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(71) Applicant *(for all designated States except US)*: **ANDERSSON, Jonas** [SE/SE]; HUSQVARNA AB, SE-561 82 Huskvarna (SE).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **JOHANSSON, Andreas** [SE/SE]; Bodekullsgatan 33B, S-214 40 Malmö (SE). **LANDBERG, Gustav** [SE/SE]; Mellangatan 20A, S-554 51 Jönköping (SE). **MEHRA, Rajinder** [SE/SE]; Tidaholmsplan 21, S-121 48 Johanneshov (SE). **CARLSSON, Daniel** [SE/SE]; Gelbgjutargatan 13, S-553 23 Jönköping (SE).

(74) Agent: **ANDERSSON, Jonas**; Husqvarna AB, Intellectual Property Dept/EM-LPH, S-SE-561 82 Huskvarna (SE).

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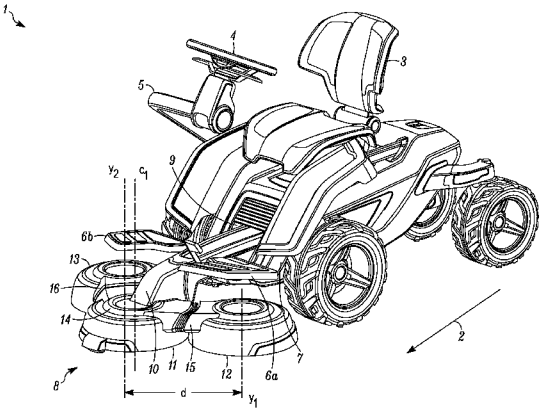

FIG. 1

(57) **Abstract**: The invention relates to a lawn mower (1); which has cutting width adjustment mechanism, cutter housings articulating mechanism and which provides convenient servicing and storage positions. The lawn mower (1) comprises a seat (3) defining an operator position, a front mounted cutting deck (8), and at least a first cutter bar enclosed in a first cutter housing (12) rotatable about a first vertical axle (Yl) and a second cutter bar enclosed in a second cutter housing (13) rotatable about a second vertical axle (Y2), a hinge mechanism for connecting footplates (6a-6b) to the lawn mower (1), a pivot support arm (5) for connecting a steering wheel (4) to the lawn mower (1), a movable arm (10) for lifting the lawn mower (1) to an upright position, the first and second axles (Yl, Y2) being spaced from each other by a transversal distance (d), wherein the transversal distance (d) between the axles (Yl, Y2) can be adjusted to increase or decrease. Moreover, the cutter housings (12, 13) can change an angle and a height with respect to a transverse centre axis (C2) of a centre cutter housing (11). Further, the footplates (6a- 6b) can fold up towards the lawn mower (1) and the steering wheel (4) can also rotate towards the seat (3) of the lawn mower (1), to allow the movable arm (10) to lift the cutting deck (B) to an upright position.

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LAWN MOWER

Technical Field

The present invention relates to lawn mowers. More particularly, it relates to cutting width adjustment, articulation and service, maintenance, and storage features of the cutting deck of a lawn mower.

Background

Lawn mowers utilize rapidly rotating blades for cutting vegetation or grass to an even height. The blades are enclosed in a housing, which forms a part of a cutting deck assembly of the lawn mower. The cutting deck assembly can be front-mounted, rear-mounted, or mid-mounted with respect to the main lawn mower body. Front-mounted mowers are usually preferred for improved stability, maneuverability, and mowing performance.

However, lawn mowers are at times unsuited for use on severe terrain, including hills, undulations, highly sloped regions, and other irregular areas. Lawn mowers with rigid and/or fixed cutting decks are unsuitable for mowing such terrain and may lead to scalping, skipping, and streaking of grass. The cutter blades in a fixed cutting deck are unable to conform to the terrain beneath them. Consequently, small bumps or upwardly sloping regions that pass underneath the fixed cutting deck may be scalped while depressions or downwardly sloping regions may be undercut or entirely missed.

Traditionally, the aforementioned disadvantages of fixed cutting deck mowers are addressed by segmenting the relatively wide fixed cutting deck into a plurality of narrower cutter bars within the deck. Each cutter bar may carry one or more rotary cutter blades. For example, U.S. Patent 7,089,722 discloses a flexible mechanism that interconnects the separate cutter bars with each other, enabling individual cutter bars to follow more closely the terrain beneath them. However, in this solution, the individual cutter bars are not able to change their height and/or orientation independent of each other in order to follow the ground contour closely. This again leads to an uneven cut on rough or undulating terrain especially where the height of the ground varies across the breadth of the mower.

Various known solutions disclose articulating cutting decks for mowing undulating terrain. However, such lawn mowers have a fixed cutting width and are inconvenient for mowing lawns with obstructions and narrow passages. Some mowers have side cutting decks that can be raised vertically and then folded to a transport position to change the cutting width or to move through confined passageways. However, the side cutting decks are inactive in the raised position, which results in redundancy and reduced flexibility.

Other known solutions include triplex trim mowers. Triplex trim mowers display variable cutting width for negotiating variable terrain. For example, U.S. Patent 6,351,929 teaches laterally offset side cutting decks in a proposed triplex system for mowing around obstacles. However, such offset systems offer limited flexibility because the cutting width remains constant. Further, U.S. Patent 7,437,864 discloses triplex system with variable cutting widths requiring an elaborate mechanism as both the longitudinal and lateral distances between the multiple individual cutting decks have to be changed. Furthermore, such mowers offer limited flexibility over undulating terrain because of the absence of angle or height adjustment means for individual cutting decks.

Moreover, front-mounted cutting deck assemblies require regular servicing and maintenance for removing the vegetation accumulated during the cutting process, and for cleaning and sharpening of the cutter blades. However, the underside of the cutting deck assembly is inaccessible for servicing in the operational position. The additional length of the lawn mower due to the front-mounted cutting deck assembly also poses a problem during storage in confined spaces. To solve the aforementioned problems, a tilting cutting deck assembly is usually provided for better access to the underside and for taking up less space during storage.

Various tilting deck systems have been proposed. In some proposed tilting deck systems, the cutting deck assembly needs to be manually disconnected from the main lawn mower body before it can be raised to an upright position. This results in a time consuming and tedious process for the operator. In related art, the cutting deck assembly is usually raised using an elaborate linkage mechanism, which results in an anti-clockwise rotation of the cutting deck. Since, the cutting deck in these solutions are not lifted to an upright position, auxiliary wheels are needed to support the cutting

deck assembly during the tilting procedure and also in the raised position.

In available tilting deck systems, the components of the main lawn mower body such as the footplates and the steering wheel hinder the movement of the cutting deck to a completely upright position, thereby not resulting in a fully compact configuration.

Therefore, there is a need for an improved flexible cutting deck system for efficiently mowing rough terrain with obstacles and narrow passageways. Moreover, there is a need for an improved lawn mower system for providing a cutting deck position for easy serviceability and compactness for storage.

Summary

In view of the above, it is an objective to solve or at least reduce the problems discussed above. In particular, an objective is to provide a lawn mower that solves the problem of maneuverability around obstacles and passage through narrow regions.

This is achieved with a variable cutting width mechanism according to the preamble of claim 1, in which a transversal distance (d) between a first vertical axle and a second vertical axle can be adjusted to increase or decrease by means of a control reachable from the operator position. The first vertical axle and the second vertical axle are the vertical axis of first and second cutter bars respectively, about which the cutter bars are operable to rotate. This leads to either a retraction or extension of the first and the second cutter bars, and thus results in passing through the narrow passages and even provides fine cutting results in passages such as those between gateposts or trees.

According to claim 2, the cutting deck comprises a first cutter housing enclosing a first cutter bar, a second cutter housing enclosing a second cutter bar and a centre cutter housing enclosing a centre cutter bar. In an aspect of the invention, the housings provide a cover to protect the cutter bars from any foreign objects such as dust, stones etc which may restrict the operation of the lawn mower.

According to the claim 3, the first and the second cutter housings are connected to an upper portion of the centre cutter

housing by means of a first support arm and a second support arm respectively. The upper portion of the centre cutter housing provide an easy slide mechanism for rotating the first support arm and the second support arm and thus provides the functionality to the first and the second cutter housings to rotate about the centre axis of the centre cutter housing either in a forward direction for retraction of the cutter housings or in a opposite direction of the forward direction for extension of the cutter housings.

According to claim 4, the first cutter housing and the second cutter housing can adjust an angle or a height with respect to transverse centre axis of the centre cutter housing. In an aspect of the invention, the cutting deck can follow the contour of the ground more closely by changing the angle and the height.

According to claim 5, the cutter bars derive power from a battery operated separate individual electric motors. Thereby, and also it is possible to run one cutter bar at a time and switch off the other cutter bar at the same time. Moreover, there is no need to use a drive belt for connecting the cutter bars in the cutting deck. Another advantage is that the battery operated individual electric motor can be cost effective. However, according to claim 6, it is also possible that the cutter bars derive power from the power source of the lawn mower.

Moreover, there can be separate electric or hydraulic motors for operating the rotation of the first and second support arms on the upper portion of the centre cutter housing.

According to claim 7, the cutting deck can be raised to an upright position by means of a movable arm connected to the chassis of the lawn mower. In an aspect of the invention, the upright position of the cutting deck assists in servicing and maintenance of the cutting deck and further assists in compact storage as well.

Another objective is to provide a lawn mower, which solves the problem of maneuverability around uneven surface or undulation in the ground contour.

This is achieved with an articulating mechanism of the cutting desk according to the preamble of claim 8, in which at least one of the support arms changes an angle and a height with respect to a transverse centre axis of the centre cutter housing to follow a

contour of a ground surface. The first and the second support arms are attached to the upper portion of the centre cutter housing by a hinge mechanism and thus provides an advantage to the cutting deck to maneuver in severe terrain, including hills, undulations, highly sloped regions, and other irregular areas.

Since, the cutting deck explained in the claim 8 is a flexible cutting deck provided by the hinge mechanism, it is suitable for mowing uneven or severe terrain and does not lead to scalping, skipping, and streaking of grass. Moreover, the cutting deck conforms to the immediate terrain beneath each cutter blade provided in the cutting deck.

Further, according to the claim 9, the cutting deck comprises a distance sensor for measuring a distance between the cutting deck and the ground. In an aspect of the invention, the first cutter housing and the second cutter housing (13) can adjust the angle or the height with respect to the transverse centre axis of the centre cutter housing based on the signal received from the distance sensor. Moreover, there can be precise adjustment of the height and angle based on the signals received from the distance sensor.

According to claim 10, a cutting width of the cutting deck can be adjusted to accommodate the narrow areas such as gateposts and trees etc. Further, the cutting deck can also be raised to an upright position, according to claim 11. The upright position assists in service and maintenance of the cutting deck and further helps in compact storage of the lawn mower.

Another objective is to provide a lawn mower, which allows for convenience in serviceability and compactness in storage.

This is achieved with a tilting cutting deck mechanism according to the preamble of claim 12, in which the footplates fold up towards the lawn mower by means of the hinge mechanism and the steering wheel rotates towards the seat for the operator position by means of the pivot support arm, to allow the cutting deck to attain the upright position. The footplates are connected to a lower structure of the lawn mower to assist the feet of the operator during operation of the lawn mower. Since, the footplates are connected to the lawn mower by means of a hinge mechanism, it does not obstruct the lifting of the cutting deck. In one advantageous feature, the

cutting deck may push the footplates towards the lawn mower and there is no need of an alternate mechanical or electric means to fold up the footplates.

Further, the steering wheel also rotates towards the seat of the operator during the lifting of the cutting deck to the upright position. This feature provides an advantage that the steering wheel does not obstruct the movement of the cutting deck to attain a complete upright position. Moreover, in the upright position, the cutting deck attains a stable position by itself and does not require any locking mechanism as the centre of gravity of the cutting deck is behind the turning point of the cutting deck.

According to claim 13, the movable arm derives power from a separate electric motor. This provides the advantage of separately operating the movable arm without compromising on other operations of the lawn mower. Moreover, according to claim 14, it is also possible to utilize the power source of the lawn mower to lift the cutting deck.

According to claim 15, the seat of the operator comprises an operator presence sensor. The presence sensor is operable to send a signal based on the occupancy of the seat. In an aspect of the invention, the operator may provide an input, by means of the control panel, to raise the cutting deck to an upright position. However, the seat will only be lifted if the control panel receives a signal from the operator presence sensor that the seat is unoccupied. The control panel may actuate the movable arm to lift the cutting deck after receiving the signal from the operator presence sensor, according to the preamble of claim 16. Since, the cutting deck is not allowed to be lifted until the seat is unoccupied, accidental chances of any sudden lifting of cutting deck during operations are avoided.

Moreover, since the cutting deck can achieve an upright position, it can easily be stored in smaller place as compared to the space required when the cutting deck is in operational position. Further, it is easier to service or perform maintenance processes on the cutting deck when it is in the upright position.

Further, according to claim 17, a cutting width of the cutting deck can be adjusted to accommodate the narrow areas such as gateposts etc. Moreover, according to claim 18, the first cutter

housing and the second cutter housing can adjust an angle or a height with respect to transverse centre axis of the centre cutter housing. In an aspect of the invention, the cutting deck can follow the contour of the ground more closely by changing the angle and the height.

Brief Description of the Drawings

The invention will in the following be described in more detail with reference to the enclosed drawings, wherein:

FIG.1 shows a perspective view of a lawn mower, according to an embodiment of the present invention;

FIG. 2 shows a top view of a cutting deck in a retracted position, according to an embodiment of the present invention;

FIG. 3 shows a perspective view of the cutting deck in an articulated position, according to an embodiment of the present invention; and

FIG. 4 shows a side view of the cutting deck in an upright position, according to an embodiment of the present invention.

Description of Embodiments

The present invention will be described more fully hereinafter with reference to the accompanying drawings, in which preferred embodiments of the invention are shown. This invention may, however, be embodied in many different forms and should not be construed as limited to the embodiments set forth herein; rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art. In the drawings, like numbers refer to like elements.

FIG.1 shows a perspective view of a lawn mower 1, according to an embodiment of the present invention. In an embodiment of the present invention, the lawn mower 1 is a ride-on lawn mower 1 that moves in a forward direction 2 during operation. The lawn mower 1 comprises a seat 3 for an operator position to maneuver the lawn

mower 1. The operator may have access to an operation panel (not shown in the figure). The operation panel may include various handles, knobs, buttons etc. for controlling various functions of the lawn mower 1. The lawn mower 1 further comprises a steering wheel 4, which is connected to the lawn mower 1 by means of a pivot support arm 5. The lawn mower also comprises footplates 6a-6b, which are hinged to a lower structure 7 of the lawn mower 1. The footplates 6a-6b in the lowered position support the feet of an operator during operation of the lawn mower 1. Other components suitable for the operation of the lawn mower 1 such as various handles, knobs, pedals, and the like have been omitted for the sake of clarity. In an embodiment of the present invention, the lawn mower 1 has two electric drive motors (not shown in the figure), one in each drive wheel (front wheels) and a battery in the rear portion of the lawn mower 1. The battery is rechargeable by plug in of the lawn mower 1 via electric cord.

The lawn mower 1 further comprises a front mounted cutting deck 8. The cutting deck 8 is utilized for cutting grass or any other unwanted material in a lawn. The cutting deck 8 is connected to a chassis 9 of the lawn mower 1 by means of a movable arm 10. The term cutting deck 8 is intended to mean the whole unit, which is connected to the movable arm 10 in front of the lawn mower 1. The whole unit includes the whole casing with at least two or more cutter bars/knives, cutter housings for each of the cutter bars, pivot wheels or distance sensors included in the cutter/knives housings and/or cutting deck, cutting height adjustment mechanism and so on.

As shown in the FIG. 1, the cutting deck 8 of the present invention comprises three housings: a centre cutter housing 11 enclosing a centre cutter bar, a first cutter housing 12 enclosing a first cutter bar and a second cutter housing 13 enclosing a second cutter bar. The housings are sometimes also referred as domes or doughnuts. A person skilled in the art may acknowledge that there are no limitations on the number of housings or the cutter bars enclosed in a housing, and the case shown in the present invention is merely for illustration purposes and does not limit the scope of the invention. In an embodiment of the present invention, each of the cutter bars in centre cutter housing 11, first cutter housing 12 and the second cutter housing 13 is operated by individual electric motors. In a further embodiment of the present invention, the

individual electric motors are either battery operated or derive power from the power source operating the lawn mower 1. For the sake of clarity batteries, motors, cutter bars etc. have been omitted from the figures.

The centre cutter housing 11 is connected to the lawn mower 1 by means of the movable arm 10. Further, the first cutter housing 12 and the second cutter housing 13 are each connected to an upper portion 14 of the centre cutter housing 11 by means of a first support arm 15 and a second support arm 16 respectively. The cutter bars in the cutter housings are generally rotary cutter bars. For example, the first cutter bar in the first cutter housing 12 and the second cutter bar in the second cutter housing 13 are rotary cutter bars and are rotatable about a first vertical axle (Y1) and a second vertical axle (Y2). As shown in the FIG.1, the first vertical axle (Y1) and the second vertical axle (Y2) are spaced from each other by a transversal distance (d). The transversal distance (d) is measured in a transversal direction perpendicular to the forward direction 2 of the lawn mower. The cutting width of the cutting deck 8 is dependent on the transversal distance (d). Precisely, the cutting width is:

$$Cutting\ width = d + a/2 + a/2 = d+a,$$

where, 'a' is the length of a cutter bar.

Further, the first cutter housing 12 is operable to rotate around the centre cutter housing 11 about a central axis (C1), which is the centre vertical axis (C1) of the centre cutter housing 11. Similarly, the second cutter housing 13 is operable to rotate around the centre cutter housing 11 about the central axis (C1). Since, the first cutter housing and the second cutter housing 13 are rotatable about the centre axis (C1), the distance between the centers of the 'first cutter housing 12' and of the 'centre cutter housing 11' remains constant. Similarly, the distance between the centers of the 'second cutter housing 13; and of the 'centre cutter housing 11' remains constant. In an embodiment of the present invention, the first cutter housing 12 and the second cutter housing 13 may rotate on the upper portion 14 of the centre cutter housing 11 by means of the first support arm 15 and the second support arm 16 respectively.

In an aspect of the present invention, the operator may adjust the transversal distance (d), as per the need to retract or extend the first cutter housing 12 enclosing the first cutter bar and the second cutter housing 13 enclosing the second cutter bar. For example, in case of narrow passages such as gateposts or trees etc, the operator may decrease the transversal distance (d) by retracting either one or both of the first cutter housing 12 and the second cutter housing 13.

FIG.2 shows a top view of the cutter deck 8 in a retracted position (shown by arrows), according to an embodiment of the present invention. As shown in the FIG. 2, the transversal distance (d) is decreased to (d') due to retraction of the first cutter housing 12 and the second cutter housing 13. In an embodiment of the present invention, the transversal distance (d) is reduced to (d'), when the first cutter housing 12 and the second cutter housing 13 rotates on the upper portion 14 of the centre cutter housing 11 in the forward direction 2, by means of the first support arm 15 and the second support arm 16 respectively. In another embodiment of the present invention, the transversal distance (d) may increase on extension of the first cutter housing 12 and the second cutter housing 13 in a direction opposite to the forward direction 2 of the lawn mower 1.

In an embodiment of the present invention, the cutting deck 3 may be configured in a manner so that both the first cutter housing 12 and the second cutter housing 13 are shifted to move between a retracted position and an extended position. In this embodiment, the center cutter housing 11 may remain stationary while the first cutter housing 12 and the second cutter housing 13 move between the retracted and extended positions. In a further embodiment of the present invention, the first cutter housing 12 and the second cutter housing 13 may be selectively shifted to one or more intermediate positions between the retracted and the independent positions. Moreover, the first cutter housing 12 and the second cutter housing 13 are independently retractable and extendable.

In an embodiment of the present invention, the operator may utilize the control panel, which includes various buttons and/or knobs present in the operation panel to retract or extend the position of the cutter housings 12 and 13. In a further embodiment of the invention, the operator may manually perform the retraction or extension of the cutter housings 12 or 13 with the help of a lever or

the like. Moreover, the same controls may be used to shift both the first and the second cutter housings between the retracted and extended positions. In one embodiment of the present invention, there are separate individual electric or hydraulic motors (not shown in the figure) for rotating the first support arm 15 and the second support arm 16 on the upper portion 14 of the centre cutter housing 11.

In an embodiment of the invention, the first cutter housing 12 and the second cutter housing 13 may be shifted between the retracted and extended positions while continuing the operation of the lawn mower 1; i.e., without shutting off the operation of the cutting deck 8.

FIG. 3 shows a perspective view of the cutting deck 8 in an articulated position, according to an embodiment of the present invention. As shown in the previous FIG. 1, the first cutter housing 12 and the second cutter housing 13 are connected to the centre cutter housing 11 by means of the first support arm 15 and the second support arm 16. In an embodiment of the present invention, the first support arm 15 is hinged at the upper portion 14 of the centre cutter housing 11. Similarly, the second support arm 16 is also hinged at the upper portion 14 of the centre cutter housing 11. In an aspect of the present invention, the hinged position of the first support arm 15 and the second support arm 16 provides the functionality to the first cutter housing 12 and the second cutter housing 13 to change an angle and a height with respect to the transverse centre axis (C2) of the centre cutter housing 11 to follow the contour of the ground more closely. As shown in the FIG. 3, the first cutter housing 12 may be raised to a height 'h1' from the transverse centre axis (C2) of the centre cutter housing 11. Moreover, the first cutter housing 12 attains an angle 'Q1' to follow the contour of the ground. Similarly, the second cutter housing 13 is shown at a height of 'h2' and angle 'Q2'.

In an embodiment of the present invention, to provide a desired positioning of the first and the second cutter housings 12 and 13 relative to the ground, the first and the second cutter housings 12 and 13 each ride at least partially on wheels, which roll over the ground. Moreover, each of the first cutter housing 12 and the second cutter housing 13 is pivotally hinged at one more location on the center cutter housing 11 coaxially to the hinge location of the first

and the second support arms 15 and 16. Further, the first and the second cutter housings 12 and 13 are also supported along the ground at one point near their outer edge. The two hinge locations in addition to the support at the outer edge, form a three point support for each of the first and the second cutter housings 12 and 13. Since the three points define a plane, the first and the second cutter housings 12 and 13 are properly supported on the ground and are free to closely follow the contour of the ground, which is especially useful on uneven grounds with ridges and depressions and also on slopes.

In an embodiment of the present invention, the cutting deck 8 may have distance sensors (not shown) such as, but not limited to, lasers for measuring the distance between the cutting deck 8 and the ground. Thus, the height and the angle can be adjusted for each of the first cutter housing 12 and the second cutter housing 13 based on the readings or signals received from the distance sensors.

A person of ordinary skill in the art may acknowledge that the embodiment of articulation of the housings enclosing the cutter blades is attained without adversely affecting the cut accomplished by the first and the second cutter bars. It will be apparent that the first and the second cutter housings 12 and 13 are positioned so that there is significant overlap of cutting as the lawn mower 1 is moved in its forward direction 2. Moreover, there is also sufficient overlap of cutting to avoid gaps in the cutting when the lawn mower 1 turns in either direction.

FIG. 4 is a side view of the cutting deck 8 in an upright position, according to an embodiment of the present invention. As shown in the previous FIG.1, the first cutter housing 12 and the second cutter housing 13 and the center cutter housing 11 are connected to the chassis 9 of the lawn mower 1 by means of the movable arm 10. Moreover, the lawn mower 1 comprises footplates 6a-6b that are hinged to the lower structure 7 of the lawn mower 1. Further the lawn mower 1 comprises the steering wheel 4, which is connected to the body of the lawn mower 1, by means of a pivot support arm 5. Since, the cutting deck requires service and maintenance, it is desirable to lift the cutting deck to a position, which is easily accessible for servicing.

As shown in the FIG. 4, the movable arm 10 lifts the cutting deck 8 to an upright position. In an aspect of the present invention, when the lifting begins, the cutting deck 8 may force the hinged footplates 6a-6b to fold up by contact towards the lower structure 7 of the lawn mower 1. In an embodiment of the present invention, there may be a mechanical connection such as an arm, a rod or a rope, through which the hinged footplates 6a-6b are folded up. The cutting deck 8 may take any position between the operational position and the upright position. In an embodiment of the present invention, a mechanical lock or a latch mechanism is provided to hold the cutting deck at any position between the operating position and the upright position.

In another aspect of the present invention, to provide a complete upright position to the cutting deck 8, the steering wheel 4 also rotates away by means of the pivot support arm 5. The pivot support arm 5 makes the steering wheel 4 rotate towards the seat 3 for the operator position. As shown in the FIG.4, the steering wheel 4 moves from a position X1 to a position X2, (a ghost image is shown in the figure to depict the movement of the steering wheel 4) i.e. towards the seat 3 of the lawn mower 1, to allow the cutting deck 8 to attain the complete upright position.

In case of an upright position, no other locking mechanism is required as in this case the centre of gravity of the cutting deck 8 is located behind the turning point of the cutting deck 8. In this upright position, the cutting deck 8 can be easily cleaned, repaired, or the like. Moreover, the upright position of the cutting deck 8 also helps in convenient transport or storage, as the cutting deck 8 may take less space in an upright position as compared to an operational position or any other position intermediate between the operational position and the upright position.

In an embodiment of the present invention, there may be a separate electric motor (not shown in the FIG) to power the movable arm to lift the cutting deck 8 to an upright position. In another embodiment of the invention, the movable arm 10 may derive the power to lift the cutting deck 8 from the power source of the lawn mower 1. Also, the same controls can be used for lifting of both the cutting deck 8, folding of footplates 6a-6b and rotating the steering wheel 4 towards the seat 3.

In an embodiment of the present invention, the seat 3 for the operator position may comprise an operator presence sensor (not shown in the figure). In one aspect of the invention, the operator may provide an input to the control panel to lift the cutting deck assembly 8 to an upright position. The control panel then checks if it has received a signal from the operator presence sensor about the occupancy status of the seat 3. In case the seat 3 is unoccupied, the control panel actuates the movable arm 10 to lift the cutting deck 8 to an upright position.

In the drawings and specification, there have been disclosed preferred embodiments and examples of the invention and, although specific terms are employed, they are used in a generic and descriptive sense only and not for the purpose of limitation, the scope of the invention being set forth in the following claims.

Parts List

Lawn Mower 1

Forward direction of lawn Mower 2

Seat 3

Steering Wheel 4

Pivot support arm 5

Foot Plates 6a-6b

Lower structure 7

Cutting deck 8

Chassis 9

Movable arm 10

Central cutting bar 11

Centre axis (C1)

Transverse Centre axis (C2)

First cutting bar 12

First vertical axle (Y1)

Second cutting bar 13

Second vertical axle (Y2)

Upper portion of the centre cutting bar 14

First support arm 15

Second support arm 16

CLAIMS

1. A ride-on lawn mower (1) having forward direction (2) and a seat (3) defining an operator position, a front mounted cutting deck (8), and at least a first cutter bar and a second cutter bar for cutting grass on a lawn, the first cutter bar being arranged for rotation about a first vertical axle (Y1), the second cutter bar being arranged for rotation about a second vertical axle (Y2), said first and second axles (Y1,Y2) generally being spaced from each other by a transversal distance (d) as seen in a transversal direction perpendicular to the forward direction (2) of the lawn mower 1, **characterized in** that,
the transversal distance (d) between the axles (Y1, Y2) can be adjusted to increase or decrease by means of a control reachable from the operator position.

2. The ride on lawn mower (1) as claimed in claim 1, further comprises a first cutter housing (12) enclosing the first cutter bar, a second cutter housing (13) enclosing the second cutter bar and a centre cutter housing (11) enclosing a centre cutter bar.

3. The ride-on lawn mower (1) as claimed in claim 1 and 2, wherein the transversal distance (d) can be adjusted by rotation of the at least one of a first support arm (15) or a second support arm (16) about a centre axis (C1) of the centre cutter housing (11), said support arms (15, 16) connect the first cutter housing (12) and the second cutter housing (13) respectively to an upper portion (14) of the center cutter housing (11).

4. The ride-on lawn mower (1) as claimed in claim 2 or 3, wherein at least one of the first cutter housing (12) and the second cutter housing (13) can adjust an angle and a height with respect to a transverse centre axis (C2) of the centre cutter housing (11).

5. The ride-on lawn mower (1) as claimed in any one of the preceeding claims, wherein each of the cutter bars derives

power from a battery operated separate individual electric motors.

6. The ride-on lawn mower (1) as claimed in any one of the preceeding claims, wherein each of the cutter bars derives power from a power source of the lawn mower (1).

7. The ride-on lawn mower (1) as claimed in any one of the preceeding claims, wherein the front mounted cutting deck (8) is raisable to an upright position by means of a movable arm (10) and wherein the upright position assists in servicing and storage of the cutting deck (8).

8. A ride-on lawn mower (1) having forward direction (2) and a seat (3) defining an operator position, a front mounted cutting deck (8), and at least a first cutter bar enclosed in a first cutter housing (12) and a second cutter bar enclosed in a second cutter housing (13) for cutting grass on a lawn, the first cutter housing (12) being attached to a centre cutter housing (11) by a first support arm (15), the second cutter housing (13) being attached to the centre cutter housing (11) by a second support arm (16), said support arms (15, 16) are connected to the centre cutter housing (11) by a hinge mechanism, **characterized in** that,
at least one of the support arms (15, 16) changes an angle and a height with respect to a transverse centre axis (C2) of the centre cutter housing (11) to follow a contour of a ground surface.

9. The ride-on lawn mower (1) as claimed in claim 8, wherein the cutting deck (8) comprises a distance sensor for measuring a distance between the cutting deck (8) and the ground and wherein the first cutter housing (12) and the second cutter housing (13) can adjust the angle or the height with respect to the transverse centre axis (C2) of the centre cutter housing (11) based on a signal received from the distance sensor.

10. The ride-on lawn mower (1) as claimed in claim 8 or 9, wherein a cutting width of the cutting deck (8) can be adjusted by changing a transverse distance 'd' between vertical axles

(Y1, Y2) of the first cutter bar and a second cutter bar respectively.

11. The ride-on lawn mower (1) as claimed in any one of claim 8-10, wherein the front mounted cutting deck (8) is raisable to an upright position by means of a movable arm (10) and wherein the upright position assists in servicing and storage of the cutting deck (8).

12. A ride-on lawn mower (1) having forward direction (2) and a seat (3) defining an operator position, a front mounted cutting deck (8), a pivot support arm (5) for connecting a steering wheel (4), a hinge mechanism for connecting footplates (6a-6b) and a movable arm (10) connecting the front mounted cutting deck (8) to the lawn mower (1), said movable arm (10) lifts the lawn mower (1) to an upright position, **characterized in** that,
the footplates (6a-6b) are foldable up towards the lawn mower (1) by means of the hinge mechanism and the steering wheel (4) is rotatable towards the seat (3) by means of the pivot support arm (5), to allow the cutting deck (8) to attain an upright position.

13. The ride-on lawn mower (1) as claimed in claim 12, wherein the movable arm (10) derives power from a separate electric motor.

14. The ride-on lawn mower (1) as claimed in claim 12, wherein the movable arm (10) power derives power form a power source of the lawn mower (1).

15. The ride-on lawn mower (1) as claimed in any one of claims 12-14, where in the seat (3) defining an operator position comprises an operator presence sensor.

16. The ride-on lawn mower (1) as claimed in any one of claims 12-15, wherein the movable arm (10) lifts the cutting deck based on a signal received from the operator presence sensor.

17. The ride-on lawn mower (1) as claimed in any one of claims 12-16, wherein the cutting deck (8) comprises a centre cutter bar enclosed in a centre cutter housing (11), a first cutter bar enclosed in a first cutter housing (12) and a second cutter bar enclosed in a second cutter housing (13) and wherein the first cutter housing (12) and the second cutter housing (13) can adjust an angle and a height with respect to a transverse centre axis (C2) of the centre cutter housing (11).

18. The ride-on lawn mower (1) as claimed in any one of claims 12-17, wherein a cutting width of the cutting deck (8) can be adjusted by changing a transverse distance d between vertical axles (Y1, Y2) of the first cutter bar and a second cutter bar respectively.

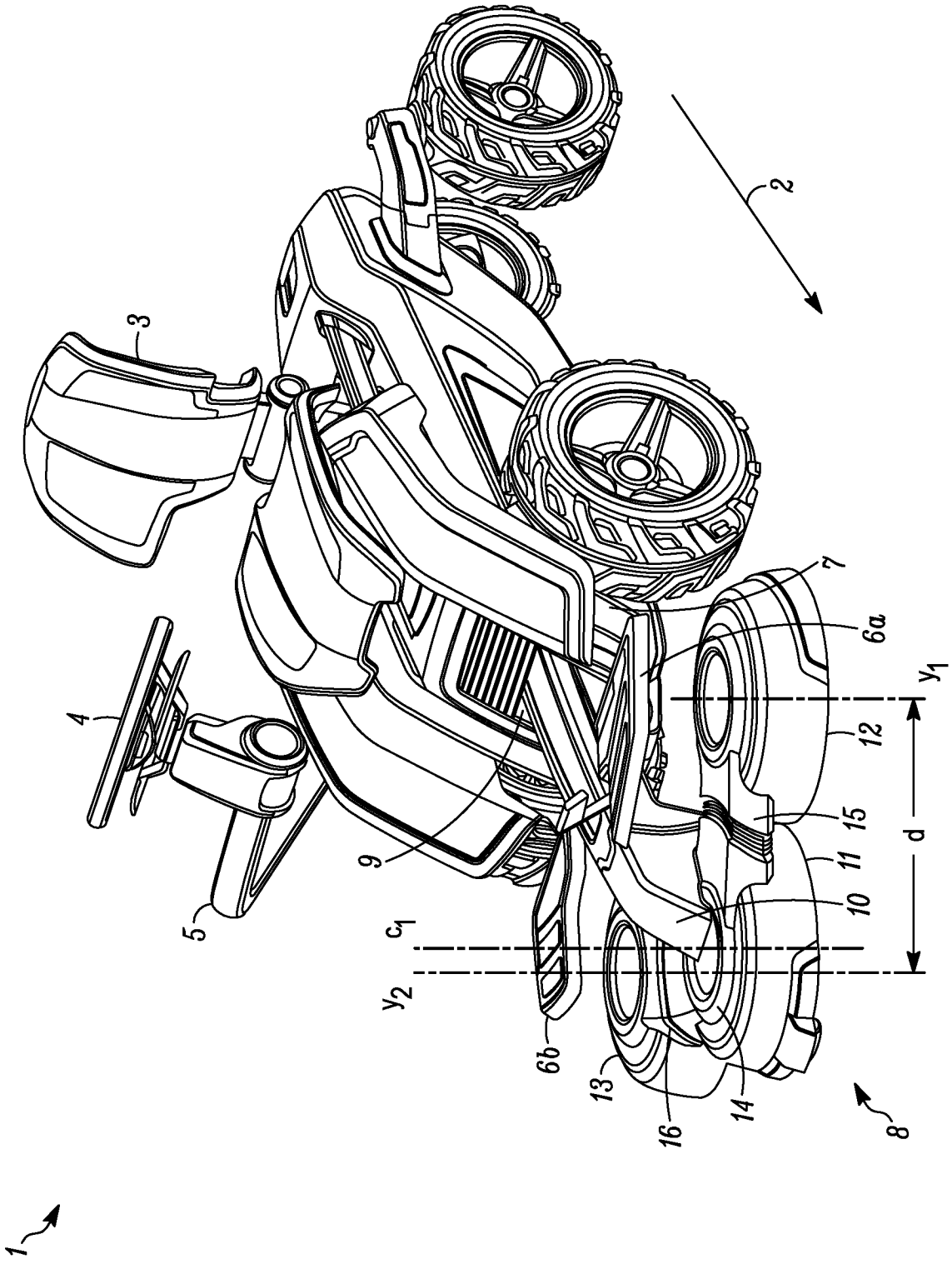

FIG. 1

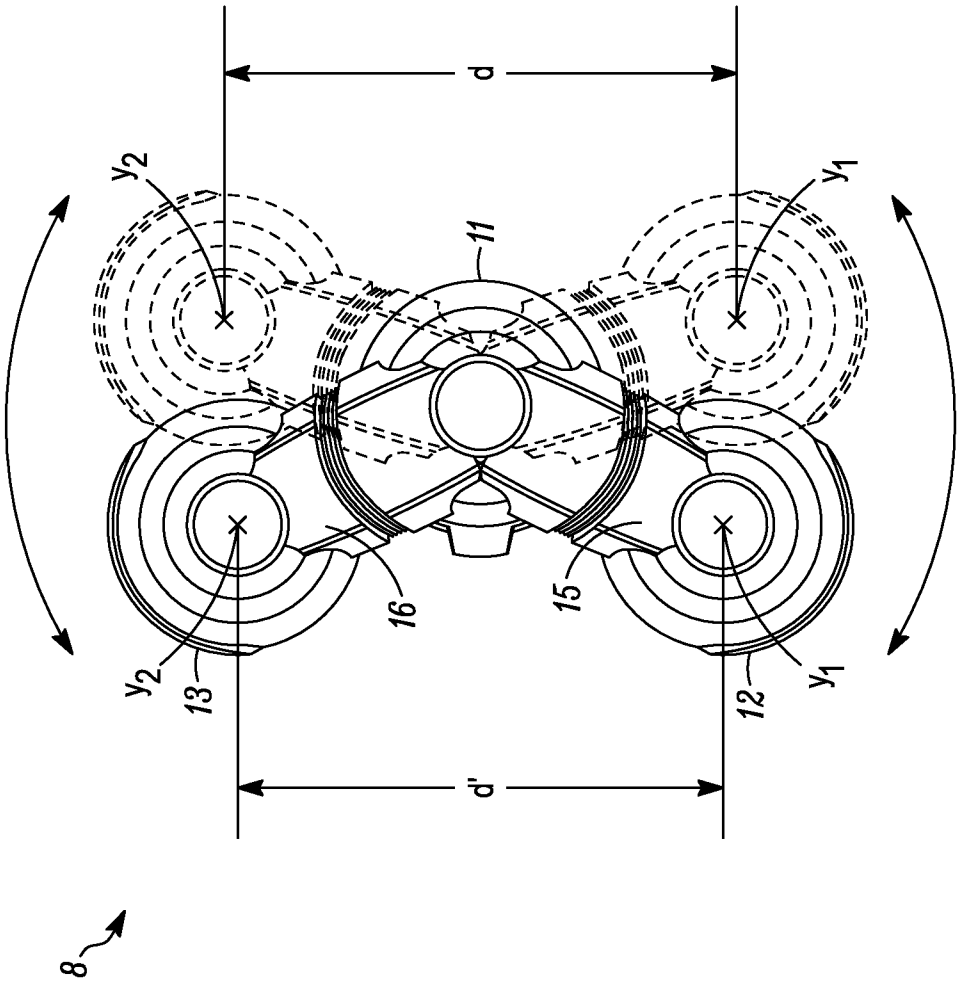

FIG. 2

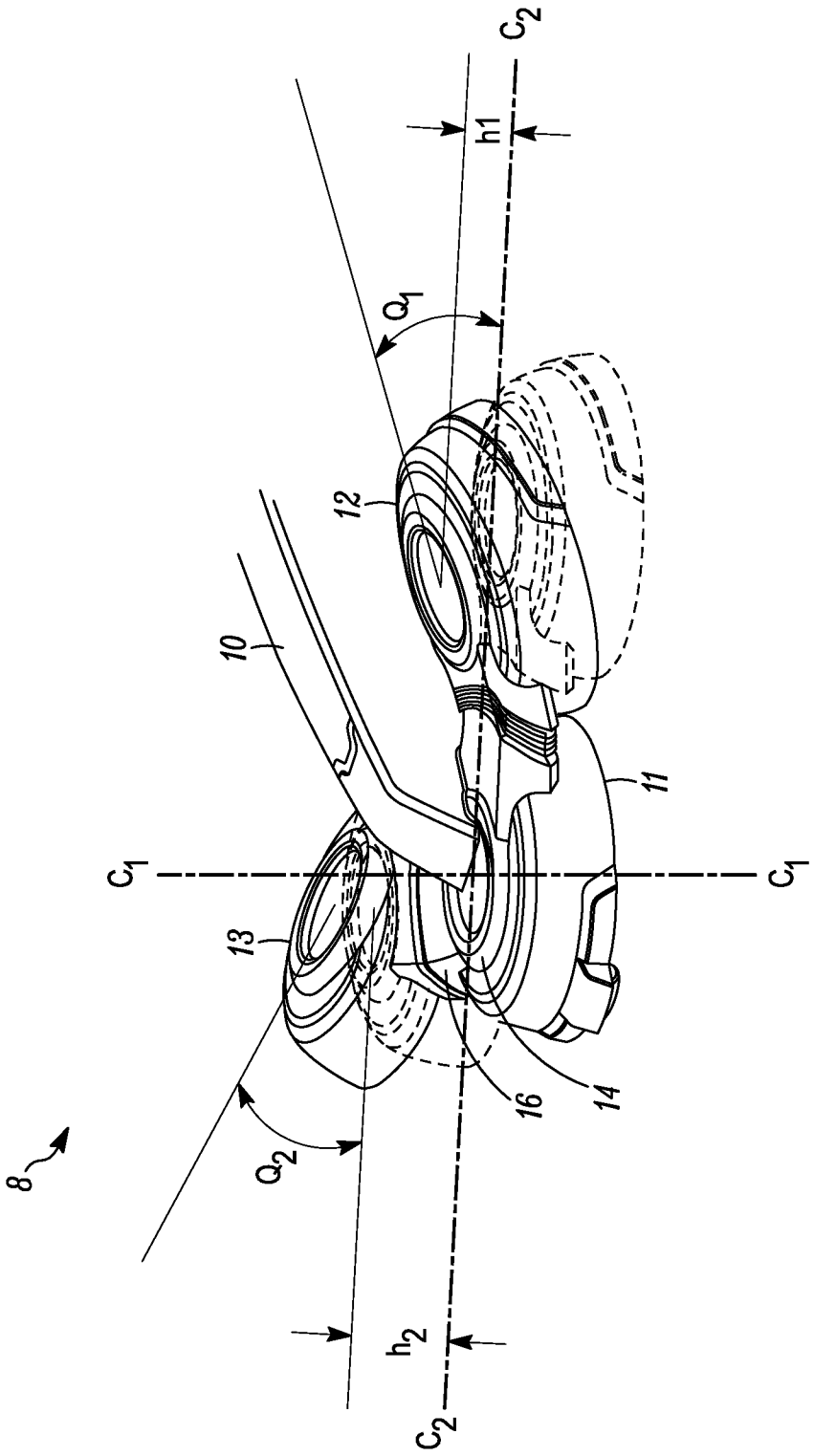

FIG. 3

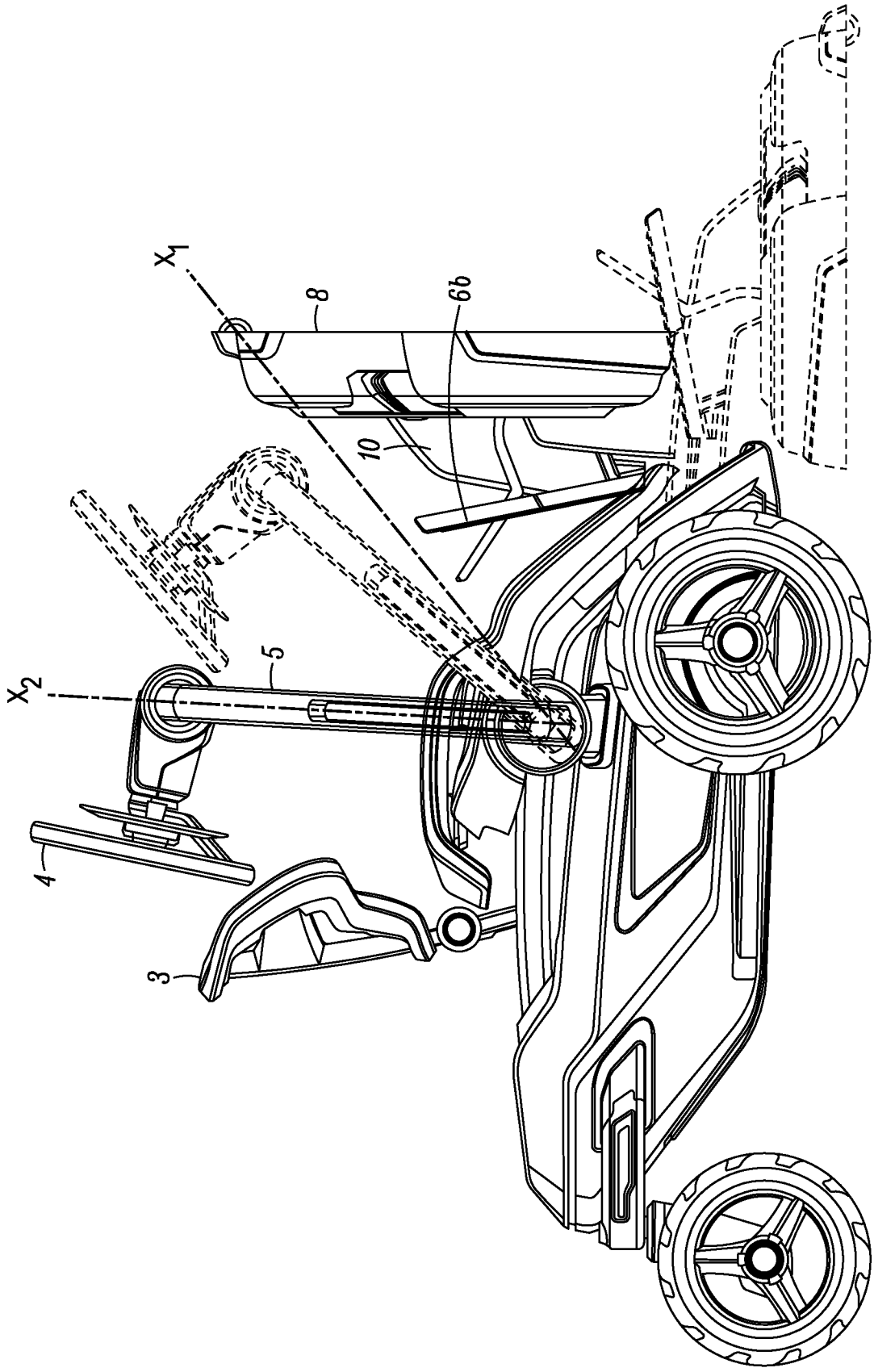

FIG. 4

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE2009/050636

A. CLASSIFICATION OF SUBJECT MATTER

IPC: see extra sheet
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)

IPC: A01D, A01B

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

SE,DK,FI,NO classes as above

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

EPO-INTERNAL, WPI DATA, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	FR 2900023 A1 (GYRAZ), 26 October 2007 (26.10.2007), figures 2,3, abstract	1-4,6,8,10
Y		5,9
	--	
Y	US 6484481 B1 (LANGWORTHY ET AL), 26 November 2002 (26.11.2002), column 4, line 41 - line 57	5
	--	
Y	WO 2009007506 A1 (ACTIONECO OY), 15 January 2009 (15.01.2009), abstract	9
	--	
X	FR 2793991 A1 (POMMIER GUY), 1 December 2000 (01.12.2000), abstract	1
	--	

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"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
"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
13 January 2010	13-01-2010
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Magnus Thorén / JA A Telephone No. +46 8 782 25 00

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE2009/050636

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5771669 A (LANGWORTHY ET AL), 30 June 1998 (30.06.1998), figures 1-7, abstract	8
A	NL 7905005 A (ALEXANDER JAN VOGELENZANG), 27 June 1979 (27.06.1979), figures 1,2	1-18
A	US 20070084173 A1 (PHILLIPS), 19 April 2007 (19.04.2007), whole document	1-18
A	JP 06022622 A, KUBOTA CORP., 1994-02-01: (abstract) Retrieved from: PAJ database; Original document: Figures 1,2	1-18
A	EP 1588602 A1 (DEERE & COMPANY), 26 October 2005 (26.10.2005), whole document	1-18

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE2009/050636

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

A ride-on lawn mower with front mounted cutter deck including more than one cutter bar:
1. where the cutters are mounted on arms that are adjustable sideways.
2. where the cutters are mounted on arms that are adjustable in height and height-angle
3. where the arms can be raised by folding seat and steering wheel.

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☒ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of any additional fees.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☐ No protest accompanied the payment of additional search fees.

International patent classification (IPC)

A01D 34/66 (2006.01)

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Use the application number as username. The password is **YWNEIZUZTF.**

Paper copies can be ordered at a cost of 50 SEK per copy from PRV InterPat (telephone number 08-782 28 85).

Cited literature, if any, will be enclosed in paper form.

FR	2900023	A1	26/10/2007	NONE			
US	6484481	B1	26/11/2002	NONE			
WO	2009007506	A1	15/01/2009	FI	119584	B	15/01/2009
FR	2793991	A1	01/12/2000	NONE			
US	5771669	A	30/06/1998	NONE			
NL	7905005	A	27/06/1979	NONE			
US	20070084173	A1	19/04/2007	NONE			
EP	1588602	A1	26/10/2005	DE	602005000790	D,T	24/01/2008
				US	7287363	B	30/10/2007
				US	20050229567	A	20/10/2005