member between the ends of the conduits to provide an improved seal between the conduits. Such an arrangement may also eliminate the need for a biasing or other retaining mechanism to exert a force on the filter assembly to maintain a seal between the conduits.

[00114] In accordance with this broad aspect, there is provided a surface cleaning apparatus comprising:

(a) an air flow path extending from a dirty air inlet to a clean air outlet;

(b) an air treatment member positioned in the air flow path; and

(c) a removable pre-motor filter assembly positioned downstream of the air treatment member and upstream of a suction motor, the pre-motor filter assembly comprising a pre-motor filter and a filter support member, the filter support member having an outlet conduit wherein a terminal end of the outlet conduit extends at a first angle to a direction of air flow through the outlet conduit.

[00115] In some embodiments, the pre-motor filter may comprise a generally cylindrical filter having a hollow interior positioned about a body portion of the filter support member having an internal filter conduit, wherein the outlet conduit is in air flow communication with the hollow interior via the internal filter conduit.

[00116] In some embodiments, the outlet conduit may be aligned with the hollow interior.

[00117] In some embodiments, the body portion of the filter support member may include a porous portion located in the hollow interior and positioned between a downstream surface of the pre-motor filter and the internal filter conduit.

[00118] In some embodiments, the hollow interior may comprise a longitudinally extending passage having an outlet end from which the outlet conduit extends away and an opposed end wherein the opposed end is sealed.

[00119] In some embodiments, the opposed end may be sealed by a sealing member that extends into the hollow interior, the sealing member having a solid wall extending inwardly and located between a downstream surface of the pre-motor filter and the passage.

[00120] In some embodiments, the filter support member may have a body portion having an internal filter conduit that may extend into a hollow interior of the pre-motor filter, the body portion may have a solid wall extending inwardly and located between a downstream surface of the pre-motor filter and the internal filter conduit.

[00121] In some embodiments, the body portion of the filter support member may include a porous portion located in the hollow interior and positioned between a downstream surface of the pre-motor filter and the internal filter conduit and is upstream of the outlet conduit.

[00122] In some embodiments, the internal filter conduit may comprise a longitudinally extending passage having an outlet end from which the outlet conduit extends away and a second end, wherein the second end is sealed.

[00123] In some embodiments, the second end may be sealed by a sealing member that extends into the hollow interior, the sealing member having a solid wall extending inwardly and located between a downstream surface of the pre-motor filter and the internal filter conduit.

[00124] In some embodiments, the sealing member and the body portion define a continuous member extending through the hollow interior.

[00125] In some embodiments, the surface cleaning apparatus may further comprise a treated air conduit extending from the outlet conduit towards the

suction motor, wherein an inlet end of the treated air conduit may also extend at about the first angle to a direction of air flow through the outlet conduit.

[00126] In some embodiments, the surface cleaning apparatus may further comprise a treated air conduit extending from the outlet conduit towards the suction motor, wherein an inlet end of the treated air conduit may also extend at a second angle to a direction of air flow through the outlet conduit and the terminal end of the outlet conduit may abut the inlet end of the treated air conduit when the filter assembly is positioned in the air flow path.

[00127] In some embodiments, the first and second angles may be about the same.

[00128] In some embodiments, the surface cleaning apparatus may further comprise a gasket provided at an interface of the terminal end of the outlet conduit and the inlet end of the treated air conduit.

[00129] In some embodiments, the filter assembly may be removable in a filter assembly removal direction that is at an angle to the direction of air flow through the outlet conduit.

[00130] In some embodiments, the filter assembly may be removable through an openable door and a side of the terminal end that is closest to the openable door may extend further in the direction of air flow though the outlet conduit than an opposed side of the terminal end that is further from the openable door.

[00131] In some embodiments, a side of the inlet end of the treated air conduit that is furthest from the openable door may extend further in the direction of air flow though the outlet conduit than an opposed side of the inlet end that is closest to the openable door.

[00132] It will be appreciated by a person skilled in the art that an apparatus or method disclosed herein may embody any one or more of the features

contained herein and that the features may be used in any particular combination or sub-combination.

[00133] These and other aspects and features of various embodiments will be described in greater detail below.

BRIEF DESCRIPTION OF THE DRAWINGS

[00134] For a better understanding of the described embodiments and to show more clearly how they may be carried into effect, reference will now be made, by way of example, to the accompanying drawings in which:

[00135] Figure 1 is a top perspective view of a hand vacuum cleaner in accordance with one embodiment;

[00136] Figure 2 is a bottom perspective view of the hand vacuum cleaner of Figure 1;

[00137] Figure 3 is a side perspective view of the hand vacuum cleaner of Figure 1;

[00138] Figure 4 is a rear perspective view of the hand vacuum cleaner of Figure 1;

[00139] Figure 5 is a front end view of the hand vacuum cleaner of Figure 1;

[00140] Figure 6 is a perspective view of the hand vacuum cleaner of Figure 1, with a front door or lid in an open position;

[00141] Figure 7 is a front end view of the hand vacuum cleaner of Figure 1, with a front door or lid in an open position;

[00142] Figure 8 is a perspective sectional view of the hand vacuum cleaner of Figure 1, taken along line 8-8 in Figure 1;

[00143] Figure 9 is a perspective sectional view of the hand vacuum cleaner of Figure 1, taken along line 9-9 in Figure 5;

[00144] Figure 10 is a cross-section view of the hand vacuum cleaner of Figure 1, taken along line 9-9 in Figure 5;

[00145] Figure 11 is an enlarged view of the upper left portion of Figure 10;

[00146] Figure 12 is an enlarged view of the upper left portion of Figure 10, with a pre-motor filter assembly removed;

[00147] Figure 13 is an enlarged view of the upper left portion of Figure 10, with a pre-motor filter assembly and an openable door removed;

[00148] Figure 14 is a top perspective view of the upper front portion of the hand vacuum cleaner of Figure 1, with an openable door removed to expose a pre-motor filter assembly;

[00149] Figure 15 is a top perspective view of the upper front portion of the hand vacuum cleaner of Figure 1, with a pre-motor filter assembly and an openable door removed;

[00150] Figure 16 is a top plan view of the upper front portion of the hand vacuum cleaner of Figure 1, with a pre-motor filter assembly and an openable door removed;

[00151] Figure 17 is a top perspective view of the upper portion of the hand vacuum cleaner of Figure 1, with a pre-motor filter assembly and an openable door removed;

[00152] Figure 18 is a bottom perspective view of an openable door of a pre-motor filter chamber of the hand vacuum cleaner of Figure 1;

[00153] Figure 19 is a perspective view of a removable pre-motor filter assembly of the hand vacuum cleaner of Figure 1;

[00154] Figure 20 is an end perspective view from the outlet end of the removable pre-motor filter assembly of the hand vacuum cleaner of Figure 19;

[00155] Figure 21 is a perspective section view of the removable pre-motor filter assembly of the hand vacuum cleaner of Figure 19, taken along line 21-21 in Figure 19;

[00156] Figure 22 is a cross section view of the removable pre-motor filter assembly of the hand vacuum cleaner of Figure 19, taken along line 21-21 in Figure 19;

[00157] Figure 23 is a bottom perspective view of the lower rear portion of the hand vacuum cleaner of Figure 1;

[00158] Figure 24 is a bottom perspective view of the lower rear portion of the hand vacuum cleaner of Figure 1, with a post-motor filter and a post-motor filter support removed;

[00159] Figure 25 is a rear perspective view of a post-motor filter support of the hand vacuum cleaner of Figure 1;

[00160] Figure 26 is a front perspective view of the post-motor filter support of Figure 25;

[00161] Figure 27 is a front perspective view of the post-motor filter support of Figure 26 and a post-motor filter;

[00162] Figure 28 is a side view of the hand vacuum cleaner of Figure 1, with an energy storage member partially removed;

[00163] Figure 29 is a bottom perspective view of the hand vacuum cleaner of Figure 1, with an energy storage member partially removed;

[00164] Figure 30 is a side view of the hand vacuum cleaner of Figure 1, with an energy storage member removed;

[00165] Figure 31 is a cross-section view of the hand vacuum cleaner of Figure 1, taken along line 9-9 in Figure 5, with an energy storage member removed;

[00166] Figure 32 is a perspective view of an energy storage member of the hand vacuum cleaner of Figure 1;

[00167] Figure 33 is a front perspective view of the energy storage member of Figure 32;

[00168] Figure 34 is a cross-section view of the energy storage member of Figure 32, taken along line 34-34 in Figure 32;

[00169] Figure 35 is a perspective view of a hand vacuum cleaner in accordance with another embodiment;

[00170] Figure 36 is a cross-section view of the hand vacuum cleaner of Figure 35, taken along line 36-36 in Figure 35;

[00171] Figure 37 is a cross-section view of the hand vacuum cleaner of Figure 35, taken along line 36-36 in Figure 35, with an energy storage member partially removed;

[00172] Figure 38 is a perspective section view of the hand vacuum cleaner of Figure 35, taken along line 36-36 in Figure 35, with a post-motor filter removed;

[00173] Figure 39 is a perspective view of a hand vacuum cleaner in accordance with another embodiment;

[00174] Figure 40 is a cross-section view of the hand vacuum cleaner of Figure 39, taken along line 40-40 in Figure 39;

[00175] Figure 41 is a perspective section view of the hand vacuum cleaner of Figure 39, taken along line 40-40 in Figure 39, with a post-motor filter removed;

[00176] Figure 42 is a perspective view of a hand vacuum cleaner in accordance with another embodiment;

[00177] Figure 43 is a cross-section view of the hand vacuum cleaner of Figure 42, taken along line 43-43 in Figure 42;

[00178] Figure 44 is a perspective section view of the hand vacuum cleaner of Figure 42, taken along line 43-43 in Figure 42;

[00179] Figure 45 is a perspective section view of the hand vacuum cleaner of Figure 42, taken along line 43-43 in Figure 42, with an energy storage member removed;

[00180] Figure 46 is a perspective view of a hand vacuum cleaner in accordance with another embodiment;

[00181] Figure 47 is a cross-section view of the hand vacuum cleaner of Figure 46, taken along line 47-47 in Figure 46;

[00182] Figure 48 is a perspective section view of the hand vacuum cleaner of Figure 46, taken along line 47-47 in Figure 46;

[00183] Figure 49 is a perspective section view of the hand vacuum cleaner of Figure 46, taken along line 47-47 in Figure 46, with an energy storage member removed; and

[00184] Figure 50 is a perspective view of the hand vacuum cleaner of Figure 46, with a front door or lid in an open position;

[00185] The drawings included herewith are for illustrating various examples of articles, methods, and apparatuses of the teaching of the present specification and are not intended to limit the scope of what is taught in any way.

DESCRIPTION OF EXAMPLE EMBODIMENTS

[00186] Various apparatuses, methods and compositions are described below to provide an example of an embodiment of each claimed invention. No embodiment described below limits any claimed invention and any claimed invention may cover apparatuses and methods that differ from those described below. The claimed inventions are not limited to apparatuses, methods and

compositions having all of the features of any one apparatus, method or composition described below or to features common to multiple or all of the apparatuses, methods or compositions described below. It is possible that an apparatus, method or composition described below is not an embodiment of any claimed invention. Any invention disclosed in an apparatus, method or composition described below that is not claimed in this document may be the subject matter of another protective instrument, for example, a continuing patent application, and the applicant(s), inventor(s) and/or owner(s) do not intend to abandon, disclaim, or dedicate to the public any such invention by its disclosure in this document.

[00187] The terms "an embodiment," "embodiment," "embodiments," "the embodiment," "the embodiments," "one or more embodiments," "some embodiments," and "one embodiment" mean "one or more (but not all) embodiments of the present invention(s)," unless expressly specified otherwise.

[00188] The terms "including," "comprising" and variations thereof mean "including but not limited to," unless expressly specified otherwise. A listing of items does not imply that any or all of the items are mutually exclusive, unless expressly specified otherwise. The terms "a," "an" and "the" mean "one or more," unless expressly specified otherwise.

[00189] As used herein and in the claims, two or more parts are said to be “coupled”, “connected”, “attached”, or “fastened” where the parts are joined or operate together either directly or indirectly (i.e., through one or more intermediate parts), so long as a link occurs. As used herein and in the claims, two or more parts are said to be “directly coupled”, “directly connected”, “directly attached”, or “directly fastened” where the parts are connected in physical contact with each other. None of the terms “coupled”, “connected”, “attached”, and “fastened” distinguish the manner in which two or more parts are joined together.

[00190] Furthermore, it will be appreciated that for simplicity and clarity of illustration, where considered appropriate, reference numerals may be repeated among the figures to indicate corresponding or analogous elements. In addition, numerous specific details are set forth in order to provide a thorough understanding of the example embodiments described herein. However, it will be understood by those of ordinary skill in the art that the example embodiments described herein may be practiced without these specific details. In other instances, well-known methods, procedures, and components have not been described in detail so as not to obscure the example embodiments described herein. Also, the description is not to be considered as limiting the scope of the example embodiments described herein.

General description of a hand vacuum cleaner

[00191] Referring to Figures 1 to 34, an exemplary embodiment of a surface cleaning apparatus is shown generally as 1000. The following is a general discussion of this embodiment which provides a basis for understanding several of the features which are discussed herein. As discussed subsequently, each of the features may be used individually or in any particular combination or sub-combination in this or in other embodiments disclosed herein.

[00192] In the illustrated embodiment, the surface cleaning apparatus is a hand vacuum cleaner, which may also be referred to also as a "handvac" or "hand-held vacuum cleaner". As used herein, a hand vacuum cleaner is a vacuum cleaner that can be operated to clean a surface generally one-handedly. That is, the entire weight of the vacuum may be held by the same one hand used to direct a dirty air inlet of the vacuum cleaner with respect to a surface to be cleaned. For example, the handle and a clean air inlet may be rigidly coupled to each other (directly or indirectly) so as to move as one while maintaining a constant orientation relative to each other. This is to be contrasted with canister and upright vacuum cleaners, whose weight is typically supported by a surface (e.g. a floor) during use.

[00193] As exemplified in Figures 1 to 7, surface cleaning apparatus 1000 includes a main body 1010 having a housing 1011 and a handle 1020, an air treatment member 1100 connected to the main body 1010, a dirty air inlet 1030, a clean air outlet 1040, and an air flow path extending between the dirty air inlet and the clean air outlet.

[00194] Surface cleaning apparatus 1000 has a front end 1002, a rear end 1004, an upper end or top 1006, and a lower end or bottom 1008. In the embodiment shown, dirty air inlet 1030 is at an upper portion of the front end 1102 and clean air outlet 1040 is at rearward portion of the lower end 1008. It will be appreciated that the dirty air inlet 1030 and the clean air outlet 1040 may be provided in different locations.

[00195] A suction motor 1200 (see e.g. Figure 10) is provided to generate vacuum suction through the air flow path, and is positioned within a motor housing 1210. In the illustrated embodiment, the suction motor is positioned downstream from the air treatment member, although it may be positioned upstream of the air treatment member (e.g., a dirty air motor) in alternative embodiments.

[00196] Air treatment member 1100 is configured to remove particles of dirt and other debris from the air flow and/or otherwise treat the air flow. In the illustrated example, air treatment member 1100 includes a cyclone assembly having a single cyclonic cleaning stage with a single cyclone chamber 1110 and a dirt collection region 1122 external to the cyclone chamber. The cyclone chamber 1110 and dirt collection region 1122 may be of any configuration suitable for separating dirt from an air stream and collecting the separated dirt, respectively.

[00197] The cyclone chamber 1110 may be oriented in any direction. For example, when surface cleaning apparatus 1000 is oriented with the upper end 1106 above the lower end 1108, e.g. positioned generally parallel to a horizontal

surface, a central axis or axis of rotation 1115 of the cyclone chamber 1110 may be oriented horizontally, as exemplified in Figure 10. In alternative embodiments, the cyclone chamber may be oriented vertically, or at any angle between horizontal and vertical.

[00198] In alternative embodiments, the cyclone assembly may include two or more cyclonic cleaning stages arranged in series with each other. Each cyclonic cleaning stage may include one or more cyclone chambers (arranged in parallel or series with each other) and one or more dirt collection chambers, of any suitable configuration. The dirt collection chamber or chambers may be external to the cyclone chambers, or may be internal the cyclone chamber and configured as a dirt collection area or region within the cyclone chamber. For example, in the embodiments exemplified in Figures 42 to 45 and 46 to 50, a second cyclonic cleaning stage is provided in series in what may be characterized as a 'nested' configuration. As exemplified in Figure 43, after traveling generally axially though the cyclone chamber 1110 from the front end wall 1160 toward the rear end wall 1170, air exits cyclone chamber 1110 and enters a secondary cyclone chamber. A secondary dirt collection chamber 1121 is positioned exterior to the secondary cyclone chamber and is in communication with a dirt outlet 1141 to receive dirt and debris dis-entrained from a dirty air flow by the secondary cyclone chamber. In the embodiment exemplified in Figures 42 to 45, air exiting the secondary cyclone chamber travels generally rearwardly and enters a pre-motor chamber 1318 via air inlet 1234. In the embodiment exemplified in Figures 46 to 50, the secondary cyclone air outlet faces a rear wall 1236 of the upflow duct or conduit 1230 that directs air upwardly towards a pre-motor filter 1320. Alternatively, the air treatment member need not include a cyclonic cleaning stage, and can incorporate a bag, a porous physical filter media (such as foam or felt), or other air treating means.

[00199] As exemplified in Figure 10, hand vacuum cleaner 1000 may include a pre-motor filter housing 1310 provided in the air flow path downstream

of the air treatment member 1100 and upstream of the suction motor 1200. Pre-motor filter housing 1310 may be of any suitable construction, including any of those exemplified herein. A pre-motor filter 1320 is positioned within the pre-motor filter housing 1310. Pre-motor filter 1320 may be formed from any suitable physical, porous filter media and having any suitable shape, including the examples disclosed herein with respect to a removable pre-motor filter assembly. For example, the pre-motor filter may be one or more of a foam filter, felt filter, HEPA filter, other physical filter media, electrostatic filter, and the like.

[00200] Optionally, the pre-motor filter housing 1310 may be openable (as described herein), and at least a portion of the sidewall 1316 (e.g. removable or otherwise openable door 1330) and/or one of the end walls 1312 or 1314 may be removable, openable, or otherwise re-configurable to provide access to the interior of the pre-motor filter housing 1310.

[00201] Positioning the pre-motor filter housing 1310 toward the top 1006 of the main body 1010 may help facilitate access to the pre-motor filter 1320 while the hand vacuum is resting on its base. For example, if the hand vacuum cleaner 1000 is rested upon a table or other such surface, an openable door 1330 of the pre-motor filter housing 1310 is provided at the upper end of the housing and is accessible to a user. A user could then open the pre-motor filter housing 1310 by removing or otherwise opening door 1330 while the hand vacuum 1000 rests on the table, to inspect or replace the pre-motor filter 1320, without having to use one hand to grasp the handle 1020 or otherwise support the hand vacuum.

[00202] As exemplified, hand vacuum cleaner 1000 may also include a post-motor filter 1420 provided in the air flow path downstream of the suction motor 1200 and upstream of the clean air outlet 1040. Post-motor filter 1420 may be formed from any suitable physical, porous filter media and having any suitable shape, including the examples disclosed herein. In alternative embodiments, the post-motor filter may be any suitable type of filter such as one or more of a foam

filter, felt filter, HEPA filter, other physical filter media, electrostatic filter, and the like.

[00203] In the illustrated embodiment, the dirty air inlet 1030 of the hand vacuum cleaner 1000 is the inlet end 1032 of an inlet conduit 1036. Optionally, inlet end 1032 of the conduit 1036 can be used as a nozzle to directly clean a surface. The air inlet conduit 1036 is, in this example, a generally linear hollow member that extends along an inlet conduit axis 1035 that is oriented in a longitudinal forward/backward direction and is generally horizontal when hand vacuum cleaner 1000 is oriented with the upper end 1006 above the lower end 1008. Alternatively, or in addition to functioning as a nozzle, inlet conduit 1036 may be connected or directly connected to the downstream end of any suitable accessory tool such as a rigid air flow conduit (e.g., an above floor cleaning wand), a crevice tool, a mini brush, and the like. As shown, dirty air inlet 1030 is positioned forward of the air treatment member 1100, although this need not be the case. As exemplified, the dirty air inlet 1030 is positioned above the cyclone chamber. Optionally, the dirty air inlet 1030 may be provided at an alternate location, such as in the front end wall 1160.

[00204] As exemplified in Figures 1, 2, 5, 6, and 7, an optional accessory power coupler 1050 may be provided adjacent to the inlet conduit 1036. Accessory power coupler 1050 includes a set of electrical connectors 1056 that can inter-engage with compatible electrical connectors on an accessory tool in order to provide an electrical connection between e.g. a power source of the hand vacuum and a motor or other electrical device of an accessory tool (e.g. a powered brush roller, a light source, and the like). While the illustrated accessory power coupler 1050 is a male connector (i.e. projecting outwardly from the main body 1010 of the hand vacuum cleaner 1000), in alternative embodiments it may be a female connector (i.e. recessed inwardly) or any other shape suitable for cooperatively engaging with corresponding connectors on an accessory tool or other attachment. As exemplified, the accessory power coupler 1050 may be

positioned laterally to one side of the inlet conduit 1036. In other examples, the accessory power coupler 1050 may be located above or below the inlet conduit 1036.

[00205] As exemplified, power may be supplied to the suction motor and other electrical components of the hand vacuum cleaner from an onboard energy storage member which may include, for example, one or more batteries or other energy storage device. In the illustrated embodiment, the hand vacuum cleaner 1000 includes a removable battery pack 1500 provided between the handle 1020 and the air treatment member 1100. Battery pack 1500 is described in further detail herein. In alternative embodiments, a battery pack may not be provided and power may be supplied to the hand vacuum cleaner by an electrical cord connected to the hand vacuum cleaner (not shown) that can be connected to a standard wall electrical outlet.

[00206] Optionally, a forward surface of the handle 1020 and a rearward surface of the battery pack 1500 may cooperatively define a finger gap 1028 therebetween (see e.g. Figure 10). An advantage of this design is that the absence of an intervening portion of main housing 1010 between the handle and the energy storage member may facilitate a more compact overall size of hand vacuum 1000.

[00207] As exemplified, a power switch 1060 may be provided to selectively control the operation of the suction motor (e.g. either on/off or variable power levels or both), for example by establishing a power connection between the batteries and the suction motor. The power switch may be provided in any suitable configuration and location, including a button, rotary switch, sliding switch, trigger-type actuator and the like. As illustrated in Figure 4, power switch 1060 is in the form of a button located toward upper end of the rear end 1004 of the hand vacuum cleaner, above a hand grip portion 1026 of the handle 1020. In this position, a user may be able to access the button 1060 while holding the

hand vacuum via the hand grip, e.g. with the thumb of the hand holding the handle, and/or with a digit of their other hand.

[00208] The power switch or an alternate controller may also be configured to control other aspects of the hand vacuum (brush motor on/off, etc.). Optionally, instead of being provided at an upper end of the handle, the power switch may be provided on the main body (such as on the motor housing or other suitable location).

[00209] As exemplified in Figure 4, an optional information display device 1070 may be provided to display one or more visual indications to a user. For example, the display device 1070 may provide a visual indication of: when suction motor is on; the current power level of the suction motor (if applicable); the current battery charge level; an estimated time until the battery charge will be depleted, and/or similar information. The display device 1070 may include one or more light sources (e.g. light emitting diodes (LEDs)), display screens (e.g. a liquid crystal, an LED screen, an organic light emitting diode (OLED) screen, and the like. The screen, and associated electronics, may be used to display status information of one or more electrical components of the hand vacuum cleaner.

[00210] In the illustrated embodiment, the information display device is in the form of a display screen 1070 that is provided at the upper end 1022 of the handle 1020. A first display portion 1072 is configured to display an indication of whether the hand vacuum cleaner is in a floor cleaning mode or in a carpet cleaning mode (e.g. where power is being supplied to a brush roller of an accessory tool via electrical connectors 1056), and a second portion 1074 is configured to display an indication of a power mode of the suction motor (e.g. a regular power mode, a higher power mode, and/or a higher power 'burst' mode).

Air flow path through a hand vacuum cleaner

[00211] The following is a description of different features of an air flow path through a hand vacuum cleaner. These features may be used by themselves in any surface cleaning apparatus or in any combination or sub-combination with any other feature or features described herein. For example, any of the airflow configurations described herein may be used with any of the pre-motor filter assemblies, relative positioning of the suction motor and energy storage members, inclined battery packs, battery pack configurations, airflow cooling configurations, and other features described herein.

[00212] As exemplified, the air treatment member 1100 of the hand vacuum cleaner 1000 may optionally be a single cyclonic cleaning stage with unidirectional air flow or a 'uniflow' cyclone chamber 1110 (i.e. where the cyclone air inlet and cyclone air outlet are at opposite ends of the cyclone chamber). Referring primarily to Figures 9 and 10, hand vacuum cleaner 1000 includes a single cyclonic cleaning stage with a cyclone chamber 1110 that has a cyclone air inlet 1120 in fluid communication with the inlet conduit 1036, a cyclone air outlet 1130, and a dirt outlet 1140 that is in communication with a dirt collection chamber 1122.

[00213] Optionally, the cyclone chamber 1110 may be generally horizontally oriented so that the cyclone air inlet 1120 is located toward the front end 1002 of the hand vacuum cleaner 1000, and the cyclone air outlet 1130 is spaced rearwardly behind the cyclone air inlet 1120, at a rear end 1114 of the cyclone chamber 1110. From the cyclone air outlet 1130, an upflow duct or conduit 1230 directs the airflow upwards to a pre-motor filter chamber 1310 that is vertically spaced from the cyclone chamber 1110. After passing through the pre-motor filter 1320, air may travel generally rearwardly from the pre-motor filter 1320 to an inlet end 1202 of the suction motor 1200. An advantage of this arrangement is that, by promoting air to travel in this manner, the need for air flow direction changes between an air outlet of the pre-motor filter and the suction motor may

be reduced or eliminated, thereby reducing backpressure and/or air flow losses through this portion of the hand vacuum cleaner. An additional, or alternative, advantage of providing a pre-motor filter chamber 1310 that is vertically spaced from the cyclone chamber 1110 is that the need for air flow direction changes between a cyclone air outlet and the suction motor may be reduced, thereby reducing backpressure and/or air flow losses through this portion of the hand vacuum cleaner. For example, any airflow in a forward direction may take place within the pre-motor filter chamber or header 1310, as opposed to taking place in a (typically narrower) conduit that directs airflow in a direction opposite to the airflow through the dirty air inlet. An additional, or alternative, advantage of providing a pre-motor filter chamber 1310 that is vertically spaced from the cyclone chamber 1110, and optionally above the cyclone chamber 1110, is that the length (front to back) of the hand vacuum cleaner may be reduced, providing a more compact configuration.

[00214] Figures 1 to 34 exemplify one embodiment of a hand vacuum cleaner 1000 having a cyclone unit that includes a uniflow cyclone chamber 1110 and a dirt collection chamber 1122 that is positioned exterior to the cyclone chamber 1110 and is in communication with the dirt outlet 1140 to receive dirt and debris dis-entrained from a dirty air flow by the cyclone chamber 1110. In the illustrated example, the cyclone air inlet 1120 and dirt outlet 1140 are positioned toward opposing ends of the cyclone chamber 1110, and the cyclone air outlet 1130 is provided toward the same end as the dirt outlet 1140 (the rear end as illustrated). In this configuration, dirty air can enter at the front end of the cyclone chamber, while cleaner air and the separated dirt particles both exit the cyclone chamber at the opposing rear end.

[00215] In this embodiment, the cyclone chamber 1110 has a front end wall 1160 and an opposing rear end wall 1170 that is spaced apart from the front end wall along the cyclone axis 1115 about which air circulates within the cyclone chamber 1110 during operation of the hand vacuum cleaner. A cyclone chamber

sidewall 1180 extends between the front and rear end walls 1160, 1170. In the illustrated example, when the hand vacuum is oriented with the upper end above the lower end, the cyclone axis 1115 is generally horizontal, and is closer to horizontal than vertical, e.g., ±20°, ±15°, ±10°, or ±5° from the horizontal. As exemplified, the cyclone axis 1115 is substantially parallel to, e.g. within ±20°, ±15°, ±10°, or ±5°, and vertically offset below the conduit axis 1035 of the air inlet conduit 1036, and the cyclone chamber 1110 and dirt collection chamber 1122 are both below the inlet conduit axis 1035. As illustrated in Figure 10, when the hand vacuum 1000 is horizontal (as illustrated), the pre-motor filter 1320 is vertically spaced from (e.g. above) the cyclone axis 1115, and the suction motor 1200 is positioned rearward of the pre-motor filter 1320, so that air travels generally rearwardly from the pre-motor filter to the suction motor.

[00216] In this embodiment, the cyclone air inlet 1120 is a tangential air inlet that, as exemplified, terminates at an aperture or port that is formed in cyclone sidewall 1180, optionally an upper portion 1182 of the cyclone sidewall 1180, adjacent the front end wall 1160. Optionally, the cyclone air inlet 1120 may be provided at an alternate location, such as in the front end wall 1160.

[00217] The cyclone air inlet 1120 is fluidly connected with the outlet end of the conduit 1036 via a corresponding air outlet aperture or port 1038 that may be provided in a lower portion of the air inlet conduit 1036. The cyclone air inlet 1120 may have any suitable arrangement and/or configuration, and in the illustrated example is configured as a tangential air inlet that is directly connected to the air outlet aperture 1038. Connecting the air inlet 1120 to the air outlet aperture 1038 in this manner may help reduce the need for additional conduits to fluidly connect the dirty air inlet 1030 to the cyclone chamber 1110, and may reduce or eliminate the need for additional bends or air flow direction changes between the dirty air inlet 1030 and the cyclone chamber 1110. Reducing the conduit length and number of bends may help reduce the backpressure and air flow losses within the air flow path.

[00218] Positioning the cyclone air inlet 1120 toward the front of the cyclone chamber 1110 may help facilitate a desired air flow configuration within the cyclone chamber 1110. For example, in this configuration the cyclone chamber 1110 itself functions as part of the air flow path that conveys air rearwardly from the front 1002 of the hand vacuum 1000, without the need for a separate fluid conduit.

[00219] In the illustrated example, cyclone air inlet 1120 is directly adjacent the front wall 1160. Alternatively, cyclone air inlet 1120 may be axially spaced from the front end wall 1160, and may be located at another location along the length of the cyclone chamber 1110. Preferably, cyclone air inlet 1120 is provided in the front half of the cyclone chamber 1110 (i.e. forward of the axial mid-point of the cyclone chamber sidewall 1080) in order to help reduce the distance between the dirty air inlet 1030 and the cyclone air inlet 1120.

[00220] As shown in Figure 10, the cyclone air outlet 1130 is provided in the rear end wall 1170 of the cyclone chamber 1110, and an axially extending vortex finder conduit 1136 extends from the rear end wall 1170 and is aligned with the cyclone air outlet 1130. Optionally, a mesh screen (not shown) may be positioned over some or all of the inlet apertures 1138 of the vortex finder conduit 1136 to help inhibit lint, hair, and other such debris from entering the vortex finder conduit 1136. Positioning the air outlet 1130 toward the rear end (and optionally in the rear end wall 1170) may help facilitate the desired air flow through the cyclone chamber 1110, such that air, while swirling, travels generally axially though the cyclone chamber 1110 from the front end wall 1160 toward the rear end wall 1170.

[00221] Positioning the air outlet 1130 in the rear end wall 1170 of the cyclone chamber 1110 may also help facilitate the air flow connection between the cyclone chamber 1110 and other downstream components in the hand vacuum, such as the pre-motor filter housing 1310 and suction motor housing 1210 described herein. In the illustrated embodiment the air outlet 1130 is

provided in the rear end wall 1170 and is connected to the pre-motor filter housing 1310 through an upflow duct or conduit 1230. This may help simplify the air flow path and construction of the hand vacuum. Alternatively, the air flow path may include one or more additional conduits connected downstream from the cyclone air outlet.

[00222] In this arrangement, air travelling through the hand vacuum 1000 will travel generally rearwardly along the air inlet conduit 1036 (i.e. parallel to the conduit axis 1035 and then enter a tangential air inlet which essentially changes the direction of the air to travel generally downwardly through the cyclone air inlet 1120 (i.e. generally orthogonal to the cyclone axis 1115). The air can then circulate within the cyclone chamber 1110, and travel generally rearwardly toward the cyclone air outlet 1130, and ultimately exit the cyclone chamber 1110 via the cyclone air outlet 1130 while travelling through the vortex finder conduit 1136 in a rearward direction (i.e. generally parallel to the cyclone axis 1115). In this configuration, the air flow changes direction only once (and by only approximately 90° which may be accomplished by a tangential air inlet), between entering the dirty air inlet 1030 and exiting the cyclone air outlet 1130.

[00223] The cyclone dirt outlet 1140 may be of any suitable configuration, and in the illustrated embodiment is a slot 1140 that is provided in the cyclone chamber side wall 1180, toward the rear end wall 1170. The slot 1140 may extend around at least a portion of the perimeter of the cyclone side wall 1180, and may have any suitable length 1186 in the axial direction (see e.g. Figure 10). As exemplified, the slot may be provided only in a lower portion of the sidewall. Accordingly, when dirty air inlet 1030 faces downwardly during use, dirt will exit into an upper end of an external dirt collection chamber. Positioning the dirt collection chamber below the cyclone chamber, and not surrounding the cyclone chamber, reduces the width of the hand vacuum. While shown directly adjacent the rear end wall 1170, such that the slot 1140 is partially bounded by the cyclone side wall 1180 and the rear end wall 1170, the slot 1140 may be located

at another location along the length of the cyclone side wall 1180, and need not be directly adjacent the rear end wall 1170. Alternatively, the dirt outlet 1140 may be provided toward the mid-point of the cyclone chamber sidewall 1180, or may be provided toward the front end wall 1160. While illustrated with a single dirt outlet 1140, the cyclone chamber 1110 may include two or more dirt outlets that are in communication with the same dirt collection chamber, or optionally with different dirt collection chambers.

[00224] Preferably, at least a portion of the air treatment member may be openable for emptying. For example, at least one end, and optionally both ends of the dirt collection chamber 1122 may be openable for emptying. Optionally, at least one end, and optionally both ends of the cyclone chamber 1110 may also be openable for emptying.

[00225] Referring primarily to Figures 9 and 10, the front end wall 1160 of the cyclone chamber 1110 and the front end wall 1126 of the dirt collection chamber 1122 are both provided by portions of an openable front door 1190 that covers the front end of the cyclone assembly. In this arrangement, opening the front door 1190 will concurrently open the front end walls 1160 and 1126 of the cyclone and dirt collection chambers 1110, 1122. In the illustrated example, a user may hold the hand vacuum 1000 via the handle 1020 with one hand and open the front door 1190 with the other hand. The front end wall 1160 of the cyclone chamber 1110 and the front end wall 1126 of the dirt collection chamber 1122 may be concurrently openable and may cover all of a substantial portion of the front end of the cyclone chamber and the dirt collection chamber. For example, the front end wall 1160 of the cyclone chamber 1110 and the front end wall 1126 of the dirt collection chamber 1122 may be a one piece assembly (i.e. they may be integrally formed).

[00226] The front door 1190 may be openably connected (e.g., pivotally openable or removably mounted) to the rest of the cyclone assembly using any suitable mechanism, including a hinge or other suitable device. Optionally, the

front door 1190 may be secured in the closed position using any suitable type of locking mechanism, including a latch mechanism that may be released by a user. In the embodiment of Figures 1 to 34, the front door 1190 may be opened by pivoting it about a hinge assembly 1192 from a closed position (e.g. as shown in Figure 1) to an open position (e.g. as shown in Figure 6). The front door 1190 may be secured in the closed position by a friction fit when connected as illustrated in Figure 1, and/or by an assembly door lock 1194 or other suitable locking mechanism. Preferably, the assembly door lock may include at least one release actuator 1196 so that a user may unlock the assembly door lock, e.g. by depressing the actuator. The actuator for opening/ releasing the openable portion of the cyclone assembly may be provided on the cyclone assembly 1100 or on any other portion of the hand vacuum 1000 (such as the handle 1020).

[00227] In the embodiments described herein, the surface cleaning apparatus includes a pre-motor filter housing 1310 positioned in the air flow path between the cyclone chamber and the suction motor. It will be appreciated that in some embodiments, the pre-motor filter may be of any configuration and the direction of air flow through the pre-motor filter 1320 may be any particular direction.

[00228] Referring primarily to Figures 9 and 10, as exemplified, in some embodiments, the main body 1010 may be configured such that the suction motor housing 1210 is located rearward of the pre-motor filter housing 1310 and, preferably, axially aligned with the pre-motor filter housing 1310 such that air exiting the pre-motor filter may travel generally linearly to the suction motor. It will be appreciated that suction motor housing 1210 and pre-motor filter housing 1310 may be of any configuration

[00229] As exemplified herein, the pre-motor filter 1320 may be configured as a generally cylindrical foam filter with a hollow, open interior and is preferably part of a removable pre-motor filter assembly, as discussed elsewhere herein. The pre-motor filter 1320, which may be a foam filter, extends longitudinally

along a filter axis 1325, which may be generally parallel with the suction motor axis of rotation and accordingly is exemplified as being generally horizontal in the illustrated embodiment. The interior, downstream surface of filter 1320 is in communication with the air outlet 1242 via an outlet conduit 1340 of the pre-motor filter assembly. An advantage of a cylindrical filter is that a relatively large upstream surface area may be provided in a small space. A further advantage of this configuration is that, if the suction motor housing 1210 is located rearward of, and generally axially aligned with, the pre-motor filter housing 1310, air exiting the pre-motor filter may travel rearwardly through the hollow interior and then travel rearwardly to the suction motor.

[00230] In the illustrated example, the pre-motor filter housing 1310 is positioned such that the pre-motor filter 1320 is vertically spaced from and mostly, and optionally entirely, located above the cyclone axis 1115 and also above the cyclone chamber. Put another way, pre-motor filter 1320 mostly, and optionally entirely, overlies the cyclone chamber. In other embodiments, only a portion of the pre-motor filter may be above the cyclone axis 1115 and optionally also above the cyclone chamber.

[00231] Referring to Figure 10, in the illustrated example the pre-motor filter housing 1310 has forward and rear end walls 1312 and 1314, and a chamber sidewall 1316 defining a pre-motor filter chamber or plenum 1318. Optionally, the pre-motor filter is removable, such as proving a removable or otherwise openable door 1330. Door 1330 may extend between forward and rear end walls 1312 and 1314. The housing 1310 also has an air inlet 1234 that is connected downstream from the cyclone air outlet 1130 via upflow duct 1230, and an air outlet 1242 positioned in the rear end wall 1314. In the illustrated example, the housing air inlet 1234 is located toward the rear end of the housing 1310. To travel from the air inlet 1234 to the air outlet 1242, air passes through the pre-motor filter 1320 positioned within the chamber 1318.

[00232] As the pre-motor filter 1320 is positioned above the cyclone air outlet, air travels upwardly to the pre-motor filter chamber 1318. As exemplified herein, the pre-motor filter may be in the shape of a hollow cylinder which has a central axis that is generally parallel with the suction motor axis of rotation. An advantage of this configuration is that, after the air travels upwardly to the pre-motor filter chamber 1318, in order to try to balance the forces in the pre-motor filter chamber 1318, the air will tend to spread across the chamber. Therefore, without using a 90□ bend to direct the air to the front part of the pre-motor filter, a plenum is used to distribute the air across the upstream surface of the pre-motor filter. In accordance with this configuration, air travels to the filter housing 1310 in a generally upward direction, where it disperses in the pre-motor filter chamber 1318 and circulates around and through the outer, upstream surface of filter 1320, and exits the housing air outlet 1242 in a generally rearward direction into the suction motor housing inlet end 1212.

[00233] In the illustrated example, the suction motor 1200 is generally horizontally oriented, such that the suction motor axis of rotation 1205 is generally horizontal (e.g., ±20°, ±15°, ±10°, or ±5° from horizontal) when the hand vacuum cleaner is positioned with the upper end above the lower end (as illustrated in Figure 10). In this arrangement, the suction motor axis 1205 is generally parallel to the cyclone axis 1115 and the pre-motor filter axis 1325.

[00234] In the example configuration illustrated in Figure 10, an inlet end 1202 of the suction motor 1200 faces towards a hollow interior of the pre-motor filter. In such a configuration, air may travel generally linearly from the pre-motor filter 1320 to the suction motor 1200. An absence of air flow direction changes between an air outlet of the pre-motor filter and the suction motor may reduce backpressure and/or air flow losses through this portion of the hand vacuum cleaner.

[00235] Also, positioning the suction motor at an upper end of a handle of the vacuum cleaner with the suction motor axis vertically displaced from the cyclone axis of rotation may facilitate the reduction of air flow conduit bends and/or air flow direction changes between a dirty air inlet and a clean air outlet, thereby reducing backpressure and/or air flow losses through the hand vacuum cleaner. Additionally, or alternatively, such a configuration may help provide a compact overall design of the hand vacuum cleaner without adversely affecting the hand feel and/or perceived balance of the hand vacuum.

[00236] It will be appreciated that the air may exit the hand vacuum cleaner via a grill located in an upper portion of the main body (e.g., via an air outlet provided in the rear end of the main body or a sidewall adjacent the rear end). Alternately, air may exit through a lower portion of the main body. This may be achieved by conveying the air downwardly through the handle of the hand vacuum cleaner. Accordingly, as exemplified, at least a portion of the air flow path between the dirty air inlet 1030 and the clean air outlet 1040 may flow through the handle 1020. This may help facilitate a variety of different air flow path configurations and clean air outlet 1040 locations. This may also allow at least some of the air being exhausted by the suction motor 1200 to flow over, and optionally help cool, operating components that are located in the handle. Examples of such components may include controllers, circuit boards, other internal electronics and the like. One example of such electronics can include a printed circuit board (PCB) provided to control optional information display device 1070 and/or power switch 1060.

[00237] In the illustrated embodiment, a handle air flow passage 1250 has an inlet end 1252 that is located toward the top 1022 of the handle downstream from the suction motor 1200, and an outlet end 1254 that is located toward the bottom 1024 of the handle. This may help channel the air through substantially the entire length of the hand grip portion 1026 of the handle 1020.

[00238] As exemplified, the air exhausted from the suction motor 1200 is routed through the handle, and the clean air outlet 1040 is provided in the form of a plurality of slots 1430 that are formed in the lower end 1024 of the handle. Air entering the inlet end 1252 is directed through the handle 1020 and exits via the slots 1430. In this example, the slots or grill 1430 are oriented such that air exiting the clear air outlet 1040 travels generally downwardly and rearwardly from the lower end 1024 of the handle 1020. It will be appreciated that the clean air outlet may be of any design and may be located anywhere in the lower portion of the hand vacuum cleaner.

[00239] Optionally, one or more post-motor filters may be placed in the air flow path between the suction motor 1200 and the clean air outlet 1040. The post-motor filter may be provided at the clean air outlet 1040. The post motor filter may be in an openable housing. For example, as exemplified, the clean air outlet 1040 may be an openable grill. Further, the openable access panel may support the post-motor filter. For example, in the embodiment of Figures 1 to 34, a post-motor filter 1420 is supported by a removable tray 1410 that covers the lower end of the post-motor filter housing 1400 and provides the clean air outlet 1040 in the form of a grill. The illustrated post-motor filter 1420 is a physical foam media filter, but optionally the post-motor filters may be any suitable type of filter and may include one or more of foam filters, felt filters, HEPA filters, other physical filter media, electrostatic filters, and the like.

[00240] With references to Figures 23-27, removable tray 1410 includes a pair of rigid engaging projections 1440 provided on a front end 1412, and a pair of movable engaging projections 1450 extending upwardly from a rear end 1414 and resiliently biased towards the rear end. To separate the tray from the main body 1010, actuating (e.g. depressing) button 1460 results in forward movement of the movable engaging projections 1450, resulting in their disengagement from corresponding recesses 1455 in the main body, allowing the rearward end 1414 of tray 1410 to be pivoted downwardly from handle 1020. Once tray 1410 has

been so pivoted, it may be translated rearwardly to remove engaging projections 1440 from corresponding recesses 1445 in the main body. To connect the tray 1410 to the main body 1010, the process may be generally reversed. That is, projections 1440 may be inserted into recesses 1445, and tray 1410 subsequently pivoted upwardly until engaging projections 1450 are secured in recesses 1455. It will be appreciated that any other constructions may be used to removably secure tray 1410 in position on the main body.

[00241] While the figures exemplify positioning the pre-motor filter and suction motor vertically spaced above the cyclone axis, it will be appreciated that the pre-motor filter and suction motor vertically spaced below the cyclone axis.

Removable pre-motor filter assembly

[00242] The following is a description of different features of a removable pre-motor filter assembly for a surface cleaning apparatus. These features may be used by themselves in any surface cleaning apparatus or in any combination or sub-combination with any other feature or features described herein. For example, any of the pre-motor filter configurations described herein may be used with any of the air flow paths, relative positioning of the suction motor and energy storage members, inclined battery packs, battery pack configurations, airflow cooling configurations, and other features described herein.

[00243] In accordance with this feature, the outlet conduit of the filter assembly may be inclined at an angle to the removal direction of the pre-motor filter assembly with the upper (or outermost portion of the outlet conduit in the removal direction) extending further in the downstream direction than the lower (or innermost portion of the outlet conduit in the removal direction). The mating downstream conduit may be similarly oriented. An advantage of this configuration is that the downstream face of the pre-motor filter assembly (which may have a sealing gasket) may be placed on the upstream face of the downstream conduit

(which may have a sealing gasket) instead of one face sliding across the other, which could damage one or both gaskets.

[00244] In accordance with this feature, as exemplified, the pre-motor filter 1320 of the hand vacuum cleaner 1000 is optionally part of a removable pre-motor filter assembly 1300. Figures 19 to 22 exemplify one embodiment of a removable pre-motor filter assembly 1300 that includes a generally cylindrical filter 1320 supported by a filter support member 1340. Filter support member 1340 has an outlet conduit 1342 for directing an air flow after it has passed through the filter 1320. In use, air flows from an outer or upstream side 1322 of the filter 1320, through the filter media and to an inner or downstream side 1324 of the filter 1320, and to the outlet conduit 1342.

[00245] Optionally, the outlet conduit 1342 generally faces an inlet end 1202 of suction motor 1200. Therefore, as exemplified, the filter support member 1340 may be generally horizontally oriented so that the pre-motor filter axis 1325 extends in a generally forwards/rearwards direction (from front end 1321 to rear end 1323 of the pre-motor filter assembly) when the hand vacuum cleaner 1000 is oriented with the upper end above the lower end, and the outlet conduit 1342 faces generally rearwardly, and optionally directly faces an inlet end 1202 of suction motor 1200. From the outlet conduit 1342, a treated air conduit 1246 directs the airflow rearwards to an inlet end 1202 of suction motor 1200 that is horizontally spaced from the pre-motor filter 1320.

[00246] As illustrated in Figures 19 to 22, filter support member 1340 has a main body portion 1350 that is located in a hollow interior of the generally cylindrical filter 1320. In the illustrated embodiment, an outer surface of main body portion 1350 is flush with a downstream or inner surface 1324 of filter 1320, and the downstream surface 1324 is in air flow communication with an internal filter conduit 1356. More specifically, in the illustrated example a plurality of apertures 1351 define a porous portion of the filter support member 1340 between a first end 1352 and a second end 1354 of the main body portion 1350.

It will be appreciated that more or fewer apertures may be provided in alternative embodiments. Accordingly, if filter 1320 is sealed to or seats securely on body portion 1350, air will be inhibited from travelling between the outer surface of main body portion 1350 and the inner surface 1324 of filter 1320 to thereby bypass the filter media.

[00247] The outlet conduit 1342 extends from the second end 1354 of the main body portion 1350. The second or opposed end 1352 of the main body portion 1350 may be sealed to or may seat securely on the second end 1354 of the main body portion 1350 to inhibit and preferably prevent air from exiting the internal filter conduit 1356 from the second end, so that substantially and preferably all of the air that exits the downstream side 1324 of the pre-motor filter 1320 is directed through outlet conduit 1342.

[00248] In order to inhibit or prevent air exiting through the front end of the internal filter conduit 1356, the front end of the main body portion 1350 may be closed. As exemplified, an end wall 1362 is provided to cap the opposed end 1352 of the main body portion 1350. Optionally, end wall 1362 has an outwardly projecting portion 1363 to facilitate positioning the pre-motor filter assembly 1300 in a surface cleaning apparatus, as discussed further below.

[00249] Optionally, flanges or other sealing members may be provided at one or both ends of the main body portion 1350 to inhibit or prevent airflow from flowing between pre-motor filter 1320 and filter support member 1340 and to the internal filter conduit 1356, e.g. effectively bypassing the pre-motor filter. In the illustrated example, a circumferential bypass flange 1358 is provided at the second end 1354 of the main body portion 1350.

[00250] The pre-motor filter assembly may be seated in position in the pre-motor filter housing by any means known in the art. As exemplified, one or more alignment or seating members may be provided on one or both of the front and rear ends 1321, 1323 of the pre-motor filter assembly.

[00251] In the illustrated example, a pair of alignment flanges 1370 extend from an axially longer (outermost) side of outlet conduit 1342. Flanges 1370 may facilitate in the seating and/or alignment of pre-motor filter assembly 1300 within a pre-motor filter chamber. For example, in the illustrated example the flanges 1370 may be configured to act as camming surfaces with one or more projections from an internal surface of the openable door 1330 of the pre-motor filter chamber. As shown in Figure 18, openable door 1330 has an inwardly extending projection 1338 that has a width approximately equal to a radial distance between flanges 1370. In this arrangement, as openable door 1330 is closed, projection 1338 is configured to come into contact with both flanges 1370, thereby promoting a predetermined orientation of pre-motor filter assembly 1300 relative to the pre-motor filter housing 1310 as well as locating the outlet conduit to be aligned with the downstream air flow conduit.

[00252] Additionally, or alternatively, flanges 1370 may allow a user to grip and/or manipulate pre-motor filter assembly 1300 without having to come into contact with pre-motor filter 1320, which may become dirty during use.

[00253] Optionally, one or more support projections may be provided on one or both ends of pre-motor filter assembly 1300. In the illustrated example, a pair of support flanges 1372 extend from opposite lateral sides of outlet conduit 1342. Flanges 1372 may facilitate the support and/or alignment of pre-motor filter assembly 1300 within a pre-motor filter chamber. For example, in the illustrated example the flanges 1372 may be configured to rest on corresponding support surfaces provided at the rearward end of the pre-motor filter chamber. As shown in Figures 15-17, surfaces 1313 are formed in end wall 1344 of the pre-motor filter chamber 1310. Also, a surface 1311 is formed in the opposing end wall 1312. In this arrangement, as pre-motor filter assembly 1300 is lowered into the pre-motor filter chamber 1310, surfaces 1313 are configured to come into contact with and support flanges 1372, and surface 1311 is configured to come into contact with and support outwardly projecting portion 1363 of filter support

member 1340, thereby promoting a predetermined vertical position and/or angle of pre-motor filter assembly 1300 relative to the pre-motor filter housing 1310.

[00254] In the illustrated embodiment, filter support member 1340 (including outlet conduit 1342, main body portion 1350, and end wall 1362) is a one piece assembly (e.g. integrally formed). In alternative embodiments, filter support member 1340 may be constructed from two or more parts.

[00255] While in the illustrated example the pre-motor filter 1320 and the filter support member 1340 are co-axial, this may not be the case in alternative embodiments.

[00256] As illustrated in Figure 22, a downstream or terminal end 1344 of the outlet conduit 1342 is at an angle 1357 to a direction of air flow through the outlet conduit (e.g. generally parallel to a central pre-motor filter axis 1325 and/or a central filter support member axis 1355). Outlet conduit 1342 mates with air conduit 1246, which provides the air outlet 1242 from pre-motor filter chamber 1310. As discussed subsequently, the inlet end of outlet conduit 1342 may be similarly angled.

[00257] An advantage of the terminal end of the outlet conduit being at an angle of to a direction through the outlet conduit is that the removable filter assembly may be positioned substantially flush against a downstream air conduit (e.g. a conduit that leads to a suction motor) having a similarly angled terminal end without requiring lateral movement of the outlet conduit towards other conduit. For example, the filter assembly may be moved in a direction substantially perpendicular to the direction of airflow (e.g., vertically upwardly in the orientation of Figure 11). Such an arrangement may, for example, facilitate the use of a gasket or other sealing member between the ends of the conduits to provide an improved seal between the conduits. For example, if the terminal end of the outlet conduit were perpendicular to a direction of airflow through the conduit, moving the filter assembly in a direction substantially perpendicular to

the direction of airflow may shear or otherwise damage a flexible or otherwise deformable gasket (e.g. an elastomeric gasket or the like) provided at the end of the conduit to which the outlet conduit is to be aligned.

[00258] Alternatively, or additionally, such an arrangement may eliminate the need for a biasing or other retaining mechanism to exert a force on the filter assembly to maintain a seal between the conduits. For example, if the terminal end of the outlet conduit were perpendicular to a direction of airflow through the conduit, to avoid damaging a gasket or other sealing member between the conduit ends, at least the final motion to align the conduit ends may be in a direction parallel to a direction of airflow through the conduit. In such a situation, it may be necessary to maintain the application of an axial force to the pre-motor filter assembly in order to maintain an adequate seal.

[00259] As illustrated in Figures 11 to 17, a terminal end 1241 of the treated air conduit 1246 may also be optionally provided at an angle 1257 (see Figure 11) to a direction of air flow through the treated air conduit 1246 that leads to the suction motor 1200. In the illustrated example, the angle 1257 is about the same as the angle 1357 between the direction of air flow through the outlet conduit 1342 of the pre-motor filter assembly and the terminal end 1344 of the outlet conduit 1342. This arrangement allows the outlet conduit 1342 and the treated air conduit 1246 to cooperatively define a generally linear air flow passage despite the angled terminal ends of the respective conduits.

[00260] Optionally, a gasket 1247 or other sealing member may be provided to help provide a substantially air tight seal between the terminal end 1344 of the outlet conduit 1342 and the terminal end 1241 of the treated air conduit 1246. In the illustrated example, the gasket 1247 has a generally consistent axial length about its perimeter, e.g. to facilitate a seal between the ends 1344, 1241 that are generally parallel to each other due to angles 1357, 1257 being about the same. Alternatively, gasket 1247 may have a variable axial

length about its perimeter, e.g. to facilitate a seal where angles 1357, 1257 are different from each other (e.g. where ends 1344, 1241 are not parallel.

[00261] Another advantage of the terminal end of the outlet conduit and the inlet end of conduit 1246 being at an angle to a direction through the outlet conduit is that the outlet face of the pre-motor filter assembly may be placed onto the inlet or upstream face of conduit 1246 during insertion of the pre-motor filter assembly. Further, when door 1330 is placed in the closed position, the engagement of inwardly extending projection 1338 and flanges 1370 may apply sufficient pressure to seal the end face and inhibit leakage out of the air flow conduits.

[00262] Another advantage of the terminal end of the outlet conduit being at an angle of to a direction through the outlet conduit is that the removable filter assembly may only be positionable within the surface cleaning apparatus in a single pre-determined orientation. In other words, a user may only be able to mount to the pre-motor filter assembly in a single orientation relative to the surface cleaning apparatus. This may prevent, for example, the pre-motor filter from being installed e.g. upside-down from its designed orientation, or otherwise mis-aligned. Accordingly, an asymmetric pre-motor filter media may be provided without the risk of a user improperly positioning the filter within a surface cleaning apparatus.

[00263] It will be appreciated that some of the embodiments disclosed herein may not use any of the features of the pre-motor filter assembly disclosed herein and that, in those embodiments, a pre-motor filter of any kind known in the art may be used, or a pre-motor filter may not be provided.

Inclined battery pack

[00264] The following is a description of different features of a hand vacuum cleaner with an inclined battery pack. These features may be used by

themselves in any surface cleaning apparatus or in any combination or sub-combination with any other feature or features described herein. For example, any of the battery pack configurations described herein may be used with any of the air flow paths, pre-motor filter assemblies, relative positioning of the suction motor and energy storage members, battery pack configurations, airflow cooling configurations, and other features described herein.

[00265] In accordance with this feature, an upper end of the battery pack may be inclined in a forward direction. Accordingly, the lower end of the battery pack may extend further rearwardly. If the dirt collection region is located adjacent a forward face of the battery pack, then the dirt collection region may extend further rearwardly, thereby enabling a larger dirt collection region to be provided.

[00266] It will be appreciated that, in many embodiments, power may be supplied to the hand vacuum cleaner 1000 by an electrical cord connected to the hand vacuum (not shown) that can be connected to a standard wall electrical outlet. In such embodiments, the suction motor 1200 and other electronics may run on AC power supplied from a wall socket. In accordance with this feature, alternatively, or in addition to being powered by an electrical cord, the hand vacuum cleaner may include one or more onboard power sources. The power sources may be any suitable device, including, for example one or more batteries. Optionally, the batteries and battery packs may be rechargeable or may be replaceable, non-rechargeable batteries.

[00267] Battery pack 1500 may include any suitable number of cells 1510, and may include, for example, lithium ion battery cells. Any number of cells may be used to create a power source having a desired voltage and current, and any type of battery may be used, including NiMH, alkaline, and the like. Battery pack 1500 may be of any known design and may be electrically connected to the hand vacuum cleaner by any means known in the art.

[00268] Figures 32 to 34 exemplify a battery pack 1500. As exemplified, battery pack 1500 has an upper end 1506, a lower end 1508, a front face 1502, and a rear face 1504. In the illustrated example, battery pack 1500 is generally rectangular, but alternative embodiments may have any suitable shape.

[00269] In the illustrated examples, battery pack 1500 has a power coupling 1540 for supplying power (e.g. charging) the cells 1510. Any suitable power coupling may be used, for example, a female coupling configured to receive a male coupling of an electrical cord that is connectable to a source of AC or DC power, such as a household power socket. Optionally, power coupling 1540 is accessible when the battery pack 1500 is electrically connected to hand vacuum cleaner 1000. An advantage of such a configuration is that the battery pack may be charged without removing it from the hand vacuum cleaner 1000. Another advantage is that it may allow for corded operation of hand vacuum cleaner 1000 when the power cells 1510 are substantially or completely discharged, as power may be supplied to the suction motor via power coupling 1540 instead of (or while) charging the cells 1510.

[00270] Optionally, the battery pack 1500 may be removable from the rest of the hand vacuum using any mechanism known in the art. Referring to Figures 28 and 29, the illustrated example battery pack 1500 is configured to be removable by sliding the battery pack downward through an aperture 1590 (see Figure 31) provided in the lower end 1008 of hand vacuum 1000. Optionally, one or more guiding features may be provided on one or both of the hand vacuum 1000 and the battery pack 1500. As illustrated in Figure 33, a pair of longitudinal ridges 1520 is provided on the front face 1502 of battery pack 1500. Ridges 1520 are configured to be slidably received in corresponding grooves 1525 on an inner face of aperture 1590 (see Figure 29). Ridges 1520 and grooves 1525 thus cooperatively assist in aligning the battery pack as is it moved upwardly into and/or downwardly out of aperture 1590.

[00271] In the illustrated embodiment, the upper end 1506 of the battery pack 1500 is provided with a plurality of electrical connectors 1530 that can inter-engage with compatible electrical connectors 1580 on the main body 1010 (see e.g. Figure 29). Engagement between the electrical connectors 1530 and 1580 can provide an electrical connection between the batteries 1510 and the suction motor 1200, and optionally other electronics, such as display device 1070. In this arrangement, removing the battery pack 1500 interrupts the supply of power to the suction motor 1200, and the suction motor 1200 is not operable when the battery pack 1500 is detached. It will be appreciated that electrical connectors 1530 may be located elsewhere on the battery pack.

[00272] The battery pack 1500 can be secured to the rest of the main body 1010 using any suitable attachment mechanism, including mechanical latches, retention catches, or any other mechanism attachment structure capable of being released to disengage and remove the battery pack. Optionally, one or more actuators for releasing the attachment mechanism may be provided on the main body 1010 (and remain with the main body when the battery pack is removed), or alternatively may be provided on the battery pack 1500 such that the actuator is removable with the battery.

[00273] Referring to Figures 9 and 33, in the illustrated example battery pack 1500 is configured to be releasably secured to hand vacuum 1000 using a single latch at the lower end 1506. The latch can be released by pressing the release actuator that is provided in the form of button 1550. Pressing rearwardly on the button 1550 results in a disengagement of a tab 1552 from a corresponding retaining surface 1523 provided proximate to and facing towards aperture 1590. The button 1550 is mounted to the lower end 1506 of battery pack 1500, and is removable with the battery pack.

[00274] Alternatively, a release actuator may be provided on the main body 1010 of the hand vacuum cleaner, and a corresponding retaining surface may be provided on the battery pack 1500. For example, in the example illustrated in

Figure 36, a retaining surface 1523 is provided on a rear face 1504 of battery pack 1500, and is removable with the battery pack. A release actuator that is provided in the form of button 1550 is positioned on the main body 1010 of hand vacuum 1000. Pressing forwardly on the button 1550 results in a pivoting and disengagement of a tab 1552 from retaining surface 1523.

[00275] Optionally, the battery pack 1500 may be configured so that it can be connected to one or more other devices/apparatuses, in addition to the hand vacuum 1000. For example, the same battery pack 1500 that is used with the hand vacuum could be connectable to another vacuum, power tool, cleaning device (such as a mop, steam cleaner, carpet extractor, etc.) or any other suitable device to power the other device(s) that the battery pack can be connected to.

[00276] Optionally, the battery pack 1500 may have one or more output devices to e.g. provide an indication of a status of the battery pack and/or of one or more of the individual battery cells 1510. For example, one or more visual indicators such as LEDs and/or an audio output device such as a speaker may be provided. In the example illustrated in Figure 32, a number of LEDs 1560 are provided along an edge between a rear face 1504 and a side face of the battery pack 1500. An advantage of positioning the output devices along an edge of the battery pack is that the indicators may be visible from a greater range of relative orientations than if they were positioned on a single face of the battery pack.

[00277] As illustrated in Figure 4, another advantage of positioning the LEDs 1560a-1560c proximate a side edge of a rear face 1504 is that they may be more readily visible to a user holding the hand vacuum cleaner 1000 in front of them. Accordingly, a user may be able to see the LEDs 1560a-1560c while using the hand vacuum without having to re-orient the hand vacuum cleaner from a typical in-use position.

[00278] As discussed above, battery pack 1500 may include any suitable number of individual battery cells 1510. In example illustrated in Figure 34, battery pack 1500 contains 7 cells 1510a-1510g. Each cell 1510 is generally cylindrical, and the cells are arranged in a generally linear configuration (in a column) along the height of battery pack 1500. More specifically, cells 1510a to 1510f are arranged with their central longitudinal axes positioned along a battery pack axis 1505 that in the illustrated example is parallel to a front wall 1501 of the battery pack 1500, and cell 1510g is positioned with its central longitudinal axis offset rearwardly from axis 1505.

[00279] As shown in Figure 10, in the illustrated example battery pack 1500 extends upwardly and forwardly when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner. For example, battery pack axis 1505 is at an angle 1507 to the horizontal when the inlet conduit axis 1035, cyclone axis 1115, filter axis 1325, and/or suction motor axis 1205 is generally horizontally oriented. For example, battery pack axis 1505 may be generally parallel to a handle axis 1025 (see Figure 31).

[00280] Also, in the configuration shown in Figure 10, a portion 1123 of the dirt collection chamber 1122 adjacent the rear end wall 1124 of the chamber 1122 is located below a portion of the battery pack 1500. An advantage of this design (i.e. providing at least some vertical overlap between an energy storage member and a dirt collection region) is that it may help provide a relatively larger dirt chamber capacity while helping to reduce the overall size of the hand vacuum 1000.

[00281] In the illustrated example, the rear end wall 1124 of the dirt collection chamber 1122 is at an angle to the vertical. As shown, rear end wall 1124 is generally parallel to the front wall 1501 of the battery pack 1500 and to the battery pack axis 1505, although in alternative embodiments they may not be parallel.

[00282] Also, when the inlet conduit axis 1035, cyclone axis 1115, filter axis 1325, and/or suction motor axis 1205 is generally horizontally oriented, a lower end of the front face 1502 is positioned rearward of an upper portion of the front face 1502.

[00283] It will be appreciated that the dirt collection region may be of various shapes which occupies some or all of the additional volume created by orienting the battery pack 1500 such that the lower end extends further rearwardly.

[00284] It will be appreciated that some of the embodiments disclosed herein may not use the inclined energy storage members as disclosed herein and that, in those embodiments, any suitable positioning of the energy storage members, if provided, may be used.

Positioning of suction motor and energy storage member

[00285] The following is a description of different features of a hand vacuum cleaner with a suction motor positioned an upper end of a forwardly-inclined handle and rearward of at least some of the energy storage members. These features may be used by themselves in any surface cleaning apparatus or in any combination or sub-combination with any other feature or features described herein. For example, any of the relative positioning of the suction motor and energy storage members described herein may be used with any of the air flow paths, pre-motor filter assemblies, inclined battery packs, battery pack configurations, airflow cooling configurations, and other features described herein.

[00286] In accordance with this feature, the batteries and the suction motor may be positioned so as to reduce the torque experienced by a user operating the hand vacuum cleaner. For example, by positioning a suction motor positioned at or rearward of an upper end of a forwardly-inclined handle and rearward of at

least some of the energy storage members, the weight of the suction motor may partially counterbalance the weight of the batteries.

[00287] As previously discussed, in some embodiments, batteries used to power the hand vacuum cleaner 1000 may be provided at a single location, for example as one large battery pack 1500 that may include any suitable number of cells 1510, and may include, for example, lithium ion battery cells.

[00288] Optionally, a battery pack 1500 may be positioned such that some or all of the battery cells 1510 are positioned forward of a suction motor. In this configuration, the distribution of the weight of the battery pack 1500 and the weight of the suction motor 1200 may affect the hand feel and/or perceived balance of the hand vacuum 1000.

[00289] In the example illustrated in Figure 10, suction motor 1200 is positioned rearward of cells 1510a, 1510b, 1510c, 1510d, and 1510e of battery pack 1500. In the example illustrated in Figure 43, suction motor 1200 is positioned rearward of cells 1510a, 1510b, 1510d, 1510e, and 1510g of battery pack 1500. In the examples illustrated in Figures 36, 40, and 47, all of cells 1510a-1510f are positioned forward of the suction motor 1200.

[00290] Suction motor 1200 is preferably positioned at the upper end of a forwardly inclined handle 1020, as shown in the illustrated embodiments, although it may alternatively be positioned rearward of the upper end of the handle or at the lower end or at a mid-point of a handle. Additionally, or alternatively, the handle 1020 may be generally vertical or may be rearwardly inclined.

[00291] Optionally, a battery pack 1500 may be positioned such that a volume defined by the battery cells 1510 is positioned such that an axis of rotation 1115 of a cyclone chamber 1110 may intersect such a volume when the battery pack is secured to the main body 1010. For example, the cyclone chamber 1110 may be oriented horizontally, and the battery pack 1500 may be

positioned rearward of the cyclone chamber. An advantage of such a configuration is that it may facilitate a more compact design of hand vacuum 1000.

[00292] It will be appreciated that some of the embodiments disclosed herein may not use the relative positioning of the suction motor, handle, and energy storage members as disclosed herein and that, in those embodiments, any suitable design may be used.

Nested energy storage members

[00293] The following is a description of different features of a hand vacuum cleaner having an energy storage member (e.g. a battery pack that includes one or more battery cells) that is positioned rearward of a dirt collection region and at least partially underlies at least a portion of one or both of a cyclone chamber and a pre-motor filter. These features may be used by themselves in any surface cleaning apparatus or in any combination or sub-combination with any other feature or features described herein. For example, any of the battery pack configurations described herein may be used with any of the air flow paths, pre-motor filter assemblies, relative positioning of the suction motor and energy storage members, inclined battery packs, airflow cooling configurations, and other features described herein.

[00294] In accordance with this feature, the some or all of a battery pack may be located beneath some or all of a cyclone chamber and/or a pre-motor filter. For example, the dirt collection region may be configured to enable the battery pack to nest or partially nest therein. Accordingly, the overall length of the hand vacuum cleaner (in the forward/rearward direction) may be reduced, thereby providing a more compact hand vacuum cleaner.

[00295] As previously discussed, in some embodiments, batteries used to power the hand vacuum cleaner 1000 may be provided at a single location, for

example as one large battery pack 1500 that may include any suitable number of cells 1510, and may include, for example, lithium ion battery cells.

[00296] Optionally, a battery pack 1500 may be positioned such that at least a portion of the battery pack 1500 is nested vertically spaced from a dirt collection region 1122. For example, at least a portion of the battery pack 1500 may underlie at least a portion of one or both of a cyclone chamber 1110 and a pre-motor filter 1320. In such a configuration, the overall size or length of the hand vacuum 1000 may be reduced.

[00297] For example, as illustrated in the embodiment of Figures 36 and 40, as well as the embodiment of Figure 43, a battery pack 1500 is positioned rearward of a dirt collection region 1122, and the entire battery pack 1500 is below a rearward portion of a pre-motor filter 1320.

[00298] In the example illustrated in Figures 47, a battery pack 1500 is positioned rearward of a dirt collection region 1122, and below a rearward portion of the cyclone chamber and below the pre-motor filter.

[00299] As discussed previously, battery pack 1500 may include any suitable number of individual battery cells, and the individual cells may be arranged in any suitable configuration. For example, some of the energy storage members (i.e. individual battery cells 1510) may be arranged one above another and some may be arranged one behind another, e.g. within a single battery pack 1500. For example, the energy storage members within a battery pack may be arranged in at least two columns in the forward/rearward direction. Accordingly, the battery pack may have a reduced height so as to assist in nesting the battery pack under a pre-motor filter and/or a cyclone chamber. An advantage of such configurations is that they may help provide a compact overall design without adversely affecting the hand feel and/or perceived balance of the hand vacuum.

[00300] As illustrated in Figure 47, cells 1510a-1510g are arranged generally in two linear columns of cells. Specifically, cells 1510a, 1510c, 1510e,

and 1510g are arranged in a first generally vertical column along a column axis 1505a that in the illustrated example is adjacent and generally parallel to a front wall 1501 of the battery pack 1500, and cells 1510b, 1510d, and 1510f are arranged in a second generally vertical column along a column axis 1505b that in the illustrated example is adjacent and generally parallel to a rear wall 1503 of the battery pack 1500.

[00301] As illustrated in Figure 43, cells 1510a-1510g are arranged generally in three linear columns of cells. Specifically, cells 1510b and 1510e are arranged in a first generally vertical column along a column axis 1505a that in the illustrated example is adjacent and generally parallel to a front wall of the battery pack 1500, cells 1510a, 1510d, and 1510g are arranged in a second generally vertical column along a column axis 1505b positioned rearward of and generally parallel to column axis 1505a, and cells 1510c and 1510f are arranged in a third generally vertical column along a column axis 1505c positioned rearward of and generally parallel to column axis 1505b.

[00302] It will be appreciated that some of the embodiments disclosed herein may not use the nested energy storage members as disclosed herein and that, in those embodiments, any suitable positioning of the energy storage members, if provided, may be used.

Airflow cooling of an energy storage chamber

[00303] The following is a description of different features of a hand vacuum cleaner having an airflow path in which air exiting a cyclone chamber impinges on a wall of an energy storage chamber. These features may be used by themselves in any surface cleaning apparatus or in any combination or sub-combination with any other feature or features described herein. For example, any of the airflow configurations described herein may be used with any of the air flow paths, pre-motor filter assemblies, relative positioning of the suction motor

and energy storage members, inclined battery packs, battery pack configurations, and other features described herein.

[00304] Optionally, at least a portion of an air flow path between the dirty air inlet 1030 and the clean air outlet 1040 may be directed against a wall of an energy storage chamber. For example, a cyclone air outlet may face a wall of an energy storage chamber, whereby air exiting the cyclone chamber impinges on the energy storage chamber wall. In such a configuration, an airflow generated by suction motor 1200 flowing against and/or over such a wall may help cool one or more energy storage members positioned within the energy storage chamber. For example, energy storage members may include chemical batteries, such as lithium-ion batteries, that produce heat while being discharged (e.g. while supplying power to the hand vacuum 1000). By directing a stream of air directly at, or at an angle to, a wall of a battery chamber, any boundary layer of air (which may act as an insulator) or laminar flow along a wall of a battery chamber is disrupted, thereby enabling enhanced cooling.

[00305] It will be appreciated that the battery pack may be provided in a chamber that receives a battery pack. Accordingly, there may be two walls between the impinging air stream and the batteries, i.e., a wall of the battery pack and a wall of the chamber in which the batter pack is received. Provided the walls contact each other or are adjacent, the impinging air stream will provide a cooling effect.

[00306] For example, in the examples illustrated in Figures 36 and 40, cyclone air outlet 1130 faces a rear wall 1236 of the upflow duct or conduit 1230 that directs air upwardly towards a pre-motor filter 1320. In these embodiments, rear wall 1236 is also a front wall of a recess in which battery pack 1500 is positioned. That is, rear wall 1236 is a wall of an energy storage chamber in which one or more energy storage members (e.g. individual cells 1510 and/or a battery pack 1500 containing a plurality of cells 1510) are positioned.

[00307] It will be appreciated that some of the embodiments disclosed herein may not use the airflow cooling of an energy storage member as disclosed herein and that, in those embodiments, any suitable airflow design may be used.

[00308] As used herein, the wording "and/or" is intended to represent an inclusive - or. That is, "X and/or Y" is intended to mean X or Y or both, for example. As a further example, "X, Y, and/or Z" is intended to mean X or Y or Z or any combination thereof.

[00309] While the above description describes features of example embodiments, it will be appreciated that some features and/or functions of the described embodiments are susceptible to modification without departing from the spirit and principles of operation of the described embodiments. For example, the various characteristics which are described by means of the represented embodiments or examples may be selectively combined with each other. Accordingly, what has been described above is intended to be illustrative of the claimed concept and non-limiting. It will be understood by persons skilled in the art that other variants and modifications may be made without departing from the scope of the invention as defined in the claims appended hereto. The scope of the claims should not be limited by the preferred embodiments and examples, but should be given the broadest interpretation consistent with the description as a whole.

HANDHELD SURFACE CLEANING APPARATUS

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FIELD

[0001] This disclosure relates generally to surface cleaning apparatus. In a preferred embodiment, the surface cleaning apparatus comprises a portable surface cleaning apparatus, such as a hand vacuum cleaner.

INTRODUCTION

[0002] The following is not an admission that anything discussed below is part of the prior art or part of the common general knowledge of a person skilled in the art.

[0003] Various types of surface cleaning apparatus are known, including upright surface cleaning apparatus, canister surface cleaning apparatus, stick surface cleaning apparatus, central vacuum systems, and hand carriable surface cleaning apparatus such as hand vacuums. Further, various designs for cyclonic hand vacuum cleaners, including battery operated cyclonic hand vacuum cleaners are known in the art.

SUMMARY

[0004] The following introduction is provided to introduce the reader to the more detailed discussion to follow. The introduction is not intended to limit or define any claimed or as yet unclaimed invention. One or more inventions may reside in any combination or sub-combination of the elements or process steps disclosed in any part of this document including its claims and figures.

[0005] In accordance with one aspect of this disclosure, which may be used alone or in combination with any other aspect, a hand vacuum cleaner may be powered by an onboard energy source, such as a battery pack or other energy storage member. The energy storage member may include a chemical battery, such as a rechargeable battery. Some chemical batteries, such as

lithium-ion batteries, may produce heat while being discharged (e.g. while supplying power to an electric motor). As disclosed herein, a hand vacuum cleaner may have an airflow path in which air exiting a cyclone chamber impinges on a wall of an energy storage chamber in which one or more energy storage devices are located. By directing relatively high-velocity airflow directly against a wall of such a chamber, cooling of an energy storage member (e.g. battery) located in the chamber may be promoted, particularly during discharge of the battery.

[0006] In accordance with this broad aspect, there is provided a hand vacuum cleaner having a front end, a rear end, an upper end, a lower end, and first and second laterally spaced apart sides, and comprising:

(a) an air flow path extending from a dirty air inlet to a clean air outlet;

(b) a cyclone chamber positioned in the air flow path and having a cyclone air inlet, a cyclone air outlet, and a cyclone axis of rotation;

(c) a suction motor positioned in the air flow path upstream of the clean air outlet; and,

(d) at least one energy storage member positioned in an energy storage chamber having an energy storage chamber wall wherein the cyclone air outlet faces the energy storage chamber wall whereby air exiting the cyclone chamber impinges on the energy storage chamber wall.

[0007] In some embodiments, the cyclone axis of rotation may extend generally in a forward/rearward direction.

[0008] In some embodiments, the at least one energy storage member may comprise a plurality of energy storage members wherein at least some of the plurality of energy storage members are arranged one above another in a

generally upwardly extending configuration when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner.

[0009] In some embodiments, the energy storage members may be arranged one above another comprise longitudinally extending members each having a longitudinal axis which that extends laterally.

[0010] In some embodiments, the cyclone axis of rotation may intersect a volume defined by the generally upwardly extending configuration of energy storage members.

[0011] In some embodiments, the cyclone axis of rotation may extend generally in a forward/rearward direction.

[0012] In some embodiments, the at least one energy storage member may be removably receivable in the energy storage chamber.

[0013] In some embodiments, the at least one energy storage member may comprise a battery pack that is removably receivable in the energy storage chamber.

[0014] In some embodiments, the air flow path may comprise a portion that extends from the cyclone air outlet to the suction motor and is defined in part by the energy storage chamber wall.

[0015] In some embodiments, the portion of the air flow path may extend generally upwardly from the cyclone air outlet to the suction motor when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner.

[0016] In some embodiments, the suction motor may be positioned above the cyclone axis of rotation when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner.

[0017] In some embodiments, the portion of the air flow path may extend generally downwardly from the cyclone air outlet to the suction motor when the

upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner.

[0018] In some embodiments, the suction motor may be positioned below the cyclone axis of rotation when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner.

[0019] In some embodiments, the hand vacuum cleaner may further comprise a handle having a hand grip portion that extends upwardly and forwardly when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner wherein the handle is positioned rearward of the at least one energy storage member.

[0020] In some embodiments, the at least one energy storage member may comprise a plurality of energy storage members wherein at least some of the plurality of energy storage members are arranged one above another in a generally upwardly extending configuration when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner.

[0021] In some embodiments, the hand vacuum cleaner may further comprise a finger gap positioned between the handle and the energy storage chamber.

[0022] In accordance with another aspect of this disclosure, which may be used alone or in combination with any other aspect, a hand vacuum cleaner may have a cyclone chamber, a suction motor, and pre-motor filter positioned downstream of the cyclone chamber and upstream of the suction motor. The pre-motor filter may be vertically spaced from the cyclone chamber, and air may travel generally rearwardly from the pre-motor filter to the suction motor. Promoting air to travel in this manner may help reduce or eliminate the need for additional bends or air flow direction changes between an air outlet of the pre-motor filter and the suction motor, thereby reducing backpressure and/or air flow

losses through this portion of the hand vacuum cleaner due to a reduction in the number of bends in the air flow path.

[0023] In accordance with this broad aspect, there is provided a hand vacuum cleaner having a front end, a rear end, an upper end, a lower end, and first and second laterally spaced apart sides, and comprising:

(a) an air flow path extending from a dirty air inlet to a clean air outlet;

(b) a cyclone assembly comprising a cyclone chamber positioned in the air flow path and having a cyclone air inlet, a cyclone air outlet, and a cyclone axis of rotation, wherein the cyclone axis of rotation extends generally in a forward/rearward direction;

(c) a pre-motor filter positioned downstream of the cyclone air outlet; and,

(d) a suction motor positioned in the air flow path downstream of the pre-motor filter and upstream of the clean air outlet and having a suction motor axis of rotation;

wherein the pre-motor filter is vertically spaced from the cyclone axis of rotation when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner, and

wherein air travels generally rearwardly from the pre-motor filter to the suction motor.

[0024] In some embodiments, the pre-motor filter may be vertically spaced from the cyclone chamber when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner.

[0025] In some embodiments, the cyclone assembly may comprise a sidewall that extends generally parallel to the cyclone axis of rotation and the pre-motor filter may have an upstream surface that extends generally parallel to the sidewall of the cyclone assembly.

[0026] In some embodiments, the pre-motor filter may have a downstream surface that is opposed to the upstream surface, and air may exit the downstream surface in a generally vertical direction when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner.

[0027] In some embodiments, the pre-motor filter may at least partially overlie the cyclone chamber.

[0028] In some embodiments, the suction motor axis of rotation may be generally parallel to the cyclone axis of rotation.

[0029] In some embodiments, the suction motor may be positioned rearward of the cyclone chamber and the suction motor axis of rotation may be generally parallel to the cyclone axis of rotation.

[0030] In some embodiments, the pre-motor filter may comprise a generally cylindrical filter having a hollow interior wherein the suction motor has an inlet end that faces towards the hollow interior.

[0031] In some embodiments, the generally cylindrical filter may have an outer upstream surface and an inner downstream surface defining the hollow interior and the suction motor axis of rotation may intersect the hollow interior.

[0032] In some embodiments, the cyclone assembly may comprise a sidewall that extends generally parallel to the cyclone axis of rotation and the upstream surface of the pre-motor filter may extend generally parallel to the sidewall of the cyclone assembly.

[0033] In some embodiments, the pre-motor filter may at least partially overlie the cyclone chamber.

[0034] In some embodiments, the hand vacuum cleaner may further comprise a handle having a hand grip portion that extends upwardly and forwardly when the upper end of the hand vacuum cleaner is positioned above

the lower end of the hand vacuum cleaner wherein the suction motor is located at an upper end of the handle.

[0035] In some embodiments, the suction motor may be positioned rearward of the cyclone chamber.

[0036] In some embodiments, the suction motor may be located at an upper end of the hand grip portion.

[0037] Also in accordance with this broad aspect, there is provided a hand vacuum cleaner having a front end, a rear end, an upper end, a lower end, and first and second laterally spaced apart sides, and comprising:

(a) an air flow path extending from a dirty air inlet to a clean air outlet;

(b) a cyclone assembly comprising a cyclone chamber positioned in the air flow path and having a cyclone air inlet, a cyclone air outlet and a cyclone axis of rotation, wherein the cyclone axis of rotation extends generally in a forward/rearward direction;

(c) a generally cylindrical pre-motor filter positioned downstream of the cyclone air outlet and having a hollow interior; and,

(d) a suction motor positioned in the air flow path downstream of the pre-motor filter and upstream of the clean air outlet and having a suction motor axis of rotation that is generally parallel to the cyclone axis of rotation, wherein the suction motor has an inlet end that faces towards the hollow interior.

[0038] In some embodiments, the generally cylindrical filter may have an outer upstream surface and an inner downstream surface defining the hollow interior and the suction motor axis of rotation may intersect the hollow interior.

[0039] In some embodiments, the cyclone assembly may comprise a sidewall that extends generally parallel to the cyclone axis of rotation and the

upstream surface of the pre-motor filter may extend generally parallel to the sidewall of the cyclone assembly.

[0040] In some embodiments, the pre-motor filter may at least partially overlie the cyclone chamber.

[0041] In accordance with another aspect of this disclosure, which may be used alone or in combination with any other aspect, it may be desirable for a hand vacuum cleaner to have a compact overall form, for example so it can be maneuvered around and/or between objects when being carried by a user while cleaning one or more surfaces. A compact form may also improve the ergonomics of the hand vacuum (e.g. the perceived balance or 'hand feel' when carried by a user). Typically, the suction motor and energy storage members (e.g. one or more batteries) may be among the heavier (if not the heaviest) individual components of the hand vacuum cleaner. While positioning the suction motor and energy storage members adjacent to each other may promote a compact design, such an arrangement may promote an undesirable concentration of mass relative to a handle of the hand vacuum cleaner. Positioning the suction motor at an upper end of a forwardly-inclined handle and rearward of at least some of the energy storage members, particularly when some or all of the energy storage members are forward of the handle, may help distribute the weight of the motor and batteries, and may affect the hand feel and/or perceived balance of the hand vacuum.

[0042] In accordance with this broad aspect, there is provided a hand vacuum cleaner having a front end, a rear end, an upper end, a lower end, and first and second laterally spaced apart sides, and comprising:

(a) an air flow path extending from a dirty air inlet to a clean air outlet;

(b) a handle having a hand grip portion that extends upwardly and forwardly when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner;

(c) a cyclone chamber positioned in the air flow path and having a cyclone air inlet, a cyclone air outlet, and a cyclone axis of rotation;

(d) at least one energy storage member positioned in an energy storage chamber; and,

(e) a suction motor positioned in the air flow path upstream of the clean air outlet, wherein the suction motor is located at an upper end of the handle and rearward of the at least one energy storage member when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner.

[0043] In some embodiments, the suction motor may be located at an upper end of the hand grip portion.

[0044] In some embodiments, the at least one energy storage member may comprise a plurality of energy storage members wherein at least some of the plurality of energy storage members may be arranged one above another in a generally upwardly extending configuration when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner and the suction motor may be positioned rearward of at least some of the energy storage members when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner.

[0045] In some embodiments, the cyclone axis of rotation may intersect a volume defined by the generally upwardly extending configuration of energy storage members.

[0046] In some embodiments, the cyclone axis of rotation may extend generally in a forward/rearward direction.

[0047] In some embodiments, the at least one energy storage member may comprise a plurality of energy storage members wherein at least some of the plurality of energy storage members may be arranged one above another in a

generally upwardly extending configuration when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner and the suction motor may be positioned rearward of an upper end of the plurality of energy storage members when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner.

[0048] In some embodiments, the cyclone axis of rotation may extend generally in a forward/rearward direction.

[0049] In some embodiments, the suction motor may be positioned above the cyclone axis of rotation when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner.

[0050] In some embodiments, the hand vacuum may further comprise a pre-motor filter positioned in the air flow path downstream of the cyclone chamber, the pre-motor filter comprising a generally cylindrical filter having a hollow interior wherein the suction motor has an inlet end that faces towards the hollow interior.

[0051] In some embodiments, the generally cylindrical filter may have an outer upstream surface and an inner downstream surface defining the hollow interior and the suction motor axis of rotation may intersect the hollow interior.

[0052] In some embodiments, the cyclone chamber may comprise a sidewall that extends generally parallel to the cyclone axis of rotation and the upstream surface of the pre-motor filter may extend generally parallel to the sidewall of the cyclone chamber.

[0053] In some embodiments, the pre-motor filter may at least partially overlie the cyclone chamber.

[0054] In some embodiments, the dirty air inlet may have a dirty air inlet axis that extends generally rearwardly and may be positioned above the cyclone chamber.

[0055] In some embodiments, the dirty air inlet axis may intersect a volume defined by a pre-motor filter housing.

[0056] In some embodiments, the dirty air inlet axis may intersect the suction motor.

[0057] In some embodiments, the hand vacuum may further comprise a pre-motor filter positioned in the air flow path downstream of the cyclone chamber, the pre-motor filter comprising a generally cylindrical filter having a hollow interior wherein the dirty air inlet has a dirty air inlet axis that extends generally rearwardly and intersects the hollow interior.

[0058] In some embodiments, the dirty air inlet axis may intersect the suction motor.

[0059] In accordance with another aspect of this disclosure, which may be used alone or in combination with any other aspect, a hand vacuum cleaner may have an energy storage member (e.g. a battery pack that includes one or more battery cells) that is inclined so that a portion of a dirt collection region may be located below a portion of the energy storage member. Providing at least some vertical overlap between an energy storage member and a dirt collection region may help provide a relatively larger dirt chamber capacity while helping to reduce the overall size of the hand vacuum. Also, as the energy storage members (e.g. one or more batteries) may typically be among the heavier individual components of the hand vacuum cleaner, such a configuration may help provide a compact overall design, while distributing the weight of the batteries to promote a desirable hand feel and/or perceived balance of the hand vacuum.

[0060] In accordance with this broad aspect, there is provided a hand vacuum cleaner having a front end, a rear end, an upper end, a lower end, and first and second laterally spaced apart sides, and comprising:

(a) an air flow path extending from a dirty air inlet to a clean air outlet;

(b) a cyclone assembly positioned in the air flow path and having a cyclone assembly air inlet, a cyclone assembly air outlet, a dirt collection region, and a cyclone axis of rotation;

(c) a suction motor positioned in the air flow path upstream of the clean air outlet; and,

(d) a longitudinally extending battery pack wherein the battery pack extends upwardly and forwardly when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner,

wherein a portion of the dirt collection region is located below a portion of the battery pack.

[0061] In some embodiments, the dirt collection region may have an upper portion and a lower portion when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner and the lower portion of the dirt collection region may be positioned rearwardly of the upper portion of the dirt collection region.

[0062] In some embodiments, a rear wall of the dirt collection chamber may be at a first angle to a vertical axis.

[0063] In some embodiments, the battery pack may be located in a battery pack chamber, the battery pack chamber having a front wall that is at a second angle to a vertical axis.

[0064] In some embodiments, the first and second angles may be about the same.

[0065] In some embodiments, the battery pack may extend generally linearly.

[0066] In some embodiments, the battery pack may be removably receivable in the hand vacuum cleaner.

[0067] In some embodiments, the battery pack may be removably receivable in the hand vacuum cleaner, a rear wall of the dirt collection chamber may be at a first angle to a vertical axis and the battery pack may have a front wall that is at a second angle to a vertical axis, wherein the first and second angles may be about the same.

[0068] In some embodiments, the dirt collection region may be at a lower end of the hand vacuum cleaner and the battery pack may be slidably insertable into the lower end of the hand vacuum cleaner.

[0069] Also in accordance with this broad aspect, there is provided a hand vacuum cleaner having a front end, a rear end, an upper end, a lower end, and first and second laterally spaced apart sides, and comprising:

(a) an air flow path extending from a dirty air inlet to a clean air outlet;

(b) a cyclone assembly positioned in the air flow path and having a cyclone assembly air inlet, a cyclone assembly air outlet, a dirt collection region, and a cyclone axis of rotation;

(c) a suction motor positioned in the air flow path upstream of the clean air outlet; and,

(d) a plurality of energy storage members arranged one above another in a generally upwardly extending configuration when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner, the configuration having a forward side and a rearward side,

wherein a lower end of the forward side of the configuration of energy storage members is positioned rearward of an another portion of the forward side of the configuration when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner, and,

wherein a portion of the dirt collection region is located below at least a portion of one of the energy storage members.

[0070] In some embodiments, the dirt collection region may have an upper portion and a lower portion when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner and the lower portion of the dirt collection region may be positioned rearwardly of the upper portion of the dirt collection region.

[0071] In some embodiments, a rear wall of the dirt collection chamber may be at a first angle to a vertical axis.

[0072] In some embodiments, the energy storage members may be located in an energy storage member chamber, and the energy storage member chamber may have a front wall that is at a second angle to a vertical axis.

[0073] In some embodiments, the first and second angles may be about the same.

[0074] In some embodiments, the configuration of energy storage members may extend generally linearly.

[0075] In some embodiments, the energy storage members may be removably receivable in the hand vacuum cleaner.

[0076] In some embodiments, the energy storage members may be removably receivable in the hand vacuum cleaner, a rear wall of the dirt collection chamber may be at a first angle to a vertical axis and the configuration of energy storage members may have a front side that is at a second angle to a vertical axis, wherein the first and second angles may be about the same.

[0077] In some embodiments, the dirt collection region may be at a lower end of the hand vacuum cleaner and the energy storage members may be slidably insertable into the lower end of the hand vacuum cleaner.

[0078] Also in accordance with this broad aspect, there is provided a hand vacuum cleaner having a front end, a rear end, an upper end, a lower end, and first and second laterally spaced apart sides, and comprising:

(a) an air flow path extending from a dirty air inlet to a clean air outlet;

(b) a cyclone assembly positioned in the air flow path and having a cyclone assembly air inlet, a cyclone assembly air outlet, a dirt collection region, and a cyclone axis of rotation;

(c) a suction motor positioned in the air flow path upstream of the clean air outlet; and,

(d) a power pack that extends upwardly and forwardly when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner,

wherein the dirt collection region has a rear wall that extends upwardly and forwardly when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner whereby at least a portion of the dirt collection region is below at least a portion of the power pack.

[0079] In some embodiments, the dirt collection region may be at a lower end of the hand vacuum cleaner and the rear wall of the dirt collection chamber may be located proximate a front side of the power pack.

[0080] In accordance with another aspect of this disclosure, which may be used alone or in combination with any other aspect, a hand vacuum cleaner may have an energy storage member (e.g. a battery pack that includes one or more battery cells) that is positioned rearward of a dirt collection region and at least partially underlies at least a portion of one or both of a cyclone chamber and a pre-motor filter. Providing at least some vertical overlap between an energy storage member and a cyclone chamber and/or a pre-motor filter may help to

reduce the overall size (length front to back) of the hand vacuum and may therefore reduce the torque exerted on the hand of a user as the moment arm between the front of the hand vacuum cleaner and the handle may be reduced. Also, as the energy storage member (e.g. one or more batteries) may typically be among the heavier individual components of the hand vacuum cleaner, such a configuration may help provide a compact overall design without adversely affecting the hand feel and/or perceived balance of the hand vacuum.

[0081] In accordance with this broad aspect, there is provided hand vacuum cleaner having a front end, a rear end, an upper end, a lower end, and first and second laterally spaced apart sides, and comprising:

(a) an air flow path extending from a dirty air inlet to a clean air outlet;

(b) a cyclone assembly positioned in the air flow path and having a cyclone assembly air inlet, a cyclone assembly air outlet, a cyclone chamber, a dirt collection region, and a cyclone axis of rotation;

(c) a pre-motor filter downstream of the cyclone chamber;

(d) a suction motor positioned in the air flow path upstream of the clean air outlet; and,

(e) a battery pack wherein at least a portion of the battery pack is positioned rearward of the dirt collection region and at least a portion of the battery pack underlies at least a portion of one or both of the cyclone chamber and the pre-motor filter.

[0082] In some embodiments, the cyclone axis of rotation may extend generally in a forward/rearward direction.

[0083] In some embodiments, at least a portion of, or substantially all of or the entire battery pack may underlie at least a portion of the cyclone chamber, substantially all of the cyclone chamber or the entire cyclone chamber.

[0084] In some embodiments, at least a portion of, or substantially all of or the entire battery pack may underlie at least a portion of the pre-motor filter, substantially all of the pre-motor filter or the entire pre-motor filter.

[0085] In some embodiments, the battery pack may comprise at least a plurality of energy storage members wherein the energy storage members may be arranged in at least two columns in the forward/rearward direction.

[0086] In some embodiments, the dirt collection region may be at a lower end of the hand vacuum cleaner and the battery pack may be slidably insertable into the lower end of the hand vacuum cleaner.

[0087] In some embodiments, the hand vacuum may further comprise a handle and a finger gap positioned between the handle and the battery pack.

[0088] Also in accordance with this broad aspect, there is provided a hand vacuum cleaner having a front end, a rear end, an upper end, a lower end, and first and second laterally spaced apart sides, and comprising:

(a) an air flow path extending from a dirty air inlet to a clean air outlet;

(b) a cyclone assembly positioned in the air flow path and having a cyclone assembly air inlet, a cyclone assembly air outlet, a cyclone chamber, a dirt collection region, and a cyclone axis of rotation;

(c) a pre-motor filter downstream of the cyclone chamber;

(d) a suction motor positioned in the air flow path upstream of the clean air outlet; and,

(e) a plurality of energy storage members provided in a lower portion of the hand vacuum cleaner, wherein some of the energy storage members are arranged one above another and some are arranged one behind another and wherein at least some of the energy storage members underlie at least a portion of one or both of the cyclone chamber and the pre-motor filter.

[0089] In some embodiments, at least a portion of the energy storage members may be positioned rearward of the dirt collection region.

[0090] In some embodiments, the cyclone axis of rotation may extend generally in a forward/rearward direction.

[0091] In some embodiments, the at least a portion of, or substantially all of or all of the energy storage members may underlie at least a portion of the cyclone chamber, substantially all of the cyclone chamber or the entire cyclone chamber

[0092] In some embodiments, the at least a portion of, or substantially all of or all of the energy storage members may underlie at least a portion of the pre-motor filter, substantially all of the pre-motor filter or the entire pre-motor filter.

[0093] In some embodiments, the dirt collection region is at a lower end of the hand vacuum cleaner and the energy storage members are slidably insertable into the lower end of the hand vacuum cleaner.

[0094] In some embodiments, at least a portion of the energy storage members may be positioned rearward of the dirt collection region.

[0095] In some embodiments, the hand vacuum may further comprise a handle and a finger gap positioned between the handle and the energy storage members.

[0096] In accordance with another aspect of this disclosure, which may be used alone or in combination with any other aspect, a hand vacuum cleaner may have a cyclone chamber with a cyclone axis of rotation that extends in a forward/rearward direction, and a suction motor with a suction motor axis that also extends in a forward/rearward direction, where the suction motor is located at an upper end of a handle of the vacuum cleaner and the suction motor axis is vertically displaced from the cyclone axis of rotation. Such a configuration may have one or more advantages. For example, it may facilitate the reduction of

conduit bends and/or air flow direction changes between a dirty air inlet and a clean air outlet, thereby reducing backpressure and/or air flow losses through this portion of the hand vacuum cleaner due to a reduction in the number of bends in the air flow path. Additionally, or alternatively, such a configuration may help provide a compact overall design of the hand vacuum cleaner without adversely affecting the hand feel and/or perceived balance of the hand vacuum.

[0097] In accordance with this broad aspect, there is provided a hand vacuum cleaner having a front end, a rear end, an upper end, a lower end, and first and second laterally spaced apart sides, and comprising:

(a) an air flow path extending from a dirty air inlet to a clean air outlet;

(b) a handle having a hand grip portion that extends upwardly and forwardly when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner, the handle being positioned at the rear end of the hand vacuum cleaner;

(c) a cyclone chamber positioned in the air flow path and having a cyclone air inlet, a cyclone air outlet, and a cyclone axis of rotation that extends in a forward/rearward direction;

(d) a pre-motor filter positioned downstream of the cyclone chamber and upstream of the suction motor; and,

(e) a suction motor positioned in the air flow path upstream of the clean air outlet, wherein the suction motor has a suction motor axis of rotation that extends in a forward/rearward direction, wherein the suction motor is located at an upper end of the handle, and wherein the suction motor axis of rotation is vertically displaced from the cyclone axis of rotation when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner.

[0098] In some embodiments, the suction motor may be located at an upper end of the hand grip portion.

[0099] In some embodiments, the cyclone axis of rotation may intersect the hand grip portion.

[00100] In some embodiments, the suction motor may be located rearward of the cyclone chamber.

[00101] In some embodiments, the suction motor may have an inlet that faces towards the pre-motor filter.

[00102] In some embodiments, the suction motor axis of rotation may intersect a volume defined by a pre-motor filter housing.

[00103] In some embodiments, the suction motor axis of rotation may extend through a central portion of a volume containing the pre-motor filter.

[00104] In some embodiments, the pre-motor filter may be positioned above the cyclone axis of rotation when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner.

[00105] In some embodiments, the pre-motor filter may be positioned above the cyclone chamber when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner.

[00106] In some embodiments, the cyclone axis of rotation may intersect the hand grip portion, the pre-motor filter may be positioned above the cyclone axis of rotation when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner, and the suction motor axis of rotation may extend through a pre-motor filter housing.

[00107] In some embodiments, the pre-motor filter may comprise a generally cylindrical filter having a hollow interior wherein the suction motor axis of rotation intersects the hollow interior.

[00108] In some embodiments, after exiting a downstream side of the pre-motor filter, air travels generally linearly to the suction motor.

[00109] In some embodiments, the pre-motor filter may comprise a generally cylindrical filter having a hollow interior wherein the dirty air inlet has a dirty air inlet axis that extends generally rearwardly and intersects the hollow interior.

[00110] In some embodiments, the dirty air inlet axis may intersect the suction motor.

[00111] In some embodiments, the cyclone axis of rotation may intersect the hand grip portion.

[00112] In some embodiments, the hand vacuum may further comprise a plurality of energy storage members wherein at least some of the plurality of energy storage members are arranged one above another in a generally upwardly extending configuration when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner, and the suction motor may be positioned rearward of at least some of the energy storage members when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner.

[00113] In accordance with another aspect of this disclosure, which may be used alone or in combination with any other aspect, a surface cleaning apparatus may have a removable pre-motor filter assembly having an outlet conduit wherein a terminal end of the outlet conduit extends at a first angle to a direction of air flow through the outlet conduit. An advantage of this design is that the terminal end of the outlet conduit may be positioned substantially flush against another air conduit having a similarly angled terminal end without requiring lateral movement of the outlet conduit towards other conduit. Accordingly, a filter assembly may be removed and inserted by moving the filter assembly substantially perpendicular to the direction of airflow exiting the filter assembly.

Such an arrangement may, for example, facilitate the use of a gasket or other sealing member between the ends of the conduits to provide an improved seal between the conduits. Such an arrangement may also eliminate the need for a biasing or other retaining mechanism to exert a force on the filter assembly to maintain a seal between the conduits.

[00114] In accordance with this broad aspect, there is provided a surface cleaning apparatus comprising:

(a) an air flow path extending from a dirty air inlet to a clean air outlet;

(b) an air treatment member positioned in the air flow path; and

(c) a removable pre-motor filter assembly positioned downstream of the air treatment member and upstream of a suction motor, the pre-motor filter assembly comprising a pre-motor filter and a filter support member, the filter support member having an outlet conduit wherein a terminal end of the outlet conduit extends at a first angle to a direction of air flow through the outlet conduit.

[00115] In some embodiments, the pre-motor filter may comprise a generally cylindrical filter having a hollow interior positioned about a body portion of the filter support member having an internal filter conduit, wherein the outlet conduit is in air flow communication with the hollow interior via the internal filter conduit.

[00116] In some embodiments, the outlet conduit may be aligned with the hollow interior.

[00117] In some embodiments, the body portion of the filter support member may include a porous portion located in the hollow interior and positioned between a downstream surface of the pre-motor filter and the internal filter conduit.

[00118] In some embodiments, the hollow interior may comprise a longitudinally extending passage having an outlet end from which the outlet conduit extends away and an opposed end wherein the opposed end is sealed.

[00119] In some embodiments, the opposed end may be sealed by a sealing member that extends into the hollow interior, the sealing member having a solid wall extending inwardly and located between a downstream surface of the pre-motor filter and the passage.

[00120] In some embodiments, the filter support member may have a body portion having an internal filter conduit that may extend into a hollow interior of the pre-motor filter, the body portion may have a solid wall extending inwardly and located between a downstream surface of the pre-motor filter and the internal filter conduit.

[00121] In some embodiments, the body portion of the filter support member may include a porous portion located in the hollow interior and positioned between a downstream surface of the pre-motor filter and the internal filter conduit and is upstream of the outlet conduit.

[00122] In some embodiments, the internal filter conduit may comprise a longitudinally extending passage having an outlet end from which the outlet conduit extends away and a second end, wherein the second end is sealed.

[00123] In some embodiments, the second end may be sealed by a sealing member that extends into the hollow interior, the sealing member having a solid wall extending inwardly and located between a downstream surface of the pre-motor filter and the internal filter conduit.

[00124] In some embodiments, the sealing member and the body portion define a continuous member extending through the hollow interior.

[00125] In some embodiments, the surface cleaning apparatus may further comprise a treated air conduit extending from the outlet conduit towards the

suction motor, wherein an inlet end of the treated air conduit may also extend at about the first angle to a direction of air flow through the outlet conduit.

[00126] In some embodiments, the surface cleaning apparatus may further comprise a treated air conduit extending from the outlet conduit towards the suction motor, wherein an inlet end of the treated air conduit may also extend at a second angle to a direction of air flow through the outlet conduit and the terminal end of the outlet conduit may abut the inlet end of the treated air conduit when the filter assembly is positioned in the air flow path.

[00127] In some embodiments, the first and second angles may be about the same.

[00128] In some embodiments, the surface cleaning apparatus may further comprise a gasket provided at an interface of the terminal end of the outlet conduit and the inlet end of the treated air conduit.

[00129] In some embodiments, the filter assembly may be removable in a filter assembly removal direction that is at an angle to the direction of air flow through the outlet conduit.

[00130] In some embodiments, the filter assembly may be removable through an openable door and a side of the terminal end that is closest to the openable door may extend further in the direction of air flow though the outlet conduit than an opposed side of the terminal end that is further from the openable door.

[00131] In some embodiments, a side of the inlet end of the treated air conduit that is furthest from the openable door may extend further in the direction of air flow though the outlet conduit than an opposed side of the inlet end that is closest to the openable door.

[00132] It will be appreciated by a person skilled in the art that an apparatus or method disclosed herein may embody any one or more of the features

contained herein and that the features may be used in any particular combination or sub-combination.

[00133] These and other aspects and features of various embodiments will be described in greater detail below.

BRIEF DESCRIPTION OF THE DRAWINGS

[00134] For a better understanding of the described embodiments and to show more clearly how they may be carried into effect, reference will now be made, by way of example, to the accompanying drawings in which:

[00135] Figure 1 is a top perspective view of a hand vacuum cleaner in accordance with one embodiment;

[00136] Figure 2 is a bottom perspective view of the hand vacuum cleaner of Figure 1;

[00137] Figure 3 is a side perspective view of the hand vacuum cleaner of Figure 1;

[00138] Figure 4 is a rear perspective view of the hand vacuum cleaner of Figure 1;

[00139] Figure 5 is a front end view of the hand vacuum cleaner of Figure 1;

[00140] Figure 6 is a perspective view of the hand vacuum cleaner of Figure 1, with a front door or lid in an open position;

[00141] Figure 7 is a front end view of the hand vacuum cleaner of Figure 1, with a front door or lid in an open position;

[00142] Figure 8 is a perspective sectional view of the hand vacuum cleaner of Figure 1, taken along line 8-8 in Figure 1;

[00143] Figure 9 is a perspective sectional view of the hand vacuum cleaner of Figure 1, taken along line 9-9 in Figure 5;

[00144] Figure 10 is a cross-section view of the hand vacuum cleaner of Figure 1, taken along line 9-9 in Figure 5;

[00145] Figure 11 is an enlarged view of the upper left portion of Figure 10;

[00146] Figure 12 is an enlarged view of the upper left portion of Figure 10, with a pre-motor filter assembly removed;

[00147] Figure 13 is an enlarged view of the upper left portion of Figure 10, with a pre-motor filter assembly and an openable door removed;

[00148] Figure 14 is a top perspective view of the upper front portion of the hand vacuum cleaner of Figure 1, with an openable door removed to expose a pre-motor filter assembly;

[00149] Figure 15 is a top perspective view of the upper front portion of the hand vacuum cleaner of Figure 1, with a pre-motor filter assembly and an openable door removed;

[00150] Figure 16 is a top plan view of the upper front portion of the hand vacuum cleaner of Figure 1, with a pre-motor filter assembly and an openable door removed;

[00151] Figure 17 is a top perspective view of the upper portion of the hand vacuum cleaner of Figure 1, with a pre-motor filter assembly and an openable door removed;

[00152] Figure 18 is a bottom perspective view of an openable door of a pre-motor filter chamber of the hand vacuum cleaner of Figure 1;

[00153] Figure 19 is a perspective view of a removable pre-motor filter assembly of the hand vacuum cleaner of Figure 1;

[00154] Figure 20 is an end perspective view from the outlet end of the removable pre-motor filter assembly of the hand vacuum cleaner of Figure 19;

[00155] Figure 21 is a perspective section view of the removable pre-motor filter assembly of the hand vacuum cleaner of Figure 19, taken along line 21-21 in Figure 19;

[00156] Figure 22 is a cross section view of the removable pre-motor filter assembly of the hand vacuum cleaner of Figure 19, taken along line 21-21 in Figure 19;

[00157] Figure 23 is a bottom perspective view of the lower rear portion of the hand vacuum cleaner of Figure 1;

[00158] Figure 24 is a bottom perspective view of the lower rear portion of the hand vacuum cleaner of Figure 1, with a post-motor filter and a post-motor filter support removed;

[00159] Figure 25 is a rear perspective view of a post-motor filter support of the hand vacuum cleaner of Figure 1;

[00160] Figure 26 is a front perspective view of the post-motor filter support of Figure 25;

[00161] Figure 27 is a front perspective view of the post-motor filter support of Figure 26 and a post-motor filter;

[00162] Figure 28 is a side view of the hand vacuum cleaner of Figure 1, with an energy storage member partially removed;

[00163] Figure 29 is a bottom perspective view of the hand vacuum cleaner of Figure 1, with an energy storage member partially removed;

[00164] Figure 30 is a side view of the hand vacuum cleaner of Figure 1, with an energy storage member removed;

[00165] Figure 31 is a cross-section view of the hand vacuum cleaner of Figure 1, taken along line 9-9 in Figure 5, with an energy storage member removed;

[00166] Figure 32 is a perspective view of an energy storage member of the hand vacuum cleaner of Figure 1;

[00167] Figure 33 is a front perspective view of the energy storage member of Figure 32;

[00168] Figure 34 is a cross-section view of the energy storage member of Figure 32, taken along line 34-34 in Figure 32;

[00169] Figure 35 is a perspective view of a hand vacuum cleaner in accordance with another embodiment;

[00170] Figure 36 is a cross-section view of the hand vacuum cleaner of Figure 35, taken along line 36-36 in Figure 35;

[00171] Figure 37 is a cross-section view of the hand vacuum cleaner of Figure 35, taken along line 36-36 in Figure 35, with an energy storage member partially removed;

[00172] Figure 38 is a perspective section view of the hand vacuum cleaner of Figure 35, taken along line 36-36 in Figure 35, with a post-motor filter removed;

[00173] Figure 39 is a perspective view of a hand vacuum cleaner in accordance with another embodiment;

[00174] Figure 40 is a cross-section view of the hand vacuum cleaner of Figure 39, taken along line 40-40 in Figure 39;

[00175] Figure 41 is a perspective section view of the hand vacuum cleaner of Figure 39, taken along line 40-40 in Figure 39, with a post-motor filter removed;

[00176] Figure 42 is a perspective view of a hand vacuum cleaner in accordance with another embodiment;

[00177] Figure 43 is a cross-section view of the hand vacuum cleaner of Figure 42, taken along line 43-43 in Figure 42;

[00178] Figure 44 is a perspective section view of the hand vacuum cleaner of Figure 42, taken along line 43-43 in Figure 42;

[00179] Figure 45 is a perspective section view of the hand vacuum cleaner of Figure 42, taken along line 43-43 in Figure 42, with an energy storage member removed;

[00180] Figure 46 is a perspective view of a hand vacuum cleaner in accordance with another embodiment;

[00181] Figure 47 is a cross-section view of the hand vacuum cleaner of Figure 46, taken along line 47-47 in Figure 46;

[00182] Figure 48 is a perspective section view of the hand vacuum cleaner of Figure 46, taken along line 47-47 in Figure 46;

[00183] Figure 49 is a perspective section view of the hand vacuum cleaner of Figure 46, taken along line 47-47 in Figure 46, with an energy storage member removed; and

[00184] Figure 50 is a perspective view of the hand vacuum cleaner of Figure 46, with a front door or lid in an open position;

[00185] The drawings included herewith are for illustrating various examples of articles, methods, and apparatuses of the teaching of the present specification and are not intended to limit the scope of what is taught in any way.

DESCRIPTION OF EXAMPLE EMBODIMENTS

[00186] Various apparatuses, methods and compositions are described below to provide an example of an embodiment of each claimed invention. No embodiment described below limits any claimed invention and any claimed invention may cover apparatuses and methods that differ from those described below. The claimed inventions are not limited to apparatuses, methods and

compositions having all of the features of any one apparatus, method or composition described below or to features common to multiple or all of the apparatuses, methods or compositions described below. It is possible that an apparatus, method or composition described below is not an embodiment of any claimed invention. Any invention disclosed in an apparatus, method or composition described below that is not claimed in this document may be the subject matter of another protective instrument, for example, a continuing patent application, and the applicant(s), inventor(s) and/or owner(s) do not intend to abandon, disclaim, or dedicate to the public any such invention by its disclosure in this document.

[00187] The terms "an embodiment," "embodiment," "embodiments," "the embodiment," "the embodiments," "one or more embodiments," "some embodiments," and "one embodiment" mean "one or more (but not all) embodiments of the present invention(s)," unless expressly specified otherwise.

[00188] The terms "including," "comprising" and variations thereof mean "including but not limited to," unless expressly specified otherwise. A listing of items does not imply that any or all of the items are mutually exclusive, unless expressly specified otherwise. The terms "a," "an" and "the" mean "one or more," unless expressly specified otherwise.

[00189] As used herein and in the claims, two or more parts are said to be “coupled”, “connected”, “attached”, or “fastened” where the parts are joined or operate together either directly or indirectly (i.e., through one or more intermediate parts), so long as a link occurs. As used herein and in the claims, two or more parts are said to be “directly coupled”, “directly connected”, “directly attached”, or “directly fastened” where the parts are connected in physical contact with each other. None of the terms “coupled”, “connected”, “attached”, and “fastened” distinguish the manner in which two or more parts are joined together.

[00190] Furthermore, it will be appreciated that for simplicity and clarity of illustration, where considered appropriate, reference numerals may be repeated among the figures to indicate corresponding or analogous elements. In addition, numerous specific details are set forth in order to provide a thorough understanding of the example embodiments described herein. However, it will be understood by those of ordinary skill in the art that the example embodiments described herein may be practiced without these specific details. In other instances, well-known methods, procedures, and components have not been described in detail so as not to obscure the example embodiments described herein. Also, the description is not to be considered as limiting the scope of the example embodiments described herein.

General description of a hand vacuum cleaner

[00191] Referring to Figures 1 to 34, an exemplary embodiment of a surface cleaning apparatus is shown generally as 1000. The following is a general discussion of this embodiment which provides a basis for understanding several of the features which are discussed herein. As discussed subsequently, each of the features may be used individually or in any particular combination or sub-combination in this or in other embodiments disclosed herein.

[00192] In the illustrated embodiment, the surface cleaning apparatus is a hand vacuum cleaner, which may also be referred to also as a "handvac" or "hand-held vacuum cleaner". As used herein, a hand vacuum cleaner is a vacuum cleaner that can be operated to clean a surface generally one-handedly. That is, the entire weight of the vacuum may be held by the same one hand used to direct a dirty air inlet of the vacuum cleaner with respect to a surface to be cleaned. For example, the handle and a clean air inlet may be rigidly coupled to each other (directly or indirectly) so as to move as one while maintaining a constant orientation relative to each other. This is to be contrasted with canister and upright vacuum cleaners, whose weight is typically supported by a surface (e.g. a floor) during use.

[00193] As exemplified in Figures 1 to 7, surface cleaning apparatus 1000 includes a main body 1010 having a housing 1011 and a handle 1020, an air treatment member 1100 connected to the main body 1010, a dirty air inlet 1030, a clean air outlet 1040, and an air flow path extending between the dirty air inlet and the clean air outlet.

[00194] Surface cleaning apparatus 1000 has a front end 1002, a rear end 1004, an upper end or top 1006, and a lower end or bottom 1008. In the embodiment shown, dirty air inlet 1030 is at an upper portion of the front end 1102 and clean air outlet 1040 is at rearward portion of the lower end 1008. It will be appreciated that the dirty air inlet 1030 and the clean air outlet 1040 may be provided in different locations.

[00195] A suction motor 1200 (see e.g. Figure 10) is provided to generate vacuum suction through the air flow path, and is positioned within a motor housing 1210. In the illustrated embodiment, the suction motor is positioned downstream from the air treatment member, although it may be positioned upstream of the air treatment member (e.g., a dirty air motor) in alternative embodiments.

[00196] Air treatment member 1100 is configured to remove particles of dirt and other debris from the air flow and/or otherwise treat the air flow. In the illustrated example, air treatment member 1100 includes a cyclone assembly having a single cyclonic cleaning stage with a single cyclone chamber 1110 and a dirt collection region 1122 external to the cyclone chamber. The cyclone chamber 1110 and dirt collection region 1122 may be of any configuration suitable for separating dirt from an air stream and collecting the separated dirt, respectively.

[00197] The cyclone chamber 1110 may be oriented in any direction. For example, when surface cleaning apparatus 1000 is oriented with the upper end 1106 above the lower end 1108, e.g. positioned generally parallel to a horizontal

surface, a central axis or axis of rotation 1115 of the cyclone chamber 1110 may be oriented horizontally, as exemplified in Figure 10. In alternative embodiments, the cyclone chamber may be oriented vertically, or at any angle between horizontal and vertical.

[00198] In alternative embodiments, the cyclone assembly may include two or more cyclonic cleaning stages arranged in series with each other. Each cyclonic cleaning stage may include one or more cyclone chambers (arranged in parallel or series with each other) and one or more dirt collection chambers, of any suitable configuration. The dirt collection chamber or chambers may be external to the cyclone chambers, or may be internal the cyclone chamber and configured as a dirt collection area or region within the cyclone chamber. For example, in the embodiments exemplified in Figures 42 to 45 and 46 to 50, a second cyclonic cleaning stage is provided in series in what may be characterized as a 'nested' configuration. As exemplified in Figure 43, after traveling generally axially though the cyclone chamber 1110 from the front end wall 1160 toward the rear end wall 1170, air exits cyclone chamber 1110 and enters a secondary cyclone chamber. A secondary dirt collection chamber 1121 is positioned exterior to the secondary cyclone chamber and is in communication with a dirt outlet 1141 to receive dirt and debris dis-entrained from a dirty air flow by the secondary cyclone chamber. In the embodiment exemplified in Figures 42 to 45, air exiting the secondary cyclone chamber travels generally rearwardly and enters a pre-motor chamber 1318 via air inlet 1234. In the embodiment exemplified in Figures 46 to 50, the secondary cyclone air outlet faces a rear wall 1236 of the upflow duct or conduit 1230 that directs air upwardly towards a pre-motor filter 1320. Alternatively, the air treatment member need not include a cyclonic cleaning stage, and can incorporate a bag, a porous physical filter media (such as foam or felt), or other air treating means.

[00199] As exemplified in Figure 10, hand vacuum cleaner 1000 may include a pre-motor filter housing 1310 provided in the air flow path downstream

of the air treatment member 1100 and upstream of the suction motor 1200. Pre-motor filter housing 1310 may be of any suitable construction, including any of those exemplified herein. A pre-motor filter 1320 is positioned within the pre-motor filter housing 1310. Pre-motor filter 1320 may be formed from any suitable physical, porous filter media and having any suitable shape, including the examples disclosed herein with respect to a removable pre-motor filter assembly. For example, the pre-motor filter may be one or more of a foam filter, felt filter, HEPA filter, other physical filter media, electrostatic filter, and the like.

[00200] Optionally, the pre-motor filter housing 1310 may be openable (as described herein), and at least a portion of the sidewall 1316 (e.g. removable or otherwise openable door 1330) and/or one of the end walls 1312 or 1314 may be removable, openable, or otherwise re-configurable to provide access to the interior of the pre-motor filter housing 1310.

[00201] Positioning the pre-motor filter housing 1310 toward the top 1006 of the main body 1010 may help facilitate access to the pre-motor filter 1320 while the hand vacuum is resting on its base. For example, if the hand vacuum cleaner 1000 is rested upon a table or other such surface, an openable door 1330 of the pre-motor filter housing 1310 is provided at the upper end of the housing and is accessible to a user. A user could then open the pre-motor filter housing 1310 by removing or otherwise opening door 1330 while the hand vacuum 1000 rests on the table, to inspect or replace the pre-motor filter 1320, without having to use one hand to grasp the handle 1020 or otherwise support the hand vacuum.

[00202] As exemplified, hand vacuum cleaner 1000 may also include a post-motor filter 1420 provided in the air flow path downstream of the suction motor 1200 and upstream of the clean air outlet 1040. Post-motor filter 1420 may be formed from any suitable physical, porous filter media and having any suitable shape, including the examples disclosed herein. In alternative embodiments, the post-motor filter may be any suitable type of filter such as one or more of a foam

filter, felt filter, HEPA filter, other physical filter media, electrostatic filter, and the like.

[00203] In the illustrated embodiment, the dirty air inlet 1030 of the hand vacuum cleaner 1000 is the inlet end 1032 of an inlet conduit 1036. Optionally, inlet end 1032 of the conduit 1036 can be used as a nozzle to directly clean a surface. The air inlet conduit 1036 is, in this example, a generally linear hollow member that extends along an inlet conduit axis 1035 that is oriented in a longitudinal forward/backward direction and is generally horizontal when hand vacuum cleaner 1000 is oriented with the upper end 1006 above the lower end 1008. Alternatively, or in addition to functioning as a nozzle, inlet conduit 1036 may be connected or directly connected to the downstream end of any suitable accessory tool such as a rigid air flow conduit (e.g., an above floor cleaning wand), a crevice tool, a mini brush, and the like. As shown, dirty air inlet 1030 is positioned forward of the air treatment member 1100, although this need not be the case. As exemplified, the dirty air inlet 1030 is positioned above the cyclone chamber. Optionally, the dirty air inlet 1030 may be provided at an alternate location, such as in the front end wall 1160.

[00204] As exemplified in Figures 1, 2, 5, 6, and 7, an optional accessory power coupler 1050 may be provided adjacent to the inlet conduit 1036. Accessory power coupler 1050 includes a set of electrical connectors 1056 that can inter-engage with compatible electrical connectors on an accessory tool in order to provide an electrical connection between e.g. a power source of the hand vacuum and a motor or other electrical device of an accessory tool (e.g. a powered brush roller, a light source, and the like). While the illustrated accessory power coupler 1050 is a male connector (i.e. projecting outwardly from the main body 1010 of the hand vacuum cleaner 1000), in alternative embodiments it may be a female connector (i.e. recessed inwardly) or any other shape suitable for cooperatively engaging with corresponding connectors on an accessory tool or other attachment. As exemplified, the accessory power coupler 1050 may be

positioned laterally to one side of the inlet conduit 1036. In other examples, the accessory power coupler 1050 may be located above or below the inlet conduit 1036.

[00205] As exemplified, power may be supplied to the suction motor and other electrical components of the hand vacuum cleaner from an onboard energy storage member which may include, for example, one or more batteries or other energy storage device. In the illustrated embodiment, the hand vacuum cleaner 1000 includes a removable battery pack 1500 provided between the handle 1020 and the air treatment member 1100. Battery pack 1500 is described in further detail herein. In alternative embodiments, a battery pack may not be provided and power may be supplied to the hand vacuum cleaner by an electrical cord connected to the hand vacuum cleaner (not shown) that can be connected to a standard wall electrical outlet.

[00206] Optionally, a forward surface of the handle 1020 and a rearward surface of the battery pack 1500 may cooperatively define a finger gap 1028 therebetween (see e.g. Figure 10). An advantage of this design is that the absence of an intervening portion of main housing 1010 between the handle and the energy storage member may facilitate a more compact overall size of hand vacuum 1000.

[00207] As exemplified, a power switch 1060 may be provided to selectively control the operation of the suction motor (e.g. either on/off or variable power levels or both), for example by establishing a power connection between the batteries and the suction motor. The power switch may be provided in any suitable configuration and location, including a button, rotary switch, sliding switch, trigger-type actuator and the like. As illustrated in Figure 4, power switch 1060 is in the form of a button located toward upper end of the rear end 1004 of the hand vacuum cleaner, above a hand grip portion 1026 of the handle 1020. In this position, a user may be able to access the button 1060 while holding the

hand vacuum via the hand grip, e.g. with the thumb of the hand holding the handle, and/or with a digit of their other hand.

[00208] The power switch or an alternate controller may also be configured to control other aspects of the hand vacuum (brush motor on/off, etc.). Optionally, instead of being provided at an upper end of the handle, the power switch may be provided on the main body (such as on the motor housing or other suitable location).

[00209] As exemplified in Figure 4, an optional information display device 1070 may be provided to display one or more visual indications to a user. For example, the display device 1070 may provide a visual indication of: when suction motor is on; the current power level of the suction motor (if applicable); the current battery charge level; an estimated time until the battery charge will be depleted, and/or similar information. The display device 1070 may include one or more light sources (e.g. light emitting diodes (LEDs)), display screens (e.g. a liquid crystal, an LED screen, an organic light emitting diode (OLED) screen, and the like. The screen, and associated electronics, may be used to display status information of one or more electrical components of the hand vacuum cleaner.

[00210] In the illustrated embodiment, the information display device is in the form of a display screen 1070 that is provided at the upper end 1022 of the handle 1020. A first display portion 1072 is configured to display an indication of whether the hand vacuum cleaner is in a floor cleaning mode or in a carpet cleaning mode (e.g. where power is being supplied to a brush roller of an accessory tool via electrical connectors 1056), and a second portion 1074 is configured to display an indication of a power mode of the suction motor (e.g. a regular power mode, a higher power mode, and/or a higher power 'burst' mode).

Air flow path through a hand vacuum cleaner

[00211] The following is a description of different features of an air flow path through a hand vacuum cleaner. These features may be used by themselves in any surface cleaning apparatus or in any combination or sub-combination with any other feature or features described herein. For example, any of the airflow configurations described herein may be used with any of the pre-motor filter assemblies, relative positioning of the suction motor and energy storage members, inclined battery packs, battery pack configurations, airflow cooling configurations, and other features described herein.

[00212] As exemplified, the air treatment member 1100 of the hand vacuum cleaner 1000 may optionally be a single cyclonic cleaning stage with unidirectional air flow or a 'uniflow' cyclone chamber 1110 (i.e. where the cyclone air inlet and cyclone air outlet are at opposite ends of the cyclone chamber). Referring primarily to Figures 9 and 10, hand vacuum cleaner 1000 includes a single cyclonic cleaning stage with a cyclone chamber 1110 that has a cyclone air inlet 1120 in fluid communication with the inlet conduit 1036, a cyclone air outlet 1130, and a dirt outlet 1140 that is in communication with a dirt collection chamber 1122.

[00213] Optionally, the cyclone chamber 1110 may be generally horizontally oriented so that the cyclone air inlet 1120 is located toward the front end 1002 of the hand vacuum cleaner 1000, and the cyclone air outlet 1130 is spaced rearwardly behind the cyclone air inlet 1120, at a rear end 1114 of the cyclone chamber 1110. From the cyclone air outlet 1130, an upflow duct or conduit 1230 directs the airflow upwards to a pre-motor filter chamber 1310 that is vertically spaced from the cyclone chamber 1110. After passing through the pre-motor filter 1320, air may travel generally rearwardly from the pre-motor filter 1320 to an inlet end 1202 of the suction motor 1200. An advantage of this arrangement is that, by promoting air to travel in this manner, the need for air flow direction changes between an air outlet of the pre-motor filter and the suction motor may

be reduced or eliminated, thereby reducing backpressure and/or air flow losses through this portion of the hand vacuum cleaner. An additional, or alternative, advantage of providing a pre-motor filter chamber 1310 that is vertically spaced from the cyclone chamber 1110 is that the need for air flow direction changes between a cyclone air outlet and the suction motor may be reduced, thereby reducing backpressure and/or air flow losses through this portion of the hand vacuum cleaner. For example, any airflow in a forward direction may take place within the pre-motor filter chamber or header 1310, as opposed to taking place in a (typically narrower) conduit that directs airflow in a direction opposite to the airflow through the dirty air inlet. An additional, or alternative, advantage of providing a pre-motor filter chamber 1310 that is vertically spaced from the cyclone chamber 1110, and optionally above the cyclone chamber 1110, is that the length (front to back) of the hand vacuum cleaner may be reduced, providing a more compact configuration.

[00214] Figures 1 to 34 exemplify one embodiment of a hand vacuum cleaner 1000 having a cyclone unit that includes a uniflow cyclone chamber 1110 and a dirt collection chamber 1122 that is positioned exterior to the cyclone chamber 1110 and is in communication with the dirt outlet 1140 to receive dirt and debris dis-entrained from a dirty air flow by the cyclone chamber 1110. In the illustrated example, the cyclone air inlet 1120 and dirt outlet 1140 are positioned toward opposing ends of the cyclone chamber 1110, and the cyclone air outlet 1130 is provided toward the same end as the dirt outlet 1140 (the rear end as illustrated). In this configuration, dirty air can enter at the front end of the cyclone chamber, while cleaner air and the separated dirt particles both exit the cyclone chamber at the opposing rear end.

[00215] In this embodiment, the cyclone chamber 1110 has a front end wall 1160 and an opposing rear end wall 1170 that is spaced apart from the front end wall along the cyclone axis 1115 about which air circulates within the cyclone chamber 1110 during operation of the hand vacuum cleaner. A cyclone chamber

sidewall 1180 extends between the front and rear end walls 1160, 1170. In the illustrated example, when the hand vacuum is oriented with the upper end above the lower end, the cyclone axis 1115 is generally horizontal, and is closer to horizontal than vertical, e.g., ±20°, ±15°, ±10°, or ±5° from the horizontal. As exemplified, the cyclone axis 1115 is substantially parallel to, e.g. within ±20°, ±15°, ±10°, or ±5°, and vertically offset below the conduit axis 1035 of the air inlet conduit 1036, and the cyclone chamber 1110 and dirt collection chamber 1122 are both below the inlet conduit axis 1035. As illustrated in Figure 10, when the hand vacuum 1000 is horizontal (as illustrated), the pre-motor filter 1320 is vertically spaced from (e.g. above) the cyclone axis 1115, and the suction motor 1200 is positioned rearward of the pre-motor filter 1320, so that air travels generally rearwardly from the pre-motor filter to the suction motor.

[00216] In this embodiment, the cyclone air inlet 1120 is a tangential air inlet that, as exemplified, terminates at an aperture or port that is formed in cyclone sidewall 1180, optionally an upper portion 1182 of the cyclone sidewall 1180, adjacent the front end wall 1160. Optionally, the cyclone air inlet 1120 may be provided at an alternate location, such as in the front end wall 1160.

[00217] The cyclone air inlet 1120 is fluidly connected with the outlet end of the conduit 1036 via a corresponding air outlet aperture or port 1038 that may be provided in a lower portion of the air inlet conduit 1036. The cyclone air inlet 1120 may have any suitable arrangement and/or configuration, and in the illustrated example is configured as a tangential air inlet that is directly connected to the air outlet aperture 1038. Connecting the air inlet 1120 to the air outlet aperture 1038 in this manner may help reduce the need for additional conduits to fluidly connect the dirty air inlet 1030 to the cyclone chamber 1110, and may reduce or eliminate the need for additional bends or air flow direction changes between the dirty air inlet 1030 and the cyclone chamber 1110. Reducing the conduit length and number of bends may help reduce the backpressure and air flow losses within the air flow path.

[00218] Positioning the cyclone air inlet 1120 toward the front of the cyclone chamber 1110 may help facilitate a desired air flow configuration within the cyclone chamber 1110. For example, in this configuration the cyclone chamber 1110 itself functions as part of the air flow path that conveys air rearwardly from the front 1002 of the hand vacuum 1000, without the need for a separate fluid conduit.

[00219] In the illustrated example, cyclone air inlet 1120 is directly adjacent the front wall 1160. Alternatively, cyclone air inlet 1120 may be axially spaced from the front end wall 1160, and may be located at another location along the length of the cyclone chamber 1110. Preferably, cyclone air inlet 1120 is provided in the front half of the cyclone chamber 1110 (i.e. forward of the axial mid-point of the cyclone chamber sidewall 1080) in order to help reduce the distance between the dirty air inlet 1030 and the cyclone air inlet 1120.

[00220] As shown in Figure 10, the cyclone air outlet 1130 is provided in the rear end wall 1170 of the cyclone chamber 1110, and an axially extending vortex finder conduit 1136 extends from the rear end wall 1170 and is aligned with the cyclone air outlet 1130. Optionally, a mesh screen (not shown) may be positioned over some or all of the inlet apertures 1138 of the vortex finder conduit 1136 to help inhibit lint, hair, and other such debris from entering the vortex finder conduit 1136. Positioning the air outlet 1130 toward the rear end (and optionally in the rear end wall 1170) may help facilitate the desired air flow through the cyclone chamber 1110, such that air, while swirling, travels generally axially though the cyclone chamber 1110 from the front end wall 1160 toward the rear end wall 1170.

[00221] Positioning the air outlet 1130 in the rear end wall 1170 of the cyclone chamber 1110 may also help facilitate the air flow connection between the cyclone chamber 1110 and other downstream components in the hand vacuum, such as the pre-motor filter housing 1310 and suction motor housing 1210 described herein. In the illustrated embodiment the air outlet 1130 is

provided in the rear end wall 1170 and is connected to the pre-motor filter housing 1310 through an upflow duct or conduit 1230. This may help simplify the air flow path and construction of the hand vacuum. Alternatively, the air flow path may include one or more additional conduits connected downstream from the cyclone air outlet.

[00222] In this arrangement, air travelling through the hand vacuum 1000 will travel generally rearwardly along the air inlet conduit 1036 (i.e. parallel to the conduit axis 1035 and then enter a tangential air inlet which essentially changes the direction of the air to travel generally downwardly through the cyclone air inlet 1120 (i.e. generally orthogonal to the cyclone axis 1115). The air can then circulate within the cyclone chamber 1110, and travel generally rearwardly toward the cyclone air outlet 1130, and ultimately exit the cyclone chamber 1110 via the cyclone air outlet 1130 while travelling through the vortex finder conduit 1136 in a rearward direction (i.e. generally parallel to the cyclone axis 1115). In this configuration, the air flow changes direction only once (and by only approximately 90° which may be accomplished by a tangential air inlet), between entering the dirty air inlet 1030 and exiting the cyclone air outlet 1130.

[00223] The cyclone dirt outlet 1140 may be of any suitable configuration, and in the illustrated embodiment is a slot 1140 that is provided in the cyclone chamber side wall 1180, toward the rear end wall 1170. The slot 1140 may extend around at least a portion of the perimeter of the cyclone side wall 1180, and may have any suitable length 1186 in the axial direction (see e.g. Figure 10). As exemplified, the slot may be provided only in a lower portion of the sidewall. Accordingly, when dirty air inlet 1030 faces downwardly during use, dirt will exit into an upper end of an external dirt collection chamber. Positioning the dirt collection chamber below the cyclone chamber, and not surrounding the cyclone chamber, reduces the width of the hand vacuum. While shown directly adjacent the rear end wall 1170, such that the slot 1140 is partially bounded by the cyclone side wall 1180 and the rear end wall 1170, the slot 1140 may be located

at another location along the length of the cyclone side wall 1180, and need not be directly adjacent the rear end wall 1170. Alternatively, the dirt outlet 1140 may be provided toward the mid-point of the cyclone chamber sidewall 1180, or may be provided toward the front end wall 1160. While illustrated with a single dirt outlet 1140, the cyclone chamber 1110 may include two or more dirt outlets that are in communication with the same dirt collection chamber, or optionally with different dirt collection chambers.

[00224] Preferably, at least a portion of the air treatment member may be openable for emptying. For example, at least one end, and optionally both ends of the dirt collection chamber 1122 may be openable for emptying. Optionally, at least one end, and optionally both ends of the cyclone chamber 1110 may also be openable for emptying.

[00225] Referring primarily to Figures 9 and 10, the front end wall 1160 of the cyclone chamber 1110 and the front end wall 1126 of the dirt collection chamber 1122 are both provided by portions of an openable front door 1190 that covers the front end of the cyclone assembly. In this arrangement, opening the front door 1190 will concurrently open the front end walls 1160 and 1126 of the cyclone and dirt collection chambers 1110, 1122. In the illustrated example, a user may hold the hand vacuum 1000 via the handle 1020 with one hand and open the front door 1190 with the other hand. The front end wall 1160 of the cyclone chamber 1110 and the front end wall 1126 of the dirt collection chamber 1122 may be concurrently openable and may cover all of a substantial portion of the front end of the cyclone chamber and the dirt collection chamber. For example, the front end wall 1160 of the cyclone chamber 1110 and the front end wall 1126 of the dirt collection chamber 1122 may be a one piece assembly (i.e. they may be integrally formed).

[00226] The front door 1190 may be openably connected (e.g., pivotally openable or removably mounted) to the rest of the cyclone assembly using any suitable mechanism, including a hinge or other suitable device. Optionally, the

front door 1190 may be secured in the closed position using any suitable type of locking mechanism, including a latch mechanism that may be released by a user. In the embodiment of Figures 1 to 34, the front door 1190 may be opened by pivoting it about a hinge assembly 1192 from a closed position (e.g. as shown in Figure 1) to an open position (e.g. as shown in Figure 6). The front door 1190 may be secured in the closed position by a friction fit when connected as illustrated in Figure 1, and/or by an assembly door lock 1194 or other suitable locking mechanism. Preferably, the assembly door lock may include at least one release actuator 1196 so that a user may unlock the assembly door lock, e.g. by depressing the actuator. The actuator for opening/ releasing the openable portion of the cyclone assembly may be provided on the cyclone assembly 1100 or on any other portion of the hand vacuum 1000 (such as the handle 1020).

[00227] In the embodiments described herein, the surface cleaning apparatus includes a pre-motor filter housing 1310 positioned in the air flow path between the cyclone chamber and the suction motor. It will be appreciated that in some embodiments, the pre-motor filter may be of any configuration and the direction of air flow through the pre-motor filter 1320 may be any particular direction.

[00228] Referring primarily to Figures 9 and 10, as exemplified, in some embodiments, the main body 1010 may be configured such that the suction motor housing 1210 is located rearward of the pre-motor filter housing 1310 and, preferably, axially aligned with the pre-motor filter housing 1310 such that air exiting the pre-motor filter may travel generally linearly to the suction motor. It will be appreciated that suction motor housing 1210 and pre-motor filter housing 1310 may be of any configuration

[00229] As exemplified herein, the pre-motor filter 1320 may be configured as a generally cylindrical foam filter with a hollow, open interior and is preferably part of a removable pre-motor filter assembly, as discussed elsewhere herein. The pre-motor filter 1320, which may be a foam filter, extends longitudinally

along a filter axis 1325, which may be generally parallel with the suction motor axis of rotation and accordingly is exemplified as being generally horizontal in the illustrated embodiment. The interior, downstream surface of filter 1320 is in communication with the air outlet 1242 via an outlet conduit 1340 of the pre-motor filter assembly. An advantage of a cylindrical filter is that a relatively large upstream surface area may be provided in a small space. A further advantage of this configuration is that, if the suction motor housing 1210 is located rearward of, and generally axially aligned with, the pre-motor filter housing 1310, air exiting the pre-motor filter may travel rearwardly through the hollow interior and then travel rearwardly to the suction motor.

[00230] In the illustrated example, the pre-motor filter housing 1310 is positioned such that the pre-motor filter 1320 is vertically spaced from and mostly, and optionally entirely, located above the cyclone axis 1115 and also above the cyclone chamber. Put another way, pre-motor filter 1320 mostly, and optionally entirely, overlies the cyclone chamber. In other embodiments, only a portion of the pre-motor filter may be above the cyclone axis 1115 and optionally also above the cyclone chamber.

[00231] Referring to Figure 10, in the illustrated example the pre-motor filter housing 1310 has forward and rear end walls 1312 and 1314, and a chamber sidewall 1316 defining a pre-motor filter chamber or plenum 1318. Optionally, the pre-motor filter is removable, such as proving a removable or otherwise openable door 1330. Door 1330 may extend between forward and rear end walls 1312 and 1314. The housing 1310 also has an air inlet 1234 that is connected downstream from the cyclone air outlet 1130 via upflow duct 1230, and an air outlet 1242 positioned in the rear end wall 1314. In the illustrated example, the housing air inlet 1234 is located toward the rear end of the housing 1310. To travel from the air inlet 1234 to the air outlet 1242, air passes through the pre-motor filter 1320 positioned within the chamber 1318.

[00232] As the pre-motor filter 1320 is positioned above the cyclone air outlet, air travels upwardly to the pre-motor filter chamber 1318. As exemplified herein, the pre-motor filter may be in the shape of a hollow cylinder which has a central axis that is generally parallel with the suction motor axis of rotation. An advantage of this configuration is that, after the air travels upwardly to the pre-motor filter chamber 1318, in order to try to balance the forces in the pre-motor filter chamber 1318, the air will tend to spread across the chamber. Therefore, without using a 90□ bend to direct the air to the front part of the pre-motor filter, a plenum is used to distribute the air across the upstream surface of the pre-motor filter. In accordance with this configuration, air travels to the filter housing 1310 in a generally upward direction, where it disperses in the pre-motor filter chamber 1318 and circulates around and through the outer, upstream surface of filter 1320, and exits the housing air outlet 1242 in a generally rearward direction into the suction motor housing inlet end 1212.

[00233] In the illustrated example, the suction motor 1200 is generally horizontally oriented, such that the suction motor axis of rotation 1205 is generally horizontal (e.g., ±20°, ±15°, ±10°, or ±5° from horizontal) when the hand vacuum cleaner is positioned with the upper end above the lower end (as illustrated in Figure 10). In this arrangement, the suction motor axis 1205 is generally parallel to the cyclone axis 1115 and the pre-motor filter axis 1325.

[00234] In the example configuration illustrated in Figure 10, an inlet end 1202 of the suction motor 1200 faces towards a hollow interior of the pre-motor filter. In such a configuration, air may travel generally linearly from the pre-motor filter 1320 to the suction motor 1200. An absence of air flow direction changes between an air outlet of the pre-motor filter and the suction motor may reduce backpressure and/or air flow losses through this portion of the hand vacuum cleaner.

[00235] Also, positioning the suction motor at an upper end of a handle of the vacuum cleaner with the suction motor axis vertically displaced from the cyclone axis of rotation may facilitate the reduction of air flow conduit bends and/or air flow direction changes between a dirty air inlet and a clean air outlet, thereby reducing backpressure and/or air flow losses through the hand vacuum cleaner. Additionally, or alternatively, such a configuration may help provide a compact overall design of the hand vacuum cleaner without adversely affecting the hand feel and/or perceived balance of the hand vacuum.

[00236] It will be appreciated that the air may exit the hand vacuum cleaner via a grill located in an upper portion of the main body (e.g., via an air outlet provided in the rear end of the main body or a sidewall adjacent the rear end). Alternately, air may exit through a lower portion of the main body. This may be achieved by conveying the air downwardly through the handle of the hand vacuum cleaner. Accordingly, as exemplified, at least a portion of the air flow path between the dirty air inlet 1030 and the clean air outlet 1040 may flow through the handle 1020. This may help facilitate a variety of different air flow path configurations and clean air outlet 1040 locations. This may also allow at least some of the air being exhausted by the suction motor 1200 to flow over, and optionally help cool, operating components that are located in the handle. Examples of such components may include controllers, circuit boards, other internal electronics and the like. One example of such electronics can include a printed circuit board (PCB) provided to control optional information display device 1070 and/or power switch 1060.

[00237] In the illustrated embodiment, a handle air flow passage 1250 has an inlet end 1252 that is located toward the top 1022 of the handle downstream from the suction motor 1200, and an outlet end 1254 that is located toward the bottom 1024 of the handle. This may help channel the air through substantially the entire length of the hand grip portion 1026 of the handle 1020.

[00238] As exemplified, the air exhausted from the suction motor 1200 is routed through the handle, and the clean air outlet 1040 is provided in the form of a plurality of slots 1430 that are formed in the lower end 1024 of the handle. Air entering the inlet end 1252 is directed through the handle 1020 and exits via the slots 1430. In this example, the slots or grill 1430 are oriented such that air exiting the clear air outlet 1040 travels generally downwardly and rearwardly from the lower end 1024 of the handle 1020. It will be appreciated that the clean air outlet may be of any design and may be located anywhere in the lower portion of the hand vacuum cleaner.

[00239] Optionally, one or more post-motor filters may be placed in the air flow path between the suction motor 1200 and the clean air outlet 1040. The post-motor filter may be provided at the clean air outlet 1040. The post motor filter may be in an openable housing. For example, as exemplified, the clean air outlet 1040 may be an openable grill. Further, the openable access panel may support the post-motor filter. For example, in the embodiment of Figures 1 to 34, a post-motor filter 1420 is supported by a removable tray 1410 that covers the lower end of the post-motor filter housing 1400 and provides the clean air outlet 1040 in the form of a grill. The illustrated post-motor filter 1420 is a physical foam media filter, but optionally the post-motor filters may be any suitable type of filter and may include one or more of foam filters, felt filters, HEPA filters, other physical filter media, electrostatic filters, and the like.

[00240] With references to Figures 23-27, removable tray 1410 includes a pair of rigid engaging projections 1440 provided on a front end 1412, and a pair of movable engaging projections 1450 extending upwardly from a rear end 1414 and resiliently biased towards the rear end. To separate the tray from the main body 1010, actuating (e.g. depressing) button 1460 results in forward movement of the movable engaging projections 1450, resulting in their disengagement from corresponding recesses 1455 in the main body, allowing the rearward end 1414 of tray 1410 to be pivoted downwardly from handle 1020. Once tray 1410 has

been so pivoted, it may be translated rearwardly to remove engaging projections 1440 from corresponding recesses 1445 in the main body. To connect the tray 1410 to the main body 1010, the process may be generally reversed. That is, projections 1440 may be inserted into recesses 1445, and tray 1410 subsequently pivoted upwardly until engaging projections 1450 are secured in recesses 1455. It will be appreciated that any other constructions may be used to removably secure tray 1410 in position on the main body.

[00241] While the figures exemplify positioning the pre-motor filter and suction motor vertically spaced above the cyclone axis, it will be appreciated that the pre-motor filter and suction motor vertically spaced below the cyclone axis.

Removable pre-motor filter assembly

[00242] The following is a description of different features of a removable pre-motor filter assembly for a surface cleaning apparatus. These features may be used by themselves in any surface cleaning apparatus or in any combination or sub-combination with any other feature or features described herein. For example, any of the pre-motor filter configurations described herein may be used with any of the air flow paths, relative positioning of the suction motor and energy storage members, inclined battery packs, battery pack configurations, airflow cooling configurations, and other features described herein.

[00243] In accordance with this feature, the outlet conduit of the filter assembly may be inclined at an angle to the removal direction of the pre-motor filter assembly with the upper (or outermost portion of the outlet conduit in the removal direction) extending further in the downstream direction than the lower (or innermost portion of the outlet conduit in the removal direction). The mating downstream conduit may be similarly oriented. An advantage of this configuration is that the downstream face of the pre-motor filter assembly (which may have a sealing gasket) may be placed on the upstream face of the downstream conduit

(which may have a sealing gasket) instead of one face sliding across the other, which could damage one or both gaskets.

[00244] In accordance with this feature, as exemplified, the pre-motor filter 1320 of the hand vacuum cleaner 1000 is optionally part of a removable pre-motor filter assembly 1300. Figures 19 to 22 exemplify one embodiment of a removable pre-motor filter assembly 1300 that includes a generally cylindrical filter 1320 supported by a filter support member 1340. Filter support member 1340 has an outlet conduit 1342 for directing an air flow after it has passed through the filter 1320. In use, air flows from an outer or upstream side 1322 of the filter 1320, through the filter media and to an inner or downstream side 1324 of the filter 1320, and to the outlet conduit 1342.

[00245] Optionally, the outlet conduit 1342 generally faces an inlet end 1202 of suction motor 1200. Therefore, as exemplified, the filter support member 1340 may be generally horizontally oriented so that the pre-motor filter axis 1325 extends in a generally forwards/rearwards direction (from front end 1321 to rear end 1323 of the pre-motor filter assembly) when the hand vacuum cleaner 1000 is oriented with the upper end above the lower end, and the outlet conduit 1342 faces generally rearwardly, and optionally directly faces an inlet end 1202 of suction motor 1200. From the outlet conduit 1342, a treated air conduit 1246 directs the airflow rearwards to an inlet end 1202 of suction motor 1200 that is horizontally spaced from the pre-motor filter 1320.

[00246] As illustrated in Figures 19 to 22, filter support member 1340 has a main body portion 1350 that is located in a hollow interior of the generally cylindrical filter 1320. In the illustrated embodiment, an outer surface of main body portion 1350 is flush with a downstream or inner surface 1324 of filter 1320, and the downstream surface 1324 is in air flow communication with an internal filter conduit 1356. More specifically, in the illustrated example a plurality of apertures 1351 define a porous portion of the filter support member 1340 between a first end 1352 and a second end 1354 of the main body portion 1350.

It will be appreciated that more or fewer apertures may be provided in alternative embodiments. Accordingly, if filter 1320 is sealed to or seats securely on body portion 1350, air will be inhibited from travelling between the outer surface of main body portion 1350 and the inner surface 1324 of filter 1320 to thereby bypass the filter media.

[00247] The outlet conduit 1342 extends from the second end 1354 of the main body portion 1350. The second or opposed end 1352 of the main body portion 1350 may be sealed to or may seat securely on the second end 1354 of the main body portion 1350 to inhibit and preferably prevent air from exiting the internal filter conduit 1356 from the second end, so that substantially and preferably all of the air that exits the downstream side 1324 of the pre-motor filter 1320 is directed through outlet conduit 1342.

[00248] In order to inhibit or prevent air exiting through the front end of the internal filter conduit 1356, the front end of the main body portion 1350 may be closed. As exemplified, an end wall 1362 is provided to cap the opposed end 1352 of the main body portion 1350. Optionally, end wall 1362 has an outwardly projecting portion 1363 to facilitate positioning the pre-motor filter assembly 1300 in a surface cleaning apparatus, as discussed further below.

[00249] Optionally, flanges or other sealing members may be provided at one or both ends of the main body portion 1350 to inhibit or prevent airflow from flowing between pre-motor filter 1320 and filter support member 1340 and to the internal filter conduit 1356, e.g. effectively bypassing the pre-motor filter. In the illustrated example, a circumferential bypass flange 1358 is provided at the second end 1354 of the main body portion 1350.

[00250] The pre-motor filter assembly may be seated in position in the pre-motor filter housing by any means known in the art. As exemplified, one or more alignment or seating members may be provided on one or both of the front and rear ends 1321, 1323 of the pre-motor filter assembly.

[00251] In the illustrated example, a pair of alignment flanges 1370 extend from an axially longer (outermost) side of outlet conduit 1342. Flanges 1370 may facilitate in the seating and/or alignment of pre-motor filter assembly 1300 within a pre-motor filter chamber. For example, in the illustrated example the flanges 1370 may be configured to act as camming surfaces with one or more projections from an internal surface of the openable door 1330 of the pre-motor filter chamber. As shown in Figure 18, openable door 1330 has an inwardly extending projection 1338 that has a width approximately equal to a radial distance between flanges 1370. In this arrangement, as openable door 1330 is closed, projection 1338 is configured to come into contact with both flanges 1370, thereby promoting a predetermined orientation of pre-motor filter assembly 1300 relative to the pre-motor filter housing 1310 as well as locating the outlet conduit to be aligned with the downstream air flow conduit.

[00252] Additionally, or alternatively, flanges 1370 may allow a user to grip and/or manipulate pre-motor filter assembly 1300 without having to come into contact with pre-motor filter 1320, which may become dirty during use.

[00253] Optionally, one or more support projections may be provided on one or both ends of pre-motor filter assembly 1300. In the illustrated example, a pair of support flanges 1372 extend from opposite lateral sides of outlet conduit 1342. Flanges 1372 may facilitate the support and/or alignment of pre-motor filter assembly 1300 within a pre-motor filter chamber. For example, in the illustrated example the flanges 1372 may be configured to rest on corresponding support surfaces provided at the rearward end of the pre-motor filter chamber. As shown in Figures 15-17, surfaces 1313 are formed in end wall 1344 of the pre-motor filter chamber 1310. Also, a surface 1311 is formed in the opposing end wall 1312. In this arrangement, as pre-motor filter assembly 1300 is lowered into the pre-motor filter chamber 1310, surfaces 1313 are configured to come into contact with and support flanges 1372, and surface 1311 is configured to come into contact with and support outwardly projecting portion 1363 of filter support

member 1340, thereby promoting a predetermined vertical position and/or angle of pre-motor filter assembly 1300 relative to the pre-motor filter housing 1310.

[00254] In the illustrated embodiment, filter support member 1340 (including outlet conduit 1342, main body portion 1350, and end wall 1362) is a one piece assembly (e.g. integrally formed). In alternative embodiments, filter support member 1340 may be constructed from two or more parts.

[00255] While in the illustrated example the pre-motor filter 1320 and the filter support member 1340 are co-axial, this may not be the case in alternative embodiments.

[00256] As illustrated in Figure 22, a downstream or terminal end 1344 of the outlet conduit 1342 is at an angle 1357 to a direction of air flow through the outlet conduit (e.g. generally parallel to a central pre-motor filter axis 1325 and/or a central filter support member axis 1355). Outlet conduit 1342 mates with air conduit 1246, which provides the air outlet 1242 from pre-motor filter chamber 1310. As discussed subsequently, the inlet end of outlet conduit 1342 may be similarly angled.

[00257] An advantage of the terminal end of the outlet conduit being at an angle of to a direction through the outlet conduit is that the removable filter assembly may be positioned substantially flush against a downstream air conduit (e.g. a conduit that leads to a suction motor) having a similarly angled terminal end without requiring lateral movement of the outlet conduit towards other conduit. For example, the filter assembly may be moved in a direction substantially perpendicular to the direction of airflow (e.g., vertically upwardly in the orientation of Figure 11). Such an arrangement may, for example, facilitate the use of a gasket or other sealing member between the ends of the conduits to provide an improved seal between the conduits. For example, if the terminal end of the outlet conduit were perpendicular to a direction of airflow through the conduit, moving the filter assembly in a direction substantially perpendicular to

the direction of airflow may shear or otherwise damage a flexible or otherwise deformable gasket (e.g. an elastomeric gasket or the like) provided at the end of the conduit to which the outlet conduit is to be aligned.

[00258] Alternatively, or additionally, such an arrangement may eliminate the need for a biasing or other retaining mechanism to exert a force on the filter assembly to maintain a seal between the conduits. For example, if the terminal end of the outlet conduit were perpendicular to a direction of airflow through the conduit, to avoid damaging a gasket or other sealing member between the conduit ends, at least the final motion to align the conduit ends may be in a direction parallel to a direction of airflow through the conduit. In such a situation, it may be necessary to maintain the application of an axial force to the pre-motor filter assembly in order to maintain an adequate seal.

[00259] As illustrated in Figures 11 to 17, a terminal end 1241 of the treated air conduit 1246 may also be optionally provided at an angle 1257 (see Figure 11) to a direction of air flow through the treated air conduit 1246 that leads to the suction motor 1200. In the illustrated example, the angle 1257 is about the same as the angle 1357 between the direction of air flow through the outlet conduit 1342 of the pre-motor filter assembly and the terminal end 1344 of the outlet conduit 1342. This arrangement allows the outlet conduit 1342 and the treated air conduit 1246 to cooperatively define a generally linear air flow passage despite the angled terminal ends of the respective conduits.

[00260] Optionally, a gasket 1247 or other sealing member may be provided to help provide a substantially air tight seal between the terminal end 1344 of the outlet conduit 1342 and the terminal end 1241 of the treated air conduit 1246. In the illustrated example, the gasket 1247 has a generally consistent axial length about its perimeter, e.g. to facilitate a seal between the ends 1344, 1241 that are generally parallel to each other due to angles 1357, 1257 being about the same. Alternatively, gasket 1247 may have a variable axial

length about its perimeter, e.g. to facilitate a seal where angles 1357, 1257 are different from each other (e.g. where ends 1344, 1241 are not parallel.

[00261] Another advantage of the terminal end of the outlet conduit and the inlet end of conduit 1246 being at an angle to a direction through the outlet conduit is that the outlet face of the pre-motor filter assembly may be placed onto the inlet or upstream face of conduit 1246 during insertion of the pre-motor filter assembly. Further, when door 1330 is placed in the closed position, the engagement of inwardly extending projection 1338 and flanges 1370 may apply sufficient pressure to seal the end face and inhibit leakage out of the air flow conduits.

[00262] Another advantage of the terminal end of the outlet conduit being at an angle of to a direction through the outlet conduit is that the removable filter assembly may only be positionable within the surface cleaning apparatus in a single pre-determined orientation. In other words, a user may only be able to mount to the pre-motor filter assembly in a single orientation relative to the surface cleaning apparatus. This may prevent, for example, the pre-motor filter from being installed e.g. upside-down from its designed orientation, or otherwise mis-aligned. Accordingly, an asymmetric pre-motor filter media may be provided without the risk of a user improperly positioning the filter within a surface cleaning apparatus.

[00263] It will be appreciated that some of the embodiments disclosed herein may not use any of the features of the pre-motor filter assembly disclosed herein and that, in those embodiments, a pre-motor filter of any kind known in the art may be used, or a pre-motor filter may not be provided.

Inclined battery pack

[00264] The following is a description of different features of a hand vacuum cleaner with an inclined battery pack. These features may be used by

themselves in any surface cleaning apparatus or in any combination or sub-combination with any other feature or features described herein. For example, any of the battery pack configurations described herein may be used with any of the air flow paths, pre-motor filter assemblies, relative positioning of the suction motor and energy storage members, battery pack configurations, airflow cooling configurations, and other features described herein.

[00265] In accordance with this feature, an upper end of the battery pack may be inclined in a forward direction. Accordingly, the lower end of the battery pack may extend further rearwardly. If the dirt collection region is located adjacent a forward face of the battery pack, then the dirt collection region may extend further rearwardly, thereby enabling a larger dirt collection region to be provided.

[00266] It will be appreciated that, in many embodiments, power may be supplied to the hand vacuum cleaner 1000 by an electrical cord connected to the hand vacuum (not shown) that can be connected to a standard wall electrical outlet. In such embodiments, the suction motor 1200 and other electronics may run on AC power supplied from a wall socket. In accordance with this feature, alternatively, or in addition to being powered by an electrical cord, the hand vacuum cleaner may include one or more onboard power sources. The power sources may be any suitable device, including, for example one or more batteries. Optionally, the batteries and battery packs may be rechargeable or may be replaceable, non-rechargeable batteries.

[00267] Battery pack 1500 may include any suitable number of cells 1510, and may include, for example, lithium ion battery cells. Any number of cells may be used to create a power source having a desired voltage and current, and any type of battery may be used, including NiMH, alkaline, and the like. Battery pack 1500 may be of any known design and may be electrically connected to the hand vacuum cleaner by any means known in the art.

[00268] Figures 32 to 34 exemplify a battery pack 1500. As exemplified, battery pack 1500 has an upper end 1506, a lower end 1508, a front face 1502, and a rear face 1504. In the illustrated example, battery pack 1500 is generally rectangular, but alternative embodiments may have any suitable shape.

[00269] In the illustrated examples, battery pack 1500 has a power coupling 1540 for supplying power (e.g. charging) the cells 1510. Any suitable power coupling may be used, for example, a female coupling configured to receive a male coupling of an electrical cord that is connectable to a source of AC or DC power, such as a household power socket. Optionally, power coupling 1540 is accessible when the battery pack 1500 is electrically connected to hand vacuum cleaner 1000. An advantage of such a configuration is that the battery pack may be charged without removing it from the hand vacuum cleaner 1000. Another advantage is that it may allow for corded operation of hand vacuum cleaner 1000 when the power cells 1510 are substantially or completely discharged, as power may be supplied to the suction motor via power coupling 1540 instead of (or while) charging the cells 1510.

[00270] Optionally, the battery pack 1500 may be removable from the rest of the hand vacuum using any mechanism known in the art. Referring to Figures 28 and 29, the illustrated example battery pack 1500 is configured to be removable by sliding the battery pack downward through an aperture 1590 (see Figure 31) provided in the lower end 1008 of hand vacuum 1000. Optionally, one or more guiding features may be provided on one or both of the hand vacuum 1000 and the battery pack 1500. As illustrated in Figure 33, a pair of longitudinal ridges 1520 is provided on the front face 1502 of battery pack 1500. Ridges 1520 are configured to be slidably received in corresponding grooves 1525 on an inner face of aperture 1590 (see Figure 29). Ridges 1520 and grooves 1525 thus cooperatively assist in aligning the battery pack as is it moved upwardly into and/or downwardly out of aperture 1590.

[00271] In the illustrated embodiment, the upper end 1506 of the battery pack 1500 is provided with a plurality of electrical connectors 1530 that can inter-engage with compatible electrical connectors 1580 on the main body 1010 (see e.g. Figure 29). Engagement between the electrical connectors 1530 and 1580 can provide an electrical connection between the batteries 1510 and the suction motor 1200, and optionally other electronics, such as display device 1070. In this arrangement, removing the battery pack 1500 interrupts the supply of power to the suction motor 1200, and the suction motor 1200 is not operable when the battery pack 1500 is detached. It will be appreciated that electrical connectors 1530 may be located elsewhere on the battery pack.

[00272] The battery pack 1500 can be secured to the rest of the main body 1010 using any suitable attachment mechanism, including mechanical latches, retention catches, or any other mechanism attachment structure capable of being released to disengage and remove the battery pack. Optionally, one or more actuators for releasing the attachment mechanism may be provided on the main body 1010 (and remain with the main body when the battery pack is removed), or alternatively may be provided on the battery pack 1500 such that the actuator is removable with the battery.

[00273] Referring to Figures 9 and 33, in the illustrated example battery pack 1500 is configured to be releasably secured to hand vacuum 1000 using a single latch at the lower end 1506. The latch can be released by pressing the release actuator that is provided in the form of button 1550. Pressing rearwardly on the button 1550 results in a disengagement of a tab 1552 from a corresponding retaining surface 1523 provided proximate to and facing towards aperture 1590. The button 1550 is mounted to the lower end 1506 of battery pack 1500, and is removable with the battery pack.

[00274] Alternatively, a release actuator may be provided on the main body 1010 of the hand vacuum cleaner, and a corresponding retaining surface may be provided on the battery pack 1500. For example, in the example illustrated in

Figure 36, a retaining surface 1523 is provided on a rear face 1504 of battery pack 1500, and is removable with the battery pack. A release actuator that is provided in the form of button 1550 is positioned on the main body 1010 of hand vacuum 1000. Pressing forwardly on the button 1550 results in a pivoting and disengagement of a tab 1552 from retaining surface 1523.

[00275] Optionally, the battery pack 1500 may be configured so that it can be connected to one or more other devices/apparatuses, in addition to the hand vacuum 1000. For example, the same battery pack 1500 that is used with the hand vacuum could be connectable to another vacuum, power tool, cleaning device (such as a mop, steam cleaner, carpet extractor, etc.) or any other suitable device to power the other device(s) that the battery pack can be connected to.

[00276] Optionally, the battery pack 1500 may have one or more output devices to e.g. provide an indication of a status of the battery pack and/or of one or more of the individual battery cells 1510. For example, one or more visual indicators such as LEDs and/or an audio output device such as a speaker may be provided. In the example illustrated in Figure 32, a number of LEDs 1560 are provided along an edge between a rear face 1504 and a side face of the battery pack 1500. An advantage of positioning the output devices along an edge of the battery pack is that the indicators may be visible from a greater range of relative orientations than if they were positioned on a single face of the battery pack.

[00277] As illustrated in Figure 4, another advantage of positioning the LEDs 1560a-1560c proximate a side edge of a rear face 1504 is that they may be more readily visible to a user holding the hand vacuum cleaner 1000 in front of them. Accordingly, a user may be able to see the LEDs 1560a-1560c while using the hand vacuum without having to re-orient the hand vacuum cleaner from a typical in-use position.

[00278] As discussed above, battery pack 1500 may include any suitable number of individual battery cells 1510. In example illustrated in Figure 34, battery pack 1500 contains 7 cells 1510a-1510g. Each cell 1510 is generally cylindrical, and the cells are arranged in a generally linear configuration (in a column) along the height of battery pack 1500. More specifically, cells 1510a to 1510f are arranged with their central longitudinal axes positioned along a battery pack axis 1505 that in the illustrated example is parallel to a front wall 1501 of the battery pack 1500, and cell 1510g is positioned with its central longitudinal axis offset rearwardly from axis 1505.

[00279] As shown in Figure 10, in the illustrated example battery pack 1500 extends upwardly and forwardly when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner. For example, battery pack axis 1505 is at an angle 1507 to the horizontal when the inlet conduit axis 1035, cyclone axis 1115, filter axis 1325, and/or suction motor axis 1205 is generally horizontally oriented. For example, battery pack axis 1505 may be generally parallel to a handle axis 1025 (see Figure 31).

[00280] Also, in the configuration shown in Figure 10, a portion 1123 of the dirt collection chamber 1122 adjacent the rear end wall 1124 of the chamber 1122 is located below a portion of the battery pack 1500. An advantage of this design (i.e. providing at least some vertical overlap between an energy storage member and a dirt collection region) is that it may help provide a relatively larger dirt chamber capacity while helping to reduce the overall size of the hand vacuum 1000.

[00281] In the illustrated example, the rear end wall 1124 of the dirt collection chamber 1122 is at an angle to the vertical. As shown, rear end wall 1124 is generally parallel to the front wall 1501 of the battery pack 1500 and to the battery pack axis 1505, although in alternative embodiments they may not be parallel.

[00282] Also, when the inlet conduit axis 1035, cyclone axis 1115, filter axis 1325, and/or suction motor axis 1205 is generally horizontally oriented, a lower end of the front face 1502 is positioned rearward of an upper portion of the front face 1502.

[00283] It will be appreciated that the dirt collection region may be of various shapes which occupies some or all of the additional volume created by orienting the battery pack 1500 such that the lower end extends further rearwardly.

[00284] It will be appreciated that some of the embodiments disclosed herein may not use the inclined energy storage members as disclosed herein and that, in those embodiments, any suitable positioning of the energy storage members, if provided, may be used.

Positioning of suction motor and energy storage member

[00285] The following is a description of different features of a hand vacuum cleaner with a suction motor positioned an upper end of a forwardly-inclined handle and rearward of at least some of the energy storage members. These features may be used by themselves in any surface cleaning apparatus or in any combination or sub-combination with any other feature or features described herein. For example, any of the relative positioning of the suction motor and energy storage members described herein may be used with any of the air flow paths, pre-motor filter assemblies, inclined battery packs, battery pack configurations, airflow cooling configurations, and other features described herein.

[00286] In accordance with this feature, the batteries and the suction motor may be positioned so as to reduce the torque experienced by a user operating the hand vacuum cleaner. For example, by positioning a suction motor positioned at or rearward of an upper end of a forwardly-inclined handle and rearward of at

least some of the energy storage members, the weight of the suction motor may partially counterbalance the weight of the batteries.

[00287] As previously discussed, in some embodiments, batteries used to power the hand vacuum cleaner 1000 may be provided at a single location, for example as one large battery pack 1500 that may include any suitable number of cells 1510, and may include, for example, lithium ion battery cells.

[00288] Optionally, a battery pack 1500 may be positioned such that some or all of the battery cells 1510 are positioned forward of a suction motor. In this configuration, the distribution of the weight of the battery pack 1500 and the weight of the suction motor 1200 may affect the hand feel and/or perceived balance of the hand vacuum 1000.

[00289] In the example illustrated in Figure 10, suction motor 1200 is positioned rearward of cells 1510a, 1510b, 1510c, 1510d, and 1510e of battery pack 1500. In the example illustrated in Figure 43, suction motor 1200 is positioned rearward of cells 1510a, 1510b, 1510d, 1510e, and 1510g of battery pack 1500. In the examples illustrated in Figures 36, 40, and 47, all of cells 1510a-1510f are positioned forward of the suction motor 1200.

[00290] Suction motor 1200 is preferably positioned at the upper end of a forwardly inclined handle 1020, as shown in the illustrated embodiments, although it may alternatively be positioned rearward of the upper end of the handle or at the lower end or at a mid-point of a handle. Additionally, or alternatively, the handle 1020 may be generally vertical or may be rearwardly inclined.

[00291] Optionally, a battery pack 1500 may be positioned such that a volume defined by the battery cells 1510 is positioned such that an axis of rotation 1115 of a cyclone chamber 1110 may intersect such a volume when the battery pack is secured to the main body 1010. For example, the cyclone chamber 1110 may be oriented horizontally, and the battery pack 1500 may be

positioned rearward of the cyclone chamber. An advantage of such a configuration is that it may facilitate a more compact design of hand vacuum 1000.

[00292] It will be appreciated that some of the embodiments disclosed herein may not use the relative positioning of the suction motor, handle, and energy storage members as disclosed herein and that, in those embodiments, any suitable design may be used.

Nested energy storage members

[00293] The following is a description of different features of a hand vacuum cleaner having an energy storage member (e.g. a battery pack that includes one or more battery cells) that is positioned rearward of a dirt collection region and at least partially underlies at least a portion of one or both of a cyclone chamber and a pre-motor filter. These features may be used by themselves in any surface cleaning apparatus or in any combination or sub-combination with any other feature or features described herein. For example, any of the battery pack configurations described herein may be used with any of the air flow paths, pre-motor filter assemblies, relative positioning of the suction motor and energy storage members, inclined battery packs, airflow cooling configurations, and other features described herein.

[00294] In accordance with this feature, the some or all of a battery pack may be located beneath some or all of a cyclone chamber and/or a pre-motor filter. For example, the dirt collection region may be configured to enable the battery pack to nest or partially nest therein. Accordingly, the overall length of the hand vacuum cleaner (in the forward/rearward direction) may be reduced, thereby providing a more compact hand vacuum cleaner.

[00295] As previously discussed, in some embodiments, batteries used to power the hand vacuum cleaner 1000 may be provided at a single location, for

example as one large battery pack 1500 that may include any suitable number of cells 1510, and may include, for example, lithium ion battery cells.

[00296] Optionally, a battery pack 1500 may be positioned such that at least a portion of the battery pack 1500 is nested vertically spaced from a dirt collection region 1122. For example, at least a portion of the battery pack 1500 may underlie at least a portion of one or both of a cyclone chamber 1110 and a pre-motor filter 1320. In such a configuration, the overall size or length of the hand vacuum 1000 may be reduced.

[00297] For example, as illustrated in the embodiment of Figures 36 and 40, as well as the embodiment of Figure 43, a battery pack 1500 is positioned rearward of a dirt collection region 1122, and the entire battery pack 1500 is below a rearward portion of a pre-motor filter 1320.

[00298] In the example illustrated in Figures 47, a battery pack 1500 is positioned rearward of a dirt collection region 1122, and below a rearward portion of the cyclone chamber and below the pre-motor filter.

[00299] As discussed previously, battery pack 1500 may include any suitable number of individual battery cells, and the individual cells may be arranged in any suitable configuration. For example, some of the energy storage members (i.e. individual battery cells 1510) may be arranged one above another and some may be arranged one behind another, e.g. within a single battery pack 1500. For example, the energy storage members within a battery pack may be arranged in at least two columns in the forward/rearward direction. Accordingly, the battery pack may have a reduced height so as to assist in nesting the battery pack under a pre-motor filter and/or a cyclone chamber. An advantage of such configurations is that they may help provide a compact overall design without adversely affecting the hand feel and/or perceived balance of the hand vacuum.

[00300] As illustrated in Figure 47, cells 1510a-1510g are arranged generally in two linear columns of cells. Specifically, cells 1510a, 1510c, 1510e,

and 1510g are arranged in a first generally vertical column along a column axis 1505a that in the illustrated example is adjacent and generally parallel to a front wall 1501 of the battery pack 1500, and cells 1510b, 1510d, and 1510f are arranged in a second generally vertical column along a column axis 1505b that in the illustrated example is adjacent and generally parallel to a rear wall 1503 of the battery pack 1500.

[00301] As illustrated in Figure 43, cells 1510a-1510g are arranged generally in three linear columns of cells. Specifically, cells 1510b and 1510e are arranged in a first generally vertical column along a column axis 1505a that in the illustrated example is adjacent and generally parallel to a front wall of the battery pack 1500, cells 1510a, 1510d, and 1510g are arranged in a second generally vertical column along a column axis 1505b positioned rearward of and generally parallel to column axis 1505a, and cells 1510c and 1510f are arranged in a third generally vertical column along a column axis 1505c positioned rearward of and generally parallel to column axis 1505b.

[00302] It will be appreciated that some of the embodiments disclosed herein may not use the nested energy storage members as disclosed herein and that, in those embodiments, any suitable positioning of the energy storage members, if provided, may be used.

Airflow cooling of an energy storage chamber

[00303] The following is a description of different features of a hand vacuum cleaner having an airflow path in which air exiting a cyclone chamber impinges on a wall of an energy storage chamber. These features may be used by themselves in any surface cleaning apparatus or in any combination or sub-combination with any other feature or features described herein. For example, any of the airflow configurations described herein may be used with any of the air flow paths, pre-motor filter assemblies, relative positioning of the suction motor

and energy storage members, inclined battery packs, battery pack configurations, and other features described herein.

[00304] Optionally, at least a portion of an air flow path between the dirty air inlet 1030 and the clean air outlet 1040 may be directed against a wall of an energy storage chamber. For example, a cyclone air outlet may face a wall of an energy storage chamber, whereby air exiting the cyclone chamber impinges on the energy storage chamber wall. In such a configuration, an airflow generated by suction motor 1200 flowing against and/or over such a wall may help cool one or more energy storage members positioned within the energy storage chamber. For example, energy storage members may include chemical batteries, such as lithium-ion batteries, that produce heat while being discharged (e.g. while supplying power to the hand vacuum 1000). By directing a stream of air directly at, or at an angle to, a wall of a battery chamber, any boundary layer of air (which may act as an insulator) or laminar flow along a wall of a battery chamber is disrupted, thereby enabling enhanced cooling.

[00305] It will be appreciated that the battery pack may be provided in a chamber that receives a battery pack. Accordingly, there may be two walls between the impinging air stream and the batteries, i.e., a wall of the battery pack and a wall of the chamber in which the batter pack is received. Provided the walls contact each other or are adjacent, the impinging air stream will provide a cooling effect.

[00306] For example, in the examples illustrated in Figures 36 and 40, cyclone air outlet 1130 faces a rear wall 1236 of the upflow duct or conduit 1230 that directs air upwardly towards a pre-motor filter 1320. In these embodiments, rear wall 1236 is also a front wall of a recess in which battery pack 1500 is positioned. That is, rear wall 1236 is a wall of an energy storage chamber in which one or more energy storage members (e.g. individual cells 1510 and/or a battery pack 1500 containing a plurality of cells 1510) are positioned.

[00307] It will be appreciated that some of the embodiments disclosed herein may not use the airflow cooling of an energy storage member as disclosed herein and that, in those embodiments, any suitable airflow design may be used.

[00308] As used herein, the wording "and/or" is intended to represent an inclusive - or. That is, "X and/or Y" is intended to mean X or Y or both, for example. As a further example, "X, Y, and/or Z" is intended to mean X or Y or Z or any combination thereof.

[00309] While the above description describes features of example embodiments, it will be appreciated that some features and/or functions of the described embodiments are susceptible to modification without departing from the spirit and principles of operation of the described embodiments. For example, the various characteristics which are described by means of the represented embodiments or examples may be selectively combined with each other. Accordingly, what has been described above is intended to be illustrative of the claimed concept and non-limiting. It will be understood by persons skilled in the art that other variants and modifications may be made without departing from the scope of the invention as defined in the claims appended hereto. The scope of the claims should not be limited by the preferred embodiments and examples, but should be given the broadest interpretation consistent with the description as a whole.

Amendments to the Specification:

A substitute specification is submitted herein for consideration by the Office. The substitute specification includes no new matter.

The substitute specification includes the following insertions and deletions. Insertions are shown underlined while deletions are ~~struck through~~ or [[double bracketed]].

On page 33 of the specification as filed, please replace paragraph [00198] as follows:

[00198] In alternative embodiments, the cyclone assembly may include two or more cyclonic cleaning stages arranged in series with each other. Each cyclonic cleaning stage may include one or more cyclone chambers (arranged in parallel or series with each other) and one or more dirt collection chambers, of any suitable configuration. The dirt collection chamber or chambers may be external to the cyclone chambers, or may be internal the cyclone chamber and configured as a dirt collection area or region within the cyclone chamber. For example, in the embodiments exemplified in Figures 42 to 45 and 46 to 50, a second cyclonic cleaning stage is provided in series in what may be characterized as a 'nested' configuration. As exemplified in Figure 43, after traveling generally axially though the cyclone chamber 1110 from the front end wall 1160 toward the rear end wall 1170, air exits cyclone chamber 1110 and enters a secondary cyclone chamber. A secondary dirt collection chamber 1121 is positioned exterior to the secondary cyclone chamber and is in communication with a dirt outlet 1141 to receive dirt and debris dis-entrained from a dirty air flow by the secondary cyclone chamber. In the embodiment exemplified in Figures 42 to 45, air exiting the secondary cyclone chamber travels generally rearwardly and enters a pre-motor chamber 1318 via air inlet 1234. In the embodiment exemplified in Figures 46 to 50, the secondary cyclone air outlet faces a rear wall 1236 of the upflow duct or conduit 1230 that directs air upwardly towards a pre-motor filter 1320. Alternatively, the air treatment member need not

include a cyclonic cleaning stage, and can incorporate a bag, a porous physical filter media (such as foam or felt), or other air treating means.

Attachment: marked-up and clean copies of the specification

Bereskin & Parr
INTELLECTUAL PROPERTY LAW

Appl. No	:	15/642,781	Confirmation No.: 5834
Applicant	:	Omachron Intellectual Property Inc.	
Filed	:	July 6, 2017	
Title	:	HANDHELD SUFACE CLEANING APPARATUS	
TC./A.U.	:	3723	
Examiner	:	N/A	
Docket No.	:	10452-P52585US00	
Customer No.	:	01059	

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

September 13, 2017

PRELIMINARY AMENDMENT

Sir:

Please amend the specification as follows:

Amendments to the Specification begin on page 2 of this paper.

Amendments to the Drawings begin on page 4 of this paper.

Remarks/Arguments begin on page 5 of this paper.

An **Appendix** including marked-up and clean copies of the substitute specification follows page 3.

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Amendments to the drawings

The attached sheets of drawings include changes to Figs. 1-50. These sheets, which include Figs. 1-50, replace the original sheets including Figs. 1-50.

Attachment: Replacement Sheets

REMARKS/ARGUMENTS

This Preliminary Amendment is submitted subsequent to the filing date of July 6, 2017 and prior to issuance of the substantive Office Action on the merits. Accordingly, this Preliminary Amendment is timely filed.

The Applicant encloses herewith a set of replacement drawings in compliance with the United States Patent and Trademark Office requirements. The Applicant submits that the formal drawings enclosed herewith are of reasonable quality such that all details in the drawings are reproducible in black and white in the printed publication. Each view of the drawings is numbered in consecutive Arabic numerals and in orderly manner. Accordingly, it is respectfully submitted that the drawings as submitted herewith comply with 37 CFR 1.84 and 37 CFR 1.121(d). The Applicant respectfully submits that no new matter has been added by the means of this amendment. Please replace the drawings as filed with the enclosed replacement sheets of drawings.

The Applicant also submits herewith an amendment to paragraph [00198] of the specification as filed. It is respectfully submitted that a substitute specification submitted herewith is presented in a form having sufficient clarity, acceptable margins, consecutive paragraph numbers and legible writing which permits direct reproduction. The location and text of the replacement paragraph is unambiguously identified. Accordingly, it is respectfully submitted that the specification as submitted herewith complies with 37 CFR 1.52., 1.121(b)(3) and 1.125. The Applicant respectfully submits that no new matter has been added by the means of this amendment. Accordingly, the Applicant respectfully requests that the specification as filed be replaced with the enclosed substitute specification.

The Applicant respectfully submits that a substitute specification contains a brief description of all views of the drawings as required by 37 CFR 1.74 and 37 CFR 1.77(b)(9).

Favourable consideration of the application is respectfully requested.

Respectfully submitted,

BERESKIN & PARR LLP/
S.E.N.C.R.L., s.r.l.

P. Mendes da Costa

By _____
Philip C. Mendes da Costa
Reg. No. 33,106
Tel: 416-957-1695

Electronic Acknowledgement Receipt	
EFS ID:	30794010
Application Number:	15642781
International Application Number:	
Confirmation Number:	5834
Title of Invention:	HANDHELD SURFACE CLEANING APPARATUS
First Named Inventor/Applicant Name:	Wayne Ernest Conrad
Customer Number:	1059
Filer:	Philip C. Mendes da Costa/Nakita D'souza
Filer Authorized By:	Philip C. Mendes da Costa
Attorney Docket Number:	10452-P52585US00
Receipt Date:	30-OCT-2017
Filing Date:	06-JUL-2017
Time Stamp:	11:02:02
Application Type:	Utility under 35 USC 111(a)

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Submitted with Payment	no

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New Applications Under 35 U.S.C. 111

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

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

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

New International Application Filed with the USPTO as a Receiving Office

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

Electronic Acknowledgement Receipt	
EFS ID:	30794185
Application Number:	15642781
International Application Number:	
Confirmation Number:	5834
Title of Invention:	HANDHELD SURFACE CLEANING APPARATUS
First Named Inventor/Applicant Name:	Wayne Ernest Conrad
Customer Number:	1059
Filer:	Philip C. Mendes da Costa/Nakita D'souza
Filer Authorized By:	Philip C. Mendes da Costa
Attorney Docket Number:	10452-P52585US00
Receipt Date:	30-OCT-2017
Filing Date:	06-JUL-2017
Time Stamp:	11:12:03
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

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37	Non Patent Literature	NPL1_KR1020050054551A_ENG.pdf	136781 b2c5dbc5d8e2b4dac45bd55e69d3cb0cb93a156f	no	11
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39	Non Patent Literature	NPL3_KR1020040088978A_ENG.pdf	111634 a8d26953a119cf0fbb49441d482b5f5b6bfd21de	no	9
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41	Non Patent Literature	NPL5_KR20020085478A_EN.pdf	119946 31d4ee8f685a8d8f68a059d5d6b80658dce43898	no	8
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44	Non Patent Literature	NPL8_KR1020010024752A_ENG.pdf	93823 9d3922c6a7b6e7db9e580d94aebf743d54c4e064	no	7
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46	Non Patent Literature	NPL10_DE202010018085U1_ENG.pdf	157785 ef24e17695fdb1f6a658753902e8c52b0fb661ca	no	19
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47	Non Patent Literature	NPL11_DE202010018084U1_ENG.pdf	157349 72d98560c4357b91140501702c585a80550310d1	no	19
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48	Non Patent Literature	NPL12_DE202010018047UI_ENG.pdf	156931 c9679a44914b1a4f6e783e27e4f3f1b6b34e7370	no	19
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50	Non Patent Literature	NPL14_DE112010001135T5_ENG.pdf	111309 90806b9cba05b963f4cea7caa0443f562c422dc9	no	11
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51	Non Patent Literature	NPL15_DE112007003052T5_ENG.pdf	97745 f33d27c69310f96f32ab9a05ad2f3853fc4a5c4f	no	13
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52	Non Patent Literature	NPL16_DE112007003039T5_ENG.pdf	160351 7ecbae12ae0d21a6057af763cc72e7ba72725239	no	22
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53	Non Patent Literature	NPL17_DE102012211246A1_ENG.pdf	129364 ffd0569f5ec5926d4cc8f5c57d593d3a00435527	no	13
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54	Non Patent Literature	NPL18_DE102007011457A1_ENG.pdf	270381 3309eb7ce9858ac2a3ab5e81e67c32771f5c3955	no	42
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55	Non Patent Literature	NPL19_DE102004028677A_ENG.pdf	117798 2cd767afc2dfa31109c6f6cf5e4972b5b5c3e26b	no	8
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56	Non Patent Literature	NPL20_JP2013086228A_ENG.pdf	155028 76f5c1beef95fa8ae7cbb9b5debab9a3d136609d	no	13
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		Total Files Size (in bytes):	29050054		

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

New Applications Under 35 U.S.C. 111

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

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

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

New International Application Filed with the USPTO as a Receiving Office

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

Electronic Acknowledgement Receipt

EFS ID:	30795228
Application Number:	15642781
International Application Number:	
Confirmation Number:	5834
Title of Invention:	HANDHELD SURFACE CLEANING APPARATUS
First Named Inventor/Applicant Name:	Wayne Ernest Conrad
Customer Number:	1059
Filer:	Philip C. Mendes da Costa/Nakita D'souza
Filer Authorized By:	Philip C. Mendes da Costa
Attorney Docket Number:	10452-P52585US00
Receipt Date:	30-OCT-2017
Filing Date:	06-JUL-2017
Time Stamp:	12:07:17
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Foreign Reference	FR32_CA2659212A1.pdf	2109061 0d53a68bed8ef858d874bdc493b47ddcb519ec34	no	57

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2	Foreign Reference	FR33_CA2658014A1.pdf	587874 0539340cf7fa7a0552cb1ec26645b10b4ca12b8b	no	34
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6	Foreign Reference	FR37_CA2620703C.pdf	1013591 743cd08b510b966479e94ebba3cc5f15752d4ffd	no	29
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36	Non Patent Literature	NPL17_KR1020050091837_English.pdf	167256 d5fbf6194020f041d379f445e014d8e3a3fd7d6f	no	13
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43	Foreign Reference	FR1_WO2008009891A1.pdf	306063 8ffa4a754cd2e0fd3b45b9749b181acca31dd7bf	no	17
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This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

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

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

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

New International Application Filed with the USPTO as a Receiving Office

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

Electronic Acknowledgement Receipt

EFS ID:	30794860
Application Number:	15642781
International Application Number:	
Confirmation Number:	5834
Title of Invention:	HANDHELD SURFACE CLEANING APPARATUS
First Named Inventor/Applicant Name:	Wayne Ernest Conrad
Customer Number:	1059
Filer:	Philip C. Mendes da Costa/Nakita D'souza
Filer Authorized By:	Philip C. Mendes da Costa
Attorney Docket Number:	10452-P52585US00
Receipt Date:	30-OCT-2017
Filing Date:	06-JUL-2017
Time Stamp:	11:49:45
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Non Patent Literature	NPL21_JP2011189133A_ENG.pdf	154177 3b256c181161656f2fb7c891484fd181ec3b2815	no	12

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2	Non Patent Literature	NPL22_JP2011189132A_ENG.pdf	155160 62e8c2ba3bddbdb0038fa875fe7ee996c48d4b53	no	12
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3	Non Patent Literature	NPL23_JP2010220632A_ENG.pdf	158959 084cae918cf5d2f19462e6dbfcce42ba284f77b7	no	10
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9	Non Patent Literature	NPL29_JP2006102034A_ENG.pdf	135789 38d8c31b335b123387ffed25c71842793b4bb0b3	no	6
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54	Foreign Reference	FR25_AU2008201597A1.pdf	516394 27d072b5f22e4d13cc2c27ad916cc7c0f3a9abeb	no	33
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New Applications Under 35 U.S.C. 111

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

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

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

New International Application Filed with the USPTO as a Receiving Office

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

Electronic Acknowledgement Receipt

EFS ID:	30795775
Application Number:	15642781
International Application Number:	
Confirmation Number:	5834
Title of Invention:	HANDHELD SURFACE CLEANING APPARATUS
First Named Inventor/Applicant Name:	Wayne Ernest Conrad
Customer Number:	1059
Filer:	Philip C. Mendes da Costa/Nakita D'souza
Filer Authorized By:	Philip C. Mendes da Costa
Attorney Docket Number:	10452-P52585US00
Receipt Date:	30-OCT-2017
Filing Date:	06-JUL-2017
Time Stamp:	12:35:01
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

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New Applications Under 35 U.S.C. 111

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

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

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

New International Application Filed with the USPTO as a Receiving Office

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

Electronic Acknowledgement Receipt

EFS ID:	30795868
Application Number:	15642781
International Application Number:	
Confirmation Number:	5834
Title of Invention:	HANDHELD SURFACE CLEANING APPARATUS
First Named Inventor/Applicant Name:	Wayne Ernest Conrad
Customer Number:	1059
Filer:	Philip C. Mendes da Costa/Nakita D'souza
Filer Authorized By:	Philip C. Mendes da Costa
Attorney Docket Number:	10452-P52585US00
Receipt Date:	30-OCT-2017
Filing Date:	06-JUL-2017
Time Stamp:	12:40:01
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
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3	Foreign Reference	FR28_WO2008035032A2.pdf	638008 f9fdc1334050caceb22f327c7e2888a2a0c1052d	no	17
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New Applications Under 35 U.S.C. 111

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

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

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

New International Application Filed with the USPTO as a Receiving Office

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

Bereskin & Parr
INTELLECTUAL PROPERTY LAW

October 30, 2017

Philip C. Mendes da Costa B.Sc. (Chem. Eng.), LL.B.
416 957 1695 pmdcosta@bereskinparr.com

Our Reference: 10452-P52585US00

INFORMATION DISCLOSURE STATEMENT
UNDER CFR.1.56 and CFR 1.97(b)(3)

The Commissioner of Patents
and Trademarks
Washington, D.C.
U.S.A 20231

Dear Commissioner:

Re: United States Patent Application No. 15/642,781
Title: HANDHELD SURFACE CLEANING APPARATUS
Applicant: Omachron Intellectual Property Inc.
Filed: July 6, 2017

In accordance with 37 CFR 1.97 and 1.98, and in recognition of the duty of disclosure set forth in 37 CFR 1.56, the applicant hereby submits an Information Disclosure Statement including a listing of patents and other publications of which the applicant is aware on PTO form SB08a.

In accordance with the requirements of 1.97(b)(3), this Information Disclosure Statement is filed before the mailing date of a first Office Action on the merits.

The filing of this statement shall not be construed as an admission that the information cited in the attached statement is, or is considered to be, material to patentability (37 CFR 1.97(h)), nor as an admission that it constitutes prior art.

(A) List of References

A list of the patents and other publications of which the applicant is aware is set out in the attached PTO Form SB08a which is attached hereto.

(B) Copies of References

Copies of the foreign and non-patent literature references are enclosed.

Accordingly, the applicant submits that the Information Disclosure Statement is properly considered at this time.

Respectfully submitted,

BERESKIN & PARR LLP/S.E.N.C.R.L., s.r.l.

P. Mendes da Costa

Philip C. Mendes da Costa
Registration No. 33,106
/nd
Encls.

Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (03-15)
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (**Not for submission under 37 CFR 1.99**)		
	Application Number	15642781
	Filing Date	2017-07-06
	First Named Inventor	Wayne Ernest Conrad
	Art Unit	3723
	Examiner Name	N/A
	Attorney Docket Number	10452-P52585US00

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	1	20170290476	A1	2017-10-12	CONRAD	
	2	20170290477	A1	2017-10-12	CONRAD	
	3	20170290478	A1	2017-10-12	CONRAD	
	4	20170290479	A1	2017-10-12	CONRAD	
	5	20170290480	A1	2017-10-12	CONRAD	

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	15642781
	Filing Date	2017-07-06
	First Named Inventor	Wayne Ernest Conrad
	Art Unit	3723
	Examiner Name	N/A
	Attorney Docket Number	10452-P52585US00

	6	20170290481	A1	2017-10-12	CONRAD			

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Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2]	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1	2017046560	WO	A1	2017-03-23	DYSON TECHNOLOGY LTD		
	2	2017046559	WO	A1	2017-03-23	DYSON TECHNOLOGY LTD		
	3	2017046557	WO	A1	2017-03-23	DYSON TECHNOLOGY LTD		
	4	2016173466	WO	A1	2016-11-03	SUZHOU PROVAC TEACHNOLOGY CO., LTD.	English machine translation	X
	5	2016095041	WO	A1	2016-06-23	OMACHRON INTELLECTUAL PROPERTY INC.		☐
	6	2016065151	WO	A1	2016-04-28	TECHTRONICS INDUCTRIES et al.		☐
	7	2015129387	WO	A1	2015-09-03	MITSUBISHI ELECTRIC		☐
	8	2014131105	WO	A1	2014-09-04	G.B.D. CORP.		☐

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	First Named Inventor	Wayne Ernest Conrad
	Art Unit	3723
	Examiner Name	N/A
	Attorney Docket Number	10452-P52585US00

	9	2012117231	WO	A1	2012-09-07	DYSON TECHNOLOGY LTD			☐
	10	2012042240	WO	A1	2012-04-05	DYSON TECHNOLOGY LTD			☐
	11	2011054106	WO	A1	2011-05-12	G.B.D. CORP.			☐
	12	2010147247	WO	A1	2010-12-23	KIM			☐
	13	2010142971	WO	A1	2010-12-16	DYSON TECHNOLOGY LTD			☐
	14	2010142970	WO	A1	2010-12-16	DYSON TECHNOLOGY LTD			☐
	15	2010142969	WO	A1	2010-12-16	DYSON TECHNOLOGY LTD			☐
	16	2010142968	WO	A1	2010-12-16	DYSON TECHNOLOGY LTD			☐
	17	2010102396	WO	A1	2010-09-16	G.B.D. CORP.			☐
	18	2009026709	WO	A1	2009-03-05	GBD CORP.			☐
	19	2008135708	WO	A1	2008-11-13	DYSON TECHNOLOGY LTD			☐

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	15642781
	Filing Date	2017-07-06
	First Named Inventor	Wayne Ernest Conrad
	Art Unit	3723
	Examiner Name	N/A
	Attorney Docket Number	10452-P52585US00

	20	2008088278	WO	A2	2008-07-24	AKTIEBOLAGET ELECTROLUX			☐
	21	2008070975	WO	A1	2008-06-19	GBD CORP.			☐
	22	2008070974	WO	A1	2008-06-19	GBD CORP.			☐
	23	2008070973	WO	A1	2008-06-19	GBD CORP et al.			☐
	24	2008070972	WO	A1	2008-06-19	GBD CORP.			☐
	25	2008070971	WO	A1	2008-06-19	GBD CORP.			☐
	26	2008070970	WO	A1	2008-06-19	GBD CORP.			☐
	27	2008070969	WO	A1	2008-06-19	GBD CORP.			☐
	28	2008035032	WO	A2	2008-03-27	DYSON TECHNOLOGY LTD			☐
	29	2008035032	WO	A3	2008-06-12	DYSON TECHNOLOGY LTD			☐
	30	9843721	WO	A1	1998-10-08	KONINKL PHILIPS ELECTRONICS NV			☐

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	Application Number	15642781
	Filing Date	2017-07-06
	First Named Inventor	Wayne Ernest Conrad
	Art Unit	3723
	Examiner Name	N/A
	Attorney Docket Number	10452-P52585US00

	31	9809121	WO	A1	1998-03-05	CHYDROFUSER TECHNOLOGIES, INC.		☐
	32	9720492	WO	A1	1997-06-12	ELECTROLUC et al.		☐
	33	9627446	WO	A1	1996-09-12	NOTETRY LTD		☐
	34	8002561	WO	A1	1980-11-27	TEIJIN	English machine translation	☒
	35							☐

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NON-PATENT LITERATURE DOCUMENTS Remove

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T5
	1	English machine translation of WO2016173466A1 published on November 3, 2016	
	2	English machine translation of WO2015129387A1 published on September 3, 2015	
	3	English machine translation of WO8002561A1 published on November 27, 1980	
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	Application Number	15642781
	Filing Date	2017-07-06
	First Named Inventor	Wayne Ernest Conrad
	Art Unit	3723
	Examiner Name	N/A
	Attorney Docket Number	10452-P52585US00

EXAMINER SIGNATURE			
Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	15642781
	Filing Date	2017-07-06
	First Named Inventor	Wayne Ernest Conrad
	Art Unit	3723
	Examiner Name	N/A
	Attorney Docket Number	10452-P52585US00

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Philip C. Mendes da Costa/	Date (YYYY-MM-DD)	2017-10-30
Name/Print	Philip C. Mendes da Costa	Registration Number	33,106

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

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

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

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

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

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

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

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

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

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

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

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

Electronic Acknowledgement Receipt	
EFS ID:	30793843
Application Number:	15642781
International Application Number:	
Confirmation Number:	5834
Title of Invention:	HANDHELD SURFACE CLEANING APPARATUS
First Named Inventor/Applicant Name:	Wayne Ernest Conrad
Customer Number:	1059
Filer:	Philip C. Mendes da Costa/Nakita D'souza
Filer Authorized By:	Philip C. Mendes da Costa
Attorney Docket Number:	10452-P52585US00
Receipt Date:	30-OCT-2017
Filing Date:	06-JUL-2017
Time Stamp:	10:51:08
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	P52585US00_IDS_commisssioner_Ltr_20171030.pdf	165659 465b4ad0f72bf96c4548abe91cfbf263f4a8c7cf	no	2

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2	Information Disclosure Statement (IDS) Form (SB08)	P52585US00_IDS_part1_20171030.pdf	1266426 aa42c0aa3cf5bfe1ec2926c8da6118271b224163	no	40
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3	Information Disclosure Statement (IDS) Form (SB08)	P52585US00_IDS_part2_20171030.pdf	1138128 02f9a2a91d9def70659a5caf517be9f065c331c7	no	17
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43	Foreign Reference	FR37_CN1981688A.pdf	1195763 63fe7fd9298fc939e26ab8542b8966ffec2e793e	no	37
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Art Unit	3723
Examiner Name	N/A
Attorney Docket Number	10452-P52585US00

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	Attorney Docket Number	10452-P52585US00

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	15642781
	Filing Date	2017-07-06
	First Named Inventor	Wayne Ernest Conrad
	Art Unit	3723
	Examiner Name	N/A
	Attorney Docket Number	10452-P52585US00

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Philip C. Mendes da Costa/	Date (YYYY-MM-DD)	2017-10-30
Name/Print	Philip C. Mendes da Costa	Registration Number	33,106

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	1	7882593	B2	2011-02-08	Beskow et al.	
	2	7887612	B2	2011-02-15	Conrad	
	3	7922794	B2	2011-04-12	Morphey	
	4	7931716	B2	2011-04-26	Oakham	
	5	7938871	B2	2011-05-10	Lloyd	
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	10	8028373	B2	2011-10-04	Rowntree	
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	40	8945258	B2	2015-02-03	Smith	
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	2	1020050013696	KR	A	2005-02-05	LG ELECTRONICS		
	3	1020040088978	KR	A	2004-10-20	SAMSUNG GWANGJU ELECTRONICS CO. LTD.		
	4	1020040050174	KR	A	2004-06-16	SAMSUNG ELECTRONICS		
	5	1020020085478	KR	A	2002-11-16	LG ELECTRONICS		
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	10	202010018085	DE	U1	2014-02-27	DYSON TECHNOLOGY LTD		
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	13	112012000251	DE	T5	2013-10-17	TECHTRONICS FLOOR CARE TECHOLOGY INC.		
	14	112010001135	DE	T5	2012-08-02	G.B.D. CORP.		
	15	112007003052	DE	T5	2010-01-14	GBD CORP.		
	16	112007003039	DE	T5	2009-10-29	GBD CORP.		
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	20	2013086228	JP	A	2013-05-13	HITACHI KOKI CO LTD	English machine translation	×
	21	2011189133	JP	A	2011-09-29	DYSON TECHNOLOGY LTD	English machine translation	☒
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	23	2010220632	JP	A	2010-10-07	MAKITA CORP	English machine translation	☒
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	26	2009261501	JP	A	2009-11-12	YAMADA ELECTRIC	English machine translation	☒
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	31	2003135335	JP	A	2003-05-13	TOSHIBA INC	English machine translation	☒
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	36	204363891	CN	U	2015-06-03	NINGBO ZHONGJIE HOME APPLIANCES MFG CO LTD	English machine translation	☒
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	42	60116336	DE	T2	2006-08-31	ROYAL APPLIANCE MANUFACTURING	English machine translation	☒
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	49	English machine translation of DE875134C published on April 30, 1953	

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Filing Date	2017-07-06
First Named Inventor	Wayne Ernest Conrad
Art Unit	3723
Examiner Name	N/A
Attorney Docket Number	10452-P52585US00

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OR

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See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Philip C. Mendes da Costa/	Date (YYYY-MM-DD)	2017-10-30
Name/Print	Philip C. Mendes da Costa	Registration Number	33,106

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

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

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

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

PTO/SB/08a (03-15)
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT
(Not for submission under 37 CFR 1.99)

Application Number	15642781
Filing Date	2017-07-06
First Named Inventor	Wayne Ernest Conrad
Art Unit	3723
Examiner Name	N/A
Attorney Docket Number	10452-P52585US00

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	1	20170265696	A1	2017-09-21	CONRAD et al.	
	2	20170215664	A1	2017-08-03	CONRAD et al.	
	3	20170215663	A1	2017-08-03	CONRAD et al.	
	4	20170209007	A1	2017-07-27	CONRAD et al.	
	5	20170196429	A1	2017-07-13	BROWN et al.	

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	6	20170196428	A1	2017-07-13	BROWN et al.	

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	1	2008009891	WO	A1	2008-01-24	DYSON TECHNOLOGY LTD		
	2	2008009890	WO	A1	2008-01-24	DYSON TECHNOLOGY LTD		
	3	2008009888	WO	A1	2008-01-24	DYSON TECHNOLOGY LTD		
	4	2008009883	WO	A1	2008-01-24	DYSON TECHNOLOGY LTD		
	5	2006076363	WO	A2	2006-07-20	ROYAL APPLIANCE MFG. CO.		
	6	2006076363	WO	A3	2006-12-14	ROYAL APPLIANCE MFG. CO.		
	7	2006026414	WO	A3	2007-08-02	EURO-PRO OPERATING, LLC		
	8	2005084511	WO	A1	2005-09-15	BISSELL HOMECAR, INC.		

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	9	2004069021	WO	A1	2004-08-19	AKTIEBOLAGET ELECTROLUX		
	10	2848173	EP	A1	2015-03-18	SAMSUNG ELECTRONICS		
	11	2812531	FR	B1	2004-11-05	SAMSUNG KWANGJU ELECTRONICS CO	English machine translation	X
	12	2581013	EP	A1	2013-04-17	BLACK & DECKER		☐
	13	2508035	GB	A	2014-05-21	DYSON TECHNOLOGY LTD		☐
	14	2508035	GB	B	2015-03-11	DYSON TECHNOLOGY LTD		☐
	15	2466290	GB	B	2012-10-03	DYSON TECHNOLOGY LTD		☐
	16	2465781	GB	A	2010-06-02	DYSON TECHNOLOGY LTD		☐
	17	2465781	GB	B	2012-10-10	DYSON TECHNOLOGY LTD		☐
	18	2441962	GB	B	2011-03-02	DYSON TECHNOLOGY LTD		☐
	19	2440111	GB	A	2008-01-23	DYSON TECHNOLOGY LTD		☐

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	Examiner Name	N/A
	Attorney Docket Number	10452-P52585US00

	20	2365324	GB	B	2002-07-31	SAMSUNG KWANGJU ELECTRONICS CO			☐
	21	2308360	EP	A2	2011-04-13	WAI			☐
	22	2308360	EP	B1	2015-06-24	WAI			☐
	23	2307849	GB	A	1997-06-11	ELECTROLUX			☐
	24	2282979	GB	B	1997-10-08	PAUL JAMES HUYTON			☐
	25	2268875	GB	A	1994-01-26	BISSELL INC			☐
	26	2223644	EP	A2	2010-09-01	BLACK & DECKER			☐
	27	2223644	EP	A3	2013-03-20	BLACK & DECKER			☐
	28	2223644	EP	B1	2014-03-26	BLACK & DECKER			☐
	29	2220986	EP	B1	2014-03-26	BLACK & DECKER			☐
	30	2163703	GB	B	1988-01-27	BONDICO INC			☐

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	31	2035787	GB	B	1982-10-13	L & H DESIGNS LTD et al.		☐
	32	2012641	EP	B1	2010-08-04	SAMSUNG ELECTRONICS		☐
	33	1955631	EP	A1	2008-08-13	BLACK & DECKER		☐
	34	1955631	EP	B1	2010-11-24	BLACK & DECKER		☐
	35	1955630	EP	A3	2009-10-07	BLACK & DECKER		☐
	36	1815777	EP	A1	2007-08-08	TEAM INTERNATIONAL MARKETING	English machine translation	☒
	37	1779761	EP	A2	2007-05-02	SAMSUNG GWANGJU ELECTRONICS CO. LTD.		☐
	38	1677661	EP	B1	2009-01-07	CAPITANI		☐
	39	1436403	GB	A	1976-05-19	MITSUBISHI DEMKI KK		☐
	40	1111074	GB	A	1968-04-24	SIEMENS-ELECTROGERAETE		☐
	41	700791	GB	A	1953-12-09	THE ENGLISH ELECTRIC COMPANY LIMITED		☐

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	42	567297	NZ	A	2009-07-31	BLACK & DECKER		☐
	43	565800	NZ	A	2009-05-31	BLACK & DECKER		☐
	44	0217766	WO	A3	2003-02-13	ROYAL APPLIANCE MFG. CO.		☐
	45	0217766	WO	A2	2002-03-07	ROYAL APPLIANCE MFG. CO.		☐
	46	10681	NL	C	1923-11-17	LEHMANN	English machine translation	☒
	47	0107168	WO	A1	2001-02-01	GBD CORP		☐
	48	0147247	WO	A2	2001-06-28	PHILIPS		☐
	49	2002017766	WO	A3	2002-03-07	ROYAL APPLIANCE MFG. CO.		☐
	50	0147247	WO	A3	2001-11-15	PHILIPS		☐

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	1	English machine translation of NL10681C published on November 17, 1923	
	2	English machine translation of FR2812531B1 published on November 5, 2004	
	3	English machine translation of EP1815777A1 published on August 8, 2007	

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CERTIFICATION STATEMENT

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SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Philip C. Mendes da Costa/	Date (YYYY-MM-DD)	2017-10-30
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	First Named Inventor	Wayne Ernest Conrad
	Art Unit	3723
	Examiner Name	Horton, Andrew Alan
	Attorney Docket Number	10452-P52585US00

U.S.PATENTS						
Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	9962048	B2	2018-05-08	Conrad et al.	
	2	9962047	B2	2018-05-08	Brown et al.	
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Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	20170215664	A1	2017-08-03	CONRAD et al.	
	2	20170215663	A1	2017-08-03	CONRAD et al.	
	3	20170209007	A1	2017-07-27	CONRAD et al.	

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	4	20170196429	A1	2017-07-13	BROWN et al.	
	5	20170196428	A1	2017-07-13	BROWN et al.	
	6	20170196427	A1	2017-07-13	BROWN et al.	
	7	20170196425	A1	2017-07-13	BROWN et al.	
	8	20170196424	A1	2017-07-13	BROWN et al.	
	9	20170196423	A1	2017-07-13	BROWN et al.	
	10	20170196422	A1	2017-07-13	BROWN et al.	
	11	20170196421	A1	2017-07-13	BROWN et al.	
	12	20170196419	A1	2017-07-13	BROWN et al.	
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	1	2017117679	WO	A1	2017-07-13	OMACHRON INTELLECTUAL PROPERTY INC.		☐
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The information provided by you in this form will be subject to the following routine uses:

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

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

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

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

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

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

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

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

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

Bereskin & Parr

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appl. No	:	15/642,781	Confirmation No. 5834
Applicant	:	Omachron Intellectual Property Inc.	
Filed	:	July 6, 2017	
For	:	HANDHELD SURFACE CLEANING APPARATUS	
T.C./A.U.	:	3723	
Examiner	:	Horton, Andrew Alan	
Docket No.	:	10452-P52585US00	
Customer No.	:	01059	

December 12, 2018

Commissioner of Patents
P.O. Box 1450
Alexandria, VA 22313-1450

SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT
Under 37 CFR 1.56 and 37 CFR 1.97(b)(3)

Sir:

In accordance with 37 CFR 1.97 and 1.98, and in recognition of the duty of disclosure set forth in 37 CFR 1.56, the applicant hereby submits a Supplemental Information Disclosure Statement including a listing of patents and other publications of which the applicant is aware on e-PTO form SB/08a.

In accordance with the requirements of 1.97 (b)(3), this Information Disclosure Statement is filed before the mailing of a first substantive Office action on the merits.

(A) List of References

A list of the patents and other publications of which the applicant is aware is set out in the attached e-PTO Form SB08a.

Bereskin & Parr LLP
Scotia Plaza, 40 King Street West, 40th Floor, Toronto, ON M5H 3Y2 Canada
Tel: 416.364.7311 Fax: 416.361.1398 bereskinparr.com

(B) Copies of References

A copy of the foreign reference is enclosed.

The filing of this statement shall not be construed as an admission that the information cited in the attached statement is, or is considered to be, material to patentability (37 CFR 1.97(h)), nor as an admission that it constitutes prior art.

Accordingly, the applicant submits that the Information Disclosure Statement is properly considered at this time.

Respectfully submitted,

December 12, 2018

BERESKIN & PARR LLP/S.E.N.C.R.L., s.r.l.
Agent for the Applicant

/Philip C. Mendes da Costa/

Philip C. Mendes da Costa, Reg. No. 33,106

BERESKIN & PARR LLP/S.E.N.C.R.L., s.r.l.
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Tel: 416-957-1695
Fax: 416-361-1398

Electronic Acknowledgement Receipt	
EFS ID:	34564845
Application Number:	15642781
International Application Number:	
Confirmation Number:	5834
Title of Invention:	HANDHELD SURFACE CLEANING APPARATUS
First Named Inventor/Applicant Name:	Wayne Ernest Conrad
Customer Number:	1059
Filer:	Philip C. Mendes da Costa/Lesley Hunter
Filer Authorized By:	Philip C. Mendes da Costa
Attorney Docket Number:	10452-P52585US00
Receipt Date:	12-DEC-2018
Filing Date:	06-JUL-2017
Time Stamp:	15:25:06
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	P52585US00_Commissioner_2018_12_12.PDF	152075 0a3a8991261581979fdfac4487024dc5eaad54da	no	2
Warnings:					

Information:					
2	Information Disclosure Statement (IDS) Form (SB08)	P52585US00_IDS_2018_12_12 v.pdf	43689 d11a438c45d7065af999f807e2b9bdf11cbe d4ab	no	5
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
3	Foreign Reference	FR1_WO2017117679.PDF	2096811 16ee53510693b2d15c409180fb4500b071d bb31b	no	196
Warnings:					
Information:					
		Total Files Size (in bytes):	2292575		

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

New Applications Under 35 U.S.C. 111

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

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

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

New International Application Filed with the USPTO as a Receiving Office

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

UNITED STATES PATENT AND TRADEMARK OFFICE

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

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
15/642,781	07/06/2017	Wayne Ernest Conrad	10452-P52585US00

CONFIRMATION NO. 5834

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

PUBLICATION NOTICE



Title:HANDHELD SURFACE CLEANING APPARATUS

Publication No.US-2019-0008338-A1
Publication Date:01/10/2019

NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

The publication may be accessed through the USPTO's publically available Searchable Databases via the Internet at www.uspto.gov. The direct link to access the publication is currently http://www.uspto.gov/patft/.

The publication process established by the Office does not provide for mailing a copy of the publication to applicant. A copy of the publication may be obtained from the Office upon payment of the appropriate fee set forth in 37 CFR 1.19(a)(1). Orders for copies of patent application publications are handled by the USPTO's Public Records Division. The Public Records Division can be reached by telephone at (571) 272-3150 or (800) 972-6382, by facsimile at (571) 273-3250, by mail addressed to the United States Patent and Trademark Office, Public Records Division, Alexandria, VA 22313-1450 or via the Internet.

In addition, information on the status of the application, including the mailing date of Office actions and the dates of receipt of correspondence filed in the Office, may also be accessed via the Internet through the Patent Electronic Business Center at www.uspto.gov using the public side of the Patent Application Information and Retrieval (PAIR) system. The direct link to access this status information is currently https://portal.uspto.gov/pair/PublicPair. Prior to publication, such status information is confidential and may only be obtained by applicant using the private side of PAIR.

Further assistance in electronically accessing the publication, or about PAIR, is available by calling the Patent Electronic Business Center at 1-866-217-9197.

Office of Data Managment, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

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PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

To:

BERESKIN & PARR LLP/S.E.N.C.R.L.,S.R.L.
Scotia Plaza
40 King Street West
40th Floor
TORONTO, Ontario
Canada, M5H 3Y2

PCT

NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL SEARCH REPORT AND THE WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY, OR THE DECLARATION

(PCT Rule 44.1)

Date of mailing *(day/month/year)*	02 October 2018 (02-10-2018)
Applicant's or agent's file reference P52585PC00 - 10952	**FOR FURTHER ACTION** See paragraphs 1 and 4 below
International application No. **PCT/CA2018/050782**	International filing date *(day/month/year)* 26 June 2018 (26-06-2018)
Applicant OMACHRON INTELLECTUAL PROPERTY INC.	

dd en f de 2, 2018 FT

1. ☑ The applicant is hereby notified that the international search report and the written opinion of the International Searching Authority have been established and are transmitted herewith.

Filing of amendments and statement under Article 19:
The applicant is entitled, if he so wishes, to amend the claims of the international application (see Rule 46):

When? The time limit for filing such amendments is normally two months from the date of transmittal of the international search report.

How? Directly to the International Bureau of WIPO preferably through ePCT or on paper to, 34 chemin des Colombettes 1211 Geneva 20, Switzerland, Facsimile No.: +41 22 338 82 70

For more detailed instructions, see *PCT Applicant=s Guide*, International Phase, paragraphs 9.004 B 9.011.

2. ☐ The applicant is hereby notified that no international search report will be established and that the declaration under Article 17(2)(a) to that effect and the written opinion of the International Searching Authority are transmitted herewith.

3. ☐ **With regard to any protest** against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:

☐ the protest together with the decision thereon has been transmitted to the International Bureau together with the any request to forward the texts of both the protest and the decision thereon to the designated Offices.

☐ no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. **Reminders**

The applicant may **submit comments on an informal basis on the written opinion of the International Searching Authority** to the International Bureau. These comments will be made available to the public after international publication. The International Bureau will send a copy of such comments to all designated Offices unless an international preliminary examination report has been or is to be established.

Shortly after the expiration of **18 months from the priority date, the international application will be published** by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau before the completion of the technical preparations for international publication (Rules 90*bis*.1 and 90*bis*.3).

Within **19 months** from the priority date, but only in respect of some designated Offices, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase **until 30 months** from the priority date (in some Offices even later); otherwise, the applicant must, **within 20 months** from the priority date, perform the prescribed acts for **entry into the national phase** before those designated Offices. In respect of other designated Offices, the time limit of **30 months** (or later) will apply even if no demand is filed within 19 months. For details about the applicable time limits, Office by Office, see www.wipo.int/pct/en/texts/time_limits.html and the *PCT Applicant's Guide*, National Chapters.

Within **22 months from the priority date, the applicant may request that a supplementary international search be carried out** by a different International Searching Authority that offers this service (Rule 45*bis*.1). The procedure for requesting supplementary international search is described in the *PCT Applicant's Guide*, International Phase, paragraphs 8.006-8.032.

Name and mailing address of the ISA/CA Canadian Intellectual Property Office Place du Portage I, C114 - 1st Floor, Box PCT 50 Victoria Street Gatineau, Quebec K1A 0C9 Facsimile No.: 819-953-2476	Authorized officer Chantal Hébert (819) 639-4268

Form PCT/ISA/220 (July 2017)

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:
BERESKIN & PARR LLP/S.E.N.C.R.L.,S.R.L.
Scotia Plaza
40 King Street West
40th Floor
TORONTO, Ontario
Canada, M5H 3Y2

PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.1)

Date of mailing *(day/month/year)*	2 October 2018 (02-10-2018)
Applicant's or agent's file reference P52585PC00	**FOR FURTHER ACTION** See paragraph 2 below

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/CA2018/050782	26 June 2018 (26-06-2018)	06 July 2017 (06-07-2017)

International Patent Classification (IPC) or both national classification and IPC
IPC: ***A47L 9/16*** (2006.01), ***A47L 5/24*** (2006.01), ***A47L 9/10*** (2006.01)

Applicant
OMACHRON INTELLECTUAL PROPERTY INC.

dd May 6, 2019 NW PT

1. This opinion contains indications relating to the following items:

- [x] Box No. I Basis of the opinion
- [ ] Box No. II Priority
- [ ] Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- [x] Box No. IV Lack of unity of invention
- [x] Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- [ ] Box No. VI Certain documents cited
- [ ] Box No. VII Certain defects in the international application
- [x] Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1*bis*(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA/CA	Date of completion of this opinion	Authorized officer
Canadian Intellectual Property Office Place du Portage I, C114 - 1st Floor, Box PCT 50 Victoria Street Gatineau, Quebec K1A 0C9 Facsimile No.: 001-819-953-2476	02 October 2018 (02-10-2018)	Sean Wilkinson (819) 639-4314

Box No I **Basis of this opinion**

1. With regard to the **language**, this opinion has been established on the basis of:

☑ the international application in the language in which it was filed.

☐ a translation of the international application into which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).

2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43*bis*.1(a))

3. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing:

a. ☐ forming part of the international application as filed:

☐ in the form of an Annex C/ST.25 text file.

☐ on paper or in the form of an image file.

b. ☐ furnished together with the international application under PCT Rule 13*ter*.1(a) for the purposes of international search only in the form of an Annex C/ST.25 text file.

c. ☐ furnished subsequent to the international filing date for the purposes of international search only:

☐ in the form of an Annex C/ST.25 text file (Rule 13*ter*.1(a)).

☐ on paper or in the form of an image file (Rule 13*ter*.1(b) and Administrative Instructions, Section 713).

4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

5. Additional comments:

Box No. IV **Lack of unity of invention**

1. ☐ In response to the invitation (Form PCT/ISA/206) to pay additional fees the applicant has, within the applicable time limit:

   ☐ paid additional fees

   ☐ paid additional fees under protest and, where applicable, the protest fee

   ☐ paid additional fees under protest but the applicable protest fee was not paid

   ☑ not paid additional fees

2. ☐ This Authority found that the requirement of unity of invention is not complied with and chose not to invite the applicant to pay additional fees.

3. This Authority considers that the requirement of unity of invention in accordance with Rules 13.1, 13.2 and 13.3 is

   ☐ complied with.

   ☑ not complied with for the following reasons:

The claims are directed to a plurality of inventive concepts as follows:

Group A - Claims 1-14 are directed to a pre-motor filter that is vertically spaced from the cyclonic axis;
Group B - Claims 15-18 are directed to a suction motor that has an inlet that faces the hollow interior of a filter;
Group C - Claims 19-36 are directed to a suction motor located at an upper end of a handle and reward of an energy storage member; and
Group D - Claims 37-55 are directed to a suction motor axis that is vertically displaced from a cyclone axis.

The claims must be limited to one inventive concept as set out in PCT Rule 13.

4. Consequently, this opinion has been established in respect of the following parts of the international application:

   ☐ all parts.

   ☑ the parts relating to claim Nos. 1-14

Box No. V **Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Statement

Novelty (N)	Claims	4-6,8-14	YES
	Claims	1-3,7	NO
Inventive step (IS)	Claims	4-6,12-14	YES
	Claims	1-3,7-11	NO
Industrial applicability (IA)	Claims	1-14	YES
	Claims	none	NO

2. Citations and explanations:

D1 WO2016095041A1, 23 June 2016 (23-06-2016)
D2 JP2004313249A, 11 November 2004 (11-11-2004)
D3 JP2016127893A, 14 July 2016 (14-07-2016)
D4 WO2017117679A1, 13 July 2017 (13-07-2017)
D5 WO2014001496A1, 03 January 2014 (03-01-2014)

NOVELTY(N)

Claims 1-3,7 are not novel and therefore do not comply with PCT Article 33(2).

With regard to claim 1, D1 teaches a hand vacuum cleaner (see Fig. 14,19-21) having a front end, a rear end, an upper end, a lower end and first and second laterally spaced apart sides and comprising: an air flow path extending from a dirty air inlet to a clean air outlet (paragraph 149; Fig. 14,19-21,65); a cyclone assembly comprising a cyclone chamber (308) positioned in the air flow path and having a cyclone air inlet(316), a cyclone air outlet(320) and a cyclone axis of rotation (see Fig. 14,65), wherein the cyclone axis of rotation extends generally in a forward/rearward direction (paragraph 149; Fig. 19-21); a pre-motor filter (1176) positioned downstream of the cyclone air outlet; and, a suction motor (204) positioned in the air flow path downstream of the pre-motor filter and upstream of the clean air outlet and having a suction motor axis of rotation (see Fig. 14), wherein the pre-motor filter is vertically spaced from the cyclone axis of rotation when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner, and wherein air travels generally rearwardly from the pre-motor filter to the suction motor(paragraph 149; Fig. 19-21).

With regard to claims 2-3,7, D1 teaches (see paragraph 149; Fig. 14,19-21,65) the claimed subject matter.

Document D1 discloses the claimed subject matter. Therefore, claims 1-3,7 are not novel.

Claims 4-6,8-14 are novel and therefore comply with PCT Article 33(2).
Document D1 is considered to represent the closest prior art. Document D1 discloses a hand vacuum with a pre-motor filter that is vertically spaced from the cyclonic axis . However, none of the cited documents discloses that the air exits the filter in a vertical direction, the filter is a cylindrical filter having a hollow interior facing the motor inlet or that the motor is located above the grip portion . Claims 4-6,8-14 are therefore novel.

INVENTIVE STEP(IS)

Claims 1-3,7 do not involve an inventive step and therefore do not comply with PCT Article 33(3). Given the above novelty objection, claims 1-3,7 do not involve an inventive step.

Continued in supplemental box

Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

Claims 5,11 do not comply with PCT Article 6. The claims shall be clear and concise. The term "partially overlies" is not clear. It is not understood what orientation the vacuum is in when the filter overlies the cyclone chamber.

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of: Box V

INVENTIVE STEP continued

Claims 8-11 do not involve an inventive step and therefore do not comply with PCT Article 33(3).

Document D1 discloses a hand vacuum with a pre-motor filter that is vertically spaced from the cyclonic axis .

Document D5 discloses a cylindrical premotor filter with a hollow interior that is in communication with the motor inlet (see Fig. 1, filter 11).

Cylindrical filters are well known in the art and are known alternatives to a planar filter. Using the known alternative filter of D5 with the vacuum of D1 does not provide any new and useful unexpected results and does not add an inventive step to the claims. It would have been obvious to a person skilled in the art to arrive at the matter defined in claims 8-11 by combining the teachings of documents D1 and D5. Documents D1 and D5 therefore show that claims 8-11 do not involve an inventive step.

Claims 4-6,12-14 involve an inventive step and therefore comply with PCT Article 33(3).

Air exiting the filter in a vertical direction or locating the motor above the grip portion would not have been obvious to a person skilled in the art from the cited documents, when taken individually or in any combination. Claims 4-6,12-14 therefore involve an inventive step.

INDUSTRIAL APPLICABILITY

The subject matter of claims 1-14 is considered to be industrially applicable and thus complies with the requirements of PCT Article 33(4).

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference	FOR FURTHER ACTION	see Form PCT/ISA/220 as well as, where applicable, item 5 below
P52585PC00		
International application No.	International filing date *(day/month/year)*	(Earliest)Priority date *(day/month/year)*
PCT/CA2018/050782	26 June 2018 (26-06-2018)	06 July 2017 (06-07-2017)

Applicant

OMACHRON INTELLECTUAL PROPERTY INC.

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 8 sheets.

☐ It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the report**

a. With regard to the **language**, the international search was carried out on the basis of:

☑ the international application in the language in which it was filed.

☐ a translation of the international application into which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).

b. ☐ This international search report has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43.6*bis*(a)).

c. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.

2. ☐ **Certain claims were found unsearchable** (see Box No. II).

3. ☑ **Unity of invention is lacking** (see Box No. III).

4. With regard to the **title**,

☑ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

☑ the text is approved as submitted by the applicant.

☐ the text has been established, according to Rule 38.2, by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. With regard to the **drawings**,

a. the figure of the **drawings** to be published with the abstract is Figure No. 9

☑ as suggested by the applicant.

☐ as selected by this Authority, because the applicant failed to suggest a figure.

☐ as selected by this Authority, because this figure better characterizes the invention.

b. ☐ none of the figures is to be published with the abstract.

Dyson Ex1026
Page 516

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of the first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claim Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claim Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claim Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

The claims are directed to a plurality of inventive concepts as follows:

Group A - Claims 1-14 are directed to a pre-motor filter that is vertically spaced from the cyclonic axis;

Group B - Claims 15-18 are directed to a suction motor that has an inlet that faces the hollow interior of a filter;

Group C - Claims 19-36 are directed to a suction motor located at an upper end of a handle and reward of an energy storage member; and

Group D - Claims 37-55 are directed to a suction motor axis that is vertically displaced from a cyclone axis.

The claims must be limited to one inventive concept as set out in PCT Rule 13.

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claim Nos.:

4. ☑ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claim Nos.:

1-14

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☑ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CA2018/050782

A. CLASSIFICATION OF SUBJECT MATTER
IPC: ***A47L 9/16*** (2006.01), ***A47L 5/24*** (2006.01), ***A47L 9/10*** (2006.01)

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: A47L 9/16, A47L 5/24, A47L 9/10

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic database(s) consulted during the international search (name of database(s) and, where practicable, search terms used)
Questel Orbit (FamPat)
Keywords: cyclon+ or swirl+, hand held or handheld or hand-held, filter

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	WO2016095041A1 (Conrad, W) 23 June 2016(23-06-2016) *Abstract; Fig. 14,Fig. 65*	1-3,7 8-11
A	JP2004313249A (Hanzawa, M) 11 November 2004 (11-11-2004) *Fig. 3; motor prefilter-37*	1-14
A	JP2016127893A (Ichino, T et al.) 14 July 2016 (14-07-2016) *Fig. 2, motor prefilter-55a*	1-14
T	WO2017117679A1 (Brown, A et al.) 13 July 2017 (13-07-2017) *Abstract; Fig. 5*	1-14
Y	WO2014001496 (Brauning, A et al.) 3 January 2014 (03-01-2014) *Abstract; Fig. 1; filter-11*	8-11

☐ Further documents are listed in the continuation of Box C. ☑ See patent family annex.

*	Special categories of cited documents:	"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
"A"	document defining the general state of the art which is not considered to be of particular relevance	"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
"E"	earlier application or patent but published on or after the international filing date	"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
"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)	"&"	document member of the same patent family
"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		

Date of the actual completion of the international search 4 September 2018 (04-09-2018)	Date of mailing of the international search report 02 October 2018 (02-10-2018)
Name and mailing address of the ISA/CA Canadian Intellectual Property Office Place du Portage I, C114 - 1st Floor, Box PCT 50 Victoria Street Gatineau, Quebec K1A 0C9 Facsimile No.: 819-953-2476	Authorized officer Sean Wilkinson (819) 639-4314

Patent Document Cited in Search Report	Publication Date	Patent Family Member(s)	Publication Date
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appl. No	:	15/642,781	Confirmation No. 5834
Applicant	:	Omachron Intellectual Property Inc.	
Filed	:	July 6, 2017	
For	:	HANDHELD SURFACE CLEANING APPARATUS	
T.C./A.U.	:	3723	
Examiner	:	Horton, Andrew Alan	
Docket No.	:	10452-P52585US00	
Customer No.	:	01059	

February 5, 2019

Commissioner of Patents
P.O. Box 1450
Alexandria, VA 22313-1450

SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT
Under 37 CFR 1.56 and 37 CFR 1.97(b)(3)

Sir:

In accordance with 37 CFR 1.97 and 1.98, and in recognition of the duty of disclosure set forth in 37 CFR 1.56, the applicant hereby submits a Supplemental Information Disclosure Statement including a listing of patents and other publications of which the applicant is aware on e-PTO form SB/08a.

In accordance with the requirements of 1.97(b)(3), this Information Disclosure Statement is filed before the mailing of a first Office Action on the merits.

The Applicant believes that no fees are due in conjunction with filing of this Information Disclosure Statement. However, should such fee be required, the Office is authorized to charge any deficiencies necessary for entry of this Information Disclosure Statement to our Deposit Account No. 022095.

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(A) List of References

A list of the patents and other publications of which the applicant is aware is set out in the attached e-PTO Form SB08a which is attached hereto.

(B) Copies of References

Copies of the foreign and non-patent literature references are enclosed. The Applicant's understanding of the cited foreign references is merely based on the English machine translation of the Abstract.

The filing of this statement shall not be construed as an admission that the information cited in the attached statement is, or is considered to be, material to patentability (37 CFR 1.97(h)), nor as an admission that it constitutes prior art.

Accordingly, the applicant submits that the Information Disclosure Statement is properly considered at this time.

Respectfully submitted,

February 5, 2019

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Electronic Acknowledgement Receipt

EFS ID:	35064607
Application Number:	15642781
International Application Number:	
Confirmation Number:	5834
Title of Invention:	HANDHELD SURFACE CLEANING APPARATUS
First Named Inventor/Applicant Name:	Wayne Ernest Conrad
Customer Number:	1059
Filer:	Philip C. Mendes da Costa/Snezana Lisowsky
Filer Authorized By:	Philip C. Mendes da Costa
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Receipt Date:	05-FEB-2019
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Application Type:	Utility under 35 USC 111(a)

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Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	10452-P52585US00_Commissioner_re IDS_2019_02_05.PDF	727435 db32f609b7947ed9fbaacb28014369beb257d277	no	2
Warnings:					

Information:					
2	Foreign Reference	FR1_ISR_JP2016127893_ADOBE.PDF	5963582 4df5f16de573ebc89b13d1fbc36cb05e4718ed21	no	12
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		Total Files Size (in bytes):	49696851		

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Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT
(Not for submission under 37 CFR 1.99)

Application Number	15642781
Filing Date	2017-07-06
First Named Inventor	Wayne Ernest Conrad
Art Unit	3723
Examiner Name	N/A
Attorney Docket Number	10452-P52585US00

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	1	2017046560	WO	A1	2017-03-23	DYSON TECHNOLOGY LTD		
	2	2017046559	WO	A1	2017-03-23	DYSON TECHNOLOGY LTD		
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	4	2016173466	WO	A1	2016-11-03	SUZHOU PROVAC TEACHNOLOGY CO., LTD.	English machine translation	X
	5	2016095041	WO	A1	2016-06-23	OMACHRON INTELLECTUAL PROPERTY INC.		☐
	6	2016065151	WO	A1	2016-04-28	TECHTRONICS INDUCTRIES et al.		☐
	7	2015129387	WO	A1	2015-09-03	MITSUBISHI ELECTRIC		☐
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First Named Inventor	Wayne Ernest Conrad
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Examiner Name	N/A
Attorney Docket Number	10452-P52585US00

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	10	2012042240	WO	A1	2012-04-05	DYSON TECHNOLOGY LTD		☐
	11	2011054106	WO	A1	2011-05-12	G.B.D. CORP.		☐
	12	2010147247	WO	A1	2010-12-23	KIM		☐
	13	2010142971	WO	A1	2010-12-16	DYSON TECHNOLOGY LTD		☐
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	15	2010142969	WO	A1	2010-12-16	DYSON TECHNOLOGY LTD		☐
	16	2010142968	WO	A1	2010-12-16	DYSON TECHNOLOGY LTD		☐
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	Examiner Name	N/A
	Attorney Docket Number	10452-P52585US00

	20	2008088278	WO	A2	2008-07-24	AKTIEBOLAGET ELECTROLUX			☐
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	Examiner Name	N/A
	Attorney Docket Number	10452-P52585US00

	31	9809121	WO	A1	1998-03-05	CHYDROFUSER TECHNOLOGIES, INC.		☐
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	1	English machine translation of WO2016173466A1 published on November 3, 2016	
	2	English machine translation of WO2015129387A1 published on September 3, 2015	
	3	English machine translation of WO8002561A1 published on November 27, 1980	
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	First Named Inventor	Wayne Ernest Conrad
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	Examiner Name	N/A
	Attorney Docket Number	10452-P52585US00

EXAMINER SIGNATURE			
Examiner Signature	/ANDREW A HORTON/	Date Considered	02/06/2019

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

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	First Named Inventor	Wayne Ernest Conrad
	Art Unit	3723
	Examiner Name	N/A
	Attorney Docket Number	10452-P52585US00

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Philip C. Mendes da Costa/	Date (YYYY-MM-DD)	2017-10-30
Name/Print	Philip C. Mendes da Costa	Registration Number	33,106

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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

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

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EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	165	("20020066262" | "20020088208" | "20020112315" | "20020134238" | "20030159238" | "20040200029" | "20040231093" | "20050132528" | "20060156508" | "20060288516" | "20080301903" | "20090205161" | "20090205298" | "3988133" | "4097381" | "4236903" | "4373228" | "4523936" | "4853008" | "5054157" | "5467835" | "5970572" | "6195835" | "6406505" | "6531066" | "6553612" | "6625845" | "6640385" | "6662403" | "6712868" | "6896711" | "7074248" | "7117973" | "7175682" | "7181803" | "20100175217" | "20100229328" | "20110023261" | "20110146024" | "20110219570" | "20120222245" | "20120222262" | "20140137363" | "20140182080" | "20170196425" | "8021453" | "8544143" | "20170215663" | "20170290480" | "1937765" | "20010018865" | "20020062531" | "20040107530" | "20050198769" | "20050198770" | "20050252179" | "20060102005" | "20060168922" | "20060207231" | "20070079473" | "20090300874" | "2678110" | "3898068" | "4307485" | "4486207" | "4744958" | "5090976" | "5267371" | "5307538" | "5309600" | "5347679" | "5481780" | "5599365" | "5755096" | "6345408" | "6599338" | "7386915" | "7691161" | "7717973" | "7776120" | "D303173" | "D380033" | "20110219576" | "20140208538" | "20140237768" | "20170196422" | "20170196424" | "7882593" | "7996956" | "8150907" | "9095245" | "9675218" | "20170290477" | "1898608" | "20020134059" | "20040010885" | "20050252180" | "20060162298" | "20060168923" | "20060230724" | "20070084159" | "20080178420" | "20080256744" | "20090019663" | "20090113659" | "2811219" | "2846024" | "2937713" | "2981369" | "3130157" | "3269097" | "3372532" | "3822533" | "3933450" | "4853011" | "4980945" | "6080022" | "6553613" | "6746500" | "6929516" | "6968596" | "7354468" | "7377953" | "7779506" | "7780753" | "7805804" | "20090313959" | "20130091658" | "20160174787" | "20170188763" | "20170196423" |	US-PGPUB; USPAT; USOCR	OR	OFF	2019/02/04 15:58

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S9	693	a47l9/1625.cpc.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/02/04 16:01
S10	777	a47l9/1641.cpc.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/02/04 16:01
S11	531	a47l9/2884.cpc. not S6	US-PGPUB; USPAT; USOCR	OR	OFF	2019/02/04 16:01
S12	620	a47l9/1625.cpc. not (S6 S11)	US-PGPUB; USPAT; USOCR	OR	OFF	2019/02/04 16:02
S13	121	a47l9/2878.cpc.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/02/05 13:11
S14	48	a47l9/2878.cpc. and (cyclon$2 centrifug$2 whirl$3)	US-PGPUB; USPAT; USOCR	OR	OFF	2019/02/05 13:16
S15	243	a47l9/2884.cpc. and (cyclon$2 centrifug$2 whirl$3)	US-PGPUB; USPAT; USOCR	OR	OFF	2019/02/05 14:16
S16	209	a47l9/2884.cpc. and (cyclon$2 centrifug$2 whirl$3) not S14	US-PGPUB; USPAT; USOCR	OR	OFF	2019/02/05 14:17
S17	172	a47l9/1625.cpc. and battery	US-PGPUB; USPAT; USOCR	OR	ON	2019/02/05 15:50
S18	99	a47l9/1625.cpc. and battery not (S14 S16)	US-PGPUB; USPAT; USOCR	OR	ON	2019/02/05 15:50
S19	48	a47l9/2878.cpc. and (cyclon$6 centrifug$4)	US-PGPUB; USPAT; USOCR	OR	OFF	2019/02/06 08:30
S20	243	a47l9/2884.cpc. and (cyclon$6 centrifug$4)	US-PGPUB; USPAT; USOCR	OR	OFF	2019/02/06 08:30
S21	1499	(wayne near2 conrad).in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2019/02/06 15:26

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/642,781	07/06/2017	Wayne Ernest Conrad	10452-P52585US00	5834

1059 7590 03/29/2019

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

EXAMINER	
HORTON, ANDREW ALAN	

ART UNIT	PAPER NUMBER
3723	

NOTIFICATION DATE	DELIVERY MODE
03/29/2019	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

ipprocessingcentre@bereskinparr.com

Office Action Summary	**Application No.** 15/642,781	**Applicant(s)** Conrad, Wayne Ernest	
	Examiner ANDREW A HORTON	**Art Unit** 3723	**AIA (FITF) Status** Yes

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

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☑ Responsive to communication(s) filed on 7/6/17.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL.** 2b) ☑ This action is non-final.

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

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5) ☑ Claim(s) 1-16 is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6) ☐ Claim(s) _____ is/are allowed.

7) ☑ Claim(s) 1-16 is/are rejected.

8) ☐ Claim(s) _____ is/are objected to.

9) ☐ Claim(s) _____ are subject to restriction and/or election requirement

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to **PPHfeedback@uspto.gov.**

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☑ The drawing(s) filed on 9/13/17 is/are: a)☑ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

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

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☑ Notice of References Cited (PTO-892)

2) ☑ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date _____.

4) ☐ Other: _____.

DETAILED ACTION

Notice of Pre-AIA or AIA Status

1. The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a)(1) the claimed invention was patented, described in a printed publication, or in public use, on sale or otherwise available to the public before the effective filing date of the claimed invention.

Claims 1-13 are rejected under 35 U.S.C. 102(a)(1) as being anticipated by Beskow (US 2008/0040883).

2. As to claim 1, Beskow discloses a hand vacuum cleaner having a front end, a rear end, an upper end, a lower end, and first and second laterally spaced apart sides, and comprising:

(a) an air flow path extending from a dirty air inlet (114) to a clean air outlet (934) (Figs. 9 and 10B)

(b) a cyclone chamber (1000; Fig. 10 and paragraph 101) positioned in the air flow path and having a cyclone air inlet (1004; paragraph 104), a cyclone air outlet (1052; paragraph 110), and a cyclone axis of rotation (A line or line segment intersecting 1000);

(c) a suction motor (910) positioned in the air flow path upstream of the clean air outlet; and,

(d) at least one energy storage member (938 and/or 930) positioned in an energy storage chamber having an energy storage chamber wall (Material surrounding the energy storage member; Fig. 9 and paragraph 94) wherein the cyclone air outlet faces the energy storage chamber wall (Figs. 9-11) whereby air exiting the cyclone chamber impinges on the energy storage chamber wall (Air passes through the cyclone chamber before contacting the inside of the energy storage chamber wall, and then the air exits through vent holes 934 before contacting the outside of the energy storage chamber wall; Figs. 9-11).

As to claims 2 and 6, wherein the cyclone axis of rotation extends generally in a forward/rearward direction. The forward and rearward directions are the rightward and leftward directions, respectively, from the perspective of Fig. 10A.

As to claim 3, wherein the at least one energy storage member comprises a plurality of energy storage members (Fig. 9, and paragraphs 93 and 95) wherein at least some of the plurality of energy storage members are arranged one above another in a generally upwardly extending configuration when the upper end (The vertically upward end, from the perspective of Fig. 9) of the hand vacuum cleaner is positioned above the lower end (The vertically downward end, from the perspective of Fig. 9) of the hand vacuum cleaner.

As to claim 4, wherein the energy storage members arranged one above another comprise longitudinally extending members each having a longitudinal axis that extends laterally (Fig. 9).

As to claim 5, wherein the cyclone axis of rotation intersects a volume defined by the generally upwardly extending configuration of energy storage members (Figs. 10A and 10B).

As to claim 7, wherein the at least one energy storage member is removably receivable in the energy storage chamber (Fig. 9, and paragraphs 93 and 95).

As to claim 8, wherein the at least one energy storage member comprises a battery pack that is removably receivable in the energy storage chamber (Fig. 9, and paragraphs 93 and 95).

As to claim 9, wherein the air flow path comprises a portion (Material extending from 1052 to 910) that extends from the cyclone air outlet to the suction motor and is defined in part by the energy storage chamber wall (Figs. 9-11).

As to claim 10, wherein the portion of the air flow path extends generally upwardly from the cyclone air outlet to the suction motor when the upper end (The vertically upward end, from the perspective of Fig. 9) of the hand vacuum cleaner is positioned above the lower end (The vertically downward end, from the perspective of Fig. 9) of the hand vacuum cleaner (Figs. 9-11).

As to claim 11, wherein the suction motor is positioned above the cyclone axis of rotation when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner (910 is above 1000, and the axis of rotation is being interpreted as a line segment extending from the top of 1000 to the bottom of 1000; Figs. 9-11).

As to claim 12, wherein the portion of the air flow path extends generally downwardly from the cyclone air outlet to the suction motor when the upper end (The vertically downward end, from the perspective of Fig. 9) of the hand vacuum cleaner is positioned above the lower end (The vertically upward end, from the perspective of Fig. 9) of the hand vacuum cleaner (Figs. 9-11).

As to claim 13, wherein the suction motor is positioned below the cyclone axis of rotation when the upper end (The vertically downward end, from the perspective of Fig. 9) of the hand vacuum cleaner is positioned above the lower end (The vertically upward end, from the perspective of Fig. 9) of the hand vacuum cleaner (Figs. 9-11).

Claims 1-4, 8 and 14-16 are rejected under 35 U.S.C. 102(a)(1) as being anticipated by Sunderland (US 2013/0207615).

3. As to claim 1, Sunderland discloses a hand vacuum cleaner having a front end, a rear end, an upper end, a lower end, and first and second laterally spaced apart sides, and comprising:

(a) an air flow path extending from a dirty air inlet to a clean air outlet;

(b) a cyclone chamber (14; Fig. 2 and paragraph 28) positioned in the air flow path and having a cyclone air inlet (16; paragraph 28), a cyclone air outlet (22; paragraph 30), and a cyclone axis of rotation (Y-Y; Fig. 2 and paragraph 29);

(c) a suction motor (6) positioned in the air flow path upstream of the clean air outlet (paragraph 27); and,

(d) at least one energy storage member (44; Fig. 7) positioned in an energy storage chamber having an energy storage chamber wall (40; Fig. 6 and paragraph 41) wherein the cyclone air outlet faces the energy storage chamber wall (Figs. 1, 2 and 6) whereby air exiting the cyclone chamber impinges on the energy storage chamber wall (Air that exits through 22 travels out of exhaust vents 12 and would then contact the outside of 40; Figs. 1, 2 and 6).

As to claim 2, wherein the cyclone axis of rotation extends generally in a forward/rearward direction (Fig. 2).

As to claims 3 and 15, wherein the at least one energy storage member comprises a plurality of energy storage members (44; Fig. 7 and paragraph 41) wherein at least some of the plurality of energy storage members are arranged one above another in a generally upwardly extending configuration when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner (Fig. 2).

As to claim 4, wherein the energy storage members arranged one above another comprise longitudinally extending members each having a longitudinal axis that extends laterally (Figs. 2 and 7).

As to claim 8, wherein the at least one energy storage member comprises a battery pack that is removably receivable in the energy storage chamber (44; Fig. 7 and paragraph 41).

As to claim 14, further comprising a handle (8) having a hand grip portion that extends upwardly and forwardly when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner wherein the handle is positioned rearward of the at least one energy storage member (Fig. 2).

As to claim 16, further comprising a finger gap (The space between 8 and 23) positioned between the handle and the energy storage chamber (Fig. 2).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ANDREW A HORTON whose telephone number is (571)270-5039. The examiner can normally be reached on Monday - Friday 7:30 AM - 4:00 PM.

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

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Sean K Hunter can be reached on 571-270-7791. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/ANDREW A HORTON/
Primary Examiner, Art Unit 3723

Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (03-15)
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT
(Not for submission under 37 CFR 1.99)

Application Number	15642781
Filing Date	2017-07-06
First Named Inventor	Wayne Ernest Conrad
Art Unit	3723
Examiner Name	N/A
Attorney Docket Number	10452-P52585US00

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	1	20090300875	A1	2009-12-10	Inge et al.	
	2	20090305862	A1	2009-12-10	Yoo	
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	2	1020100084127	KR	A	2010-07-23	SEB	English machine translation	☒
	3	1020060125954	KR	A	2006-12-07	LG ELECTRONICS	English machine translation	☒
	4	1020060125952	KR	A	2006-12-07	LG ELECTRONICS	English machine translation	☒
	5	1020060122249	KR	A	2006-11-30	LG ELECTRONICS	English machine translation	☒
	6	1020060119587	KR	A	2006-11-24	LG ELECTRONICS	English machine translation	☒
	7	1020060118803	KR	A	2006-11-24	LG ELECTRONICS	English machine translation	☒
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	9	1020060118801	KR	A	2006-11-24	LG ELECTRONICS	English machine translation	☐
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	11	1020060118795	KR	A	2006-11-24	LG ELECTRONICS	English machine translation	☒
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	18	1020050091836	KR	A	2005-09-15	LG ELECTRONICS	English machine translation	☒
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	Examiner Name	N/A
	Attorney Docket Number	10452-P52585US00

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	31	2730437	CA	A1	2011-09-12	OMACHRON INTELLECTUAL PROPERTY INC.		☐
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	34	2628573	CA	A1	2008-10-18	BLACK & DECKER			☐
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	37	2620703	CA	C	2013-09-17	BLACK & DECKER			☐
	38	2593950	CA	C	2013-01-15	OMACHRON INTELLECTUAL PROPERTY INC.			☐
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	41	2450450	CA	A1	2004-12-26	SAMSUNG KWANGJU ELECTRONICS CO., LTD.			☐
	42	2438079	CA	C	2009-08-18	DYSON TECHNOLOGY LTD			☐
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	Examiner Name	N/A
	Attorney Docket Number	10452-P52585US00

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

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See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Philip C. Mendes da Costa/	Date (YYYY-MM-DD)	2017-10-30
Name/Print	Philip C. Mendes da Costa	Registration Number	33,106

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2]	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1	203914775	CN	U	2014-11-05	DAI ZIANGMING	English Machine Translation	X

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	15642781
	Filing Date	2017-07-06
	First Named Inventor	Wayne Ernest Conrad
	Art Unit	3723
	Examiner Name	N/A
	Attorney Docket Number	10452-P52585US00

	2	203724037	CN	U	2014-07-23	KWONNIE ELECTRICAL PRODUCTS LIMITED	English Machine Translation	☒
	3	202932850	CN	U	2013-05-15	SUZHOU PROVAC ELECTRICAL CO LTD	English Machine Translation	☒
	4	202739907	CN	U	2013-02-20	NINGBO MIMIR ELECTRICAL APPLIANCE CO LTD	English Machine Translation	☒
	5	202173358	CN	U	2012-03-28	SUZHOU ITAR ELECTRICAL APPLIANCE TECHNOLOGY	English Machine Translation	☒
	6	201683850	CN	U	2010-12-29	KINGCLEAN ELECTRIC NO., LTD.	English Machine Translation	☒
	7	105816104	CN	A	2016-08-03	HITACHI APPLIANCES INC	English Machine Translation	☒
	8	104822301	CN	A	2015-08-05	TOSHIBA	English Machine Translation	☒
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	10	103169420	CN	A	2013-06-26	DYSON TECHNOLOGY LTD	English Machine Translation	☒
	11	102256523	CN	A	2011-11-23	TECHTRONIC FLOOR CARE TECHNOLOGY	English Machine Translation	☒
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	14	101897558	CN	B	2014-09-17	BLACK & DECKER	English Machine Translation	☒
	15	101822506	CN	A	2010-09-08	BLACK & DECKER	English Machine Translation	☒
	16	101700180	CN	A	2010-05-05	KINGCLEAN ELECTRIC NO., LTD.	English Machine Translation	☒
	17	101700180	CN	B	2011-08-24	KINGCLEAN ELECTRIC NO., LTD.	English Machine Translation	☒
	18	101657133	CN	A	2010-02-24	GBD CORP BS	English Machine Translation	☒
	19	101489461	CN	A	2009-07-22	DYSON TECHNOLOGY LTD	English Machine Translation	☒
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	21	101489457	CN	B	2012-06-27	DYSON TECHNOLOGY LTD	English Machine Translation	☒
	22	101489455	CN	A	2009-07-22	DYSON TECHNOLOGY LTD	English Machine Translation	☒
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	25	101448447	CN	A	2009-06-03	ELECTROLUX	English Machine Translation	☒
	26	101288572	CN	A	2008-10-22	BLACK & DECKER	English Machine Translation	☒
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	28	101243959	CN	B	2011-06-15	BLACK & DECKER	English Machine Translation	☒
	29	101108110	CN	A	2008-01-23	LG ELECTRONICS TIANJIN ELECTRIC APPLIANCE	English Machine Translation	☒
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	31	101108081	CN	A	2008-01-23	LG ELECTRONICS TIANJIN ELECTRIC APPLIANCE	English Machine Translation	☒
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	33	101095604	CN	A	2008-01-02	KWONNIE ELECTRICAL PRODUCTS LIMITED	English Machine Translation	☒
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	35	101073480	CN	B	2014-05-14	LG ELECTRONICS	English Machine Translation	☒
	36	101061932	CN	A	2007-10-31	KWONNIE ELECTRICAL PRODUCTS LIMITED	English Machine Translation	☒
	37	1981688	CN	A	2007-06-20	LG ELECTRONICS	English Machine Translation	☒
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	46	1493244	CN	A	2004-05-05	VACUUM CLEANER CO	English Machine Translation	☒
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Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T5
	1	English machine translation of CN203914775U published on November 5, 2014	
	2	English machine translation of CN203724037U published on August 23, 2014	
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	Art Unit	3723
	Examiner Name	N/A
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	Attorney Docket Number	10452-P52585US00

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Examiner Signature	/ANDREW A HORTON/	Date Considered	02/06/2019

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	Examiner Name	N/A
	Attorney Docket Number	10452-P52585US00

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Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Philip C. Mendes da Costa/	Date (YYYY-MM-DD)	2017-10-30
Name/Print	Philip C. Mendes da Costa	Registration Number	33,106

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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

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Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/642,781	Conrad, Wayne Ernest
	Examiner	Art Unit
	ANDREW A HORTON	3723

CPC - Searched*		
Symbol	Date	Examiner
A47L 5/24, 9/322, 9/2878, 9/2884, 9/1608, 9/1625, 9/1641	02/06/2019	AH

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

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Search Notes		
Search Notes	Date	Examiner
Inventor search	02/06/2019	AH

Interference Search			
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Attorney Docket Number	10452-P52585US00

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	2	20170215664	A1	2017-08-03	CONRAD et al.	
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First Named Inventor	Wayne Ernest Conrad
Art Unit	3723
Examiner Name	N/A
Attorney Docket Number	10452-P52585US00

	20	2365324	GB	B	2002-07-31	SAMSUNG KWANGJU ELECTRONICS CO		☐
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
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Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]

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	3	English machine translation of EP1815777A1 published on August 8, 2007	

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*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

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CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Philip C. Mendes da Costa/	Date (YYYY-MM-DD)	2017-10-30
Name/Print	Philip C. Mendes da Costa	Registration Number	33,106

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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Notice of References Cited	Application/Control No. 15/642,781	Applicant(s)/Patent Under Reexamination Conrad, Wayne Ernest	
	Examiner ANDREW A HORTON	Art Unit 3723	Page 1 of 1

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Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

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Art Unit	3723
Examiner Name	N/A
Attorney Docket Number	10452-P52585US00

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Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
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	46	4352065	JP	B2	2009-10-28	TOSHIBA CORP	English machine translation	☒
	47	4232382	DE	C1	1994-03-24	PBS PULVERBESCHICHTUNGS & SP	English machine translation	☒
	48	03176019	JP	A	1991-07-31	TSURUMI MFG CO LTD	English machine translation	☒
	49	1594386	EP	B1	2009-04-15	AKTIEBOLAGET ELECTROLUX		☐
	50	875134	DE	C	1953-04-30	METALLGESELLSCHAFT AG	English machine translation	☒

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NON-PATENT LITERATURE DOCUMENTS Remove

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	15642781
	Filing Date	2017-07-06
	First Named Inventor	Wayne Ernest Conrad
	Art Unit	3723
	Examiner Name	N/A
	Attorney Docket Number	10452-P52585US00

	1	English machine translation of KR1020050054551A published on June 10, 2005	
	2	English machine translation of KR1020050013696A published on February 5, 2005	
	3	English machine translation of KR1020040088978A published on October 20, 2004	
	4	English machine translation of KR1020040050174A published on June 16, 2004	
	5	English machine translation of KR1020020085478A published on November 16, 2002	
	6	English machine translation of KR1020020067489A published on August 22, 2002	
	7	English machine translation of KR1020010045598A published on June 5, 2001	
	8	English machine translation of KR1020010024752A published on March 26, 2001	
	9	English machine translation of DE602006000726T2 published on April 16, 2009	
	10	English machine translation of DE202010018085U1 published on February 27, 2014	
	11	English machine translation of DE202010018084U1 published on February 27, 2014	

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	12	English machine translation of DE202010018047U1 published on November 14, 2013	
	13	English machine translation of DE112012000251T5 published on October 17, 2013	
	14	English machine translation of DE112010001135T5 published on August 2, 2012	
	15	English machine translation of DE112007003052T5 published on January 14, 2010	
	16	English machine translation of DE112007003039T5 published on October 29, 2009	
	17	English machine translation of DE102012211246A1 published on January 2, 2014	
	18	English machine translation of DE102007011457A1 published on October 25, 2007	
	19	English machine translation of DE102004028677B4 published on January 10, 2008	
	20	English machine translation of JP2013086228A published on May 13, 2013	
	21	English machine translation of JP2011189133A published on September 29, 2011	
	22	English machine translation of JP2011189132A published on September 29, 2011	

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	Attorney Docket Number	10452-P52585US00

	23	English machine translation of JP2010220632Apublished on October 7, 2010	
	24	English machine translation of JP2010178773A published on August 19, 2010	
	25	English machine translation of JP2010081968A published on April 15, 2010	
	26	English machine translation of JP2009261501A published on November 12, 2009	
	27	English machine translation of JP2008206613A published on September 11, 2008	
	28	English machine translation of JP2006272019A published on October 12, 2006	
	29	English machine translation of JP2006102034A published on April 20, 2006	
	30	English machine translation of JP2005040246A published on February 17, 2005	
	31	English machine translation of JP2003135335A published on May 13, 2003	
	32	English machine translation of JP2002085297A published on March 26, 2002	
	33	English machine translation of JP2000140533A published on May 23, 2000	

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	Attorney Docket Number	10452-P52585US00

	34	English machine translation of CN205671986U published on November 9, 2016	
	35	English machine translation of CN204581145U published on August 26, 2015	
	36	English machine translation of CN204363891U published on June 3, 2015	
	37	English machine translation of CN204016180U published on December 17, 2014	
	38	English machine translation of DE69907201T2 published on February 5, 2004	
	39	English machine translation of JP61131720A published on June 19, 1986	
	40	English machine translation of DE60211663T2 published on May 10, 2007	
	41	English machine translation of DE60201666T2 published on June 1, 2006	
	42	English machine translation of DE60116336T2 published on August 31, 2006	
	43	English machine translation of DE10110581C2 published on November 13, 2003	
	44	English machine translation of DE10056935C2 published on January 16, 2003	

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	Filing Date	2017-07-06
	First Named Inventor	Wayne Ernest Conrad
	Art Unit	3723
	Examiner Name	N/A
	Attorney Docket Number	10452-P52585US00

	45	English machine translation of DE9216071U1 published on February 25, 1993	
	46	English machine translation of JP4352065B2 published on October 28, 2009	
	47	English machine translation of DE4232382C1 published on March 24, 1994	
	48	English machine translation of JP03176019A published on July 31, 1991	
	49	English machine translation of DE875134C published on April 30, 1953	

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EXAMINER SIGNATURE

Examiner Signature	/ANDREW A HORTON/	Date Considered	02/06/2019

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

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	First Named Inventor	Wayne Ernest Conrad
	Art Unit	3723
	Examiner Name	N/A
	Attorney Docket Number	10452-P52585US00

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Philip C. Mendes da Costa/	Date (YYYY-MM-DD)	2017-10-30
Name/Print	Philip C. Mendes da Costa	Registration Number	33,106

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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Privacy Act Statement

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

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

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

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

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

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

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

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

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

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

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

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /A.A.H/

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/642,781	Conrad, Wayne Ernest
	Examiner	**Art Unit**
	ANDREW A HORTON	3723

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

CLAIMS										
☐ Claims renumbered in the same order as presented by applicant					☐ CPA		☐ T.D.		☐ R.1.47	
CLAIM		**DATE**								
Final	Original	03/26/2019								
	1	✓								
	2	✓								
	3	✓								
	4	✓								
	5	✓								
	6	✓								
	7	✓								
	8	✓								
	9	✓								
	10	✓								
	11	✓								
	12	✓								
	13	✓								
	14	✓								
	15	✓								
	16	✓								

Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (02-18)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (**Not for submission under 37 CFR 1.99)**		
	Application Number	15642781
	Filing Date	2017-07-06
	First Named Inventor	Wayne Ernest Conrad
	Art Unit	3723
	Examiner Name	Horton, Andrew Alan
	Attorney Docket Number	10452-P52585US00

U.S.PATENTS						
Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	9962048	B2	2018-05-08	Conrad et al.	
	2	9962047	B2	2018-05-08	Brown et al.	
	3					
If you wish to add additional U.S. Patent citation information please click the Add button.						
U.S.PATENT APPLICATION PUBLICATIONS						
Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	20170215664	A1	2017-08-03	CONRAD et al.	
	2	20170215663	A1	2017-08-03	CONRAD et al.	
	3	20170209007	A1	2017-07-27	CONRAD et al.	

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	4	20170196429	A1	2017-07-13	BROWN et al.	
	5	20170196428	A1	2017-07-13	BROWN et al.	
	6	20170196427	A1	2017-07-13	BROWN et al.	
	7	20170196425	A1	2017-07-13	BROWN et al.	
	8	20170196424	A1	2017-07-13	BROWN et al.	
	9	20170196423	A1	2017-07-13	BROWN et al.	
	10	20170196422	A1	2017-07-13	BROWN et al.	
	11	20170196421	A1	2017-07-13	BROWN et al.	
	12	20170196419	A1	2017-07-13	BROWN et al.	
	13					

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Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2]	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1	2017117679	WO	A1	2017-07-13	OMACHRON INTELLECTUAL PROPERTY INC.		☐
	2							☐

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Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1		☐

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EXAMINER SIGNATURE

Examiner Signature	/ANDREW A HORTON/	Date Considered	02/06/2019

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

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☐ See attached certification statement.

☐ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☐ A certification statement is not submitted herewith.

SIGNATURE

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Signature	/Philip C. Mendes da Costa/	Date (YYYY-MM-DD)	2018-12-12
Name/Print	Philip C. Mendes da Costa	Registration Number	33,106

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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 15/642,781	Filing Date 07/06/2017	☐ To be Mailed

ENTITY: ☑ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A		N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A		N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*		x $80 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $420 =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).				
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))					
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT	06/20/2019	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 16	Minus	** 20	= 0		x $100 =	0
	Independent (37 CFR 1.16(h))	* 1	Minus	*** 3	= 0		x $460 =	0
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	0

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=		x $0 =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=		x $0 =	
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.	SLIE
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".	/DESHONNE T. MARTINO/
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".	
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.	

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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

PTO/SB/08a (02-18)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT
(Not for submission under 37 CFR 1.99)

Application Number	15642781
Filing Date	2017-07-06
First Named Inventor	Wayne Ernest Conrad
Art Unit	3723
Examiner Name	HORTON, Andrew A.
Attorney Docket Number	10452-P52585US00

U.S.PATENTS Remove

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	10238249	B2	2019-03-26	Brown et al.	

If you wish to add additional U.S. Patent citation information please click the Add button. Add

U.S.PATENT APPLICATION PUBLICATIONS Remove

Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	20170290479	A1	2017-10-12	Conrad	
	2	20170079489	A1	2017-03-23	DIMBYLOW	
	3	20160113455	A1	2016-04-28	Horvath et al.	
	4	20160106285	A1	2016-04-21	Jenson	
	5	20110314630	A1	2011-12-29	Conrad	

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	15642781
	Filing Date	2017-07-06
	First Named Inventor	Wayne Ernest Conrad
	Art Unit	3723
	Examiner Name	HORTON, Andrew A.
	Attorney Docket Number	10452-P52585US00

	6	20100154367	A1	2010-06-24	Luo et al.			

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Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2] i	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1							

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Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1		

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EXAMINER SIGNATURE

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	15642781
	Filing Date	2017-07-06
	First Named Inventor	Wayne Ernest Conrad
	Art Unit	3723
	Examiner Name	HORTON, Andrew A.
	Attorney Docket Number	10452-P52585US00

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

☒ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Philip C. Mendes da Costa/	Date (YYYY-MM-DD)	2019-06-20
Name/Print	Philip C. Mendes da Costa	Registration Number	33106

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

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

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

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

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

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

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

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

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

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

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

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

Electronic Acknowledgement Receipt	
EFS ID:	36357712
Application Number:	15642781
International Application Number:	
Confirmation Number:	5834
Title of Invention:	HANDHELD SURFACE CLEANING APPARATUS
First Named Inventor/Applicant Name:	Wayne Ernest Conrad
Customer Number:	1059
Filer:	Philip C. Mendes da Costa/Snezana Lisowsky
Filer Authorized By:	Philip C. Mendes da Costa
Attorney Docket Number:	10452-P52585US00
Receipt Date:	20-JUN-2019
Filing Date:	06-JUL-2017
Time Stamp:	12:19:41
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$240
RAM confirmation Number	062019INTEFSW12201500
Deposit Account	022095
Authorized User	Snezana Lisowsky
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: 37 CFR 1.16 (National application filing, search, and examination fees) 37 CFR 1.17 (Patent application and reexamination processing fees)	

37 CFR 1.19 (Document supply fees)

37 CFR 1.20 (Post Issuance fees)

37 CFR 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		EFSWEB_P52585US00_Response_2019_06_20.pdf	292839 28df8b43366d5572e7e8ce4078b0f116e3ed1497	yes	10

Multipart Description/PDF files in .zip description

Document Description	Start	End
Amendment/Req. Reconsideration-After Non-Final Reject	1	1
Claims	2	4
Applicant Arguments/Remarks Made in an Amendment	5	10

Warnings:					
Information:					
2	Transmittal Letter	P52585US00_Commissioner_2019_06_20.PDF	177240 e02ba4b1d6b706560e1ce163c3859c67cd62a5f9	no	2
Warnings:					
Information:					
3	Information Disclosure Statement (IDS) Form (SB08)	P52585US00_supplIDS_2019-06_20.pdf	1042034 c262bb629f0e6e3dc8df6f46a9627598d00e232a	no	4
Warnings:					
Information:					
4	Fee Worksheet (SB06)	fee-info.pdf	30569 0738b8f08178c864be1191fd9bdbfb682fc3eb1a	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	1542682		

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

New Applications Under 35 U.S.C. 111

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

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

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

New International Application Filed with the USPTO as a Receiving Office

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

Electronic Patent Application Fee Transmittal

Application Number:	15642781
Filing Date:	06-Jul-2017
Title of Invention:	HANDHELD SURFACE CLEANING APPARATUS
First Named Inventor/Applicant Name:	Wayne Ernest Conrad
Filer:	Philip C. Mendes da Costa/Snezana Lisowsky
Attorney Docket Number:	10452-P52585US00

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
SUBMISSION- INFORMATION DISCLOSURE STMT	1806	1	240	240
		Total in USD ($)		**240**

Bereskin & Parr

Appl. No	:	15/642,781
Filed:	:	July 6, 2017
Applicant	:	Omachron Intellectual Property Inc.
Title	:	SURFACE CLEANING APPARATUS
TC./A.U.	:	3723
Examiner	:	HORTON, ANDREW ALAN
Docket No.	:	10452-P52585US00
Customer No.	:	01059

Confirmation No.: 5834
June 20, 2019

Honorable Commissioner for Patents
P. O. Box 1450
Alexandria, Virginia 22313–1450

AMENDMENT AFTER NON-FINAL REJECTION

Commissioner:

This is in response to the Office Action of March 29, 2019.

Amendments to the Claims are reflected in the listing of claims, which begins on page 2 of this paper.

Remarks/Arguments begin on page 5 of this paper.

3210526

REMARKS/ARGUMENTS

Claim Amendments

Claims 1 and 9 have been amended as shown in the above listing of claims.

Claims 1 to 16 remain pending in this application, of which claim 1 is independent.

The claim amendments have been made without prejudice and without disclaimer. Applicant submits that no new matter has been added to the claims as a result of these amendments and that the amended claims submitted herewith are fully supported by the application as originally filed.

Claim Rejections – 35 USC § 102

The Examiner rejected former claims 1-13 under 35 U.S.C. 102(a)(1) as being anticipated by Beskow (US 2008/0040883).

The Examiner also rejects former claims 1-4, 8 and 14-16 under 35 U.S.C. 102(a)(1) as being anticipated by Sunderland (US 2013/0207615).

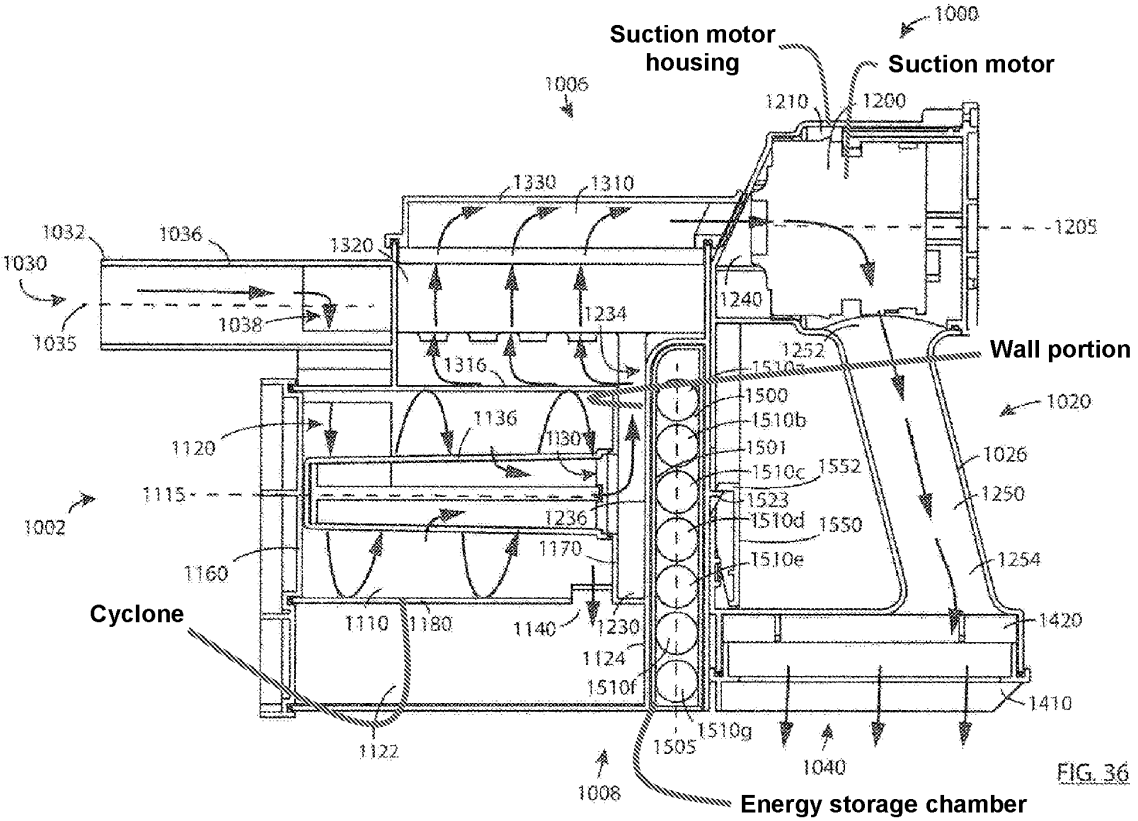
Applicant respectfully traverses the above-noted rejections with respect to the claims as amended.

Amended independent claim 1 recites, at relevant parts:

> *a suction motor housing having a suction motor, the suction motor is positioned in the air flow path upstream of the clean air outlet; and,*
>
> *at least one energy storage member positioned in an energy storage chamber*
>
> *wherein the energy storage chamber is exterior to the suction motor housing, and*
>
> *wherein a portion of the air flow path upstream of the suction motor is defined in part by a wall portion, the wall portion is in thermal communication with the energy storage chamber whereby air travelling through the portion of the air*

flow path upstream of the suction motor travels along the wall portion and cools the wall portion. [Emphasis added]

These features are exemplified in FIG. 36 of the application, reproduced below with annotations added.



Annotated FIG. 36 of the Application

As exemplified in FIG. 36 above, the air flow exiting the cyclone chamber cools the wall portion as it travels along the wall portion. Since the wall portion is in thermal communication with the energy storage chamber, this air flow assists in cooling the at least one energy storage member positioned in the energy storage chamber.

Discussion of the Rejection of Claim 1 – Beskow

In Beskow, batteries 930 are provided around the suction motor 910. Paragraph [0093] of Beskow provides:

> *In a preferred embodiment, a battery bracket **928** is mounted around the fan motor **910** to hold a number of batteries **930** around the motor's peripheral wall. The diffuser **916** may also cool these batteries **930** during operation.* (Emphasis added)

As shown in FIG. 9 of Beskow, reproduced below, batteries 930 are located rearward of diffuser 916 in the suction motor housing 908. Accordingly, batteries 930 are not positioned in an energy storage chamber exterior the suction motor housing, as specified in amended independent claim 1.

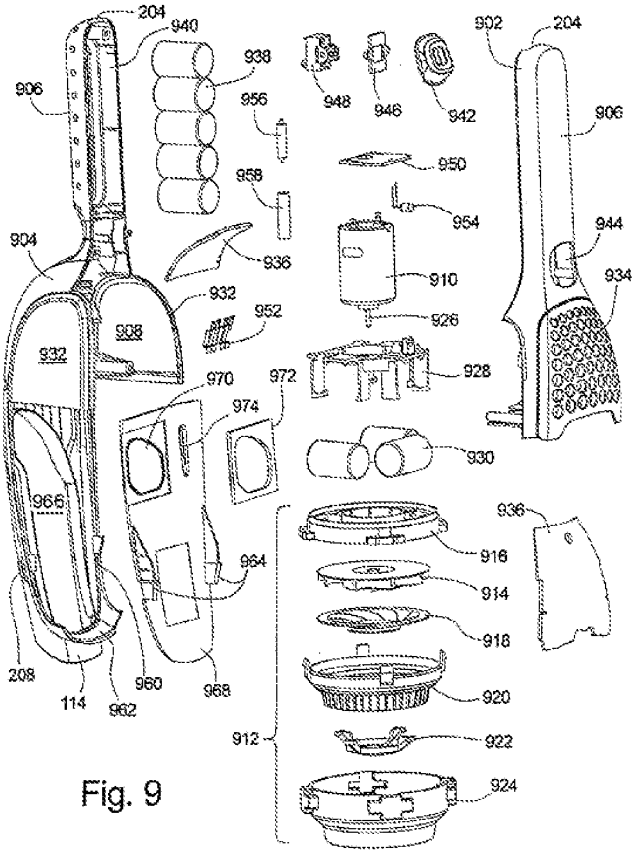


FIG. 9 of Beskow

Beskow discloses additional batteries 938 that are stored in chamber 940 (see FIG. 9 of Beskow). In FIG. 9 of Beskow, any wall portion that may be considered in thermal communication with chamber 940 is **not in the air flow path upstream** of the suction motor 910. In this way, FIG. 9 of Beskow fails to disclose that a portion of the air flow path upstream of the suction motor is defined in part by a wall portion in thermal communication with the energy storage chamber, as specified in amended independent claim 1.

Accordingly, Applicant submits that amended independent claim 1 is novel over Beskow. Withdrawal of the rejection is respectfully requested.

Discussion of the Rejection of Claim 1 – Sunderland

In Sunderland, the energy storage members are located in a battery pack 10. As shown in FIG. 1 of Sunderland, reproduced below, the battery pack 10 is located at the base of the handle 8.

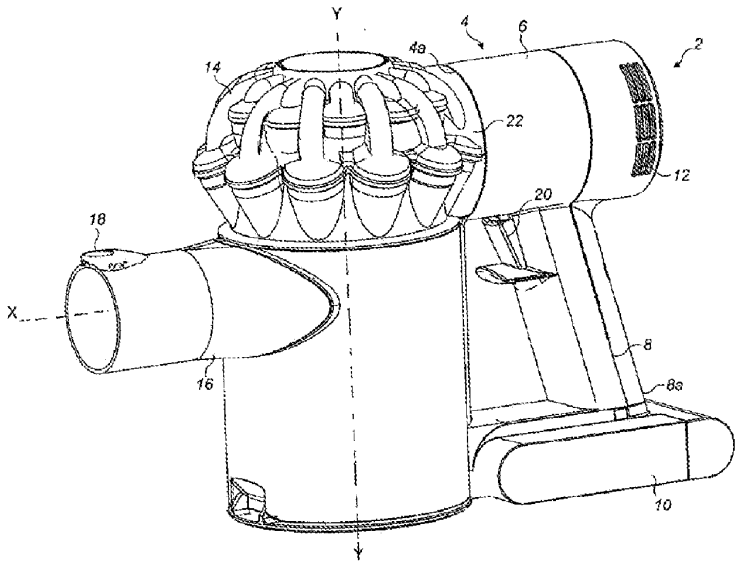


FIG. 1 of Sunderland

In FIG. 1 of Sunderland, any wall portion that may be considered in thermal communication with battery pack 910 is **not in the air flow path upstream** of the suction motor. In this way, FIG. 9 of Sunderland fails to disclose that a portion of the air flow path upstream of the suction motor is defined in part by a wall portion in thermal communication with the energy storage chamber, as specified in amended independent claim 1.

Accordingly, Applicant submits that amended independent claim 1 is novel over Beskow. Withdrawal of the rejection is respectfully requested.

Discussion of the Patentability of the Dependent Claims

The rest of the rejected claims depend from claim 1 and further define additional technical features of the present invention. In view of the patentability of amended independent claim 1 and in further view of the additional technical features, Applicant respectfully submits that the dependent claims are patentable over the prior art.

Although Applicant has not addressed all the issues of the dependent claims, Applicant respectfully submits that Applicant does not necessarily agree with the characterization and assessments of the dependent claims made by the Examiner, and Applicant believes that each claim is patentable on its own merits. Applicant respectfully submits that the dependent claims incorporate by reference all the limitations of the claim to which they refer and include their own patentable features, and are therefore in condition for allowance. Therefore, Applicant respectfully requests the withdrawal of all claim rejections and prompts allowance of the claims.

Conclusion

Applicant respectfully submits that the present application is in condition for allowance and requests that a timely Notice of Allowance be issued.

Should the Examiner deem it beneficial to discuss the application in greater detail, the Examiner is kindly requested to contact Philip C. Mendes da Costa by telephone at 416-957-1695 at the Examiner's convenience.

No Disclaimers or Disavowals

Although the present communication may include alterations to the application or claims, or characterizations of claim scope or referenced art, Applicant is not conceding in this application that previously pending claims are not patentable over the cited references. Rather, any alterations or characterizations are being made to facilitate expeditious prosecution of this application. Applicant reserves the right to peruse at a later date any previously pending or other broader or narrower claims that capture any subject matter supported by the present disclosure, including subject matter found to be specifically disclaimed herein or by any prior prosecution. Accordingly, reviewers of this or any parent, child or related prosecution history shall not reasonably infer that Applicant has made any disclaimers or disavowals of any subject matter supported by the present specification.

If additional fees are required, please charge the fees to our Deposit Account No. 02-2095.

Respectfully submitted,

BERESKIN & PARR LLP/S.E.N.C.R.L., s.r.l.

/Philip C. Mendes da Costa/

By _____
Name: Philip C. Mendes da Costa
Reg. No. 33,106
Tel: 416.957.1695

Amendments to the Claims

The following listing of claims replaces all prior versions, and listings, of claims in the application.

Listing of Claims:

1. (Currently Amended) A hand vacuum cleaner having a front end, a rear end, an upper end, a lower end, and first and second laterally spaced apart sides, and comprising:

(a) an air flow path extending from a dirty air inlet to a clean air outlet;

(b) a cyclone chamber positioned in the air flow path and having a cyclone air inlet, a cyclone air outlet, and a cyclone axis of rotation;

(c) a suction motor housing having a suction motor, the suction motor is positioned in the air flow path upstream of the clean air outlet; and,

(d) at least one energy storage member positioned in an energy storage chamber ~~having an energy storage chamber wall wherein the cyclone air outlet faces the energy storage chamber wall whereby air exiting the cyclone chamber impinges on the energy storage chamber wall~~

wherein the energy storage chamber is exterior to the suction motor housing, and

wherein a portion of the air flow path upstream of the suction motor is defined in part by a wall portion, the wall portion is in thermal communication with the energy storage chamber whereby air travelling through the portion of the air flow path upstream of the suction motor travels along the wall portion and cools the wall portion.

2. (Original) The hand vacuum cleaner of claim 1 wherein the cyclone axis of rotation extends generally in a forward/rearward direction.

3. (Original) The hand vacuum cleaner of claim 1 wherein the at least one energy storage member comprises a plurality of energy storage members wherein at least some of the plurality of energy storage members are arranged one above another in a

generally upwardly extending configuration when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner.

4. (Original) The hand vacuum cleaner of claim 3 wherein the energy storage members arranged one above another comprise longitudinally extending members each having a longitudinal axis that extends laterally.

5. (Original) The hand vacuum cleaner of claim 3 wherein the cyclone axis of rotation intersects a volume defined by the generally upwardly extending configuration of energy storage members.

6. (Original) The hand vacuum cleaner of claim 5 wherein the cyclone axis of rotation extends generally in a forward/rearward direction.

7. (Original) The hand vacuum cleaner of claim 1 wherein the at least one energy storage member is removably receivable in the energy storage chamber.

8. (Original) The hand vacuum cleaner of claim 7 wherein the at least one energy storage member comprises a battery pack that is removably receivable in the energy storage chamber.

9. (Currently Amended) The hand vacuum cleaner of claim 1 wherein the ~~air flow path comprises a~~ wall portion faces ~~that extends from~~ the cyclone air outlet ~~to the suction motor and is defined in part by the energy storage chamber wall~~.

10 (Original) The hand vacuum cleaner of claim 9 wherein the portion of the air flow path extends generally upwardly from the cyclone air outlet to the suction motor when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner.

11. (Original) The hand vacuum cleaner of claim 10 wherein the suction motor is positioned above the cyclone axis of rotation when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner.

12. (Original) The hand vacuum cleaner of claim 9 wherein the portion of the air flow path extends generally downwardly from the cyclone air outlet to the suction motor when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner.

13. (Original) The hand vacuum cleaner of claim 12 wherein the suction motor is positioned below the cyclone axis of rotation when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner.

14. (Original) The hand vacuum cleaner of claim 1 further comprising a handle having a hand grip portion that extends upwardly and forwardly when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner wherein the handle is positioned rearward of the at least one energy storage member.

15. (Original) The hand vacuum cleaner of claim 14 wherein the at least one energy storage member comprises a plurality of energy storage members wherein at least some of the plurality of energy storage members are arranged one above another in a generally upwardly extending configuration when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner.

16. (Original) The hand vacuum cleaner of claim 15 further comprising a finger gap positioned between the handle and the energy storage chamber.

Bereskin & Parr

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appl. No	:	15/642,781	Confirmation No. 5834
Applicant	:	Omachron Intellectual Property Inc.	
Filed	:	July 6, 2017	
For	:	HANDHELD SURFACE CLEANING APPARATUS	
T.C./A.U.	:	3723	
Examiner	:	HORTON, Andrew Alan	
Docket No.	:	10452-P52585US00	
Customer No.	:	01059	

June 18, 2019

Commissioner of Patents
P.O. Box 1450
Alexandria, VA 22313-1450

SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT
Under 37 CFR 1.56 and 37 CFR 1.97(c)(2)

Sir:

In accordance with 37 CFR 1.97 and 1.98, and in recognition of the duty of disclosure set forth in 37 CFR 1.56, the applicant hereby submits a Supplemental Information Disclosure Statement including a listing of patents and other publications of which the applicant is aware on e-PTO form SB/08a.

In accordance with the requirements of 1.97(c)(2), this Information Disclosure Statement is filed before the mailing date of any of a final action, a notice of allowance or an action that otherwise closes prosecution in the application and is accompanied with the requisite fee under 37 CFR 1.17(p).

Accordingly, the Commissioner is authorized to charge the requisite fee of $240 to our Deposit Account No. 022095.

Bereskin & Parr LLP
Scotia Plaza, 40 King Street West, 40th Floor, Toronto, ON M5H 3Y2 Canada
Tel: 416.364.7311 Fax: 416.361.1398 bereskinparr.com

(A) List of References

A list of the patents and other publications of which the applicant is aware is set out in the attached e-PTO Form SB08a.

(B) Copies of References

No foreign or non-patent literature references are being cited at this time.

The filing of this statement shall not be construed as an admission that the information cited in the attached statement is, or is considered to be, material to patentability (37 CFR 1.97(h)), nor as an admission that it constitutes prior art.

Accordingly, the applicant submits that the Information Disclosure Statement is properly considered at this time.

Respectfully submitted,

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(54) Title: HANDHELD VACUUM CLEANER

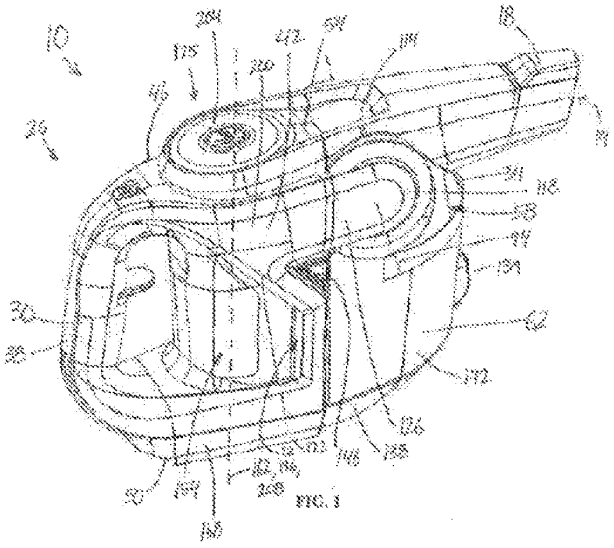


FIG. 1

(57) Abstract: A handheld vacuum cleaner includes a fluid flow path extending from a dirty air inlet to a clean air outlet, a main body including a handle, and a fluid flow motor positioned in the fluid flow path. The vacuum cleaner further includes a dirt collection region with an openable bottom and a cyclonic separator in the fluid flow- path. The cyclonic separator includes a cyclone chamber having a first end wall and a second end wall, a cyclone dirty fluid inlet, and a cyclone clean fluid outlet. The vacuum cleaner further includes a filter chamber in the fluid flow path downstream from the cyclonic separator and upstream from the fluid flow motor. The filter chamber includes an outlet fluidly communicating the filter chamber and the fluid flow motor and a tangential inlet fluidly communicating the cyclonic separator and the filter chamber.

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HANDHELD VACUUM CLEANER

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to co-pending U.S. Provisional Patent Application No. 62/253,508, filed on November 10, 2015, the entire contents of which are incorporated herein by reference.

BACKGROUND

[0002] The present invention relates to handheld vacuum cleaners, and more particularly, to cyclonic handheld vacuum cleaners.

SUMMARY

[0003] In one embodiment, the invention provides a vacuum cleaner including a fluid flow path extending from a dirty air inlet to a clean air outlet, a main body including a handle, and a fluid flow motor positioned in the fluid flow path. The vacuum cleaner further includes a dirt collection region with an openable bottom and a cyclonic separator in the fluid flow path. The cyclonic separator includes a cyclone chamber having a first end wall and a second end wall, a cyclone dirty fluid inlet, and a cyclone clean fluid outlet. The vacuum cleaner further includes a filter chamber in the fluid flow path downstream from the cyclonic separator and upstream from the fluid flow motor. The filter chamber includes an outlet fluidly communicating the filter chamber and the fluid flow motor and a tangential inlet fluidly communicating the cyclonic separator and the filter chamber.

[0004] In one embodiment, the invention provides a vacuum cleaner including a fluid flow path extending from a dirty air inlet to a clean air outlet, a main body including a handle, and a fluid flow motor positioned in the fluid flow path. The vacuum cleaner further includes a cyclonic separator in the fluid flow path. The cyclonic separator includes a cyclone chamber having a first end wall, a second end wall, a sidewall extending along a cyclone axis, a cyclone dirty fluid inlet, and a cyclone clean fluid outlet. The vacuum cleaner further includes a filter chamber housing a cylindrical filter in the fluid flow path downstream from the cyclonic separator and upstream from the fluid flow motor. An axis defined by the cylindrical filter is transverse to the cyclone axis.

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[0005] In another embodiment, the invention provides a vacuum cleaner including a fluid flow path extending from a dirty air inlet to a clean air outlet, a main body including a handle, and a fluid flow motor positioned in the fluid flow path. The vacuum cleaner further includes a cyclonic separator in the fluid flow path. The cyclonic separator includes a cyclone chamber having a first end wall, a second end wall, a sidewall extending along a cyclone axis, a cyclone dirty fluid inlet, and a cyclone clean fluid outlet. The vacuum cleaner further includes a filter chamber in the fluid flow path downstream from the cyclonic separator and upstream from the fluid flow motor, and an airflow passage between the cyclone clean fluid outlet and the filter chamber. The airflow passage defines an upstream cross-sectional area and defines a downstream cross-sectional area. The downstream cross-sectional area is larger than the upstream cross-sectional area.

[0006] In another embodiment, the invention provides a vacuum cleaner including a fluid flow path extending from a dirty air inlet to a clean air outlet, a fluid flow motor positioned in the fluid flow path, and a cyclonic separator in the fluid flow path. The cyclonic separator includes a cyclone chamber having a first end wall and a second end wall, a cyclone dirty fluid inlet, and a cyclone clean fluid outlet. The vacuum cleaner further includes a filter chamber in the fluid flow path downstream from the cyclonic separator and upstream from the fluid flow motor. The filter chamber houses a pre-motor filter having a first cylindrical filter and a second cylindrical filter. The second cylindrical filter is nested within the first cylindrical filter.

[0007] In another embodiment, the invention provides a vacuum cleaner including a fluid flow path extending from a dirty air inlet to a clean air outlet, a main body including a handle, and a fluid flow motor positioned in the fluid flow path. The vacuum cleaner further includes a cyclonic separator in the fluid flow path. The cyclonic separator includes a cyclone chamber having a first end wall, a second end wall, a sidewall extending along a cyclone axis, a cyclone dirty fluid inlet, and a cyclone clean fluid outlet. The vacuum cleaner further includes a filter chamber housing a pre-motor filter in the fluid flow path downstream from the cyclonic separator and upstream from the fluid flow motor. A gap between the pre-motor filter and an adjacent sidewall of the filter chamber is between 5 and 10 millimeters.

[0008] In another embodiment, the invention provide a handheld vacuum cleaner including a fluid flow path extending from a dirty air inlet to a clean air outlet, a main body including a handle, and a fluid flow motor positioned in the fluid flow path. The vacuum

cleaner further includes a cyclonic separator in the fluid flow path. The cyclonic separator includes a cyclone chamber having a first end wall and a second end wall, a cyclone dirty fluid inlet, and a cyclone clean fluid outlet. The vacuum cleaner further includes a filter chamber housing a filter in the fluid flow path downstream from the cyclonic separator and upstream from the fluid flow motor. The filter chamber includes a lid removable to open the filter chamber and the filter is coupled to the lid.

[0009] In another embodiment, the invention provides a vacuum cleaner including a fluid flow path extending from a dirty air inlet to a clean air outlet, a fluid flow motor positioned in the fluid flow path, and a cyclonic separator in the fluid flow path. The vacuum cleaner further includes a filter chamber in the fluid flow path downstream from the cyclonic separator and upstream from the fluid flow motor. The filter chamber houses a pre-motor filter having a first stage filter and a second stage filter. The first stage filter is removable from the second stage filter.

[0010] In another embodiment, the invention provides a vacuum cleaner including a fluid flow path extending from a dirty air inlet to a clean air outlet, a main body including a handle, and a fluid flow motor positioned in the fluid flow path. The vacuum cleaner further includes a cyclonic separator in the fluid flow path. The cyclonic separator includes a cyclone chamber having a first end wall and a second end wall, a cyclone dirty fluid inlet, and a cyclone clean fluid outlet. The vacuum cleaner further includes a filter chamber in the fluid flow path downstream from the cyclonic separator and upstream from the fluid flow motor. The filter chamber includes an inlet fluidly communicating the cyclonic separator and the filter chamber. The filter chamber includes an outlet fluidly communicating the filter chamber and the fluid flow motor, and the inlet is perpendicular to the outlet.

[0011] In another embodiment, the invention provides a vacuum cleaner including a fluid flow path extending from a dirty air inlet to a clean air outlet, a main body including a handle, and a fluid flow motor positioned in the fluid flow path. The vacuum cleaner further includes a cyclonic separator in the fluid flow path. The cyclonic separator includes a cyclone chamber having a first end wall and a second end wall, a cyclone dirty fluid inlet, and a cyclone clean fluid outlet. The vacuum cleaner further includes a filter chamber in the fluid flow path downstream from the cyclonic separator and upstream from the fluid flow motor. The filter chamber includes an inlet fluidly communicating the cyclonic separator and the filter chamber and an outlet fluidly communicating the filter chamber and the fluid flow

motor. The inlet includes a rectangular cross-section and the outlet includes a circular cross-section.

[0012] In another embodiment, the invention provides a vacuum cleaner including a fluid flow path extending from a dirty air inlet to a clean air outlet, a main body including a handle, and a fluid flow motor positioned in the fluid flow path. The vacuum cleaner further includes a cyclonic separator in the fluid flow path. The cyclonic separator includes a cyclone chamber having a first end wall, a second end wall, a sidewall extending along a cyclone axis, a cyclone dirty fluid inlet, and a cyclone clean fluid outlet. The vacuum cleaner further includes a filter chamber in the fluid flow path downstream from the cyclonic separator and upstream from the fluid flow motor. An axis defined by the filter chamber is perpendicular to the cyclone axis.

[0013] In another embodiment, the invention provides a vacuum cleaner including a fluid flow path extending from a dirty air inlet to a clean air outlet, a main body including a handle, a fluid flow motor positioned in the fluid flow path. The vacuum cleaner further includes a cyclonic separator in the fluid flow path, and a filter chamber housing a cylindrical filter in the fluid flow path downstream from the cyclonic separator and upstream from the fluid flow motor. The filter chamber includes a tangential inlet fluidly communicating the cyclonic separator and the filter chamber. The fluid flow path extends through the cylindrical filter in a normal flow orientation.

[0014] Other aspects of the invention will become apparent by consideration of the detailed description and accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] FIG. 1 is a perspective view of a handheld vacuum cleaner according to an embodiment of the invention.

[0016] FIG. 2 is another perspective view of the handheld vacuum cleaner of FIG. 1.

[0017] FIG. 3 is a bottom perspective view of the handheld vacuum cleaner of FIG. 1.

[0018] FIG. 4 is a perspective view of a separator according to an embodiment of the invention.

[0019] FIG. 5 is another perspective view of the separator of FIG. 4.

[0020] FIG. 6 is a side view of the separator of FIG. 4.

[0021] FIG. 7 is a cross-sectional view of the separator of FIG. 4 taken along lines 7-7 shown in FIG. 4.

[0022] FIG. 8 is another cross-sectional view of the separator of FIG. 4 taken along lines 8-8 shown in FIG. 5.

[0023] FIG. 9 is another cross-sectional view of the separator of FIG. 4 taken along lines 9-9 shown in FIG. 4.

[0024] FIG. 10 is another cross-sectional view of the separator of FIG. 4 taken along lines 10-10 shown in FIG. 4.

[0025] FIG. 10A is a cross-sectional view of the separator of FIG. 4 taken along lines 10A-10A shown in FIG. 10.

[0026] FIG. 11 is a partial perspective view of the cross-sectional view of FIG. 10.

[0027] FIG. 12 is a perspective view of a filter assembly and a suction source according to an embodiment of the invention, with other components removed for clarity.

[0028] FIG. 13 is an exploded view of the filter assembly of FIG. 12.

[0029] FIG. 13A is a perspective view of the filter assembly of FIG. 12 with a pre-motor filter removed from a filter chamber.

[0030] FIG. 14 is a cross-sectional view of the filter assembly and suction source of FIG. 12 taken along lines 14-14 shown in FIG. 12.

[0031] FIG. 15 is a cross-sectional view of the filter assembly and motor assembly of FIG. 12 taken along lines 15-15 shown in FIG. 12.

[0032] FIG. 16 is a perspective view of a handheld vacuum cleaner according to another embodiment of the invention.

[0033] FIG. 17 is a side view of the handheld vacuum cleaner of FIG. 16.

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[0034] FIG. 18 is a perspective schematic view of the handheld vacuum cleaner of FIG. 16.

[0035] FIG. 19 is a perspective view of a separator according to an alternative embodiment of the invention.

[0036] FIG. 20 is another perspective view of the separator of FIG. 19.

[0037] FIG. 21 is a perspective view of a cross-section of the separator of FIG. 19 taken along lines 21-21 shown in FIG. 19.

[0038] FIG. 22 is another perspective view of the cross-section of the separator of FIG. 19 taken along lines 21-21 shown in FIG. 19.

[0039] Before any embodiments of the invention are explained in detail, it is to be understood that the invention is not limited in its application to the details of construction and the arrangement of components set forth in the following description or illustrated in the following drawings. The invention is capable of other embodiments and of being practiced or of being carried out in various ways

DETAILED DESCRIPTION

[0040] FIGS. 1-15 illustrate a handheld vacuum cleaner 10. The handheld vacuum cleaner 10 includes a fluid flow path extending from a dirty air inlet 14 formed in a suction nozzle 18 to a clean air outlet 22 (FIG. 1). The handheld vacuum cleaner 10 also includes a main body 26 (i.e., a main housing) with a handle 30, a front end 34, a back end 38, a first side 42, a second side 46, a bottom 50, and a top 54. The dirty air inlet 14 and the suction nozzle 18 are located at the front end 34 of the main body 26. The handle 30 is located at the back end 38 and extends generally in a top-to-bottom direction along the main body 26. In other words, the handle 30 is oriented generally vertical when the handheld vacuum cleaner 10 is sitting on a horizontal surface.

[0041] With reference to FIGS. 1-11, the handheld vacuum cleaner 10 includes a cyclonic separator 58 and a dirt collection region 62. It is understood the cyclonic separator 58 is positioned in the fluid flow path and the assemblies illustrated in FIGS. 4-11 are utilized within the handheld vacuum cleaner 10 illustrated in FIGS. 1-3. In other words, FIGS. 4-11

schematically illustrate certain details of the handheld vacuum cleaner 10 with other components removed for clarity.

[0042] With reference to FIGS. 4-11, the cyclonic separator 58 includes a cyclone chamber 66 (FIG. 7) having a first end wall 70, a second end wall 74, and a sidewall 78 extending between the first wall 70 and the second wall 74. The cyclonic separator 58 further includes a cyclone dirty fluid inlet 82 (FIG. 7), a cyclone clean fluid outlet 86, and cyclone dirt outlet 90 (FIG. 8). In the illustrated embodiment, the cyclone dirt outlet 90 is formed in the sidewall 78 proximal the second end wall 74, the cyclone dirty fluid inlet 82 is formed in the sidewall 78 proximate the first end wall 70, and the cyclone clean fluid outlet 86 is formed in the first end wall 70.

[0043] With continued reference to FIG. 9, a flow-diverting wall 91 is positioned adjacent the cyclone dirt outlet 90. The flow-diverting wall 91 is positioned downstream from the cyclone dirt outlet 90 and debris exiting the cyclone dirt outlet 90 travels past an upstream wall 92 and impinges (i.e., impacts) the flow-diverting wall 91. This is a result of the airflow within the cyclonic separator moving in a generally clockwise direction, as viewed from FIG. 9. The flow-diverting wall 91 extends from the cyclone sidewall 78 between the cyclone chamber 66 and the dirt collection region 62 in a direction along a cyclone chamber axis 94 (FIG. 8). The flow-diverting wall 91 forms a downstream boundary of the cyclone dirt outlet 90 and intersects the fluid flow path adjacent the second end wall 74 between the cyclone chamber 66 and the dirt collection region 62. A duct 93 is formed in part by the flow-diverting wall 91 and the opposite wall 92 around the perimeter of the cyclone dirt outlet 90 in fluid communication with the dirt collection region 62. The flow-diverting wall 91 eliminates a common "knife-edge" formed in prior art designs between the edge of the material throw-off in cyclone sidewalls and the adjacent dust bin. Such "knife-edge" transitions in the prior art tended to catch debris flowing toward it forming a debris clog point that reduced performance in traditional prior art cyclonic separator designs. In the embodiment shown in FIG. 9, debris exiting the cyclone dirt outlet 90 that passes over the wall 92 and impacts the flow-diverting wall 91 is at least partially guided toward the dirt collection region 62, which has been found to inhibit clogging of the cyclone dirt outlet 90.

[0044] The cyclone chamber axis 94 is defined by the sidewall 78 and passes through the first end wall 70 and the second end wall 74 (FIG. 8). The first end wall 70 and the second end wall 74 of the cyclone chamber 66 both intersect a common horizontal plane 98 (FIG. 6)

when the handheld vacuum cleaner 10 is positioned on a horizontal surface. In other words, normally the cyclone chamber axis 94 is approximately horizontal when the handheld vacuum cleaner 10 is in use. As used in the present description and claims, an approximately or generally horizontal orientation means an orientation that is tilted over such that it is not vertical or upright. The generally horizontal orientation includes various embodiments that are approximately parallel to the ground or floor, as well as orientations that are not parallel to the ground or floor but being generally more laying over than upright (i.e., being tilted more than about 45 degrees). For example, a horizontal orientation can include a cyclonic separator having a portion of a first end and a portion of a second end both intersecting a common horizontal plane.

[0045] With reference to FIGS. 10 and 11, the cyclonic separator 58 further includes a ramp 102 positioned in the cyclone chamber 66 around at least a portion of the second end wall 74 extending along the sidewall 78 toward the cyclone dirt outlet 90. In particular, the ramp 102 includes a beginning 106 spaced from the second end wall 74, and the ramp 102 includes an end 110 positioned at the second end wall 74 of the cyclone chamber 66. In the illustrated embodiment, a portion of the ramp surface 102 as viewed in a plane parallel to and through the cyclone chamber axis 94 is approximately perpendicular to the sidewall 78, shown as angle θ in FIG. 10A. Alternatively, the ramp surface angle θ may be at a non-perpendicular angle from the sidewall between about 30 degrees and 150 degrees. In yet another alternative, the ramp surface angle θ may be at a non-perpendicular angle from the sidewall between about 60 degrees and 120 degrees.

[0046] The ramp 102 is positioned such that the ramp end 110 positioned at the second end wall is along a flow path directed toward the cyclone dirt outlet 90 and the flow-diverting wall 91. In the illustrated embodiment, the ramp 102 is a helical ramp. The ramp 102 shown in FIG. 11 extends around an upper portion 114 of the sidewall 78; however, the ramp may be arranged along a middle portion or lower portion of the sidewall in embodiments having the cyclone dirt outlet in a different location than in the present embodiment. In the illustrated embodiment, the ramp 102 extends around approximately 180 degrees around the sidewall 78 (i.e., approximately half). In alternative embodiments, the ramp can extend around more or less of the perimeter of the cyclone to guide debris along a flow path directed toward the cyclone dirt outlet. The ramp may extend between about 90 degrees and 300 degrees around the cyclone perimeter. The ramp 102 guides debris in the cyclone chamber

66 to the cyclone dirt outlet 90. In addition, the ramp 102 inhibits the mixing of any air flow out of the cyclone through the dirt outlet with corresponding air flow in the cyclone across the cyclone dirt outlet 90, which in turn minimizes the re-entrainment of debris.

[0047] With reference to FIGS. 7 and 8, the cyclonic separator 58 further includes a shroud 115 positioned around a portion of the cyclone clean fluid outlet 86 configured to allow airflow from the cyclonic separator 58 to pass through the shroud 115 into the clean fluid outlet 86 and inhibiting passage of debris into the clean fluid outlet 86. In the illustrated embodiment, the shroud 115 includes a conical frame 116 with a mesh 117. The conical frame 116 and the mesh 117 provides more volume between the conical frame 116 and the sidewall 78 at the smaller end of the conical frame 116. The tangential flow of the swirling air and debris within the cyclonic separator 58 washes against the mesh 117 while the axial component of the flow pushes the debris toward the smaller end of the conical frame 116, which helps clear debris from the shroud 115 back into the separator flow. As such, a self-cleaning effect is achieved with the shroud 115 as debris is carried along with the flow, slowing the "wrapping" of debris in the cyclone chamber 66 around the shroud 115. Reducing the wrapping of debris inhibits clogging of the separator that formed in some prior art designs. In some embodiments, the shroud 115 and the first end wall 70 of the cyclonic separator 58 may be removable by a user from the first side 42 of the main body 26 to allow a user access to the cyclone chamber 66.

[0048] With reference to FIGS. 5-7, the handheld vacuum cleaner 10 further includes an outlet scroll 118 in fluid communication with the cyclone clean fluid outlet 86. The outlet scroll 118 includes a central portion 122 forming an end of the clean fluid outlet 86 and an airflow passage 126 downstream of the central portion 122. The outlet scroll 118 is configured to change the airflow path from a generally helical airflow along a first direction through the clean fluid outlet 86 to an airflow having less rotation along a second direction different than the first direction along the airflow passage 126 downstream of the central potion 122. In the illustrated embodiment, the first direction is along a first axis defined by the clean fluid outlet 86, and the second direction is along a second axis defined by the airflow passage 126 downstream of the central portion 122, where the second axis is transverse to the first axis. In other words, the outlet scroll 118 tends to straighten the flow as it passes from the cyclone clean fluid outlet 86 to the airflow passage 126. The airflow passage 126 is generally tangentially aligned with the central portion 122. In the illustrated

embodiment, the central portion 122 is generally cylindrical having a dimension larger than a dimension of the airflow passage, the airflow passage 126 being radially offset in the central portion 122 in the direction of the airflow such that the airflow has a tangential exit from the central portion 122 into the airflow passage 126. More specifically, the airflow passage 126 defines a central longitudinal axis 130 that does not intersect a midpoint 134 of the central portion 122. The outlet scroll 118 is more compact than a 90-degree elbow that was required in prior designs to change direction from the center axis of the separator to the direction toward the filter assembly. In addition, the outlet scroll 118 converts the swirling flow along the clean fluid outlet 86 into a more straightened flow along the airflow passage 126, which retains some of the kinetic energy that would otherwise be lost in a 90-degree elbow, resulting in a lower pressure drop. In other words, as a result of the passage 126 being tangentially aligned with the central portion 122 in the airflow direction, clean air entering the central portion 122 from the cyclone clean fluid outlet 86 leaves the central portion 122 with a lower pressure drop when compared to traditional elbow turns.

[0049] With reference to FIGS. 1-3 and 8-10, the dirt collection region 62 (i.e., dirt collection chamber) is removably secured to the main body 26 and in fluid communication with the cyclone dirt outlet 90 of the cyclonic separator 58. The dirt collection region 62 includes an openable bottom door 138 on the bottom of the dirt collection region 62, which allows for emptying the dirt collection region 62. In the illustrated embodiment, the bottom door 138 is released by actuation of a catch 139 (FIG. 2), or other suitable releasable securing means. The dirt collection region 62 is at least partially defined by a transparent bin 142 that is removably secured to the main body 26 via a catch 146 (FIG. 1), or other suitable releasable securing means. In the illustrated embodiment, the bin 142 is both removable from the main body 26 and the bottom door 138 is openable. As such, the bottom of the dirt collection region 62 is openable when the bin 142 is removed from the main body 26 or attached to the main body 26. The dirt collection region 62 includes ribs 150 to deflect the flow of air and inhibit the debris contained in the dirt collection region 62 from becoming re-entrained in the airflow.

[0050] With reference to FIGS. 12 and 15, the handheld vacuum cleaner 10 further includes a suction source 154 positioned in the fluid flow path. The suction source 154 is located in the main body 26 and includes a fluid flow motor 158 (FIG. 15) and a fan operable to generate a fluid flow path (i.e., a suction airflow) through the handheld vacuum cleaner 10

that is drawn from the dirty air inlet 14 through the cyclonic separator 58 to a motor air outlet 20, which is ducted to the clean air outlet 22 (FIG. 1). The motor 158 defines a motor axis 162 and the motor 158 is operable to rotate the fan about the motor axis 162. In the illustrated embodiment, the motor 158 and the fan are oriented such that the motor axis 162 extends in a direction toward the bottom 50 and the top 54 of the main body 26 and therefore, the motor axis 162 is generally vertical when the vacuum is positioned on a horizontal surface. In other words, the fluid flow motor axis 162 of the fluid flow motor 158 is approximately vertical when the handheld vacuum cleaner 10 is positioned on a horizontal surface. The fluid flow motor axis 162 is positioned closer to the handle 30 than the cyclone chamber axis 94 is to the handle 30. The fluid flow motor axis 162 is offset from and approximately perpendicular to the cyclone chamber axis 94.

[0051] With reference to FIGS. 1-3, the handheld vacuum cleaner 10 includes a battery 168 (i.e., a removable, rechargeable battery pack) to supply power to the suction source 154 to operate the motor 158 and other electrical components. The battery 168 is positioned at least partially below the bottom openable door 138 of the dirt collection region 62. When the battery 168 is attached to the main body 26, the handheld vacuum cleaner 10 is supported solely on the battery 168 when positioned on the horizontal surface. In other words, the battery 168 provides a bottom surface 172 that allows the entire handheld vacuum cleaner 10 to be supported by the battery 168 when the handheld vacuum cleaner is positioned on a horizontal surface.

[0052] With reference to FIGS. 12-15, the handheld vacuum cleaner 10 further includes a filter assembly 175 having a pre-motor filter 176 and a filter chamber 180. The pre-motor filter assembly 175 is located in the main body 26 with the filter chamber 180 positioned above the motor 158. The pre-motor filter 176 and the filter chamber 180 are in the fluid flow path downstream from the cyclonic separator 58 and are upstream from the fluid flow motor 158. The pre-motor filter 176 and filter chamber 180 are positioned between the handle 30 and the cyclonic separator 58. The pre-motor filter 176 filters the fluid flow path before the air travels through the fan and the motor 158. With reference to FIG. 13, the pre-motor filter 176 has a first cylindrical filter 184, optionally a second cylindrical filter 188, and a filter frame 192. The second cylindrical filter 188 is nested within and removable from the first cylindrical filter 184, and both filters 184, 188 are positioned around the filter frame 192. In the illustrated embodiment, the first cylindrical filter 184 defines an inner diameter

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189 (FIG. 13) and the second cylindrical filter 188 defines an outer diameter 190, and the inner diameter 189 and the outer diameter 190 are approximately equal (e g , within approximately 1 mm, 5mm, 10mm, etc. of each other). In some embodiments, the inner diameter 189 of the first cylindrical filter 184 is smaller than the outer diameter 190 of the second cylindrical filter 188 such that the second cylindrical filter 188 is slightly compressed (i.e. deformed) in order to be nested within the first cylindrical filter 184 in a press-fit type configuration. In alternative embodiments, there exists a gap radially between the first cylindrical filter 184 and the second cylindrical filter 188.

[0053] The filter frame may be integral with one of the first or second cylindrical filters, and for some embodiments the filter frame is omitted. In the illustrated embodiment, the second cylindrical filter 188 is configured to remove finer particles from the airflow than the first cylindrical filter 184 and the combination of the first and second cylindrical filters provides desired filtration of the airflow. In alternative embodiments, the first cylindrical filter 184 provides desired filtration of the airflow and the second cylindrical filter 188 is omitted. The first cylindrical filter 184 and second cylindrical filter 188 may be any desired filter media, including pleated or non-pleated, non-woven fiber, foam, or other media. The pre-motor filter 176 defines a filter axis 196 that is co-axial with the fluid flow motor axis 162 when the pre-motor filter 176 is assembled within the filter chamber 180. In addition, the filter axis 196 is transverse to the cyclone axis 94. In the illustrated embodiment, the filter axis 196 defined by the cylindrical pre-motor filter 176 is perpendicular to the cyclone chamber axis 94. In alternative embodiments, the pre-motor filter assembly 175 may be positioned such that the filter axis 196 is offset from and parallel to the motor axis.

[0054] With reference to FIGS. 12-14, the filter chamber 180 includes a tangential inlet 200 fluidly communicating the cyclonic separator 58 and the filter chamber 180. In particular, the airflow passage 126 extends between the cyclone clean fluid outlet 86 (more specifically, the outlet scroll 118) and the tangential inlet 200. The passage 126 ends downstream with the tangential inlet 200 to the filter chamber 180, the tangential inlet 200 providing a smooth airflow transition into the filter chamber 180 reducing the velocity of the airflow into the pre-motor filter 176. More specifically, the inlet 200 to the filter chamber 180 shown in FIG. 14 is a scroll inlet. The airflow passage 126 is positioned providing an entry 201 to the scroll inlet 200 adjacent the filter chamber 180. The scroll inlet 200 is an arcuate passage from an entry 201 to a tangential entry 202 to the filter chamber 180. The

tangential entry 202 to the filter chamber 180 may be between 90 and 360 degrees from the entry 201 to the scroll inlet 200, shown as angle β in FIG. 14. In other words, the filter chamber 180 includes a scroll inlet 200 having a tangential inlet 202 to the filter chamber 180 between 90 and 360 degrees from entry 201 of the scroll inlet 200. In some embodiments, part or all of the passage 126 and the outlet scroll 118 are openable to allow a user access to the same.

[0055] With continued reference to FIGS. 13-15, the filter chamber 180 also includes an outlet 203 fluidly communicating the filter chamber 180 and the fluid flow motor 158. In the illustrated embodiment, the outlet 203 is perpendicular to the tangential inlet 200. For example, with the vacuum cleaner 10 positioned on a horizontal surface, the fluid flow enters the tangential inlet 200 generally horizontal and leaves the outlet 203 generally vertically (i.e., the fluid flow makes approximately a 90 degree turn in the filter chamber 180). The fluid flow path extends through the cylindrical filters 184,188 in a normal flow orientation (i.e., the fluid flow move radially inwards toward the center of the cylindrical filters 184, 188). In some embodiments, the inlet 200 includes a rectangular cross-section shape and the outlet 203 includes a circular cross-section shape.

[0056] With reference to FIGS. 12 and 13, the filter chamber 180 is openable from the top 54 of the main body 26 when the handheld vacuum cleaner 10 is positioned on a horizontal surface. In particular, a removable lid 204 is provided on the top of the filter chamber 180 that may be opened by a user. As such, the pre-motor filter 176 is removable from the top of the filter chamber 180 through the top 54 of the main body 26. In some embodiments, the pre-motor filter 176 is attached to the lid 204 such that the lid acts as a handle to lift the filter out of the filter chamber. In some embodiments, the first cylindrical filter 184 is coupled to the removable lid 204 and the first cylindrical filter 184 is removed with the lid 204 by a user, leaving the second cylindrical filter 188 behind in the filter chamber 180. Alternatively or additionally, the filter frame 192 is attached to or integral with the lid 204 as shown in FIG. 13A.

[0057] The pre-motor filter 176 is positioned in the filter chamber 180. The filter chamber 180 is configured to provide a gap 181 (FIGS. 14 and 15) between the pre-motor filter 176 and an adjacent sidewall 182 of the filter chamber 180 between 5 and 10 millimeters. In one alternative, the gap 181 between the pre-motor filter 176 and adjacent sidewall 182 of the filter chamber 180 is between 5 and 8 millimeters. In another alternative,

the gap 181between the pre-motor filter 176 and adjacent sidewall 182 of the filter chamber 180 is between 8 and 10 millimeters. In other embodiments, the gap 181 between the pre-motor filter 176 and the adjacent sidewall 182 of the filter chamber 180 is larger than 5 millimeters to provide the desired airflow around the filter.

[0058] The airflow passage 126 extends in a lengthwise direction between the cyclonic separator 58 and the filter chamber 180, and has a height 124 and a width 125. As shown in FIG. 13A, the height 124 of the airflow passage 126 may increase along the downstream direction to slow the velocity of the air passing through the passage 126. Alternatively or additionally, the width 125 of the airflow passage 126 may increase along the downstream direction. In other words, with reference to FIG. 13A, the airflow passage 126 defines an upstream cross-sectional area 127 and defines a downstream cross-sectional area 128, and the downstream cross-sectional area 128 is larger than the upstream cross-sectional area 127 (i.e., the airflow passage 126 increases in volume along the downstream direction).

[0059] With reference to FIGS. 1-15, the handheld vacuum cleaner 10 includes a layout including the dirt collection region 62 generally located below the cyclonic separator 58 and adjacent the battery 168 and the suction source 154. The battery 168 is positioned below the fluid flow motor 158. In the embodiment illustrated in FIGS. 1-2, the battery 168 is entirely positioned below the fluid flow motor 158. The fluid flow motor 158 is positioned between the dirt collection region 62 and the handle 30. The filter chamber 180 is positioned above the fluid flow motor 158 when the handheld vacuum cleaner 10 is positioned on a horizontal surface. Furthermore, the filter chamber 180 defines a filter chamber axis 208 that is coaxial with the fluid flow motor axis 162 and the filter axis 196. In alternative embodiments, the filter chamber axis 208 is offset from and parallel to the fluid flow motor axis 162. In the illustrated embodiment, the filter chamber axis 208 is perpendicular to the cyclone chamber axis 94. The filter chamber 180 and the fluid flow motor 158 are both positioned between the cyclonic separator 58 and the handle 30.

[0060] In operation, the battery 168 provides power to the motor 158 to rotate the fan to generate a suction airflow that is drawn through the suction nozzle 18 along with debris. The airflow, entrained with debris, travels to cyclone dirty fluid inlet 82 of the cyclonic separator 58. The airflow and debris travel into the cyclone chamber 66 where the airflow and debris rotate about the cyclone chamber axis 94. Rotation of the airflow and debris causes the debris to separate from the airflow and the debris is discharged through the cyclone dirt outlet

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90. The ramp 102 aids in expelling the separated debris out the cyclone dirt outlet 90. The separated debris then falls into the dirt collection region 62. The clean air travels through the shroud 115 into the cyclone clean fluid outlet 86. The clean airflow then travels through the outlet scroll 118 and is routed to the tangential inlet 200 of the filter chamber 180. The airflow then travels through the pre-motor filter 176 before traveling through the suction source 154. After traveling through the suction source 154, the airflow is exhausted from the handheld vacuum cleaner 10 through exhaust openings in the main body 26.

[0061] After using the handheld vacuum cleaner 10, the user can open the door 138 to empty the dirt collection region 62. After several uses, debris may have collected on the shroud 115 and within the cyclone chamber 66. If so, the user can open or remove a portion of the first end wall 70 and outlet scroll 118 to remove the shroud 115 from the cyclonic separator 58. This allows the user to clean the shroud 115 and inside the sidewall 78. In addition, opening the removable lid 204 provides the user access to the filter chamber 180 and the pre-motor filter 176 so the user can clean or replace the pre-motor filter 176.

[0062] With reference to FIGS. 16-18, an alternative handheld vacuum cleaner 310 is illustrated. The alternative handheld vacuum cleaner 310 is similar to and includes many of the same components as the handheld vacuum cleaner 10 illustrated in FIGS. 1-15. As such, like components are reference the same with only the differences described in detail below. Similar to the handheld vacuum cleaner 10, the handheld vacuum cleaner 310 includes a fluid flow path extending from a dirty air inlet 14 formed in a suction nozzle 18 to a clean air outlet. The handheld vacuum cleaner 310 also includes a main body 26 with a handle 30, and a fluid flow motor 158 (FIG. 18) and a cyclonic separator 358 positioned in the fluid flow path.

[0063] The cyclonic separator 358 includes a cyclone chamber 366 having a first end wall 370, a second end wall 374, and a sidewall 378 extending between the first end wall 370 and the second end wall 374. The cyclonic separator 358 further includes a cyclone dirty fluid inlet 382, a cyclone clean fluid outlet 386, and a cyclone dirt outlet 390. A cyclone chamber axis 394 (FIG. 16) passes through the first end wall 370 and the second end wall 374. The first end wall 370 and the second end wall 374 of the cyclone chamber 366 both intersect a common horizontal plane 398 when the handheld vacuum cleaner 310 is positioned on a horizontal surface. In other words, normally the cyclone chamber axis 394 is approximately horizontal when the handheld vacuum cleaner 310 is in use.

[0064] A debris deceleration chamber 380 is positioned between the cyclone chamber 366 and a dirt collection region 362. The debris deceleration chamber 380 is in fluid communication with the cyclonic separator 358 and the dirt collection region 362. In particular, the debris deceleration chamber 380 is in fluid communication with the cyclone dirt outlet 390. In the illustrated embodiment, the debris deceleration chamber 380 is conical or funnel shaped defining a deceleration chamber axis 385 that is transverse to the cyclone axis 394. In the illustrated embodiment, the chamber axis 385 is approximately perpendicular to the cyclone axis 394. The debris deceleration chamber 380 includes an inlet 381 that is larger in cross-sectional area than an outlet 383. The outlet 383 of the debris deceleration chamber 380 is in fluid communication with the dirt collection region 362. Dirt exiting the cyclone dirt outlet 390 having a general flow direction around the cyclone axis 394 enters the debris deceleration chamber 380 which turns the flow in a direction around the chamber axis 385 where the velocity of the dirt is decreased before entering the dirt collection region 362. The slower debris speed created by the debris deceleration chamber 380 helps prevent debris in the dirt collection region 362 from becoming re-entrained in the fluid flow path. The debris deceleration chamber 380 defines the axis 385 (FIG. 17) that passes through the inlet 381 and the outlet 383. The axis 385 is generally askew and is neither oriented vertically nor horizontally. In the illustrated embodiment, the axis is approximately 30 degrees from vertical.

[0065] With reference to FIG. 17, the dirt collection region 362 includes an openable bottom door 438. The door 438 is openable while the handheld vacuum cleaner 310 is supported solely on a battery 168. In other words, a bottom surface 172 of the battery 168 is below the openable door 438. With reference to FIG. 18, the handheld vacuum cleaner 310 further includes a filter chamber 180 with a tangential inlet 200. The filter chamber 180 defines a filter chamber axis 208 that is coaxial with a motor axis 162 of a motor 158.

[0066] With reference to FIGS. 19-22, an alternative cyclonic separator 558 is illustrated. The alternative cyclonic separator 558 is similar to and includes many of the same components as the cyclonic separator 58 illustrated in FIGS. 4-11. As such, like components are referenced the same with only the differences described in detail below. It is understood that the cyclonic separator 558 can be implemented in either of the handheld vacuum cleaners 10, 310 described above. Similar to the cyclonic separator 58, the cyclonic separator 558 is positioned in the fluid flow path.

[0067] The cyclonic separator 558 includes a cyclone chamber 566 having a first end wall 570, a second end wall 574, and a sidewall 578 extending along a cyclone axis 594 between the first end wall 570 and the second end wall 574. The cyclonic separator 558 further includes a cyclone dirt fluid inlet 582, a cyclone clean fluid outlet, and a cyclone dirt outlet 590 formed in the sidewall 578. The cyclone chamber axis 594 passes through the first end wall 570 and the second end wall 574. The first end wall 570 and the second end wall 574 of the cyclone chamber 566 both intersect a common horizontal plane when the handheld vacuum cleaner is positioned on a horizontal surface. In other words, normally the cyclone chamber axis 594 is approximately horizontal when the handheld vacuum cleaner is in use.

[0068] With reference to FIGS. 21 and 22, the second end wall 574 includes an inner portion 575 and an outer portion 576. The outer portion 576 is offset from the inner portion 575 in a direction away from the first end wall 570. A flow-diverting wall 591 connects the inner portion 575 and the outer portion 576 of the second end wall 574, which bounds the downstream end of the cyclone dirt outlet 590. In other words, the flow-diverting wall 591 forms a downstream boundary of the cyclone dirt outlet 590, and the flow-diverting wall 591 is positioned along the direction of the cyclone axis 594. The flow-diverting wall 591 intersects the fluid flow path adjacent the second end wall 574 and is positioned between the cyclone chamber 566 and a dirt collection region 562. The flow-diverting wall 591 is positioned downstream from the cyclone dirt outlet 590 and debris exiting the cyclone dirt outlet 590 impinges (i.e., impacts) the flow-diverting wall 591 while the same debris exiting the cyclone dirt outlet 590 travels over an opposite wall 592. A duct 593 is at least partially formed by the flow-diverting wall 591, the opposite wall 592, and the second end wall 574. The duct 593 is in fluid communication with the cyclone dirt outlet 590 and the dirt collection region 562. Similar to the flow-diverting wall 91 described above, the flow-diverting wall 591 eliminates a common "knife-edge" formed in prior art designs between the edge of the material throw-off in cyclone sidewalls and the adjacent dust bin. Such "knife-edge" transitions in the prior art tended to catch debris flowing toward it forming a debris clog point that reduced performance in traditional prior art cyclonic separator designs. In the illustrated embodiment, the flow-diverting wall 591 is larger in cross-sectional area than the opposite wall 592. In addition, the inner portion 575 is similar to the ramp 102 described above since the inner portion 575 includes a beginning 606 spaced from the outer portion 576 and an end 610 positioned at the outer portion 576 of the second end wall 574.

[0069] Although the separators 58, 358, and 558 described above were detailed as cyclonic, over-the-wall type separators, other alternative cyclonic and non-cyclonic separators are considered. In particular, the cyclonic separator can be, in alternative embodiments: a bag filtering unit; a conical separator; etc.

[0070] Various features and advantages of the invention are set forth in the following claims.

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CLAIMS

What is claimed is:

1. A vacuum cleaner comprising:
a fluid flow path extending from a dirty air inlet to a clean air outlet;
a main body including a handle;
a fluid flow motor positioned in the fluid flow path;
a dirt collection region with an openable bottom;
a cyclonic separator in the fluid flow path, the cyclonic separator including, a cyclone chamber having a first end wall and a second end wall, a cyclone dirty fluid inlet, and a cyclone clean fluid outlet; and
a filter chamber in the fluid flow path downstream from the cyclonic separator and upstream from the fluid flow motor,
wherein the filter chamber includes an outlet fluidly communicating the filter chamber and the fluid flow motor and a tangential inlet fluidly communicating the cyclonic separator and the filter chamber.

2. The vacuum cleaner of claim 1, further comprising a ramp in the cyclone chamber extending along a sidewall toward the cyclone dirt outlet; and wherein a beginning of the ramp is spaced from the second end wall and an end of the ramp is positioned at the second end wall of the cyclone chamber.

3. The vacuum cleaner of claim 1 or 2, wherein the fluid flow motor has a fluid flow motor axis that is vertical when the handheld vacuum cleaner is positioned on a horizontal surface.

4. The vacuum cleaner as in any one of claims 1 – 3, wherein the filter chamber houses a pre-motor filter having a cylindrical filter; and wherein the fluid flow path extends through the cylindrical filter in a normal flow orientation.

5. The vacuum cleaner as in any one of claims 1 – 4, wherein the filter chamber inlet includes a rectangular cross-section and the filter chamber outlet includes a circular cross-section.

6. The vacuum cleaner as in any one of claims 1 – 5, wherein the filter chamber includes a scroll inlet having the tangential inlet to the filter chamber between 90 and 360 degrees from entry of the scroll inlet.

7. The vacuum cleaner as in any one of claims 1 – 6, wherein the filter chamber includes a lid removable to open the filter chamber, and wherein the filter is coupled to the lid.

8. The vacuum cleaner as in any one of claims 1 – 7, wherein the fluid flow motor defines a fluid flow motor axis and the filter chamber defines a filter chamber axis that is coaxial with the fluid flow motor axis.

9. The vacuum cleaner as in any one of claims 1 – 8, wherein the fluid flow motor is positioned between the dirt collection region and the handle.

10. The vacuum cleaner as in any one of claims 1 – 9, further comprising a battery positioned below the fluid flow motor, wherein a bottom surface of the battery is below the openable bottom of the dirt collection region.

11. The vacuum cleaner of claim 10, wherein the handheld vacuum cleaner is supported solely by the battery when the handheld vacuum cleaner is positioned on a horizontal surface.

12. The vacuum cleaner as in any one of claims 1 – 11, wherein the filter chamber is positioned between the handle and the cyclonic separator.

13. The vacuum cleaner as in any one of claims 1 – 12, wherein the filter chamber houses a pre-motor filter having a cylindrical filter.

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14. The vacuum cleaner as in any one of claims 1 – 13, wherein the filter chamber houses a pre-motor filter having a first cylindrical filter and a second cylindrical filter, the second cylindrical filter being nested within the first cylindrical filter.

15. The vacuum cleaner as in any one of claims 1 – 14, wherein the first end wall and the second end wall of the cyclone chamber both intersect a common horizontal plane when the vacuum cleaner is positioned on a horizontal surface.

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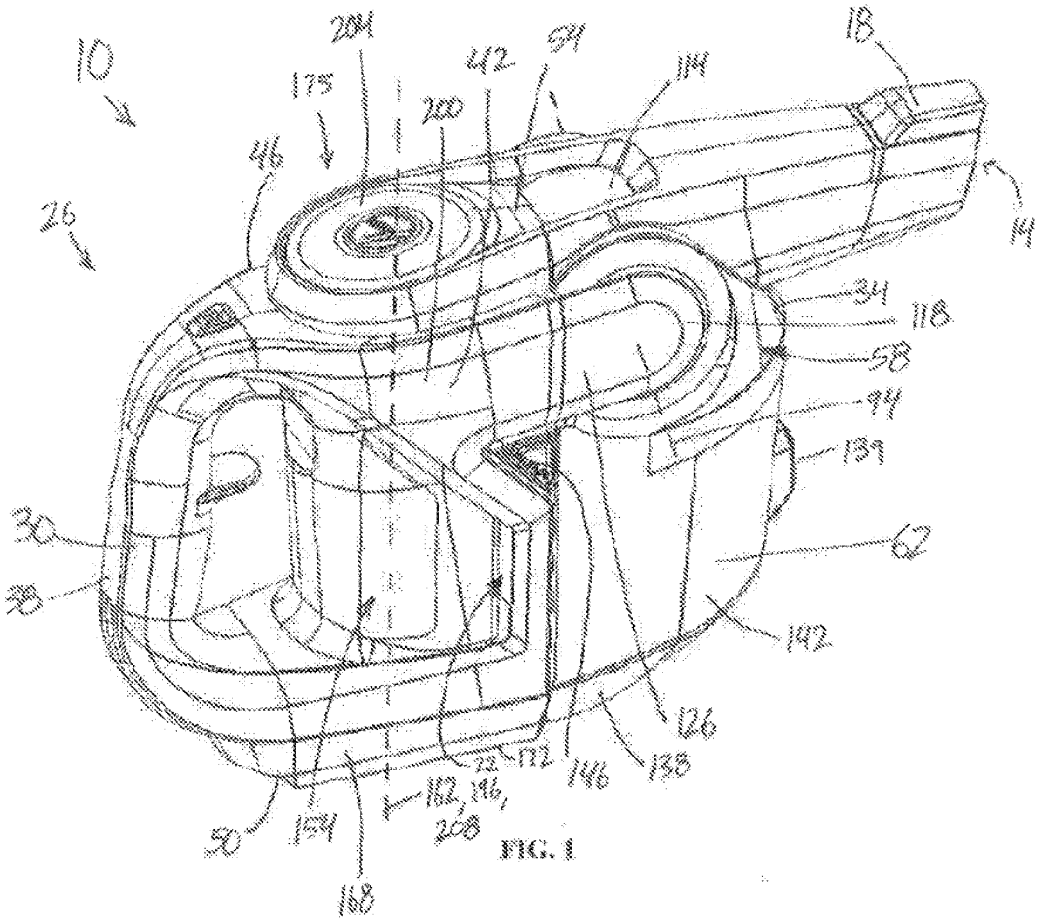


FIG. 1

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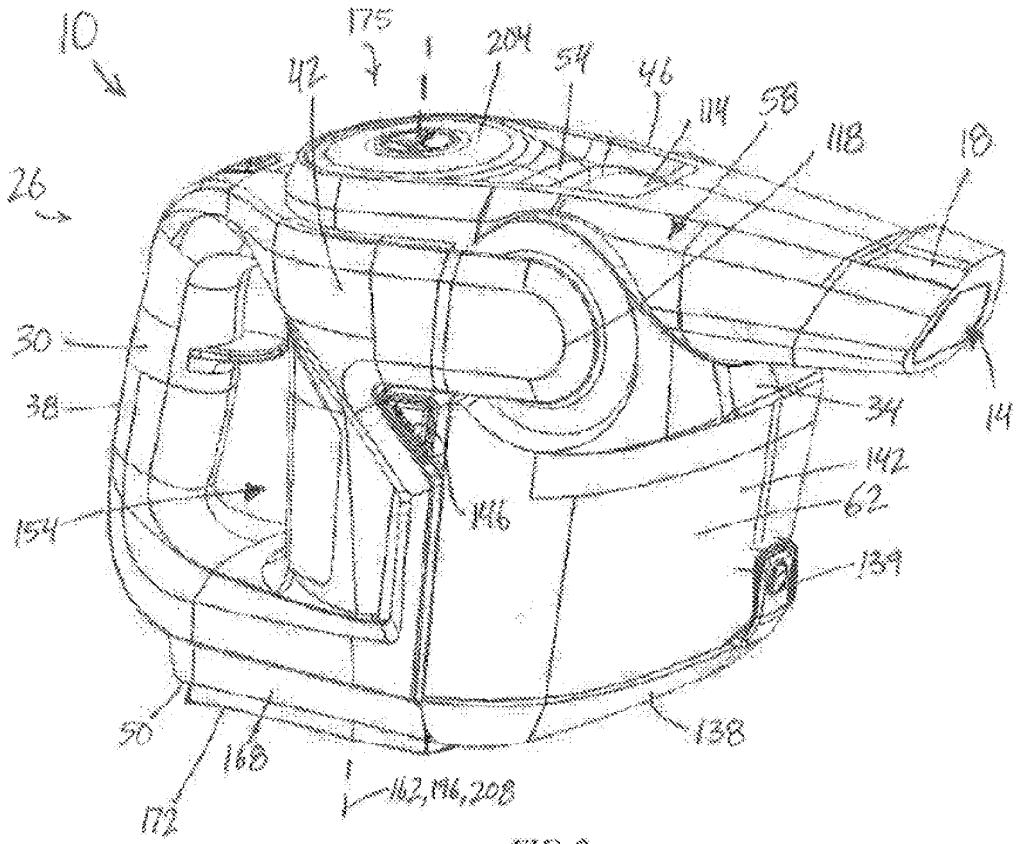


FIG. 2

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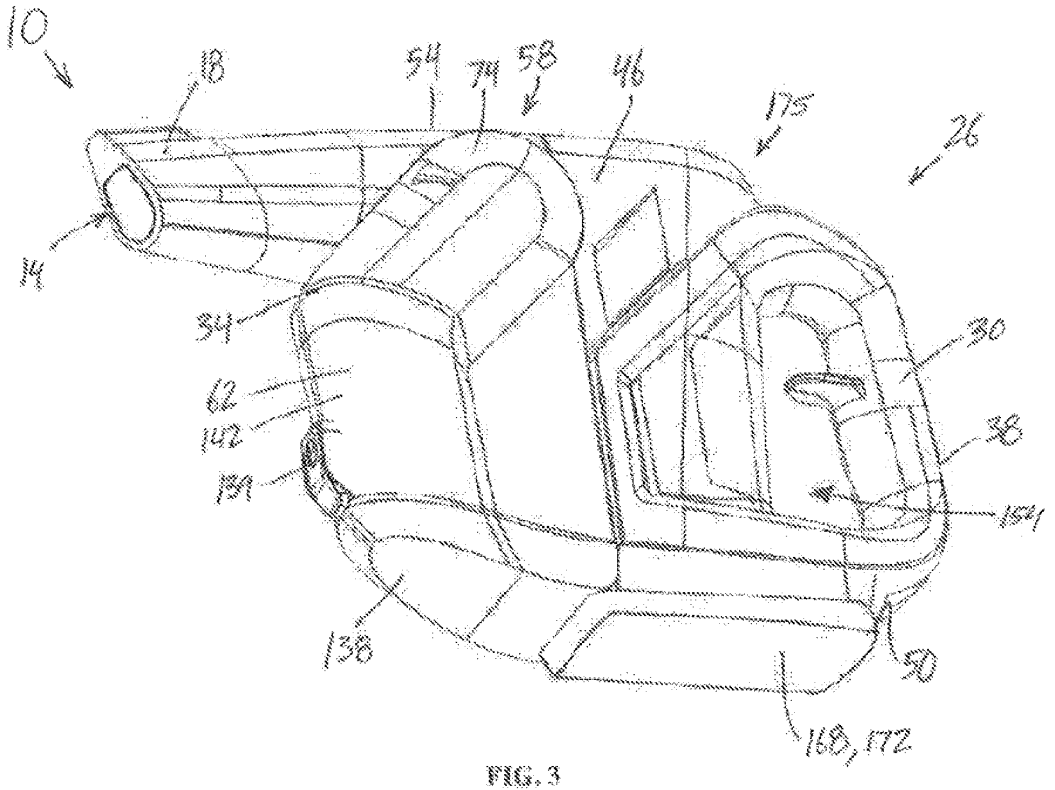


FIG. 3

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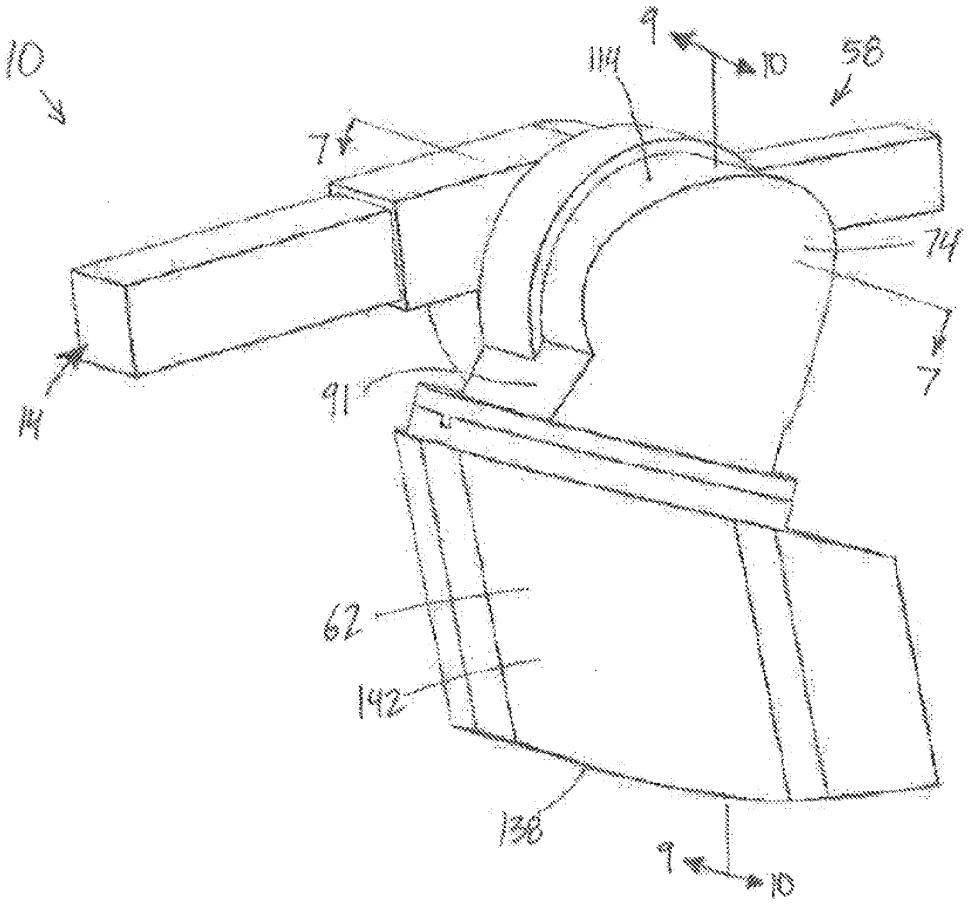


FIG. 4

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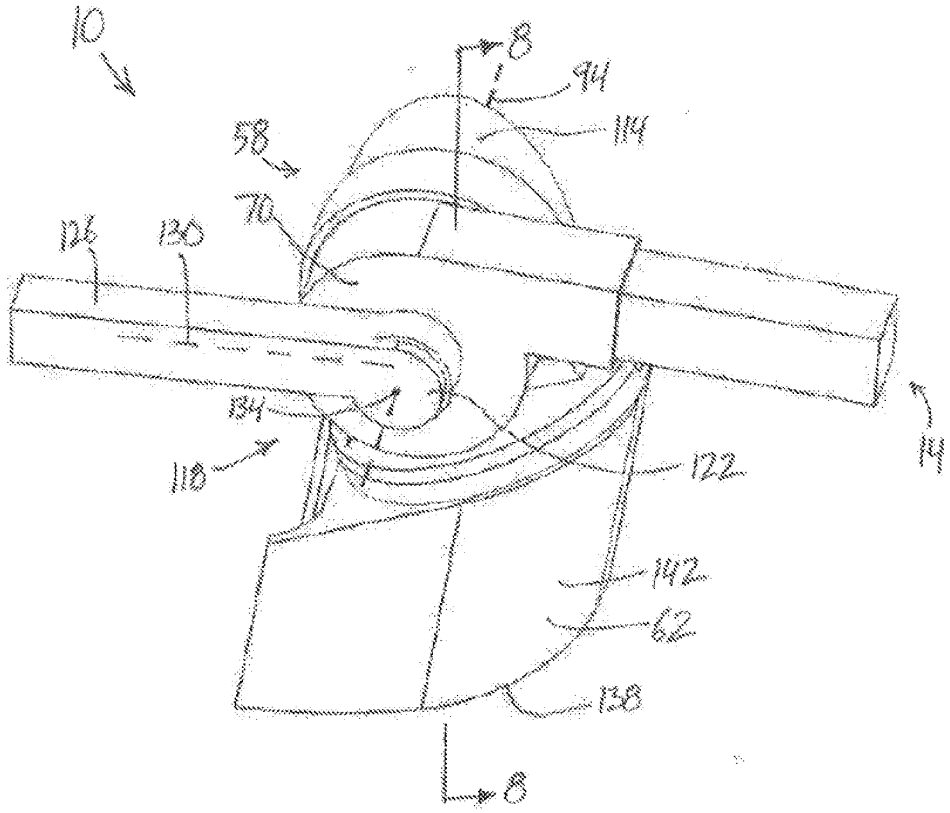


FIG. 5

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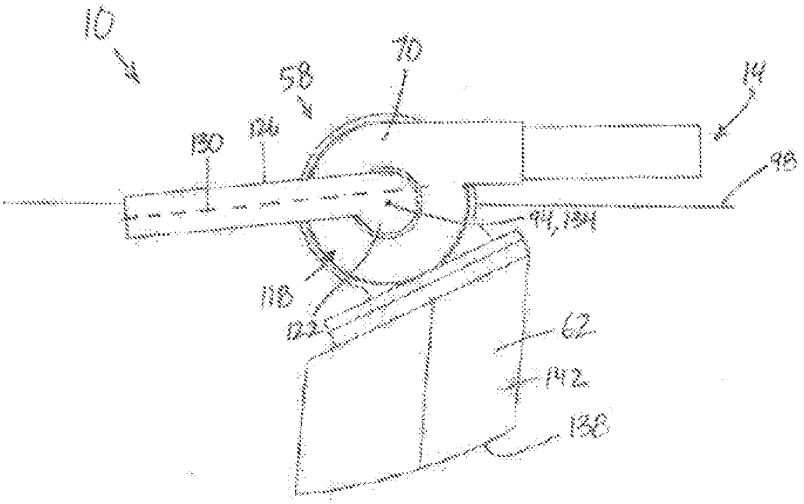


FIG. 6

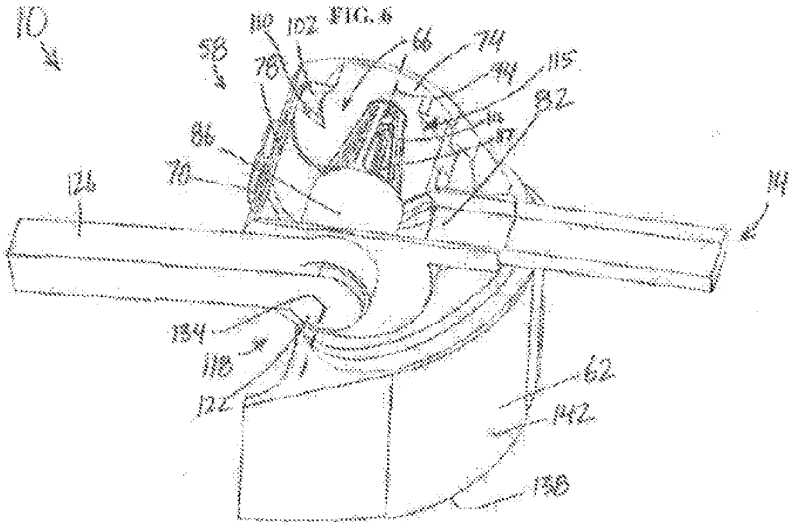


FIG. 7

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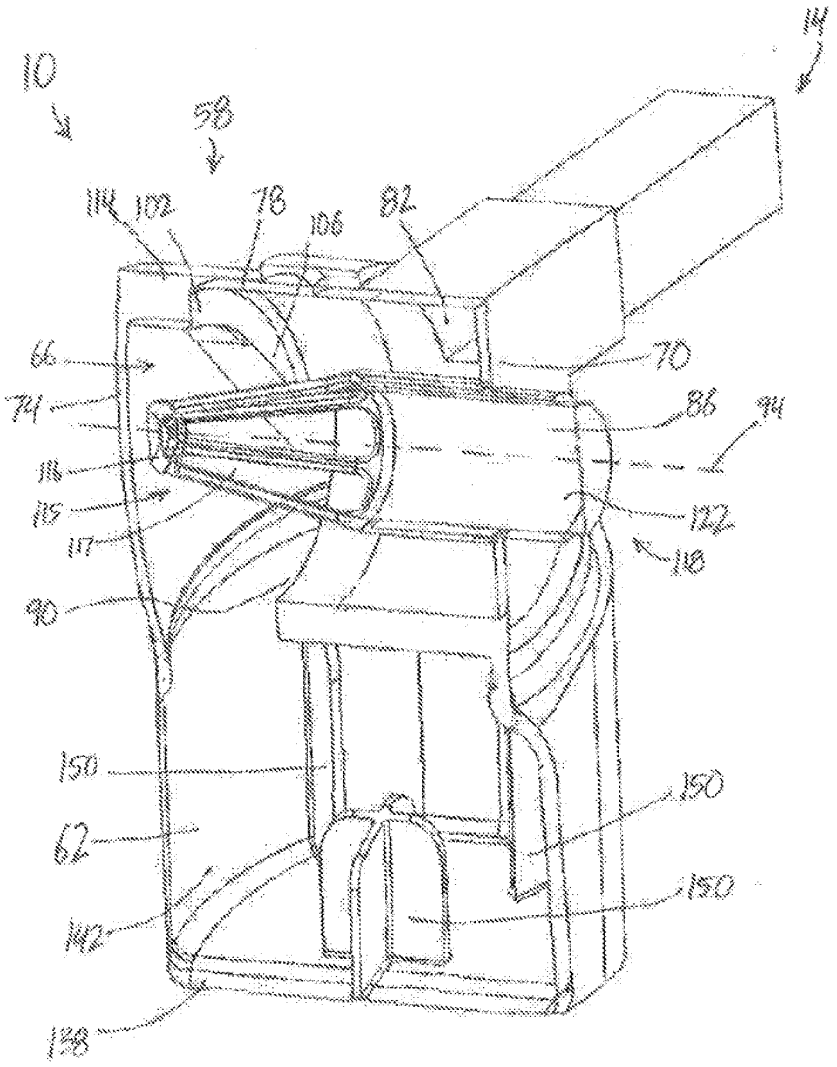


FIG. 8

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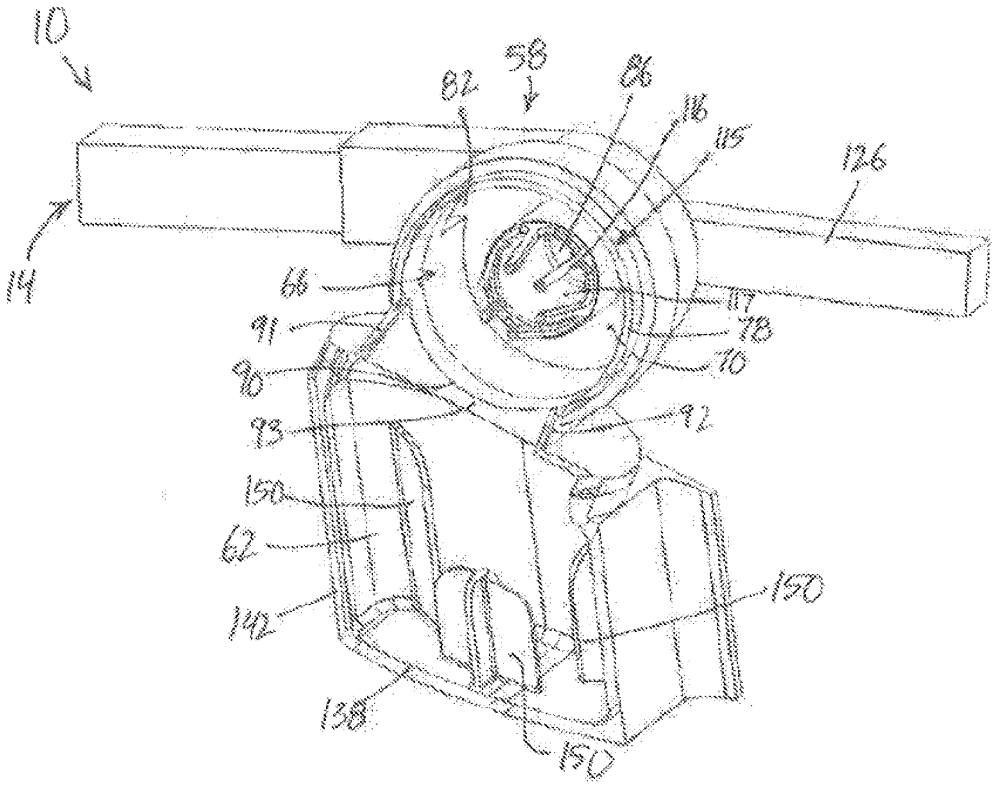


FIG. 9

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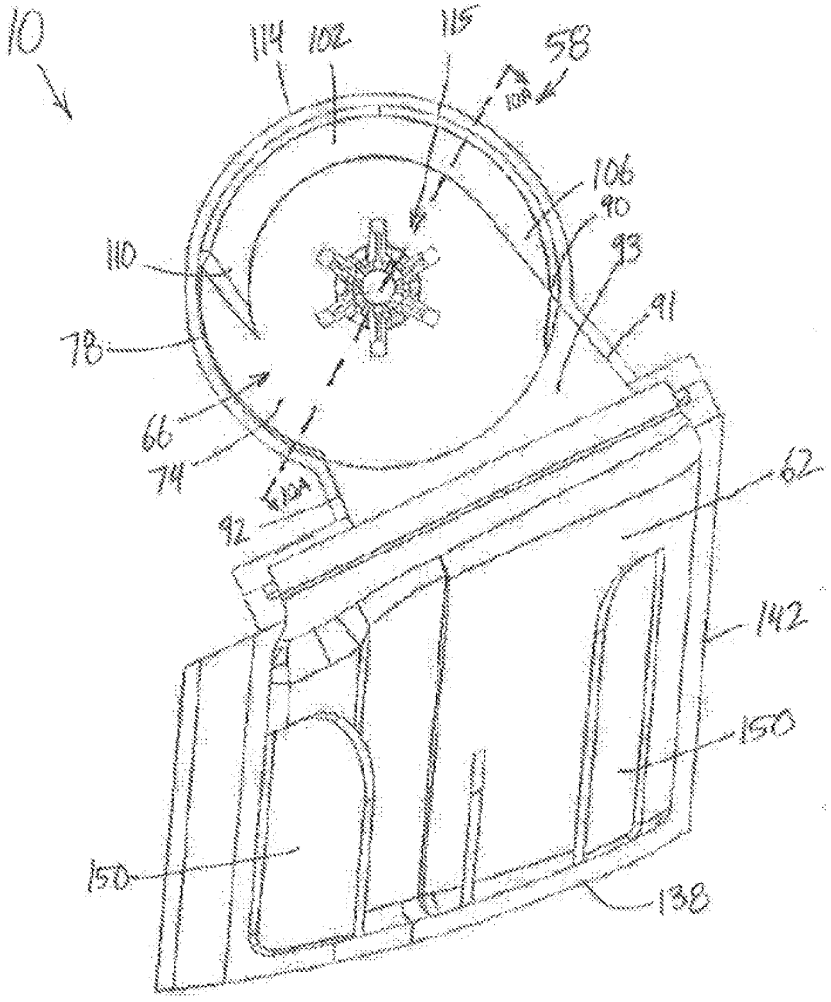
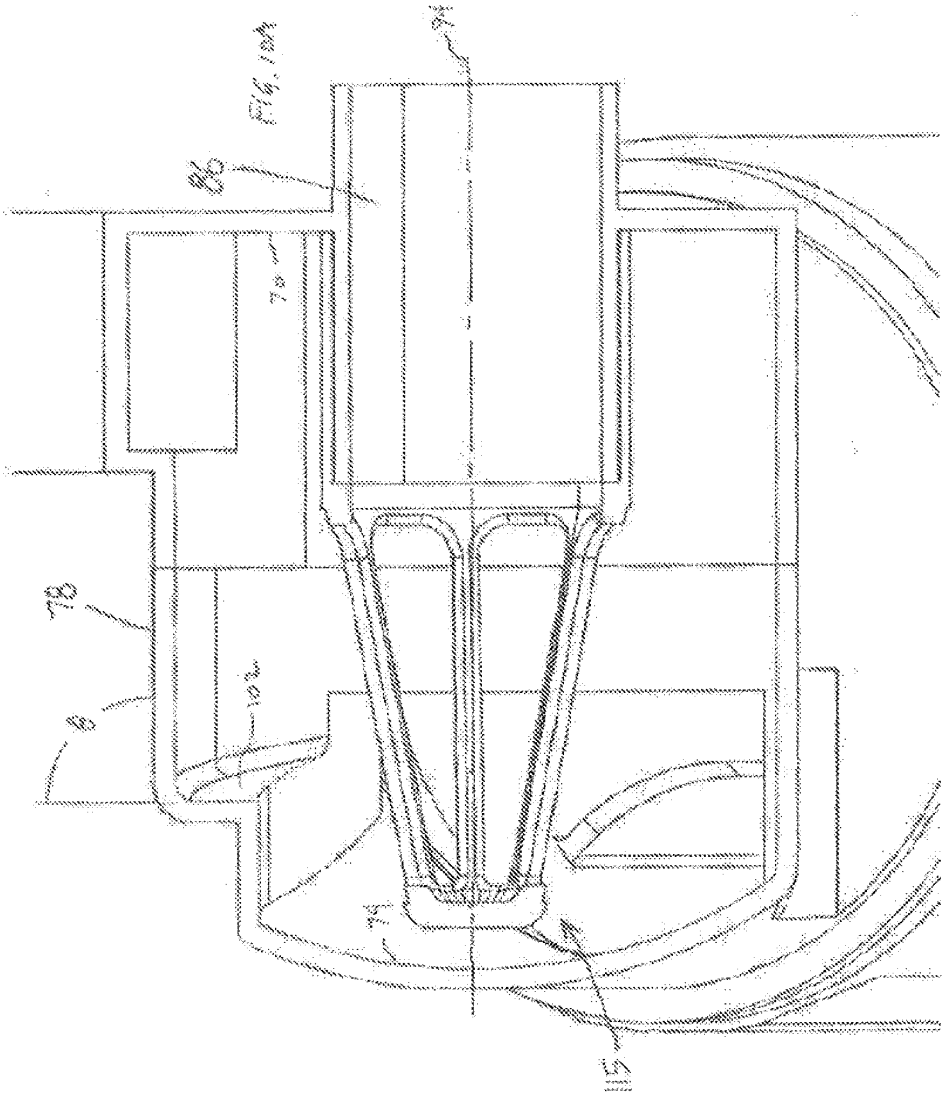


FIG. 10

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Fig. 18A
86
78
76
104
θ
74
15

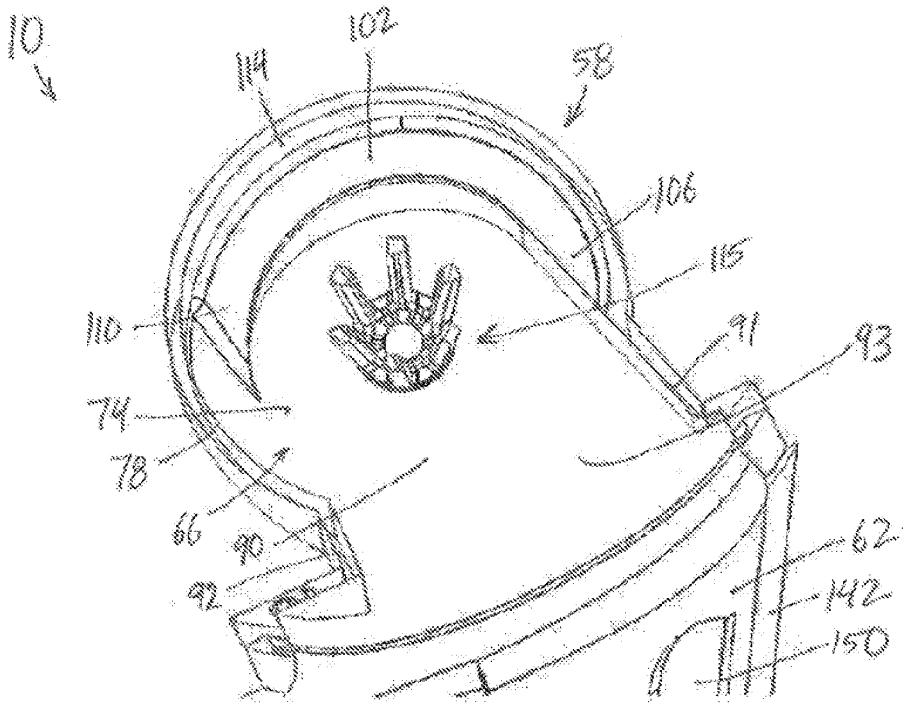


FIG. 11

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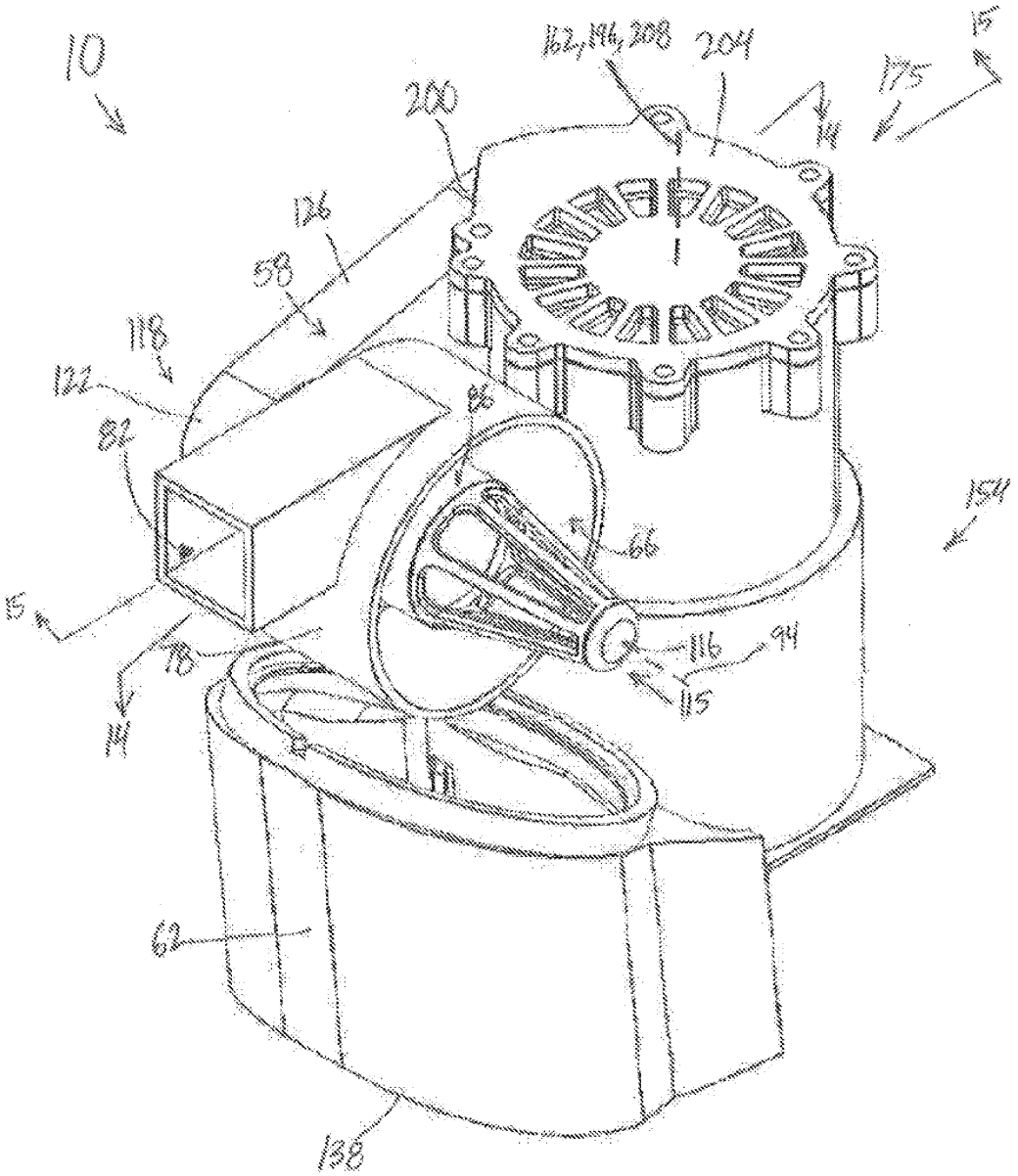


FIG. 12

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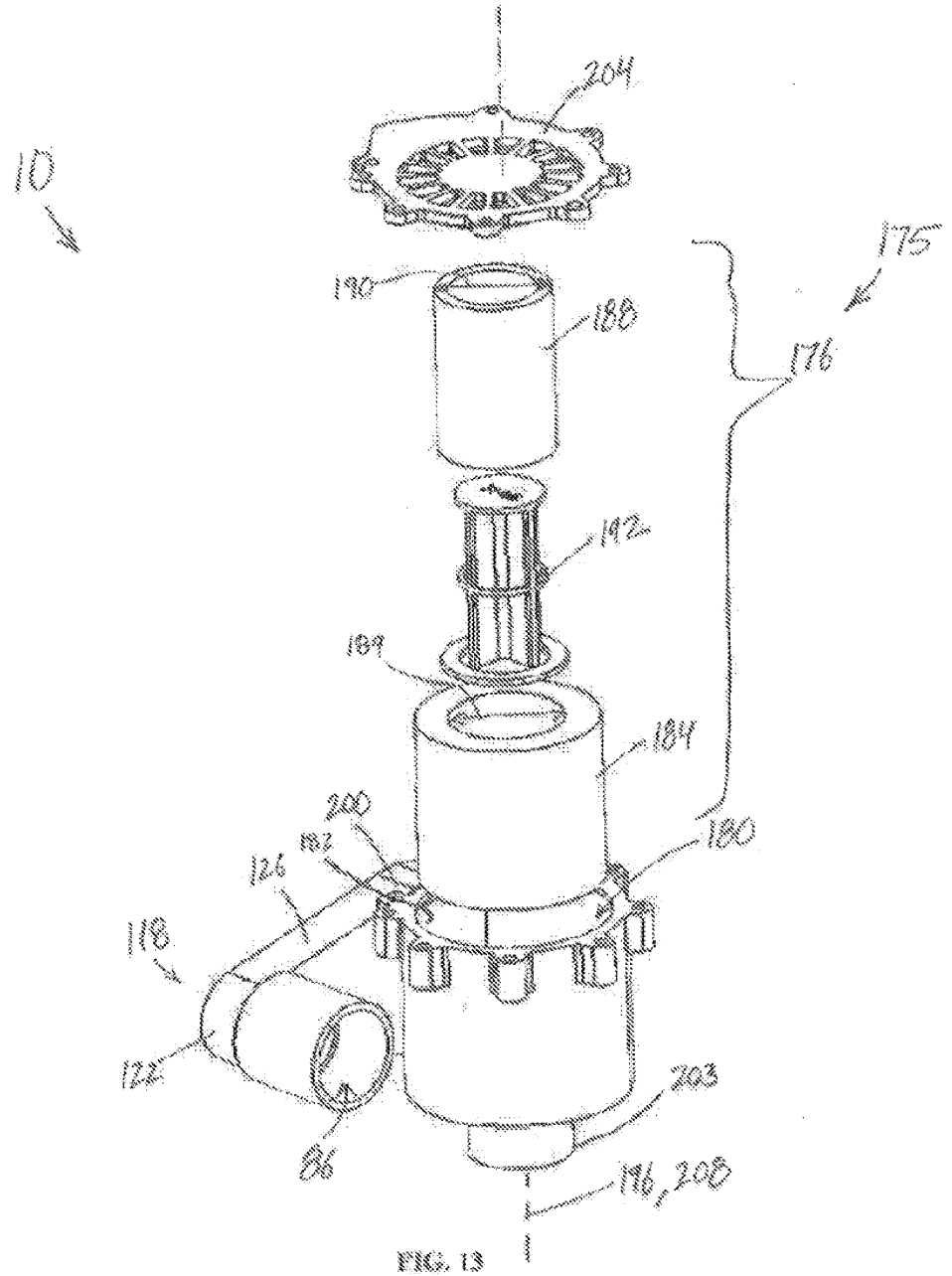
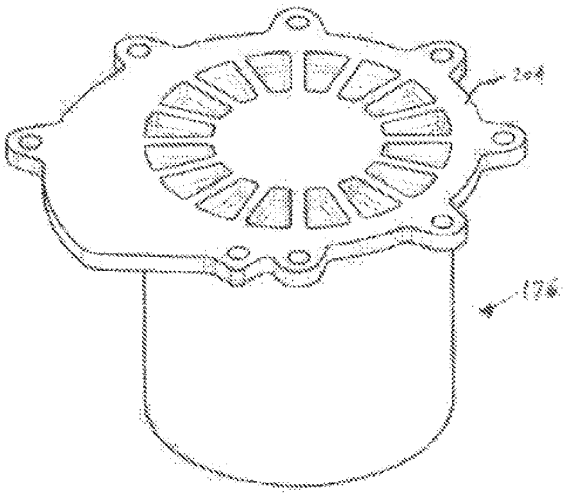


FIG. 13

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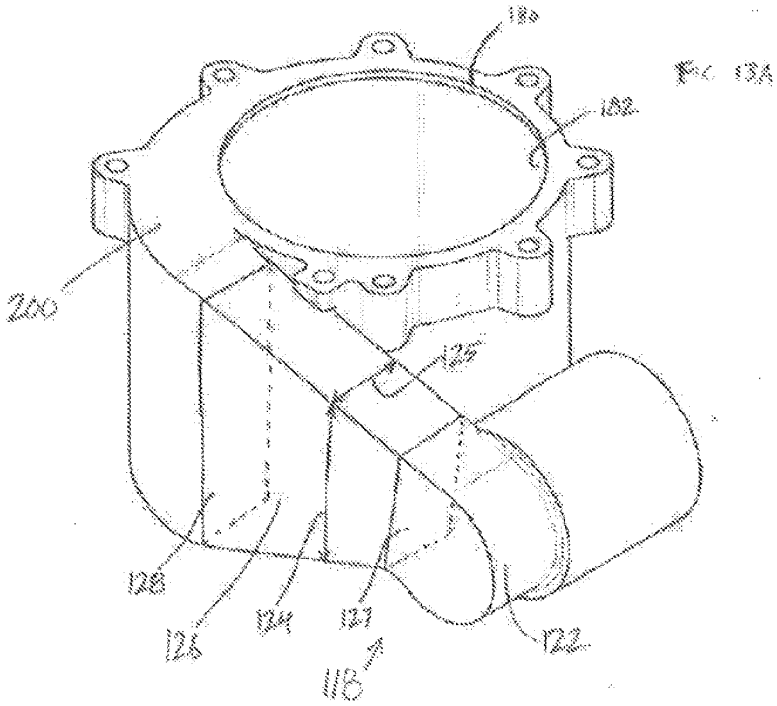


FIG. 13A

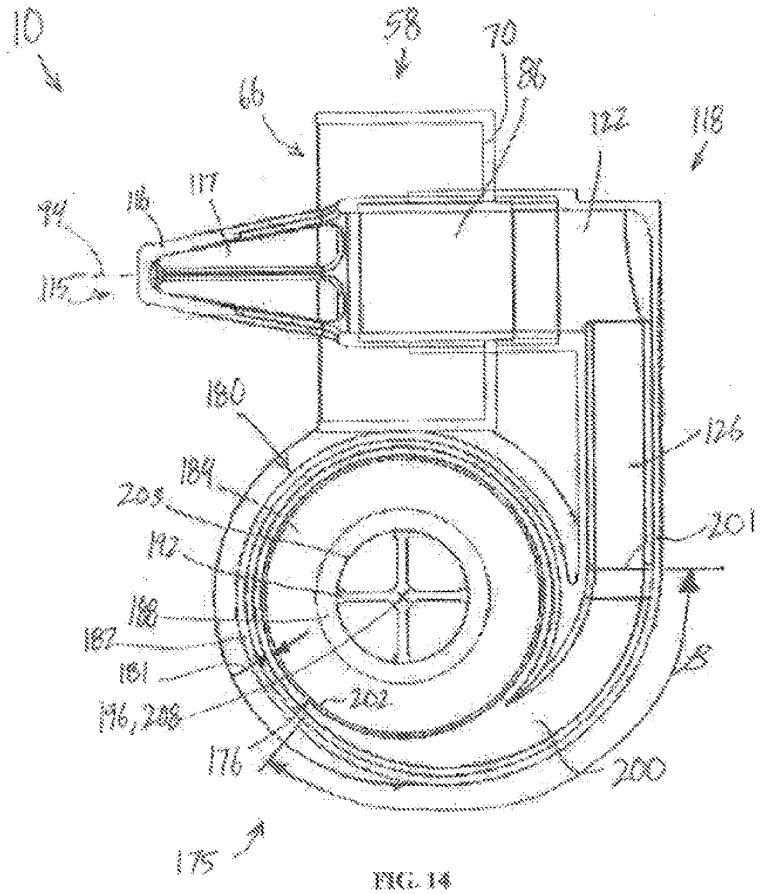


FIG. 14

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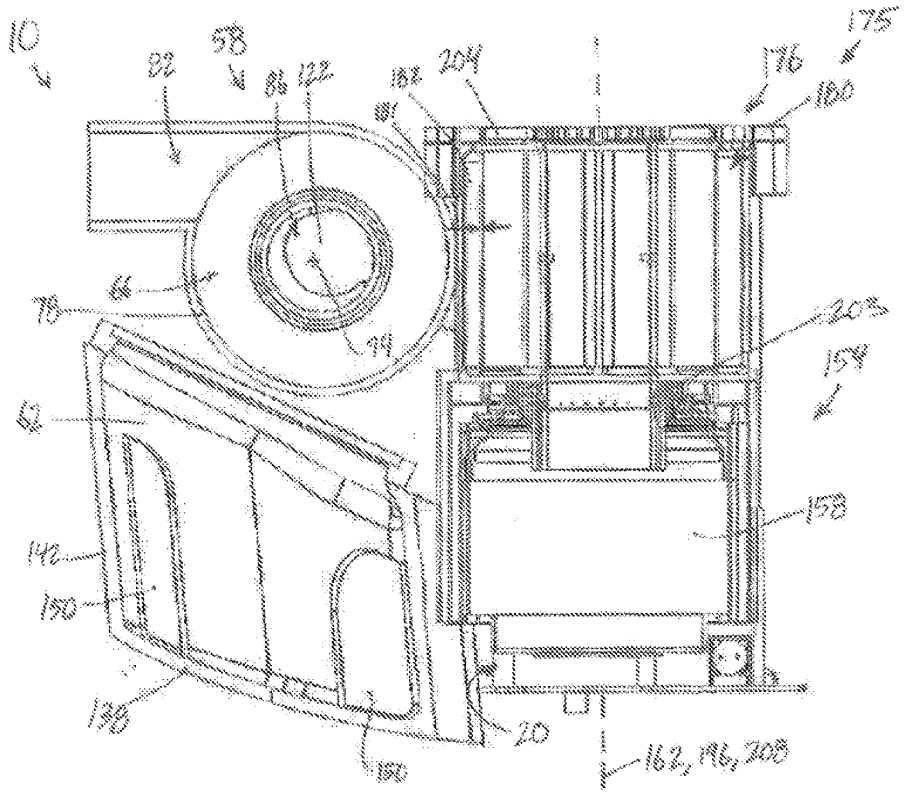

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122
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162, 196, 208

FIG. 15

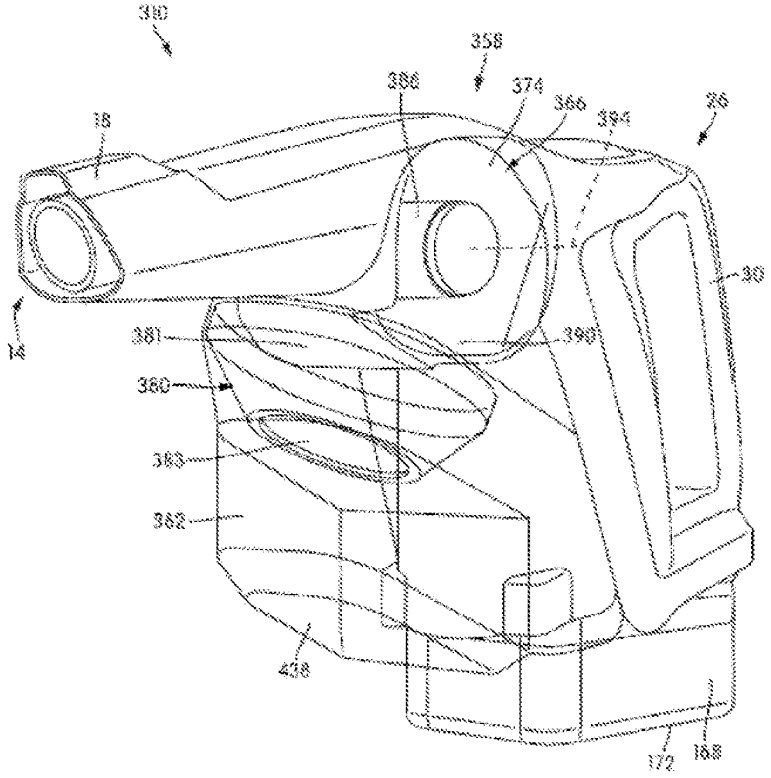


FIG. 16

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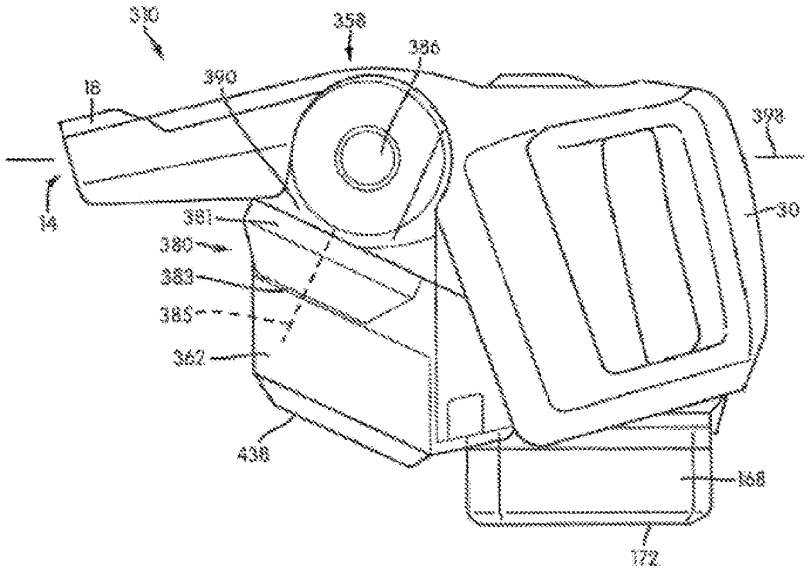


FIG. 17

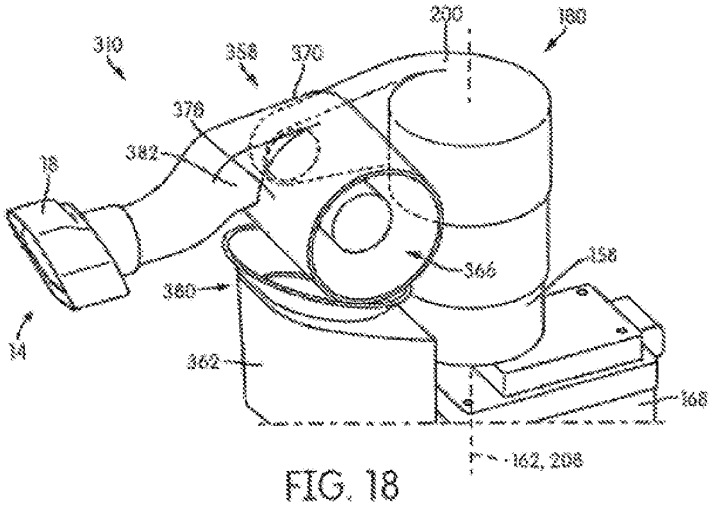


FIG. 18

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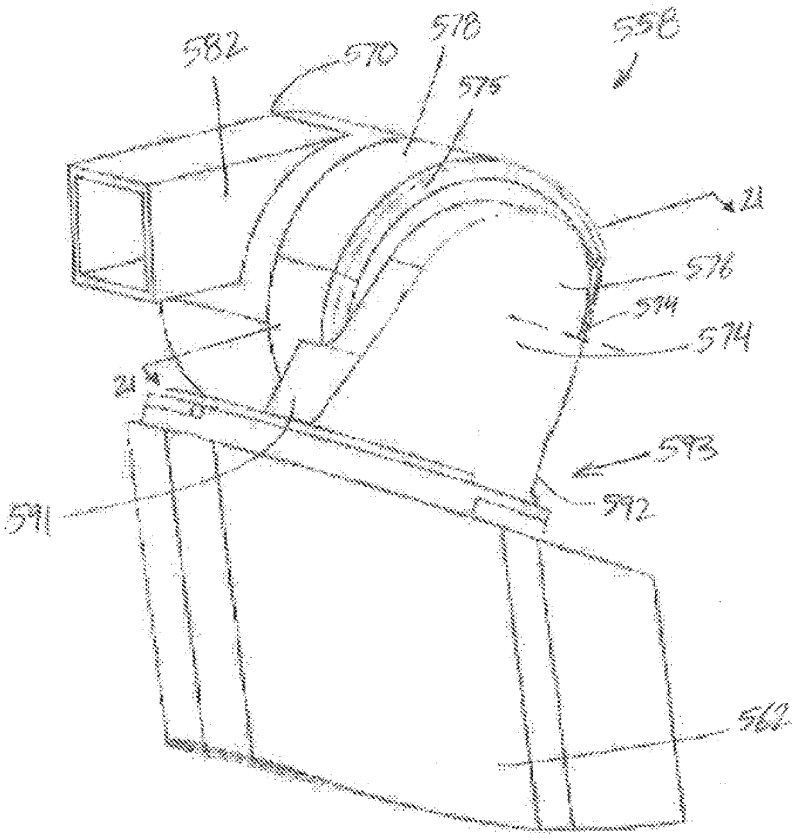


FIG. 19

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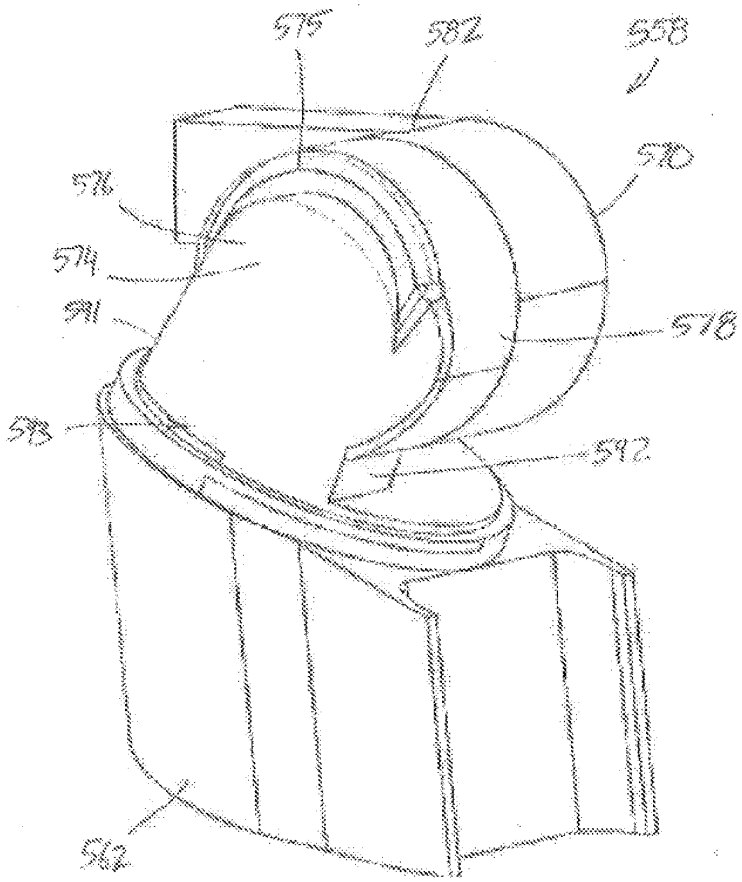


FIG. 20

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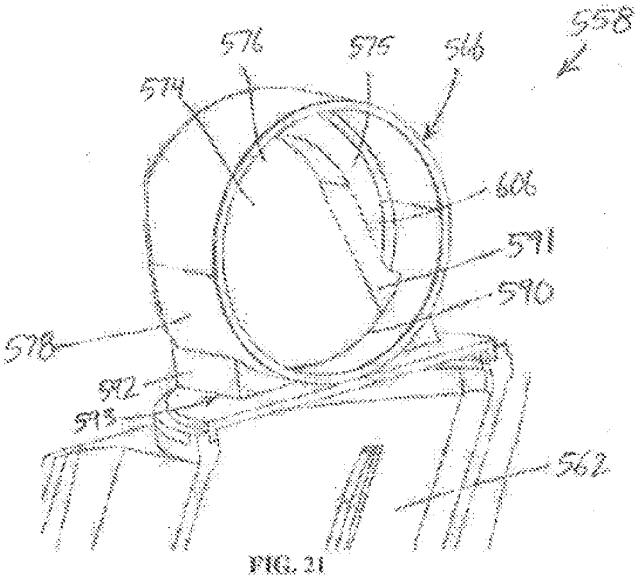


FIG. 21

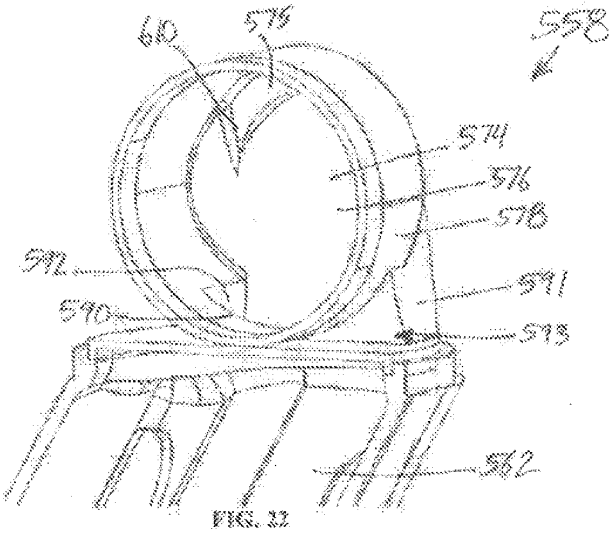


FIG. 22

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INTERNATIONAL SEARCH REPORT

International application No
PCT/US2016/061293

A. CLASSIFICATION OF SUBJECT MATTER
INV. A47L5/24 A47L9/12 A47L9/16
ADD.

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)
A47L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2014/237757 A1 (CONRAD WAYNE ERNEST [CA]) 28 August 2014 (2014-08-28) paragraphs [0082] - [0108]	1-15
A	US 2011/219577 A1 (CONRAD WAYNE ERNEST [CA]) 15 September 2011 (2011-09-15) paragraphs [0060] - [0066]	1-15
A	US 2013/232722 A1 (CONRAD WAYNE ERNEST [CA]) 12 September 2013 (2013-09-12) paragraph [0086]; figures 5,6,9	1
A	EP 2 191 761 A1 (PANASONIC CORP [JP]) 2 June 2010 (2010-06-02) paragraph [0038]	1
A	US 2002/092123 A1 (STEPHENS PAUL D [US] ET AL) 18 July 2002 (2002-07-18) paragraph [0034]	1

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* 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	Date of mailing of the international search report
17 January 2017	22/02/2017

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Eckenschwiller, A

1

Form PCT/ISA/210 (second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2016/061293

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2014237757 A1	28-08-2014	NONE	
US 2011219577 A1	15-09-2011	CN 102188209 A	21-09-2011
		EP 2364630 A2	14-09-2011
		US 2011219577 A1	15-09-2011
		US 2016120382 A1	05-05-2016
		US 2016213211 A1	28-07-2016
US 2013232722 A1	12-09-2013	US 2013232722 A1	12-09-2013
		WO 2013131168 A1	12-09-2013
EP 2191761 A1	02-06-2010	CN 101861117 A	13-10-2010
		CN 102715870 A	10-10-2012
		EP 2191761 A1	02-06-2010
		EP 2662009 A1	13-11-2013
		JP 4770821 B2	14-09-2011
		JP 2009119105 A	04-06-2009
		KR 20100092933 A	23-08-2010
		MY 151255 A	30-04-2014
		US 2010275406 A1	04-11-2010
		WO 2009063581 A1	22-05-2009
US 2002092123 A1	18-07-2002	US 2002092123 A1	18-07-2002
		US 2002194695 A1	26-12-2002
		US 2004139573 A1	22-07-2004
		US 2007056136 A1	15-03-2007
		US 2010064471 A1	18-03-2010
		US 2011214247 A1	08-09-2011

Electronic Acknowledgement Receipt

EFS ID:	36408164
Application Number:	15642781
International Application Number:	
Confirmation Number:	5834
Title of Invention:	HANDHELD SURFACE CLEANING APPARATUS
First Named Inventor/Applicant Name:	Wayne Ernest Conrad
Customer Number:	1059
Filer:	Philip C. Mendes da Costa/Snezana Lisowsky
Filer Authorized By:	Philip C. Mendes da Costa
Attorney Docket Number:	10452-P52585US00
Receipt Date:	25-JUN-2019
Filing Date:	06-JUL-2017
Time Stamp:	17:22:59
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Foreign Reference	WO2017083497Adobe.pdf	7520223 fbb301be9c65b2051a63d0dc709e44e42b387e02	no	46

Warnings:

Information:	
Total Files Size (in bytes):	7520223

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

New Applications Under 35 U.S.C. 111

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

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

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

New International Application Filed with the USPTO as a Receiving Office

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

Electronic Patent Application Fee Transmittal

Application Number:	15642781
Filing Date:	06-Jul-2017
Title of Invention:	HANDHELD SURFACE CLEANING APPARATUS
First Named Inventor/Applicant Name:	Wayne Ernest Conrad
Filer:	Philip C. Mendes da Costa/Snezana Lisowsky
Attorney Docket Number:	10452-P52585US00

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
SUBMISSION- INFORMATION DISCLOSURE STMT	1806	1	240	240
		Total in USD ($)		**240**

Bereskin & Parr

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appl. No	:	15/642,781	Confirmation No. 5834
Applicant	:	Omachron Intellectual Property Inc.	
Filed	:	July 6, 2017	
For	:	HANDHELD SURFACE CLEANING APPARATUS	
T.C./A.U.	:	3723	
Examiner	:	HORTON, Andrew Alan	
Docket No.	:	10452-P52585US00	
Customer No.	:	01059	

June 25, 2019

Commissioner of Patents
P.O. Box 1450
Alexandria, VA 22313-1450

SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT
Under 37 CFR 1.56 and 37 CFR 1.97(c)(2)

Sir:

In accordance with 37 CFR 1.97 and 1.98, and in recognition of the duty of disclosure set forth in 37 CFR 1.56, the applicant hereby submits a Supplemental Information Disclosure Statement including a listing of patents and other publications of which the applicant is aware on e-PTO form SB/08a.

In accordance with the requirements of 1.97(c)(2), this Information Disclosure Statement is filed before the mailing date of any of a final action, a notice of allowance or an action that otherwise closes prosecution in the application and is accompanied with the requisite fee under 37 CFR 1.17(p).

Accordingly, the Commissioner is authorized to charge the requisite fee of $240 to our Deposit Account No. 022095.

Bereskin & Parr LLP
Scotia Plaza, 40 King Street West, 40th Floor, Toronto, ON M5H 3Y2 Canada
Tel: 416.364.7311 Fax: 416.361.1398 bereskinparr.com

3221008

(A) List of References

A list of the patents and other publications of which the applicant is aware is set out in the attached e-PTO Form SB08a.

(B) Copies of References

A copy of the cited foreign patent reference is attached.

The filing of this statement shall not be construed as an admission that the information cited in the attached statement is, or is considered to be, material to patentability (37 CFR 1.97(h)), nor as an admission that it constitutes prior art.

Accordingly, the applicant submits that the Information Disclosure Statement is properly considered at this time.

Respectfully submitted,

June 25, 2019

BERESKIN & PARR LLP/S.E.N.C.R.L., s.r.l.
Agent for the Applicant

/Philip C. Mendes da Costa/

Philip C. Mendes da Costa, Reg. No. 33,106

BERESKIN & PARR LLP/S.E.N.C.R.L., s.r.l.
Box 401, 40 King Street West
Toronto, Ontario, Canada M5H 3Y2
Tel: 416-957-1695
Fax: 416-361-1398

3221008

Electronic Acknowledgement Receipt	
EFS ID:	36407999
Application Number:	15642781
International Application Number:	
Confirmation Number:	5834
Title of Invention:	HANDHELD SURFACE CLEANING APPARATUS
First Named Inventor/Applicant Name:	Wayne Ernest Conrad
Customer Number:	1059
Filer:	Philip C. Mendes da Costa/Snezana Lisowsky
Filer Authorized By:	Philip C. Mendes da Costa
Attorney Docket Number:	10452-P52585US00
Receipt Date:	25-JUN-2019
Filing Date:	06-JUL-2017
Time Stamp:	17:14:12
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$240
RAM confirmation Number	062619INTEFSW17144400
Deposit Account	022095
Authorized User	Snezana Lisowsky
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: 37 CFR 1.16 (National application filing, search, and examination fees) 37 CFR 1.17 (Patent application and reexamination processing fees)	

37 CFR 1.19 (Document supply fees)

37 CFR 1.20 (Post Issuance fees)

37 CFR 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	P52585US00_Commissioner_2019_06_25.pdf	175991 e9a007e2930bdd1abfe50fef29a2b9c228c6f967	no	2
Warnings:					
Information:					
2	Information Disclosure Statement (IDS) Form (SB08)	P52585US00_SupIDS_2019_06_25.pdf	1041973 81f6b006cac2815aba6b9f0c5d662c75cebe66be	no	4
Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	30569 7357ccc812fd9597ecceaea4e5914aac2e4d28a9	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	1248533		

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

New Applications Under 35 U.S.C. 111

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

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

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

New International Application Filed with the USPTO as a Receiving Office

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

Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (02-18)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	15642781
Filing Date	2017-07-06
First Named Inventor	Wayne Ernest Conrad
Art Unit	3723
Examiner Name	HORTON, Andrew Alan
Attorney Docket Number	10452-P52585US00

U.S.PATENTS Remove

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1					

If you wish to add additional U.S. Patent citation information please click the Add button. Add

U.S.PATENT APPLICATION PUBLICATIONS Remove

Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	20140245564	A1	2014-09-04	Conrad	
	2	20090307866	A1	2009-12-17	Witter et al.	

If you wish to add additional U.S. Published Application citation information please click the Add button. Add

FOREIGN PATENT DOCUMENTS Remove

Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2] i	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1	2017083497	WO	A1	2017-05-18	BOHLEN et al.		

If you wish to add additional Foreign Patent Document citation information please click the Add button Add

NON-PATENT LITERATURE DOCUMENTS Remove

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (**Not for submission under 37 CFR 1.99)**		
	Application Number	15642781
	Filing Date	2017-07-06
	First Named Inventor	Wayne Ernest Conrad
	Art Unit	3723
	Examiner Name	HORTON, Andrew Alan
	Attorney Docket Number	10452-P52585US00

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1		

If you wish to add additional non-patent literature document citation information please click the Add button Add

EXAMINER SIGNATURE

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	15642781
	Filing Date	2017-07-06
	First Named Inventor	Wayne Ernest Conrad
	Art Unit	3723
	Examiner Name	HORTON, Andrew Alan
	Attorney Docket Number	10452-P52585US00

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

☒ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Philip C. Mendes da Costa/	Date (YYYY-MM-DD)	2019-06-25
Name/Print	Philip C. Mendes da Costa	Registration Number	33106

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

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

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

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

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

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

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

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

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

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

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

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

UNITED STATES PATENT AND TRADEMARK OFFICE

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

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/642,781	07/06/2017	Wayne Ernest Conrad	10452-P52585US00	5834

1059 7590 07/12/2019

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

EXAMINER	
HORTON, ANDREW ALAN	

ART UNIT	PAPER NUMBER
3723	

NOTIFICATION DATE	DELIVERY MODE
07/12/2019	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

ipprocessingcentre@bereskinparr.com

Office Action Summary	**Application No.** 15/642,781	**Applicant(s)** Conrad, Wayne Ernest	
	Examiner ANDREW A HORTON	**Art Unit** 3723	**AIA (FITF) Status** Yes

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

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☑ Responsive to communication(s) filed on 6/20/19.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☑ This action is **FINAL.** 2b) ☐ This action is non-final.

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

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5) ☑ Claim(s) 1-16 is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6) ☐ Claim(s) _____ is/are allowed.

7) ☑ Claim(s) 1-16 is/are rejected.

8) ☐ Claim(s) _____ is/are objected to.

9) ☐ Claim(s) _____ are subject to restriction and/or election requirement

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to **PPHfeedback@uspto.gov.**

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☑ The drawing(s) filed on 9/13/17 is/are: a)☑ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

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

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☑ Notice of References Cited (PTO-892)

2) ☑ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date _____.

4) ☐ Other: _____.

DETAILED ACTION

Notice of Pre-AIA or AIA Status

1. The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103 which forms the basis for all obviousness rejections set forth in this Office action:

> A patent for a claimed invention may not be obtained, notwithstanding that the claimed invention is not identically disclosed as set forth in section 102, if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-16 are rejected under 35 U.S.C. 102(a)(1) as anticipated by Beskow (US 2008/0040883) or, in the alternative, under 35 U.S.C. 103 as obvious over Beskow in view of Qu (US 6,727,621).

2. As to claim 1, Beskow discloses a hand vacuum cleaner having a front end, a rear end, an upper end, a lower end, and first and second laterally spaced apart sides, and comprising:

(a) an air flow path extending from a dirty air inlet (114) to a clean air outlet (934) (Figs. 9 and 10B)

(b) a cyclone chamber (1000; Fig. 10 and paragraph 101) positioned in the air flow path and having a cyclone air inlet (1004; paragraph 104), a cyclone air outlet (1052; paragraph 110), and a cyclone axis of rotation (A line or line segment intersecting 1000);

(c) a suction motor housing (910 **or** the casing of 910 which contains the internal motor components such as drive shaft 926) having a suction motor (The internal motor components are being interpreted as the suction motor), the suction motor is positioned in the air flow path upstream of the clean air outlet; and,

(d) at least one energy storage member (930) positioned in an energy storage chamber (928) wherein the energy storage chamber is exterior to the suction motor housing (928 is on the outside of 910 and is a separate constructional element from 910), and wherein a portion of the air flow path upstream of the suction motor is defined in part by a wall portion (916), the wall portion is in thermal communication with the energy storage chamber (916 and 928 contact each other, and therefore they are in thermal communication with each other) whereby air travelling through the portion of the air flow path upstream of the suction motor travels along the wall portion and cools the wall portion (Element 916 is an air diffuser which is cooled by air flowing past it and cools at least elements 910 and 930; paragraphs 90 and 93).

Alternatively, Beskow may be combined with Qu.

Qu provides a more clear teaching of a suction motor housing (30 **or** the frame 120, which contains a rotor 100 and a stator 110) of a vacuum cleaner (10) having a suction motor (The suction motor is being interpreted as both of rotor 100 and stator 110; column 2, lines 34-36 and Fig. 2).

It would have been obvious to have modified Beskow such that the suction motor includes a suction motor housing having a suction motor such that a frame, rotor, and stator are provided and configured in the manner taught by Qu, in order to provide a suitable configuration for the suction motor housing and suction motor.

As to claims 2 and 6, wherein the cyclone axis of rotation extends generally in a forward/rearward direction. The forward and rearward directions are the rightward and leftward directions, respectively, from the perspective of Fig. 10A.

As to claim 3, wherein the at least one energy storage member comprises a plurality of energy storage members (Fig. 9, and paragraphs 93 and 95) wherein at least some of the plurality of energy storage members are arranged one above another in a generally upwardly extending configuration when the upper end (The leftward end, from the perspective of Fig. 9) of the hand vacuum cleaner is

positioned above the lower end (The rightward end, from the perspective of Fig. 9) of the hand vacuum cleaner.

As to claim 4, wherein the energy storage members arranged one above another comprise longitudinally extending members each having a longitudinal axis that extends laterally (Fig. 9).

As to claim 5, wherein the cyclone axis of rotation intersects a volume defined by the generally upwardly extending configuration of energy storage members (Figs. 10A and 10B).

As to claim 7, wherein the at least one energy storage member is removably receivable in the energy storage chamber (Fig. 9, and paragraphs 93 and 95).

As to claim 8, wherein the at least one energy storage member comprises a battery pack that is removably receivable in the energy storage chamber (Fig. 9, and paragraphs 93 and 95).

As to claim 9, wherein the wall portion (916 & 924) faces the cyclone air outlet (paragraph 102 and Figs. 9-10A). For claims 9-13, the wall portion is being interpreted both 916 and 924.

As to claim 10, wherein the portion of the air flow path extends generally upwardly from the cyclone air outlet to the suction motor when the upper end (The vertically upward end, from the perspective of Fig. 9) of the hand vacuum cleaner is positioned above the lower end (The vertically downward end, from the perspective of Fig. 9) of the hand vacuum cleaner (Figs. 9-11).

As to claim 11, wherein the suction motor is positioned above the cyclone axis of rotation when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner (910 is above 1000, and the axis of rotation is being interpreted as a line segment extending from the top of 1000 to the bottom of 1000; Figs. 9-11).

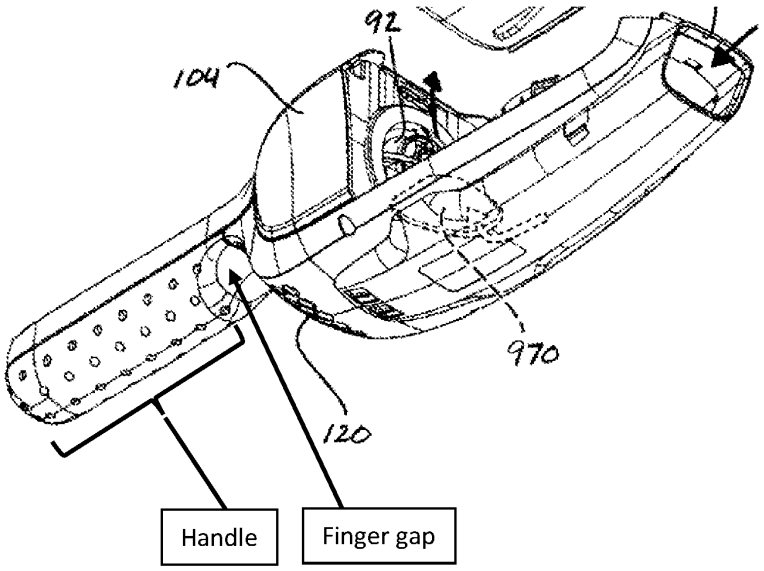
As to claim 12, wherein the portion of the air flow path extends generally downwardly from the cyclone air outlet to the suction motor when the upper end (The vertically downward end, from the perspective of Fig. 9) of the hand vacuum cleaner is positioned above the lower end (The vertically upward end, from the perspective of Fig. 9) of the hand vacuum cleaner (Figs. 9-11).

As to claim 13, wherein the suction motor is positioned below the cyclone axis of rotation when the upper end (The vertically downward end, from the perspective of Fig. 9) of the hand vacuum cleaner is positioned above the lower end (The vertically upward end, from the perspective of Fig. 9) of the hand vacuum cleaner (Figs. 9-11).

As to claim 14, further comprising a handle (906) having a hand grip portion (paragraph 89) that extends upwardly (The upward direction may be interpreted as one of the leftward and rightward directions, from the perspective of Fig. 9) and forwardly (906 has a dimension in all directions, including upward and forward directions) when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner wherein the handle is positioned rearward of the at least one energy storage member (The rearward direction is being interpreted as the upward direction, from the perspective of Fig. 9, and the frontward direction as the downward direction. Therefore, 906 is further rearward than 930).

As to claim 15, wherein the at least one energy storage member comprises a plurality of energy storage members (Fig. 9, and paragraphs 93 and 95) wherein at least some of the plurality of energy storage members are arranged one above another in a generally upwardly extending configuration when the upper end (The leftward end, from the perspective of Fig. 9) of the hand vacuum cleaner is positioned above the lower end (The rightward end, from the perspective of Fig. 9) of the hand vacuum cleaner (One of batteries 930 is above another one of batteries 930; Fig. 9).

As to claim 16, further comprising a finger gap (See figure below) positioned between the handle (The portion of 906 labeled in the figure below) and the energy storage chamber (Figs. 9, 9A and 10B).



Response to Arguments

3. Applicant's arguments filed 6/20/19 have been fully considered but they are not persuasive.

On pages 7-8, Applicant argued that Beskow does not include "at least one energy storage member positioned in an energy storage chamber wherein the energy storage chamber is exterior to the suction motor housing".

Beskow discloses at least one energy storage member (930) positioned in an energy storage chamber (928) wherein the energy storage chamber is exterior to the suction motor housing (928 is on the outside of 910 and is a separate constructional element from 910).

Alternatively, Beskow may be combined with Qu.

Qu provides a more clear teaching of a suction motor housing (30 **or** the frame 120, which contains a rotor 100 and a stator 110) of a vacuum cleaner (10) having a suction motor (The suction motor is being interpreted as both of rotor 100 and stator 110; column 2, lines 34-36 and Fig. 2).

It would have been obvious to have modified Beskow such that the suction motor includes a suction motor housing having a suction motor such that a frame, rotor, and stator are provided and

configured in the manner taught by Qu, in order to provide a suitable configuration for the suction motor housing and suction motor.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ANDREW A HORTON whose telephone number is (571)270-5039. The examiner can normally be reached on Monday - Friday 7:30 AM - 4:00 PM.

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

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Sean K Hunter can be reached on 571-270-7791. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available

through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/ANDREW A HORTON/
Primary Examiner, Art Unit 3723

EAST Search History

EAST Search History (Prior Art)

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	Examiner ANDREW A HORTON	Art Unit 3723	Page 1 of 1

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Doc description: Information Disclosure Statement (IDS) Filed

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	15642781
Filing Date	2017-07-06
First Named Inventor	Wayne Ernest Conrad
Art Unit	3723
Examiner Name	HORTON, Andrew Alan
Attorney Docket Number	10452-P52585US00

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	15642781
	Filing Date	2017-07-06
	First Named Inventor	Wayne Ernest Conrad
	Art Unit	3723
	Examiner Name	HORTON, Andrew Alan
	Attorney Docket Number	10452-P52585US00

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

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☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

☒ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Philip C. Mendes da Costa/	Date (YYYY-MM-DD)	2019-06-25
Name/Print	Philip C. Mendes da Costa	Registration Number	33106

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/642,781	Conrad, Wayne Ernest
	Examiner	**Art Unit**
	ANDREW A HORTON	3723

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

CLAIMS

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	03/26/2019	07/09/2019							
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Examiner Name	HORTON, Andrew A.
Attorney Docket Number	10452-P52585US00

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	Attorney Docket Number	10452-P52585US00

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	First Named Inventor	Wayne Ernest Conrad
	Art Unit	3723
	Examiner Name	HORTON, Andrew A.
	Attorney Docket Number	10452-P52585US00

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

☒ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Philip C. Mendes da Costa/	Date (YYYY-MM-DD)	2019-06-20
Name/Print	Philip C. Mendes da Costa	Registration Number	33106

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /A.A.H/

Privacy Act Statement

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

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

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

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

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

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

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

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

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

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

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

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /A.A.H/

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/642,781	Conrad, Wayne Ernest
	Examiner	Art Unit
	ANDREW A HORTON	3723

CPC - Searched*		
Symbol	Date	Examiner
A47L 5/24, 9/322, 9/2878, 9/2884, 9/1608, 9/1625, 9/1641	02/06/2019	AH
Search update	07/02/2019	AH

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
Inventor search	02/06/2019	AH

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner

Dyson Ex1026
Page 751

REMARKS/ARGUMENTS

This letter is responsive to the Office Action dated July 19, 2019 and is submitted with a request for consideration under AFCP 2.0. Applicant submits that the amendments made by way of this paper do not broaden the scope of the independent claims in any aspect. An AFCP 2.0 request form is enclosed. It is submitted that this response is timely filed. Applicant respectfully requests entry of the amendments and reconsideration of the present application in view of the amendments and remarks set forth below.

Remarks Regarding Claim Amendments

The claims are amended to expedite prosecution, and without prejudice.

Amendments have been made to claim 1 to enhance clarity, as well as to respond to the Examiner's objections. New claims 17 to 20 are added. No new matter has been added.

Claims 1 to 20 are pending, of which claim 1 is independent.

Summary of the Interview

The Examiner is thanked for the interview of September 6, 2019 with the undersigned and Ryan De Vries. During the interview, clarifying amendments to address the anticipation and obviousness rejections were discussed.

Claim Rejections Under 35 U.S.C. § 103

The Examiner rejected claims 1 to 16 under 35 U.S.C. 102(a)(1) as being anticipated by Beskow (US 2008/0040883) or, in the alternative, under 35 U.S.C. 103 as obvious over Beskow in view of Qu (US 6,727,621).

Discussion of the rejection of claim 1 over Beskow

As discussed during the interview, claim 1 has been amended to recite that "*a plurality of energy storage members"* are *"mounted to one side of the suction motor housing*". Claim 1 has also been amended to recite that the energy storage chamber is "*spaced from*" the suction motor housing".

Figure 9 of the present application is reproduced below. Figure 9 depicts an example of a hand vacuum cleaner 1000. Hand vacuum cleaner 1000 includes a plurality of energy storage members (cells 1510 as exemplified) mounted to one side of the suction motor housing 1210. Hand vacuum cleaner 1000 also includes an energy storage chamber (the chamber holding battery pack 1500) that is spaced from the suction motor housing 1210.

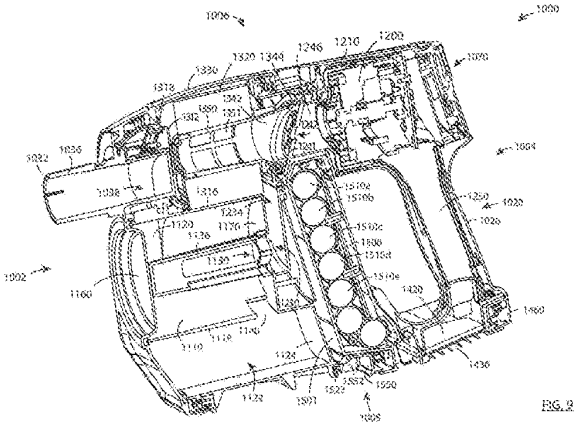


Figure 9 of Beskow is reproduced below on the left. As may be seen, Beskow discloses a motor 910, a battery bracket 928, and batteries 930. The Examiner has alleged that the motor 910 is analogous to the suction motor housing of claim 1, the battery bracket 928 is analogous to the energy storage chamber of clam 1, and the batteries 930 are analogous to the at least one energy storage member of claim 1. Beskow does not depict motor 910, battery bracket 928, and batteries 930 assembled, but Applicant submits that the assembly would look similar to the mock-up below and to the right of the reproduced Figure 9 of Beskow.

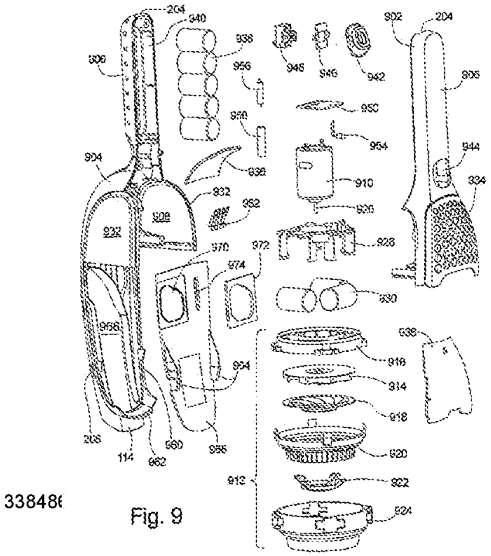
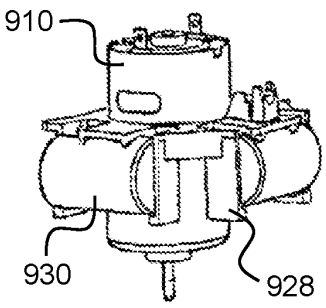


Fig. 9

Mock-up



As set out above, claim 1 has been amended to recite that the energy storage chamber is "*spaced from*" the suction motor housing". As shown in the mock-up, bracket 928 (the "energy storage chamber") surrounds motor 910. As the batteries 930 are arranged in a U-shaped configuration around the motor 930, the batteries 930 are not "*spaced from*" motor 910.

Claim 1 has also been amended to recite "*a plurality of energy storage members"* that are *"mounted to one side of the suction motor housing*". In Beskow, batteries 930 are arranged in a U-shaped configuration. Accordingly, one battery 930 is on one lateral side of the motor 910, one battery 930 is below the motor 910 and one battery 930 is on the other lateral side of the motor 910. Therefore, Beskow does not disclose two batteries on the same side of motor 910.

Accordingly, Applicant submits that amended claim 1 is patentable over Beskow. Applicant requests withdrawal of the rejection of claim 1 under 35 USC 102.

Discussion of the rejection of claim 1 over Beskow in view of Qu

The Examiner also alleged that Beskow may be combined with Qu. The Examiner stated that Qu provides a more clear teaching of a suction motor housing. Applicant respectfully submits that Qu does not remedy the deficiencies of Beskow set out above.

Accordingly, Applicant submits that amended claim 1 is patentable over Beskow in view of Qu. Applicant requests withdrawal of the rejection under 35 USC 103.

Discussion of the Patentability of the Dependent Claims

Although Applicant has not addressed all the issues of the dependent claims, Applicant respectfully submits that Applicant does not necessarily agree with the characterization and assessments of the dependent claims made by the Examiner, and Applicant believes

that each claim is patentable on its own merits. Applicant respectfully submits that the dependent claims incorporate by reference all the limitations of the claim to which they refer and include their own patentable features, and are therefore in condition for allowance. Therefore Applicant respectfully requests the withdrawal of all claim rejections and prompts allowance of the claims.

Conclusion

In light of Applicant's amendments to the claims and the foregoing Remarks, it is respectfully submitted that the present application is in condition for allowance. Should the Examiner have any remaining concerns which might prevent the prompt allowance of the application, the Examiner is respectfully invited to contact the undersigned at the telephone number appearing below.

No Disclaimers or Disavowals

Although the present communication may include alterations to the application or claims, or characterizations of claim scope or referenced art, Applicant is not conceding in this application that previously pending claims are not patentable over the cited references. Rather, any alterations or characterizations are being made to facilitate expeditious prosecution of this application. Applicant reserves the right to peruse at a later date any previously pending or other broader or narrower claims that capture any subject matter supported by the present disclosure, including subject matter found to be specifically disclaimed herein or by any prior prosecution. Accordingly, reviewers of this or any parent, child or related prosecution history shall not reasonably infer that Applicant has made any disclaimers or disavowals of any subject matter supported by the present specification.

The Commissioner is hereby authorized to charge any deficiency in fees required to keep the present application in good standing (including any extension of time fees, excess claim fees, and request for continued examination fees) or credit any overpayment to our Deposit Account No. 02-2095.

Should the Examiner deem it beneficial to discuss the application in greater detail, the Examiner is kindly requested to contact Philip C. Mendes da Costa by telephone at 416-957-1695 at the Examiner's convenience.

Respectfully submitted,

BERESKIN & PARR LLP/S.E.N.C.R.L., s.r.l.

/Philip C. Mendes da Costa/

By _____
Philip C. Mendes da Costa
Reg. No. 33,106
Tel: 416-364-7311

Doc Code: A.NE.AFCP
Document Description: After Final Consideration Pilot Program Request

PTO/SB/434 (05-13)

CERTIFICATION AND REQUEST FOR CONSIDERATION UNDER THE AFTER FINAL CONSIDERATION PILOT PROGRAM 2.0

Practitioner Docket No.:	Application No.:	Filing Date:
10452-P52585US00	15/642,781	July 6, 2017
First Named Inventor:	**Title:**	
Wayne Ernest Conrad	HANDHELD SURFACE CLEANING APPARATUS	

APPLICANT HEREBY CERTIFIES THE FOLLOWING AND REQUESTS CONSIDERATION UNDER THE AFTER FINAL CONSIDERATION PILOT PROGRAM 2.0 (AFCP 2.0) OF THE ACCOMPANYING RESPONSE UNDER 37 CFR 1.116.

1. The above-identified application is (i) an original utility, plant, or design nonprovisional application filed under 35 U.S.C. 111(a) [a continuing application (*e.g.*, a continuation or divisional application) is filed under 35 U.S.C. 111(a) and is eligible under (i)], or (ii) an international application that has entered the national stage in compliance with 35 U.S.C. 371(c).
2. The above-identified application contains an outstanding final rejection.
3. Submitted herewith is a response under 37 CFR 1.116 to the outstanding final rejection. The response includes an amendment to at least one independent claim, and the amendment does not broaden the scope of the independent claim in any aspect.
4. This certification and request for consideration under AFCP 2.0 is the only AFCP 2.0 certification and request filed in response to the outstanding final rejection.
5. Applicant is willing and available to participate in any interview requested by the examiner concerning the present response.
6. This certification and request is being filed electronically using the Office's electronic filing system (EFS-Web).
7. Any fees that would be necessary consistent with current practice concerning responses after final rejection under 37 CFR 1.116, *e.g.*, extension of time fees, are being concurrently filed herewith. [There is no additional fee required to request consideration under AFCP 2.0.]
8. By filing this certification and request, applicant acknowledges the following:

- Reissue applications and reexamination proceedings are not eligible to participate in AFCP 2.0.
- The examiner will verify that the AFCP 2.0 submission is compliant, *i.e.*, that the requirements of the program have been met (see items 1 to 7 above). For compliant submissions:
  - The examiner will review the response under 37 CFR 1.116 to determine if additional search and/or consideration (i) is necessitated by the amendment and (ii) could be completed within the time allotted under AFCP 2.0. If additional search and/or consideration is required but cannot be completed within the allotted time, the examiner will process the submission consistent with current practice concerning responses after final rejection under 37 CFR 1.116, *e.g.*, by mailing an advisory action.
  - If the examiner determines that the amendment does not necessitate additional search and/or consideration, or if the examiner determines that additional search and/or consideration is required and could be completed within the allotted time, then the examiner will consider whether the amendment places the application in condition for allowance (after completing the additional search and/or consideration, if required). If the examiner determines that the amendment does not place the application in condition for allowance, then the examiner will contact the applicant and request an interview.
    - The interview will be conducted by the examiner, and if the examiner does not have negotiation authority, a primary examiner and/or supervisory patent examiner will also participate.
    - If the applicant declines the interview, or if the interview cannot be scheduled within ten (10) calendar days from the date that the examiner first contacts the applicant, then the examiner will proceed consistent with current practice concerning responses after final rejection under 37 CFR 1.116.

Signature	Date
/Philip C. Mendes da Costa/	September 10, 2019
Name (Print/Typed) Philip C. Mendes da Costa	**Practitioner Registration No.** 33,106

***Note**: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. Submit multiple forms if more than one signature is required, see below*.*

☐ * Total of _____ forms are submitted.

Privacy Act Statement

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

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

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

Amendments to the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Currently Amended) A hand vacuum cleaner having a front end, a rear end, an upper end, a lower end, and first and second laterally spaced apart sides, and comprising:

(a) an air flow path extending from a dirty air inlet to a clean air outlet;

(b) a cyclone chamber positioned in the air flow path and having a cyclone air inlet, a cyclone air outlet, and a cyclone axis of rotation;

(c) a suction motor housing having a suction motor, the suction motor is positioned in the air flow path upstream of the clean air outlet; and,

(d) ~~at least one~~ a plurality of energy storage members positioned in an energy storage chamber

wherein the energy storage chamber is exterior to and spaced from the suction motor housing, and the plurality of energy storage members are mounted to one side of the suction motor housing, and

wherein a portion of the air flow path upstream of the suction motor is defined in part by a wall portion, the wall portion is in thermal communication with the energy storage chamber whereby air travelling through the portion of the air flow path upstream of the suction motor travels along the wall portion and cools the wall portion.

2. (Original) The hand vacuum cleaner of claim 1 wherein the cyclone axis of rotation extends generally in a forward/rearward direction.

3. (Original) The hand vacuum cleaner of claim 1 wherein the at least one energy storage member comprises a plurality of energy storage members wherein at least some of the plurality of energy storage members are arranged one above another in a generally upwardly extending configuration when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner.

4. (Original) The hand vacuum cleaner of claim 3 wherein the energy storage members arranged one above another comprise longitudinally extending members each having a longitudinal axis that extends laterally.

5. (Original) The hand vacuum cleaner of claim 3 wherein the cyclone axis of rotation intersects a volume defined by the generally upwardly extending configuration of energy storage members.

6. (Original) The hand vacuum cleaner of claim 5 wherein the cyclone axis of rotation extends generally in a forward/rearward direction.

7. (Original) The hand vacuum cleaner of claim 1 wherein the at least one energy storage member is removably receivable in the energy storage chamber.

8. (Original) The hand vacuum cleaner of claim 7 wherein the at least one energy storage member comprises a battery pack that is removably receivable in the energy storage chamber.

9. (Previously Presented) The hand vacuum cleaner of claim 1 wherein the wall portion faces the cyclone air outlet.

10 (Original) The hand vacuum cleaner of claim 9 wherein the portion of the air flow path extends generally upwardly from the cyclone air outlet to the suction motor when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner.

11. (Original) The hand vacuum cleaner of claim 10 wherein the suction motor is positioned above the cyclone axis of rotation when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner.

12. (Original) The hand vacuum cleaner of claim 9 wherein the portion of the air flow path extends generally downwardly from the cyclone air outlet to the suction motor when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner.

13. (Original) The hand vacuum cleaner of claim 12 wherein the suction motor is positioned below the cyclone axis of rotation when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner.

14. (Original) The hand vacuum cleaner of claim 1 further comprising a handle having a hand grip portion that extends upwardly and forwardly when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner wherein the handle is positioned rearward of the at least one energy storage member.

15. (Original) The hand vacuum cleaner of claim 14 wherein the at least one energy storage member comprises a plurality of energy storage members wherein at least some of the plurality of energy storage members are arranged one above another in a generally upwardly extending configuration when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner.

16. (Original) The hand vacuum cleaner of claim 15 further comprising a finger gap positioned between the handle and the energy storage chamber.

17. (New) The hand vacuum cleaner of claim 1 wherein the energy storage chamber is provided in a volume in the hand vacuum cleaner and the suction motor is located exterior to the volume.

18. (New) The hand vacuum cleaner of claim 1, wherein the plurality of energy storage members are positioned underneath the suction motor.

19. (New) The hand vacuum cleaner of claim 1, wherein the plurality of energy storage members are positioned forward of the suction motor.

20. (New) The hand vacuum cleaner of claim 1, wherein the plurality of energy storage members are positioned underneath and forward of the suction motor.

Bereskin & Parr

Appl. No	:	15/642,781
Inventor(s)	:	Wayne Ernest Conrad
Filed	:	July 6, 2017
Title	:	HANDHELD SURFACE CLEANING APPARATUS
TC./A.U.	:	3723
Examiner	:	HORTON, ANDREW ALAN
Docket No.	:	10452-P52585US00
Customer No.	:	1059

Confirmation No.: 5834
September 10, 2019

Mail Stop Amendments
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313–1450

AMENDMENT AND RESPONSE AFTER FINAL

&

CERTIFICATION AND REQUEST FOR CONSIDERATION UNDER THE AFTER FINAL CONSIDERATION PILOT PROGRAM 2.0

In response to the Office Action of July 12, 2019, please amend the above-identified application as noted below. A request for consideration under AFCPP 2.0 is submitted with this Response.

Amendments to the Claims are reflected in the listing of claims, which begins on page 2 of this paper.

Remarks/Arguments begin on page 6 of this paper.

Bereskin & Parr LLP
Scotia Plaza, 40 King Street West, 40th Floor, Toronto, ON M5H 3Y2 Canada
Tel: 416.364.7311 Fax: 416.361.1398 bereskinparr.com

Electronic Acknowledgement Receipt	
EFS ID:	37122993
Application Number:	15642781
International Application Number:	
Confirmation Number:	5834
Title of Invention:	HANDHELD SURFACE CLEANING APPARATUS
First Named Inventor/Applicant Name:	Wayne Ernest Conrad
Customer Number:	1059
Filer:	Philip C. Mendes da Costa/Snezana Lisowsky
Filer Authorized By:	Philip C. Mendes da Costa
Attorney Docket Number:	10452-P52585US00
Receipt Date:	10-SEP-2019
Filing Date:	06-JUL-2017
Time Stamp:	17:17:39
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		P52585US00_Response_2019-09-10.pdf	1005967 e1c441fac2af11d0aae4a9ae4e24ce7e330183af	yes	9

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Response After Final Action	1	1
	Claims	2	4
	Applicant Arguments/Remarks Made in an Amendment	5	9

Warnings:					
Information:					
2	After Final Consideration Program Request	P52585US00_AFCPP_2019_09_10.pdf	226242 25d5d7a161ef8f622a7711a9629b184854e8134b	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	1232209		

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

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 15/642,781	Filing Date 07/06/2017	☐ To be Mailed

ENTITY: ☑ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

	(Column 1)	(Column 2)			
FOR	NUMBER FILED	NUMBER EXTRA		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A		N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A		N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*		x $80 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $420 =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).				
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))					
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT	09/10/2019	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 20	Minus	** 20	= 0		x $100 =	0
	Independent (37 CFR 1.16(h))	* 1	Minus	*** 3	= 0		x $460 =	0
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	0

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=		x $0 =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=		x $0 =	
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.	SLIE
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".	/KIMBERLY R WHITE/
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".	
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.	

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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

UNITED STATES PATENT AND TRADEMARK OFFICE

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

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/642,781	07/06/2017	Wayne Ernest Conrad	10452-P52585US00	5834

1059 7590 09/12/2019

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TORONTO, ONTARIO M5H 3Y2
CANADA

EXAMINER	
HORTON, ANDREW ALAN	

ART UNIT	PAPER NUMBER
3723	

NOTIFICATION DATE	DELIVERY MODE
09/12/2019	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

ipprocessingcentre@bereskinparr.com

Applicant-Initiated Interview Summary	**Application No.** 15/642,781	**Applicant(s)** Conrad, Wayne Ernest	
	Examiner ANDREW A HORTON	**Art Unit** 3723	**AIA (FITF) Status** Yes

All participants (applicant, applicants representative, PTO personnel):

(1) ANDREW A. HORTON. (3) _____.

(2) Philip C. Mendes da Costa. (4) _____.

Date of Interview: 06 September 2019.

Type: ☑ Telephonic ☐ Video Conference
☐ Personal [copy given to: ☐ applicant ☐ applicant's representative]

Exhibit shown or demonstration conducted: ☐ Yes ☑ No.
If Yes, brief description: _____.

Issues Discussed ☐101 ☐112 ☐102 ☑103 ☐Others
(For each of the checked box(es) above, please describe below the issue and detailed description of the discussion)

Claim(s) discussed: 1.

Identification of prior art discussed: Beskow (US 2008/0040883), Qu (US 6,727,621).

Substance of Interview
(For each issue discussed, provide a detailed description and indicate if agreement was reached. Some topics may include: identification or clarification of a reference or a portion thereof, claim interpretation, proposed amendments, arguments of any applied references etc...)

Applicant proposed an amendment to claim 1 in order to overcome Beskow in view of Qu. The examiner would consider Beskow in view of Qu to meet claim 1, as amended, because the energy storage chamber may be interpreted as a space inside of 928 which holds one of batteries 930, such as a space between two arms of 928 which hold one of batteries 930. Various proposed amendments to claim 1 were discussed. The examiner suggested reciting a row of batteries being forward of the suction motor, which appears to overcome Beskow in view of Qu. No agreement was reached regarding allowable subject matter..

Applicant recordation instructions: The formal written reply to the last Office action must include the substance of the interview. (See MPEP section 713.04). If a reply to the last Office action has already been filed, applicant is given a non-extendable period of the longer of one month or thirty days from this interview date, or the mailing date of this interview summary form, whichever is later, to file a statement of the substance of the interview.

Examiner recordation instructions: Examiners must summarize the substance of any interview of record. A complete and proper recordation of the substance of an interview should include the items listed in MPEP 713.04 for complete and proper recordation including the identification of the general thrust of each argument or issue discussed, a general indication of any other pertinent matters discussed regarding patentability and the general results or outcome of the interview, to include an indication as to whether or not agreement was reached on the issues raised.

☑ Attachment

/ANDREW A HORTON/ Primary Examiner, Art Unit 3723	

Summary of Record of Interview Requirements

Manual of Patent Examining Procedure (MPEP), Section 713.04, Substance of Interview Must be Made of Record
A complete written statement as to the substance of any face-to-face, video conference, or telephone interview with regard to an application must be made of record in the application whether or not an agreement with the examiner was reached at the interview.

Title 37 Code of Federal Regulations (CFR) 1.133 Interviews
Paragraph (b)

In every instance where reconsideration is requested in view of an interview with an examiner, a complete written statement of the reasons presented at the interview as warranting favorable action must be filed by the applicant. An interview does not remove the necessity for reply to Office action as specified in §§ 1.111, 1.135. (35 U.S.C. 132)

37 CFR §1.2 Business to be transacted in writing.
All business with the Patent or Trademark Office should be transacted in writing. The personal attendance of applicants or their attorneys or agents at the Patent and Trademark Office is unnecessary. The action of the Patent and Trademark Office will be based exclusively on the written record in the Office. No attention will be paid to any alleged oral promise, stipulation, or understanding in relation to which there is disagreement or doubt.

The action of the Patent and Trademark Office cannot be based exclusively on the written record in the Office if that record is itself incomplete through the failure to record the substance of interviews.

It is the responsibility of the applicant or the attorney or agent to make the substance of an interview of record in the application file, unless the examiner indicates he or she will do so. It is the examiners responsibility to see that such a record is made and to correct material inaccuracies which bear directly on the question of patentability.

Examiners must complete an Interview Summary Form for each interview held where a matter of substance has been discussed during the interview by checking the appropriate boxes and filling in the blanks. Discussions regarding only procedural matters, directed solely to restriction requirements for which interview recordation is otherwise provided for in Section 812.01 of the Manual of Patent Examining Procedure, or pointing out typographical errors or unreadable script in Office actions or the like, are excluded from the interview recordation procedures below. Where the substance of an interview is completely recorded in an Examiners Amendment, no separate Interview Summary Record is required.

The Interview Summary Form shall be given an appropriate Paper No., placed in the right hand portion of the file, and listed on the "Contents" section of the file wrapper. In a personal interview, a duplicate of the Form is given to the applicant (or attorney or agent) at the conclusion of the interview. In the case of a telephone or video-conference interview, the copy is mailed to the applicants correspondence address either with or prior to the next official communication. If additional correspondence from the examiner is not likely before an allowance or if other circumstances dictate, the Form should be mailed promptly after the interview rather than with the next official communication.

The Form provides for recordation of the following information:
- Application Number (Series Code and Serial Number)
- Name of applicant
- Name of examiner
- Date of interview
- Type of interview (telephonic, video-conference, or personal)
- Name of participant(s) (applicant, attorney or agent, examiner, other PTO personnel, etc.)
- An indication whether or not an exhibit was shown or a demonstration conducted
- An identification of the specific prior art discussed
- An indication whether an agreement was reached and if so, a description of the general nature of the agreement (may be by attachment of a copy of amendments or claims agreed as being allowable). Note: Agreement as to allowability is tentative and does not restrict further action by the examiner to the contrary.
- The signature of the examiner who conducted the interview (if Form is not an attachment to a signed Office action)

It is desirable that the examiner orally remind the applicant of his or her obligation to record the substance of the interview of each case. It should be noted, however, that the Interview Summary Form will not normally be considered a complete and proper recordation of the interview unless it includes, or is supplemented by the applicant or the examiner to include, all of the applicable items required below concerning the substance of the interview.

A complete and proper recordation of the substance of any interview should include at least the following applicable items:
1) A brief description of the nature of any exhibit shown or any demonstration conducted,-
2) an identification of the claims discussed,
3) an identification of the specific prior art discussed,
4) an identification of the principal proposed amendments of a substantive nature discussed, unless these are already described on the Interview Summary Form completed by the Examiner,
5) a brief identification of the general thrust of the principal arguments presented to the examiner,
   (The identification of arguments need not be lengthy or elaborate. A verbatim or highly detailed description of the arguments is not required. The identification of the arguments is sufficient if the general nature or thrust of the principal arguments made to the examiner can be understood in the context of the application file. Of course, the applicant may desire to emphasize and fully describe those arguments which he or she feels were or might be persuasive to the examiner.)
6) a general indication of any other pertinent matters discussed, and
7) if appropriate, the general results or outcome of the interview unless already described in the Interview Summary Form completed by the examiner.

Examiners are expected to carefully review the applicants record of the substance of an interview. If the record is not complete and accurate, the examiner will give the applicant an extendable one month time period to correct the record.

Examiner to Check for Accuracy

If the claims are allowable for other reasons of record, the examiner should send a letter setting forth the examiners version of the statement attributed to him or her. If the record is complete and accurate, the examiner should place the indication, Interview Record OK on the paper recording the substance of the interview along with the date and the examiners initials.

Bereskin & Parr

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appl. No	:	15/642,781	Confirmation No.: 5834
Inventor	:	Wayne Ernest Conrad	
Title	:	**HANDHELD SUFACE CLEANING APPARATUS**	
Filed	:	July 6, 2017	
TC./A.U.	:	3723	
Examiner	:	Andrew A. Horton	
Docket No.	:	10452-P52585US00	
Customer No.	:	01059	

September 4, 2019

Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

Proposed Telephone Interview Agenda

Date: Friday, September 6, 2019 at 1:30 PM EST

Agenda Items:

1) Final Office Action dated July 12, 2019

2) Proposed amendments to the claims are reflected in the appended listing of claims, which begins on page 2 of this agenda.

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3376477

PROPOSED AMENDMENTS TO THE CLAIMS

The proposed amendments to the claims are for discussion purposes only during the telephonic interview with Examiner Andrew A. Horton on September 5, 2019, and are not for entry in the case.

Listing of Claims:

1. (Currently Amended) A hand vacuum cleaner having a front end, a rear end, an upper end, a lower end, and first and second laterally spaced apart sides, and comprising:

(a) an air flow path extending from a dirty air inlet to a clean air outlet;

(b) a cyclone chamber positioned in the air flow path and having a cyclone air inlet, a cyclone air outlet, and a cyclone axis of rotation;

(c) a suction motor housing having a suction motor, the suction motor is positioned in the air flow path upstream of the clean air outlet; and,

(d) at least one energy storage member positioned in an energy storage chamber

wherein the energy storage chamber is exterior to and spaced from the suction motor housing, and

wherein a portion of the air flow path upstream of the suction motor is defined in part by a wall portion, the wall portion is in thermal communication with the energy storage

chamber whereby air travelling through the portion of the air flow path upstream of the suction motor travels along the wall portion and cools the wall portion.

2. (Original) The hand vacuum cleaner of claim 1 wherein the cyclone axis of rotation extends generally in a forward/rearward direction.

3. (Original) The hand vacuum cleaner of claim 1 wherein the at least one energy storage member comprises a plurality of energy storage members wherein at least some of the plurality of energy storage members are arranged one above another in a generally upwardly extending configuration when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner.

4. (Original) The hand vacuum cleaner of claim 3 wherein the energy storage members arranged one above another comprise longitudinally extending members each having a longitudinal axis that extends laterally.

5. (Original) The hand vacuum cleaner of claim 3 wherein the cyclone axis of rotation intersects a volume defined by the generally upwardly extending configuration of energy storage members.

6. (Original) The hand vacuum cleaner of claim 5 wherein the cyclone axis of rotation extends generally in a forward/rearward direction.

7. (Original) The hand vacuum cleaner of claim 1 wherein the at least one energy storage member is removably receivable in the energy storage chamber.

8. (Original) The hand vacuum cleaner of claim 7 wherein the at least one energy storage member comprises a battery pack that is removably receivable in the energy storage chamber.

9. (Previously Presented) The hand vacuum cleaner of claim 1 wherein the wall portion faces the cyclone air outlet.

10 (Original) The hand vacuum cleaner of claim 9 wherein the portion of the air flow path extends generally upwardly from the cyclone air outlet to the suction motor when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner.

11. (Original) The hand vacuum cleaner of claim 10 wherein the suction motor is positioned above the cyclone axis of rotation when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner.

12. (Original) The hand vacuum cleaner of claim 9 wherein the portion of the air flow path extends generally downwardly from the cyclone air outlet to the suction motor when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner.

13. (Original) The hand vacuum cleaner of claim 12 wherein the suction motor is positioned below the cyclone axis of rotation when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner.

14. (Original) The hand vacuum cleaner of claim 1 further comprising a handle having a hand grip portion that extends upwardly and forwardly when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner wherein the handle is positioned rearward of the at least one energy storage member.

15. (Original) The hand vacuum cleaner of claim 14 wherein the at least one energy storage member comprises a plurality of energy storage members wherein at least some of the plurality of energy storage members are arranged one above another in a generally upwardly extending configuration when the upper end of the hand vacuum cleaner is positioned above the lower end of the hand vacuum cleaner.

16. (Original) The hand vacuum cleaner of claim 15 further comprising a finger gap positioned between the handle and the energy storage chamber.

17. (New) The hand vacuum cleaner of claim 1 wherein the energy storage chamber is provided in a volume in the hand vacuum cleaner and the suction motor is located exterior to the volume.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/642,781	07/06/2017	Wayne Ernest Conrad	10452-P52585US00	5834

1059 7590 09/19/2019

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CANADA

EXAMINER	
HORTON, ANDREW ALAN	

ART UNIT	PAPER NUMBER
3723	

NOTIFICATION DATE	DELIVERY MODE
09/19/2019	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

ipprocessingcentre@bereskinparr.com

Advisory Action Before the Filing of an Appeal Brief	**Application No.** 15/642,781	**Applicant(s)** Conrad, Wayne Ernest	
	Examiner ANDREW A HORTON	**Art Unit** 3723	**AIA (FITF) Status** Yes

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

THE REPLY FILED 10 September 2019 FAILS TO PLACE THIS APPLICATION IN CONDITION FOR ALLOWANCE.

NO NOTICE OF APPEAL FILED

1. ☑ The reply was filed after a final rejection. No Notice of Appeal has been filed. To avoid abandonment of this application, applicant must timely file one of the following replies: (1) an amendment, affidavit, or other evidence, which places the application in condition for allowance; (2) a Notice of Appeal (with appeal fee) in compliance with 37 CFR 41.31; or (3) a Request for Continued Examination (RCE) in compliance with 37 CFR 1.114 if this is a utility or plant application. Note that RCEs are not permitted in design applications. The reply must be filed within one of the following time periods:
   a) ☐ The period for reply expires ____ months from the mailing date of the final rejection.
   b) ☑ The period for reply expires on: (1) the mailing date of this Advisory Action; or (2) the date set forth in the final rejection, whichever is later. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of the final rejection.
   c) ☐ A prior Advisory Action was mailed more than 3 months after the mailing date of the final rejection in response to a first after-final reply filed within 2 months of the mailing date of the final rejection.The current period for reply expires ____ months from the mailing date of *the prior Advisory Action* or SIX MONTHS from the mailing date of the final rejection, whichever is earlier.
   Examiner Note: If box 1 is checked, check either box (a), (b) or (c). ONLY CHECK BOX (b) WHEN THIS ADVISORY ACTION IS THE FIRST RESPONSE TO APPLICANTS FIRST AFTER-FINAL REPLY WHICH WAS FILED WITHIN TWO MONTHS OF THE FINAL REJECTION. ONLY CHECK BOX (c) IN THE LIMITED SITUATION SET FORTH UNDER BOX (c). See MPEP 706.07(f).

Extensions of time may be obtained under 37 CFR 1.136(a). The date on which the petition under 37 CFR 1.136(a) and the appropriate extension fee have been filed is the date for purposes of determining the period of extension and the corresponding amount of the fee. The appropriate extension fee under 37 CFR 1.17(a) is calculated from: (1) the expiration date of the shortened statutory period for reply originally set in the final Office action; or (2) as set forth in (b) or (c) above, if checked. Any reply received by the Office later than three months after the mailing date of the final rejection, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

NOTICE OF APPEAL

2. ☐ The Notice of Appeal was filed on _____. A brief in compliance with 37 CFR 41.37 must be filed within two months of the date of filing the Notice of Appeal (37 CFR 41.37(a)), or any extension thereof (37 CFR 41.37(e)), to avoid dismissal of the appeal. Since a Notice of Appeal has been filed, any reply must be filed within the time period set forth in 37CFR 41.37(a).

AMENDMENTS

3. ☑ The proposed amendments filed after a final rejection, but prior to the date of filing a brief, will not be entered because
   a) ☑ They raise new issues that would require further consideration and/or search (see NOTE below);
   b) ☐ They raise the issue of new matter (see NOTE below);
   c) ☐ They are not deemed to place the application in better form for appeal by materially reducing or simplifying the issues for appeal; and/or
   d) ☐ They present additional claims without canceling a corresponding number of finally rejected claims.
   NOTE: The amendments to claim 1 and new claims 17-20 raise new issues that would require further search and consideration (See 37CFR 1.116 and 41.33(a)).
4. ☐ The amendments are not in compliance with 37CFR 1.121. See attached Notice of Non-Compliant Amendment (PTOL-324).
5. ☐ Applicants reply has overcome the following rejection(s): _____
6. ☐ Newly proposed or amended claim(s) _____ would be allowable if submitted in a separate, timely filed amendment canceling the non-allowable claim(s).
7. ☑ For purposes of appeal, the proposed amendment(s):(a) ☑ will not be entered, or (b) ☐ will be entered, and an explanation of how the new or amended claims would be rejected is provided below or appended.

AFFIDAVIT OR OTHER EVIDENCE

8. ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____
9. ☐ The affidavit or other evidence filed after final action, but before or on the date of filing a Notice of Appeal will not be entered because applicant failed to provide a showing of good and sufficient reasons why the affidavit or other evidence is necessary and was not earlier presented. See 37 CFR 1.116(e).
10. ☐ The affidavit or other evidence filed after the date of filing the Notice of Appeal, but prior to the date of filing a brief, will not be entered because the affidavit or other evidence failed to overcome all rejections under appeal and/or appellant fails to provide a showing of good and sufficient reasons why it is necessary and was not earlier presented. See 37 CFR 41.33(d)(1).
11. ☐ The affidavit or other evidence is entered. An explanation of the status of the claims after entry is below or attached.

REQUEST FOR RECONSIDERATION/OTHER

12. ☐ The request for reconsideration has been considered but does NOT place the application in condition for allowance because: _____.
13. ☐ Note the attached Information *Disclosure Statement*(s). (PTO/SB/08) Paper No(s). _____
14. ☑ Other: PTO-2323.

STATUS OF CLAIMS

15. The status of the claim(s) is (or will be) as follows:
    Claim(s) allowed:_____.
    Claim(s) objected to:_____.
    Claim(s) rejected:1-16.
    Claim(s) withdrawn from consideration:_____.

/ANDREW A HORTON/ Primary Examiner, Art Unit 3723	

AFCP 2.0 Decision

Application No.	Applicant(s)	
15/642,781	Conrad, Wayne Ernest	
Examiner	**Art Unit**	**AIA (FITF) Status**
ANDREW A HORTON	3723	Yes

This is in response to the After Final Consideration Pilot request filed 10 September 2019.

1. **Improper Request** – The AFCP 2.0 request is improper for the following reason(s) and the after final amendment submitted with the request will be treated under pre-pilot procedure.

   ☐ An AFCP 2.0 request form PTO/SB/434 (or equivalent document) was not submitted.

   ☐ A non-broadening amendment to at least one independent claim was not submitted.

   ☐ The request is not the first proper AFCP 2.0 request submitted in response to the most recent final rejection.

   ☐ Other: _____

2. **Proper Request**

   A. After final amendment submitted with the request will not be treated under AFCP 2.0.
   The after final amendment cannot be reviewed and a search conducted within the guidelines of the pilot program.

   ☑ The after final amendment will be treated under pre-pilot procedure.

   B. Updated search and/or completed additional consideration.
   The examiner performed an updated search and/or completed additional consideration of the after final amendment within the time authorized for the pilot program. The result(s) of the updated search and/or completed additional consideration are:

   ☐ 1. All of the rejections in the most recent final Office action are overcome and a Notice of Allowance is issued herewith.

   ☐ 2. The after final amendment would not overcome all of the rejections in the most recent final Office action . See attached interview summary for further details.

   ☐ 3. The after final amendment was reviewed, and it raises a new issue(s). See attached interview summary for further details.

   ☐ 4. The after final amendment raises new issues, but would overcome all of the rejections in the most recent final Office action. A decision on determining allowability could not be made within the guidelines of the pilot. See attached interview summary for further details, including any newly discovered prior art.

   ☐ 5. Other: _____

   Examiner Note: Please attach an interview summary when necessary as described above.

Bereskin & Parr

Appl. No	:	15/642,781
Inventor(s)	:	Wayne Ernest Conrad
Filed	:	July 6, 2017
Title	:	HANDHELD SURFACE CLEANING APPARATUS
TC./A.U.	:	3723
Examiner	:	HORTON, ANDREW ALAN
Docket No.	:	10452-P52585US00
Customer No.	:	1059

Confirmation No.: 5834
September 10, 2019

Mail Stop Amendments
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313–1450

AMENDMENT AND RESPONSE AFTER FINAL

&

CERTIFICATION AND REQUEST FOR CONSIDERATION UNDER THE AFTER FINAL CONSIDERATION PILOT PROGRAM 2.0

In response to the Office Action of July 12, 2019, please amend the above-identified application as noted below. A request for consideration under AFCPP 2.0 is submitted with this Response.

Amendments to the Claims are reflected in the listing of claims, which begins on page 2 of this paper.

Remarks/Arguments begin on page 6 of this paper.

DO NOT ENTER: /A.A.H/

09/16/2019

Bereskin & Parr LLP
Scotia Plaza, 40 King Street West, 40th Floor, Toronto, ON M5H 3Y2 Canada
Tel: 416.364.7311 Fax: 416.361.1398 bereskinparr.com

Doc code: RCEX
Doc description: Request for Continued Examination (RCE)

PTO/SB/30EFS (02-18)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

REQUEST FOR CONTINUED EXAMINATION(RCE)TRANSMITTAL
(Submitted Only via EFS-Web)

Application Number	15642781	Filing Date	2017-07-06	Docket Number (if applicable)	10452-P52585US00	Art Unit	3723
First Named Inventor	Wayne Ernest Conrad			Examiner Name	HORTON, Andrew Alan		

This is a Request for Continued Examination (RCE) under 37 CFR 1.114 of the above-identified application.
Request for Continued Examination (RCE) practice under 37 CFR 1.114 does not apply to any utility or plant application filed prior to June 8 1995, or to any design application. The Instruction Sheet for this form is located at WWW.USPTO.GOV

SUBMISSION REQUIRED UNDER 37 CFR 1.114

Note: If the RCE is proper, any previously filed unentered amendments and amendments enclosed with the RCE will be entered in the orde in which they were filed unless applicant instructs otherwise. If applicant does not wish to have any previously filed unentered amendment(s entered, applicant must request non-entry of such amendment(s).

☒ Previously submitted. If a final Office action is outstanding, any amendments filed after the final Office action may be considered as a submission even if this box is not checked.

☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed on _____

☒ Other Response to Final Office Action of July 12, 2019, filed on September 10, 2019

☐ Enclosed

☐ Amendment/Reply

☐ Information Disclosure Statement (IDS)

☐ Affidavit(s)/ Declaration(s)

☐ Other _____

MISCELLANEOUS

☐ Suspension of action on the above-identified application is requested under 37 CFR 1.103(c) for a period of months _____ (Period of suspension shall not exceed 3 months; Fee under 37 CFR 1.17(i) required)

☐ Other _____

FEES

☒ **The RCE fee under 37 CFR 1.17(e) is required by 37 CFR 1.114 when the RCE is filed.**
The Director is hereby authorized to charge any underpayment of fees, or credit any overpayments, to Deposit Account No 022095

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED

X Patent Practitioner Signature

Applicant Signature

EFS - Web 2.1.16

PTO/SB/30EFS (02-18)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Signature of Registered U.S. Patent Practitioner			
Signature	/Philip C. Mendes da Costa/	Date (YYYY-MM-DD)	2019-09-20
Name	Philip C. Mendes da Costa	Registration Number	33106

This collection of information is required by 37 CFR 1.114. The information is required to obtain or retain a benefit by the public which is t file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Tim will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions fo reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450.

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

Privacy Act Statement

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

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

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

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

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

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

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

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

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

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

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

Electronic Patent Application Fee Transmittal

Application Number:	15642781
Filing Date:	06-Jul-2017
Title of Invention:	HANDHELD SURFACE CLEANING APPARATUS
First Named Inventor/Applicant Name:	Wayne Ernest Conrad
Filer:	Philip C. Mendes da Costa/Snezana Lisowsky
Attorney Docket Number:	10452-P52585US00

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
RCE- 1ST REQUEST	1801	1	1300	1300
		Total in USD ($)		**1300**

Electronic Acknowledgement Receipt	
EFS ID:	37223301
Application Number:	15642781
International Application Number:	
Confirmation Number:	5834
Title of Invention:	HANDHELD SURFACE CLEANING APPARATUS
First Named Inventor/Applicant Name:	Wayne Ernest Conrad
Customer Number:	1059
Filer:	Philip C. Mendes da Costa/Snezana Lisowsky
Filer Authorized By:	Philip C. Mendes da Costa
Attorney Docket Number:	10452-P52585US00
Receipt Date:	20-SEP-2019
Filing Date:	06-JUL-2017
Time Stamp:	10:47:16
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$1300
RAM confirmation Number	E20199JA47421475
Deposit Account	022095
Authorized User	Snezana Lisowsky
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: 37 CFR 1.16 (National application filing, search, and examination fees) 37 CFR 1.17 (Patent application and reexamination processing fees)	

37 CFR 1.19 (Document supply fees)

37 CFR 1.20 (Post Issuance fees)

37 CFR 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Request for Continued Examination (RCE)	P52585US00_RCE_2019_09_20.pdf	1349976 52ba7d3c4b3376da105cabef2e844d9d7176736d	no	3
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30418 7f61f448df4da2658fefc0ff394e21ca0791ee5e	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	1380394		

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

New Applications Under 35 U.S.C. 111

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

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

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

New International Application Filed with the USPTO as a Receiving Office

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

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 15/642,781	Filing Date 07/06/2017	☐ To be Mailed

ENTITY: ☑ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A		N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A		N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*		x $80 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $420 =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).				
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))					
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT	09/20/2019	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 20	Minus	** 20	= 0		x $100 =	0
	Independent (37 CFR 1.16(h))	* 1	Minus	*** 3	= 0		x $460 =	0
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	0

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=		x $0 =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=		x $0 =	
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.	LIE
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".	/TAMARA D HARRELL/
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".	
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.	

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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

Examiner-Initiated Interview Summary	Application No. 15/642,781	Applicant(s) Conrad, Wayne Ernest	
	Examiner ANDREW A HORTON	Art Unit 3723	AIA (FITF) Status Yes

All participants (applicant, applicant's representative, PTO personnel):

(1) ANDREW A. HORTON. (3) _____.

(2) Philip C. Mendes da Costa. (4) _____.

Date of Interview: 20 February 2020.

Type: ☑ Telephonic ☐ Video Conference
☐ Personal [copy given to: ☐ applicant ☐ applicant's representative]

Exhibit shown or demonstration conducted: ☐ Yes ☑ No.
If Yes, brief description: _____.

Issues Discussed ☐ 101 ☑ 112 ☐ 102 ☑ 103 ☐ Others
(For each of the checked box(es) above, please describe below the issue and detailed description of the discussion)

Claim(s) discussed: 1 and 14.

Identification of prior art discussed: Beskow (US 2008/0040883).

Substance of Interview
(For each issue discussed, provide a detailed description and indicate if agreement was reached. Some topics may include: identification or clarification of a reference or a portion thereof, claim interpretation, proposed amendments, arguments of any applied references etc...)

The examiner proposed an amendment to claim 1 which would overcome Beskow and place the case in a condition for allowance. Applicant suggested an amendment to claim 14 which would overcome a 112(b) issue that would be introduced after the amendment to claim 1 were made. Applicant permitted the changes to be made by examiner's amendment.

Applicant recordation instructions: It is not necessary for applicant to provide a separate record of the substance of interview.

Examiner recordation instructions: Examiners must summarize the substance of any interview of record. A complete and proper recordation of the substance of an interview should include the items listed in MPEP 713.04 for complete and proper recordation including the identification of the general thrust of each argument or issue discussed, a general indication of any other pertinent matters discussed regarding patentability and the general results or outcome of the interview, to include an indication as to whether or not agreement was reached on the issues raised.

☐ Attachment

/ANDREW A HORTON/ Primary Examiner, Art Unit 3723	

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/642,781	Conrad, Wayne Ernest
	Examiner	**Art Unit**
	ANDREW A HORTON	3723

CPC						
Symbol					**Type**	**Version**
A47L	/	5	/	24	F	2013-01-01
A47L	/	9	/	1641	I	2013-01-01
A47L	/	9	/	322	I	2013-01-01
A47L	/	9	/	1666	I	2013-01-01
A47L	/	9	/	2878	I	2013-01-01
A47L	/	9	/	1683	I	2013-01-01
A47L	/	9	/	1625	I	2013-01-01
A47L	/	9	/	2857	I	2013-01-01
A47L	/	9	/	1608	I	2013-01-01
A47L	/	9	/	2842	I	2013-01-01
A47L	/	9	/	2884	I	2013-01-01
A47L	/	9	/	122	I	2013-01-01
A47L	/	9	/	2889	I	2013-01-01
A47L	/	9	/	246	I	2013-01-01
A47L	/	9	/	106	I	2013-01-01
A47L	/	9	/	127	I	2013-01-01

CPC Combination Sets								
Symbol					**Type**	**Set**	**Ranking**	**Version**
	/		/					

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	20	
/ANDREW A HORTON/ Primary Examiner, Art Unit 3723	09 March 2020	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

U.S. Patent and Trademark Office — Part of Paper No.: 20200220

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/642,781	Conrad, Wayne Ernest
	Examiner	**Art Unit**
	ANDREW A HORTON	3723

INTERNATIONAL CLASSIFICATION				
CLAIMED				
A47L5/24	/	5	/	24
A47L9/16	/	9	/	16
A47L9/32	/	9	/	32
A47L9/28	/	9	/	28
A47L9/12	/	9	/	12
A47L9/24	/	9	/	24
A47L9/10	/	9	/	10

NON-CLAIMED				
	/		/	

US ORIGINAL CLASSIFICATION	
CLASS	**SUBCLASS**

CROSS REFERENCES(S)						
CLASS	**SUBCLASS (ONE SUBCLASS PER BLOCK)**					

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	20	
/ANDREW A HORTON/ Primary Examiner, Art Unit 3723	09 March 2020	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

U.S. Patent and Trademark Office — Part of Paper No.: 20200220

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/642,781	Conrad, Wayne Ernest
	Examiner	**Art Unit**
	ANDREW A HORTON	3723

☑ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIMS

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	20	
/ANDREW A HORTON/ Primary Examiner, Art Unit 3723	09 March 2020	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

U.S. Patent and Trademark Office Part of Paper No.: 20200220

Bibliographic Data

Application No: 15/642,781

Foreign Priority claimed: ○ Yes ◉ No

35 USC 119 (a-d) conditions met: ☐ Yes ☑ No ☐ Met After Allowance

Verified and Acknowledged: /ANDREW A HORTON/ Examiner's Signature | Initials

Title: HANDHELD SURFACE CLEANING APPARATUS

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
07/06/2017	015	3723	
RULE			

APPLICANTS

Omachron Intellectual Property Inc., Hampton, CANADA

INVENTORS

Wayne Ernest Conrad Hampton, CANADA

CONTINUING DATA

FOREIGN APPLICATIONS

IF REQUIRED, FOREIGN LICENSE GRANTED**

07/12/2017

STATE OR COUNTRY

CANADA

ADDRESS

FILING FEE RECEIVED

$1,600

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	165	("20020066262" | "20020088208" | "20020112315" | "20020134238" | "20030159238" | "20040200029" | "20040231093" | "20050132528" | "20060156508" | "20060288516" | "20080301903" | "20090205161" | "20090205298" | "3988133" | "4097381" | "4236903" | "4373228" | "4523936" | "4853008" | "5054157" | "5467835" | "5970572" | "6195835" | "6406505" | "6531066" | "6553612" | "6625845" | "6640385" | "6662403" | "6712868" | "6896711" | "7074248" | "7117973" | "7175682" | "7181803" | "20100175217" | "20100229328" | "20110023261" | "20110146024" | "20110219570" | "20120222245" | "20120222262" | "20140137363" | "20140182080" | "20170196425" | "8021453" | "8544143" | "20170215663" | "20170290480" | "1937765" | "20010018865" | "20020062531" | "20040107530" | "20050198769" | "20050198770" | "20050252179" | "20060102005" | "20060168922" | "20060207231" | "20070079473" | "20090300874" | "2678110" | "3898068" | "4307485" | "4486207" | "4744958" | "5090976" | "5267371" | "5307538" | "5309600" | "5347679" | "5481780" | "5599365" | "5755096" | "6345408" | "6599338" | "7386915" | "7691161" | "7717973" | "7776120" | "D303173" | "D380033" | "20110219576" | "20140208538" | "20140237768" | "20170196422" | "20170196424" | "7882593" | "7996956" | "8150907" | "9095245" | "9675218" | "20170290477" | "1898608" | "20020134059" | "20040010885" | "20050252180" | "20060162298" | "20060168923" | "20060230724" | "20070084159" | "20080178420" | "20080256744" | "20090019663" | "20090113659" | "2811219" | "2846024" | "2937713" | "2981369" | "3130157" | "3269097" | "3372532" | "3822533" | "3933450" | "4853011" | "4980945" | "6080022" | "6553613" | "6746500" | "6929516" | "6968596" | "7354468" | "7377953" | "7779506" | "7780753" | "7805804" | "20090313959" | "20130091658" | "20160174787" | "20170188763" | "20170196423" |	US-PGPUB; USPAT; USOCR	OR	OFF	2019/02/04 15:58

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S20	243	a47l9/2884.cpc. and (cyclon$6 centrifug$4)	US-PGPUB; USPAT; USOCR	OR	OFF	2019/02/06 08:30
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EAST Search History (Interference)

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3/9/2020 9:36:00 AM
C:\Users\ahorton\Documents\EAST\Workspaces\15642781.wsp

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NOTICE OF ALLOWANCE AND FEE(S) DUE

1059 7590 03/12/2020

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TORONTO, ONTARIO M5H 3Y2
CANADA

EXAMINER
HORTON, ANDREW ALAN

ART UNIT	PAPER NUMBER
3723	

DATE MAILED: 03/12/2020

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/642,781	07/06/2017	Wayne Ernest Conrad	10452-P52585US00	5834

TITLE OF INVENTION: HANDHELD SURFACE CLEANING APPARATUS

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1000	$0.00	$0.00	$1000	06/12/2020

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

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

HOW TO REPLY TO THIS NOTICE:

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

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

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

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

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

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

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

PTOL-85 (Rev. 02/11)

PART B - FEE(S) TRANSMITTAL

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

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

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

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

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

1059 7590 03/12/2020

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

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

Certificate of Mailing or Transmission

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

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

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/642,781	07/06/2017	Wayne Ernest Conrad	10452-P52585US00	5834

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APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1000	$0.00	$0.00	$1000	06/12/2020

EXAMINER	ART UNIT	CLASS-SUBCLASS
HORTON, ANDREW ALAN	3723	015-344000

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

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

❑ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-09 or more recent) attached. **Use of a Customer Number is required.**

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

1 _____
2 _____
3 _____

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

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

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

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

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

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

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

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

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

❑ Applicant certifying micro entity status. See 37 CFR 1.29

❑ Applicant asserting small entity status. See 37 CFR 1.27

❑ Applicant changing to regular undiscounted fee status.

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

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

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

Dyson Ex1026
Page 802

UNITED STATES PATENT AND TRADEMARK OFFICE

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

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/642,781	07/06/2017	Wayne Ernest Conrad	10452-P52585US00	5834

1059 7590 03/12/2020

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40 KING STREET WEST
40TH FLOOR
TORONTO, ONTARIO M5H 3Y2
CANADA

EXAMINER	
HORTON, ANDREW ALAN	
ART UNIT	PAPER NUMBER
3723	

DATE MAILED: 03/12/2020

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

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

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

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

PTOL-85 (Rev. 02/11)

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

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

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

Privacy Act Statement

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

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

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

Notice of Allowability	**Application No.** 15/642,781	**Applicant(s)** Conrad, Wayne Ernest	
	Examiner ANDREW A HORTON	**Art Unit** 3723	**AIA (FITF) Status** Yes

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

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

1. ☑ This communication is responsive to 9/20/19.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

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

3. ☑ The allowed claim(s) is/are 1-20 . As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see **http://www.uspto.gov/patents/init_events/pph/index.jsp** or send an inquiry to **PPHfeedback@uspto.gov.**

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

   Certified copies:

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

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

   * Certified copies not received: _____ .

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

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

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

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

Attachment(s)

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

/ANDREW A HORTON/
Primary Examiner, Art Unit 3723

EXAMINER'S AMENDMENT

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in an interview with Philip C. Mendes da Costa on 2/20/20.

The application has been amended as follows:

Claim 1, part d, line 3: Insert -- a handle -- after "exterior to".

Claim 14 (line 1): Replace "further comprising a handle having" with -- wherein the handle has --.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ANDREW A HORTON whose telephone number is (571)270-5039. The examiner can normally be reached on Monday - Friday 7:30 AM - 4:00 PM.

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

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Orlando E Aviles-Bosques can be reached on 571-270-5531. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see https://ppair-my.uspto.gov/pair/PrivatePair. Should you have questions on access to the Private PAIR system, contact

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

/ANDREW A HORTON/
Primary Examiner, Art Unit 3723

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/642,781	Conrad, Wayne Ernest
	Examiner	Art Unit
	ANDREW A HORTON	3723

CPC - Searched*		
Symbol	**Date**	**Examiner**
A47L 5/24, 9/322, 9/2878, 9/2884, 9/1608, 9/1625, 9/1641	02/06/2019	AH
Search update	07/02/2019	AH
Search update	03/09/2020	AH

CPC Combination Sets - Searched*		
Symbol	**Date**	**Examiner**

US Classification - Searched*			
Class	**Subclass**	**Date**	**Examiner**

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	**Date**	**Examiner**
Inventor search	02/06/2019	AH

Interference Search			
US Class/CPC Symbol	**US Subclass/CPC Group**	**Date**	**Examiner**
ALL	ALL	03/09/2020	AH

Electronic Patent Application Fee Transmittal

Application Number:	15642781
Filing Date:	06-Jul-2017
Title of Invention:	HANDHELD SURFACE CLEANING APPARATUS
First Named Inventor/Applicant Name:	Wayne Ernest Conrad
Filer:	Philip C. Mendes da Costa/Snezana Lisowsky
Attorney Docket Number:	10452-P52585US00

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
PUBL. FEE- EARLY, VOLUNTARY, OR NORMAL	1504	1	0	0
UTILITY APPL ISSUE FEE	1501	1	1000	1000
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**1000**

PART B - FEE(S) TRANSMITTAL

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

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Commissioner for Patents
P.O. Box 1450
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CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

1059 7590 03/12/2020

BERESKIN & PARR LLP/S.E.N.C.R.L., s.r.l.
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(Typed or printed name)
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(Date)

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15/642,781	07/06/2017	Wayne Ernest Conrad	10452-P52585US00	5834

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nonprovisional	UNDISCOUNTED	$1000	$0.00	$0.00	$1000	06/12/2020

EXAMINER	ART UNIT	CLASS-SUBCLASS
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☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-09 or more recent) attached. **Use of a Customer Number is required.**

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

1 Philip C. Mendes da Costa
2 BERESKIN & PARR LLP/ S.E.N.C.R.L., s.r.l.
3

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

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

(A) NAME OF ASSIGNEE: OMACHRON INTELLECTUAL PROPERTY INC.

(B) RESIDENCE: (CITY and STATE OR COUNTRY): Hampton, Ontario, Canada

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

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

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

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

☒ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. 022095

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☐ Applicant certifying micro entity status. See 37 CFR 1.29

☐ Applicant asserting small entity status. See 37 CFR 1.27

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

Authorized Signature /Philip C. Mendes da Costa/ Date June 12, 2020

Typed or printed name Philip C. Mendes da Costa Registration No. 33106

PTOL-85 Part B (08-18) Approved for use through 01/31/2020 OMB 0651-0033 U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Bereskin & Parr

Appl. No	:	15/642,781	Confirmation No.:	5834
Applicant	:	Omachron Intellectual Property Inc.		
Filed	:	July 6, 2017		
Title	:	HANDHELD SURFACE CLEANING APPARATUS		
TC./A.U.	:	3723		
Examiner	:	HORTON, Andrew Allan		
Docket No.	:	10452-P52585US00		
Customer No.	:	01059		

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

June 12, 2020

ISSUE FEES

This correspondence is responsive to the Notice of Allowance and Issue Fee Due dated March 12, 2020, which issued in the above-identified patent application. As required, we enclose herewith the Issue Fee transmittal form.

The government fee of $1000 is included. Please charge any deficiency or credit any overpayment to our deposit account no. 02-2095.

Respectfully submitted,

BERESKIN & PARR LLP/ S.E.N.C.R.L., s.r.l.

/Philip C. Mendes da Costa/

Name: Philip C. Mendes da Costa
Registration No. 33,106
416. 957.1695

Bereskin & Parr LLP
Scotia Plaza, 40 King Street West, 40th Floor, Toronto, ON M5H 3Y2 Canada
Tel: 416.364.7311 Fax: 416.361.1398 bereskinparr.com

4022843

Electronic Acknowledgement Receipt	
EFS ID:	39709607
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First Named Inventor/Applicant Name:	Wayne Ernest Conrad
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1	Issue Fee Payment (PTO-85B)	USPTO_IssueFeeTransmittal_2020-06-12_P52585US00.PDF	121417 a48155e0f3eca30bccf3b90def8ebf894d76393b	no	1
Warnings:					
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2	Miscellaneous Incoming Letter	USPTO_Commissioner_IssueFee_2020-06-12_P52585US00.PDF	125830 164566420029a5e224309c4e38f549ee43a6ba04	no	1
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3	Fee Worksheet (SB06)	fee-info.pdf	32106 317d38a2b62a93a7f828e946ba033ea3f6b708b2	no	2
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15/642,781	07/28/2020	10722086	10452-P52585US00	5834

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ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

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

The Patent Term Adjustment is 251 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Data Management (ODM) at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site http://pair.uspto.gov for additional applicants):

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