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(54) **AUTOMATED VACUUM AND CHARGER SYSTEM AND METHOD**

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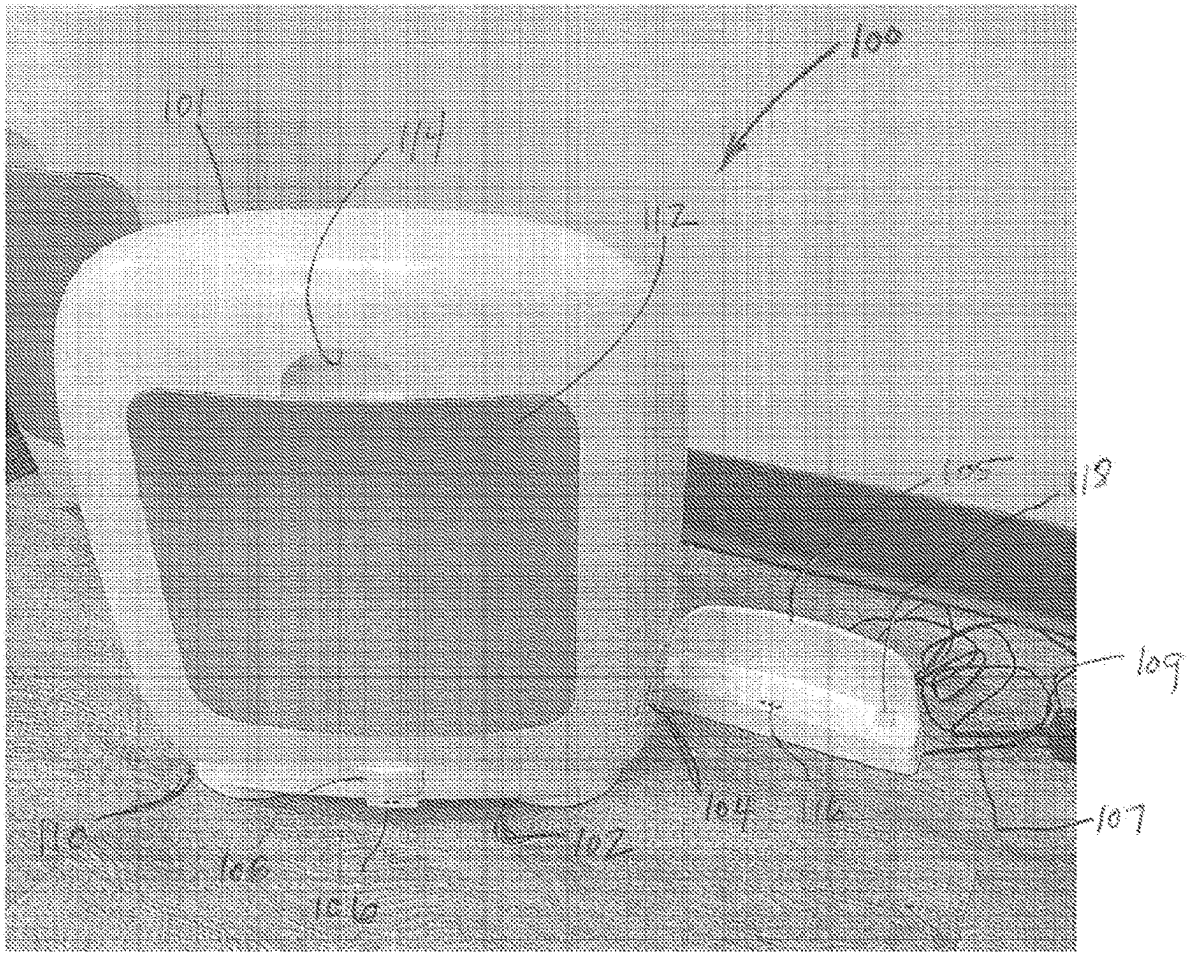
(57) **ABSTRACT**

A system for vacuuming and charging includes a vacuum, a battery of the vacuum, a circuit for controlling the vacuum, a sensor connected to the circuit for detecting movement, and a cradle for charging the battery when the vacuum is connected to the cradle. The vacuum is moveable from the cradel and operational via the battery.



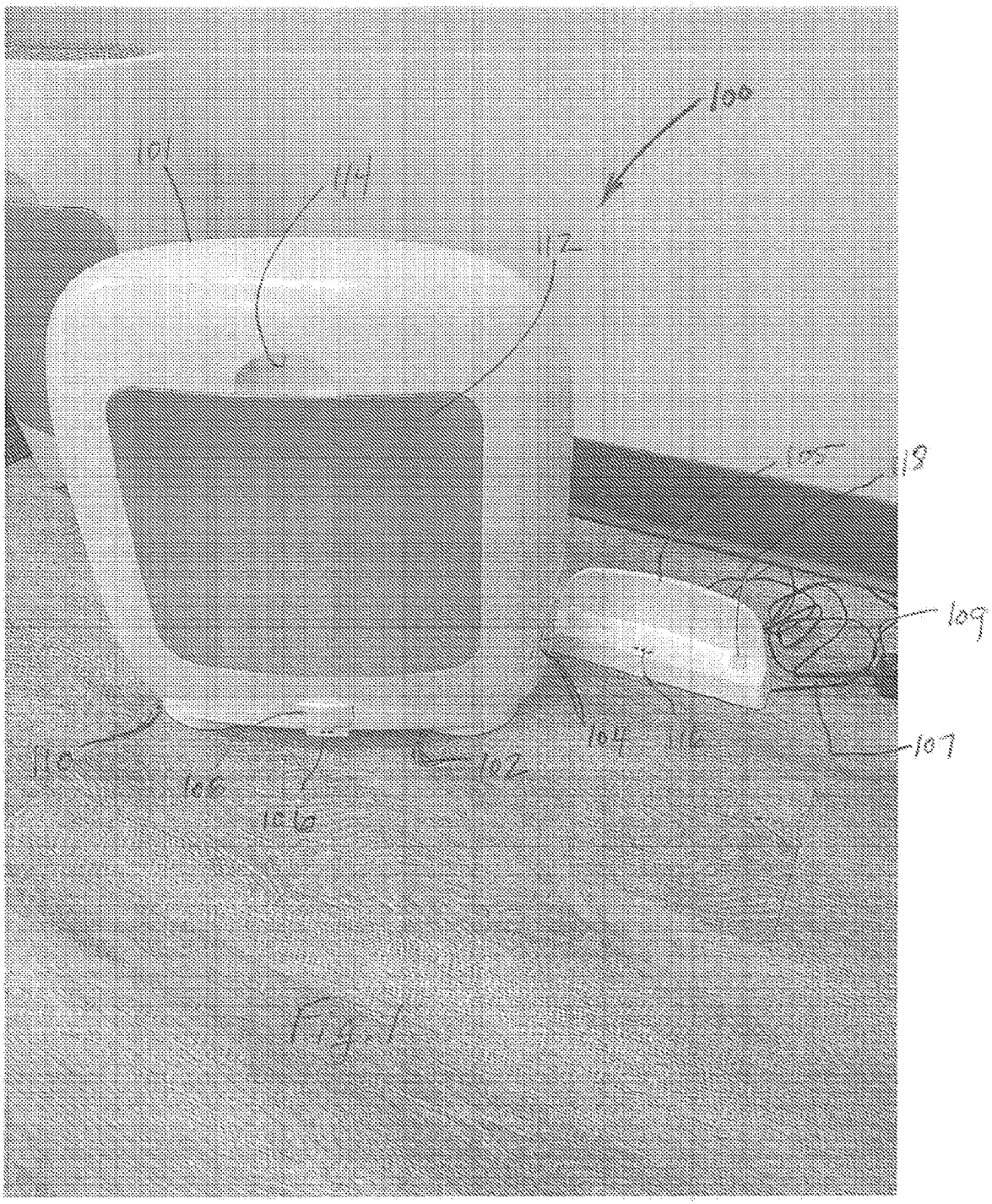


Fig. 1

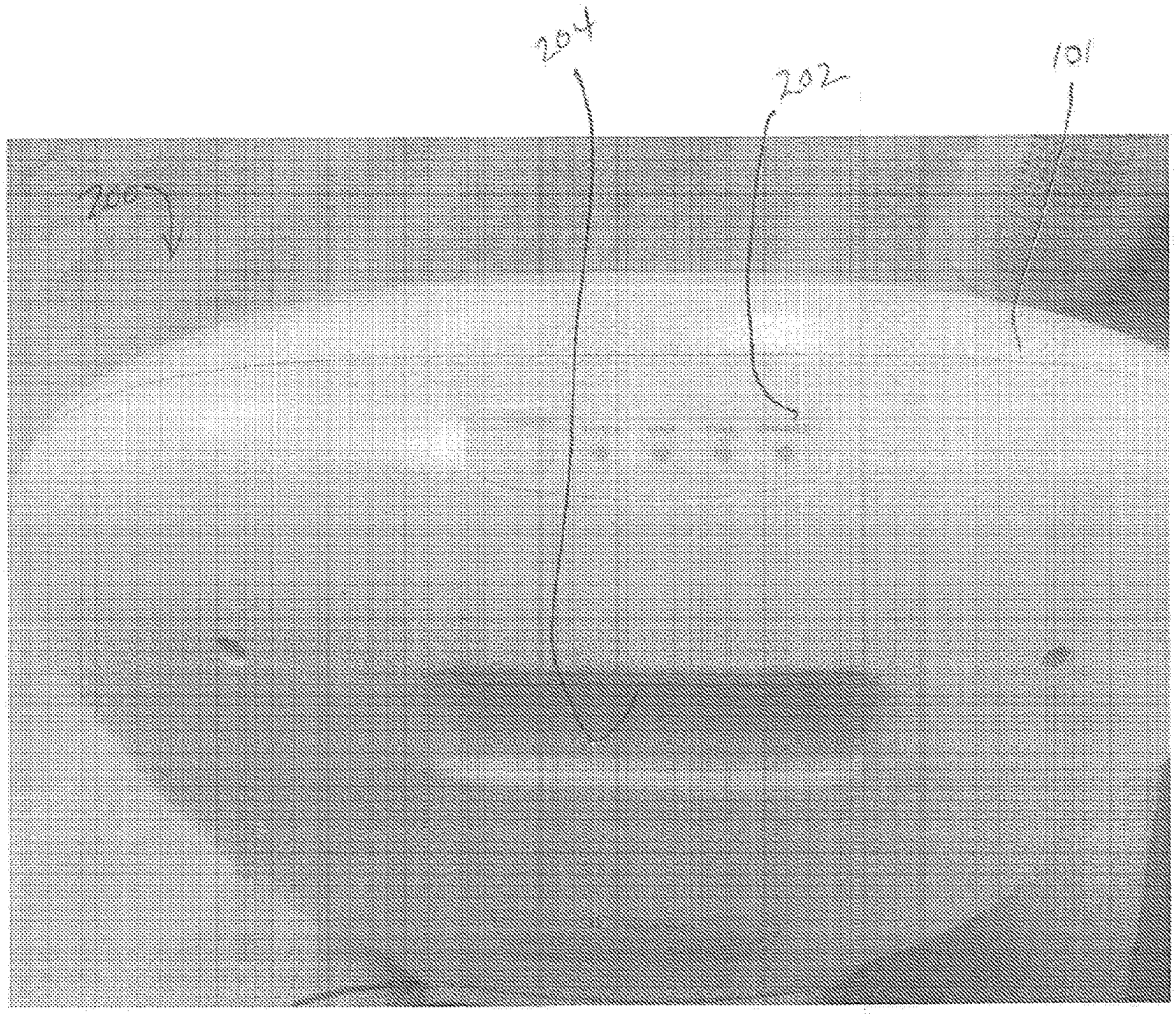


Fig. 2

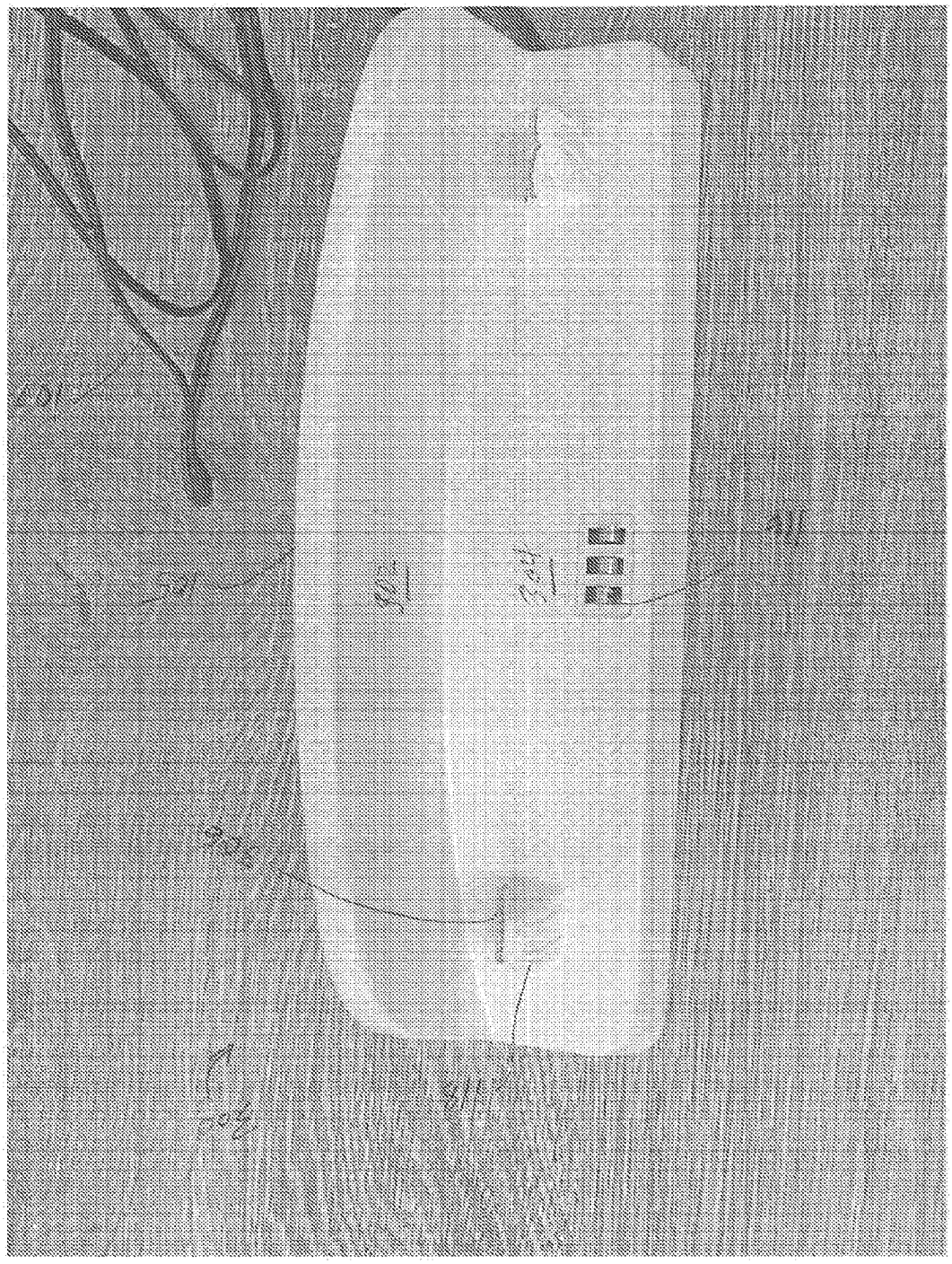


Fig. 2

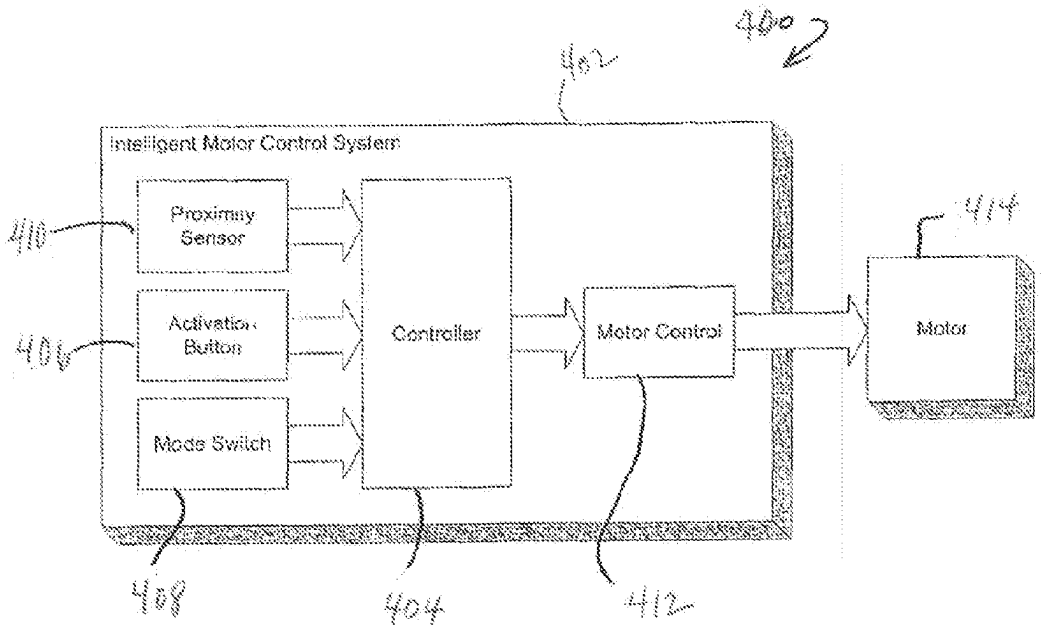
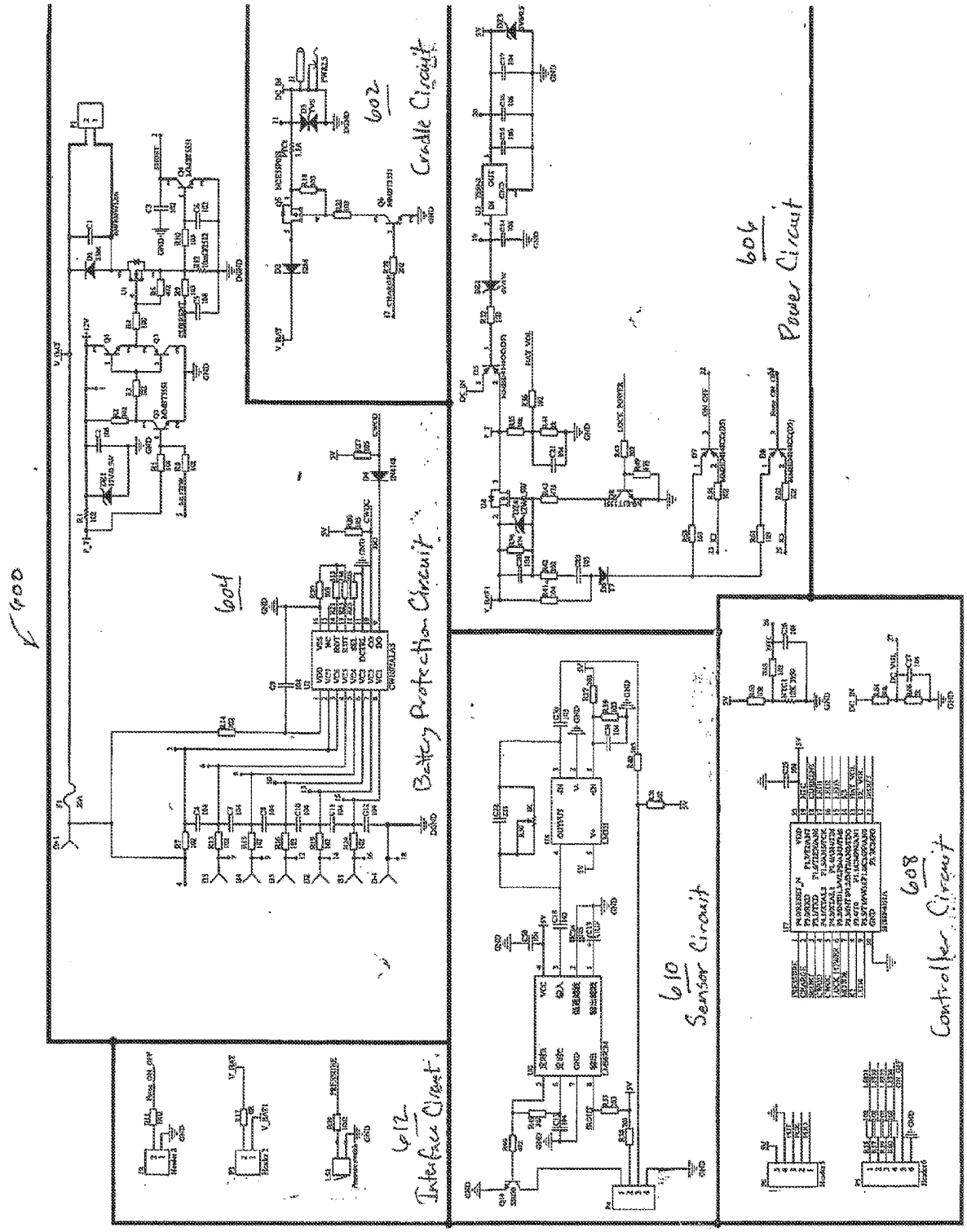

400
402
Intelligent Motor Control System
Proximity Sensor
Activation Button
Mode Switch
Controller
Motor Control
Motor
410
406
408
404
412
414

Fig. 4

Controller Logic

Inputs	Motor (Vacuum Blower) Conditions
State 1: Mode: Off Button: Off Sensor: Off	Off
State 2: Mode: On Button: Off Sensor: Off	On
State 4: Mode: Auto Button: Off Sensor: On	On only for time interval during which sensor detects motion (and any lagging interval after motion finally detected, if any)
State 5: Mode: Auto Button: On Sensor: On	On for period that "Button" is on, then Off; except that On for time interval during which sensor detects motion (and any lagging interval, if any) notwithstanding "Button" activation

Fig. 5


600
602
Cradle Circuit
604
Battery Protection Circuit
606
Power Circuit
608
Controller Circuit
610
Sensor Circuit
612
Interface Circuit

AUTOMATED VACUUM AND CHARGER SYSTEM AND METHOD

TECHNICAL FIELD

[0001] The invention generally relates to cleaning systems for home and commercial environment, and more particularly relates to a sensor automated vacuum and charger station, which sensor automated vacuum may be charged and moved from the charger within the environment to clean swept refuse.

BACKGROUND

[0002] Swept refuse is conventionally pushed to a dust pan and the dust pan emptied in a trash can. Certain devices, such as the automated electronic vacuum of U.S. Pat. No. 7,357,872, provide efficiency and ease of vacuuming swept refuse. That automated electronic vacuum includes sensor that detects movement near an inlet of the vacuum. The vacuum turns on and pulls refuse swept in vicinity of the inlet, when the sensor detects movement near the inlet.

[0003] The automated electronic vacuums have conventionally been relatively stationary in placement. They have operated by electricity provided from an electric outlet connected by an electrical cord of the vacuum. Though the automated electronic vacuums have provided ease of use, it can be cumbersome to locate an electric outlet for cord connection when it is desired to place the vacuum in certain places.

[0004] Certain portable handheld vacuums have included batteries and been chargeable. This has allowed the portable handheld vacuums to be employed in a location remote from any electric outlet and without cord connection. These portable handheld vacuums have typically not had strong enough vacuum motor for use in a wider area without directly running the vacuum over particles to be vacuumed. Moreover, these portable handheld vacuums have primarily operated by on/off button or the like, and in any event have not sensed movement for operation. Further, use of these handheld vacuums has generally required the user to bend the body to locate the vacuum on the refuse.

[0005] It would therefore be a significant benefit and improvement in the art and technology to provide a sensor automated electronic vacuum that is battery operated and charged in a charging cradle. It would also be a significant benefit and improvement to move and reposition such sensor automated electronic vacuum away from the charging cradle. It would further be a significant benefit and improvement to provide a sufficiently strong vacuum motor, operable by sensor detection of movement, in a battery operated configuration.

SUMMARY

[0006] An embodiment of the invention includes a system for vacuuming and charging. The system includes a vacuum, a battery of the vacuum, a circuit for controlling the vacuum, a sensor connected to the circuit for detecting movement, and a cradle for charging the battery when the vacuum is connected to the cradle. The vacuum is moveable from the cradle and operational via the battery.

[0007] Another embodiment of the invention is a method for vacuuming and charging. The method includes vacuuming by a vacuum in response to movement detected by a sensor and charging a battery of the vacuum via a cradle. The vacuum is removable from the cradle and operational by the battery.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] The present invention is illustrated by way of example and not limitation in the accompanying figures, in which like references indicate similar elements, and in which:

[0009] FIG. **1** illustrates a front perspective view of a system for vacuuming and charging a battery for vacuuming, according to certain embodiments of the invention;

[0010] FIG. **2** illustrates a top and back perspective view of a system for vacuuming and charging a battery for vacuuming, according to certain embodiments of the invention;

[0011] FIG. **3** illustrates a top and front perspective view of a cradle of a system for vacuuming and charging a battery for vacuuming, according to certain embodiments of the invention;

[0012] FIG. **4** illustrates a circuit for vacuuming, according to certain embodiments of the invention;

[0013] FIG. **5** illustrates a table of operating states for vacuuming, according to certain embodiments of the invention;

[0014] FIG. **6** illustrates a circuit for a system for illustrates a table of operating states for vacuuming, according to certain embodiments of the invention.

DETAILED DESCRIPTION

[0015] Referring to FIG. **1**, a system **100** includes a housing **101**. The housing **101** forms or connects to a vacuum air inlet **102** and a vacuum air outlet **104**. A vacuum unit (not shown) contained in the housing **101** communicatively connects between the inlet **102** and the outlet **104**.

[0016] The vacuum unit is powered by a battery (not shown) contained in or connected to the housing **101**. The battery is chargeable via a cradle **105**. The cradle **105** communicatively connects via a cord **107**, which may also include a converter **109**, to an AC electrical outlet, such as 110V or 220V or otherwise. The housing **101** includes conforming features to those of the cradle **105**, such as in a base **110** of the housing **101**. The housing **101** is connectable to the cradle **105**, physically and communicatively, to charge the battery contained in the housing **101** for powering the vacuum unit.

[0017] The system **100** also includes a sensor **106**. The sensor **106** is positioned near the inlet **102**, and contained by or connected to the housing **101**. The sensor **106** is communicatively connected (through circuitry as later described) to the vacuum unit. The sensor **106** detects any movement in vicinity of the sensor **106**, such as refuse or debris and/or sweep of these. On detection of movement by the sensor **106**, the vacuum unit may be turned on to vacuum pull refuse into the housing **101** and may, according to certain nonexclusive embodiments, cycle to off or otherwise automatically turn off as implemented.

[0018] The housing **101** includes a bin **112** or an access panel to the bin **112**. The bin **112** or access panel, as applicable, may be opened via a notch **114** and manual tilt of the bin **112** with respect to the housing **101**. Refuse

vacuumed by the system **100** deposits in the bin **112**. When the bin **112** is filled, it may be emptied on removal from the housing **101**.

[0019] The cradle **105** may, for nonexclusive example, include contact elements **116** and guides **118**. The base **110** is formed at a backside of the housing **101** with conforming structures to the cradle **105**, such that the inlet **102** is located on or adjacent an underlying floor or surface when the base **110** is connected to the cradle. This allows the inlet **102** to operate for vacuuming when the housing **101** is connected to the cradle **105** for charging of a battery (not shown) contained in or connected to the housing **101**. The battery powers the vacuum unit when turned on.

[0020] For non-exclusive example, the base **110** includes mating contact elements (not shown in detail) and mating guide receptors (not shown in detail). The guides **118** and mating guide receptors connect to retain the base **110** of the housing **101** to the cradle **105**, in manner that the housing **101** is removable from the cradle **105**. When the base **110** is retained to the cradle **105**, the contact elements **116** and mating contact elements communicatively connect for charging of the battery of the housing **101** communicatively connected to the vacuum unit.

[0021] Referring to FIG. **2**, in conjunction with FIG. **1**, a system **200**, such as the system **100**, includes a control panel **202** connected to or included in the housing **101**. The housing **101** also includes a backside handle **204**, for nonexclusive example, an indentation in the housing **101** sufficient for hand grasp. For nonexclusive example, the control panel **202** may include a power button, an auto button, a manual button, a full bin indicator light, and a charging light.

[0022] Referring to FIG. **3**, in conjunction with FIGS. **1-2**, a system **300** includes the cradle **105**. The cradle **105** may include a back portion **302** perpendicular to a bottom portion **304**. The bottom portion **304** may include, contain or form features for containing and presenting the contact elements **116** and projecting the guides **118**. The cord **107** (shown in part) communicatively connects to the contact elements **116** of the cradle **105**. The guides **118**, for nonexclusive example, may include click pieces **306** for engaging the base **110** of the housing **101** when placed in the cradle **105** and releasing the base **110** from the cradle **105** when the housing **101** is grasped by the backside handle **204** and lifted from the cradle **105**.

[0023] In operation, the systems **100**, **200**, **300** vacuum debris swept in vicinity of the inlet of the housing. The cradle, when the base of the housing is connected to it, charges a battery of the vacuum. The vacuum may be operated to on by button of the control panel or button near the inlet. The vacuum may also be automatically triggered on if the control panel setting is set to auto and movement is detected by the sensor. The vacuum may cycle off or otherwise automatedly turn off according to implementation. The vacuum may be moved from the cradle and operates for vacuuming, when the battery has been charged. The vacuum may therefore be moved about an environment and away from the cradle, in order to vacuum areas of an environment including where no electrical outlet is readily accessible.

[0024] Referring to FIG. **4**, a system **400** of a vacuum includes a circuit **402**. The circuit **402** includes a controller **404**. The controller **404** is communicatively connected to an activation button **406** to turn power on the system **400**. A mode switch **408** is also communicatively connected to the controller **404**. The mode switch **408** may be, for nonexclusive example, one or more button to set the operation of the system **400** in an auto mode, a manual mode, or otherwise according to the embodiment. The controller **404** is also communicatively connected to a sensor **410**. The sensor **410**, for nonexclusive example, detects movement in vicinity of a sensing element, such as a movement sensor, infrared sensor, or other. A motor control **412** is communicatively connected to the controller **404**. The motor control **412** operates a vacuum motor **414** communicatively connected to the motor control **412**.

[0025] Referring to FIG. **5**, in conjunction with FIG. **4**, various states for logical operations of the controller **404** are shown in the table. In effect, the controller **404**, based on the inputs of the activation button **406**, the mode switch **408** and the sensor **410**, dictates operations of the motor control **412** to physically control the vacuum motor **414** either on or off. As listed in the table, the vacuum motor **414** is "on", if and when either: (i) the Mode is set to On via manual input by a human user; or (ii) the Sensor is set to On by detection of an event (such as movement in vicinity of a vacuum inlet) when the Mode is set to "auto" via manual input by a human user. In other states, the vacuum motor **414** is controlled off (e.g., is not supplied with power) via the logic of the controller **404** and its handling of the motor **414** through the motor controller **412**, for nonexclusive example, the controller **404** and/or the motor controller **412** may provide a cycle off timing or other automated turn off implementation.

[0026] Referring to FIG. **6**, a system **600** for charging and vacuuming includes a cradle circuit **602**. The cradle circuit **602** is communicatively connected to a battery protection circuit **604** when a battery powered vacuum is connected to a charging cradle. The battery protection circuit **604** is communicatively connected in the vacuum to a power circuit **606**. The power circuit **606** is communicatively connected in the vacuum to a controller circuit **608**. The controller circuit **608** is communicatively connected in the vacuum to a sensor circuit **610**. An interface circuit **612** of the vacuum is communicatively connected to the controller circuit **608**.

[0027] Additional, different, or other output devices, input devices, controllers, power sources, and other devices, as well as additional, different or other circuits and connections are possible.

[0028] As will be understood, wide variation is possible in the foregoing embodiments. Various arrangements of cradle and charging elements of the vacuum are possible. Also, the vacuum unit can be any type of vacuum device and can include all possible vacuum technologies. Non-exclusive embodiments include unitized features of the system, as well as component options. For example, the vacuum can be contained in a single housing, and parts or all of the respective elements and units may be detachable, such as for cleaning, repair and otherwise. Although housing of the unit is illustrated as standalone, cradleable, and moveable from the cradle, the vacuum and cradle can be integrated into or with other devices or systems. Variation is also possible in the operations of the vacuum. Although certain operations and elements for operation are disclosed, numerous other steps, operations, processes and methods, as well as other and similar elements, may be implemented in the systems.

[0029] In the foregoing, the invention has been described with reference to specific embodiments. One of ordinary skill in the art will appreciate, however, that various modifications, substitutions, deletions, and additions can be made

without departing from the scope of the invention. Accordingly, the specification and figures are to be regarded in an illustrative rather than a restrictive sense, and all such modifications substitutions, deletions, and additions are intended to be included within the scope of the invention. Any benefits, advantages, or solutions to problems that may have been described above with regard to specific embodiments, as well as device(s), connection(s), step(s) and element(s) that may cause any benefit, advantage, or solution to occur or become more pronounced, are not to be construed as a critical, required, or essential feature or element.

What is claimed is:

1. A system, comprising:

a vacuum;

a battery of the vacuum;

a circuit for controlling the vacuum;

a sensor connected to the circuit for detecting movement; and

a cradle for charging the battery when the vacuum is connected to the cradle;

wherein the vacuum is moveable from the cradle and operational via the battery.

2. A method, comprising:

vacuuming by a vacuum in response to movement detected by a sensor; and

charging a battery of the vacuum via a cradle;

wherein the vacuum is removable from the cradle and operational by the battery.

* * * * *