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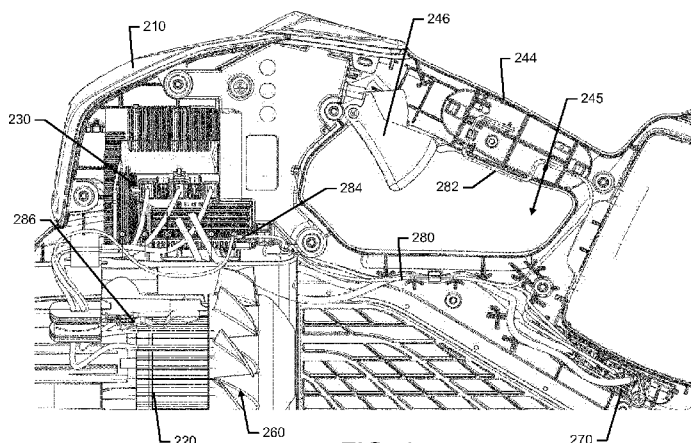


FIG. 4

(57) Abstract: A hand-held power tool (100/200) may include an electric power source (110/240), an electric motor (120/220), a working assembly (130/260) including rotating equipment operably coupled to the electric motor (120/220) to perform a working function responsive to actuation of the electric motor (120/220), an electronic control unit (140/230) operably coupled to the electric motor (120/220) to provide selective control over powering the electric motor (120/220), and an electrostatic discharge prevention assembly (190). The electrostatic discharge prevention assembly (190) may be electrically connected to a metallic component of the hand-held power tool (100/200) to provide a leakage path to ground through an operator of the hand-held power tool (100/200) to inhibit static charge build up in the metallic component responsive to operation of the working assembly (130/260).



ESD PREVENTION ON HAND-HELD, BATTERY POWERED EQUIPMENT

TECHNICAL FIELD

[0001] Example embodiments generally relate to hand held power equipment and, more particularly, relate to battery powered equipment that is provided with electrostatic discharge (ESD) prevention measures.

BACKGROUND

[0002] Hand-held outdoor power equipment of many kinds may include working assemblies that have rotating components. In some cases, these rotating components may rotate in conditions and/or environments that can generate electrostatic charges. If these charges are generated without any path to ground, they may begin to build up and perhaps be stored at various locations within the equipment. In cases in which these charges build to levels sufficient to jump to a path to ground, a phenomena known as ESD may occur.

[0003] ESD is a sudden flow of electricity between two objects caused when the objects have different charges and are brought close enough to each other to cause the dielectric between them to break down. ESD may often be experienced as a spark or a shock. Generally speaking, sparks require a field strength of 4 kV/cm in air, and thus air gaps of varying sizes can be traversed by sparks when sufficient charge is built up.

[0004] In the case of rotary equipment such as, for example, a hand-held blower, the rotary movement of the blower fan in a dusty environment may cause charges to be generated at components proximate to the blower fan. If these charges are allowed to build up, they may reach sufficient levels to cause ESD through the operator, or other contacted objects, to ground. Not only can this experience be uncomfortable or surprising for the operator, it can also be harmful to components.

BRIEF SUMMARY OF SOME EXAMPLES

[0005] Some example embodiments may provide for the inclusion of an ESD prevention assembly for facilitating inhibition of static charges on rotating hand-held outdoor power equipment. The ESD prevention assembly may essentially provide a leakage path to ground so

that components that might otherwise be capable of building up static charges are instead strategically dissipated through the ESD prevention assembly.

[0006] In one example embodiment, a hand-held power tool is provided. The hand-held power tool may include an electric power source, an electric motor, a working assembly including rotating equipment operably coupled to the electric motor to perform a working function responsive to actuation of the electric motor, an electronic control unit operably coupled to the electric motor to provide selective control over powering the electric motor, and an electrostatic discharge prevention assembly. The electrostatic discharge prevention assembly may be electrically connected to a metallic component of the hand-held power tool to provide a leakage path to ground through an operator of the hand-held power tool to inhibit static charge build up in the metallic component responsive to operation of the working assembly.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING(S)

[0007] Having thus described some example embodiments of the invention in general terms, reference will now be made to the accompanying drawings, which are not necessarily drawn to scale, and wherein:

[0008] FIG. 1 illustrates a block diagram of a hand-held power tool according to an example embodiment;

[0009] FIG. 2 illustrates a perspective view of a blower, which may be an example of the hand-held power tool, and which may incorporate an electrostatic discharge prevention assembly in accordance with an example embodiment;

[0010] FIG. 3 illustrates a side view of the blower showing a electrostatic charge dissipation conductor according to an example embodiment; and

[0011] FIG. 4 illustrates a close up, side view of portions of the blower of FIG. 3 in which the electrostatic charge dissipation conductor is provided in accordance with an example embodiment.

DETAILED DESCRIPTION

[0012] Some example embodiments now will be described more fully hereinafter with reference to the accompanying drawings, in which some, but not all example embodiments are shown. Indeed, the examples described and pictured herein should not be construed as being

limiting as to the scope, applicability or configuration of the present disclosure. Rather, these example embodiments are provided so that this disclosure will satisfy applicable legal requirements. Like reference numerals refer to like elements throughout. Furthermore, as used herein, the term “or” is to be interpreted as a logical operator that results in true whenever one or more of its operands are true. As used herein, operable coupling should be understood to relate to direct or indirect connection that, in either case, enables functional interconnection of components that are operably coupled to each other.

[0013] Electric motors may be powered from a battery or corded connection to mains power. In any case, using electric motors to power hand-held tools and other outdoor power equipment may provide certain advantages in terms of enabling various electronic control features to be employed on the equipment. These electronic control features may be implemented, at least in part, by the provision of electronic control devices such as an electronic control unit (or ECU). As indicated above, if ESD should occur relative to operation of the equipment, the operator may experience discomfort or surprise. However, it is also possible that the electronic control unit or other components of the equipment could be damaged. Accordingly, the provision of an ESD prevention assembly can enhance the operator experience and improve the performance and useful life of the equipment.

[0014] On some petrol blowers, actions may be taken to protect the user from ESD. In those instances, the user may be protected by electrically connecting the operator to the motor block. However, for electrically powered equipment, the electronics themselves also require protection. Thus, example embodiments may provide a leakage path to ground through the operator so that charge build up in metallic components is inhibited in the first place.

[0015] FIG. 1 illustrates a block diagram of a hand-held power tool 100 according to an example embodiment. As shown in FIG. 1, the tool 100 may include an electric power source 110 that powers an electric motor 120. The electric power source 110 could be a battery or mains power. Moreover, the electric power source 110 may include a power control unit that may include electronic components for regulating, converting, or otherwise providing consistent and/or usable power to the electric motor 120. The electric motor 120 may rotate to operate a working assembly 130 to perform a functional task. In some cases, the working assembly 130 may be a fan assembly, or other rotating equipment or device capable of performing the functional task when engaged. As such, for example, when the working assembly 130 is a fan assembly,

the rotating equipment is used to move air or other fluid media. The electric motor 120 may operate under the control of an electronic control unit 140 that may control the application of power to actuate the electric motor 120.

[0016] In some embodiments, the electronic control unit 140 may include a printed circuit board (PCB) and various electronic components or circuits that are configured to provide safety functions, performance enhancements, or other control-related functions relative to the control of the operation of the electric motor 120. Accordingly, for example, the electronic control unit 140 may be configured to provide selective control over the electric motor 120 based on the configuration of, and operator inputs provided to, the electronic control unit 140. The electronic control unit 140 may include processing equipment and/or memory devices along with transistors, capacitors, inductors and/or other circuitry that may, in some cases, be sensitive to damage from high voltages and/or uncontrolled currents that may be associated with ESD phenomena.

[0017] As discussed above, the work assembly 130 may include rotating equipment. When such rotating equipment (e.g., a fan assembly) operates in certain environments, electrostatic charge generation may occur as indicated by arrow 150. As an example, in an environment in which dust and/or debris is being vigorously moved by a fan assembly, the fan assembly may generate static charges at nearby components. Particularly for metallic components of the tool 100, these charges can build up and essentially be stored. Thus, for example, any or all of the metallic parts of the electric power source 110, the electric motor 120 and/or the electronic control unit 140 may begin to accumulate static charges. These metallic parts may be referred to, individually or collectively, as potential charge storage components 160.

[0018] Without further design effort, the potential charge storage components 160 may build up static charges to the point where the charge built up travels through the operator to ground in an ESD event. As an example, the tool 100 may have a casing 170 that houses the electric power source 110, the electric motor 120, the work assembly 130 and/or the electronic control unit 140, and the casing 170 may further include a connection point 180 (e.g., a handle) that the operator may grasp to control the tool 100. The operator's hand and body may form a path 185 to ground from the connection point 180 and that ESD event may occur when the charge built up at one or more of the potential charge storage components 160 is sufficient to bridge the gap between such components and the operator's hand at the connection point 180. The ESD event could be

upsetting to the operator and may even damage some or all of the components of the electric power source 110, the electric motor 120 and/or the electronic control unit 140.

[0019] To prevent buildup of charge in the potential charge storage components 160, some example embodiments may employ an ESD prevention assembly 190. The ESD prevention assembly 190 may couple some or all of the potential charge storage components 160 to the connection point 180 so that a continuous discharge path is available for static charge to dissipate through the path 185 to ground while, for example, the operator is grasping the connection point 180. Accordingly, the electrostatic charge generation indicated by arrow 150 may essentially be provided from the potential charge storage components 160 to the connection point 180 via the ESD prevention assembly 190 so that the path 185 can be continuously utilized during operation of the tool 100 and there is therefore likely never sufficient charge buildup to trigger an ESD event. Essentially, the ESD prevention assembly 190 provides a continuous leakage path so that electrostatic charges are strategically leaked to ground instead of being built up in the potential charge storage components 160. The ESD prevention assembly 190 may electrically connect to the metallic portions of components that form the potential charge storage components 160 in series, in parallel, or in combinations of series and parallel connections.

[0020] In some embodiments, as will be described below, the ESD prevention assembly 190 may be formed as a conductor that extends from one or more of the metallic portions of the electric power source 110, the electric motor 120 and/or the electronic control unit 140 to the connection point 180. The ESD prevention assembly 190 may be integrated into the connection point 180 and/or the casing 170 so that the ESD prevention assembly 190 maintains an exposed surface at the connection point 180 to facilitate contact with the operator. By providing the integration with both the casing 170 and the connection point 180 (e.g., the handle), the operator's hand may contact the ESD prevention assembly 190 to form the leakage path desired. However, in some cases, the diameter or profile of the ESD prevention assembly 190 may also be maintained consistent over substantially the entire length of the ESD prevention assembly 190 in order to avoid making the ESD prevention assembly 190 a noticeable or distracting feature for the operator. Although the connection point 180 may be provided as the handle of the tool 100 in some embodiments, other examples may provide the connection point 180 as a discharge strap that can be coupled to the operator, or as another suitable structure.

[0021] FIGS. 2-4 will be used to illustrate one example structure employed in the context of a blower 200. FIG. 2 illustrates a perspective view of the blower 200 and FIG. 3 illustrates a partially cut-away side view of the blower 200. FIG. 4 illustrates a close up of an area of the blower 200 of FIG. 3 in which ESD protection is implemented. It should be appreciated that the blower 200 of FIGS. 2-4 merely represents one example of power equipment on which an example embodiment may be employed. Referring to FIGS 2-4, the blower 200 may include a housing 210 inside which various components of the blower 200 are housed.

[0022] The blower 200 may further include a motor 220 or power unit for providing the driving force to move air through the blower 200. In some embodiments, the power unit may be a three phase electric motor that is operated under the control of a control unit 230 or control circuitry and powered by a battery 240 or battery adaptor. However, a DC motor could be used in some embodiments as well. In any case, it should be appreciated that the motor 220 may be an example of the electric motor 120 of FIG. 1. Similarly, the control unit 230 may be an example of electronic control unit 140 and the battery 240 may be an example of the electric power source 110 of FIG. 1.

[0023] The housing 210 may be formed of plastic, composite materials, or any other desirable (e.g., insulating or non-conductive) materials. In an example embodiment, the housing 210 may be formed of two or more molded pieces that can be fit together. In some cases, the molded pieces may form half-shells (e.g., right and left half-shells) that can be affixed to each other via welding, adhesives, snap fittings, fixing members (e.g., screws), and/or the like. When molded pieces are fit together, they may form a seam at the location of joining between the molded pieces. Thus, for example, the housing 210 may include a first half-shell 212 and a second half-shell 214 that meet each other at seam 216. The seam 216 may extend to all places where the first and second half-shells 212 and 214 meet each other. For the sake of clarity, it is noted that the first half-shell 212 is removed in FIGS. 3 and 4, but is present in FIG. 2. Thus, the view shown in FIGS. 3 and 4 is a view of the blower 200 with the first half-shell 212 removed.

[0024] In some embodiments, the control unit 230 may be housed in its own portion of the housing 210. The portion of the housing 210 in which the control unit 230 is housed may be positioned proximate to (and forward of) a handle 244 of the housing 210. The control unit 230 may also be disposed proximate to (and above) a portion of the housing 210 near which the motor 220 is provided.

[0025] In an example embodiment, the battery 240 may be housed in a battery compartment 242 that may be disposed at a rear portion of the housing 210, separated from the control unit 230 by the handle 244. The handle 244 may be formed by extending between the portion of the housing 210 in which the control unit 230 is housed and a top portion of the battery compartment 242. Thus, the handle 244 may extend above a portion of the housing 210 in which the motor 220 is housed. In some embodiments, an aperture or gap may be formed in the housing 210 by the handle 244 to enable the operator's hand to extend around the handle 244. The aperture may be referred to as a handle aperture 245.

[0026] The handle 244 may include a trigger 246 that may be operated by a finger of the operator while the operator holds the handle 244. Actuation of the trigger 246 may cause power from the battery 240 to be selectively applied to the motor 220 to turn the motor 220 based on control provided by the control unit 230. In some cases, the control unit 230 may include interlocks, protective functions or other control mechanisms that may sense various conditions of the blower 200 via sensors, switches or other mechanisms in order to selectively control the application of power to the motor 220 based on indications of user intent (e.g., via actuation of the trigger 246) and/or determinations regarding the state of the blower 200 as provided by the sensors, switches or other mechanisms. As can be seen from FIGS. 2-4, the trigger 246 may extend downward from the handle 244 into the handle aperture 245.

[0027] It should be appreciated that although FIGS 2-4 show an example in which the trigger 246 is used for selective powering of the motor 220, other example embodiments may employ a selector, switch, button or other such operative member in order to selectively control operation of the motor 220. Thus, for example, on/off, speed control or other operable functions for controlling the motor 220 may be performed using an operative member of any desirable form, and the trigger 246 is just one example. Some embodiments could also use other power sources instead of the battery 240 (e.g., a corded connection to mains power).

[0028] The blower 200 may further include a blower tube 250 that is attached to housing 210 (or is a part of the housing 210) and through which air may be expelled. The blower tube 250 may include an inlet portion 254 and an outlet 256. The outlet 256 may be at a distal end of the blower tube 250 (e.g., a forward end) and the inlet portion 254 may be at an opposite end of the blower tube 250 proximate to the motor 220 and the battery 240 (e.g., a rearward end).

[0029] In an example embodiment, the inlet portion 254 may be disposed proximate to an aperture array 258 including louvers, vanes, guide holes or other such apertures formed in the housing 210 to enable air to enter into the blower tube 250 responsive to operation of the motor 220 to be expelled via the outlet 256. In this regard, the operation of the motor 220 may cause an impeller or fan assembly 260 to rotate so that a low pressure area is generated to draw air into the inlet portion 254 through the aperture array 258 to be passed through the fan assembly 260 and expelled from the blower tube 250 at the outlet 256 to blow leaves, debris, or any other material.

[0030] In some cases, as shown in FIG. 3, the motor 220 and the fan assembly 260 may each be coaxial with a blower tube axis of the blower tube 150, so that air exiting the fan assembly 260 is generally moved (although such flow may be turbulent) along a direction substantially parallel to the blower tube axis. However, air entering into the inlet portion 254 is generally drawn in at an angle relative to the blower tube axis.

[0031] In an example embodiment, the battery compartment 242 may be disposed at a rearward most end of the housing 210, which may be above or even rearward of the inlet portion 254. Meanwhile, the control unit 230 may be disposed proximate to the motor 220 outside of the blower tube 250. Thus, in reference to FIGS. 2-4, the battery 240 is located at a rear of the blower 200 and the outlet 256 is at the front of the blower 200. The handle 244 is generally held by the operator in a manner that places the handle 244 at the top with the motor 120 suspended below the handle 244.

[0032] In some cases, the battery 240 may also have a battery control unit 270 associated therewith. The battery control unit 270 may include electronics for controlling battery power distribution. As such, for example, the battery control unit 270 may include electronics for providing interlocks, enforcing power limits, providing power regulation, sensing various parameters and/or other functions associated with battery power distribution. The battery control unit 270 may also include metallic components and therefore could be an example of potential charge storage components 160 described in reference to FIG. 1.

[0033] In the specific case of outdoor power equipment that is an electric powered and handheld blower, like the examples of FIGS. 2-4, the fan assembly 260 may be involved in generation of static charges. For example, rotation of the blades of the fan assembly 260, particularly in dusty environments, may generate static charges at components proximate thereto (e.g., the discharge tube 250). These static charges may begin to accumulate in metallic parts of

nearby components such as, for example, the motor 220, the control unit 230 and/or the battery control unit 270. In some cases, components closer to the generation source may tend to accumulate charge faster. Thus, for example, the motor 220 and the control unit 230 may be expected to accumulate charges faster and larger than those that may accumulate at the battery control unit 270. The example of FIGS. 3 and 4 therefore provides a series connection from metallic components of the motor 220 and the control unit 230 to provide a static charge dissipation conductor 280 that decumulates or dissipates static charges at these components.

[0034] The static charge dissipation conductor 280 may be an example of the ESD prevention assembly 190 described in reference to FIG. 1. As such, for example, the static charge dissipation conductor 280 may be formed as a conductor that extends from one or more of the metallic portions of the motor 220, the control unit 230 and the battery control unit 270 to the handle 244. For example, the static charge dissipation conductor 280 may be formed as a stainless steel or copper wire having a diameter of about 1/32 inch to 1/4 inch. The static charge dissipation conductor 280 may be enclosed entirely within the housing 210 except at the handle 244, where a portion of the static charge dissipation conductor 280 may be exposed to contact the operator's hand. The exposed portion 282 of the static charge dissipation conductor 280 may be integrated into the handle 244 by being fit into the seam 216 of the handle 244 at a portion of the handle 244 that faces the handle aperture 245. However, in other alternatives, the exposed portion 282 could be on a top portion of the handle 244 (e.g., facing opposite the handle aperture 245). In some cases, only about 30% of the diameter of the static charge dissipation conductor 280 may be exposed from the seam 216. Thus, more than half of the diameter of the exposed portion 282 of the static charge dissipation conductor 280 may be fit between the first and second half-shells 212 and 214 within the seam. By providing the static charge dissipation conductor 280 in the seam 216, the operator's hand may contact the static charge dissipation conductor 280 to form a leakage path to ground through the operator, so that static charges do not accumulate (and decumulate or dissipate instead).

[0035] In some embodiments, the diameter or profile of the static charge dissipation conductor 280 may be the same or substantially consistent over substantially the entire length of the static charge dissipation conductor 280. This allows a relatively low cost, and simple structure to be employed to define the static charge dissipation conductor 280. The static charge dissipation conductor 280 may be anchored at one end proximate to the exposed portion 282

within the handle 244. For example, an anchored end of the static charge dissipation conductor 280 may be pinched between the first and second half-shells 212 and 214 after a series of bends (e.g., at least two 90 degree bends) while extending away from a first end of the exposed surface 282 and toward the anchored end. A series of bends of the static charge dissipation conductor 280 (e.g., at least two 90 degree bends) may also be provided at or proximate to the other end of the exposed surface 282 as well. Thus, the exposed surface 282 may be well fixed with a relatively low profile that will not distract the operator, but is also naturally contacted by the operator when the operator grasps the handle 244 for operation of the blower 200.

[0036] The static charge dissipation conductor 280 may then extend away from the other end of the exposed surface 282 to establish a control unit contact point 284 with metallic portions of the control unit 230. In an example embodiment, the static charge dissipation conductor 280 may extend rearward from the handle 244 toward the battery 240 and around the back and underside of the handle aperture 245 within the housing 210 to reach the control unit contact point 284. The static charge dissipation conductor 280 may then extend (e.g., in a series configuration) from the control unit contact point 284 to a motor contact point 286 at which a metallic portion of the motor 220 (e.g., the motor housing or casing) is contacted. Static charges generated by the rotation of the fan assembly 260 that would otherwise potentially accumulate at the metallic portions of the motor 220 and/or the control unit 230 may then be operably (and electrically) coupled to the exposed surface 282 for dissipation of such charges through a leakage path to ground that may be provided via the operator's grasp of the exposed portion 282.

[0037] Although not shown in this example, the static charge dissipation conductor 280 could also connect in series to the battery control unit 270 or any other metallic components. As yet another alternative, parallel connections may be established from the static charge dissipation conductor 280 to various metallic components or portions thereof. As a result, metallic components that could otherwise accumulate static charges that may be sufficient to cause an ESD event are continuously able to have those static charges dissipated so that an ESD event becomes unlikely or is prevented. Moreover, in some embodiments, the static charge dissipation conductor 280 may also extend to a negative terminal of the battery 240 to further inhibit static charge buildup.

[0038] Example embodiments may therefore provide a relatively easy way to improve the safety and operability of the power tool (e.g., the chainsaw, blower, edger, trimmer and/or the like).

[0039] A hand-held power tool of an example embodiment may include an electric power source, an electric motor, a working assembly including rotating equipment operably coupled to the electric motor to perform a working function responsive to actuation of the electric motor, an electronic control unit operably coupled to the electric motor to provide selective control over powering the electric motor, and an electrostatic discharge prevention assembly. The electrostatic discharge prevention assembly may be electrically connected to a metallic component of the hand-held power tool to provide a leakage path to ground through an operator of the hand-held power tool to inhibit static charge build up in the metallic component responsive to operation of the working assembly.

[0040] The power tool (which may be a blower in some cases) of some embodiments may include additional features that may be optionally added either alone or in combination with each other. For example, in some embodiments, (1) the metallic component may be a part of the electric motor or the electronic control unit. In some embodiments, (2) the electrostatic discharge prevention assembly may include a static charge dissipation conductor extending from the metallic component to a grounding strap electrically coupled to the operator. Alternatively, (3) the electrostatic discharge prevention assembly may include a static charge dissipation conductor extending from the metallic component to a handle of the hand-held power tool within a housing of the hand-held power tool. In some embodiments, (4) the static charge dissipation conductor may include an exposed portion at the handle. In an example embodiment, (5) the static charge dissipation conductor may include a stainless steel or copper conductor having a diameter of about 1/32 inch to about 1/4 inch. In some cases, (6) any or all of (3) to (5) may be employed (with or without (1) and (2)), and the housing may include a first half-shell and a second half-shell combining at a seam. The exposed portion may be disposed in the seam proximate to a handle aperture formed in the housing. In addition to (6), in some cases (7), less than half of the diameter of the static charge dissipation conductor may extend out of the seam and toward the handle aperture. In some cases, (8) the static charge dissipation conductor extends rearward from the handle to extend around at least a portion of three sides of the handle aperture.

[0041] In some cases, any or all of (1) to (8) may be employed and the static charge dissipation conductor may be electrically connected to a first metallic component of the electric motor and a second metallic component of the working assembly. In such an example, (9) the static charge dissipation conductor may be electrically connected to the first metallic component and the second metallic component in series or in parallel. Additionally or alternatively, (10) the static charge dissipation conductor may be further electrically connected to a third metallic component of the electric power source. In an example embodiment, any or all of (1) to (10) may be employed and a diameter of the static charge dissipation conductor may be substantially the same over substantially a full extent of the static charge dissipation conductor. Alternatively or additionally, any or all of (1) to (10) may be employed and a first end of the static charge dissipation conductor may be anchored at the handle, while a second end of the static charge dissipation conductor is anchored at the metallic component.

[0042] Many modifications and other embodiments of the inventions set forth herein will come to mind to one skilled in the art to which these inventions pertain having the benefit of the teachings presented in the foregoing descriptions and the associated drawings. Therefore, it is to be understood that the inventions are not to be limited to the specific embodiments disclosed and that modifications and other embodiments are intended to be included within the scope of the appended claims. Moreover, although the foregoing descriptions and the associated drawings describe exemplary embodiments in the context of certain exemplary combinations of elements and/or functions, it should be appreciated that different combinations of elements and/or functions may be provided by alternative embodiments without departing from the scope of the appended claims. In this regard, for example, different combinations of elements and/or functions than those explicitly described above are also contemplated as may be set forth in some of the appended claims. In cases where advantages, benefits or solutions to problems are described herein, it should be appreciated that such advantages, benefits and/or solutions may be applicable to some example embodiments, but not necessarily all example embodiments. Thus, any advantages, benefits or solutions described herein should not be thought of as being critical, required or essential to all embodiments or to that which is claimed herein. Although specific terms are employed herein, they are used in a generic and descriptive sense only and not for purposes of limitation.

CLAIMS

1. A hand-held power tool (100/200) comprising:
 - an electric power source (110/240);
 - an electric motor (120/220);
 - a working assembly (130/260) comprising rotating equipment operably coupled to the electric motor (120/220) to perform a working function responsive to actuation of the electric motor (120/220);
 - an electronic control unit (140/230) operably coupled to the electric motor (120/220) to provide selective control over powering the electric motor (120/220); and
 - an electrostatic discharge prevention assembly (190),**characterized in that**
 - the electrostatic discharge prevention assembly (190) is electrically connected to a metallic component of the hand-held power tool (100/200) to provide a leakage path to ground through an operator of the hand-held power tool (100/200) to inhibit static charge build up in the metallic component responsive to operation of the working assembly (130/260).
2. The hand-held power tool (100/200) of claim 1, wherein the metallic component is a part of the electric motor (120/220) or the electronic control unit (140/230).
3. The hand-held power tool (100/200) of claim 1 or 2, wherein the electrostatic discharge prevention assembly (190) comprises a static charge dissipation conductor (280) extending from the metallic component to a grounding strap electrically coupled to the operator.
4. The hand-held power tool (100/200) of claim 1 or 2, wherein the electrostatic discharge prevention assembly (190) comprises a static charge dissipation conductor (280) extending from the metallic component to a handle (244) of the hand-held power tool (100/200) within a housing (210) of the hand-held power tool (100/200).
5. The hand-held power tool (100/200) of claim 4, wherein the static charge dissipation conductor (280) comprises an exposed portion (282) at the handle (244).

6. The hand-held power tool (100/200) of claim 5, wherein the static charge dissipation conductor (280) comprises a stainless steel or copper conductor having a diameter of about 1/32 inch to about 1/4 inch.

7. The hand-held power tool (100/200) of any of claims 4-6, wherein the housing (210) comprises a first half-shell (212) and a second half-shell (214) combining at a seam (216), and wherein the exposed portion (282) is disposed in the seam (216).

8. The hand-held power tool (100/200) of claim 7, wherein the exposed portion (282) is disposed in the seam (216) proximate to a handle aperture (245) formed in the housing (210).

9. The hand-held power tool (100/200) of claim 8, wherein less than half of the diameter of the static charge dissipation conductor (280) extends out of the seam and toward the handle aperture (245).

10. The hand-held power tool (100/200) of any claim 8 or 9, wherein the static charge dissipation conductor (280) extends rearward from the handle (244) to extend around at least a portion of three sides of the handle aperture (245).

11. The hand-held power tool (100/200) of any preceding claim, wherein the static charge dissipation conductor (280) is electrically connected to a first metallic component of the electric motor (120/220) and a second metallic component of the working assembly (130/260).

12. The hand-held power tool (100/200) of claim 11, wherein the static charge dissipation conductor (280) is electrically connected to the first metallic component and the second metallic component in series.

13. The hand-held power tool (100/200) of claim 11, wherein the static charge dissipation conductor (280) is electrically connected to the first metallic component and the second metallic component in parallel.

14. The hand-held power tool (100/200) of claim 12 or 13, wherein the static charge dissipation conductor (280) is further electrically connected to a third metallic component of the electric power source (110/240).

15. The hand-held power tool (100/200) of any preceding claim, wherein the hand-held power tool (100/200) comprises a blower (200).

16. The hand-held power tool (100/200) of any of claims 3-15, wherein a diameter of the static charge dissipation conductor (280) is substantially the same over substantially a full extent of the static charge dissipation conductor (280).

17. The hand-held power tool (100/200) of any of claims 3-15, wherein a first end of the static charge dissipation conductor (280) is anchored at the handle (244), and a second end of the static charge dissipation conductor (280) is anchored at the metallic component.

18. The hand-held power tool (100/200) of any of claims 3-15, wherein the static charge dissipation conductor (280) is further electrically coupled to a negative terminal of the electric power source (110/240).

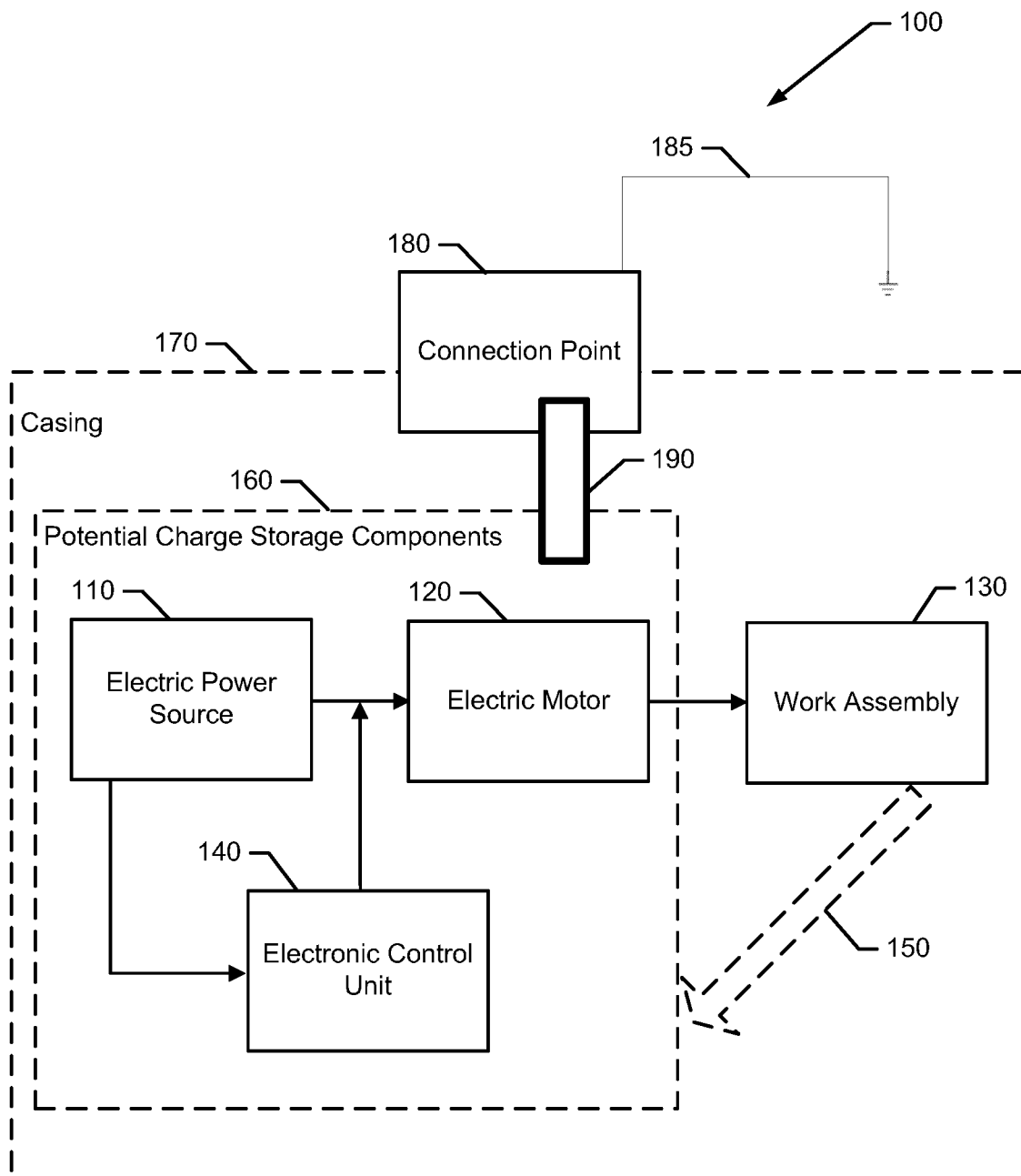


FIG. 1

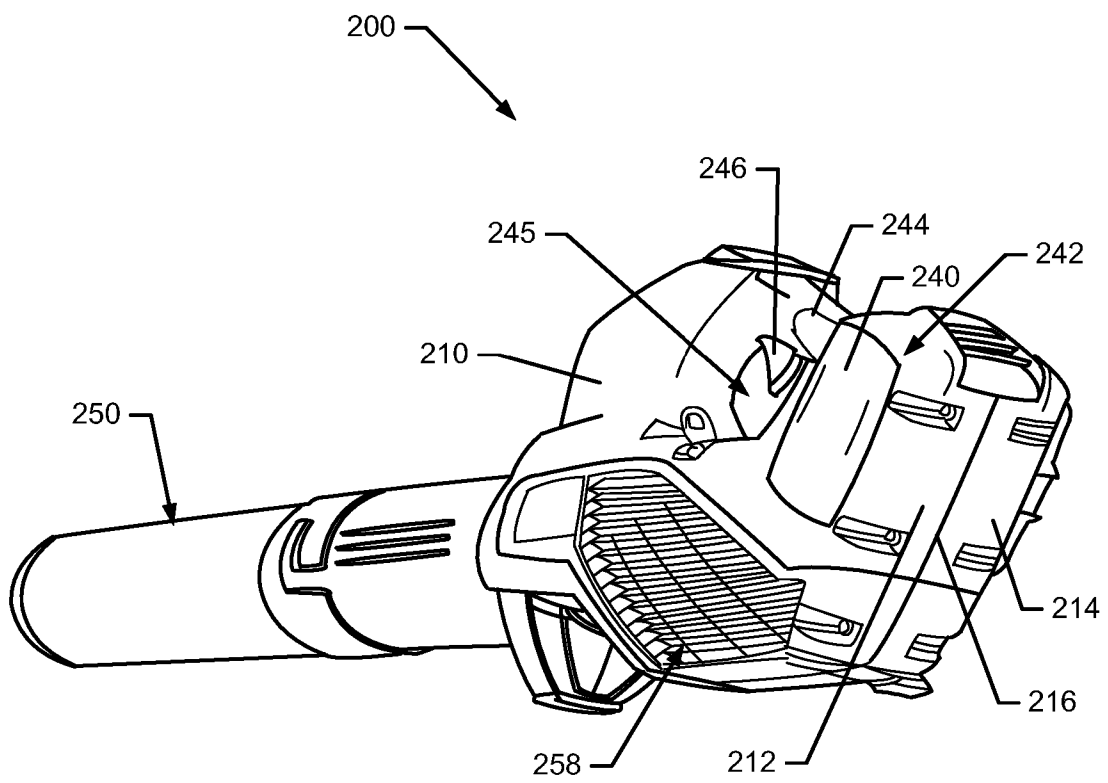


FIG. 2

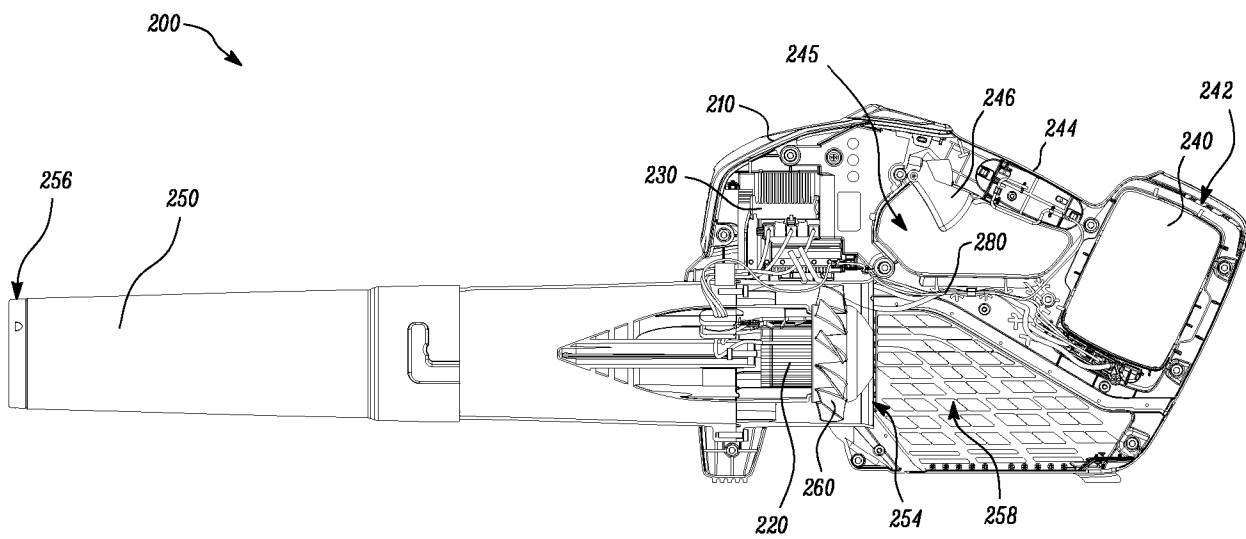


FIG.3

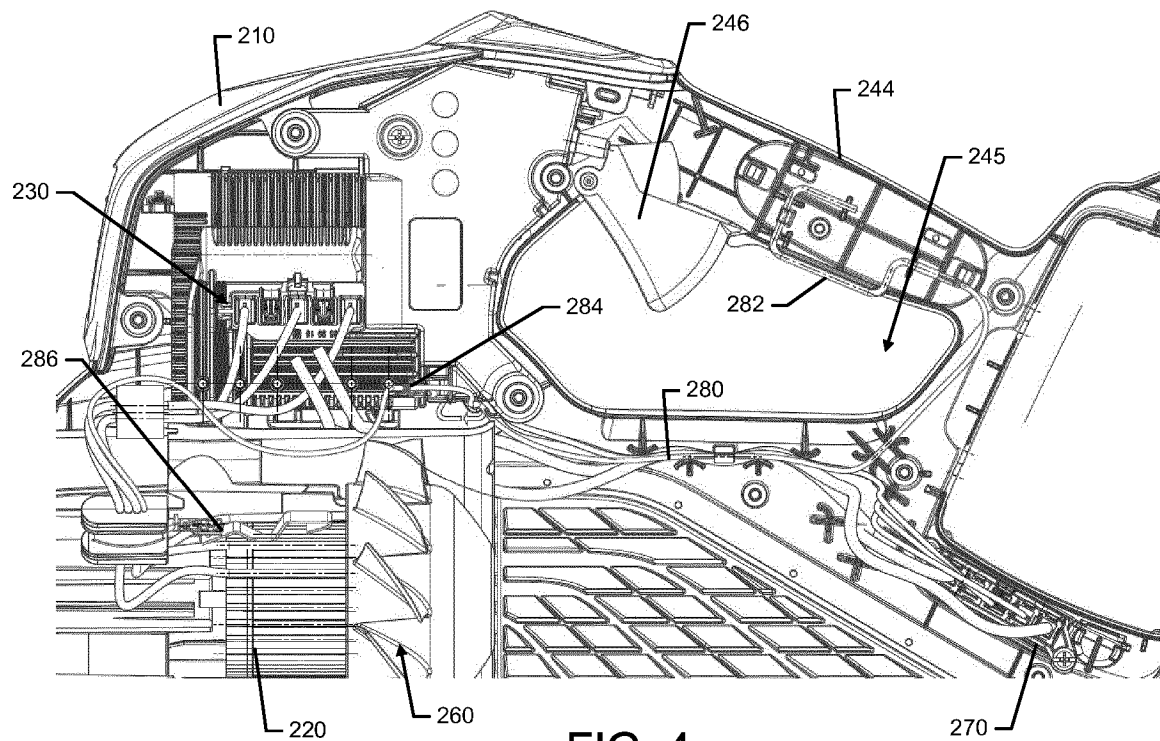


FIG. 4

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2015/054633

A. CLASSIFICATION OF SUBJECT MATTER
INV. H05F3/02
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)
H05F A01G 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.
X	US 6 552 891 B1 (PRACH KLAUS [DE]) 22 April 2003 (2003-04-22) column 1, lines 30-47 column 2, lines 44-47 column 3, line 26 - column 4, line 35; figures 1,2,3	1-18
X	US 2011/000048 A1 (YAMAZAKI MAKI [JP] ET AL) 6 January 2011 (2011-01-06) claim 1; figures	1



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

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

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"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

11 November 2015

Date of mailing of the international search report

18/11/2015

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2015/054633

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