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(54)

SNOW BLOWER WITH NON CLOGGING CHUTE

- (57)

A snow blower may include a frame, a rotatable auger, one or more wheels, and a chute. The rotatable auger may be mounted to the frame. The one or more wheels may be mounted to the frame apart from the rotatable auger to support the snow blower. The chute may extend from the frame above the rotatable auger. One or more features such as an active heater, a resilient chute body, or a controller configured to direct a blowing operation may further be provided.

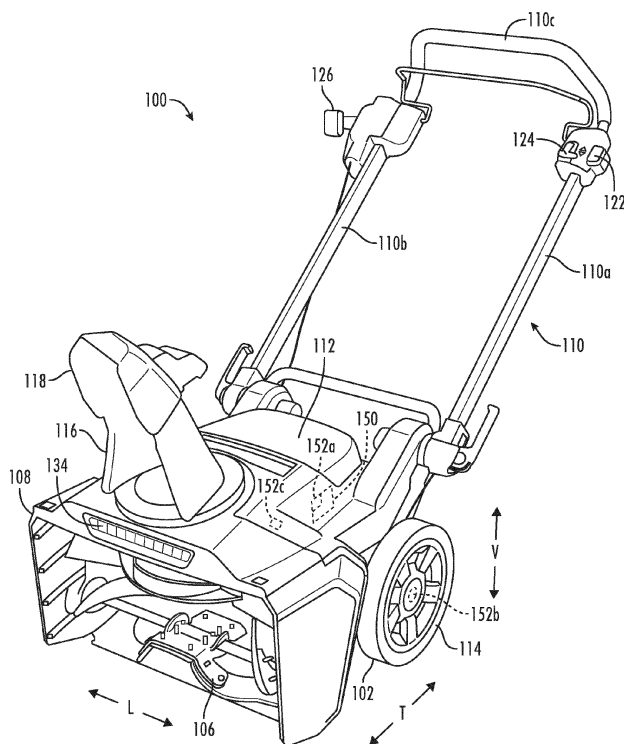


FIG. 1

Description

FIELD OF THE INVENTION

[0001] The present subject matter relates generally to power tools, such as snow blower power tools.

BACKGROUND OF THE INVENTION

[0002] Power tools are generally utilized to make working conditions easier. For example, snow blowers eliminate the need for shoveling snow. Instead of manually lifting snow from a surface (e.g., a driveway or sidewalk) to move the snow therefrom, the operator can push or walk a snow blower through the snow. The snow blower lifts the snow and discharges it a distance from the underlying surface. Typically, this involves moving snow from a rotating auger to a downstream chute that can direct the moving snow away from the snow blower. In this regard, snow blowers make snow removal easier than previous manual operations.

BRIEF DESCRIPTION OF THE INVENTION

[0003] Although snow blowers can greatly reduce the amount of human effort to clear an area of snow, existing appliances still maintain certain drawbacks during use. For instance, it is common for the chute of existing snow blowers to become clogged especially over extended use. Specifically, snow can become packed within the chute and restrict the flow of snow from the rotatable auger. In certain cases, this can cause the entire chute to become obstructed, which may prevent the passage of any snow therethrough. If left untreated, this may cause snow agitated by the rotatable auger to fly forward or otherwise flow to an undesired location. Damage to the snow blower may even occur. In order to treat clog conditions, a user must typically stop the snow blower and manually unpack or dislodge any clogged masses from the chute. This can be tedious and obviously slows down any snow clearing operations.

[0004] Accordingly, snow blowers, features, or methods of operation are desired in the art. In particular, systems or methods that prevent or discourage snow from clogging on, within, or upstream of the chute would be advantageous.

[0005] Aspects and advantages of the invention will be set forth in part in the following description, or may be obvious from the description, or may be learned through practice of the invention.

[0006] In one exemplary aspect of the present disclosure, a snow blower is provided. The snow blower may include a frame, a rotatable auger, one or more wheel, a chute, and an active heater. The rotatable auger may be mounted to the frame. The one or more wheels may be mounted to the frame apart from the rotatable auger to support the snow blower. The chute may extend from the frame above the rotatable auger. The active heater

may be supported on the frame in thermal communication with the chute to heat a predefined area thereof.

[0007] In another exemplary aspect of the present disclosure, a snow blower is provided. The snow blower may include a frame, a rotatable auger, one or more wheel, a chute, and an active heater. The frame may include an auger housing. The auger housing may include a top wall and define a front opening permitting snow to the auger housing. The rotatable auger may be mounted to the frame and housed within the auger housing below the top wall and rearward from the front opening. The one or more wheels may be mounted to the frame apart from the rotatable auger to support the snow blower. The chute may extend from the frame above the rotatable auger. The chute may include a resilient chute body deformable about a chute axis perpendicular to an auger axis.

[0008] In yet another exemplary aspect of the present disclosure, a snow blower is provided. The snow blower may include a frame, a rotatable auger, one or more wheel, a chute, an auger motor, and a controller. The rotatable auger may be mounted to the frame. The one or more wheels may be mounted to the frame apart from the rotatable auger to support the snow blower. The chute may extend from the frame above the rotatable auger. The auger motor may be supported on the frame in mechanical communication with the rotatable auger to motivate rotation thereof. The controller may be in operative communication with the auger motor and configured to direct a blower operation. The blower operation may include receiving an operational sensor signal, determining a motor output setting based on the received operational sensor signal, and directing the auger motor to rotate the rotatable auger according to the determined motor output setting.

[0009] These and other features, aspects and advantages of the present invention will become better understood with reference to the following description and appended claims. The accompanying drawings, which are incorporated in and constitute a part of this specification, illustrate embodiments of the invention and, together with the description, serve to explain the principles of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] A full and enabling disclosure of the present invention, including the best mode thereof, directed to one of ordinary skill in the art, is set forth in the specification, which makes reference to the appended figures.

FIG. 1 provides a perspective view of a snow blower according to exemplary embodiments of the present disclosure.

FIG. 2 provides a side elevation view of a portion of a snow blower according to exemplary embodiments of the present disclosure.

FIG. 3 provides a side elevation view of a portion of

a snow blower according to exemplary embodiments of the present disclosure.

FIG. 4 provides a front perspective view of a portion of a snow blower according to exemplary embodiments of the present disclosure.

FIG. 5 provides a front perspective view of a portion of a snow blower according to exemplary embodiments of the present disclosure.

FIG. 6 provides a front elevation view of a portion of a snow blower according to exemplary embodiments of the present disclosure.

FIG. 7 provides a front perspective view of a portion of a snow blower according to exemplary embodiments of the present disclosure.

FIG. 8 provides a flow chart illustrating a method of operating a snow blower according to exemplary embodiments of the present disclosure.

[0011] Repeat use of reference characters in the present specification and drawings is intended to represent the same or analogous features or elements of the present invention.

DETAILED DESCRIPTION

[0012] Reference now will be made in detail to embodiments of the invention, one or more examples of which are illustrated in the drawings. Each example is provided by way of explanation of the invention, not limitation of the invention. In fact, it will be apparent to those skilled in the art that various modifications and variations can be made in the present invention without departing from the scope of the invention. For instance, features illustrated or described as part of one embodiment can be used with another embodiment to yield a still further embodiment. Thus, it is intended that the present invention covers such modifications and variations as come within the scope of the appended claims and their equivalents.

[0013] As used herein, the terms "first", "second", and "third" may be used interchangeably to distinguish one component from another and are not intended to signify location or importance of the individual components. The singular forms "a," "an," and "the" include plural references unless the context clearly dictates otherwise. The terms "coupled," "fixed," "attached to," and the like refer to both direct coupling, fixing, or attaching, as well as indirect coupling, fixing, or attaching through one or more intermediate components or features, unless otherwise specified herein. As used herein, the terms "comprises," "comprising," "includes," "including," "has," "having" or any other variation thereof, are intended to cover a non-exclusive inclusion. For example, a process, method, article, or apparatus that comprises a list of features is not necessarily limited only to those features but may include other features not expressly listed or inherent to such process, method, article, or apparatus. Further, unless expressly stated to the contrary, "or" refers to an inclusive- or and not to an exclusive- or. For example, a con-

dition A or B is satisfied by any one of the following: A is true (or present) and B is false (or not present), A is false (or not present) and B is true (or present), and both A and B are true (or present).

[0014] Terms of approximation, such as "about," "generally," "approximately," or "substantially," include values within ten percent greater or less than the stated value. When used in the context of an angle or direction, such terms include within ten degrees greater or less than the stated angle or direction. For example, "generally vertical" includes directions within ten degrees of vertical in any direction, e.g., clockwise or counter-clockwise.

[0015] Benefits, other advantages, and solutions to problems are described below with regard to specific embodiments. However, the benefits, advantages, solutions to problems, and any feature(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 of any or all the claims.

[0016] Referring now to the drawings, FIGS. 1 through 3 illustrate a snow blower 100 in accordance with an exemplary embodiment of the present disclosure. Generally, snow blower 100 defines a mutually orthogonal vertical direction V, lateral direction L, and transverse direction T. The snow blower 100 includes a frame 102, one or more motors 104 (e.g., element motor 104a or wheel motor 104b), an auger 106 coupled (e.g., rotatably mounted) to the frame 102, such as disposed in an auger housing 108, and a handle assembly 110 extending from the frame 102. As illustrated, the handle assembly 110 can extend from a rear end of the frame 102 in a generally vertical direction. A battery compartment 112 can be coupled to the frame 102 to receive one or more batteries (not illustrated) which can provide power to the one or more motors 104a, 104b (e.g., one more electric motors). In other embodiments, motors 104 can include an engine powered by fuel. In such embodiments, the battery compartment 112 can be replaced or supplemented with a fuel storage tank (not illustrated) which stores fuel for powering the engine.

[0017] The snow blower 100 is supported by walking elements, e.g., wheels 114. In optional embodiments, the wheels 114 are provided as a pair of driven wheels that can be driven or rotated by a discrete wheel motor 104b (e.g., separate from element motor 104a). As illustrated, the wheel motor 104b may be supported on the frame 102 apart from the element motor 104a. Although the driven wheels 114 may be motivated or rotated by wheel motor 104b, an operator or user may selectively push the snow blower 100 (e.g., manually).

[0018] It is noted that although the illustrated snow blower 100 is shown as a single-stage snow blower, the present disclosure is not limited to the same and may be applicable to any suitable snow blowing power tool, such as a dual-stage (e.g., impeller) snow blower, self-propelled snow blower, manually propelled or push snow blower, etc.

[0019] In some embodiments, a controller 150 may be

provided in operative communication with one or more components of snow blower 100 (e.g., motors 104a, 104b, sensors 152a, 152b, 152c, etc.). The controller 150 may include a memory and one or more microprocessors, CPUs or the like, such as general or special purpose microprocessors operable to execute programming instructions or micro-control code associated with operation of snow blower 100. The memory may represent random access memory such as DRAM, or read only memory such as ROM or FLASH. In some embodiments, the processor executes non-transitory programming instructions stored in memory. For certain embodiments, the instructions include a software package configured to operate snow blower 100 or execute an operation routine (e.g., the exemplary method 800 described below with reference to FIG. 8). The memory may be a separate component from the processor or may be included on-board within the processor. Alternatively, controller 150 may be constructed without using a microprocessor (e.g., using a combination of discrete analog or digital logic circuitry; such as switches, amplifiers, integrators, comparators, flip-flops, AND gates, and the like) to perform control functionality instead of relying upon software.

[0020] Controller 150 may be positioned in a variety of locations throughout snow blower 100. Input/output ("I/O") signals may be routed between controller 150 and various operational components of snow blower 100. One or more components of snow blower 100 may be in operative communication (e.g., electric communication) with controller 150 via one or more conductive signal lines or shared communication busses.

[0021] In optional embodiments, one or more operational sensors 152a, 152b, 152c are provided on snow appliance 100 in operative (e.g., wired or wireless) communication with controller 150. Generally, such operational sensors 152a, 152b, 152c are configured to detect one or more operational conditions of the snow blower 100 and transmit signals corresponding to the same (e.g., to controller 150). Such operational conditions may be related to performance of the snow blower 100. As an example, a motor sensor 152a may be provided (e.g., at controller 150) to detect a motor loading signal received from the auger motor 104a according to an operational load (e.g., voltage draw) on the auger motor 104a. Such motor loading signals and sensors 152a, 152b, 152c for the same are generally understood. As an additional or alternative, example, a speed sensor 152b may be mounted on frame 102 and configured to detect a velocity of the snow blower 100. The detected velocity may generally correspond to forward movement of the snow blower 100. For instance, speed sensor 152b may detect velocity based on a rotational speed of one or more wheels 114. To that end, and as would be understood the speed sensor 152b may include a rotational sensor (e.g., Hall effect sensor, inductive sensor, eddy-current sensor, photodiode array, etc.) be configured to detect rotational movement at the wheels 114 (or an axle thereof).

[0022] Separate from or in addition to performance

of snow blower 100, operational conditions may relate to the environment (e.g., ambient area or geographic location) that the snow blower 100 is located in. As an example, a temperature sensor 152c may be provided to detect an ambient air temperature. In some embodiments, the temperature sensor 152c may be mounted to the frame 102 (e.g., apart from the motor(s) thereof). As would be understood, the temperature may include a thermistor, thermocouple, or any other suitable electric temperature sensing element.

[0023] Optionally, the snow blower 100 can include one or more lighting elements (e.g., one or more light emitting diodes, commonly referred to as LEDs) configured to illuminate one or more areas of the environment in which the snow blower 100 is operating. For example, the snow blower 100 can include a light 134 disposed on the auger housing 108.

[0024] The auger housing 108 generally houses the auger 106 (e.g., such that the auger 106 is housed below the top wall 108a and rearward from the front opening). Moreover, auger housing 108 can be in communication (e.g., fluid communication) with a chute 116. Moreover, the auger housing 108 can be connected with the chute 116 mechanically, electrically, or both. The chute 116 can extend, for example, above the auger housing 108. The chute 116 can direct discharged snow in a desired direction. In an embodiment, the chute 116 can rotate about a (e.g., vertical) chute axis A. The chute 116 can include a moveable interface 118 configured to rotate the discharge direction about a horizontal axis. In this regard, the direction and height of discharged snow can be controlled. In certain instances, the direction of at least one of the chute 116 and moveable interface 118 can be controlled by the operator at the handle assembly 110. For instance, a chute lever 126 may be provided on the handle assembly 110 to selectively rotate the chute 116. Additionally or alternatively, a movable flap lever may be provided on the chute 116 to selectively rotate the moveable interface 118.

[0025] In certain embodiments, handle assembly 110 include a top handle 110c (e.g., as an unbroken unitary piece or having left and right portions to receive a user's left and right hands, respectively). One or more inputs for controlling snow blower 100 may be provided on or proximal to top handle 110c. Although top handle 110c is shown as a single-piece construction handle having left and right portions to receive a user's left and right hands, respectively. In other instances, the handle assembly 110 can include a multi-piece construction (e.g., having multiple discrete handles to receive a user's hands). The top handle 110c can be coupled to one or more additional portions, which extend from the frame 102 to the first and second handles 110a and 110b (e.g., to support the top handle 110c or permit selective height adjustments or storage configurations of the handle assembly 110).

[0026] The handle assembly 110 generally include one or more controls associated with controlling operational

aspect(s) of the snow blower 100. By way of non-limiting example, the handle assembly 110 can include a power button 122 and one or more speed inputs (e.g., speed input 124) operably coupled to a controller 150. One or more position sensors 152a, 152b, 152c (e.g., a potentiometer, Hall effect sensor, infrared proximity sensor, capacitive displacement sensor, inductive sensor, eddy-current sensor, photodiode array, etc.) may be attached to or in operable communication with a speed input 124 to detect the relative position of an input (e.g., on handle assembly 110) and communicate the same (e.g., to a controller 150).

[0027] Optionally, the speed input 124 may define a set range of motion (e.g., pivoting motion) between a predefined maximum and minimum. For instance, the speed input 124 may define a range of motion corresponding to a range of rotational speeds between a top speed (e.g., as defined by RPM or power draw) and a base speed (e.g., as defined by RPM or power draw). The top speed of auger 106 may be set as the maximum of the range of motion, while the base speed may be set as the minimum range of motion of speed input 124.

[0028] In optional embodiments, snow blower 100 includes a fuel gauge (e.g., mounted on a control panel or handle assembly) generally configured to display, for instance, the level of charge of one or more batteries on snow blower 100 (e.g., within battery compartment 112). For instance, as would be understood, a digital screen or LED array may be provided to provide a visual indication of the relative charge level of the connected batteries at a given moment (e.g., between a maximum level and a minimum or depleted level). In certain embodiments, the fuel gauge is configured to adjust or tune the display based on a detected temperature (e.g., at the temperature sensor 152c or another temperature sensor mounted on or within battery compartment 112). Such adjustments or tunings may include changing the display of a default condition of displaying the battery level. As an example, a predetermined color (e.g., blue) may be presented (e.g., on a progress bar(s) indicating the battery level) based on a detected temperature, such as in response to detecting a temperature below a set threshold. As an additional or alternative example, a predetermined icon (e.g., timer or pictorial thermometer) may be presented (e.g., on or in place of a progress bar(s) indicating the battery level) based on a detected temperature, such as in response to detecting a temperature below a set threshold. As another additional or alternative embodiment, a temperature value (e.g., variable value) may be presented (e.g., on or in place of a progress bar(s) indicating the battery level) based on a detected temperature. Thus, a value (e.g., in degrees Celsius or Fahrenheit) of the detected temperature may be shown to a user. As yet another additional or alternative example, an updated battery level may be calculated and presented (e.g., on a progress bar(s) indicating the battery level) based on a detected temperature value, which may generally affect the relative battery level or capacity accord-

ing to a predetermined chart, graph, lookup table or formula. Thus, the effects of temperature to the battery level may be illustrated.

[0029] In certain embodiments, one or more active heaters 154 are provided. In particular, an active heater 154 may be supported on the frame 102 in thermal communication with at least a portion of the chute 116. The thermal communication may be defined or directed at a predefined area 155 such that activation of the active heater 154 actively heats the predefined area 155.

[0030] Turning especially to FIG. 2, in certain embodiments, the active heater 154 includes an electric heating element 156 (e.g., resistive heating wire or line configured to generate heat from an electric current flowed through the element, as would be understood). The electric heating element 156 may be conductive thermal communication with the chute 116. For instance, when assembled, the electric heating element 156 may be defined on the chute 116, such as at the predefined area 155. Optionally, the electric heating element 156 may be mounted or secured onto the chute body 158 of the chute 116, such as by embedding, encasing, or adhering the electric heating element 156 within or on the chute body 158. During use, the electric heating element 156 may thus be selectively activated (e.g., automatically without direct user intervention or, alternatively, in response to a received input signal from a corresponding input engaged by a user).

[0031] Turning especially to FIG. 3, in additional or alternative embodiments, the active heater 154 includes a convective assembly 160, which itself may include a motor (e.g., auger motor 104a) and one or more air channels or nozzles defined through the frame 102 (e.g., an outer shell of the frame 102, which encloses auger motor 104a). The convective assembly 160 is generally configured to force or direct heated air to the predefined area 155 of the chute 116. For instance, the frame 102 may define one or more air inlets 162 upstream from the motor 104a and one or more exhaust outlets 164 downstream from the motor 104a. The motor 104a or the exhaust outlet 164 may be provided or defined rearward from the chute 116. Additionally or alternatively, the exhaust outlet 164 may be directed at the predefined area 155 in convective thermal communication therewith. For instance, the exhaust outlet 164 may define an air path for a heated airflow from the motor 104a that is aimed at and configured to flow to the predefined area 155 (e.g., at a base of the chute 116). As shown, the exhaust outlet 164 may be disposed above (e.g., at a higher height relative to the vertical direction V) than the motor 104a or air inlet 162. Natural convective airflow may, at least in part, motivate the heated airflow across the motor 104a and to the exhaust outlet 164. Additionally or alternatively, an active fan (not pictured) may be provided to selectively force or further motivate the heated airflow across the motor 104a and to the exhaust outlet 164.

[0032] Turning now generally to FIGS. 4 and 5, in some embodiments, one or more vibrational engagement ele-

ments 170 are provided. In particular, a vibrational engagement element 170 may be supported on the frame 102 in mechanical communication with at least a portion of the rotatable auger 106 or chute 116 (e.g., to agitate or disrupt snow to or within the chute 116).

[0033] Turning especially to FIG. 4, in optional embodiments, the vibrational engagement element 170 includes a resilient contact flap 172. Generally, the resilient contact flap 172 is formed, at least in part, by a resilient or elastic material, such as a natural or synthetic polymer, such as rubber. When assembled, the resilient contact flap 172 may extend from the frame 102 and into a rotational path of the rotatable auger 106. As shown, resilient contact flap 172 may extend from a first end 172a to a second end 172b. The first end 172a may be attached to the auger housing 108 (e.g., above the rotatable auger 106). In certain embodiments, the first end 172a is fixed to the auger housing 108 (e.g., at the top wall 108a). Additionally or alternatively, the first end 172a may be secured to the auger housing 108 proximal to the base of the chute 116. Apart from the first end 172a, the second end 172b may be disposed within a portion of the rotational path of the rotatable auger 106. Thus, as the rotatable auger 106 selectively rotates, the resilient contact flap 172 may contact or strike the rotatable auger 106. This contact may notably disrupt snow clumps or vibrate the chute 116 or auger housing 108, which may itself agitate snow within the chute 116.

[0034] Turning especially to FIG. 5, in optional embodiments, the vibrational engagement element 170 includes a secondary motor 174a. Generally, the secondary motor 174a is mounted to the frame 102 (e.g., separate from the auger motor 104a) and is in mechanical communication with the chute 116 (e.g., to generate vibrations thereon). In some embodiments, an eccentric vibrating weight or vibration arm 174b is coupled to the secondary motor 174a. For instance, the vibration arm 174b may extend from the secondary motor 174a to the chute 116 (e.g., to an outer portion or surface of the chute 116). Generally, the secondary motor 174a and vibration arm 174b may be configured to transfer vibration-inducing movement from the secondary motor 174a to the chute 116. Optionally, an eccentric element within the secondary motor 174a (not pictured) may be motivated to shake or vibrate the secondary motor 174a and, by extension, the vibration arm 174b. This vibration may notably disrupt or vibrate the chute 116 or auger housing 108, which may itself agitate snow within the chute 116.

[0035] Turning especially to FIG. 6, in optional embodiments, the rotatable auger 106 defines a lateral gap 176 within which a breaker blade 178 is received. Generally, the breaker blade 178 is formed, at least in part, by a rigid or sharpened material, such as a rigid metal (e.g., stainless steel or aluminum, including alloys thereof). When assembled, the breaker blade 178 may extend from the frame 102 and into a rotational path of the rotatable auger 106. As shown, breaker blade 178 may extend from a first end 178a to a second end 178b. The

first end 178a may be attached to the auger housing 108 (e.g., above the rotatable auger 106). In certain embodiments, the first end 178a is fixed to the auger housing 108 (e.g., at the top wall 108a). Additionally or alternatively, the first end 178a may be secured to the auger housing 108 forward from the chute 116. Apart from the first end 178a, the second end 178b may be disposed within a portion of the rotational path of the rotatable auger 106. Specifically, the second end 178b may be seated within the lateral gap 176 (e.g., between a pair of laterally extending, rotatable auger blades, as shown). Thus, as the rotatable auger 106 selectively rotates, the breaker blade 178 may notably contact or disrupt clumped masses of snow upstream from the snow (e.g., without contacting the rotatable auger 106).

[0036] Turning especially to FIG. 7, in optional embodiments, a transverse channel 180 is provided. For instance, a transverse channel 180 may extend continuously rearward from the front opening of auger housing 108 as an open channel (e.g., open along the vertical direction V). The transverse channel 180 may extend (e.g., transversely) all the way to a snow passage 182 defined by the chute 116, which extends (e.g., vertically) above the top wall 108a. Thus, the transverse channel 180 may converge with the top wall 108a on the base of chute 116. Notably, large snow clumps may be permitted to gently escape the auger housing 108 or chute 116 (e.g., before a clog is able to form).

[0037] In additional or alternative embodiments, the chute 116 itself includes a resilient chute body 158 that is deformable about the chute axis A. Generally, the resilient chute body 158 is formed, at least in part, by a resilient or elastic material, such as a natural or synthetic polymer, such as rubber. In certain embodiments, the resilient chute body 158 has a static base 184. Specifically, the static base 184 may be non-rotatably fixed to the frame 102 or auger housing 108 (e.g., at the top wall 108a). Thus, an upper end 186 of the chute 116 is rotate, the resilient chute body 158 is generally deformed while the static base 184 remains stationary (e.g., relative to the top wall 108a).

[0038] Now that the construction of a power tool (e.g., snow blower 100) according to exemplary embodiments have been presented, exemplary methods (e.g., method 800) of operating a power tool will be described. Although the above discussion is primarily directed to the details of a single-stage snow blower, one skilled in the art will appreciate that the exemplary method 800 is applicable to the operation of a variety of other snow blowers, such as dual-stage snow blowers having a separate impeller element for propelling snow downstream from a rotatable auger. In exemplary embodiments, the various method steps as disclosed herein may be performed (e.g., in whole or part) by controller 150.

[0039] FIG. 8 depicts steps performed in a particular order for purpose of illustration and discussion. Those of ordinary skill in the art, using the disclosures provided herein and except as otherwise indicated, will understand

that the steps of the method 800 can be modified, adapted, rearranged, omitted, interchanged, or expanded in various ways without deviating from the scope of the present disclosure.

[0040] Advantageously, methods in accordance with the present disclosure may account for and mitigate or prevent clogging within the chute (e.g., caused by snow).

[0041] At 810, the method 800 includes receiving an operational sensor signal. Specifically, one or more operational signals may be received from a corresponding electrical element or sensor (e.g., attached to the frame of the snow blower or otherwise in communication with the controller thereof). In some embodiments, the operational sensor signal includes a motor loading signal (e.g., voltage draw) received from the auger motor. For instance, as would be understood, the received motor loading signal may indicate the operational load on the auger motor (e.g., resistance on the auger motor rotation caused by the amount, volume, or mass of snow being engaged by the rotatable auger). Thus, the motor loading signal may be received from the auger motor according to an operational load on the auger motor. In additional or alternative embodiments, the operational sensor signal includes a temperature signal received from the temperature sensor (e.g., as described above). For instance, as would be understood, the received temperature signal may indicate the temperature at a portion of the snow blower (e.g., at the chute or frame). In further additional or alternative embodiments, the operational sensor signal includes a velocity signal received from the speed sensor (e.g., as described above). For instance, as would be understood, the received velocity signal may indicate the speed of movement (e.g., at the wheels or generally along the transverse direction) of the snow blower. Optionally, acceleration may be calculated (e.g., using multiple velocity signals overtime) to provide an acceleration signal as a modified operational sensor signal.

[0042] At 820, the method 800 includes determining a motor output setting based on the received operational sensor signal. Specifically, a predetermined relationship may be established between the input of the received operational signal and the motor output setting. For instance, a predetermined formula, chart, look-up table, or graph may be established (e.g., stored within the controller) for determining the motor output setting using the received operational sensor signal. In turn, and as an example, in response to receiving the operational sensor signal at 810, the motor output setting may be determined.

[0043] Generally, the motor output setting may provide a setting of power, speed, or torque to which the auger motor is directed to apply or output to the rotatable auger. Thus, the directed power, speed, or torque that the rotatable auger is rotated at (or at least instructed to rotate at) may correspond to the motor output setting. In some embodiments, the motor output setting generally increases based on or in response to increased motor loading and generally decreases based on or in response to de-

creased motor loading. In additional or alternative embodiments, the motor output setting generally increases based on or in response to increased temperatures (e.g., in which snow is relatively dense and "wet") and generally decreases based on or in response to decreased temperatures (e.g., in which snow is relatively loose and "dry"). In further additional or alternative embodiments, the motor output setting generally increases based on or in response to increased velocities or acceleration (e.g., in which the snow blower is moving or accelerating relatively quickly) and generally decreases based on or in response to decreased velocities or acceleration (e.g., in which the snow blower is moving or accelerating relatively slowly)

[0044] At 830, the method 800 includes directing the auger motor to rotate the rotatable auger according to the determined motor output setting. In other words, the rotatable auger may be directed or instructed to rotate at the motor output setting (e.g., automatically or without direct user input).

[0045] Further aspects of the invention are provided by one or more of the following embodiments:

Embodiment 1. A snow blower comprising a frame; a rotatable auger mounted to the frame; one or more wheels mounted to the frame apart from the rotatable auger to support the snow blower; a chute extending from the frame above the rotatable auger; and an active heater supported on the frame in thermal communication with the chute to heat a predefined area thereof.

Embodiment 2. The snow blower of any one or more of the embodiments, wherein the active heater comprises an electric heating element disposed on the chute at the predefined area in conductive thermal communication therewith.

Embodiment 3. The snow blower of any one or more of the embodiments, wherein the active heater comprises a motor disposed rearward from the chute and an exhaust outlet downstream from the motor, the exhaust outlet being directed at the predefined area in convective thermal communication therewith.

Embodiment 4. The snow blower of any one or more of the embodiments, wherein the frame comprises an auger housing within which the rotatable auger is housed, and wherein the snow blower further comprises a resilient contact flap attached to the auger housing extending therefrom and into a rotational path of the rotatable auger to selectively contact the rotatable auger during rotation of the rotatable auger.

Embodiment 5. The snow blower of any one or more of the embodiments, further comprising: a secondary motor supported on the frame; and a vibration arm coupled to the secondary motor in mechanical communication with the chute to selectively transfer vibration-inducing movement from the secondary motor to the chute.

Embodiment 6. The snow blower of any one or more

of the embodiments, wherein the rotatable auger defines a lateral gap, wherein the frame comprises an auger housing within which the rotatable auger is housed, and wherein the snow blower further comprises a breaker blade attached to the auger housing extending therefrom and into a rotational path of the rotatable auger at the lateral gap.

Embodiment 7. The snow blower of any one or more of the embodiments, wherein the frame comprises an auger housing within which the rotatable auger is housed, the auger housing comprising a top wall and defining a front opening permitting snow to the rotatable auger, wherein the chute is attached to the frame at the top wall, wherein the chute defines a snow passage extending above the top wall, and wherein the top wall defines an open transverse channel extending continuously from the front opening to the snow passage.

Embodiment 8. The snow blower of any one or more of the embodiments, wherein the frame comprises an auger housing within which the rotatable auger is housed, and wherein the chute comprises a resilient chute body deformable about a chute axis perpendicular to an auger axis, the resilient chute body have a static base non-rotatably fixed to the auger housing.

Embodiment 9. The snow blower of any one or more of the embodiments, an auger motor supported on the frame in mechanical communication with the rotatable auger to motivate rotation thereof; and a controller in operative communication with the auger motor and configured to direct a blower operation comprising: receiving an operational sensor signal, determining a motor output setting based on the received operational sensor signal, and directing the auger motor to rotate the rotatable auger according to the determined motor output setting.

Embodiment 10. A snow blower comprising: a frame comprising an auger housing, the auger housing comprising a top wall and defining a front opening permitting snow to the auger housing; a rotatable auger mounted to the frame and housed within the auger housing below the top wall and rearward from the front opening; one or more wheels mounted to the frame apart from the rotatable auger to support the snow blower; and a chute extending from the top wall above the rotatable auger, the chute comprising a resilient chute body deformable about a chute axis perpendicular to an auger axis.

Embodiment 11. The snow blower of any one or more of the embodiments, wherein the snow blower further comprises a resilient contact flap attached to the auger housing extending therefrom and into a rotational path of the rotatable auger to selectively contact the rotatable auger during rotation of the rotatable auger.

Embodiment 12. The snow blower of any one or more of the embodiments, further comprising: a secondary motor supported on the frame; and a vibration arm

coupled to the secondary motor in mechanical communication with the chute to selectively transfer vibration-inducing movement from the secondary motor to the chute.

Embodiment 13. The snow blower of any one or more of the embodiments, wherein the rotatable auger defines a lateral gap, wherein the frame comprises an auger housing within which the rotatable auger is housed, and wherein the snow blower further comprises a breaker blade attached to the auger housing extending therefrom and into a rotational path of the rotatable auger at the lateral gap.

Embodiment 14. The snow blower of any one or more of the embodiments, wherein the chute defines a snow passage extending above the top wall, and wherein the top wall defines an open transverse channel extending continuously from the front opening to the snow passage.

Embodiment 15. The snow blower of any one or more of the embodiments, wherein the resilient chute body has a static base non-rotatably fixed to the auger housing.

Embodiment 16. The snow blower of any one or more of the embodiments, further comprising: an auger motor supported on the frame in mechanical communication with the rotatable auger to motivate rotation thereof; and a controller in operative communication with the auger motor and configured to direct a blower operation comprising: receiving an operational sensor signal, determining a motor output setting based on the received operational sensor signal, and directing the auger motor to rotate the rotatable auger according to the determined motor output setting.

Embodiment 17. A snow blower comprising: a frame; a rotatable auger mounted to the frame; one or more wheels mounted to the frame apart from the rotatable auger to support the snow blower; a chute extending from the frame above the rotatable auger; an auger motor supported on the frame in mechanical communication with the rotatable auger to motivate rotation thereof; and a controller in operative communication with the auger motor and configured to direct a blower operation comprising: receiving an operational sensor signal, determining a motor output setting based on the received operational sensor signal, and directing the auger motor to rotate the rotatable auger according to the determined motor output setting.

Embodiment 18. The snow blower of any one or more of the embodiments, wherein the operational sensor signal comprises a motor loading signal received from the auger motor according to an operational load on the auger motor.

Embodiment 19. The snow blower of any one or more of the embodiments, further comprising a temperature sensor in operative communication with the controller, wherein the operational sensor signal com-

prises a temperature signal received from the temperature sensor.

Embodiment 20. The snow blower of any one or more of the embodiments, further comprising a speed sensor mounted to the frame in operative communication with the controller to detect a speed of the snow blower, wherein the operational sensor signal comprises a velocity signal received from the speed sensor.

[0046] This written description uses examples to disclose the invention, including the best mode, and also to enable any person skilled in the art to practice the invention, including making and using any devices or systems and performing any incorporated methods. The patentable scope of the invention is defined by the claims, and may include other examples that occur to those skilled in the art. Such other examples are intended to be within the scope of the claims if they include structural elements that do not differ from the literal language of the claims, or if they include equivalent structural elements with insubstantial differences from the literal languages of the claims.

Claims

1. A snow blower comprising:

a frame;
a rotatable auger mounted to the frame;
one or more wheels mounted to the frame apart from the rotatable auger to support the snow blower;
a chute extending from the frame above the rotatable auger; and
an active heater supported on the frame in thermal communication with the chute to heat a predefined area thereof.

2. The snow blower of claim 1, wherein the active heater comprises an electric heating element disposed on the chute at the predefined area in conductive thermal communication therewith.

3. The snow blower of any of claims 1-2, wherein the active heater comprises a motor disposed rearward from the chute and an exhaust outlet downstream from the motor, the exhaust outlet being directed at the predefined area in convective thermal communication therewith.

4. The snow blower of any of claims 1-3, wherein the frame comprises an auger housing within which the rotatable auger is housed, and wherein the snow blower further comprises a resilient contact flap attached to the auger housing extending therefrom and into a rotational path of the rotatable auger to selec-

tively contact the rotatable auger during rotation of the rotatable auger.

5. The snow blower of any of claims 1-4, further comprising:

a secondary motor supported on the frame; and
a vibration arm coupled to the secondary motor in mechanical communication with the chute to selectively transfer vibration-inducing movement from the secondary motor to the chute.

6. The snow blower of any of claims 1-5, wherein the rotatable auger defines a lateral gap, wherein the frame comprises an auger housing within which the rotatable auger is housed, and wherein the snow blower further comprises a breaker blade attached to the auger housing extending therefrom and into a rotational path of the rotatable auger at the lateral gap.

7. The snow blower of any of claims 1-6, wherein the frame comprises an auger housing within which the rotatable auger is housed, the auger housing comprising a top wall and defining a front opening permitting snow to the rotatable auger, wherein the chute is attached to the frame at the top wall, wherein the chute defines a snow passage extending above the top wall, and wherein the top wall defines an open transverse channel extending continuously from the front opening to the snow passage.

8. The snow blower of any of claims 1-7, wherein the frame comprises an auger housing within which the rotatable auger is housed, and wherein the chute comprises a resilient chute body deformable about a chute axis perpendicular to an auger axis, the resilient chute body have a static base non-rotatably fixed to the auger housing.

9. The snow blower of any of claims 1-8, further comprising:

an auger motor supported on the frame in mechanical communication with the rotatable auger to motivate rotation thereof; and
a controller in operative communication with the auger motor and configured to direct a blower operation comprising:

receiving an operational sensor signal,
determining a motor output setting based on the received operational sensor signal, and
directing the auger motor to rotate the rotatable auger according to the determined motor output setting.

10. A snow blower comprising:

a frame comprising an auger housing, the auger housing comprising a top wall and defining a front opening permitting snow to the auger housing; 5

a rotatable auger mounted to the frame and housed within the auger housing below the top wall and rearward from the front opening; 10

one or more wheels mounted to the frame apart from the rotatable auger to support the snow blower; and

a chute extending from the top wall above the rotatable auger, the chute comprising a resilient chute body deformable about a chute axis perpendicular to an auger axis. 15

11. The snow blower of claim 10, wherein the snow blower further comprises a resilient contact flap attached to the auger housing extending therefrom and into a rotational path of the rotatable auger to selectively contact the rotatable auger during rotation of the rotatable auger. 20

12. The snow blower of any of claims 10-11, further comprising: 25

a secondary motor supported on the frame; and

a vibration arm coupled to the secondary motor in mechanical communication with the chute to selectively transfer vibration-inducing movement from the secondary motor to the chute. 30

13. The snow blower of any of claims 10-12, wherein the rotatable auger defines a lateral gap, wherein the frame comprises an auger housing within which the rotatable auger is housed, and wherein the snow blower further comprises a breaker blade attached to the auger housing extending therefrom and into a rotational path of the rotatable auger at the lateral gap. 35 40

14. The snow blower of any of claims 10-13, wherein the chute defines a snow passage extending above the top wall, and wherein the top wall defines an open transverse channel extending continuously from the front opening to the snow passage. 45

15. The snow blower of any of claims 10-14, wherein the resilient chute body has a static base non-rotatably fixed to the auger housing. 50

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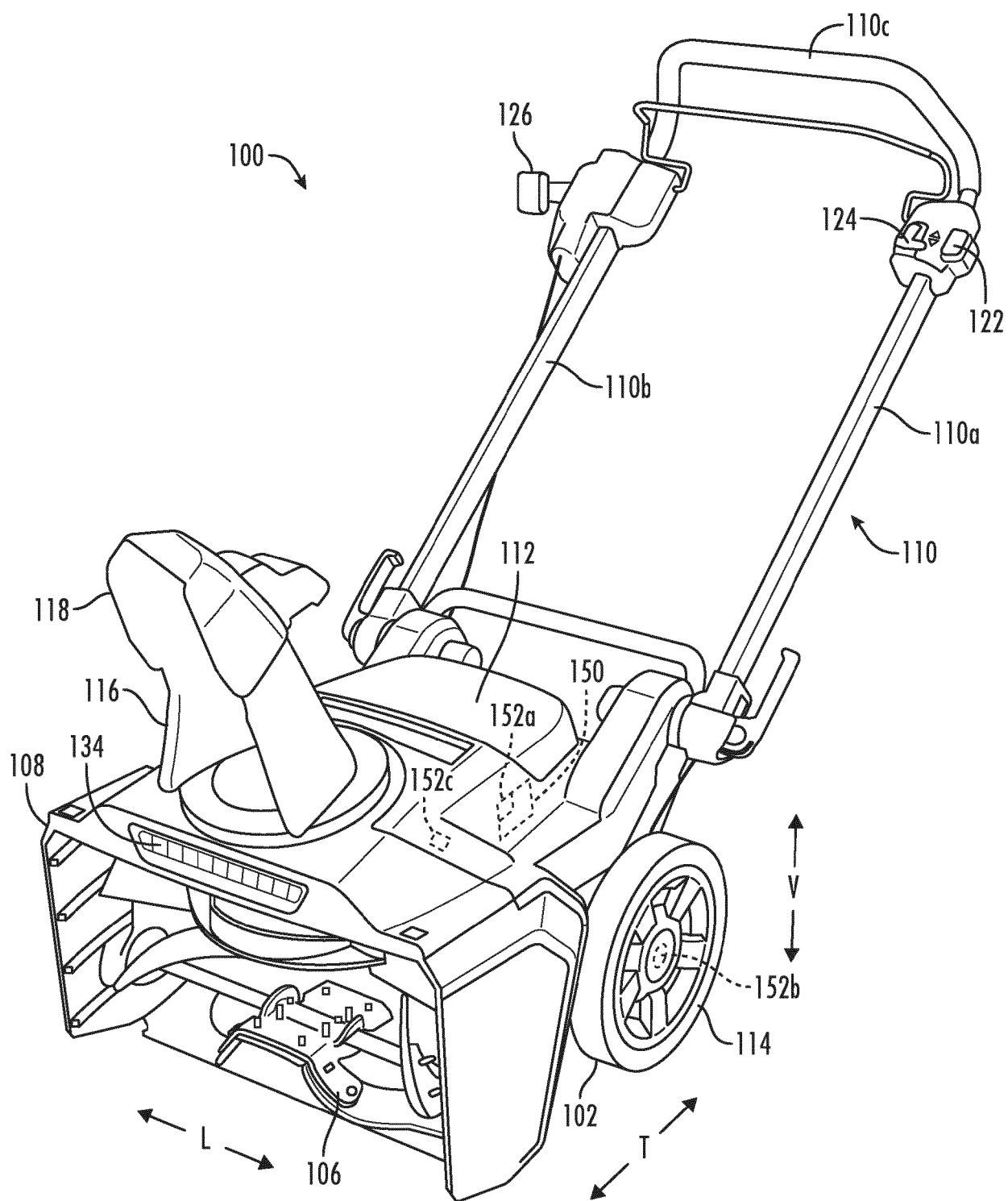


FIG. 1

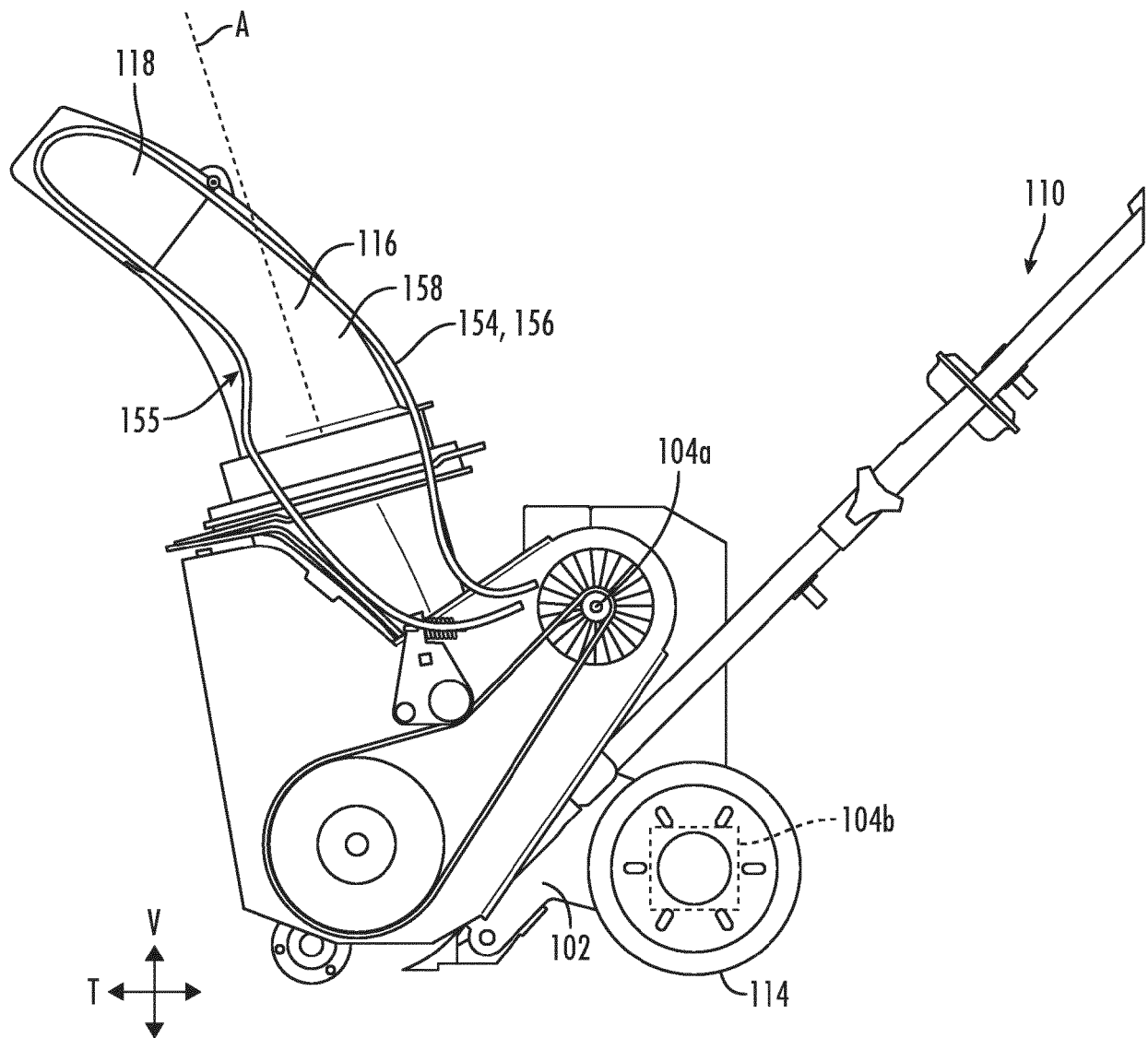


FIG. 2

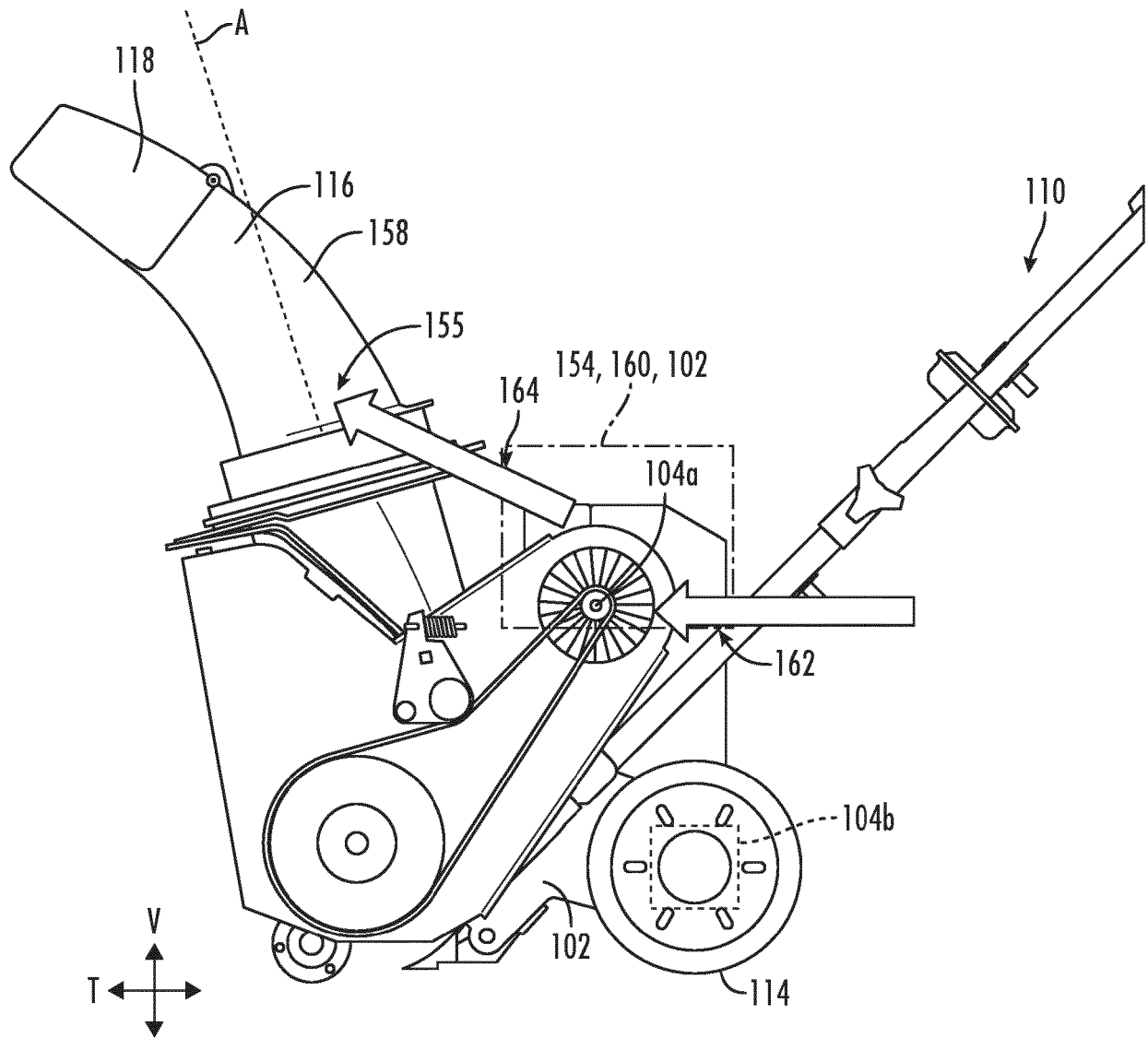
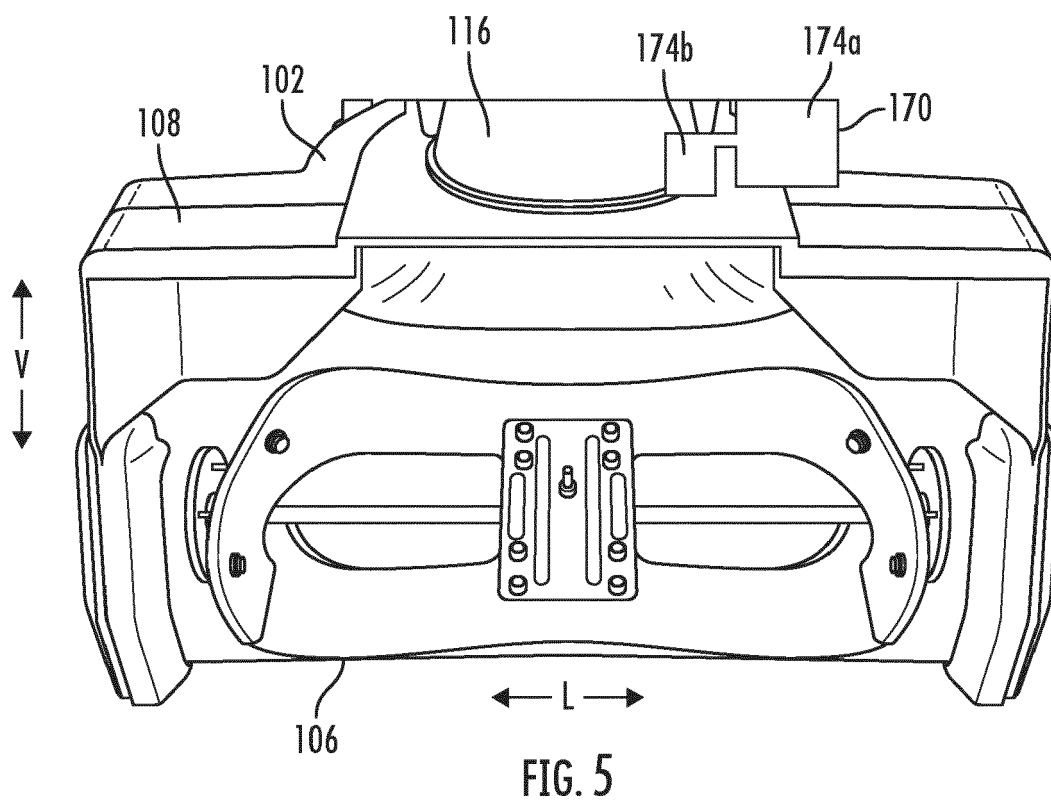
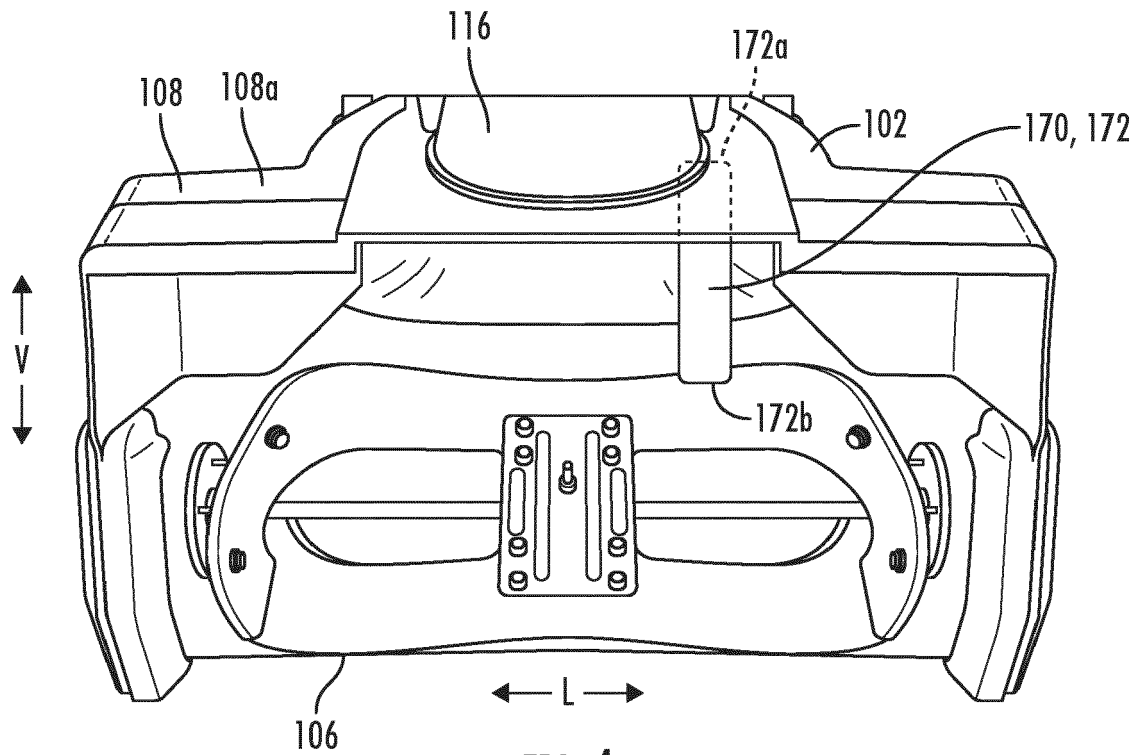


FIG. 3



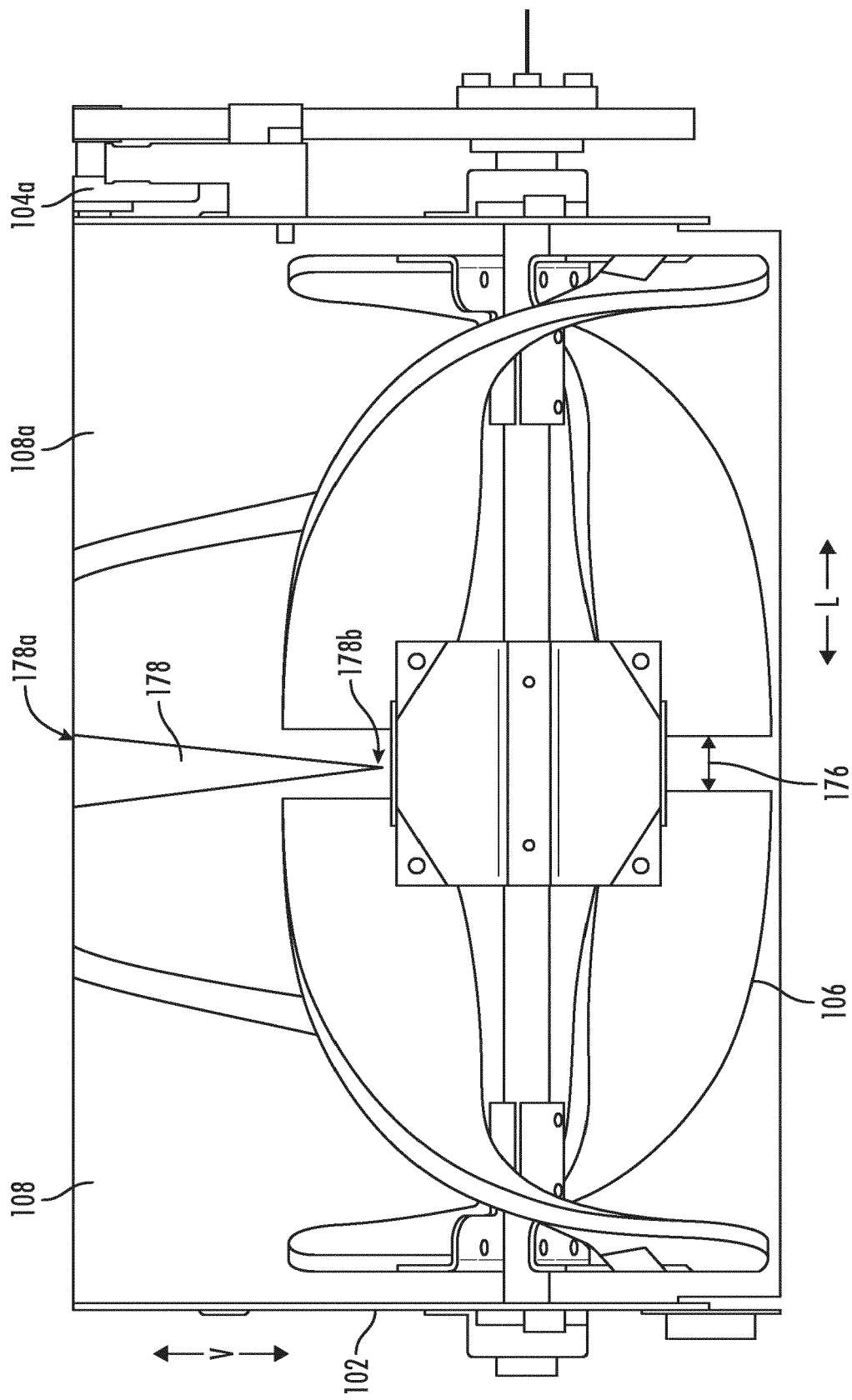


FIG. 6

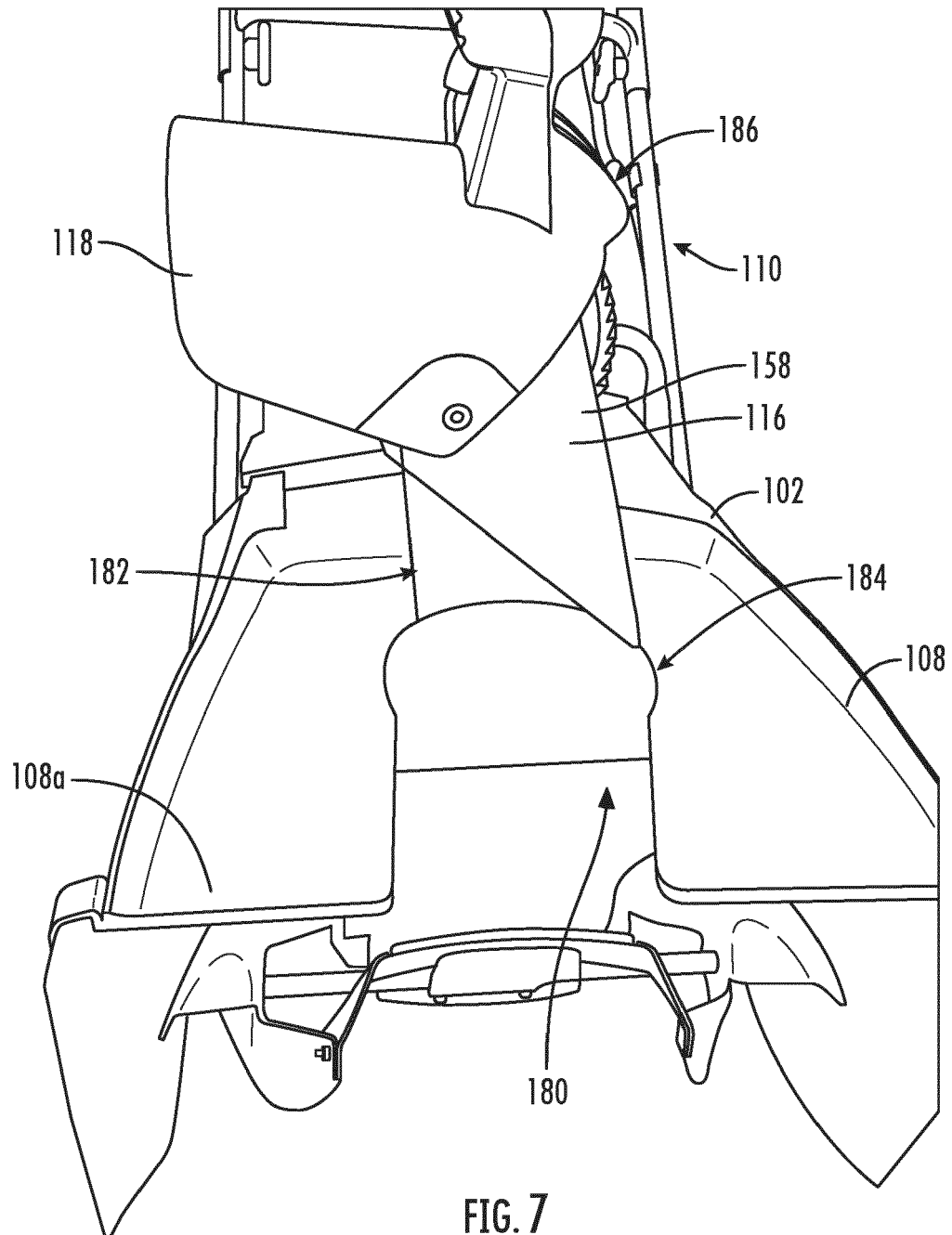


FIG. 7

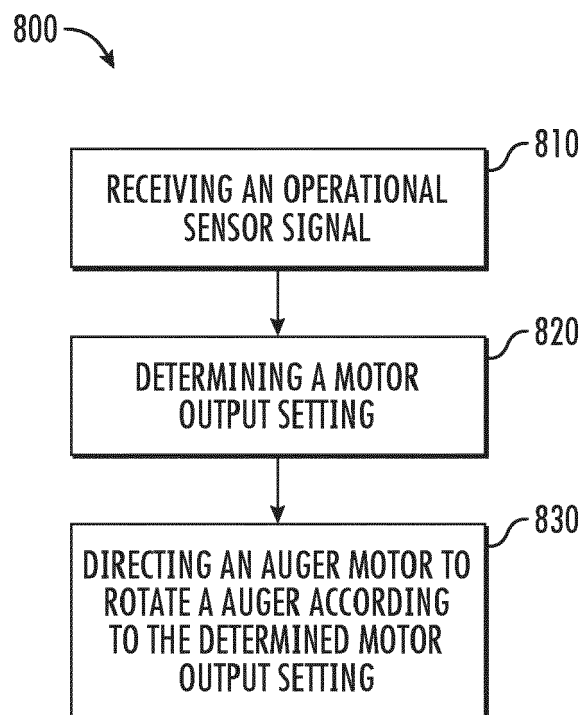


FIG. 8