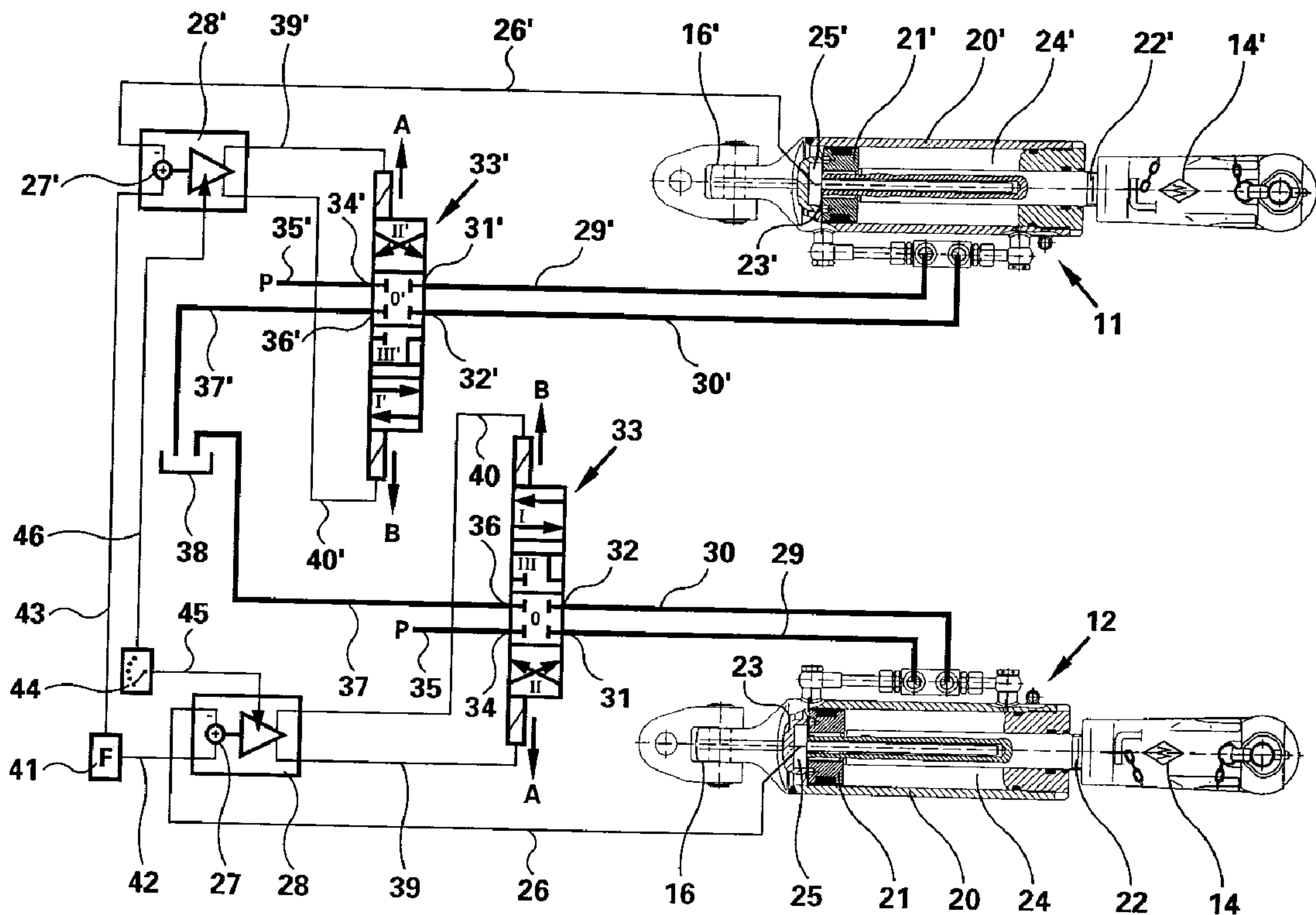




(22) Date de dépôt/Filing Date: 1999/12/16
 (41) Mise à la disp. pub./Open to Public Insp.: 2000/07/09
 (45) Date de délivrance/Issue Date: 2002/07/23
 (30) Priorités/Priorities: 1999/01/09 (199 00 570.2) DE;
 1999/08/23 (199 39 967.0) DE

(51) Cl.Int.⁷/Int.Cl.⁷ A01B 63/10
 (72) Inventeur/Inventor:
 COENEN, HERBERT, DE
 (73) Propriétaire/Owner:
 GKN WALTERSCHEID GMBH, DE
 (74) Agent: RIDOUT & MAYBEE LLP

(54) Titre : DISPOSITIF DE LEVAGE POUR BRAS DE DIRECTION INFERIEURS D'UN DISPOSITIF DE FIXATION D'UN TRACTEUR
 (54) Title: LIFTING DEVICE FOR THE LOWER STEERING ARMS OF AN ATTACHING DEVICE OF A TRACTOR



(57) Abrégé/Abstract:

The invention relates to a lifting device for the lower steering arms of a tractor. Per lower steering arm 2, 3 there are provided a position recording device 25 which generates a position signal representing the pivot position of said lower steering arms 2, 3, and a piston-cylinder unit 11, 12 which acts on the tractor and on the lower steering arm 2, 3. Per piston-cylinder unit 11, 12 there is provided a switching circuit which comprises a directional valve 33, 33' with four ports and four switching positions, and

(57) Abrégé(suite)/Abstract(continued):

in the first position of said directional valve 33, 33' all ports are blocked, in whose second position the cylinder chamber at the piston end is connected to the pressure agent supply source and the cylinder chamber at the piston rod end is connected to the return line, and in whose third position the cylinder chamber at the piston rod end is connected to the pressure agent supply source and the cylinder chamber at the piston end is connected to the return line and in whose fourth position both cylinder chambers are connected to the return line. A switching unit 28, 28' is provided with a guiding value F which corresponds to the nominal position of the lower steering arm 2, 3, and with a position signal which originates from the position recording device 25, 25' and represents the respective position of the lower steering arm. A comparator compares the guiding value F with the position signal. The switching unit 28, 28', as a function of the result of the comparison, causes the directional valve 33, 33' to occupy one of the four positions.

GKN Walterscheid GmbH

Hauptstrasse 150

53797 Lohmar

Hw/lem (01485)

P98002DE10

Lifting device for the lower steering arms
of an attaching device of a tractor

Abstract

The invention relates to a lifting device for the lower steering arms of a tractor. Per lower steering arm 2, 3 there are provided a position recording device 25 which generates a position signal representing the pivot position of said lower steering arms 2, 3, and a piston-cylinder unit 11, 12 which acts on the tractor and on the lower steering arm 2, 3. Per piston-cylinder unit 11, 12 there is provided a switching circuit which comprises a directional valve 33, 33' with four ports and four switching positions, and in the first position of said directional valve 33, 33' all ports are blocked, in whose second position the cylinder chamber at the piston end is connected to the pressure agent supply source and the cylinder chamber at the piston rod end is connected to the return line, and in whose third position the cylinder chamber at the piston rod end is connected to the pressure agent supply source and the cylinder chamber at the piston end is connected to the return line and in whose fourth position both cylinder chambers are connected to the return line. A switching unit 28, 28' is provided with a guiding value F which corresponds to the nominal position of the lower steering arm 2, 3, and with a position signal which originates from the position recording device 25, 25' and represents the respective

position of the lower steering arm. A comparator compares the guiding value F with the position signal. The switching unit 28, 28', as a function of the result of the comparison, causes the directional valve 33, 33' to occupy one of the four positions.

Figure 2

GKN Walterscheid GmbH
Hauptstrasse 150
53797 Lohmar

18th August 1999
Hw/lem (01485)
P98002DE10

**Lifting device for the lower steering arms
of an attaching device of a tractor**

Description

The invention relates to a lifting device for the lower steering arms of an attaching device of a tractor or self-driving implement.

At their rears or, optionally also at their fronts, tractors or self-driving implements are provided with an attaching device which comprises lower steering arms which are arranged so as to be offset in the direction opposite to the longitudinal axis of the tractor or the self-driving implement. One end of said lower steering arms is articulatable, especially it is attached at the rear and/or front so as to be pivotable around a substantially horizontal axis. In addition, there exists a slight lateral pivotability. At their free ends, the lower steering arms are provided with coupling means for providing a connection with an implement to be attached. To be able to pivot the lower steering arms, there is provided a lifting device, i.e. an implement attached to the lower steering arms is carried by the lifting device and raised or lowered relative to the ground. Furthermore, as a function of the implement to be

attached and the type of application, the lifting device must permit the lower steering arms, to a certain extent, to be freely movable sideways. In other applications, free pivotability in the vertical direction is essential. In particular, there are types of lifting device which are integrated into the tractor or the implement and comprise two parallel lifting arms which are connected to the ends of a lifting shaft. The lifting shaft itself is pivoted by a drive, so that, in consequence, the lifting arms move in a circular arch. To the ends of the lifting arms, there are secured lifting struts which are connected to the lower steering arms. In addition, the lifting shaft ensures synchronisation of the two lifting arms. To improve adaptability, especially the lifting device arranged at the rear is provided with precision adjustment means for adjusting the length of the lifting struts. Furthermore, there is normally provided an assembly which optionally allows a rigid connection with the lower steering arm or disconnection and free vertical movability. Said assembly allows a vertical floating path for yawing the implement, i.e. compensation for transverse inclinations in order to permit tension-free operation.

In the case of a lifting device attached to the front, the lower steering arms are normally connected to one another to form a rocker, and the drive in the form of two hydraulic lifting struts is connected directly to the lower steering arms. The vertical degree of freedom for compensating for transverse inclinations is provided by an oblong hole in the coupling element.

Such an assembly is described in WO 96/03024 for example. The two hydraulic lifting struts can be connected by a

common hydraulic line to a pump or to a pressure supply source. This means that the pressure level is the same for both hydraulic lifting struts and that they are both supplied with the same amount of pressure agent.

Although the above-described types of lifting device have different designs, they have a common characteristic in that the synchronous movements of the two lower steering arms is ensured and that a vertical degree of freedom is available. The hydraulic lifting struts are disadvantageous in that accurate uniform operation is not ensured because leakages can lead to different settings in spite of identical pressure levels.

It is the object of the invention, on the one hand, to simplify the design of the lifting device in respect of the main functions of same as compared to prior art solutions and, on the other hand, to ensure accurate synchronisation in respect of adjustment and, finally, to provide further adjustment possibilities.

In accordance with the invention, the objective is achieved by providing a lifting device for the lower steering arms of an attaching device of a tractor, which lower steering arms, at one end, are pivotably attached to the tractor and which lifting device comprises, per lower steering arm, a position recording device which generates a position signal representing the respective pivot position of the lower steering arm; per lower steering arm, a hydraulically loadable, double-acting piston-cylinder unit which, at one end, is attached to the tractor and which, at its other end, acts either directly or indirectly via an intermediate lever drive, on the lower steering arm and comprises a cylinder

chamber at the piston end and a cylinder chamber at the piston rod end; per piston-cylinder unit, a switching circuit which comprises a directional valve with four ports, which directional valve can be transferred into at least three switching positions; wherein two ports serve to be connected to the piston-cylinder unit, of which the first port is connected to the cylinder chamber at the piston end, with the second port being connected to the cylinder chamber at the piston rod end via lines; wherein, furthermore, the third port serves to be connected to a pressure agent supply source and the fourth port serves to be connected to a return line, and wherein, in the first position of the directional valve, all ports of the directional valve are blocked, wherein, in the second position, the cylinder chamber at the piston end is connected to the pressure agent supply source and the cylinder chamber at the piston rod end is connected to the return line, wherein, in the third position, the cylinder chamber at the piston rod end is connected to the pressure agent supply source and the cylinder chamber at the piston end is connected to the return line, with the switching circuit comprising an electric switching unit which is provided with an input for introducing a guiding value corresponding to the nominal position of the lower steering arm, with an input for introducing a position signal coming from the position recording device and representing the respective position of the lower steering arm, and a comparator which compares the guiding value with the position signal, with the switching unit - as a function of the result of the comparison - causing the directional valve to assume one of the at least three positions.

The advantage of this embodiment is that while the design has been simplified, there have been provided additional functions. Furthermore, accurate setting is ensured because the respective actual position of the lower steering arms is compared with the predetermined nominal position, and any adjustment takes place in such a way that the nominal position is aimed at. This also means that both lower steering arms assume the same or the predetermined position. In addition, by being able to control the piston-cylinder units individually, it is possible to set the two lower steering arms independently of one another, for example for compensating for any transverse inclination.

According to a further embodiment of the invention, it is proposed that the directional valve provided per lower steering arm can be transferred into a fourth switching position in which both the cylinder chamber at the piston end and the cylinder chamber at the piston rod end are connected to the return pipe. For example, if the piston-cylinder units are switched to "return", i.e. if the length of the piston-cylinder units can set itself freely, the implement can also be uncoupled in a force-free way. Furthermore, it is possible to set the floating path without the operative having to leave the driver's seat, which is the case with mechanical solutions.

To permit the lower steering arms to be adjusted synchronously, it is proposed that identical or different guiding values are fed into the two switching units.

To complement the solution in accordance with the invention there is provided a selector switch which permits the selection of different operating modes and

which acts on both switching units. The two switching units can thus be preprogrammed in such a way that the two lower steering arms are either controlled in accordance with the same guiding value or different guiding values. Furthermore, it is proposed that the two switching units are connected to a common selector switch by means of which the switching units can be programmed to transfer one directional valve for a specific lower steering arm or directional valves for both lower steering arms into the fourth position. In the fourth position, there takes place an exchange of pressure agent between the cylinder chamber at the piston rod end and that at the piston end of both piston-cylinder units and between said chambers and the return line. In a preferred embodiment, the guiding values are manually predeterminable, especially by a setting element. The operative can thus predetermine the desired position of the lower steering arms. Any transverse inclination can be compensated for by using different guiding values for the lower steering arms.

In order to specifically align the implement relative to the tractor when the tractor is transversely inclined, it is also possible to use an inclination sensor which, for example, records the transverse inclination of the tractor, and in addition, it is possible to provide means by which at least one of the two switching units can be provided with a signal which is superimposed on the guiding value representing the transverse inclination. One type of compensation is possible in that the driver himself visually assesses the transverse inclination. For example, it is possible to determine that the lower steering arm closest to the ground is controlled in accordance with a predetermined guiding

value, whereas the other lower steering arm is adapted only in the sense of being lifted further. In addition, it is proposed that the selector switch comprises a switching position in which the inclination sensor is activated and that the signal generated thereby can be superimposed on the guiding value(s) fed into the two switching units. It is also possible to specify maximum differences between the guiding values in order to prevent the components and the attached implement from being subjected to excessive loads. Finally, when the implement is lifted into the transport position, provision can be made for it to be straightened from a certain lifting position onwards.

For setting the two lower steering arms it is possible to use a device which is able to record the respective extended position of the piston rod of the piston-cylinder unit.

However, it is also possible for the position recording device to be represented by a rotary angle sensor which records the respective angular position of the associated lower steering arm relative to the tractor.

The drawing shows different embodiments of the invention. In principle, said embodiments are suitable for both a rear attaching device and a front attaching device.

Figure 1 shows a first embodiment of a lifting device for a tractor attaching device which is arranged at the rear of the tractor.

Figure 2 shows a switching circuit for setting the piston-cylinder units for actuating the lower steering

arms, with the piston-cylinder units being provided with a length measuring device serving as a position recording device.

Figure 3 is a diagrammatic illustration of an embodiment wherein the position recording devices are provided in the form of rotary angle sensors.

Figure 4 shows an embodiment wherein the lower steering arms are loaded indirectly by piston-cylinder units, with a lever drive being arranged inbetween.

Figure 1 shows a tractor rear having a rear attaching device. There are provided two lower steering arms 2, 3. When looking at the rear of the tractor 1, it can be seen that the right-hand lower steering arm is displaced towards the right and the left-hand lower steering arm is displaced towards the left away from the longitudinal axis of the tractor. Both lower steering arms 2, 3 are pivotably supported by connecting ends 5, 6 on respective bearing blocks 7, 8 of the tractor rear around a transverse axis 4, so that the ends provided with the coupling hooks 9, 10 can be moved, to a greater or lesser extent, to approach the ground on which the tractor 1 is positioned, or moved upwards away from the ground. For moving the two lower steering arms 2, 3 around the pivot axis 4, each arm 2, 3 is associated with a piston-cylinder unit 11, 12. The piston-cylinder units 11, 12 act by means of a yoke-shaped attaching end 13, 14 on the associated lower steering arm 2, 3. By means of their other connecting ends 15, 16, they are held on bearing blocks 17, 18 secured to the rear of the tractor. Said assembly comprises, for example, an intermediate articulating element which is pivotably connected to the

housing of the associated piston-cylinder unit 11, 12 around a first axis and which, additionally, is pivotably connected to the respective bearing block 17, 18 around an axis extending parallel to the pivot axis 4 in order, thus, to permit the piston-cylinder unit 11, 12 to be set freely on all sides when adjusting the lower steering arms 2, 3.

Furthermore, in the region of the attaching ends 5, 6, the two lower steering arms are slightly tiltable round their longitudinal axes.

To complete the attaching device, there is also provided an upper steering arm 19 which is engaged by the upper attaching means of the associated implement. The two coupling hooks 9, 10 are engaged by the lower attaching elements of the implement to be received.

The functioning of the lifting device comprising the two piston-cylinder units 11, 12 is described in greater detail in connection with Figure 2.

The two piston-cylinder units 11, 12 for actuating the right-hand and left-hand lower steering arms 2, 3 and their associated switching means are designed identically, so that, below, actuation of same is described only with reference to the piston-cylinder unit associated with the left-hand lower steering arm 3. The piston-cylinder unit 12 comprises a housing 20 which adjustably receives the piston 21 with the piston rod 22 projecting from the housing 20. The piston rod 22 carries the attaching end 14 to be connected to the left-hand lower steering arm and the housing 20 carries the attaching end 16 to be connected to the bearing block

provided at the tractor end. For the purpose of the further description, the cylinder chamber at the piston end has been given the reference number 23, whereas the cylinder chamber at the piston rod end has been given the reference number 24. In Figure 2, the piston-cylinder unit is shown in the fully shortened position, i.e. the cylinder chamber 23 at the piston end has occupied a minimum, whereas the cylinder chamber 24 at the piston rod end has occupied a maximum. Furthermore, a position recording device 25 is integrated into the piston-cylinder unit 12. The position recording device 25 generates a signal which represents the shortened and the extended position of the piston rod 22 in the housing 20 and thus the length which is obtained between the articulation points of the attaching ends 14, 16. The position recording device 25 is connected by a signal line 26 to the comparator 27 of a switching unit 28. The piston-cylinder unit 12 is connected by pressure agent lines 29, 30 to the two ports 31, 32 of a directional valve 33. The pressure agent line 29 thus provides a connection between the cylinder chamber 23 at the piston end and the first port 31, whereas the second pressure agent line 30 provides a connection between the cylinder chamber 24 at the piston rod end and the second port 32 of the directional valve 33. The directional valve 33 comprises two further ports, i.e. a third port 34 which is connected to the pressure line 25 fed by a pump P or any other pressure agent supply source. The fourth port 36 is connected in a pressure-less way by the return line 37 to the tank 38. The directional valve 33 is an electromagnetically adjustable valve which can assume the four positions and establishes or blocks different connections between the ports 31, 32, 34, 36. For this purpose, it is adjustable either in direction A or in direction B, but

the Figure shows the basic position in which all ports 31, 32, 34, 36 are disconnected from one another. The movement of the directional valve 33 for the purpose of assuming one of the possible switching positions is effected by suitable control lines 39, 40 which receive their switching pulses from the switching unit 28. Via a control line 42, the comparator 27 of the switching unit 28 can be provided with a guiding value F by a manually controllable setting element 41 by means of which the raised position of the lower steering arm, with which the piston-cylinder unit 12 is associated, can be set. The directional valve 33 is shown in the first position, i.e. the switching position "0", with all ports 31, 32, 34, 36 being blocked. In the switching position "I" the pressure line 35 is connected by the port 34 and the port 31 to the pressure agent line 29 and by means of the latter to the cylinder chamber 23 at the piston end, so that the piston rod 22 moves out of the housing 20. In position "II" of the directional valve 33, the pressure line 35 is connected by the port 34 to the port 32 and by the associated pressure agent line 30 to the cylinder chamber 24 at the piston rod end, so that the piston rod 22 moves into the housing 20. This corresponds to the associated lower steering arm being lifted.

In position "III" of the directional valve 33, the connection of the pressure line 35 and of the port 34 is blocked. The pressure agent lines 29 and 30 are connected by the fourth port 36 to the return line 37 leading to the tank 38, so that a free exchange of pressure agent is possible, i.e. the piston rod can move freely into and out of the housing 20.

The piston-cylinder unit 11 has the same design as that described in connection with the piston-cylinder unit 12. The description of the piston-cylinder unit 12 therefore also applies to the piston-cylinder unit 11, and any components of the latter which correspond to those of the piston-cylinder unit 12 have been given the same reference numbers, with an apostrophe being added for differentiating purposes.

The setting element 41 also acts via a control line 43 on the switching unit 28'. This means that the switching unit 28', too, is provided with the same or a different guiding value F which, via the control line 42, is fed into the switching unit 28. In addition, there is provided a selector switch 44 which also acts on both switching units 28 and 28' via control lines 45, 46. The selector switch 44 allows different operating modes to be set. For instance, in a first selected position, it is possible to achieve a mode of operation wherein synchronous adjustment of both lower steering arms is desirable. This means that identical changes in the length of the two piston-cylinder units 11, 12 are required. This also means that the guiding value F fed into the two switching units 28, 28' by the setting element 41 is the same for both piston-cylinder units 11 and 12, so that any deviation of the two piston-cylinder units 11, 12 from the guiding value - as a function of the magnitude of the deviation - leads to the individual directional valves 33, 33' being controlled to be able to achieve the respective length settings. These are achieved when the control signal which is passed on by the position recording device 25 via the signal line 26 to the comparator 27 is reproduced in a magnitude which corresponds to the guiding value F. Then the switching

position "0" is assumed. In case of deviations therefrom which require the piston rod 22 to be extended or shortened, the directional valve 33 is transferred into one of the other two switching positions "I" or "II". In case the selector switch 44 is transferred into a position wherein a floating movement of the two lower steering arms is to be permitted, both directional valves 33 are transferred into position "III". If identical guiding values are predetermined by the setting element 41 for actuating the two lower steering arms, both are moved into identical positions.

This system can be complemented by additionally using a transverse inclination sensor in which an additional value can be superimposed as a function of the inclined position of the tractor. The selector switch 44 can also provide such a control function and influence the two switching units 28, 28' accordingly. The signal additionally fed into the switching unit 28 or 28' by the inclination sensor can then lead to the guiding value F being superimposed, thus causing one of the piston-cylinder units 11, 12 to assume a greater or shorter length.

Figure 3 shows an embodiment which is modified as compared to Figures 1 and 2. It also shows the two lower steering arms 2', 2' and the upper steering arm 19' arranged thereabove. It can also be seen that each of the two lower steering arms 2', 3' is associated with a piston-cylinder unit 11' 12'. The piston-cylinder units 11', 12' according to Figure 3 differ from the piston-cylinder units 11, 12 according to Figure 2 in that they do not comprise a length measuring device as a position recording device. The position recording devices 25' are

provided in the form of rotary angle sensors which are arranged on the pivot axis 4' of the two lower steering arms 2', 3' and record the angular position of the two lower steering arms 2', 3', which angular position represents the pivot position of same. The signal generated by the position recording devices 25'' is fed into the respective switching units.

Figure 4 shows a further embodiment wherein the two lower steering arms 2, 2', 3'' are connected by simple lifting struts 47, 48, whose length is not adjustable, to two lever arms 49, 50 which are pivotably adjustable around a common pivot axis 51, but without being synchronised relative to one another. The two lever arms 49, 50 are loaded by two piston-cylinder units 11'' and 12'', so that the two lower steering arms 2'' and 3'' are actuated via an intermediate lever drive by the two lifting struts 47, 48 and the associated lever arms 49, 50. The two piston-cylinder units 11'' and 12'' can be designed as described in connection with Figure 2. As far as recording the position of the lower steering arms 2, 2' is concerned, it is also possible to provide a design as described in connection with Figure 3.

GKN Walterscheid GmbH

Hauptstrasse 150

53797 Lohmar

Hw/lem (01485)

P98002DE10

Lifting device for the lower steering arms
of an attaching device of a tractor

Claims

1. A lifting device for the lower steering arms of an attaching device of a tractor, which lower steering arms, at one end, are pivotably attached to the tractor and which lifting device comprises

per lower steering arm (2, 2', 2'', 3, 3', 3'') a position recording device (25, 25', 25'') which generates a position signal representing the respective pivot position of the lower steering arm (2, 2', 2'', 3, 3', 3'');

per lower steering arm (2, 2', 2'', 3, 3', 3'') a hydraulically loadable, double-acting piston-cylinder unit (11, 11', 11'', 12, 12', 12'') which, at one end (5, 6, 13, 14, 14', 15, 16, 16'), is attached to the tractor (1) and which, at its other end (5, 6, 13, 14, 14', 15, 16, 16'), acts either directly or indirectly via an intermediate lever drive (47, 48, 49, 50), on the lower steering arm (2, 2', 2'', 3, 3', 3'') and which comprises a cylinder chamber (23, 23') at the piston end and a cylinder chamber (24, 24') at the piston rod end;

per piston-cylinder unit (11, 11', 11'', 12, 12', 12'') a switching circuit which comprises a directional valve (33, 33') with four ports (31, 31',

32, 32', 34, 34', 35, 35', 36, 36'), which directional valve can be transferred into at least three switching positions,

wherein two ports (31, 31', 32, 32') serve to be connected to the piston-cylinder unit (11, 11', 11'', 12, 12', 12''), of which the first port (31, 31') is connected to the cylinder chamber (23, 23') at the piston end, with the second port (32, 32') being connected to the cylinder chamber (24, 24') at the piston rod end via lines (29, 29', 30, 30'),

wherein, furthermore, the third port (34, 34') serves to be connected to a pressure agent supply source (P) and the fourth port (36, 36') serves to be connected to a return line (37, 37'), and

wherein, in the first position of the directional valve (33, 33'), all ports (31, 31', 32, 32', 34, 34', 36, 36') of the directional valve (33, 33') are blocked, wherein, in the second position, the cylinder chamber (23, 23') at the piston end is connected to the pressure agent supply source (P) and the cylinder chamber (24, 24') at the piston rod end is connected to the return line (37, 37'), wherein, in the third position, the cylinder chamber (24, 24') at the piston rod end is connected to the pressure agent supply source (P) and the cylinder chamber (23, 23') at the piston end is connected to the return line (37, 37'), with the switching circuit, furthermore, comprising an electric switching unit (28, 28') which is provided with an input for introducing a guiding value (F) corresponding to the nominal position of the lower steering arm (2, 2', 2'', 3, 3', 3''), with an input for introducing a position signal coming from the position recording device (25, 25', 25'') and representing the respective position of the lower

steering arm (2, 2', 2'', 3, 3', 3'') and a comparator (27, 27') which compares the guiding value (F) with the position signal, with the switching unit (28, 28') - as a function of the result of the comparison - causing the directional valve (33, 33') to assume one of the at least three positions.

2. A lifting device according to claim 1,

characterised in

that the directional valve (33, 33') provided per lower steering arm (2, 2', 3, 3', 3'') can be transferred into a fourth switching position in which both the cylinder chamber (23, 23' at the piston end and the cylinder chamber (24, 24') at the piston rod end are connected to the return line (37, 37').

3. A lifting device according to claim 1,

characterised in

that identical guiding values (F) have been fed into the two switching units (28, 28').

4. A lifting device according to claim 3,

characterised in

that the two switching units (28, 28') are connected to a common selector switch (44) by means of which the switching units (28, 28') can be programmed to control the two lower steering arms (2, 2', 2'', 3, 3', 3'')

on the basis of the same guiding value (F) or different guiding values (F).

5. A lifting device according to claim 1,

characterised in

that the two switching units (28, 28') are connected to a common selector switch (44) by means of which the switching units (28, 28') can be programmed to transfer one directional valve (33, 33') for a specific lower steering arm (2, 2', 2'', 3, 3', 3'') or the directional valves (33, 33') for both lower steering arms (2, 2', 2'', 3, 3', 3'') into the fourth position.

6. A lifting device according to claim 3,

characterised in

that the guiding value (F) can be manually predetermined by a setting element (41).

7. A lifting device according to claim 1,

characterised in

that there are provided means by means of which at least one of the two switching units (28, 28') can be provided with a signal which represents the transverse inclination and which is superimposed on the guiding value (F).

8. A lifting device according to claim 7,

characterised in

that there exists an inclination sensor which records the transverse inclination of the tractor (1).

9. A lifting device according to claim 8,

characterised in

that the selector switch (44) comprises a switching position in which the inclination sensor is activated, which inclination sensor generates a signal which can be superimposed on the guiding values (F) fed into the two switching units (28, 28').

10. A lifting device according to any one of claims 1 to 9,

characterised in

that the position recording device (26, 25', 25'') is provided in the form of a device by means of which the respective extended position of the piston rod (22, 22'') of the piston-cylinder unit (11, 11', 11'') can be recorded.

11. A lifting device according to any one of claims 1 to 9,

characterised in

that the position recording device (25, 25', 25'') constitutes a rotary angle sensor which records the respective angular position of the associated lower steering arm (2, 2', 2'', 3, 3', 3'') relative to the tractor (1).

GKN Walterscheid GmbH
 Hauptstrasse 150
 53797 Lohmar

18th August 1999
 Hw/lem (01485)
 P98002DE10

Lifting device for the lower steering arms
 of an attaching device of a tractor

List of reference numbers

1	tractor
2, 2', 2''	right-hand lower steering arm
3, 3', 3''	left-hand lower steering arm
4, 4'	pivot axis
5	attaching end
6	attaching end
7	bearing block
8	bearing block
9	coupling hook
10	coupling hook
11, 11', 11'', 1'''	piston cylinder unit
12, 12', 12''	piston cylinder unit
13	attaching end
14, 14'	attaching end
15	attaching end
16, 16'	attaching end
17	bearing block
18	bearing block
19, 19'	upper steering arm
20, 20'	housing
21, 21'	piston
22, 22'	piston rod
23, 23', 23''	cylinder chamber at piston end
24, 24'	cylinder chamber at piston rod end

25, 25', 25''	position recording device
26, 26'	signal line
27, 27'	comparator
28, 28'	switching unit
29, 29'	pressure agent line
30, 30'	pressure agent line
31, 31', 31'''	first port
32, 32'	second port
33, 33', 33'''	directional valve
34, 34', 34'''	third port
35, 35'	pressure line
36, 36', 36'''	fourth port
37, 37'	return line
38	tank
39, 39'	control line
40, 40'	control line
41	setting element
42	control line
43	control line
44	selector switch
45	control line
46	control line
47	lifting strut
48	lifting strut
49	lever arm
50	lever arm
51	pivot axis
F	guiding value
P	pressure agent supply source

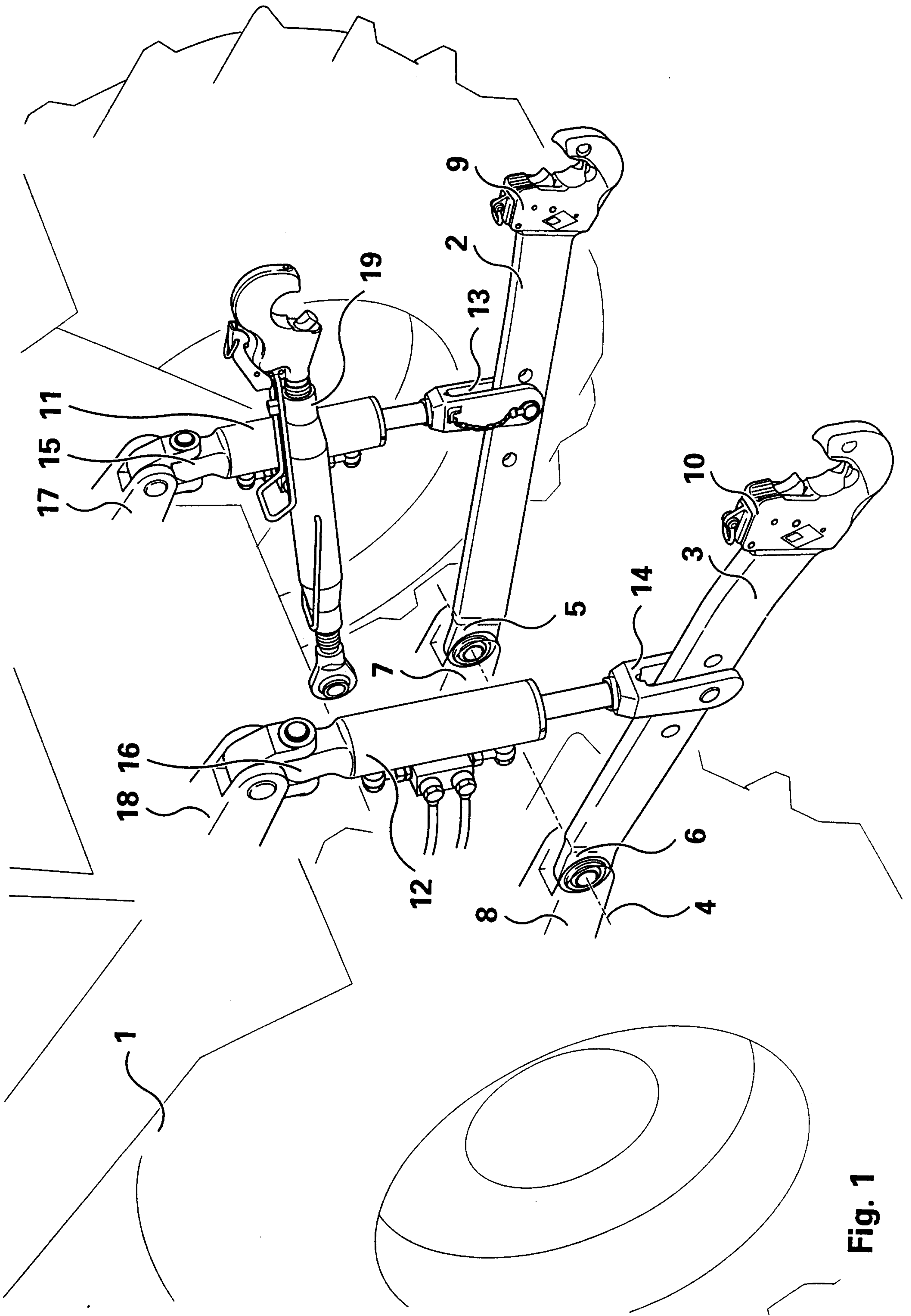


Fig. 1

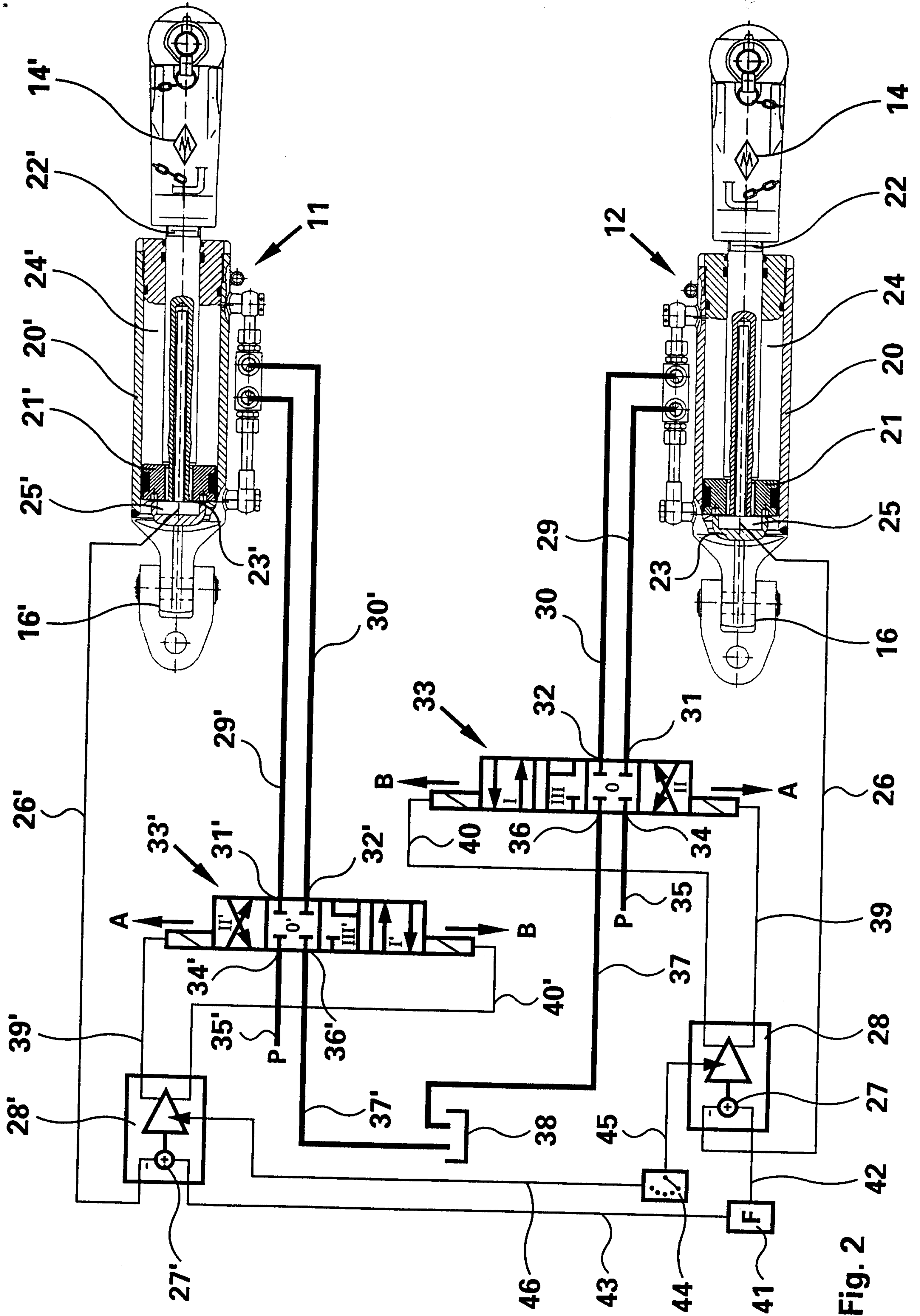


Fig. 2

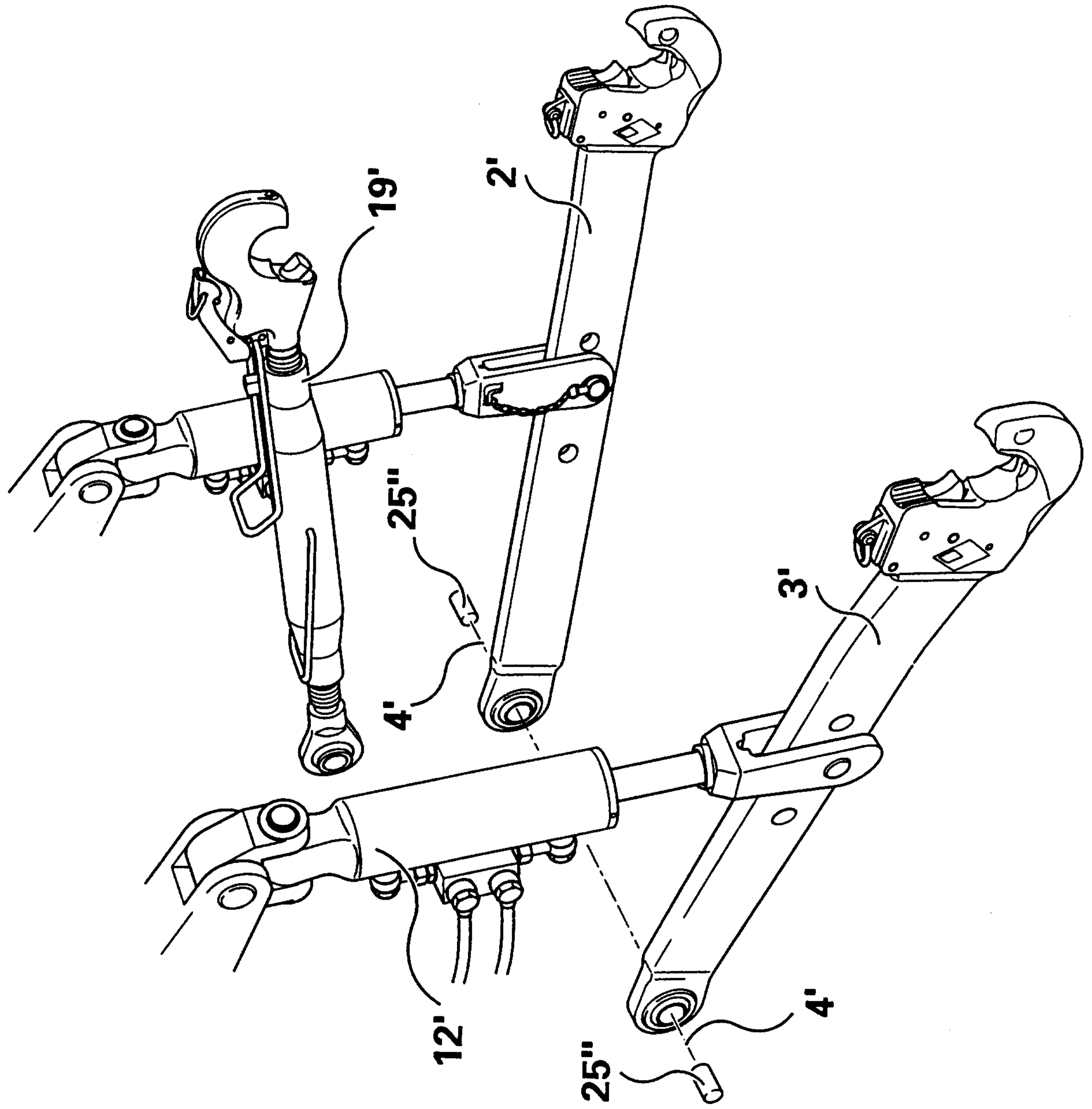


Fig. 3

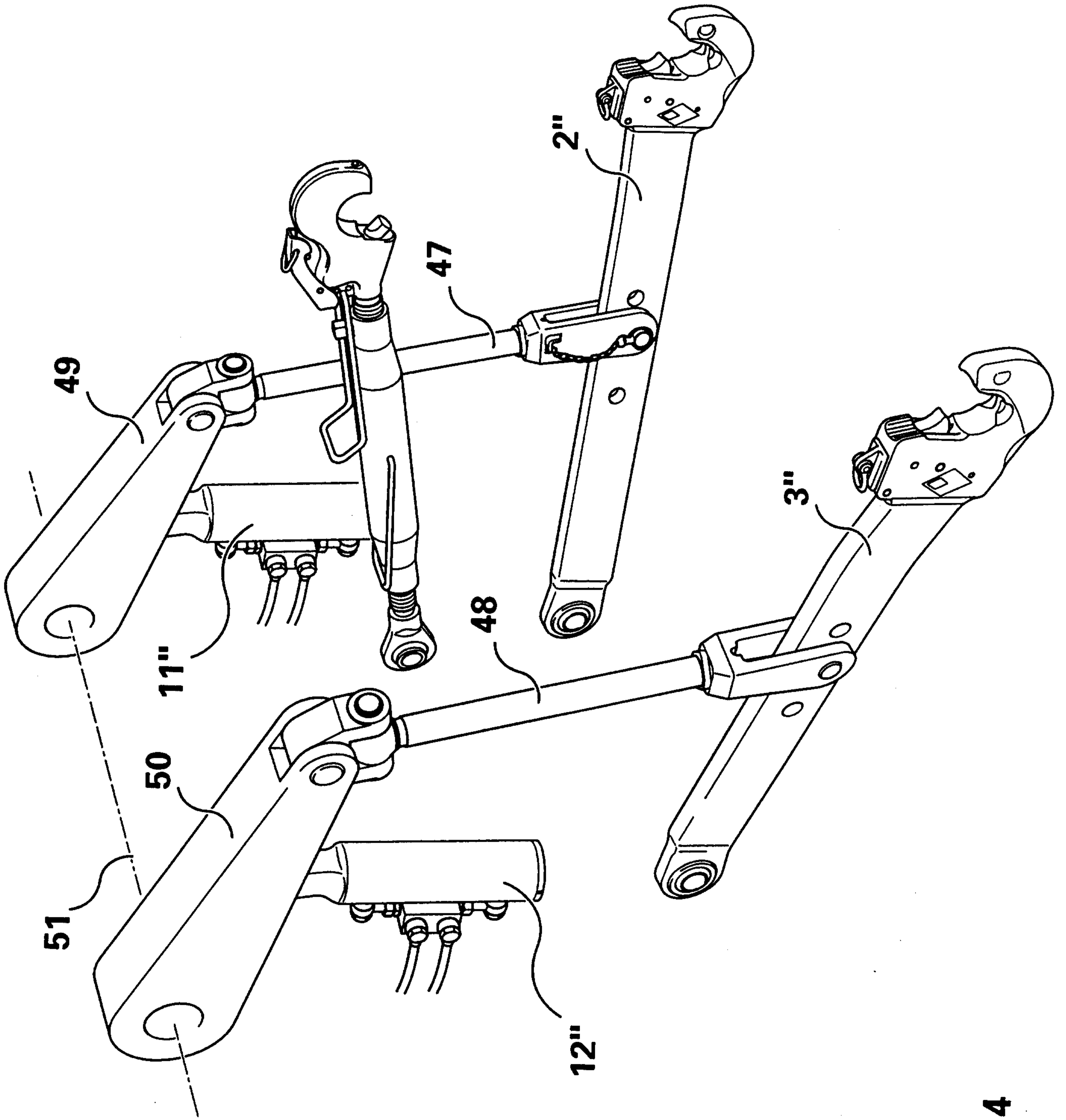


Fig. 4

