Abstract:

Wing component (320; 420) for use with an implement that is coupleable with a power machine (100; 200; 300). The wing component includes a stationary portion (322; 422) configured to be mounted to the implement and having a wing support (324; 424). A wing portion (326; 426) is slidably coupled to the wing support such that the wing portion is configured to move laterally relative to the wing support. A biasing mechanism (328; 428) is coupled to the wing portion and is configured to provide a biasing force to bias the wing portion relative to the wing support.
WING FOR AN IMPLEMENT

BACKGROUND

[0001] The present disclosure is directed toward implements for power machines. More particularly, the present disclosure is related to implements and accessories used to clear material such as snow, sand, gravel and the like from a support surface.

[0002] Power machines, for the purposes of this disclosure, include any type of machine that generates power for the purpose of accomplishing a particular task or a variety of tasks. One type of power machine is a work vehicle. Work vehicles, such as loaders, are generally self-propelled vehicles that have a work device, such as a lift arm (although some work vehicles can have other work devices) that can be manipulated to perform a work function. Work vehicles include loaders, excavators, utility vehicles, tractors, and trenchers, to name a few examples.

[0003] A variety of implements are available for mounting on an implement carrier of a power machine to accomplish various work tasks. One such implement is a bucket used to push, lift, load, or otherwise move various materials. In some applications, where material is being removed from an area directly adjacent to a wall (such as along an exterior or interior of a building), fence, or other structure, it is often difficult to remove the material directly adjacent to the structure without having the implement make contact with the object and potentially damaging the structure.

[0004] The discussion above is merely provided for general background information and is not intended to be used as an aid in determining the scope of the claimed subject matter.

SUMMARY

[0005] This Summary and the Abstract are provided to introduce a selection of concepts in a simplified form that are further described below in the Detailed Description. The Summary and the Abstract are not intended to identify key features or essential features of the claimed subject matter.

[0006] Disclosed are embodiments of accessories and implements each having wing components. A portion of these wing components are moveable under contact so that if the wing would make contact with a structure such as a wall or a fence, the wing will move to limit damage to the contacted structure. In accordance with some embodiments, an accessory includes a stationary portion configured to be mounted to an implement and having a wing support. A
wing portion is slidably coupled to the wing support such that the wing portion is configured to move laterally relative to the wing support. A biasing mechanism is coupled to the wing portion and is configured to provide a biasing force to bias the wing portion relative to the wing support.

[0007] In accordance with some embodiments, an accessory includes a stationary member and a wing portion moveable relative to the stationary member by up to a maximum distance. A position indicator is configured to provide a visual indication of a remaining portion of the maximum distance that the wing portion can move relative to the stationary member.

[0008] In accordance with some embodiments, an implement configured to be mountable to a power machine is provided. The implement includes a side wall and a stationary wing support fixedly coupled to the side wall and extending outward at an angle relative to the side wall. A wing portion of the implement is slidably coupled to the wing support such that the wing portion is configured to move laterally relative to the wing support. A biasing mechanism of the implement is coupled to the wing portion and is configured to provide a biasing force to bias the wing portion relative to the wing support.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] FIG. 1 is a block diagram illustrating functional systems of a representative power machine on which implements according to the embodiments of the present disclosure can be advantageously practiced.

[0010] FIGs. 2-3 illustrate perspective views of a power machine on which an implement having a wing can be advantageously employed.

[0011] FIG. 4 is a diagrammatic illustration of an implement with a wing accessory in accordance with some exemplary embodiments.

[0012] FIGs. 5-6 illustrate a bucket implement with wing accessories mounted thereon according to one illustrative embodiment.

[0013] FIG. 7 illustrates the wing accessory of FIG. 6 free from attachment with an implement and with a wing portion removed.

[0014] FIG. 8 is a rear view of the wing accessory of FIG. 6.

[0015] FIG. 9 illustrates a portion of the wing accessory of FIG. 6 showing a position indicator in more detail.
DETAILED DESCRIPTION

[0016] The concepts disclosed in this discussion are described and illustrated with reference to exemplary embodiments. These concepts, however, are not limited in their application to the details of construction and the arrangement of components in the illustrative embodiments and are capable of being practiced or being carried out in various other ways. The terminology in this document is used for the purpose of description and should not be regarded as limiting. Words such as "including," "comprising," and "having" and variations thereof as used herein are meant to encompass the items listed thereafter, equivalents thereof, as well as additional items.

[0017] The present disclosure includes a wing accessory configured to be removably attached to an implement such as a bucket to allow the implement to be used to move a material in close proximity to a building or structure. The disclosure also includes implements having the wing components permanently attached to, or integrated with, the implement. In various embodiments, a wing portion is collapsible or laterally slidable relative to a wing support such that the wing portion can engage a building or structure either without causing damage to the structure or causing less damage than would otherwise occur if the implement engaged the structure.

[0018] These concepts can be practiced on various power machines, as will be described below. A representative power machine on which the embodiments can be practiced is illustrated in diagram form in Fig. 1. Power machines, for the purposes of this discussion, include a frame, at least one work element, and a power source that is capable of providing power to the work element to accomplish a work task. One type of power machine is a loader.

[0019] Fig. 1 illustrates a block diagram including the basic systems of a loader type of power machine 100 upon which the embodiments discussed below can be advantageously incorporated. The block diagram of Fig. 1 identifies various systems on power machine 100 and the relationship between various components and systems. The power machine 100 has a frame 110, a power source 120, and a work element 130. Because power machine 100 shown in Fig. 1 is a self-propelled power machine, it also has tractive elements 140, which are themselves work elements provided to move the power machine over a support surface and an operator station 150 that provides an operating position for controlling the work elements of the power machine. A
control system 160 is provided to interact with the other systems to perform various work tasks at least in part in response to control signals provided by an operator.

[0020] Certain power machines have work elements that are capable of performing a dedicated task. For example, some power machines have a lift arm to which an implement, such as a bucket, is attached such as by a pinning arrangement. The work element, i.e., the lift arm can be manipulated to position the implement for the purpose of performing the task. The implement, in some instances can be positioned relative to the work element, such as by rotating a bucket relative to a lift arm, to further position the implement. Under normal operation of such a power machine, the bucket is intended to be attached and under use. Such power machines may be able to accept other implements by disassembling the implement/work element combination and reassembling another implement in place of the original bucket. Other power machines, however, are intended to be used with a wide variety of implements and have an implement interface such as implement interface 170 shown in Fig. 1. At its most basic, implement interface 170 is a connection mechanism between the frame 110 or a work element 130 and an implement, which can be as simple as a connection point for attaching an implement directly to the frame 110 or a work element 130 or more complex, as discussed below. In exemplary embodiments, implements connected to implement interface 170 include the wing components described below in greater detail as either integral components or as a wing accessory.

[0021] On some power machines, implement interface 170 can include an implement carrier, which is a physical structure movably attached to a work element. The implement carrier has engagement features and locking features to accept and secure any of a number of implements to the work element. One characteristic of such an implement carrier is that once an implement is attached to it, it is fixed to the implement (i.e. not movable with respect to the implement) and when the implement carrier is moved with respect to the work element, the implement moves with the implement carrier. The term implement carrier as used herein is not merely a pivotal connection point, but rather a dedicated device specifically intended to accept and be secured to various different implements. The implement carrier itself is mountable to a work element 130 such as a lift arm or the frame 110. Implement interface 170 can also include one or more power sources for providing power to one or more work elements on an implement. Some power machines can have a plurality of work element with implement interfaces, each of which may,
but need not, have an implement carrier for receiving implements. Some other power machines can have a work element with a plurality of implement interfaces so that a single work element can accept a plurality of implements simultaneously. Each of these implement interfaces can, but need not, have an implement carrier.

[0022] Frame 110 includes a physical structure that can support various other components that are attached thereto or positioned thereon. The frame 110 can include any number of individual components. Some power machines have frames that are rigid. That is, no part of the frame is movable with respect to another part of the frame. Other power machines have at least one portion that is capable of moving with respect to another portion of the frame.

[0023] Frame 110 supports the power source 120, which is capable of providing power to one or more work elements 130 including the one or more tractive elements 140, as well as, in some instances, providing power for use by an attached implement via implement interface 170. Power from the power source 120 can be provided directly to any of the work elements 130, tractive elements 140, and implement interfaces 170. Alternatively, power from the power source 120 can be provided to a control system 160, which in turn selectively provides power to the elements that capable of using it to perform a work function. Power sources for power machines typically include an engine such as an internal combustion engine and a power conversion system such as a mechanical transmission or a hydraulic system that is capable of converting the output from an engine into a form of power that is usable by a work element. Other types of power sources can be incorporated into power machines, including electrical sources or a combination of power sources, known generally as hybrid power sources.

[0024] Fig. 1 shows a single work element designated as work element 130, but various power machines can have any number of work elements. Work elements are typically attached to the frame of the power machine and movable with respect to the frame when performing a work task. In addition, tractive elements 140 are a special case of work element in that their work function is generally to move the power machine 100 over a support surface. Tractive elements 140 are shown separate from the work element 130 because many power machines have additional work elements besides tractive elements, although that is not always the case. Power machines can have any number of tractive elements, some or all of which can receive power from the power source 120 to propel the power machine 100. Tractive elements can be, for
example, track assemblies, wheels attached to an axle, and the like. Tractive elements can be mounted to the frame such that movement of the tractive element is limited to rotation about an axle (so that steering is accomplished by a skidding action) or, alternatively, pivotally mounted to the frame to accomplish steering by pivoting the tractive element with respect to the frame.

Power machine 100 includes an operator station 150 that includes an operating position from which an operator can control operation of the power machine. Further, some power machines such as power machine 100 and others may be capable of being operated remotely (i.e. from a remotely located operator station) instead of or in addition to an operator station adjacent or on the power machine. This can include applications where at least some of the operator controlled functions of the power machine can be operated from an operating position associated with an implement that is coupled to the power machine. Alternatively, with some power machines, a remote control device can be provided (i.e. remote from both of the power machine and any implement to which is it coupled) that is capable of controlling at least some of the operator controlled functions on the power machine.

FIGs. 2-3 illustrate a loader 200, which is one particular example of a power machine of the type illustrated in FIG. 1 where the embodiments discussed below can be advantageously employed. More particularly, loader 200 is of the type that can accept implements that have a wing or implements to which a wing accessory can be attached. Loader 200 is a track loader and more particularly, a compact tracked loader. A track loader is a loader that has endless tracks as tractive elements (as opposed to wheels). Other loaders can have wheels instead of tracks. Track loader 200 is one particular example of the power machine 100 illustrated broadly in FIG. 1 and discussed above. To that end, features of loader 200 described below include reference numbers that are generally similar to those used in FIG. 1. For example, loader 200 is described as having a frame 210, just as power machine 100 has a frame 110. Track loader 200 is described herein to provide a reference for understanding one environment on which the embodiments described below related to track assemblies and mounting elements for mounting the track assemblies to a power machine may be practiced. The loader 200 should not be considered limiting especially as to the description of features that loader 200 may have described herein that are not essential to the disclosed embodiments and thus may or may not be included in power machines other than loader 200 upon which the embodiments disclosed below may be advantageously practiced.
Unless specifically noted otherwise, embodiments disclosed below can be practiced on a variety of power machines, with the track loader 200 being only one of those power machines. For example, some or all of the concepts discussed below can be practiced on many other types of track work vehicles such as various other loaders, excavators, trenchers, and dozers, to name but a few examples.

[0027] Loader 200 includes frame 210 that supports a power system 220, the power system being capable of generating or otherwise providing power for operating various functions on the power machine. Frame 210 also supports a work element in the form of a lift arm structure 230 that is powered by the power system 220 and is capable of performing various work tasks. As loader 200 is a work vehicle, frame 210 also supports a traction system 240, which is also powered by power system 220 and is capable of propelling the power machine over a support surface. The lift arm structure 230 in turn supports an implement carrier interface 270, which includes an implement carrier 272 that is capable of receiving and securing various implements to the loader 200 for performing various work tasks and power couplers 274, which are provided to selective provide power to an implement that might be connected to the loader. The implement carrier interface 270 can receive implements of the type that have wings or wing accessories, as discussed below. The loader 200 can be operated from within a cab 250 from which an operator can manipulate various control devices 260 to cause the power machine to perform various functions. Cab 250 can be pivoted back about an axis that extends through mounts 254 to access components as needed for maintenance and repair.

[0028] Various power machines that are capable of including and/or interacting with the embodiments discussed below can have various different frame components that support various work elements. The elements of frame 210 discussed herein are provided for illustrative purposes and should not be considered to be the only type of frame that a power machine on which the embodiments can be practiced can employ. Frame 210 of loader 200 includes an undercarriage or lower portion 211 of the frame and a mainframe or upper portion 212 of the frame that is supported by the undercarriage. The mainframe 212 of loader 200 is attached to the undercarriage 211 such as with fasteners or by welding the undercarriage to the mainframe. Mainframe 212 includes a pair of upright portions 214A and 214B located on either side and toward the rear of the mainframe that support lift arm structure 230 and to which the lift arm
structure 230 is pivotally attached. The lift arm structure 230 is illustratively pinned to each of the upright portions 214A and 214B. The combination of mounting features on the upright portions 214A and 214B and the lift arm structure 230 and mounting hardware (including pins used to pin the lift arm structure to the mainframe 212) are collectively referred to as joints 216A and 216B (one is located on each of the upright portions 214) for the purposes of this discussion. Joints 216A and 216B are aligned along an axis 218 so that the lift arm structure is capable of pivoting, as discussed below, with respect to the frame 210 about axis 218. Other power machines may not include upright portions on either side of the frame, or may not have a lift arm structure that is mountable to upright portions on either side and toward the rear of the frame. For example, some power machines may have a single arm, mounted to a single side of the power machine or to a front or rear end of the power machine. Other machines can have a plurality of work elements, including a plurality of lift arms, each of which is mounted to the machine in its own configuration. Frame 210 also supports a pair of tractive elements 219A and 219B on either side of the loader 200, which on loader 200 are track assemblies.

[0029] The lift arm structure 230 shown in FIG. 1 is one example of many different types of lift arm structures that can be attached to a power machine such as loader 200 or other power machines on which embodiments of the present discussion can be practiced. The lift arm structure 230 has a pair of lift arms 234 that are disposed on opposing sides of the frame 210. A first end of each of the lift arms 234 is pivotally coupled to the power machine at joints 216 and a second end 232B of each of the lift arms is positioned forward of the frame 210 when in a lowered position as shown in FIG. 2. The lift arm structure 230 is moveable (i.e. the lift arm structure can be raised and lowered) under control of the loader 200 with respect to the frame 210. That movement (i.e. the raising and lowering of the lift arm structure 230) is described by a travel path, shown generally by arrow 237. For the purposes of this discussion, the travel path 237 of the lift arm structure 230 is defined by the path of movement of the second end 232B of the lift arm structure.

[0030] Each of the lift arms 234 of lift arm structure 230 as shown in FIG. 2 includes a first portion 234A and a second portion 234B that is pivotally coupled to the first portion 234A. The first portion 234A of each lift arm 234 is pivotally coupled to the frame 210 at one of the joints 216 and the second portion 234B extends from its connection to the first portion 234A to the
second end 232B of the lift arm structure 230. The lift arms 234 are each coupled to a cross member 236 that is attached to the first portions 234A. Cross member 236 provides increased structural stability to the lift arm structure 230. A pair of actuators 238, which on loader 200 are hydraulic cylinders configured to receive pressurized fluid from power system 220, are pivotally coupled to both the frame 210 and the lift arms 234 at pivotable joints 238A and 238B, respectively, on either side of the loader 200. The actuators 238 are sometimes referred to individually and collectively as lift cylinders. Actuation (i.e., extension and retraction) of the actuators 238 cause the lift arm structure 230 to pivot about joints 216 and thereby be raised and lowered along a fixed path illustrated by arrow 237. Each of a pair of control links 217 are pivotally mounted to the frame 210 and one of the lift arms 232 on either side of the frame 210. The control links 217 help to define the fixed travel path of the lift arm structure 230. The lift arm structure 230 shown in FIG. 2 is representative of one type of lift arm structure that may be coupled to the power machine 100. Other lift arm structures, with different geometries, components, and arrangements can be pivotally coupled to the loader 200 or other power machines upon which the embodiments discussed herein can be practiced without departing from the scope of the present discussion. For example, other machines can have lift arm structures with lift arms that each has one portion (as opposed to the two portions 234A and 234B of lift arm 234) that is pivotally coupled to a frame at one end with the other end being positioned in front of the frame. Other lift arm structures can have an extendable or telescoping lift arm. Still other lift arm structures can have several (i.e. more than two) portions segments or portions. Some lift arms, most notably lift arms on excavators but also possible on loaders, may have portions that are controllable to pivot with respect to another segment instead of moving in concert (i.e. along a pre-determined path) as is the case in the lift arm structure 230 shown in FIG. 2. Some power machines have lift arm structures with a single lift arm, such as is known in excavators or even some loaders and other power machines. Other power machines can have a plurality of lift arm structures, each being independent of the other(s).

[0031] Implement interface 270 is provided at a second end 234B of the arm 234. The implement interface 270 includes an implement carrier 272 that is capable of accepting and securing a variety of different implements to the lift arm 230. Such implements have a machine interface that is configured to be engaged with the implement carrier 272. The implement carrier
272 is pivotally mounted to the second end 234B of the arm 234. Implement carrier actuators are operably coupled the lift arm structure 230 and the implement carrier 272 and are operable to rotate the implement carrier with respect to the lift arm structure.

[0032] The implement interface 270 also includes an implement power source 274 available for connection to an implement on the lift arm structure 230. The implement power source 274 includes pressurized hydraulic fluid port to which an implement can be coupled. The pressurized hydraulic fluid port selectively provides pressurized hydraulic fluid for powering one or more functions or actuators on an implement. The implement power source can also include an electrical power source for powering electrical actuators and/or an electronic controller on an implement. The implement power source 274 also exemplarily includes electrical conduits that are in communication with a data bus on the excavator 200 to allow communication between a controller on an implement and electronic devices on the loader 200.

[0033] The lower frame 211 supports and has attached to it a pair of tractive elements 219A and 219B. Each of the tractive elements 219A and 219B has a track frame that is coupled to the lower frame 211. The track frame supports and is surrounded by an endless track, which rotates under power to propel the loader 200 over a support surface. Various elements are coupled to or otherwise supported by the track frame for engaging and supporting the endless track and cause it to rotate about the track frame. For example, a sprocket is supported by the track frame and engages the endless track to cause the endless track to rotate about the track frame. An idler is held against the track by a tensioner (not shown) to maintain proper tension on the track. The track frame also supports a plurality of rollers, which engage the track and, through the track, the support surface to support and distribute the weight of the loader 200.

[0034] Loaders can include human-machine interfaces including display devices that are provided in the cab to give indications of information relatable to the operation of the power machines in a form that can be sensed by an operator, such as, for example audible and/or visual indications. Audible indications can be made in the form of buzzers, bells, and the like or via verbal communication. Visual indications can be made in the form of graphs, lights, icons, gauges, alphanumeric characters, and the like. Displays can be dedicated to provide dedicated indications, such as warning lights or gauges, or dynamic to provide programmable information, including programmable display devices such as monitors of various sizes and capabilities.
Display devices can provide diagnostic information, troubleshooting information, instructional information, and various other types of information that assists an operator with operation of the power machine or an implement coupled to the power machine. Other information that may be useful for an operator can also be provided.

[0035] The description of power machine 100 and loader 200 above is provided for illustrative purposes, to provide illustrative environments on which the embodiments discussed below can be practiced. While the embodiments discussed can be practiced on a power machine such as is generally described by the power machine 100 shown in the block diagram of FIG. 1 and more particularly on a loader such as track loader 200, unless otherwise noted or recited, the concepts discussed below are not intended to be limited in their application to the environments specifically described above.

[0036] Fig. 4, is a block diagram that illustrates an implement 310 operably coupled to a power machine 300. Power machine 300 is of the type generally discussed above with respect to FIGs. 1-3 and can be any type of work vehicle that is capable of having such an implement operably coupled to it. Implement 310 is coupled to the power machine along a lateral plane 342 (for example, implement 310 can be coupled to a power machine via an implement carrier such as is discussed above). In many embodiments, implements are rotatable with respect to power machines, so the lateral connection plane moves with respect to the power machine as the implement rotates. Typically, however, the lateral plane is perpendicular to a centerline 336 of the power machine 300. Centerline 336 in FIG. 4 also refers to the centerline of implement 310 - thus the centerline of the implement is also perpendicular to the lateral plane 342. Implement 310 is shown as having a pair of wings 320 operably coupled on each of left and right sides of the implement. The wings 320 have features that allow use of implement 310 to remove material directly adjacent structure 305 while reducing the likelihood of damaging the adjacent structure.

In the illustrated embodiment, implement 310 has wings on each of the left and right sides of the implement, though that need not be the case. In some embodiments, wings of the type illustrated in FIG. 4 are permanently coupled to an implement and are considered part of the implement. In other embodiments, wings are removably coupled to the implement. For discussion purposes, only one of the illustrated wing accessories shown in FIG. 4 are discussed, as the wing accessories can be substantially identical to one another. In some embodiments, an implement
may have only one wing component or one wing accessory. The implement 310 shown in FIG. 4 is illustrative in nature and is not intended to limit this disclosure merely to implements with wings of the type shown and described herein. More particularly, in some embodiments, wings such as those shown and discussed herein are intended to be attached to implements that were otherwise not designed to have such wings attached thereto. For the purposes of this discussion, wings that are capable of being operably coupled to implements that were otherwise not originally designed to have such wings are referred to in this discussion as wing accessories. Wings that are capable of being coupled, permanently or otherwise, to an implement specifically designed to accept them are, for the purposes of this discussion, wing components. The term wing as described herein can be either a wing accessory or a wing component.

[0037] The features of wing 320 allow the wing to move or collapse a certain amount in the event of contact with a structure such as structure 305 so as to reduce damage to the structure in the event of contact between the wing and the structure as opposed to having another portion of an implement that might make contact with a structure (such as a side edge of a bucket). Implement 310 can be any of a variety of different implement types, but in exemplary embodiments discussed herein is a bucket type of implement used to push, load, or otherwise move material. Other types of implements that may advantageously incorporate wings include push blades and snow blowers, to name two.

[0038] Wing 320 includes a stationary portion 322 configured to be removably mounted to, or permanently fixedly attached to or integrally formed with, the implement 310. In some embodiments, stationary portion 322 includes a mounting plate 323 that is configured to be positioned adjacent and substantially parallel to a side wall or other structure 330 of the implement to attach wing 320 to the implement using conventional fasteners such as bolts. In other embodiments, other attachment structures can include cams, over center latches, or other structures that do not require tools to couple or uncouple the wing from the implement. In some other embodiments, mounting plate 323 can be more permanently attached to structure 330, for example by welding. Also, in some embodiments, wing 320 can be partially integrally formed with structure 330. In yet other embodiments, the wing is adapted to mount to other surfaces on the implement that are not substantially perpendicular to a lateral plane along which an implement is coupled to a power machine as an endplate of a bucket is like, for example, a front
or back surface of a push blade, which may be substantially parallel to the lateral plane 342. In those types of applications, at least a portion of the mounting plate 323 may be parallel to the lateral plane 342.

Stationary portion 322 includes a wing support 324 that extends from the mounting plate 323 or structure 330 at an angle \( \Theta \) with reference to dashed line 334 extending parallel to mounting plate 323 and structure 330. In these or other embodiments, wing support 324 also extends at angle \( \Theta \) relative to centerline 336 of implement 310, regardless of the orientation of the mounting plate 323. It must be noted that wing support 324 is stationary relative to implement 310 in that it remains substantially stationary relative to the structure 330 of the implement, with no pivot or sliding mechanism between stationary portion 324 and the implement. However, remaining stationary or substantially stationary includes minor flexing of the stationary portion under sufficient loads.

The wing 320 also includes a wing portion 326 that is slidably coupled, for example, by using a sliding mechanism 329, to the wing support 324 such that the wing portion is configured to move laterally relative to the wing support. In exemplary embodiments, wing portion 326 is coupled to wing support 324 such that wing portion 326 is configured to move in a plane that is parallel to a surface of the wing support, that is, the wing portion is positioned at angle \( \Theta \) with respect to the centerline 336. Angle \( \Theta \) is selected to funnel material toward the main portion of the implement 310. Another consideration of the selection of angle \( \Theta \) is for visibility so that an operator in a power machine can easily see the entire wing portion 326 from an operating position. This can be advantageous in situations where a single accessory is adapted to be used with a variety of different implements. The plane of the movement of the wing portion 326 relative to wing support 324 is parallel to line 327. Wing portion 326 is rigidly defined with respect to wing support 324, but in some embodiments, the wing portion can be hinged or otherwise attached to allow for adjustment of the wing portion relative to the wing support 324 and thereby change the plane 327. In exemplary embodiments, the slidable coupling of the wing portion to the wing support substantially prevents movement (e.g., not including flexing, etc.) of the wing portion in directions other than in the plane that is parallel to the surface of the wing support. The coupling structure between wing portion 326 and wing support 324 allows for a range of movement or travel of the wing portion relative to the wing support. A flexible member
340 is, in some embodiments, attached to a distal end of wing portion 326 to allow contact between the wing portion and structure 305 reducing the likelihood and/or severity of damage to the contacted structure. In addition, as discussed above, the wing portion 326, by being capable of moving with respect to the wing support 324, allows for give in the wing so that if a structure is contacted, the wing gives, also reducing the likelihood and/or severity of damage to the contacted structure.

[0041] As illustrated in FIG. 4, a biasing mechanism 328 is coupled to the wing portion 326 and is configured to provide a biasing force to bias the wing portion to a bias position relative to the wing support. For example, the biasing mechanism 328 can bias wing portion 326 to a fully extended position to maximize material funnelling into implement 310 and to keep the implement and stationary components of the wing accessory a distance from structure 305. In some exemplary embodiments, the biasing mechanism 328 includes one or more springs coupled between the wing portion and the wing support. The springs can be used to set the bias force or tension required to move wing portion 326 relative to wing support 324. In some embodiments, the one or more springs or spring members can be adjustable to set the bias force. In other embodiments, the number of springs used can be adjusted to set the bias force.

[0042] In some embodiments, wing 320 includes an indicator 345 configured to provide a visual indication of the remaining portion of the maximum distance 345 that the wing portion can move relative to the wing support. With visual indicator 345, an operator of the power machine can, with more certainty, continue to move the power machine forward after contact occurs between structure 305 and wing portion 326. This allows an operator to deliberately contact a structure and have knowledge as to how much more the wing can collapse before it becomes rigid and more likely to cause damage to the structure or the wing itself.

[0043] FIG. 5 illustrates an implement 410 in the form of a bucket that can be attached to a power machine such as a skid-steer loader, a compact track loader, and various other types of power machines as discussed above. Implement 410 is shown with wings 420 mounted on both sides of the implement. Wings 420 shown in FIG. 5 and subsequent figures are advantageously capable of being mounted on either of a left side or a right side of an implement. In other words, the wings 420 shown in FIG. 5 are not mirror images of each other, but identical components. Like wing 320 above, wing 420 includes a stationary portion, 422 that includes a mounting
portion 423 and a wing support 424, and a wing portion 426 that is slidable with respect to the wing support 424. The wing portion 426 is removed from the wing mounted on the right side (from the perspective of an operator sitting in operator compartment) of the implement 410 to show components of sliding mechanism 429 on the wing support 424. FIG. 6 illustrates the components of the left side wing accessory 420 shown in FIG. 4. FIG. 7 is an illustration of portions of the wing accessory with the wing portion removed. FIG. 8 illustrates a back side view of the left side wing accessory 420 illustrates further components of sliding mechanism 429 and springs of bias mechanism 428. The discussion below is in references to these figures. Wing 420 is removably mounted to the bucket 410 via a plurality of fasteners 470 and 474. In some embodiments, a wing component can be permanently secured to or integrated with a bucket.

[0044] Mounting portion 423, which is best shown in FIGs. 7-8, includes a plurality of mounting apertures 472 and 476 through which fasteners can be inserted to secure the wing 420 to an implement. The apertures 472 and 476 are patterned so that the wing 420 can be attached to either of the left or the right side of an implement. A pair of shims 478 is shown in in FIG 7. The shims can be used to adjust to implements such as buckets that may have a side edge that is not planar with an end plate. The shims 478 are used to keep the mounting portion 423 in a plane that is generally parallel with the implement. Shims can be positioned in-line with mounting apertures and held by the same fasteners that attach the wing 420 to an implement or they can be otherwise attached to the wing such as by welding.

[0045] Sliding mechanism 429 includes multiple spacer members or spacers 405 that in some embodiments are attached to the wing portion 426 and positioned between wing portion 426 and wing support 424, the spacers 405 are contacted by the wing portion 426 as it slides relative to the wing support 424. The spaces 405 allow for a consistent distance between the wing portion 426 and the wing support 424 as well as a low friction surface over which the wing portion can slide without causing substantial wear damage to either the wing portion or the wing support. Spacers 405 can be made of an ultra-high molecular weight plastic material, which will wear slowly over time. Also included in wing support 424 are slots 416 through which a back plate 430 (shown in FIG. 6) is movably attached to wing portion 426 using bolts 412.

[0046] The back side view of wing 420 shown in FIG. 8 illustrates further spacers 438 on the back of wing support 424. Spacers 438 similar to the spacers 405 and are positioned between
back plate 430 and the wing support 424 to maintain a consistent distance between the wing support and the back plate, and to allow movement of the back plate relative to the wing support without causing wear damage to either. The wing support 424 also has sliding blocks 480 mounted on top and bottom surfaces thereof. Sliding blocks 480 are advantageously made of a wear resistant material such as ultra-high molecular weight plastic and are removably mounted to the top and bottom surfaces of the wing support 424. The sliding blocks 480 are provided to act as wear surfaces that engage a support surface during operation. Back plate 430 is slidably attached to wing portion 426 using the bolts 412 which extend through slots 416 in wing support 424, thereby allowing back plate 430 and wing portion 426 to move together relative to wing support 424. Springs 440 are connected between wing support 424 and back plate 430 to provide the bias mechanism and bias force to wing portion 426 as described above. A tab 482 extends from the wing support 424, and one end of springs 440 attaches to tab 482. The other end of each of the springs is attached to the back plate 430 via a bracket 484. The springs 440 bias the wing portion 426 in an extended position. Springs 440 are adjustable relative to each of the tabs to which there are attached to allow for varying biasing forces, as may be desired. Two springs 440 are shown, but any number of springs may be used as necessary to obtain a desired biasing force.

[0047] A position indicator 460 is also included and is configured to provide a visual indication of a remaining portion of the maximum distance (e.g., indicator 345 shown in FIG. 4) that the wing portion can move relative to the stationary member. In an exemplary embodiment, the position indicator 460 includes a tab 462 attached to, or formed integrally with, back plate 430. Tab 462 extends through a slot 464 formed in a flange 473 at the top of stationary member 424 and is visible to an operator of the power machine. As back plate 430 and wing portion 426 each move relative to stationary member or wing support 424, tab 462 moves within slot 464 to provide the visual indication of the remaining portion of the maximum distance that the wing portion can move relative to the stationary member. Similarly, tab 462A extends through a slot 464A so that wing 420 can have a visible indicator regardless of which side of the implement it is attached.

[0048] A bearing 450 is carried on each of four bolts 412. The bearings 450 are captured on the bolts on the opposing side of the back plate 430 and are positioned such that each bearing runs in one of the slots 416 in the wing support 424 to facilitate smooth movement of the wing
portion 426 with respect to the wing support 424. Stops 452 and 454 are positioned in the path of back plate 430 to define the range of movement of the wing portion 426.

[0049] The embodiments discussed above provide important advantages. By providing a wing accessory or component for a bucket or other implement, an operator can clear material such as snow, grain, sand, and the like right up to a wall of a building or other structure while minimizing the chance of damaging the structure. By confining movement of the wing portion of the implement to a linear movement and by providing a visual indicator of how far a wing portion has moved relative to the stationary portion of the wing component or accessory so that an operator can see how much more the wing can move before the wing movement is limited.

[0050] Although the present invention has been described with reference to preferred embodiments, workers skilled in the art will recognize that changes may be made in form and detail without departing from the spirit and scope of the invention.
WHAT IS CLAIMED IS:

1. A wing for an implement, comprising:
   a stationary portion configured to be mounted to the implement and having a wing support;
   a wing portion slidably coupled to the wing support such that the wing portion is configured to move laterally relative to the wing support; and
   a biasing mechanism coupled to the wing portion and configured to provide a biasing force to bias the wing portion relative to the wing support.

2. The wing of claim 1, wherein the stationary portion includes a mounting plate configured to be positioned adjacent and substantially parallel to the side wall of the implement, and wherein the wing support extends from the mounting plate at an angle.

3. The wing of claim 2, wherein the wing portion is allowed to move in a plane that is parallel to a surface of the wing support.

4. The wing of claim 3, wherein the wing portion is slidably coupled to the wing support such that the wing portion is prevented from movement in directions other than in the plane that is parallel to the surface of the wing support.

5. The wing of claim 1 wherein the stationary portion is configured to be mounted to the implement and is substantially perpendicular to a lateral plane along which the implement is attached to a power machine.

6. The wing of claim 1, wherein the biasing mechanism comprises a spring member coupled between the wing portion and the wing support.

7. The wing of claim 1 and further comprising a sliding mechanism slidably coupling the wing portion to the wing support.

8. The wing of claim 7, wherein the sliding mechanism is a bearing captured in an aperture formed into the wing support.

9. The wing of claim 1, and further comprising an indicator wherein the wing portion is configured to move laterally relative to the wing support along a range of movement, and wherein an indicator provides a visual indication of the position of the wing portion relative to the available range of motion.

10. An implement comprising a frame having the wing of claim 1 mounted thereto, the wing extending outward at an angle relative to the frame.

11. The implement of claim 10, wherein the frame includes an attachment structure extending along a lateral plane for mounting the implement to a power machine and wherein
the wing support includes a first portion that extends perpendicularly with respect to the lateral plane and a second portion that extends at an angle to the first portion.

12. The implement of claim 10, wherein the wing portion is configured to move laterally relative to the wing along a range of movement, and further comprising an indicator that provides a visual indication of the position of the wing portion relative to the available range of motion.

13. The implement of claim 10 wherein the implement is one of a bucket, a snowblade, a sweeping implement, and a snowblower.

14. The implement of claim 10, wherein the frame includes a material handling mechanism and wherein the wing portion is disposed at an angle with respect to the frame so as to engage and urge material toward the material handling mechanism.

15. A wing for an implement comprising:
   a stationary member;
   a moveable portion moveable relative to the stationary member along a range of movement; and
   a position indicator configured to provide a visual indication of the position of the wing portion relative to the available range of motion.
FIG. 7
### C. DOCUMENTS CONSIDERED TO BE RELEVANT

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<td>US 3 231 991 A (EVERT WANDSCHEER ET AL) 1 February 1966 (1966-02-01) figures 1, 2 figures 8, 9</td>
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<td>CA 2 313 901 A1 (BOULET BROTHERS CONCRETE LTD [CA]) 14 January 2002 (2002-01-14) abstract; figures 1-4</td>
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#### Date of the actual completion of the international search
10 February 2017

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