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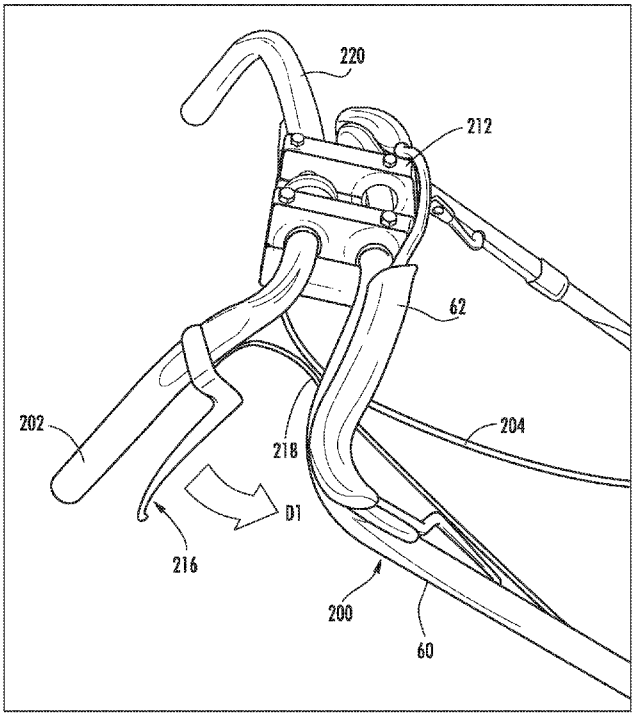

FIG. 3

(57) Abstract: A drive control assembly (100,200,300) for a walk behind outdoor power tool (10), the drive control assembly (100,200,300) including a rotatable actuation handle (102,202,302) configured to rotate about a handle axis perpendicular to the direction of extension of at least one handle member between a first position and second position, a drive transmission (130), and a transmission linkage (104, 204, 304) operably coupled to the drive transmission (130) and the rotatable actuation handle (102,202,302). The transmission linkage (104, 204, 304) engages the drive transmission (130) in response to the rotatable actuation handle (102,202,302) moving to the second position and disengages the drive transmission (130) in response to the rotatable actuation handle (102,202,302) moving to the first position.

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DRIVE CONTROL, WALK BEHIND OUTDOOR POWERTOOL

CROSS REFERENCE TO RELATED APPLICATIONS

This application claims the benefit of U.S. Provisional Application No. 62/184,957 filed on June 26, 2015, the entire contents of which are hereby incorporated herein by reference.

TECHNICAL FIELD

Example embodiments generally relate to outdoor power equipment and, more particularly, relate to a walk behind lawn mower with drive control.

BACKGROUND

Yard maintenance tasks are commonly performed using various tools and/or machines that are configured for the performance of corresponding specific tasks. Certain tasks, like grass cutting, are typically performed by walk behind outdoor power equipment or tools, such as a lawn mower. Lawn mowers themselves may have many different configurations to support the needs and budgets of consumers. Walk-behind outdoor power tools, such as lawn mowers, are typically relatively compact, have comparatively small engines and are relatively inexpensive.

Some relatively simple walk behind models may move responsive only to the pushing force provided by the operator. However, other models may provide power to the wheels to assist the operator in providing mobility for the walk behind outdoor power tool. In many instances, the lawn mower may have power provided to the front set of wheels, the back set of wheels, or in some cases, all wheels. The power may be provided, for example, via a belt system that is selectively powered off the same shaft that turns a blade for cutting grass. The provision of power may be selectively controlled, in some cases, via a drive control system.

Drive control systems may sometimes be employed in connection with a control bail or presence lever that is to be operated to enable rotation of the cutting blade. The drive control system may employ a cable system to operably couple various components thereof. These drive control systems have may be activated by hand, requiring the operator to pull the control bail or presence lever with one or both hands. To achieve sufficient travel and tension, the operator is sometimes required to apply force of 12-20 pounds, which may be difficult for some operators to sustain during operation.

Typically, the force applied to activate aspects of the drive control system of the walk

behind outdoor power tool, such as a lawn mower, is applied in the direction opposite of travel, e.g. toward the operator and away from the direction the lawn mower is being driven. As such, the activation force is not assisting the operation and direction of the walk behind outdoor power tool.

Additionally, most drive assisted walk behind outdoor power tools stop immediately upon the cessation of control activation. This abrupt cessation of forward movement may sometimes not allow the transmission to return to a neutral position, e.g. the transmission remains engaged to the wheels and requires the operator to pull the mower in reverse while also driving the transmission, which may cause an annoyance for operators.

BRIEF SUMMARY OF SOME EXAMPLES

Some example embodiments may therefore provide alternative methods for drive control. In this regard, some embodiments may provide for drive control assembly which engages a drive transmission with operational force applied in the direction of travel of a walk behind outdoor power tool. An actuation handle may be provided which is rotatable to engage the drive control and may be used to guide and direct the walk behind outdoor power tool. The rotatable handle may also allow for a gradual release of the tension engaging the transmission. The gradual release of engagement tension may allow for the operator to move the rotatable handle to a disengagement position while the walk behind outdoor power tool continues forwards. The transmission of the walk behind outdoor power tool may disengage during the forward travel of the walk behind outdoor power tool while the rotatable handle is moving from the engaged to the disengaged position, which may help to prevent or limit back drive when the operator pulls the unit backwards.

In an example embodiment, a drive control assembly for a walk behind outdoor power tool, is provided, the drive control assembly including, a rotatable actuation handle configured to rotate about a handle axis perpendicular to the direction of extension of at least one handle member between a first position and second position, a drive transmission, and a transmission linkage operably coupled to the drive transmission and the rotatable actuation handle. The transmission linkage engages the drive transmission in response to the rotatable actuation handle moving to the second position and disengages the drive transmission in response to the rotatable actuation handle moving to the first position.

In another example embodiment, a walk behind outdoor power tool is provided including a mobility assembly, an engine operably coupled to the mobility assembly, a handle assembly operably coupled to the mobility assembly, and a drive control assembly operably

coupled to the handle assembly. The drive control assembly including an actuation handle operably coupled to at least one handle member, wherein the actuation handle has a first and second position, and a drive transmission, a transmission linkage connected to the drive transmission end and the actuation handle at a second end. The transmission linkage engages the drive transmission in response to the actuation handle moving to the second position and disengages the drive transmission in response to the actuation handle moving to the first position.

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

Having thus described the invention in general terms, reference will now be made to the accompanying drawings, which are not necessarily drawn to scale, and wherein:

FIG. 1 illustrates a perspective view of a walk behind outdoor power tool according to an example embodiment

FIG. 1A illustrates an block diagram of the drive control assembly according to an example embodiment;

FIG. 1B illustrates the actuation of actuation handles in an example embodiment;

FIG. 1C illustrates actuation of actuation handles in accordance with an alternative example embodiment;

FIG. 1D illustrates another example of actuation of actuation handles according to an example embodiment;

FIG. 1E illustrates a further example of actuation handles according to an example embodiment;

FIG. 2 illustrates a view of internal portions of a transmission linkage housing of a drive control assembly according to an example embodiment;

FIG. 3 depicts a side view of a drive control assembly according to an example embodiment; and

FIG. 4 depicts a side view of a drive control assembly according to another example embodiment.

DETAILED DESCRIPTION

Some example embodiments now will be described more fully hereinafter with reference to the accompanying drawings, in which some, but not all example embodiments are shown. Indeed, the examples described and pictured herein should not be construed as being limiting as to the scope, applicability or configuration of the present disclosure. Rather,

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

Some example embodiments described herein provide alternative methods and/or structures for engagement of a drive control system of a walk behind outdoor power tool. In an example embodiment, a drive control assembly may include an actuation handle configured to rotate or pivot to apply tension to a transmission linkage to engage the transmission. The force applied to the actuation handle to engage the transmission may be applied in substantially the same direction as the drive direction of the drive control system. The actuation handle may also serve for guidance and directional control of the walk behind outdoor power tool by the operator.

In some example embodiments, the actuation handle of the drive assembly may allow for a gradual release of tension applied to a transmission linkage. The gradual release of the tension on the transmission linkage may allow the operator to control the drive speed of the power tool and may cause the walk behind outdoor power tool to continue travel in the drive direction for the at least a portion of the actuation handle movement from the engaged to the disengaged position, allowing the transmission to disengage while in motion, thus preventing back drive.

FIG. 1 illustrates a perspective view of a walk behind outdoor power tool 10 of an example embodiment. The walk behind outdoor power tool 10 is depicted as a lawn mower, but the drive control system or assembly 100, may be applied to any walk behind outdoor power tool, such as a tiller, trencher, brusher mower, or the like. The lawn mower 10 of FIG. 1 includes a blade housing 20 that may house a rotatable cutting blade (not shown). The cutting blade may be suspended above the ground at the end of a rotatable shaft (e.g., a drive shaft – again not shown in FIG. 1) that may be turned responsive to operation of an engine 30, such as a gasoline powered engine. Operation of the engine 30 may be initiated by a recoil starter via pulling of a recoil starter handle 32 by the operator. However, in other embodiments, the engine 30 may alternatively be started via a key, switch or other similar device. In some example embodiments, the engine may be an electric motor.

The lawn mower 10 may include a mobility assembly on which a substantial portion of the weight of the lawn mower 10 may rest, when the lawn mower 10 is stationary. The

mobility assembly may also provide for movement of the lawn mower 10. In some cases, the mobility assembly may be driven via power from the engine 30 that may be selectively provided to either or both of front wheels 40 and back wheels 42, which make up the mobility assembly. However, in some cases, the mobility assembly may simply provide for mobility of the lawn mower 10 responsive to pushing by the operator if, for example, drive power is not being provided to both the front wheels 40 and the back wheels 42. In other words, for example, the mobility assembly may be an active or passive provider of mobility for the lawn mower 10.

In some examples, the front wheels 40 and/or the back wheels 42 may be adjustable in their respective heights. Adjusting the height of the front wheels 40 and/or the back wheels 42 may be employed in order to provide a level cut and/or to adjust the height of the cutting blade. In some embodiments, a local wheel height adjuster 44 may be provided at the front wheels 40 and/or the back wheels 42. However, in other embodiments, remote wheel height adjustment may also or alternatively be possible.

Rotation of the cutting blade may generate grass clippings, and/or other debris that may be ejected from the blade housing 20. In some cases, the clippings/debris may be ejected from a side or rear of the blade housing 20. When rear discharge is employed, many such lawn mowers may employ a bagging attachment 50 to collect discharged clippings/debris. However, bagging attachments may also be used for side discharge models in some cases. The bagging attachment 50 may be removable to enable the operator to empty the bagging attachment 50.

In an example embodiment, the lawn mower 10 may further include a handle assembly. The handle assembly of FIG. 1 may include two handle members 60 that extend generally rearward and upward from opposing sides of a rear portion of the blade housing 20. The handle members 60 may be substantially parallel to each other and may be connected to each other at their distal ends via a cross bar 62. The handle members 60 may be adjustable in length or may be foldable to reduce the amount of space that the lawn mower 10 consumes when stored or shipped.

In some embodiments, various controls may be provided proximate to the cross bar 62 and/or one or more of the handle members 60. For example, the pictured embodiment shows a drive control assembly 100. The drive control assembly 100 may include a presence bar 116. When the presence bar 116 is actuated, power may be enabled to be delivered to either or both of the front wheels 40 and the back wheels 42. The drive control assembly 100 may include an actuation handle 102 configured to rotate toward the crossbar 62 to engage one or

more drive transmissions 130 (shown in Figure 1B) which are operably coupled to the front wheels 40, back wheels 42, or both sets of wheels. The actuation handle 102 may be released to the staring position, by rotating the actuation handle toward the operator, disengaging the drive transmission 130. In some embodiments a throttle control may be provided to increase or decrease the speed of the engine 30. The drive control assembly 100 is discussed in further detail in Figures 1B-4.

FIG. 1A Illustrates a block diagram of the of the drive control assembly 100. The drive control assembly 100, may include the actuation handle 102, the drive transmission 130, and a transmission linkage 104. The actuation handle may be a handle bar or grip which the operator may push in the drive direction of the walk behind outdoor power tool10. In an example embodiment the actuation handle may be operably coupled to at least one end of a pivot rod 120, which is operably coupled parallel to the cross bar 62. The actuation handle or handles 102 may rotate about a center axis of the pivot rod 120. In another embodiment the actuation handle(s) 102 and/or pivot rod 120 may be operably coupled to the crossbar 62 at a substantially center position, perpendicular to the cross bar or collinear to the cross bar.

The pivot rod 120 may be operably coupled to a transmission linkage mount 106. The transmission linkage mount 106 may be within a transmission linkage housing 112. The transmission linkage mount 106 may be a portion of the pivot rod 120 or a separate component. The transmission linkage mount may include a linkage aperture 110 configured to receive a linkage connector 108. The linkage aperture may be a recess in the pivot rod 120 or transmission linkage mount 106, configured to receive and capture the linkage connector 108, such as an end nipple, of the transmission linkage 104. In an example embodiment, the linkage aperture 110 may include a retention screw configured to receive, around or through, a linkage connector 108, such as a termination end of a cable wire, of the transmission linkage 104.

The transmission linkage mount may be configured to cause tension to be applied to the transmission linkage 104 and to cause the tension linkage 104 to travel toward the transmission linkage mount, when rotated, to a "tension" position. The travel of the transmission linkage 104 may cause engagement of the drive transmission 130. Similarly, the return of the transmission linkage 108 to a "slack" position may disengage the drive transmission 130. Engagement of the drive transmission 130 may cause the drive transmission 130 to provide power to the front wheels, 40, the rear wheels 42, or both sets of wheels. In some example embodiments, the drive transmission 130 may be normally engaged, e.g. the drive transmission 130 is engaged in a first position, in which case the

operation of the transmission linkage 104 may be reversed, e.g. the drive transmission 130 is disengaged by moving the actuation handle 102 to the second position.

In operation, the actuation handle 102 may be moved from a first position to a second position, rotating about the axis of the pivot rod 120. The pivot rod 120 rotates with the actuation handle and, in turn, rotates a transmission linkage mount 106. Rotation of the transmission linkage mount 106 puts tension on the transmission linkage 104 causing the transmission linkage 14 to move to a tension position or tension state. The movement of the transmission linkage 104 to the tension state causes the drive transmission 130 to engage and provide power to the wheels 40,42; causing the walk behind outdoor power tool 10 to move in a drive direction.

In an instance in which the actuation handle 102 is moved, e.g. returned to the first position, e.g. toward the operator, The actuation handle 102 cause the pivot rod 120 to rotate, with the rotation of the actuation handle, which may in turn, cause the transmission linkage mount to rotate. Rotation of the transmission mount may cause the transmission linkage 104 to return to slack position causing disengagement of the drive transmission 130. Disengagement of the drive transmission 130 may stop power supplied to the wheels 40, 42. The drive transmission 130 may disengage during at least a portion of the travel of the transmission linkage 104, transmission linkage mount 106, pivot rod 120, and actuation handle 102, while the walk behind outdoor power tool 10 continues in the drive direction. The gradual disengagement of the drive transmission 130, while the walk behind outdoor power tool 10 is moving in the drive direction, allows for speed variability and prevents back drive.

In an example embodiment, the drive transmission 130 may be a variable speed transmission. The variable speed transmission may adjust transmission speed proportionally or substantially proportional to the position of the actuation handle 102. In an example embodiment, as the actuation handle 102 is moved from the first position to the second position the variable speed transmission may be engaged and increase speed proportionally to the relative position of the actuation handle between the first and second position. Similarly, as the actuation handle 102 is moved from the second position to the first position, the variable speed transmission may reduce speed proportional to the position of the actuation handle 102, until the variable speed transmission is disengaged in the first position.

In another example embodiment, the drive transmission 130 may be embodied as a fixed speed transmission. The fixed speed transmission may allow for transmission belt slip for variability speed. Similar to the variable speed transmission discussed above, the fixed

speed transmission may increase or decrease speed proportional to the movement of the actuation handle 102 from the first to second position or second position to the first position.

Additionally or alternatively, the drive control assembly 100 may include a presence lever 116. The presence lever 116 may be a palm press lever, a hand lever, such as those used in bicycle brakes, a thumb lever, or the like. The presence lever 116 may have an engaged position, e.g. depressed or otherwise actuated, and a disengaged position, e.g. not actuated. The presence lever 116 may prevent operation of the walk behind outdoor power tool 10 in an instance in which the presence lever is in the disengaged position. Operation of the walk behind outdoor power tool 10 may be permissive in an instance in which the presence lever 116 is in the engaged position.

Operation of the walk behind outdoor power tool 10 may include operation or starting of the engine 30 or engagement of the drive transmission 130. The presence lever 116 may be operably coupled to the transmission linkage mount 106, the engine 30, pivot rod 120, or the like, via the presence linkage 118. The presence linkage 118 may operate a locking pin (not shown) to prevent or allow rotation of the transmission linkage mount 106, pivot rod or the like, thereby preventing engagement of the drive transmission 130. The presence linkage 118 may operate a throttle, fuel valve, eclectic switch, or the like, associated with the engine 30 to prevent or allow operation of the engine.

Additionally or alternatively, the drive control assembly 100, may also include a throttle control 122. The throttle control 122 may be a lever, slider, dial or the like. The throttle control 122 may be operably connected to the engine, for example to the engine throttle, to control the engine operation speed.

Additionally or alternatively, the drive control assembly 100 may include a return spring 126. The return spring 126 may be operably coupled to the pivot arm 120 and the transmission linkage housing 112 and/or cross bar 62. The return spring 126 may bias the actuation handle 102 toward the first position.

FIG. 1B -1E illustrate actuation of an actuation handle in example embodiments. FIG. 1B depicts a actuation handle 102 operably coupled to a pivot rod 120. The pivot rod is operably coupled parallel with the cross bar 62. The actuation handle may be moved from a first position to a second position, in direction D1 toward and substantially below the cross bar 62. Although, the actuation handle depicted is mounted substantially below the cross bar, the actuation handle could be mounted substantially above the cross bar 62. In an instance in which the actuation handle 102 is mounted substantially above the cross bar, the movement of the actuation handle 102 from the first to the second position may be toward and

substantially above the cross bar 62. The force applied in direction D1 may be assistive to the drive of the walk behind outdoor power tool 10.

FIG. 1C illustrates an actuation handle configuration substantially similar to the actuation handle of FIG 1B, in which the pivot rod 120 is collinear with the crossbar 62. In an example the pivot rod may rotate within the cross bar 62.

FIG. 1D illustrates an actuation handle 102 pair operably coupled to a pivot rod 120. One or both of the actuation handles may be utilized for engagement of the drive transmission. The actuation handle 102 may rotate from a first position to a second position in the direction D2. In this example the actuation handle moves from approximately 30 degrees from parallel to parallel with the cross bar 62. The force applied in direction D2 may be assistive to the drive direction of the walk behind outdoor power tool 10. The force applied in direction D2 may be assistive to the drive direction of the walk behind outdoor power tool 10.

FIG. 1E illustrates an actuation handle 102 operably coupled to the pivot shaft 120, via a thrust rod 121. The actuation handle 102 may be parallel to the cross bar 62. The pivot rod is operably coupled to the cross bar 62. The actuation handle 102 may be moved from a first position to a second position in direction substantially perpendicular to the cross bar 62. The force applied in direction D3 may be assistive to the drive direction of the walk behind outdoor power tool 10.

FIGS. 2-4 illustrate views of a drive control assembly actuation housing according to example embodiments. FIG. 2 depicts a view of the internal portions of the transmission linkage housing 112. The transmission linkage housing 112 may include mounting brackets to couple the drive control assembly to the cross bar 62. The pivot rod 120 rotatably penetrates either side of the transmission linkage housing 112. The pivot rod includes a transmission linkage mount 106, e.g. a raised cylindrical collar, substantially centered in the transmission linkage housing 112.

The transmission linkage mount 106 includes the linkage aperture 110, including a receiving and retention portion. The receiving portion of the linkage aperture 110 being wide enough to accept a end nipple, and disposed on the transmission linkage mount side wall. The retention portion of the linkage aperture 110, disposed on the face of the transmission linkage mount 106, is narrower than the receiving portion to prevent escape of an end nipple.

The transmission linkage 104 has a linkage connection 108, e.g. an end nipple retained by the linkage aperture 110. A transmission linkage 104 extends from the linkage connection 108 through the transmission linkage guide 123 of the transmission linkage

housing 112. The transmission linkage 104 extends from the transmission linkage housing to the drive transmission 130 (not Shown in FIG. 2).

FIG. 3 depicts a side view of a drive control assembly 200. The drive control assembly 200 is configured in a manner substantially similar to FIG. 1B. The drive control assembly 200 includes a transmission linkage housing 212 operably coupled to the cross bar 62 and the pivot rod 220. The pivot rod is operably coupled to the actuation handle 202 and configured to rotate in direction D1, toward and substantially below the cross bar 62. A presence lever 216, e.g. hand lever, is operably coupled to the pivot rod 220. A presence linkage 218, e.g. cable, extends from the presence lever to the engine 30. A transmission linkage 204, e.g. cable extends from the transmission linkage housing 212 to the drive transmission 130.

FIG. 4 depicts a side view of a drive control assembly 300. The drive control assembly 300 includes actuation handles 302 which extend rearward, from the walk behind outdoor power tool 10, from the ends of the pivot rod 320 on either side of the transmission linkage housing 312. A return spring 322, e.g. coil spring, is operably coupled to the pivot rod 320 and the transmission linkage housing 312. A transmission linkage 304, e.g. cable extends from the transmission linkage housing 312, past the cross bar 62, to the drive transmission 130.

Thus, according to various example embodiments, a walk behind outdoor power tool may include a mobility assembly, an engine operably coupled to the mobility assembly, a handle assembly operably coupled to the mobility assembly, and a drive control assembly operably coupled to the handle assembly. The drive control assembly may include an actuation handle operably coupled to at least one handle member, wherein the actuation handle has a first and second position, a drive transmission and a transmission linkage connected to the drive transmission end and the actuation handle at a second end. The transmission linkage may engage the drive transmission in response to the actuation handle moving to the second position and disengage the drive transmission in response to the actuation handle moving to the first position.

In some embodiments, the features described above may be augmented or modified, or additional features may be added. These augmentations, modifications and additions may be optional and may be provided in any combination. Thus, although some example modifications, augmentations and additions are listed below, it should be appreciated that any of the modifications, augmentations and additions could be implemented individually or in combination with one or more, or even all of the other modifications, augmentations and

additions that are listed. As such, for example, the walk behind outdoor power tool continues travel in a drive direction for at least a portion of the movement of the actuation handle from the second position to the first position. In some example embodiments, disengagement of the drive transmission occurs during the continued travel of the walk behind outdoor power tool. In an example embodiment, the actuation handle includes a pivot rod operably coupled to the at least one handle member and having a first and second end and a first handle connected to the first end of the pivot rod and the second handle connected to the second end of the pivot rod. In some example embodiments, the actuation handle is a push bar mechanically connected to the at least one handle member. In an example embodiment the drive control assembly further includes a presence lever having an engaged position and a disengaged position and operation of the walk behind outdoor power tool is permissive in the engaged position and operation of the walk behind outdoor power tool is prevented in the disengaged position. In some example embodiments, the presence lever is operably coupled to the actuation handle. In an example embodiment, the actuation handle including a transmission linkage mount configured to pivot or rotate in response to actuation of the actuation handle. In an example embodiment, the transmission linkage mount comprises a linkage aperture, the transmission linkage includes a linkage connector physically connected to the linkage aperture, and actuation of the transmission mount actuates the linkage aperture causing movement of the transmission linkage. In some example embodiments, the drive control assembly includes a throttle lever operably coupled to the actuation handle, wherein actuation of the throttle lever adjusts a motor operation speed. In an example embodiment, the drive control assembly also includes a return spring operably coupled to the rotatable handle and the at least one handle member. The return spring biases the rotatable handle toward the first position. In some example embodiments, the walk behind outdoor power tool is a lawn mower. In some example embodiments, a speed of the drive transmission is substantially proportional to the position of the actuation handle relative to the first and second position.

Many modifications and other embodiments of the inventions set forth herein will come to mind to one skilled in the art to which these inventions pertain having the benefit of the teachings presented in the foregoing descriptions and the associated drawings. Therefore, it is to be understood that the inventions are not to be limited to the specific embodiments disclosed and that modifications and other embodiments are intended to be included within the scope of the appended claims. Moreover, although the foregoing descriptions and the associated drawings describe exemplary embodiments in the context of certain exemplary combinations of elements and/or functions, it should be appreciated that different

combinations of elements and/or functions may be provided by alternative embodiments without departing from the scope of the appended claims. In this regard, for example, different combinations of elements and/or functions than those explicitly described above are also contemplated as may be set forth in some of the appended claims. In cases where advantages, benefits or solutions to problems are described herein, it should be appreciated that such advantages, benefits and/or solutions may be applicable to some example embodiments, but not necessarily all example embodiments. Thus, any advantages, benefits or solutions described herein should not be thought of as being critical, required or essential to all embodiments or to that which is claimed herein. Although specific terms are employed herein, they are used in a generic and descriptive sense only and not for purposes of limitation.

THAT WHICH IS CLAIMED:

1. A drive control assembly (100,200,300) for a walk behind outdoor power tool (10), the drive control assembly (100,200,300) comprising:

a rotatable actuation handle (102,202,302) configured to rotate about a handle axis perpendicular to the direction of extension of at least one handle member between a first position and second position;

a drive transmission (130); and

a transmission linkage (104, 204, 304) operably coupled to the drive transmission (130) and the rotatable actuation handle (102,202,302);

wherein the transmission linkage (104, 204, 304) engages the drive transmission (130) in response to the rotatable actuation handle (102,202,302) moving to the second position and disengages the drive transmission (130) in response to the rotatable actuation handle (102,202,302) moving to the first position.

2. The drive control assembly (100,200,300) of claim 1, wherein the walk behind outdoor power tool (10) continues travel in a drive direction for at least a portion of the movement of the rotatable actuation handle (102,202,302) from the second position to the first position.

3. The drive control assembly (100,200,300) of claim 2, wherein disengagement of the drive transmission (130) occurs during the continued travel of the walk behind outdoor power tool (10).

4. The drive control assembly (100,200,300) of any preceding claim, wherein the rotatable actuation handle (102,202,302) comprises:

a pivot rod (120, 220, 320) rotatably connected to the at least one handle member and having a first end and a second end; and

a first handle connected to the first end of the pivot rod (120, 220, 320) and the second handle connected to the second end of the pivot rod (120, 220, 320).

5. The drive control assembly (100,200,300) of any preceding claim, wherein the rotatable actuation handle (102, 202, 302) is a push bar mechanically connected to the at least one handle member.

6. The drive control assembly (100,200,300) of any preceding claim, further comprising:

a presence lever (116, 216) having an engaged position and a disengaged position,

wherein operation of the walk behind outdoor power tool (10) is permissive in the engaged position and operation of the walk behind outdoor power tool (10) is prevented in the disengaged position.

7. The drive control assembly (100,200,300) of claim 6, wherein the presence lever (116, 216) is operably coupled to the rotatable actuation handle (102,202,302).

8. The drive control assembly (100,200,300) of any preceding claim, wherein the rotatable actuation handle (102,202,302) comprises a transmission linkage mount (106) configured to rotate with the rotatable actuation handle (102,202,302).

9. The drive control assembly (100,200,300) of claim 8, wherein the transmission linkage mount (106) comprises a linkage aperture (110),

wherein the transmission linkage (104, 204, 304) comprises a linkage connector (108) physically connected to the linkage aperture (110), and

wherein rotation of the transmission linkage mount (106) rotates the linkage aperture (110) causing movement of the transmission linkage (104, 204, 304).

10. The drive control assembly (100,200,300) of any preceding claim, further comprising:

a throttle lever (122) operably coupled to the rotatable actuation handle (102,202,302), wherein actuation of the throttle lever (122) adjusts a motor operation speed.

11. The drive control assembly (100,200,300) of claim 1 further comprising:

a return spring (126, 322) operably coupled to the rotatable actuation handle (102, 202, 302) and the at least one handle member;

wherein the return spring (126, 322) biases the rotatable actuation handle (102, 202, 302) toward the first position.

12. The drive control assembly (100,200,300) of any preceding claim, wherein the

walk behind outdoor power tool (10) is a lawn mower.

13. The drive control assembly (100,200,300) of any preceding claim, wherein a speed of the drive transmission (130) is substantially proportional to a position of the rotatable actuation handle (102,202,302) relative to the first and second positions.

14. A walk behind outdoor power tool (10) comprising:

a mobility assembly;

an engine operably coupled to the mobility assembly;

a handle assembly operably coupled to the mobility assembly; and

a drive control assembly (100,200,300) operably coupled to the handle assembly, the drive control assembly (100,200,300) comprising:

an actuation handle (102,202,302) operably coupled to at least one handle member, wherein the actuation handle (102,202,302) has a first position and a second position;

a drive transmission (130); and

a transmission linkage (104, 204, 304) connected to the drive transmission (130) and the actuation handle (102,202,302);

wherein the transmission linkage (104, 204, 304) engages the drive transmission (130) in response to the actuation handle (102,202,302) moving to the second position and disengages the drive transmission (130) in response to the actuation handle (102,202,302) moving to the first position.

15. The walk behind outdoor power tool (10) of claim 14, wherein the walk behind outdoor power tool (10) continues travel in a drive direction for at least a portion of the movement of the actuation handle (102,202,302) from the second position to the first position.

16. The walk behind outdoor power tool (10) of claim 15, wherein disengagement of the drive transmission (130) occurs during the continued travel of the walk behind outdoor power tool (10).

17. The walk behind outdoor power tool (10) of any of claims 14-16, wherein the actuation handle (102,202,302) comprises:

a pivot rod (120, 220, 320) operably coupled to the at least one handle member and having a first end and a second end; and

a first handle connected to the first end of the pivot rod (120, 220, 320) and the second handle connected to the second end of the pivot rod (120, 220, 320).

18. The walk behind outdoor power tool (10) of any of claims 14-17, wherein the actuation handle (102,202,302) is a push bar mechanically connected to the at least one handle member.

19. The walk behind outdoor power tool (10) of any of claims 14-18, wherein the drive control assembly (100,200,300) further comprises:

a presence lever (116, 216) having an engaged position and a disengaged position,

wherein operation of the walk behind outdoor power tool (10) is permissive in the engaged position and operation of the walk behind outdoor power tool (10) is prevented in the disengaged position.

20. The walk behind outdoor power tool (10) of claim 19, wherein the presence lever (116, 216) is operably coupled to the actuation handle (102,202,302).

21. The walk behind outdoor power tool (10) of any of claims 14-20, wherein the actuation handle (102,202,302) comprises a transmission linkage mount (106) configured to pivot or rotate in response to actuation of the actuation handle (102,202,302).

22. The walk behind outdoor power tool (10) of claim 21, wherein the transmission linkage mount (106) comprises a linkage aperture (110),

wherein the transmission linkage (104, 204, 304) comprises a linkage connector (108) physically connected to the linkage aperture (110), and

wherein actuation of the transmission linkage mount (106) actuates the linkage aperture (110) causing movement of the transmission linkage (104, 204, 304).

23. The walk behind outdoor power tool (10) of any of claims 14-22, wherein the drive control assembly (100,200,300) further comprises:

a throttle lever (122) operably coupled to the actuation handle (102,202,302), wherein actuation of the throttle lever (122) adjusts a motor operation speed.

24. The walk behind outdoor power tool (10) of any of claims 14-23, wherein the drive control assembly (100,200,300) further comprises:

a return spring (126, 322) operably coupled to the actuation handle (102,202,302) and the at least one handle member;

wherein the return spring (126, 322) biases the actuation handle (102,202,302) toward the first position.

25. The walk behind outdoor power tool (10) of any of claims 14-24, wherein the walk behind outdoor power tool (10) is a lawn mower.

26. The walk behind outdoor power tool (10) of any of claims 14-25, wherein a speed of the drive transmission (130) is substantially proportional to a position of the actuation handle (102,202,302) relative to the first and second position.

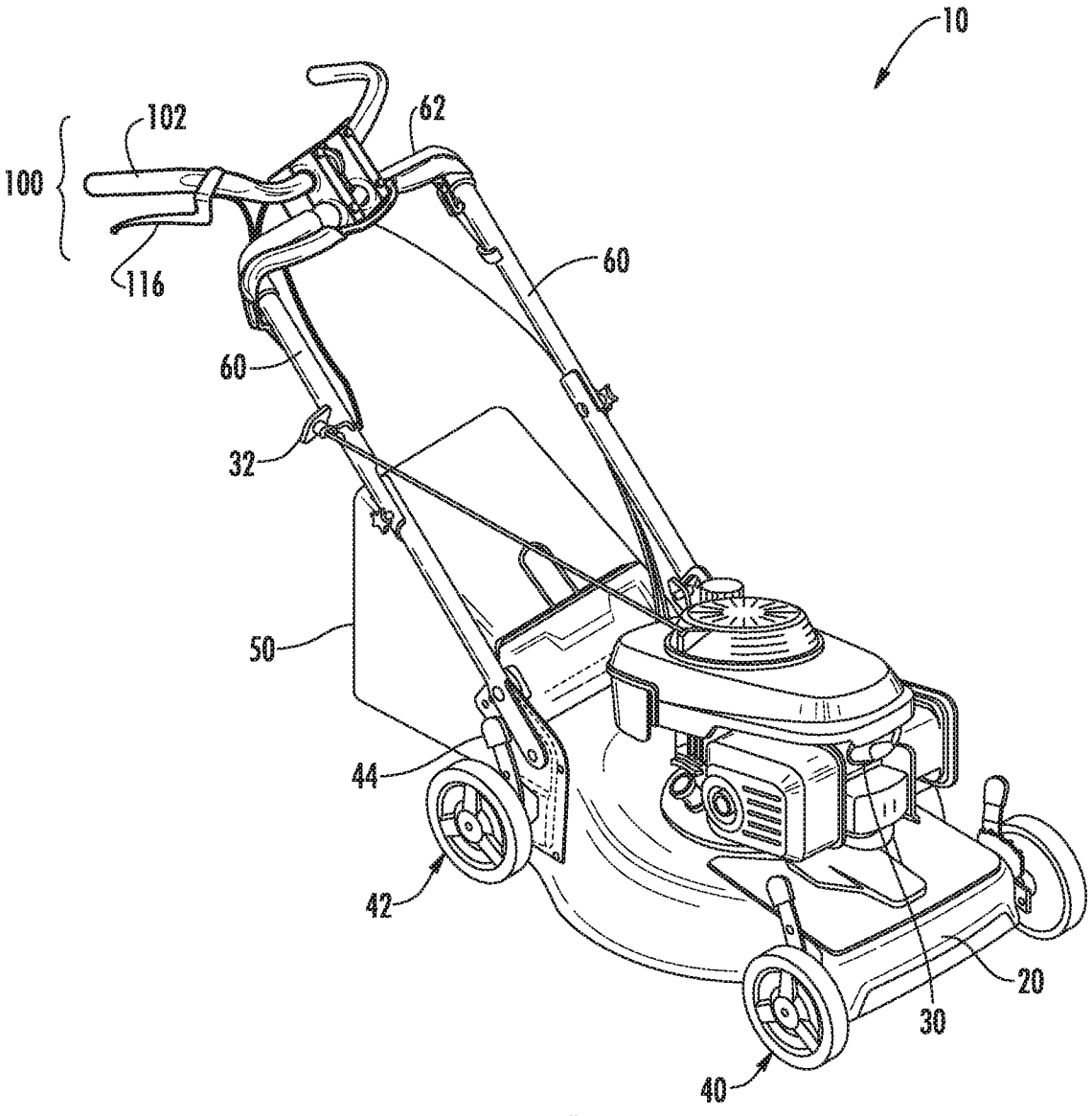

FIG. 1

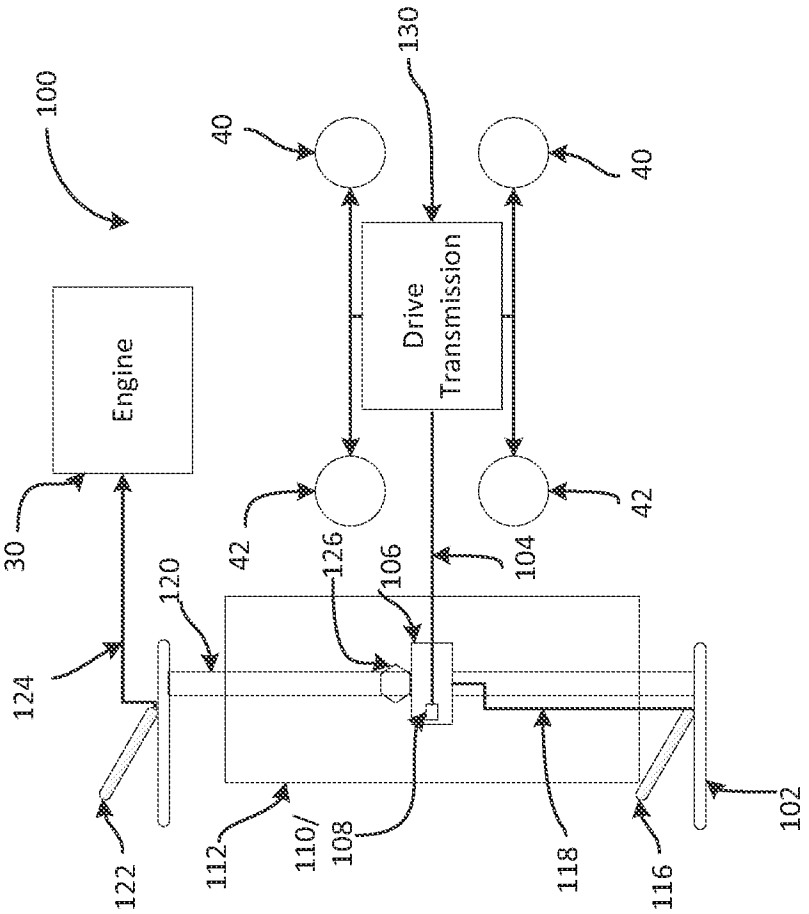
100
130
40
40
Drive Transmission
Engine
30
42
42
126
106
104
120
124
122
112
110/
108
118
116
102

FIG. 1A

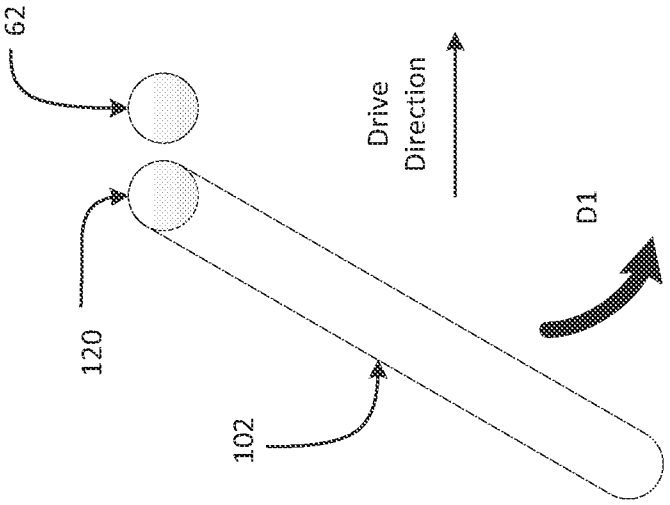

FIG. 1B

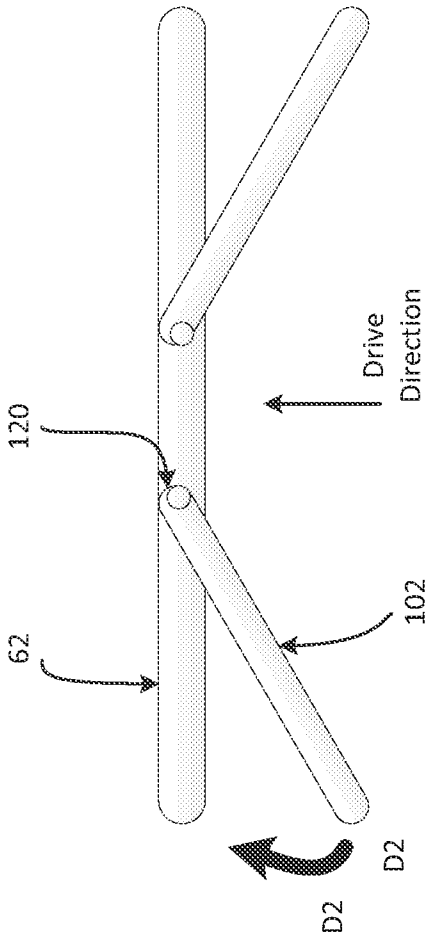

FIG. 1D

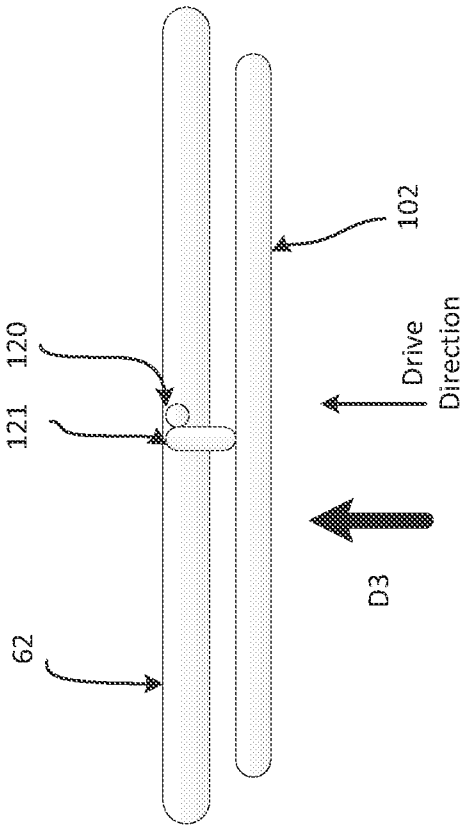

FIG. 1E

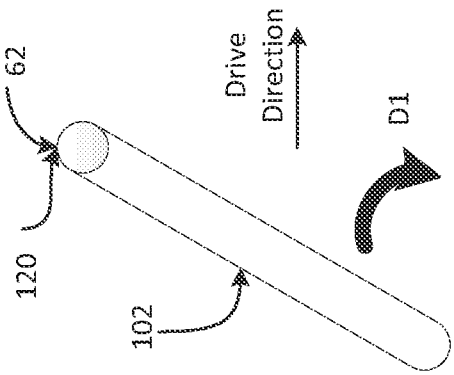

FIG. 1C

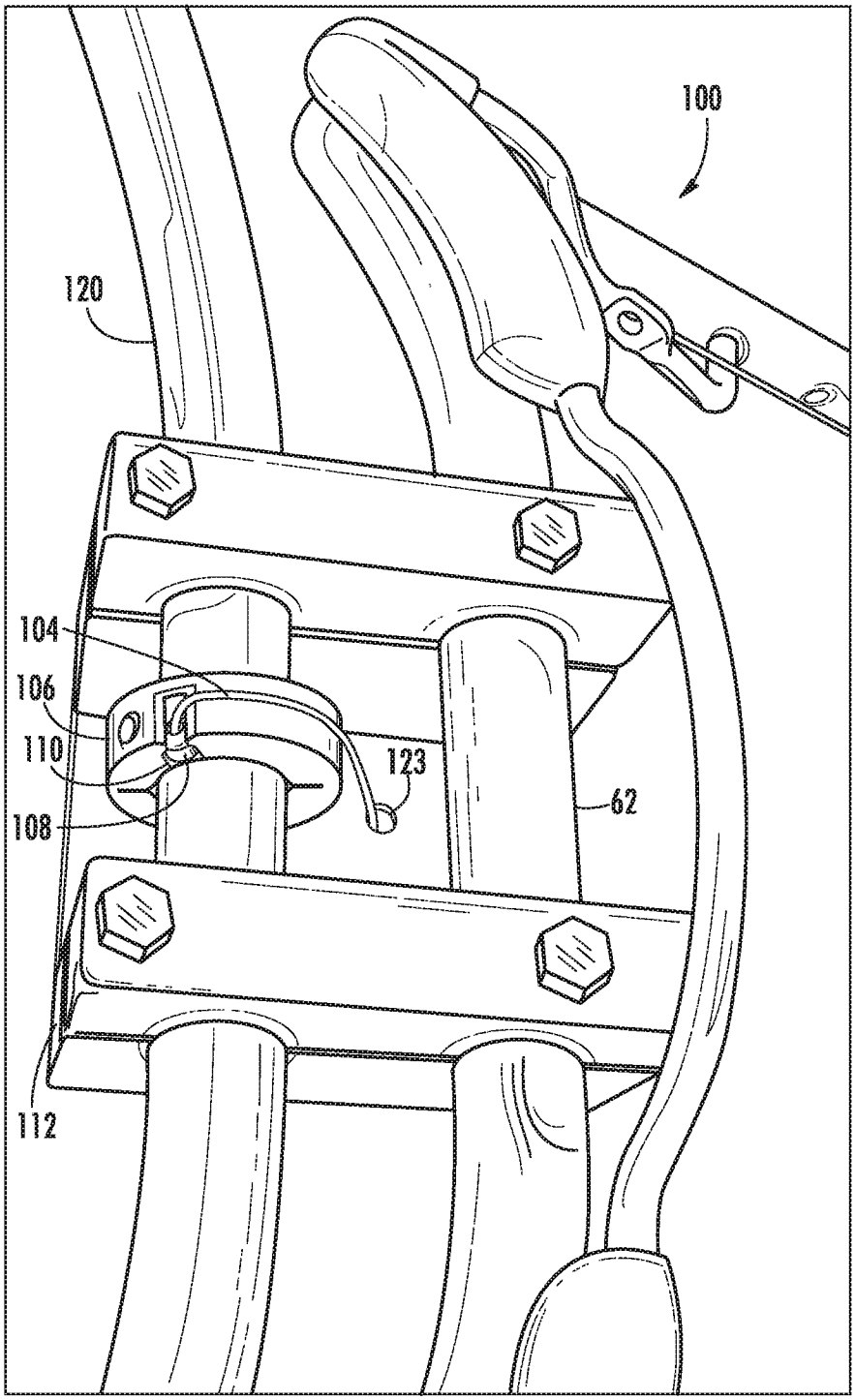

FIG. 2

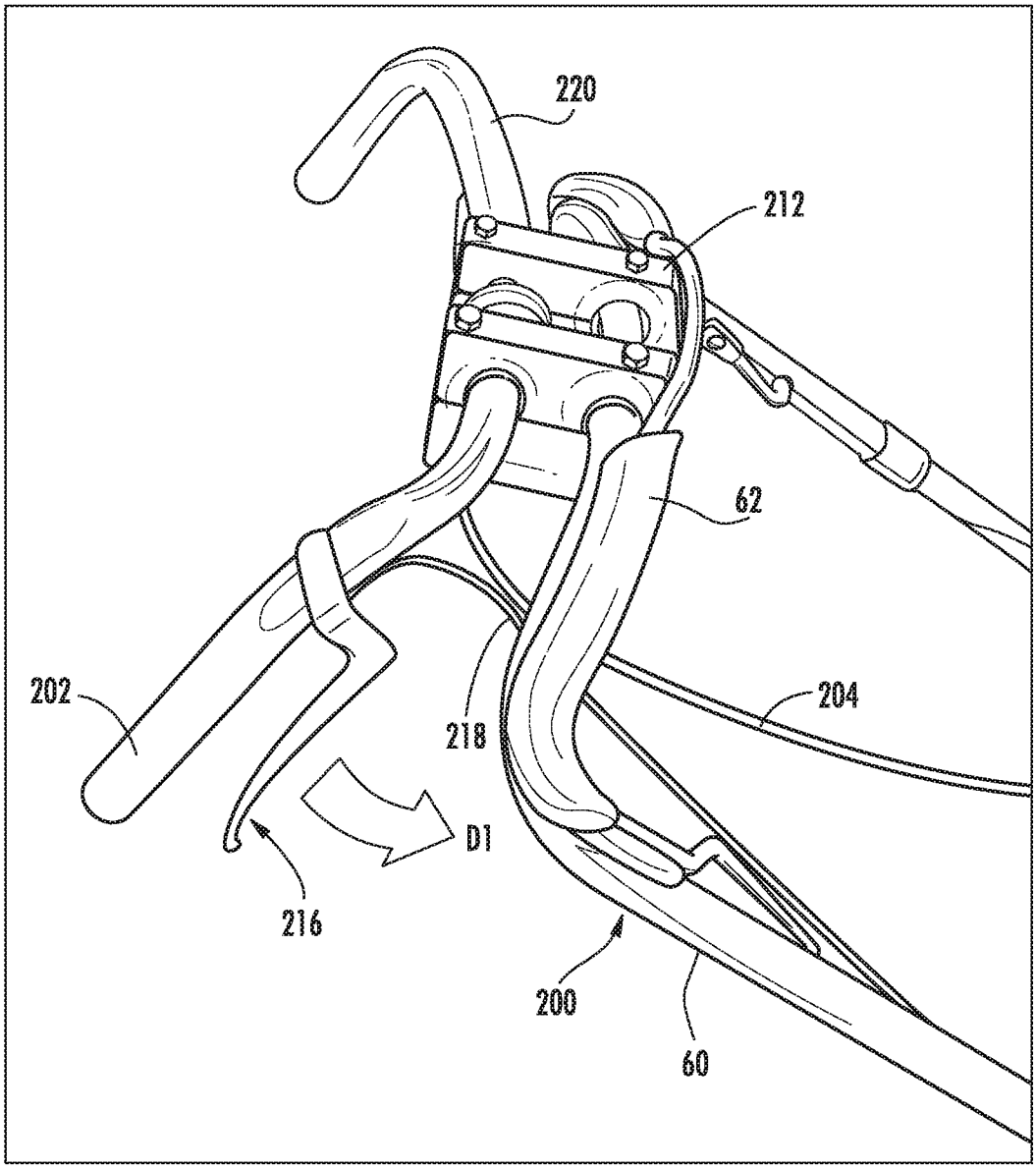

FIG. 3

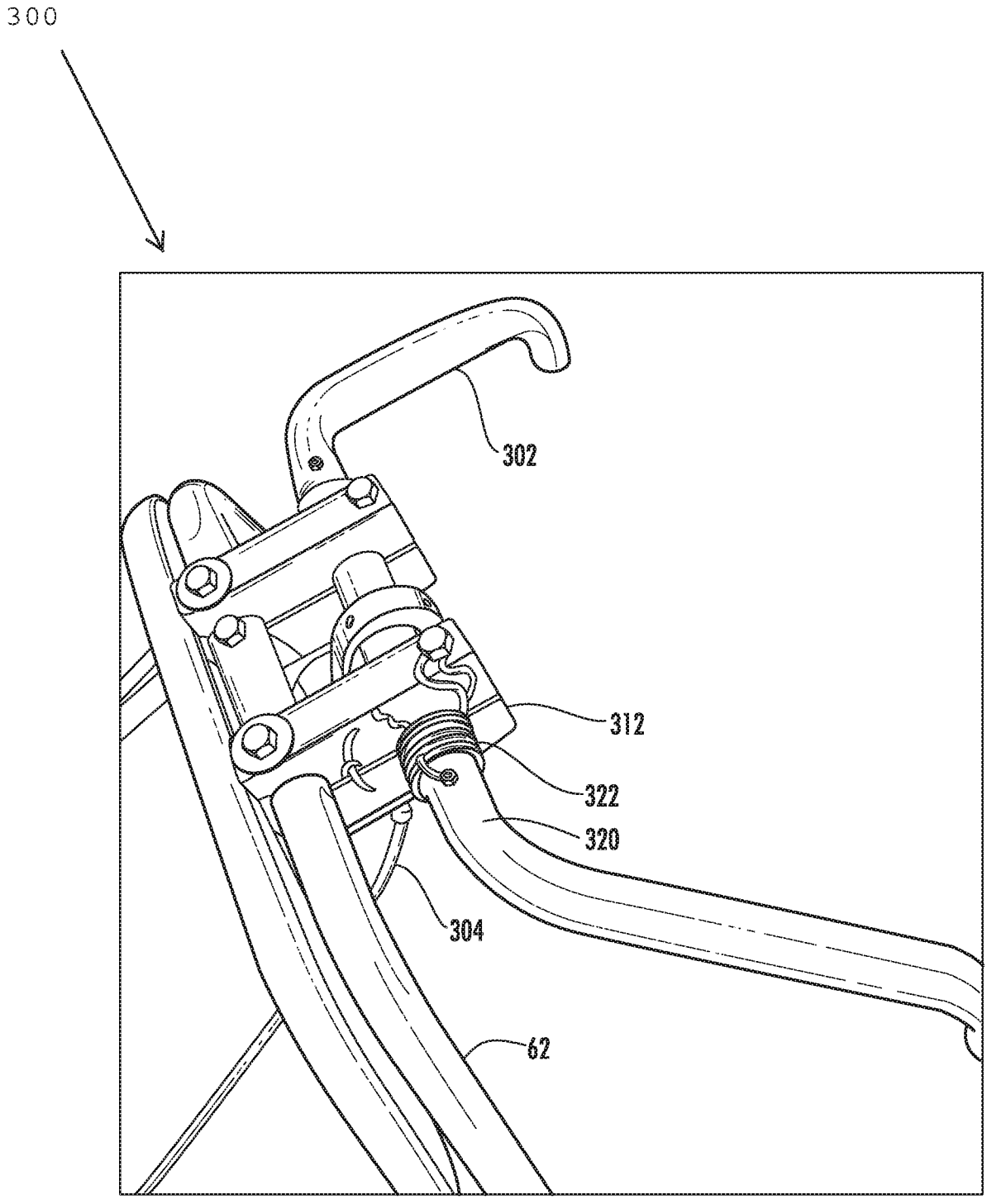

FIG. 4

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2016/053755

A. CLASSIFICATION OF SUBJECT MATTER
INV. A01D34/47 A01D34/68
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A01D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2002/153179 A1 (KOBAYASHI TAKAO [JP] ET AL) 24 October 2002 (2002-10-24) abstract; figures 1-10 [0035]; [0044]-[0049]; [0065]-[0067] -----	1-3, 5-16, 18-26
X	US 2015/135670 A1 (KASKAWITZ SCOTT [US] ET AL) 21 May 2015 (2015-05-21) paragraph [0017] - paragraph [0026]; figures 1-4 ----- -/--	1-5,8,9, 12-18, 21,22, 25,26

[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

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"O" document referring to an oral disclosure, use, exhibition or other means

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"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
29 September 2016	17/10/2016

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Sprenger, Lisa

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2016/053755

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	FR 1 408 403 A (HOOVER LTD) 13 August 1965 (1965-08-13) page 5, column 1, paragraph 3 - page 6, column 1, paragraph 4; figures 12, 13	1-5,8,9, 12-18, 21,22, 25,26
A	AU 2012 333 044 A1 (HELIN PHILIP [US] ET AL) 15 May 2014 (2014-05-15) abstract; figures 1-4, 13A [0003]; [0036]-[0039]; [0063]	1-26
A	FR 2 586 161 A1 (HONDA MOTOR CO LTD) 20 February 1987 (1987-02-20) page 4, line 1 - page 6, line 33; figures 1-13	1-26

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