

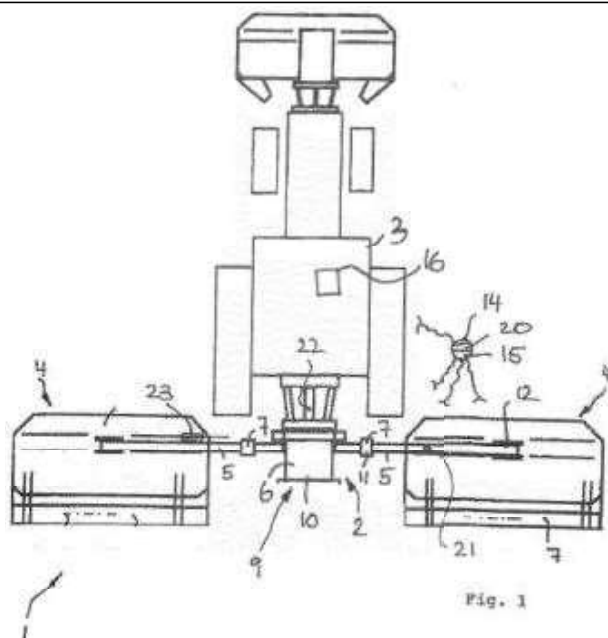
Implement with height adjustable support frame EP3192343 B1

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Family													
SI3192343	T1	2022-01-31					EP3192343	B1	2021-09-08				
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(EP3192343)

The present invention relates to an attachment for mounting on a land - and/or forestry machine, in particular to a tractor, wherein the attachment a height-adjustable support frame is provided, at least one operating unit such as cutter, spinners or the like between an operating position and a transporting position is suspended. Detecting means are provided for detecting the height position of the support frame and a display terminal for displaying the sensed vertical position of the membrane support, wherein said display terminal control station of the land - and/or forestry machine in the field of view of the machine guide are positioned.



English description

(EP3192343)

The present invention relates to an attachment for attachment to an agricultural and/or forestry machine, in particular to a tractor or tractor, wherein the attachment has a height-adjustable support frame on which at least one working unit, such as a mower, rotary rake or the like, is suspended so as to be adjustable between a working position and a transport position. [0003] 2.

Background of the invention Various agricultural implements are known for attachment to a tractor, the working units of which are, for example, a mower unit, a rotary rake, a conditioner or a soil working unit with cultivator tines, Coulter discs or packer wheels are adjustably suspended on a height-adjustable support frame, so that the working unit, which performs the agricultural and/or forestry main function of the implement, can be moved between a lowered working position and a raised transport position. For example, the working units can be suspended by means of support arms which can be pivoted about horizontal pivot axes, so that the working units project over the ground in a roughly speaking horizontal working position and project upwards in an upright transport position. As a result, machines with large working widths can be realized, which nevertheless maintain the permissible road transport width, in that the working units are pivoted upward for transport.

However, because of the ever increasing working widths, the maximum permissible transport height is sometimes no longer maintained, since the working units project upward by more than four meters. In order to be able to countercontrol or maintain the permissible transport height here, the supporting frame is therefore usually lowered as far as possible, if appropriate below the working height which is customary or optimum for the working position. In the working position, the supporting frame is to be driven in a specific desired height range in order to permit up and down movements of the working unit for the purpose of ground adaptation, to drive a weight relief in a favourable desired range and/or to avoid excessive bending angles of cardan shafts or other drive train elements. If, in the working position, the supporting frame is moved to a "wrong" supporting frame height which deviates too much, suspension elements can come up against stops during the adaptation of the ground and can no longer carry out the necessary adaptation of the ground, or in that a weight-relieving device, such as, for example, tension springs, is no longer driven in a region providing the intended relieving force, and/or in that cardan shafts bend too sharply, energy supply hoses, such as hydraulic hoses, are bent too sharply, or similar functional impairments or wear potential arise.

It is, of course, known in the prior art to monitor the working height of the working units by detecting the height position of the working units with various sensors and then displaying it on a display device on the tractor, cf., for example, EP 13 00 061 A1, EP 21 58 799 A1, US 2012/186503 A1, US 6076611 A, US 2012/227992 A1, US 6085846 A, WO 2012/167258 A1, US 2013/081830 A1 and US 5339906 A.

SUMMARY of the invention Proceeding from this, it is the object of the present invention to provide an improved attachment of the type mentioned which avoids disadvantages of the prior art and further develops the latter in an advantageous manner. In particular, operation of the attachment with incorrect height positions of the support frame is to be avoided.

This object is achieved according to the invention by an attachment according to claim. Preferred embodiments of the invention are the subject matter of the dependent claims.

It is therefore proposed to detect the vertical position of the support frame and to display it in the field of view of the machine operator, in particular in such a way that the detected actual height is displayed in comparison with a desired range for the support frame height, so that the machine operator can easily recognize whether the support frame of the attachment is located in the range of the desired height or outside. According to the invention, at least one detection means for detecting the height position of the support frame and a display terminal for displaying the detected height position of the support frame are provided, said display terminal being positionable in the field of view of the machine operator at the operator's cab of the agricultural and/or forestry machine. By means of the proposed detection and display of the height position of the support frame, it is possible to avoid the machine operator forgetting to correct the support frame height, for example after the lowering of the working units from the transport position into the working position, if the support frame height has previously been lowered specifically for road transport. A similar situation applies if the height of the support frame has been specifically raised, for example, in the case of difficult field entrances via road slopes or terrain cusps, in order to have sufficient ground clearance and the machine operator then forgets to lower the support frame again.

The display terminal can be a tractor display which is fixedly arranged on the tractor and which is used to display the

detected height position of the support frame of the attachment. The tractor display can be controlled from the attachment, for example, a job computer provided thereon. alternatively or additionally, the control of the tractor display can also be effected by a tractor-side display control or control device to which the height position signal of the detection means is supplied.

As an alternative or in addition to such an attachment unspecific tractor display, however, the display terminal can also have an attachment specific implement display on which the detected height position of the support frame can be displayed. The implement display can also be controlled from the attachment, for example its job computer, and/or from a control unit on the tractor side, wherein the implement display can advantageously also be positioned in the driver's cab of the tractor, for example by means of a mounting provided there.

In principle, said display terminal can be of mobile design and have a mobile display, for example in the form of a tablet. alternatively, however, a permanently installed display is also possible. The display can be, for example, a computer-like screen.

The display terminal can be connected to the control unit on the implement side and/or tractor side by means of a signal and/or power supply line. alternatively, wireless communication between the detection means for detecting the vertical position of the support frame or the corresponding control device on the one hand and the display terminal on the other hand is also possible.

According to the invention, the display terminal has a range display for displaying a desired range of the support frame height and an actual display for displaying the detected actual height position of the support frame relative to said desired range of the support frame height in order to make it easy to detect whether the actual height lies outside or inside the desired range. For example, said target range display may comprise a bar graph representation to which a pointer representation of the actual display may be assigned. Advantageously, for example, a green bar can display the desired region, for example with yellow and/or red bordering edge regions, which display height positions of the support frame lying outside the optimum height range, wherein the actual display can move the aforementioned pointer in the region of the green bar and also outside. It goes without saying, however, that other designs of the display units are possible, for example traffic lights or the like. Acoustic displays are also possible.

According to the invention, the display terminal comprises at least two range displays, of which a first range display displays the desired range of the support arm height for the working position of the working unit and a second range display displays the desired range of the support frame height for the transport position of the working unit.

The suspension or articulation or mounting of the at least one working unit on the supporting frame can in principle be of different design and adapted to the respective type of machine. Accordingly, the at least one detection means for detecting the height position can be of different design and comprise one or more sensors which themselves can in turn be of different design.

According to the invention, the at least one working unit is suspended by means of at least one pivotable support arm which can be pivoted about an at least approximately horizontal support arm pivot axis between a lowered working position and a raised transport position. In such a design of the attachment, the detection means for detecting the vertical position of the support frame can advantageously have at least one angle sensor, by means of which the pivot position of said support arm can be determined. Depending on the specific design of the support frame and/or the suspension of the working unit, two or more angle sensors may also be useful. In a further development of the invention, the working unit can be articulated, for example, on a bearing arm which, in turn, is articulated pivotably on the abovementioned carrying arm, for example about a pivot axis which, in turn, is oriented horizontally and can extend approximately parallel to the abovementioned carrying arm pivot axis. In such a design, it may be expedient to provide two angle sensors, one of which detects the angular position of the support arm with respect to the horizontal and/or vertical and/or with respect to a base part of the support frame, and another angle sensor determines the angular position of the bearing arm with respect to the horizontal or vertical and/or with respect to the support arm.

As an alternative or in addition to such an angle sensor, the at least one detection means can also comprise a height sensor which, for example, can measure directly the distance of a height-relevant structural part of the support frame from the ground and/or the height position relative to the tractor. For example, a sensor can measure the distance of a central base support from the ground, preferably in a contactless manner, wherein said base support can support the at least one working unit in a height-adjustable manner and/or itself can be suspended in a height-adjustable manner on the tractor, for

example by means of a three-point linkage.

As an alternative or in addition, the at least one detection means for detecting the vertical position can also have at least one sensor which can detect an extended state or a position and/or a distance of an actuating actuator, in particular an actuating cylinder, wherein the said sensor can advantageously be a linear sensor and/or can be integrated into the said actuating actuator. For example, such a sensor can be associated with the lifting cylinder, by means of which the support arm carrying the working unit can be lifted out. As an alternative or in addition, such a sensor can also be associated with an adjusting cylinder of the three-point linkage of the central base support in order to be able to determine the height position of the base support relative to the tractor.

As an alternative or in addition, the at least one detection means can also comprise a displacement measuring cylinder, by means of which the distance covered in each case by a height-relevant component can be measured.

The aforementioned display terminal can advantageously have a pivot position desired range display which displays a desired angular range for the pivot position of the support arm and/or for the pivot position of the bearing arm, wherein the display terminal can further comprise an actual pivot position display which can display the actual pivot position of the support arm and/or of the bearing arm relative to the respectively associated desired range.

Alternatively or in addition to such a direct display of the pivot positions, an evaluation device can also be provided, by means of which the detected pivot position of the support arm and/or of the bearing arm and/or of further suspension arms is evaluated, in order to determine the height position of the support frame therefrom, so that the height position of the support frame can be displayed in the manner described above, in particular relative to a desired range for this purpose. In a further development of the invention, a control device is provided for controlling a height adjustment device, by means of which the height position of the support frame of the attachment can be adjusted.

In this case, the aforementioned control device can comprise a manual operating mode which makes it possible for the machine operator to carry out the height adjustment of the supporting frame manually, it being possible for the machine operator to proceed here on the basis of the actual value and/or desired value of the height position displayed on the display terminal.

In order to further facilitate the height adjustment, the aforementioned control device can also be designed to operate semi-automatically or fully automatically, in particular in such a way that a height position is approached semi-automatically or fully automatically which lies within the desired range of the height adjustment. If, for example, the display terminal indicates that the actual height position lies outside the desired range for this purpose, the control device can cause the adjustment of the support frame, for example, to control a corresponding actuator in order to reach the desired height position, possibly after release by the machine operator or after input of a corresponding start command by the machine operator. In the case of a fully automatic design of the control device, the desired height position can also be approached automatically, for example whenever the working unit is lowered from the transport position into the working position or, conversely, is lifted out of the working position into the transport position.

If the detection device for detecting the actual height position of the support frame operates in the above-mentioned manner with at least one angle sensor, the above-mentioned control device can also be constructed in the manner of a regulating device and the height position of a support frame part, to which the above-mentioned support arm is articulated, until the determined pivot position angle of the support arm is in a desired range provided for this purpose and/or the pivot position angle of the aforementioned bearing arm comes to lie in a desired range provided for this purpose when the implement is in its working position or is operated in working operation.

As an alternative or in addition, the above-mentioned control device can also comprise a control and/or regulating module which lowers the height position of the support frame when the working unit is brought into the transport position until the permissible transport height of, for example, 4 m at present, is reached or fallen below or is maintained.

The measuring sensors can in principle be of different design and arrangement, for example angle measuring sensors provided on the boom or the attachment or a rocker of the attachment. The sensors can be connected to a control unit or to a computer in which, for example, the length and/or width of the attachment and/or of the respective cantilevered working unit is stored. From the measured angle of attack of the attachment and/or working unit and its known length and/or width, the vertical extension or the height of the attachment can thus be determined without additional expenditure on components. For this purpose, it is merely necessary to set the control accordingly and no additional components are required.

In a preferred embodiment, it is conceivable for the attachment to be a plough, a cultivator, a mower, a harrow, a seed bed combination, a seed drill, a hay turner, a chopper and/or another agricultural and/or forestry attachment. In particular, the invention thus relates generally to attachments which, in their working positions, have a relatively large width in relation to the corresponding machine and which, in their vertically upwardly pivoted transport state, can assume correspondingly large heights.

In a further preferred embodiment, it is conceivable for the attachment to be arranged essentially horizontally in the working position and/or essentially vertically in the transport position. As a result, the attachment can be pivoted by approximately 90 ° between the two positions, the exact angle here also being necessary. Thus, the attachment can also be pivoted by 60 ° to 120 ° between the two positions or by an angle deviating therefrom, without deviating from the idea of the invention.

The invention also relates to the combination of an agricultural and/or forestry machine, in particular a tractor with at least one attachment of the type described above.

Other objects, advantages and novel features of the present invention will become apparent from the following detailed description of the invention when considered in conjunction with the accompanying drawings. In the drawings:

Fig. 1: a schematic top view of an attachment in the form of a mowing machine which is mounted on a tractor and shows two laterally projecting working units located in the working position,

Fig. 2: a schematic representation of the mounting of the working units on the support frame of the attachment of Fig. 1,

Fig. 3: a schematic representation of the display of the support frame height, and

Fig. 4: a schematic rear view of the attachment, wherein a working unit is shown in the lowered working position and a working unit in the raised transport position.

As shown in Fig. 1 and 2, the attachment 1 can have a support frame 2 which can be attached to a tractor 3. Depending on the design of the attachment, the support frame can be attached to the tractor by means of an attachment block and a three-point linkage and can be height-adjustable by means of the three-point linkage. alternatively, when the attachment is designed as a semitrailer, the supporting frame can also be supported on the ground by means of a chassis and can be articulated on the tractor via a drawbar, it being possible for the supporting frame to be height-adjustable, for example, by virtue of a height-adjustable design of the chassis and/or an articulated drawbar and/or other height-adjusting means.

Mixed forms are also possible in which the supporting frame 2 is supported on the ground in the working position by means of a feeler running gear and can be lifted out for transport.

As shown in Fig. Fig. 2 shows in more detail a plurality of working units 4, which in the case of the mowing machine shown can be constructed as mowing unit units, can be articulated or suspended on the supporting frame 2. In this case, the working units can advantageously be articulated on the base support of the support frame by means of support arms, it being possible for the said support arms to be mounted such that they can pivot about horizontal support arm pivot axes, which can point in the direction of travel, so that the support arms can be pivoted out of the position shown in Fig. 2 can be brought into a raised transport position with approximately upright support arm alignment. For this purpose, a suitable lifting actuator, for example in the form of a pressure medium cylinder, can be linked on the one hand to the base support and on the other hand to the respective support arm.

The working units 4 can be linked directly or indirectly to the support arms 5, for example by means of the linkage arrangement shown in Fig. 2, which in turn can be suspended from the projecting ends of the support arms 5 so as to be pivotable about horizontal pivot axes 8, which can be aligned parallel to the support arm pivot axes 7.

Said attachment also comprises detection means for detecting the vertical position of the supporting frame, it being possible for detection means to comprise at least one sensor or various sensors. The at least one sensor can in this case be of different design, it also being possible for a plurality of sensors to be provided, each of which can be of identical design or else of different design. For example, a height sensor, which measures the distance of the base support from the ground, can be assigned to the central base support. As an alternative or in addition, the height of the central base support can also be determined via the height position of the three-point linkage of the tractor.

Alternatively or additionally, angle sensors can be assigned to the support arms, which angle sensors can determine the pivot position of the support arms relative to the horizontal and/or vertical and/or relative to the base support. Furthermore, further angle sensors can be assigned to the bearing arms or to the joint between the support arms and the bearing arms, in order to also be able to determine their angular position relative to the horizontal and/or vertical and/or relative to the

support arms.

As an alternative or in addition to the angle sensors mentioned, the detection means can also have at least one linear sensor for detecting the position or covered distance of the lifting cylinder, by means of which the respective support arm can be lifted out, so that the position of the support arm can be derived from the position of this lifting cylinder. Alternatively or additionally, at least one sensor, preferably a linear sensor, can also be assigned to the lifting cylinder of the three-point linkage, by means of which the central base support of the support frame is linked to the tractor in order to be able to calculate the height position of the base support from the position of the three-point cylinder.

Alternatively or additionally, the at least one detection means can also comprise a displacement measuring cylinder, by means of which the distance covered by a height-relevant structural component can be measured.

As shown in Fig. 1, the at least one detection means 9, in particular its sensors such as the various height and/or linear and/or angle sensors 10 to 12 mentioned, is connected to a control device 14 which comprises an evaluation unit 15 in order to determine the height position of the support frame 2 from the sensor signals.

The determined actual height position of the support frame 2 is displayed on a display terminal 16 which can be constructed in the form of a display which can be positioned on the driver's cab of the tractor 3 and can be controlled by the said control device 14. Said display terminal 16 can in this case display both the desired regions 17, 18 for the vertical position of the supporting frame 2 in the working configuration and for the transport configuration of the attachment 1 in the manner described at the beginning, and display the actual value of the height position relative to the at least one desired height range as an actual height display 19, for example in the pointer bar diagram display explained at the beginning, cf. 3rd

Said control device 14 can advantageously also be used to control the height adjustment actuators for adjusting the height position of the support frame 2, advantageously in a semi-automatic or fully automatic manner, wherein the control device can advantageously comprise different operating modes in order to be able to adjust the height position of the support frame advantageously selectively manually, semi-automatically and fully automatically, as has been explained at the beginning.

In order to determine the height of the implement, measurement data of the measurement sensors or of the angle sensors on the individual components can be acquired by a control (not shown). Furthermore, the vertical position or vertical extension of the attachment can be determined from the determined data as well as from the known length of the attachment. Since the position of the mounting block can also be determined by means of corresponding sensors, and furthermore the position of the mounting block relative to the ground of the machine can be known, the vertical extension of the attachment from the ground to its highest point can thus be measured and indicated.

By means of the control, it is also conceivable to bring the attachment automatically into the transport position or to pivot it between the working and transport positions. For this purpose, an operator can start the corresponding pivoting operation via, for example, the operating terminal. In order to assume the transport position, it is then possible, on the one hand, for the respective carrying arm to be pivoted upward and for the attachment bracket to be moved downward, in order to minimize the vertical extent of the attachment and to maintain the maximum permissible displacement height of, for example, 4 meters.

Claims

(EP3192343)

1. An attachment for attaching to a hauler (3) having a height adjustable support frame (2) at which at least one work assembly (4) such as a mower, a rotary rake, a soil cultivation device, or the like is adjustably suspended between a lowered working position and a raised transport position suspended by means of at least one support arm (5) that is pivotably supported about a horizontal support arm pivot axis (7) at a height adjustable support frame (2), wherein at least one detection means (9) for detecting the height position of the support frame (2) and a display terminal (16) for displaying the detected height position of the support frame (2) are provided, with said display terminal (16) being positionable at the driver's cabin of the hauler (3) in the field of view of the machine operator, characterized in that the display terminal (16) has a range display (17, 18) for displaying a desired range of the support frame height and an actual display (19) for displaying the detected actual height position of the support frame (2) relative to said desired range, with the display terminal (16) having a first range display (17) for displaying a desired range of the support frame height for the work position of the attachment (1) in which the support arm (5) is downwardly pivoted and a second range display (18) for

displaying a desired range of the support frame height for the work position of the attachment (1) in which the support arm (5) is upwardly pivoted.

2. An attachment in accordance with the preceding claim, wherein the display terminal (16) has a hauler display fixedly provided at the hauler (3) and/or a unit display associated with the attachment (1).

3. An attachment in accordance with one of the preceding claims, wherein the at least one detection means (9) comprises at least one sensor (10, 11, 21, 22) for detecting a position and/or alignment and/or a covered distance and/or a covered pivot angle of a height relevant structural component of the attachment.

4. An attachment in accordance with one of the preceding claims, wherein at least one angle sensor (11) for detecting the pivot position of the support arm (7) is provided, wherein the display terminal (16) has a pivot position desired range display for displaying a desired range for the pivot position of the support arm, and/or wherein an evaluation device for evaluating the detected pivot position and for determining the height position of the support frame (2) from the detected pivot position is provided.

5. An attachment in accordance with one of the preceding claims, wherein the at least one detection means (9) has a height sensor (10) for detecting the distance of a central base frame (6) of the support frame (2) from the ground.

6. An attachment in accordance with one of the preceding claims, wherein the at least one detection means (9) has at least one sensor (21, 22), in particular a linear sensor, for detecting the position and/or the covered distance of a servo control cylinder that is provided for the adjustment of the work assembly (4) and/or the support frame (2).

7. An attachment in accordance with one of the preceding claims, wherein the at least one detection means has at least one distance measurement sensor (23) for detecting the covered distance and/or the position of a height relevant structural part of the attachment.

8. An attachment in accordance with one of the preceding claims, wherein a control device (14) for controlling a height adjustment device for setting the height of the support frame (2) is provided, with the control device (14) having a control module (20) for the semiautomatic or fully automatic setting of the support frame height in dependence on the detected support frame height.

9. An attachment in accordance with the preceding claim in conjunction with claim 5, wherein the control device is configured to adjust the height setting device in dependence on the detected pivot position of the support arm (5) such that the detected pivot position of the support arm (5) reaches a desired range.

10. An attachment in accordance with one of the preceding claims, wherein the control device (14) is configured to adjust the support frame height (2) during or after the traveling of the work assembly (4) into the transport position such that a maximum permitted transport height is observed or fallen below.

11. An attachment in accordance with one of the preceding claims, wherein the work assembly (4) adopts a substantially horizontal alignment in its working position and a substantially upright alignment in its transport position.

12. An attachment in accordance with one of the preceding claims, wherein a support frame height adjustment device (21) for the automatic adjustment of the support frame height of the support frame (2) on the moving of the work assembly (4) from its work position into its transport position or vice versa from its transport position into its work position is provided, with the height adjustment device (21) being configured to lower the support frame (2) on the moving of the work assembly (4) into the transport position so far that a permitted road transport height is observed and, on the moving of the work assembly (4) into its work position to automatically move the support frame (2) into a desired height range for the work position.

13. An attachment in accordance with one of the preceding claims, wherein the attachment is a soil cultivation device, in particular a plow, a grubber, a harrow, a seedbed combination, a seeder, and/or a grassland machine, in particular a mowing machine, a hay-making machine, a conditioner, a chaff cutter, and/or any other agricultural and/or forestry attachment.

14. An agricultural and/or forestry machine, in particular a hauler (3), having at least one attachment (1) that is configured in accordance with one of the preceding claims.

Apparatus and Method for Controlling Plowing Depth in Tractor KR101877062 B1

<p>Current assignees LS MTRON*</p> <p>Inventors LEE, DAE-HYUN ChoiJungwoong KIM, YONG JOO</p> <p>Priority data including date 2012KR-0124767 2012-11-06</p>	<p>IPC - International classification A01B-013/00 A01B-015/20 A01B-071/00*</p> <p>CPC - Cooperative classification A01B-003/40 A01B-063/111*</p>
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Family

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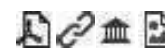
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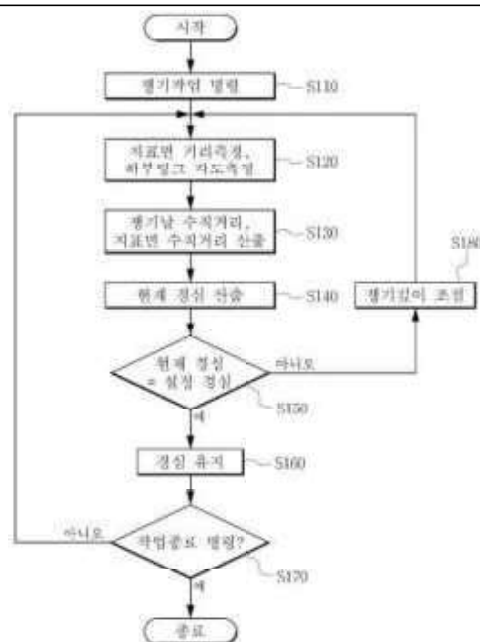
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(KR10-1877062)

The present invention relates to a device and a method for controlling a plowing depth in a tractor. The device for controlling a plowing depth in a tractor includes a distance sensor measuring the earth surface distance and transmitting the earth surface distance to a control unit; an angle sensor measuring the angle of a lower link and transmitting the angle of the lower link to the control unit; the control unit controlling a flow control valve; a storage unit storing data for controlling the plowing depth according to the control of the control unit; a display unit displaying driving state information; the flow control valve controlling the depth of a plow by lifting a plow frame with a lift rod; and an operation unit applying a command and the data inputted according to manual control to the control unit.



English description

(KR10-1877062)

TECHNICAL FIELD

The present invention relates to an apparatus and method for controlling a plough center of a tractor, and more particularly, to an apparatus and method for controlling a plough center of a tractor to perform a plough operation by measuring a centroid while performing a plough operation when performing a plough operation by connecting the plough to the tractor.

BACKGROUND ART

Typically, among the plough operations, a plough operation is performed using a tractor as a ground running operation to grow crops.

When the plough operation is performed using the tractor, the plough operation is performed in such a manner that the plough is connected to the tractor and the plough is pulled in a state where the plough is inserted under the ground.

It is very important to perform plough operations to a constant depth for the composition of soil conditions for growing crops well during plough operations. However, the plowing depth in most plough operations using tractors is determined by subjective judgment of the operator depending on the curvature of the ground surface, and thus it is very difficult to maintain constant plowing during plough operations.

SUMMARY OF INVENTION**TECH PROBLEM**

The present invention has been proposed to solve the problems of the related art, and it is an object to provide an apparatus and method for controlling a plough center of a tractor to perform a plough operation by measuring the center of the plough while automatically adjusting the center of the plough operation to maintain a constant center of the plough operation when performing a plough operation by connecting the plough to the tractor.

TECH SOLUTION

In order to achieve the objects described above, the apparatus for controlling a plough center of a tractor according to the present invention comprises: a distance sensor installed in a plough frame connection unit connected to a lower connection unit provided at a front end of a lower link, according to control of the control unit, for measuring a ground surface distance corresponding to a distance from the ground surface, and transmitting the measured ground surface distance to the control unit; An angle sensor configured to measure a lower link angle corresponding to a driving angle of the lower link according to a control of a controller and transmit the lower link angle to the controller; Performing a centroid control process for controlling the centroid of the plough to maintain the centroid of the plough constant according to a plough centroid control program at the time of the plough operation, the controller comprising: a controller for receiving a ground surface distance from the distance sensor, receiving a lower link angle from the angle sensor, calculating a current centroid, and controlling a flow rate control valve to maintain the centroid of the plough constant; A storage unit configured to store and provide the plough core control program to a control unit, and store full data for processing the core control according to the control of the control unit; a display unit configured to display full drive state information according to the plough core control according to the control of the control unit; A flow rate control valve configured to apply hydraulic pressure to an actuator for driving a lift rod according to control of the control unit to drive the lift rod up and down to drive the lift rod to raise and lower the plough frame by the lift rod to adjust a depth of the plough; and an operation unit configured to apply an input command and data to the control unit according to a manual operation.

According to an apparatus for controlling the plough center of a tractor according to the present invention, the control unit calculates a plough edge vertical distance by multiplying a plough edge depth corresponding to a distance from a plough frame to a plough edge tip by a cosine value of the angle of the lower link, Calculates a ground surface vertical distance by multiplying the ground surface distance by a cosine value of a lower link angle, and calculates the current center by calculating a difference between the planoid vertical distance and the ground surface vertical distance.

In addition, according to the plough center control device of the tractor according to the present invention, when the calculated current center coincides with the set center, the control unit controls the flow rate control valve to keep the hydraulic pressure applied to the actuator intact, thereby keeping the position of the lift rod by the actuator intact, thereby keeping the position of the plough frame intact, thereby keeping the current center.

In addition, according to the apparatus for controlling the plough center of the tractor according to the present invention, when the calculated current center does not match the set center, the control unit controls the flow rate control valve to

adjust the hydraulic pressure applied to the actuator to raise and lower the lift rod by the actuator to adjust the lift rod to raise and lower the plough frame by the lift rod to adjust the depth of the plough to reach the set center.

On the other hand, in order to achieve the objects described above, a method for controlling a plough center of a tractor according to the present invention comprises the steps of: measuring, by a control unit, a ground surface distance corresponding to a distance from a ground surface through a distance sensor installed in a plough frame connecting unit connected to a lower connecting unit installed in a front end of a lower link and measuring, by an angle sensor, a lower link angle corresponding to a driving angle of the lower link; Calculating, by a control unit, a planoid vertical distance by multiplying a planoid depth corresponding to a distance from a planoid frame to a planoid by a codeine value of the lower link angle and calculating a ground surface vertical distance by multiplying the ground surface distance by a codeine value of the lower link angle; Calculating, by the control unit, a current center by calculating a center based on a difference between a vertical distance of the plough day and a vertical distance of a ground surface; and controlling, by the control unit, driving of the plough frame based on whether the calculated current center and the set center coincide with each other.

According to the method for controlling a plough center of a tractor, the step of controlling the driving of the plough frame comprises the steps of: checking, by a control unit, whether the calculated current center matches with a set center; if the calculated current center does not match with the set center, Controlling the flow rate control valve to adjust the hydraulic pressure applied to the actuator to raise and lower the lift rod by the actuator to adjust raising and lowering the plough frame by the lift rod to adjust the depth of the plough blade to reach the set center; And if the calculated current center coincides with the set center, controlling the flow rate control valve to keep the hydraulic pressure applied to the actuator intact, thereby keeping the position of the lift rod by the actuator intact, thereby keeping the position of the plough frame intact, thereby keeping the current center.

ADVANTAGEOUS EFFECTS

According to the present invention, when performing a plough operation by connecting a plough to a tractor, the plough operation is performed by automatically adjusting the centroid while performing the plough operation to maintain a constant centroid, so that the plough operation is performed to build good soil conditions for crop plants.

DESCRIPTION OF DRAWINGS

Figure 1 is a diagram illustrating a plough center control device of a tractor according to the present invention. Figure 2 illustrates an instrument configuration for plough drive in a tractor according to the present invention. FIG. 3 is a diagram provided to explain core core control processing by a plough core control device of a tractor according to the present invention.

DESCRIPTION OF EMBODIMENTS

Embodiments of the present invention will be described in detail below with reference to the accompanying drawings, in which: The present invention has been described with reference to the embodiments shown in the drawings, but this is explained as one embodiment, whereby the technical concept of the present invention and the key configuration and operation thereof are not limited.

An apparatus for controlling a plough center of a tractor according to the present invention comprises, as shown in FIG. 1, an angle sensor 40, a distance sensor 50, a control unit 70, a display unit 75, a storage unit 80, a flow rate control valve 85, and an operation unit 90.

The distance sensor 50 is formed of a laser sensor and is installed at a connecting portion of a plough frame connected to a lower connecting portion provided at a front end of a lower link and measures a distance to the ground surface. the distance sensor 50 emits laser light to the ground surface under control of the controller 70, measures the distance to the ground surface based on the laser light reflected from the ground surface, and transmits the measured distance to the controller 70. The angle sensor 40 is driven according to the control of the controller 70 to measure the angle of the lower link and transmit the measured angle to the controller 70.

A control unit (70) performs core core control processing for controlling the core of the plough while controlling the core of the plough to be kept constant according to a plough core control program at the time of a plough operation. In addition, the storage unit 80 stores the plough core control program and provides it to the control unit 70, and stores full data for processing the core core control according to the control of the control unit 70. Further, a display unit 75 displays full driving state information according to plough center control in accordance with the control of the control unit 70.

The flow rate control valve (85) applies hydraulic pressure to the actuator for driving the lift rod according to the control of the control unit (70) to drive the lift rod up and down to drive the lift rod to raise and lower a plough frame connected to the tractor, thereby enabling adjustment of the depth of plough during plough operation. The operation unit (90) applies an input command and data to the control unit (70) in accordance with a manual operation of the tractor driver.

In addition, the appliance configuration for plough drive in a tractor according to the present invention is made as illustrated in Figure 2.

A plough frame (20) having a plough blade (21) is mounted on a tractor (10) by being connected to a lower link (13) via a lower connecting portion (15) and to an upper link (11) via an upper connecting portion (22). In addition, a lift rod 12 driven up and down by an actuator provided in the tractor is coupled with the lower link 13 to drive up and down the lower link 13 to raise and lower a plough frame 20 connected to the lower connecting portion 15.

In addition, the distance sensor 50 is provided at a connection portion of the plough frame 20 connected to the lower connection portion 15, emits laser light to the ground surface 31 under the control of the control portion 70, measures the distance from the ground surface 31 based on the laser light reflected from the ground surface 31, and transmits the measured distance to the control portion 70. The angle sensor (40) is provided in a tractor coupling unit for coupling the lower link (13) to the tractor (10), measures the angle of the lower link (13) and transmits the measured angle to the control unit (70). Further, although FIG. 2 illustrates that the angle sensor 40 is installed at the tractor coupler to couple the lower link 13 to the tractor 10, exemplary embodiments may not be limited thereto.

In Figure 2, ground surface vertical distance 33 is the vertical distance between distance sensor 50 and ground surface 31, ground surface distance 34 is the distance between distance sensor 50 and ground surface 31 measured via distance sensor 50, plough day vertical distance 35 is the vertical distance from plough frame 20 to plough day 21, The plough blade depth (36) is defined as the distance from the plough frame (20) to the tip of the plough blade (21), the centroid (37) is the vertical distance from the ground surface (31) to the plough blade (21), and the lower link angle (32) is the angle between the lower link (13) and the ground surface (31).

When the control unit (70) controls the flow rate control valve (85) to apply hydraulic pressure to an actuator for driving a lift rod by the flow rate control valve (85) to drive the lift rod (12) up and down to drive a plough frame (20) connected to the tractor (10) up and down to perform a plough operation, The lower link (13) is driven up and down according to the raising and lowering of the lift rod (12), so that the lower link angle (32) changes, and when the lower link angle (32) changes, the position and slope of the plough frame (20) changes.

Then, the control unit (70) determines the center (37) by the depth of the most leading pline edge (21) of the pline frame (20), and can calculate the center (37) by the difference between the pline edge vertical distance (35) and the ground surface vertical distance (33), The planoid vertical distance (35) is calculated by multiplying the planoid depth (36) and the codeine value of the underlink angle (32), and the ground surface vertical distance (33) is calculated by multiplying the ground surface distance (34) and the codeine value of the underlink angle (32). The core (37) has a fixed value set as corresponding to the depth from the ground surface (31) to the most leading pline edge (21) of the pline frame (20), and the pline edge depth (36) has a fixed value set as the distance from the pline frame (20) to the tip of the pline edge (21).

That is, the control unit 70 calculates the center 37 by the difference between the vertical distance 35 of the plough day and the ground surface vertical distance 33 as in Equation 1, but the vertical distance 35 of the plough day is calculated as in Equation 2, and the ground surface vertical distance 33 is calculated as in Equation 3.

[Equation 1]

Core=Vertical to Purch-Earth surface vertical

EQ. 2

Vertical distance to plough=depth to plough × cos (underlink angle)

EQ. 3

Ground Surface Vertical=Ground Surface Distance × cos (Underlink Angle)

The control unit 70 performs core control processing to perform a plough operation but maintain the core constant according to a command input through the operation unit 90. A control unit (70) measures a ground surface distance (34) through a distance sensor (50) and measures a lower link angle (32) through an angle sensor (40) when performing a plough operation, calculates a plough edge vertical distance (35) by multiplying a plough edge depth (36) and a codeine value of the lower link angle (32) as shown in Equation 2, A ground surface vertical distance 33 is calculated by multiplying

the ground surface distance 34 by the codeine value of the lower link angle 32 as shown in Equation 3, and then calculating the centroid by the difference between the ground surface vertical distance 35 and the ground surface vertical distance 33 as shown in Equation 1.

Then, the control unit (70) checks whether the calculated current center coincides with the set center (37). When the calculated current center coincides with the set center 37, the control unit 70 controls the flow rate control valve 85 to maintain the hydraulic pressure applied to the actuator as it is, and controls the actuator to maintain the position of the lift rod 12 as it is, and maintains the position of the plough frame 20 as it is, and maintains the current center. Further, if the calculated current center does not coincide with the set center 37, the control unit 70 controls the flow rate control valve 85 to adjust the hydraulic pressure applied to the actuator to raise and lower the lift rod 12 by the actuator, thereby adjusting the depth of the plough blade 21 to reach the set center 37 by the lift rod 12.

The plough center control apparatus of the tractor according to the present invention having the function described above is performed as shown in FIG. 3 when a center control process is performed.

First, when a plough operation command is input (S110) through the operation unit (90), the control unit (70) measures the ground surface distance (34) through the distance sensor (50) and measures the lower link angle (32) through the angle sensor (40) (S120).

The control unit 70 calculates a plough vertical distance 35 by multiplying the plough depth 36 by the codeine value of the lower link angle 32 as shown in Equation 2, and calculates a ground surface vertical distance 33 by multiplying the ground surface distance 34 by the codeine value of the lower link angle 32 as shown in Equation 3 (S130).

Thereafter, the control unit (70) calculates the current center by calculating the center with the difference between the vertical distance (35) and the ground surface vertical distance (33) of the plough day as Equation (1) (S140).

The control unit (70) checks whether the calculated current center coincides with the set center (37) (S150).

When the current center calculated at S150 does not match the set center 37, A flow rate control valve 85 is controlled to adjust the hydraulic pressure applied to the actuator to raise and lower the lift rod 12 by the actuator to control the lift rod 12 up and down the plough frame 20 by the lift rod 12 to adjust the depth of the plough blade 21 to reach the set core 37 (S180), and then return to S120 described above to perform repeated processing.

In addition, when the calculated current center coincides with the set center 37 at S150, the control unit 70 controls the flow rate control valve 85 to maintain the hydraulic pressure applied to the actuator as such and to maintain the position of the lift rod 12 as such by the actuator, thereby maintaining the position of the plough frame 20 as such and maintaining the current center (S160) by the lift rod 12.

Then, the control unit 70 checks whether or not a plough operation termination command has been input through the operation unit 90 (S170), returns to S120 described above if the plough operation termination command has not been input, and terminates the operation if the plough operation termination command has been input.

As described above, the apparatus for controlling the plough core of a tractor according to the present invention performs the plough operation by automatically adjusting the center of the plough while performing the plough operation by connecting the plough to the tractor, thereby performing the plough operation to establish good soil conditions for crop cultivation.

The present disclosure is not limited to the foregoing description, and it will be understood by those skilled in the art that the present disclosure may be modified to various forms within the scope of the disclosure without departing from the spirit of the disclosure, and such modifications may be made to correspond to the technical scope of the present disclosure.

INDUSTRIAL APPLICABILITY

The present invention is usefully applicable to a tattacker for performing plough operations. According to the present invention, when performing a plough operation by connecting a plough to a tractor, the plough operation is performed by automatically adjusting the centroid while performing the plough operation to maintain a constant centroid, so that the plough operation can be performed to build good soil conditions for crop cultivation.

REFERENCE SIGNS LIST

10; tractor 11; upper link 12; lift rod 13; lower link 15; lower link 20; planoframe 21; planoid 22; Upper connecting portion 40; angle sensor 50; distance sensor 70; control portion 75; display portion 80; storage portion 85; flow rate control valve 90; operation portion

Claims

(KR10-1877062)

1. An apparatus for controlling a plough center of a tractor, the apparatus comprising: a distance sensor installed in a plough frame connection unit connected to a lower connection unit provided at a front end of a lower link, under control of the control unit, for measuring a ground surface distance corresponding to a distance from the ground surface, and transmitting the measured ground surface distance to the control unit; an angle sensor for measuring an angle of the lower link corresponding to a driving angle of the lower link, under control of the control unit, and transmitting the measured ground surface distance to the control unit; Performing a centroid control process for controlling the centroid of the plough to maintain the centroid of the plough constant according to a plough centroid control program at the time of the plough operation, the controller comprising: a controller for receiving a ground surface distance from the distance sensor, receiving a lower link angle from the angle sensor, calculating a current centroid, and controlling a flow rate control valve to maintain the centroid of the plough constant; A storage unit configured to store and provide the plough core control program to a control unit and store full data for processing the core core control according to the control of the control unit; A display unit configured to display the full driving state information according to the plough center control according to the control of the control unit; A flow rate control valve configured to apply hydraulic pressure to an actuator for driving a lift rod according to control of the control unit to drive the lift rod up and down to drive the lift rod to raise and lower the plough frame by the lift rod to adjust the depth of the plough; and an operation unit configured to apply an input command and data to the control unit according to a manual operation, Wherein the control unit calculates a planoid vertical distance by multiplying a planoid depth corresponding to a distance from a planoid frame to a planoid tip portion by a codeine value of the lower link angle, Calculates a ground surface vertical distance by multiplying the ground surface distance by a codeine value of a lower link angle, and calculates the current center by calculating a difference between the plough edge vertical distance and the ground surface vertical distance.

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3. The plough center control device of a tractor according to claim 1, wherein, when the calculated current center coincides with the set center, the control unit controls the flow rate control valve to maintain the hydraulic pressure applied to the actuator as such, to maintain the position of the lift rod by the actuator as such, to maintain the position of the plough frame as such, to maintain the current center.

4. The apparatus for controlling the plough center of a tractor according to claim 3, wherein the control unit controls the flow rate control valve to adjust the hydraulic pressure applied to the actuator to raise and lower the lift rod by the actuator to adjust the lift rod to raise and lower the plough frame by the lift rod to adjust the depth of the plough to reach the set center.

5. A method for controlling a plough center of a tractor, comprising the steps of: measuring, by a control unit, a ground surface distance corresponding to a distance from a ground surface through a distance sensor provided in a plough frame connection unit connected to a lower connection unit provided in a front end of a lower link, and measuring an angle of a lower link corresponding to a driving angle of the lower link through an angle sensor; Calculating, by a control unit, a planoid vertical distance by multiplying a planoid depth corresponding to a distance from a planoid frame to a planoid by a codeine value of the lower link angle and calculating a ground surface vertical distance by multiplying the ground surface distance by a codeine value of the lower link angle; Calculating, by the control unit, a current center by calculating, by the control unit, the center with the difference between the plain edge vertical distance and the ground surface vertical distance; and controlling, by the control unit, the driving of the plin frame based on whether or not the calculated current center and the set center coincide with each other.

6. The method according to claim 5, wherein the step of controlling the driving of the plough frame comprises the steps of: checking, by the control unit, whether or not the calculated current center coincides with the set center; if the calculated current center does not coincide with the set center, Controlling the flow rate control valve to adjust the hydraulic pressure applied to the actuator to raise and lower the lift rod by the actuator to adjust raising and lowering the plough frame by the lift rod to adjust the depth of the plough blade to reach the set center; And if the calculated current center coincides with the set center, controlling the flow rate control valve to keep the hydraulic pressure applied to the actuator as it is, thereby keeping the position of the lift rod as it is, thereby keeping the position of the plough frame as it is, thereby keeping the current center.