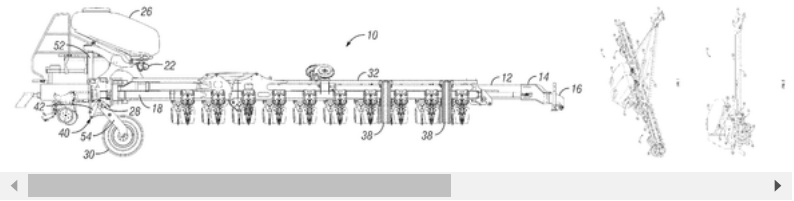
Forward rotating transport axle

Abstract

A forward folding implement is provided. The implement includes a telescoping tongue to allow forward folding wings of the implement. At one end of the tongue are positioned transport wheels that are used to level the height of the frame during planting to keep the row units at determined heights of the single plant uniform depth, while also providing a support for the implement during transport of the implement. A transport wheel rotating assembly is provided to rotate the transport wheels about a pivot point such that the transport wheels will adjust the height of the implement, and also increase or decrease the length of the wheelbase between the tractor tires and the transport tires to increase the maneuverability and transportability of the implement both within a field and outside a field. The assembly includes a linkage and a cylinder connected to the implement.

Images (8)



Classifications

A01B63/22 Lifting or adjusting devices or arrangements for agricultural machines or implements for implements drawn by animals or tractors with wheels adjustable relatively to the frame operated by hydraulic or pneumatic means

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External links: USPTO, USPTO Assignment, Espacenet, Global Dossier, Discuss

Claims (18)

What is claimed is:

1. A forward folding implement having a field use configuration and a transport configuration, comprising:

a telescoping tongue having a first end including a hitch and an opposite second end;

a main frame at the second end of the tongue and including a main axle and a plurality of transport wheels extending from the main axle;

first and second wings extending from the main frame and including a plurality of wing wheels extending therefrom; and

at least one transport wheel rotating assembly positioned at the main axle and comprising a planar four-bar linkage attaching at least one of the transport wheels to the main axle and a cylinder operatively attached to the planar four-bar linkage;

wherein the at least one transport wheel rotating assembly is configured to rotate the transport wheels about an axis created by the main axle between the field use configuration of the implement wherein the transport wheels are positioned away from the hitch and a rotational axis of the transport wheels being rearward of the main axle, and the transport configuration wherein the transport wheels are positioned toward the hitch and the rotational axis of the transport wheels being in front of the main axle.

2. The implement of claim 1 wherein a bar of the planar four-bar linkage includes a wheel arm extending from the main axle to the at least one transport wheel.

3. The implement of claim 1 wherein the at least one transport wheel rotating assembly is configured to also move the transport wheels to a field turn position, wherein the transport wheels contact the ground generally below the main axle.

4. The implement of claim 1 wherein the at least one transport wheel rotating assembly rotates the transport wheels approximately 150°.

5. The implement of claim 2 wherein another bar of the planar four-bar linkage is pivotally connected to the wheel arm between the main axle and the at least one transport wheel.

6. The implement of claim 5 wherein the rotation of the at least one transport wheel rotating assembly from the field use configuration to the transport configuration decreases a distance between the hitch and the transport wheels by 1.5 times the length of the wheel arm.

7. The implement of claim 1 wherein each transport wheel includes the at least one transport wheel rotating assembly.

8. The implement of claim 1 wherein the plurality of transport wheels comprises four transport wheels operatively connected to the main axle.

9. The implement of claim 8 wherein the at least one transport wheel rotating assembly is operatively connected to each of the four transport wheels and configured to rotate the four transport wheels in unison about the main axle.

10. The implement of claim 1 further comprising first and second cylinders operatively connected between the first and second wings and the tongue and configured to move the wings between a folded configuration and an open configuration.

11. A forward folding implement having first and second wings extending from a main frame extending from a telescoping tongue and having a field use configuration and a field turn configuration with the wings substantially perpendicular to the tongue, and a transport configuration with the wings substantially parallel to the tongue, comprising:

a plurality of transport wheels operatively connected to the main frame, said main frame including a main axle;

a transport wheel rotating assembly operatively connected to each of the transport wheels and comprising a planar four-bar linkage attaching the transport wheels to the main axle and a cylinder operatively attached to the planar four-bar linkage;

a plurality of wing wheels operatively connected to the first and second wings;

wherein the transport wheels include a rotational axis that is behind the main axle in the field use configuration;

wherein the transport wheels are in contact with the ground and at least partially behind the main axle in the field turn configuration; and

wherein the transport wheels are in contact with the ground and the rotational axis of the transport wheels in front of the main axle in the transport configuration.

12. The implement of claim 11 wherein the wing wheels are in contact with the ground and at least partially behind the wings in the field use configuration, and wherein the wing wheels are not in contact with the ground in the transport configuration.

13. The implement of claim 11 wherein the transport wheel rotating assembly rotates the transport wheels approximately 150° about the main axle.

14. The implement of claim 13 wherein the planar four-bar linkage includes a wheel arm extending from the main axle to the transport wheels.

15. The implement of claim 14 wherein the rotation of the transport wheel rotating assembly from the field use configuration to the transport configuration decreases the distance between the hitch and the transport wheels by 1.5 times the length of the wheel arm.

16. The implement of claim 11 wherein the tongue comprises at least two members configured to move relative to one another to lengthen or shorten the length of the tongue.

17. The implement of claim 16 further comprising first and second cylinders operatively connected between the first and second wings and the tongue and configured to move the wings between a folded configuration and an open configuration.

18. A forward folding implement having a field use configuration and a transport configuration, comprising:

a telescoping tongue having a first end including a hitch and an opposite second end;

a main frame at the second end of the tongue and including a main axle and a plurality of transport wheels extending from the main axle;

first and second wings extending from the main frame and including a plurality of wing wheels extending therefrom; and

at east one transport wheel rotating assembly positioned at the main axle and comprising a planar four-bar linkage attaching at least one of the transport wheels to the main axle and a cylinder operatively attached to the planar four-bar linkage;

wherein the at least one transport wheel rotating assembly is configured to rotate the transport wheels about an axis created by the main axle between the field use configuration of the implement wherein the transport wheels are positioned away from the hitch and rearward of the main axle, and the transport configuration wherein the transport wheels are positioned toward the hitch and frontward of the main axle;

wherein another bar of the planar four-bar linkage is pivotally connected to a wheel arm extending from the main axle to the at least one transport wheel; and

wherein the rotation of the at least one transport wheel rotating assembly from the field use configuration to the transport configuration decreases a distance between the hitch and the transport wheels by 1.5 times the length of the wheel arm.

Description

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims priority under 35 U.S.C. §119 to provisional application Ser. No. 61/667,486, filed Jul. 3, 2012, which is hereby incorporated in its entirety.

FIELD OF THE INVENTION

The present invention relates generally to the field of agricultural equipment. More particularly, but not exclusively, the invention relates to a forward folding implement, such as a forward folding planter.

BACKGROUND OF THE INVENTION

As the power of tractors and agricultural efficiency has increased, agricultural implements such as planters have increased in span, or width, to accommodate larger numbers of individual row units. Large planters generally include a main frame having a forward hitch assembly for drawing by a tractor and left and right wing sections pivotally attached to a portion of the main frame. The pivoting wing connections allow the wings to fold relative to the main frame for transport and storage of the planter. Early planters pivotally displaced the wings vertically to reduce planter width and provide clearance for transport through narrow spaces.

However, as the size of planters has increased, planter wings are generally folded in a forward direction to accommodate longer planter wings. This evolution has necessitated the incorporation of telescoping hitch assemblies and specific folding functions to accommodate planter wings of increased length. The telescoping hitch assemblies allow components of the hitch to be inserted within each other to vary the length between the hitch and the main frame. Therefore, the longer the wing sections, the longer the tongue will have to telescope to accommodate folding of the wings. This causes the transport wheels of the main frame to be extended away from the tractor.

As the planters are getting larger and heavier, it is becoming more difficult to be able to transport these machines to and from the field. Forward folding planters are prone to extreme hitch weight on the tractor and a large turning radius due to the long wheelbase between the tractor tires or tracks and the planter transport tires. This long wheelbase is because the transport tires of the planter are also used to set the height of the frame during planting to keep the row units at a height so the machine will plant

at a uniform depth. The ideal location for the tires to level the frame height is between the row units. This location of the tires also provides that the planter does not account for negative hitch weight on the tractor when the planter is unfolded and the row units are off the ground.

Methods exist to shorten the wheelbase between the tractor tires and the planter transport tires. For instance, some planters include a sliding transport axle at the main frame of the planter. The axle is able to slide along the tongue to move toward and away from the rear of the tractor to alter the wheelbase. However, it can be very difficult to cause the axle to slide, especially when seed, fertilizer, insecticide, or other material weighs down the planter. The sliding action can cause increase wear and stress to the main frame of the implement, while also adding complexity to the machine. Furthermore, as the components of planters are commonly made from metals, there exists a chance that rusting or deformation could occur, which could prevent the axle from being able to slide along the tongue.

U.S. Pat. No. 6,408,950 to Shoup (the '950 patent) discloses a planter having an independent support wheel assembly that is slideable towards the a new center of gravity after the frame has moved from an extended or working position to a folded or transport position. However, the '950 patent includes the use of two separate motor mechanisms and wheel systems. Each of the motor mechanisms includes separate cylinders to raise and lower separate wheels. Therefore, one wheel may be lowered while the other is raised. However, the wheels must be raised and lowered individually. The separate motor mechanisms, wheels, and cylinders will also take up much space and will add a great deal of weight to the planter. The addition of multiple moving assemblies and parts also increases the chances that a moving component can fail or become damaged, which will affect the use of the planter. The multiple moving parts also increase the cost and complexity of the machine and the operation thereof.

Therefore, there is a need in the art of agricultural equipment for a method and apparatus for adjusting the wheelbase length between tractor wheel and implement transport wheel and accommodating a shift of the center of gravity of the implement that is simple to operate. There is also a need in the art for a method and apparatus for adjusting the wheelbase length and accommodating a shift of the center of gravity that will not increase the weight and cost of the implement, while also being effective.

SUMMARY OF THE INVENTION

It is therefore a primary object, feature, and/or advantage of the present invention to overcome deficiencies in the art.

It is another object, feature, and/or advantage of the present invention to provide an implement with an adjustable wheelbase length.

It is yet another object, feature, and/or advantage of the present invention to provide an implement with a transport wheel assembly capable of accommodating a shift of the center of gravity from movement of the wings between an extended, working position and a folded, transport position.

It is still yet another object, feature, and/or advantage of the present invention to provide a forward folding implement with a rotatable transport axle.

It is a further object, feature, and/or advantage of the present invention to provide an agricultural implement that includes a transport axle capable of rotating approximately 150°.

It is still a further object, feature, and/or advantage of the present invention to provide an agricultural implement including a wheel arm extending from a transport axle that will change the wheelbase length by 1.5 times the wheel arm length.

It is yet a further object, feature, and/or advantage of the present invention to provide an agricultural implement including a rotatable transport axle that is operated by a single cylinder and linkage.

It is another object, feature, and/or advantage of the present invention to provide an agricultural implement having a transport axle movable between a planting position, turning position, and a transport position.

These and/or other objects, features, and advantages of the present invention will be apparent to those skilled in the art. The present invention is not to be limited to or by these objects, features and advantages. No single embodiment need provide each and every object, feature, or advantage.

The invention includes a forward folding implement attached to a tractor. The implement includes a hitch, a telescoping tongue, a main frame including an axle, and wheels extending from the main frame and axle. The implement also includes wings and a plurality of row units at the main frame and wings. Because the ideal location of the transport wheels is between the row units during planting, the wheelbase length of the planter is extended. To reduce the wheelbase between the planter and tractor, the planter support wheels need to move forward towards the hitch during transport. To accomplish this shorter wheelbase, the axle that connects the transport tires will rotate close to 150 degrees underneath the planter. The rotation can decrease the tractor/planter wheelbase by 1.5 times the wheel arm length.

According to an exemplary embodiment of the present invention, a forward folding implement having a field use configuration and a transport configuration is provided. The implement includes a telescoping tongue having a first end including a hitch and an opposite second end. A main frame is positioned at the second end of the tongue and includes a main axle and a plurality of transport wheels extending from the main axle. First and second wings extend from the main frame and include a plurality of wing wheels extending therefrom. A transport wheel rotating assembly is positioned at the main frame and comprises a linkage attaching the transport wheels to the main frame and a cylinder operatively attached to the linkage. The transport wheel rotating assembly is configured to move the transport wheels between a retracted position for the field use of the implement wherein the transport wheels are positioned rearward of the main frame, and a transport position wherein the transport wheels are positioned frontward of the main frame.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a forward folding implement according to the present invention with the implement in a planting position.

FIG. 2 is a side elevation view of the implement of FIG. 1 with the main or transport wheels in a planting position.

FIG. 3 is a side elevation view of the implement of FIG. 1 with the main or transport wheels in a field turn position.

FIG. 4 is a side elevation view of the implement of FIG. 1 with the transport wheels in a transport position without axle rotation.

FIG. 5 is a view similar to FIG. 4, but with axle rotation of the transport wheels.

FIG. 6 is a perspective view of the implement of FIG. 1 with the wings and transport wheels in a transport position and with axle rotation.

FIG. 7 is an enlarged side view of the transport wheel rotating assembly of the implement of the present invention being in a planting position.

FIG. 8 is an enlarged side view of the transport wheel rotating assembly of the implement of the present invention being in a transport position.

Before any independent features and embodiments of the invention are explained in detail, it is to be understood that the invention is not limited in its application to the details of the construction and the arrangement of the components set forth in the following description or illustrated in the drawings. The invention is capable of other embodiments and of being practiced or of being carried out in various ways. In addition, it is understood that the phraseology and terminology used herein is for the purpose of description and should not be regarded as limiting.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. 1 is a perspective view of a forward folding implement **10** according to the present invention with the implement **10** in a planting position. While the present invention shows the implement **10** to be a planter, it should be appreciated by those skilled in the art that the invention covers other types of implements, including but not limited to, nutrient applicators, plows, disks, and other agricultural equipment. However, for exemplary purposes, the invention will be described for a forward folding-type implement **10**, such as a forward folding planter.

FIG. 1 shows a forward folding planter **10** with a tongue **12**. The tongue **12** includes a first end **14** and an opposite second end **18**. At the first end **14** of the tongue **12** is a hitch **16**, The hitch **16** allows the implement **10** to be attached to a tractor (not shown) or other vehicle for pulling the implement **10**. The hitch **16** may be any hitch used in the industry. The tongue **12** may be a telescoping tongue such that the tongue **12** includes multiple sections that can be inserted and moved relative to one another such that the length of the tongue **12** can be varied. The telescoping of the tongue **12** may be further aided by the addition of tongue supports **20** on opposite sides of the tongue **12**. As will be discussed, the tongue supports **20** connect the first end **14** of the tongue **12** to first and second wings **32**, **35** such that when the wings fold by operation of cylinders **24**, the supports **20** will extend one section of the telescoping tongue **12** to lengthen the tongue **12** so that the wings **32**, **35** are able to be folded adjacent one another.

Positioned at or near the second end **18** of the tongue **12** is a main or central frame **22**. The main or central frame **22** extends generally perpendicular to the tongue **12**. The central frame also includes housing for main hoppers **26**. The main hoppers **26** house material, such as seed, insecticide, fertilizer, or the like, which is distributed through a system to individual row units. Therefore, a great deal of weight is located at the central frame **22**. The central frame includes central row units (not shown) extending from the rear of the central frame to distribute the material to a field. The central frame also includes a main axle **28** and transport wheels **30** extending from the main axle **28** and the main frame **22**. The transport wheels **30** support the main or central frame **22**, and also are the wheels that contact the ground when the implement **10** is transported to or from a field.

Extending from opposite sides of the central frame **22** are first and second wings **32**, **35**. The first and second wings **32**, **35** generally mirror one another, and therefore, only one wing will be described. It should be appreciated that the opposite wing will include generally the same components. The first wing **32** includes a first frame **33** extending separate from, but extending generally in the same plane as the main frame **22**. A plurality of row units (not shown) will be connected to the first frame **33**. The row units of the first wing **32** are generally the same as row units of the central frame **22** and that of the opposite wing **35**. The number of row units used with an implement **10** may vary depending on the size of the implement **10**, the requirements of the field, the type of material being distributed to the field, and the like. Also extending from the wing frame **33** are wing wheels **38**. The wing wheels **38** support the outer ends of the wings **32**, **35** and allow the implement **10** to be moved without the row units penetrating the ground when turning in the field, crossing waterways or the like.

FIGS. 1 and 2 further show the implement **10** of the present invention in a planting position. When the implement **10** is in the planting position, the wheels, including the transport wheels **30** and the wing wheels **38**, are retracted to a position where they are generally rearward of the main frame **22** and the wing frames **33**, **36**. The positioning of the wheels is such that the wheels will be raised to allow the row units to sufficiently contact and penetrate the ground of the field. However, it should be appreciated that the wheels will need to be able to move from the planting position to other positions in order to move the implement **10** both within the field and outside of the field.

As shown in FIG. 3, the wheels **30**, **38** of the implement **10** have been adjusted such that the implement **10** is in a field turn position. The wing wheels **38** include cylinders or other moving mechanisms to move the wheels between the planting position and the field turn position, as shown in FIGS. 2 and 3. Furthermore, the transport wheels **30** include a transport wheel rotating assembly **40** that allows the transport wheels **30** to be rotated relative to the main frame **22** about the main axle **28** and including more rotational movement than that of the wing wheels **38**. The transport wheel rotating assembly **40** includes a cylinder **52** connecting between the main frame **22** and the linkage **42**. The configuration and use of the linkage **42** will be discussed more below. The cylinder **52** is extended from the position of FIG. 2 to that of the position in FIG. 3 such that the transport wheels **30** are rotated in a counterclockwise direction such that the wheels contact the ground and then begin to lift the row units away from the ground as shown by the arrow generally depicted as numeral **58**. Furthermore, the cylinder **52** and linkage **42** of the transport wheel rotating assembly **40** is sized such that the rotation of the wheels will lift the implement **10** off the ground such that the row units will no longer be in contact with the ground.

Furthermore, the number of cylinders **52** and rotating assemblies **40** may vary. The present invention contemplates that only one cylinder and linkage is required to rotate the transport wheels **30**. However, as shown in the figures, the invention also contemplates that more rotating assemblies **40** may be included, including a rotating assembly **40** for each of the transport wheels **30**. For example, when the implement **10** includes four transport wheels **30**, four rotating assemblies **40** can be included and connected between the frame and the wheels to rotate the wheels between field use, turning, and transport configurations. Therefore, it should be appreciated that generally any number of rotating assemblies, including cylinders and linkages, may be used and all variations of the like are to be considered part of the invention.

In the position shown in FIG. 3, the tractor is more easily able to turn within a field, as the row units do not provide drag and are not subjected to destructive side loads that would restrict turning. It should be appreciated by those skilled in the art that while FIG. 3 shows the transport and wing wheels at an angle relative to the frames and implement **10**, the purpose of putting the implement **10** in a field turn position is to raise the row unit from the ground, and therefore, any position of the wheels such that the row units are positioned away from the field is acceptable for a field turn position.

FIGS. 4-6 show the implement **10** in a transport position with and without rotation of the transport wheels **30** about the main axle **28** by the transport wheel rotating assembly **40**. In these figures, the wings **32**, **35** have been folded in a forward movement, i.e., rotated about a generally vertical axis. The wings **32**, **35** are folded by forward folding cylinders **24** connected between the wings **32**, **35** and the tongue **12** to move the wings **32**, **35** with the first wing **32** and the second wing **35** on opposite sides of the tongue **12** and generally adjacent to one another. At this position, the wings **32**, **35** may be locked in place such that they will be held in this position. The forward folding of the wings **32**, **35** may be accomplished once the implement **10** is in a field turn position, e.g., the configuration shown in FIG. 3. As shown in FIG. 4, the raising of the row units off the ground allows the wings **32**, **35** to be folded easier and without drag or other restrictions. However, when the implement **10** is in such a transport position such that the transport wheel **30** is still in a field turn position, the wheelbase or length from the hitch **16** to the transport wheels **30** is rather large. In addition, the length is even larger from the position of the tractor wheel to the position of the transport wheels **30**. Thus, the large wheelbase will make it more difficult for an operator to control the movement of the implement **10**, including turns. The larger a wheelbase, the wider a turn must be, which can decrease the safety of the turns outside of a field for both the operator and other traffic.

As shown in FIGS. 5 and 6, the present invention contemplates the use of a transport wheel rotating assembly **40** to rotate the position of the transport wheel **30** about the direction of the arrow **56**. The transport wheel rotating assembly **40** includes a linkage **42** attached to the main axle **28**, and a rotating cylinder **52** connected to the linkage **42**. One of the bars of the linkage **42** is a wheel arm **54** extending from the main axle **28** to the axle of the transport wheel **30**. Therefore, the transport wheel **30** rotates along with the wheel arm **54**. As shown, the transport wheel rotating assembly **40** may rotate the transport wheel **30** up to approximately 150° from the position of the transport wheel **30** in the planting position. The configuration of the linkage **42** and the length of the rotating cylinder **52** are such that the wheel base length may be shortened by a distance approximately 1.5 times the length of the wheel arm **54**. This reduction in length of wheelbase increases the maneuverability of the implement **10**, reduces the turning radius of the implement **10**, and creates a generally safer transport. By allowing the wheelbase length to be shortened with the transport wheel rotating assembly **40**, the present invention also accommodates for the wings **32**, **35** being greater in length as the length of the wheelbase **10** may be shortened to compensate the forward shift of the center of gravity once the wings are in a folded position. Put another way, having longer wings **32**, **35** would normally increase the wheelbase. The assembly **40** of the present invention would compensate for the longer wing length by reducing the otherwise added length by rotating the wheels.

Advantages of the present invention are numerous. As stated, the rotational movement of the transport wheel **30** from that shown in FIG. 1 to that shown in FIG. 4 reduces the wheelbase length, which is the length of the distance between the transport wheel **30** and the hitch **16** or the wheels of the tractor (not shown). This reduction of wheel base length increases the maneuverability of the implement during transport of the implement **10**. The use of the transport wheel rotating assembly **40** also accommodates a longer set of wings **32**, **35**, which allows for the use of more row units on the wings **32**, **35**. The use of more row units on the wings **32**, **35** allows for more rows to be planted at one time, such that a farmer or operator is able to reduce the amount of time in the field during planting. In addition, as the wheelbase length may be considered to be shortened or lengthened by approximately 1.5 times the length of the wheel arm **54** by adjusting the length of said wheel arm **54**, the wheelbase length may be configured to be appropriate for different types of implements **10**.

FIGS. 7 and 8 are enlarged views of the transport wheel rotating assembly **40** of the present invention. As discussed, the transport wheel rotating assembly **40** includes a linkage **42** connected to the main axle **28** and a rotating cylinder **52** connected to the linkage **42**. The linkage **42** is a four bar linkage and includes a first bar **44**, second bar **46**, third bar **48**, and fixed link **50**. The fixed link **50** or frame may not be a discrete structural member, but rather can comprise a commonly understood component of the typical four bar linkage that extends between two cranks, in this case the first bar **44** and the third bar **48**, opposite the connecting rod. The bars of the linkage **42** are connected by pins **60** or other connecting devices, which allow the bars to rotate relative to one another. Therefore, each end of the bars **44**, **46**, **48** includes apertures therethrough such that the apertures of the bars will line up with one another to create the our bar linkage **42**. The construction of the linkage **42** and the lengths of each of the bars is such to allow for the rotation of the transport wheel **30** upon extension or retraction of the cylinder **52**. The extension of the cylinder **52** creates a rotational movement about the pivot or main axle **28** to move the transport wheel **30** from the planting position to a transport position, as well as positions therebetween. The amount of rotation can be varied by changing the lengths of the individual bars of the linkage **42**, as well as the size and length of the cylinder **52**. Furthermore, it should be appreciated that the cylinder **52** is sized such that it is able to rotate the transport wheels **30** with enough force to be able to lift the implement **10**, as was previously discussed. Furthermore, while it is preferred that the cylinder **52** be a hydraulic cylinder, other cylinders, such as pneumatic, electric, etc., may be used with the assembly and are contemplated by the present invention as well.

It should be appreciated by one skilled in the art that a transport wheel rotating assembly **40** be positioned at each of the transport wheels **30** at the main or central frame **22**. Each of the transport wheel rotating assemblies **40** can work in unison with one another to move or rotate the transport wheel **30** at the same time and rotation of velocity. Thus, each of the linkages **42** and cylinders **52** will be the same for each of the transport wheel rotating assemblies **40**. In addition, it is contemplated by the present invention that only one linkage **42** and cylinder **52** be contemplated to be used at the main or central frame **22** with the transport wheels **30** connected by a bar or other mechanism such that the one transport wheel rotating assembly **40** be used to rotate the transport wheels **30** from the planting position and all the way to the transport position. However, it is preferred that each wheel include its own linkage **42** and cylinder **52**.

As best shown in FIGS. 7 and 8, the third bar **48** of the linkage **42** may also be the wheel arm **54** connecting the transport wheel **30** to the pivot point or main axle **28**. Therefore, the length of the third bar **48** may be varied, with the length being longer than the actual third bar **48** of the linkage **42**. Thus, the length of the third bar **48** is considered to be the length between the pins **60**, **61** in FIG. 8. However, the length of the wheel arm **54** is longer than the length of the third bar **48** of the linkage **42**. This length of the wheel arm **54** may be varied according to the size of the implement **10** and wings **32**, **35**. As noted above, the length of the wheelbase will be adjusted by rotation of the transport wheel **30** such that the length may be shortened up to 1.5 times the length of the wheel arm **54**. Thus, as the length of the wheel arm **54** is adjusted, the length of the wheelbase will be adjusted as well. When an implement **10** includes longer wings **32**, **35**, a longer wheel arm **54** will be required in order to shorten or decrease the length of the wheelbase to accommodate for the longer wings **32**, **35**.

A transport wheel rotating assembly for an implement and a method of use has been shown and described. The present invention contemplates numerous variations, options, and alternatives, and is not to be limited to the specific embodiments described here. For example, the length of the bars of the linkage may be varied, the number of transport wheels and rotating assemblies may be varied, and the length of the wings and tongue may be varied as well. Furthermore, while the implement is shown to include central hoppers on the main frame that feed all the individual row units, it is further contemplated that the rotating assembly may be used with an implement including individual hoppers at each of the row units. Furthermore, it should be appreciated that the length and size of the rotating cylinder may be varied according to the amount of weight of the implement. Other changes are considered to be part of the present invention.

Patent Citations (22)

Publication number	Priority date	Publication date	Assignee	Title
US2181410A *	1938-03-19	1939-11-28	Deere & Co	Plow
US2351830A *	1942-08-06	1944-06-20	Killefer Mfg Corp	Ground working implement
US2635888A *	1947-08-18	1953-04-21	Bailiff Charles	Adjustable wheel assembly for earth handling and leveling apparatus
US2970658A *	1955-12-22	1961-02-07	Arnold F Kopaska	Harrow transport
US2994544A *	1959-12-21	1961-08-01	Int Harvester Co	Hydraulic ram mounting
US3643745A *	1969-06-25	1972-02-22	Chem Farm Inc	Earthworking implement and support
US3679224A *	1971-02-16	1972-07-25	Cole Mfg Co	Lifting arrangement for agricultural implement frame
US4043403A *	1976-03-23	1977-08-23	Chromalloy American Corporation	Agricultural implement frame elevating mechanism
US4119329A *	1977-06-15	1978-10-10	Smith L Eugene	Farm apparatus
US4171022A *	1977-09-26	1979-10-16	Great Plains Manufacturing Incorporated	Foldable construction for agricultural implements
US4364581A *	1977-09-19	1982-12-21	Shoup Kenneth E	Foldable implement frame and hitch
US4504076A *	1983-09-16	1985-03-12	Deere & Company	Forward-folding agricultural implement featuring narrow row spacing
US4582143A *	1983-12-27	1986-04-15	Deere & Company	Forwardly-folding agricultural implement
US4596290A *	1982-12-27	1986-06-24	Deere & Co	Agricultural machine with offset forwardly folding frame
US4660842A *	1986-04-24	1987-04-28	J. I. Case Company	Agricultural implement with elevation control mechanism

US4871030A *	1989-01-31	1989-10-03	Brillion Iron Works, Inc.	Farm implement having transport wheels and soil working rollers on rotating frame
US5113956A *	1991-01-23	1992-05-19	Friesen Milford E	Forwardly folding tool bar
US6408950B1 *	2000-04-20	2002-06-25	Kenneth E. Shoup	Foldable implement frame and hitch
US7063167B1 *	2000-06-16	2006-06-20	Case Corporation	Self leveling towed implement
US20100126744A1	2008-11-21	2010-05-27	Cnh America Llc	Implement frame with front folding wings and transport wheels
US8235133B2 *	2008-10-24	2012-08-07	Cnh Canada, Ltd.	Agricultural implement having wheels that caster
Family To Family Citations				
DE102005026812A1 *	2005-06-09	2007-01-11	Rabe Agri Gmbh	Agricultural machine with folding forward tools

* Cited by examiner, † Cited by third party

Cited By (2)

Publication number	Priority date	Publication date	Assignee	Title
Family To Family Citations				
CN104115582B *	2014-07-22	2016-01-13	湖南省烟草公司长沙市公司浏阳市分公司	Tobacco farming equipment at cantilever type
US9699951B2 *	2015-07-10	2017-07-11	Cnh Industrial America Llc	Wheel position control system for an agricultural implement

* Cited by examiner, † Cited by third party, ‡ Family to family citation

Similar Documents

Publication	Publication Date	Title
US3414064A	1968-12-03	Adjustable rotary hoe
US3333645A	1967-08-01	Multiple purpose drawbar
US4319643A	1982-03-16	Front folding agricultural tool bar with movable carriage to which wings coupled
US4137852A	1979-02-06	Forwardly foldable toolbar
US4700784A	1987-10-20	Combined depth-control and wing-lift hydraulic circuit
US4518046A	1985-05-21	Multiple implement hitch and transport
US6907719B2	2005-06-21	Agricultural implement comprising a transporting device
US4126187A	1978-11-21	Rearfolding implement
US4117893A	1978-10-03	Agricultural tool bar
US6125775A	2000-10-03	System for gauge wheel load adjustment
US6675907B2	2004-01-13	Flexible toolbar and operating hydraulic circuit
US6902010B2	2005-06-07	Foldable implement frame and hitch
US4619330A	1986-10-28	Flexibility for wide swath agricultural implements
US5577563A	1996-11-26	Stack-folding toolbar with floating wings
US8235133B2	2012-08-07	Agricultural implement having wheels that caster
US5346019A	1994-09-13	Agricultural implement with common mechanism for raising/lowering and rotating a lift frame about a vertical axis
US4214637A	1980-07-29	Elevation altering structure for agricultural implements
US6408950B1	2002-06-25	Foldable implement frame and hitch
US20110284252A1	2011-11-24	Agricultural implement tool frame actuating system
US4721168A	1988-01-26	Agricultural implement with raisable lift frame rotatable about vertical axis
US7469648B2	2008-12-30	Front fold planter lift and fold hydraulic control system

US7604068B1	2009-10-20	Forwardly folding tool bar
US5398771A	1995-03-21	Grain Drill
US3982773A	1976-09-28	Folding frame structure for agricultural implements
US6502645B1	2003-01-07	Folding agricultural implement frame

Priority And Related Applications

Priority Applications (2)

Application	Priority date	Filing date	Title
US201261667486	2012-07-03	2012-07-03	*US Provisional Application*
US13803186	2012-07-03	2013-03-14	Forward rotating transport axle

Applications Claiming Priority (1)

Application	Filing date	Title
US13803186	2013-03-14	Forward rotating transport axle

Legal Events

Date	Code	Title	Description
2013-04-16	AS	Assignment	**Owner name**: KINZE MANUFACTURING, INC., IOWA **Free format text**: ASSIGNMENT OF ASSIGNORS INTEREST;ASSIGNOR:BLACKWELL, ROBERT;REEL/FRAME:030227/0233 **Effective date**: 20130408

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