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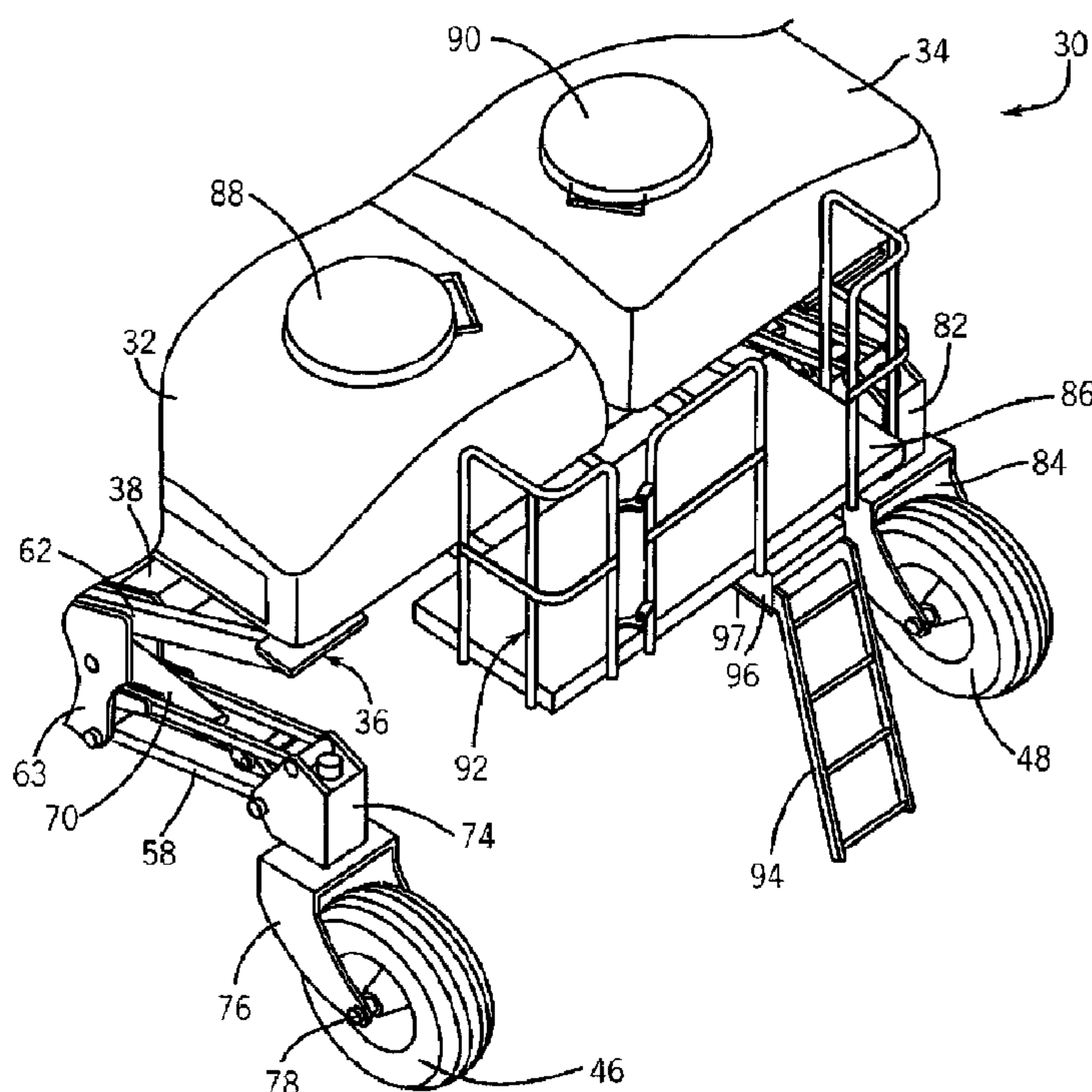
(72) Inventeur/Inventor:
REMOUE, TYLER, CA

(73) Propriétaire/Owner:
CNH INDUSTRIAL CANADA, LTD., CA

(74) Agent: GOWLING LAFLEUR HENDERSON LLP

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(54) Title: CENTRAL BULK FILL SYSTEM HAVING STOWABLE LADDER FOR STACK-FOLD FARM IMPLEMENT



(57) Abrégé/Abstract:

A stack-fold implement having a central bulk fill hopper assembly is provided. The bulk fill hopper assembly is mounted to the center frame section of the stack-fold implement and does not affect the narrowness of the stack-fold implement when it's in a stacked, transport position. The hopper assembly includes a pair of bulk fill hoppers or tanks supported by cradle that is in turn supported by a pair of wheels. The cradle is removably coupled to the center frame section by a plurality of rigid frame members. A retractable ladder may be stowed beneath the hopper assembly.

**CENTRAL BULK FILL SYSTEM HAVING STOWABLE LADDER
FOR STACK-FOLD FARM IMPLEMENT**

ABSTRACT

[0037] A stack-fold implement having a central bulk fill hopper assembly is provided. The bulk fill hopper assembly is mounted to the center frame section of the stack-fold implement and does not affect the narrowness of the stack-fold implement when it's in a stacked, transport position. The hopper assembly includes a pair of bulk fill hoppers or tanks supported by cradle that is in turn supported by a pair of wheels. The cradle is removably coupled to the center frame section by a plurality of rigid frame members. A retractable ladder may be stowed beneath the hopper assembly.

CENTRAL BULK FILL SYSTEM HAVING STOWABLE LADDER FOR STACK-FOLD FARM IMPLEMENT

BACKGROUND OF THE INVENTION

[0001] The present invention relates generally to farm implements and, more particularly, to a central fill system having a stowable ladder for a stack-fold planter.

[0002] Increasingly, farm implements have been designed to have frames that can be folded between field-working and transport positions. One such type of farm implement is a stack-fold planter, such as the 1230 Stackerbar planter from Case New Holland, LLC. Stack-fold planters generally consist of a center frame section and a pair of wing frame sections. In the field-working position, the wing frame sections are evenly aligned with the center frame section. In the transport position, however, the wing sections are lifted to a position directly above the center frame section, i.e., to a “stacked” position. In the stacked position, the width of the implement is generally that of the center frame section, thus making the implement better suited for transport along roads and between crops.

[0003] Openers are mounted to the frame sections at equal intervals, with each of the wing sections typically carrying one-half the number of openers mounted to the center frame section. The openers are designed to cut a furrow into a planting surface, deposit seed and/or fertilizer into the furrow, and then pack the furrow. In this regard, each opener will have a seed box that is manually loaded with seed and/or fertilizer. Since the size of the seed box determines how much particulate matter the box can retain, there is generally a desire to have larger seed boxes for each of the openers. Since the larger seed boxes can hold more material, fewer refilling stops are needed when planting a field.

[0004] Larger seed boxes, however, have drawbacks. The additional material that can be carried by larger seed boxes adds to the overall weight of the openers, including those mounted to the wing sections. This additional weight can stress the lifting/lowering system that stacks the wing sections, or require a more robust system, which can add to the overall size, mass, complexity, and cost of the implement. Additionally, larger seed boxes can affect the spacing between adjacent openers, and thus the spacing between seed trenches that are formed by the openers. Larger spacing between seed trenches lower per acre crop yields. Further, it can be problematic

and time consuming to individually fill each of the seed boxes, whether using bags or a conveyor system.

[0005] Many central fill systems for such stack-fold planters have a rearward platform accessible by a ladder that is fixed to a rearward edge of the platform. The platform provides a work space for an operator when refilling the central hoppers or visually inspecting the fill level in the hoppers. The ladder provides a means to access the platform. One known central fill system for a stack-fold planter includes means for raising the hoppers when the planter is in transport. It is believed that raising the hoppers provides better weight distribution and therefore allows for faster travel speeds when the planter is in transport. The transport position is commonly used as the position for the planter when being stored and serviced, particularly, the central fill system, such as the air blower and its related components, hoses, and the like. For systems having a fixed ladder mounted to the platform, the ladder constrains the workspace around the central fill system and creates a structure of which a service technician must be cognizant to avoid unnecessary contact. Alternately, the technician may find avoiding the fixed ladder cumbersome and therefore elect to remove the ladder.

SUMMARY OF THE INVENTION

[0006] The present invention is directed to a central fill system having a stowable ladder for use with a stack-fold implement. The bulk fill hopper assembly is mounted to the center frame section of the stack-fold implement and does not affect the narrowness of the stack-fold implement when in a stacked, transport position. The hopper assembly preferably includes a pair of bulk fill hoppers or tanks supported by cradle that is in turn supported by a pair of wheels. The cradle is removably coupled to the center frame section by a pair of rigid frame members. Parallel linkages interconnected the cradle and the wheels, and allow the wheels to, in effect, float to accommodate changes in terrain as the implement is being towed in either the working or transport positions. The rigid frame members preferably hold the position of the cradle constant but the position of the wheels change in response to changes in terrain. A ladder is provided that may be stowed adjacent the cradle when not being used, but may be slid rearward and lowered when its use is desired. A platform rearward of hoppers includes catches that engage the forward end of the ladder as the ladder is being withdrawn from its stowed position. The catches prevent the unintentional removal of the ladder from the central fill system.

[0007] According to one aspect of the invention, an agricultural implement is provided, and includes a tool bar adapted to be coupled to a prime mover, with the tool bar having an inner section and at least one outer section, and a plurality of row units coupled to the inner and outer sections of the tool bar. The implement further includes means for raising the outer section to a stacked position generally above the inner section, and a frame member coupled to and extending rearward from the inner section of the tool bar. A bulk fill hopper assembly is supported by the frame member and operative to deliver particulate material to the plurality of row units. The bulk fill hopper assembly includes a stowable ladder that when in use enables access to hopper(s) that store particulate matter that is ultimately delivered to the row units.

[0008] In accordance with another aspect of the invention, a central fill system for a stack-fold planter is provided. The central fill system includes a frame that supports one or more bulk fill hoppers or tanks, and is adapted to be coupled to a tool bar of the stack-fold planter. The frame further supports a platform rearward of the hoppers that provides a work space for adding product to the fill hoppers or visually inspecting the hoppers. A ladder is provided that is removably engaged with the platform such that when the platform is in a use-position, the ladder may be used to gain access to the platform. When not in use, the ladder may be stowed on the frame beneath the hoppers.

[0009] According to one object of the invention, a more efficient, greater material capacity stack-fold planter is provided.

[0010] It is another object of the invention to provide a stack-fold implement having a central bulk fill system.

[0011] It is a further object of the invention to provide a central bulk fill system for a stack-fold implement, such as a stack-fold planter.

[0012] It is yet another object of the invention to provide a central bulk fill system having a stowable ladder for use with a stack-fold planter.

[0013] Other objects, features, aspects, and advantages of the invention will become apparent to those skilled in the art from the following detailed description and accompanying drawings. It should be understood, however, that the detailed description and specific examples, while

indicating preferred embodiments of the present invention, are given by way of illustration and not of limitation. Many changes and modifications may be made within the scope of the present invention without departing from the spirit thereof, and the invention includes all such modifications.

BRIEF DESCRIPTION OF THE DRAWINGS

- [0014] Preferred exemplary embodiments of the invention are illustrated in the accompanying drawings in which like reference numerals represent like parts throughout.
- [0015] In the drawings:
- [0016] FIG. 1 is a pictorial view of an agricultural planting system comprised of a stack-fold planter coupled to a tractor;
- [0017] FIG. 2 is an isometric view of the stack-fold planter of FIG. 1 in a field-working position;
- [0018] FIG. 3 is a rear elevation view of the stack-fold planter of FIG. 1 in a stacked, transport position;
- [0019] FIG. 4 is an isometric view of the central bulk fill system of FIG. 1 in a lowered, field working position;
- [0020] FIG. 5 is a side elevation view of the central bulk fill system of FIG. 4;
- [0021] FIG. 6 is a side elevation view of the central bulk fill system in a raised, transport position;
- [0022] FIG. 7 is a rear isometric view of the central bulk fill system with a stowable ladder in a withdrawn ready-for-use position; and
- [0023] FIG. 8 is a detailed view of the stowable ladder and platform arrangement.

DETAILED DESCRIPTION

- [0024] Referring now to FIG. 1, a planting system 10 according to one embodiment of the invention includes a stack-fold implement 12, shown in a field working position, coupled to a prime mover 14, e.g., tractor, in a known manner. For purposes of illustration, the stack-fold implement 12 is a row crop planter, which as shown in FIG. 2, includes a frame 16 generally

comprised of a center section 18 and wing sections 20, 22 on opposite lateral sides of the center section. The center section 18 includes a tongue (not shown) that extends forwardly of the center section 18 for hitching the implement 12 to the prime mover 14. Gauge wheels 24 on the frame sections 18, 20, and 22 set the seeding or cutting depth for the implement.

[0025] In the illustrated embodiment, sixteen openers 26 are mounted to the frame 16 at equally spaced intervals, but it is understood that more than or fewer than sixteen openers could be mounted to the frame 16. As known in the art, the wing sections 20, 22 may be raised to a transport position, as shown in FIG. 3, in which the openers carried by the wing sections 20, 22 are stacked over the center section 18. As also known in the art, the openers 26 are designed to cut a furrow into the soil, deposit seed and/or fertilizer into the furrow, and then pack the furrow. Seed boxes or “mini-hoppers” 28 are optionally mounted to each of the openers 26. The mini-hoppers 28 are preferably smaller than conventional mini-hoppers used with stack-fold crop row planters and thus hold less material than conventional seed boxes.

[0026] The present invention allows for smaller mini-hoppers as the invention provides for a central bulk fill assembly 30 that delivers material, such as seed and/or fertilizer, to the openers 26 and/or the mini-hoppers 28. The central bulk fill assembly 30 preferably includes a pair of bulk fill hoppers 32 and 34 supported adjacently to one another on a cradle 36. The cradle 36 is supported by a frame 38 that is mounted to the center section 18 by a set of rearwardly extending frame members 40, 42, and 44. In a preferred embodiment, the frame members 40, 42, and 44 are removably coupled to center frame section 18 which allows the bulk fill assembly 30 to be removed from the implement 12 or added as an after-market add-on to an existing stack-fold implement.

[0027] The platform 38 is supported above the work surface (or transport surface) by a pair of wheels 46, 48 that are each connected to the platform 40 by respective parallel linkages 50, 52. Each linkage includes an upper link 54, 56 and a lower link 58, 60, respectively. In addition to the links 54-60, a pair of lift arms 62, 64 are provided. Lift arm 62 is coupled to frame member 44 at a knuckle 62 to which parallel linkage 50 is also connected. In a similar manner, lift arm 64 is coupled to frame member 40 at a knuckle 64 to which parallel linkage 52 is also connected. As shown particularly in FIG.4, the cradle 36 further includes a Y-beam 66 that is pivotally coupled to the center frame member 42. As is customary for most central bulk fill assemblies, an

air blower 68 is mounted beneath cradle 36 is operable transfer particulate matter from the hoppers 32, 34 to the individual mini-hoppers 28 or directly to the openers 26 in a forced air stream.

[0028] As known in the art, central bulk fill hoppers, such as those described above, provide the convenience of a central fill location rather than having to fill the individual seed boxes. Also, the central fill hoppers have greater capacity than the seed boxes, which reduces the number of fill iterations that must be taken when planting. Simply mounting a central bulk fill assembly to a stack-fold planter, such as planter 12, can create stability issues, especially when the stack-fold planter is in the transport position. In this regard, the present invention provides a mechanism for raising the bulk fill assembly 30 when the stack-fold planter 10 is in the folded, transport position. Raising the bulk assembly 30 provides greater stability during transport as well provides increased clearance between the bulk fill assembly 30 and the roadway.

[0029] Accordingly, the present invention provides a pair of hydraulic lift cylinders 70 and 72 for lifting the cradle 36, and thus the bulk fill assembly 30. Cylinder 70 is interconnected between forward knuckle 62 and a rearward knuckle 74. As shown in FIG. 5, the rearward knuckle 74 includes, or is coupled to, a mounting arm 76 that is coupled to axle 78 about which wheel 46 rotates. Cylinder 70 includes a ram 80 that is coupled to the rearward knuckle 74 whereas cylinder 70 is coupled to the forward knuckle 62. In a similar fashion, cylinder 72 includes a ram (not shown) connected to a rearward knuckle 82 whereas the cylinder 72 is connected to the forward knuckle 64. It will be appreciated that a mounting arm 84 is connected to, or formed with, the rearward knuckle 82, and the mounting arm 84 is connected to an axle (not shown) about which wheel 48 rotates.

[0030] FIGURE 6 shows the central bulk fill assembly 30 in the raised-for-transport position. The bulk fill assembly 30 is raised from the lower, field or working position by the actuation of cylinders 70 and 72. In a preferred embodiment, the cylinders 70, 72 are linked to the hydraulic system that raises and lowers the stack-fold planter 12. Thus, the central bulk fill assembly 30 is automatically raised and lowered as the planter 12 is raised and lowered. It is contemplated however that the bulk fill assembly 30 could be raised and lowered independent of the stack-fold planter. Additionally, it is contemplated that a separate hydraulic system could be used to raise and lower the central bulk fill assembly 30.

[0031] The following description details how the central bulk fill assembly 30 is raised and lowered. While reference will be made to cylinder 70 and its ram 80, it should be noted that the other cylinder 72 and its ram operate similarly and in-tandem with cylinder 70 and ram 80. In operation, the ram 80 is extended or retracted based on the pressure in cylinder 70. When the ram 80 is extended, the force applied against the rearward knuckle 74 causes the forward knuckle 62 to elevate. Conversely, when the ram is retracted, the forward knuckle 74 is drawn downward resulting in lowering of the central bulk fill assembly 30. It will be appreciated that the parallel linkages 50, 52 maintain the lift arms at a consistent orientation throughout the range of motion provided by extension and retraction of the rams. In this regard, a substantially level central fill bulk assembly 30 is maintained during raising and lowering. Further, as shown by comparing the views of FIGS. 5 and 6, the lift arms 62, 64 remain above the parallel linkages throughout the range of vertical motion of the bulk fill assembly 30.

[0032] Referring now to FIGS. 4 and 5, a platform 86 is mounted to the Y-beam 66 and extends rearward therefrom beneath the bulk fill hoppers 32, 34. The platform 86 provides a standing area for a user to access the respective top hatches 88, 90 for the hoppers 32, 34 for inspecting the fill level of the hoppers 32, 34 or add additional material to the hoppers 32, 34. Extending uprightly generally from a back edge of the platform 86 is a barrier 92 designed to prevent a user from falling off the back edge of the platform 86.

[0033] As shown in FIG. 5, even when the bulk fill assembly 30 is in the lowered, field position, the platform is substantially elevated above the field surface. Thus, to provide access to the platform, the present invention provides a stowable ladder 94 that when stowed is retained in a slot 95 formed between the bottom surface of platform 86 and a floor 97 that is mounted below the platform 86. The ladder 94 may be slid rearwardly from the slot 95 and then lowered to a use position, as illustrated in FIG. 7. It will be appreciated that the rearward end of the slot 95 includes catches 96 that retain the forward (top) end of the ladder 94 so that the ladder 94 is not completely removed from the slot 95 when the ladder 94 is moved to the use position. The catches 96 are shaped such that the ladder 94, when it reaches its fully extended position, it may be pivoted or rotated downward so that the trailing (bottom) end engages the ground.

[0034] FIGURE 8 is a detailed view of the stowable ladder and platform arrangement generally described above. When the ladder 94 is in the working, extended position (FIG. 7), the ladder 94

may be stowed by lifting up at (or near) the ground engaging end of the ladder along pivot line 98 extending through catches 96 and then sliding the ladder toward the front of the central bulk fill assembly 30 as indicated by arrow 100 until the ladder 94 is fully seated in position in slot 97 beneath the platform 92. It will therefore be appreciated that when the ladder 94 is in the stowed position, the ladder 94 does not interfere with access to the lower components of the central bulk fill assembly 30, such as the air blower 68 for example.

[0034] It will be appreciated that the present invention provides a stack-fold implement having a central bulk system and thus the advantages typically associated with bulk fill systems, such as reducing filling intervals, longer seeding times, and greater efficiency. Additionally, the centralized hoppers provide the convenience of a central fill location that is generally clear of the openers whether the implement 12 is in a working position or a stacked, transport position. The placement of the bulk fill system rearward of the center section 18 also provides additional stability to the implement 12 when the implement is in the stacked position.

[0035] Many changes and modifications could be made to the invention without departing from the scope thereof. The scope of these changes will become apparent from the appended claims.

CLAIMS:

1. A stack-fold planter comprising:

a center frame section and a pair of outer frame sections mounted to opposite lateral sides of the center frame section, wherein the outer sections are configured to be raised and folded to an over-center stacked position;

a plurality of ground engaging tools mounted to the center frame section and the pair of outer frame sections;

a trailing frame section coupled to and extending rearward from the center frame section;

a central bulk fill assembly supported by the trailing frame section; and

a ladder for enabling access to the central bulk fill assembly, the ladder movable between a stowed position wherein at least a portion of the ladder is beneath the central bulk fill assembly and an extended, working position wherein the ladder is rearward of the central bulk fill assembly.

2. The planter of claim 1 wherein the central bulk fill assembly includes:

a pair of lift arms coupled to the trailing frame section;

at least one bulk fill hopper supported by the pair of lift arms; and

a pair of parallel linkages pivotably coupled to the trailing frame section and operative to maintain an orientation of the bulk fill hopper when the lift arms are being raised and lowered, and wherein a lowermost position of the pair of lift arms is above an uppermost portion of the pair of parallel linkages throughout a range of motion for the pair of parallel linkages.

3. The planter of claim 2 further comprising a cradle coupled to the pair of lift arms, and wherein the cradle defines a seat for the at least one bulk fill hopper.

4. The planter of claim 1 further comprising a platform mounted to and extending rearward of the central bulk fill assembly.

5. The planter of claim 4 wherein the ladder is stowable in a slot formed adjacent the platform.

6. The planter of claim 5 wherein the slot is formed adjacent a bottom surface of the platform.

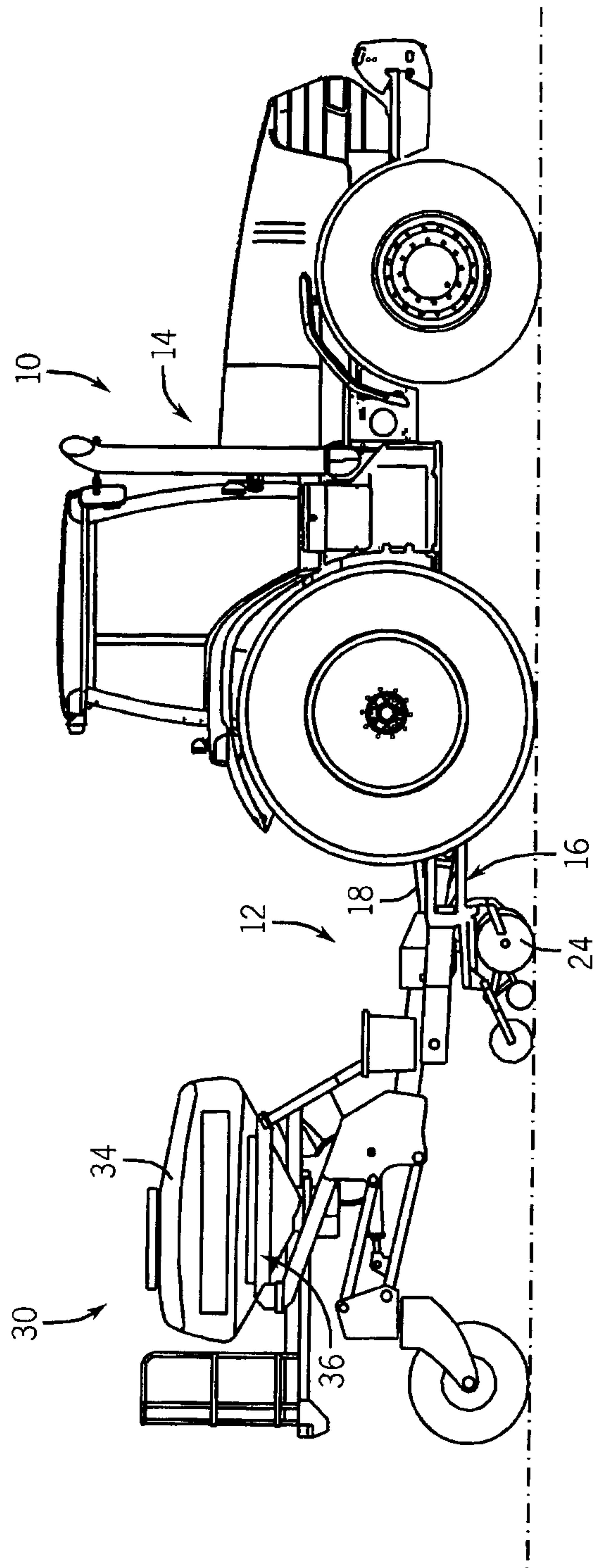


FIG. 1

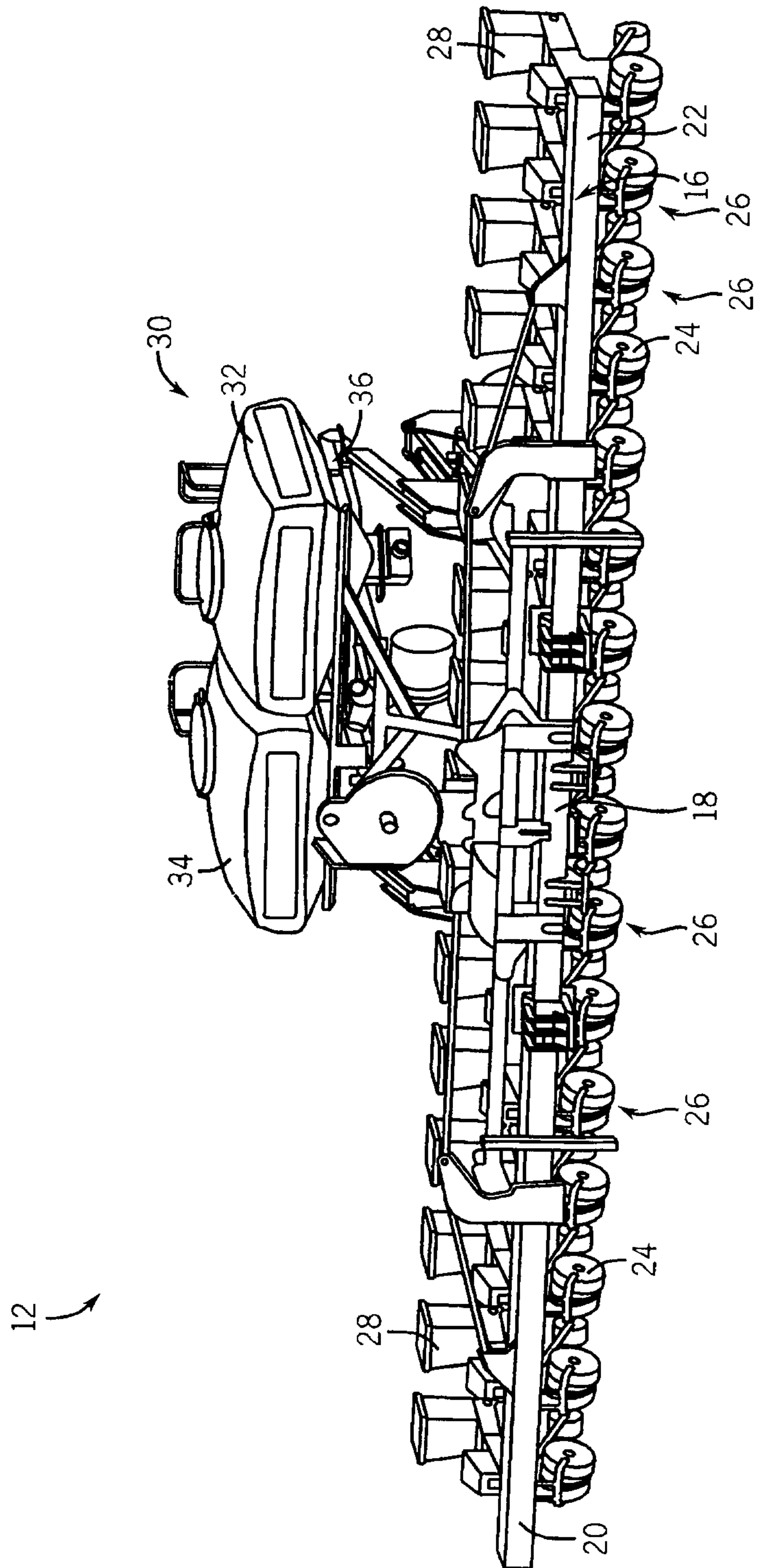


FIG. 2

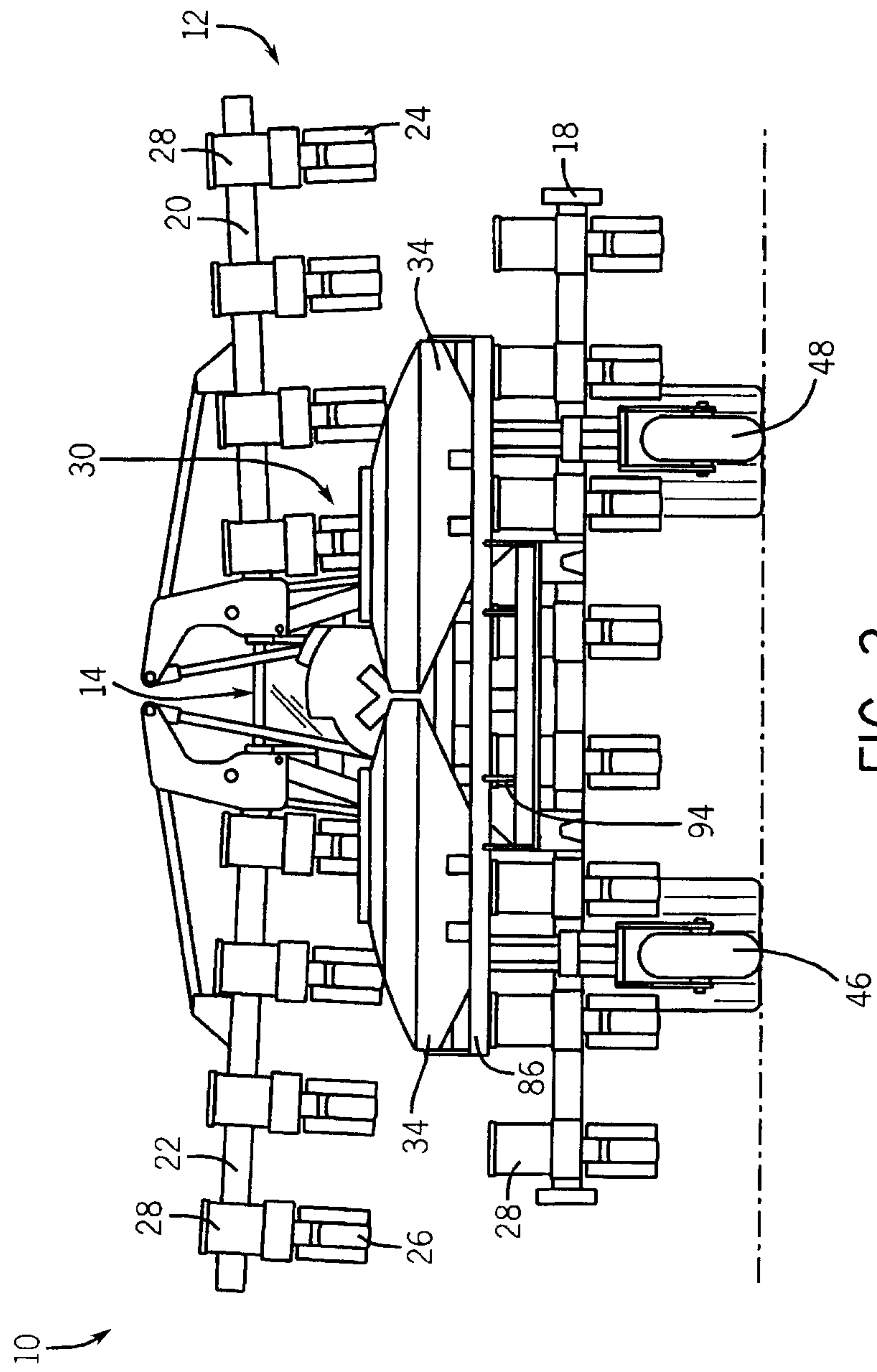


FIG. 3

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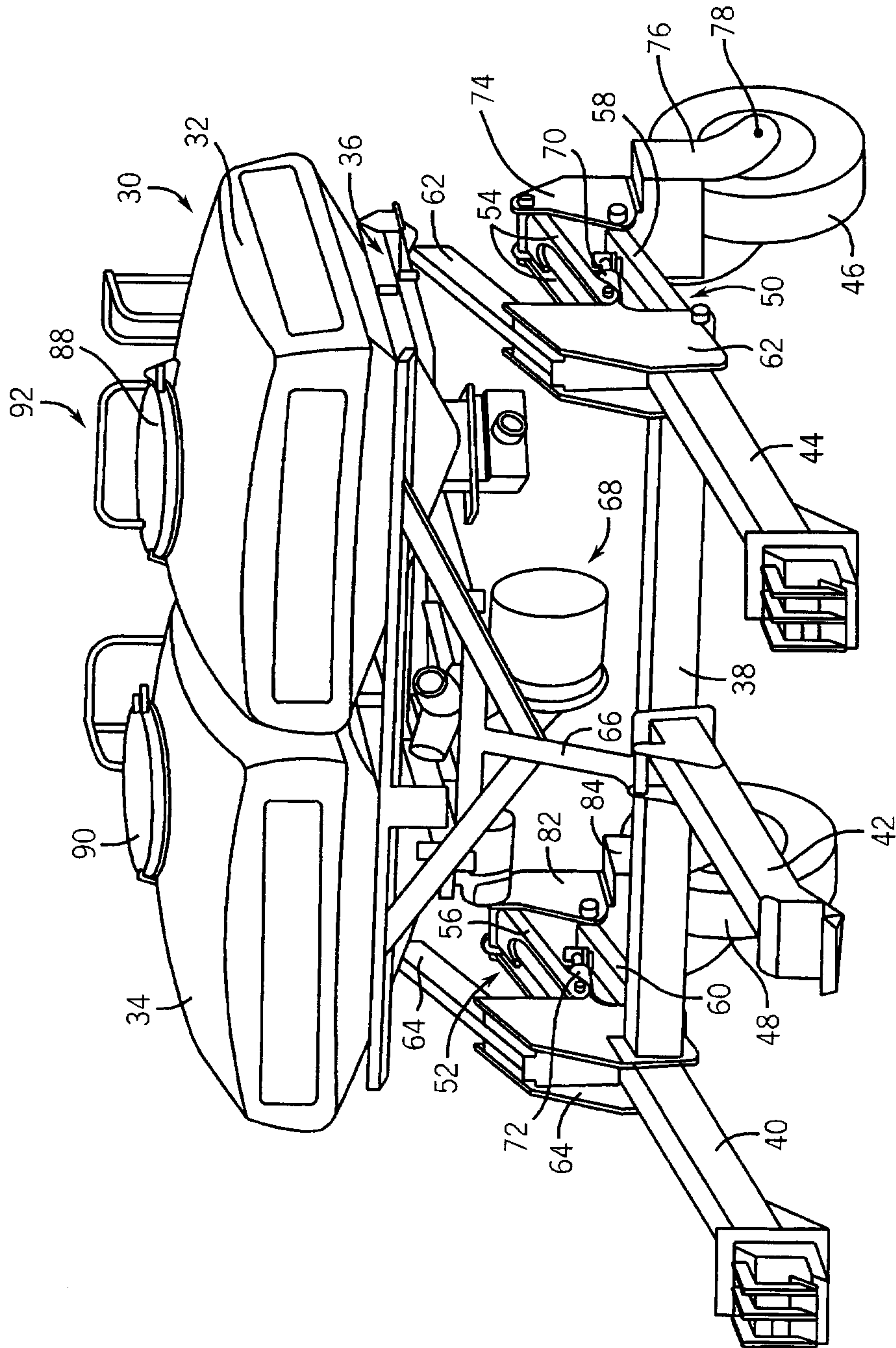


FIG. 4

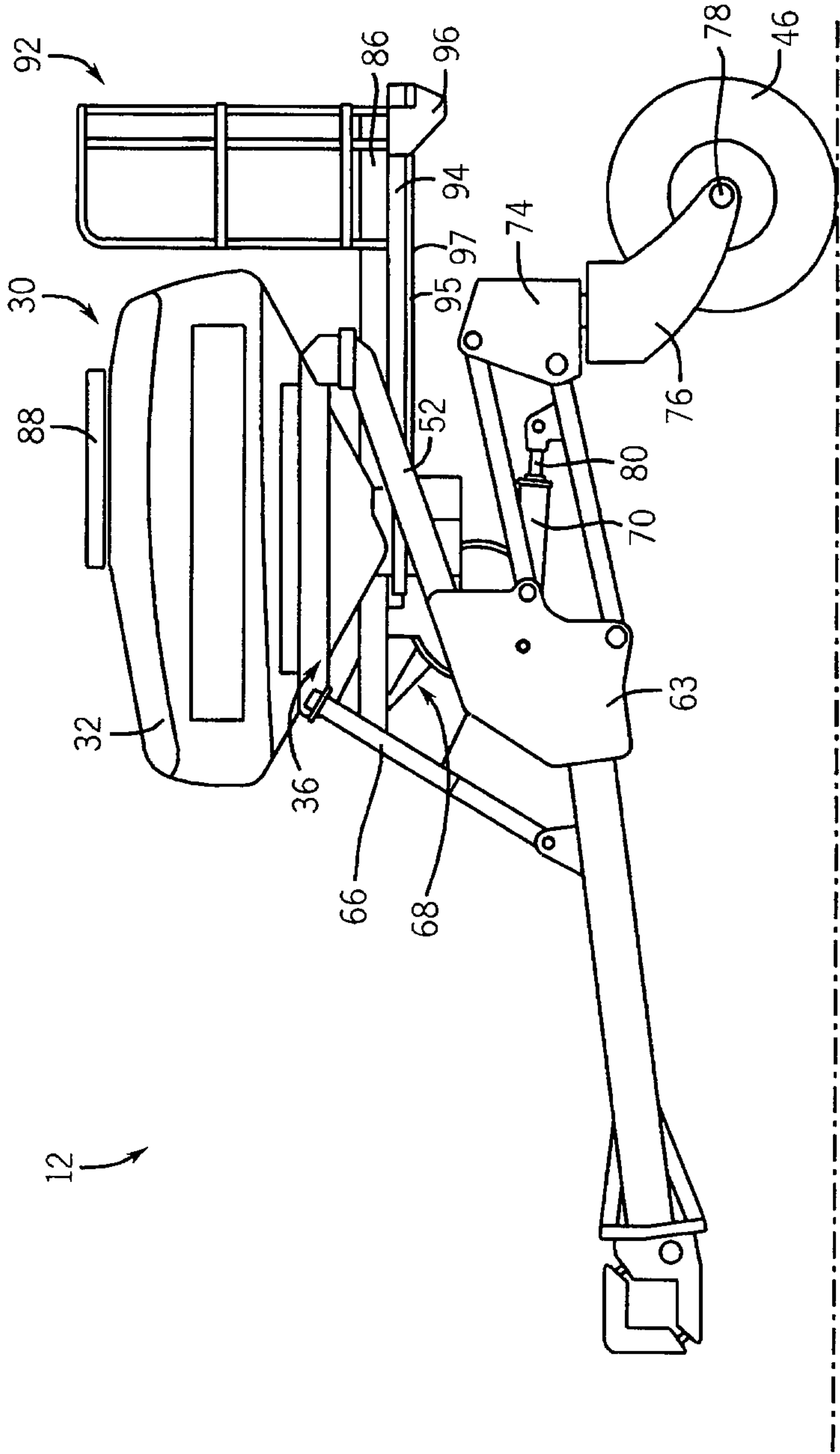


FIG. 5

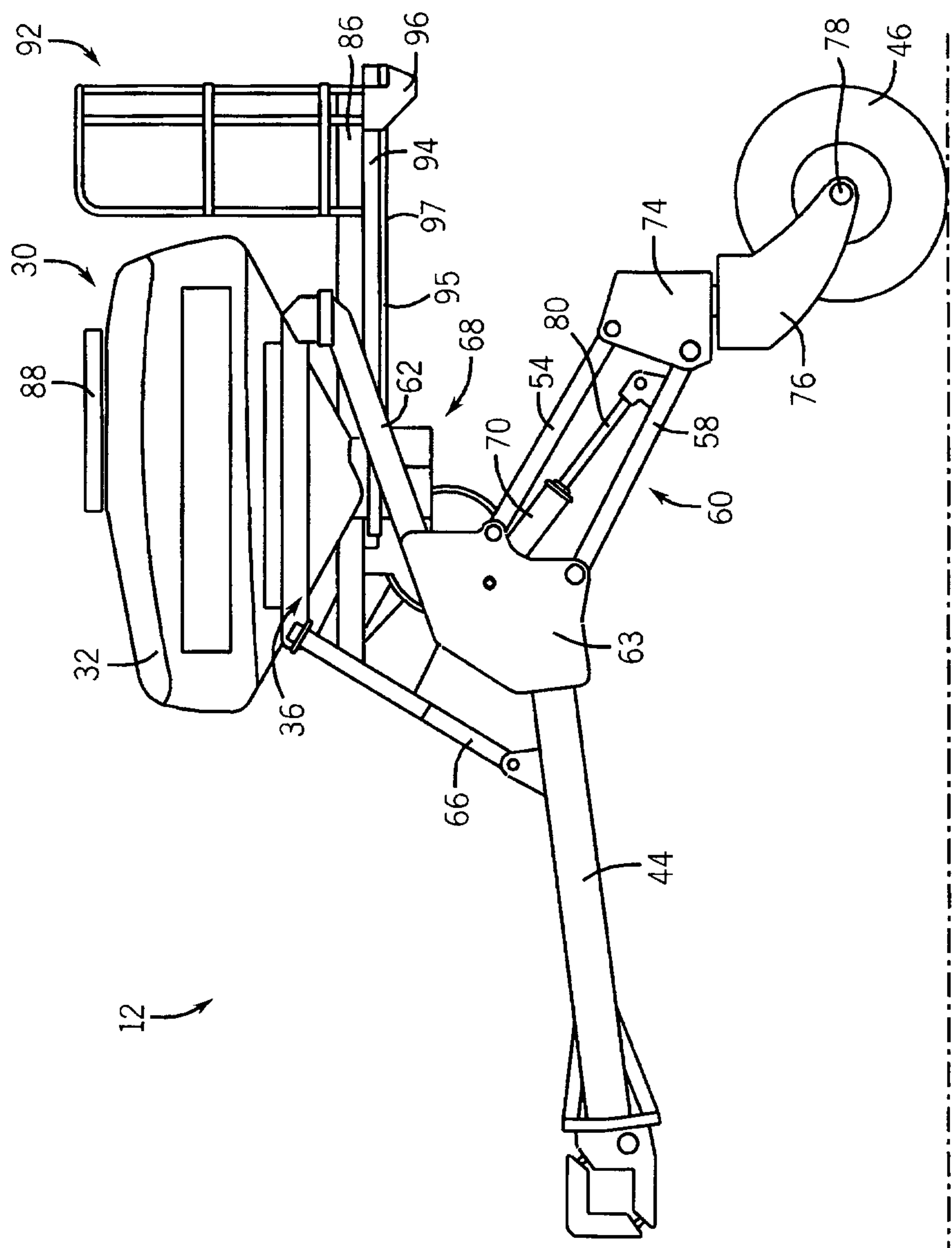


FIG. 6

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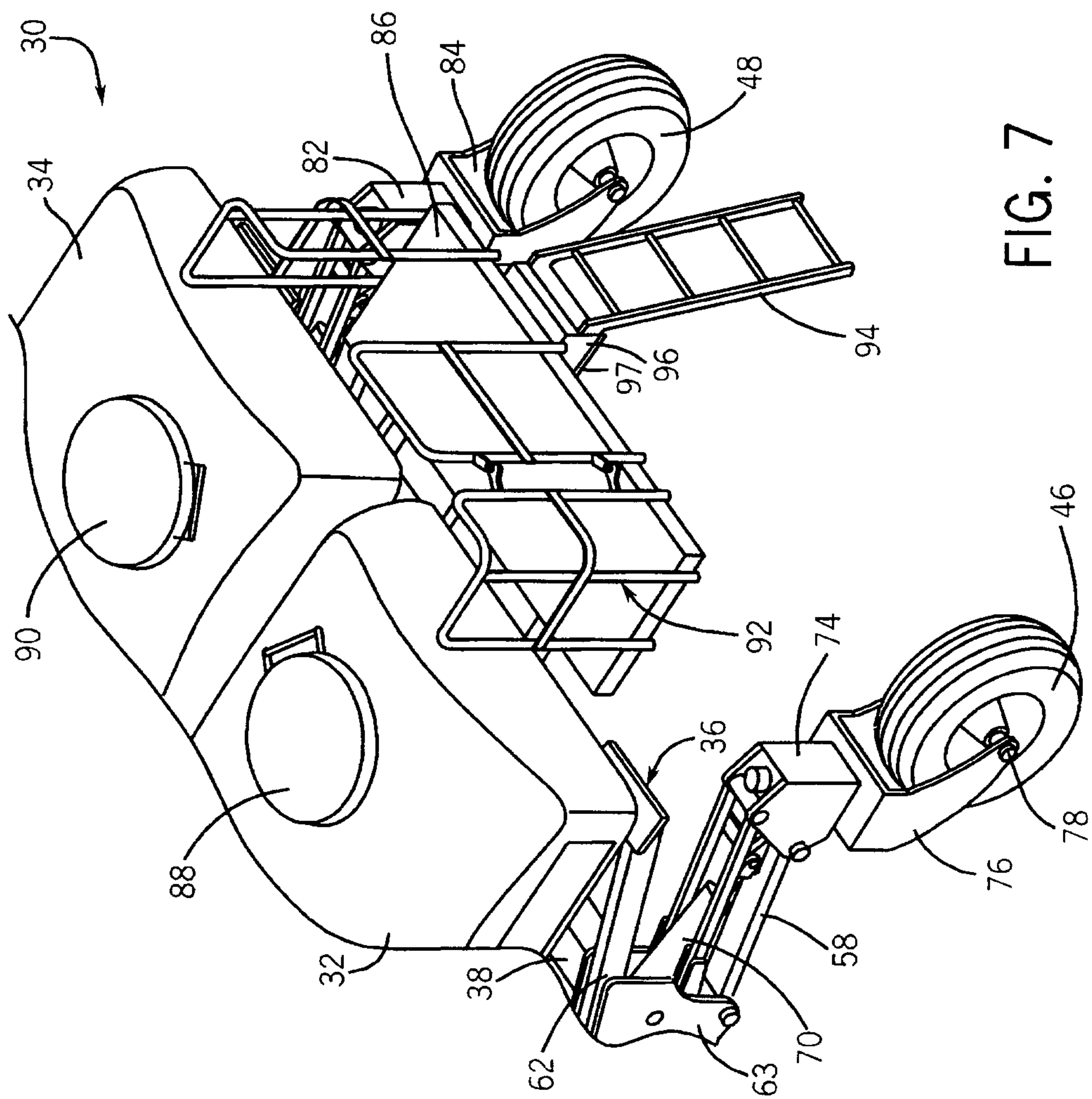


FIG. 7

