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(54) **Linkage for a front loader**

Arm für einen Frontlader

Bras pour chargeur frontal

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EP 1 997 960 B1

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Description

[0001] The present invention relates to a linkage for a front loader. The linkage is formed by an oblong power transmission section and by two coupling elements, which are provided on the ends of the oblong power transmission section in each case. A linkage according to the prior art is disclosed in WO2007/009207. Front loaders are used particularly with agricultural vehicles, such as for example traction engines or farm tractors. A front loader is formed by two parallel-running front loader rockers, which are connected together by a tie bar, wherein on the proximal end, that is to say the end attached to the vehicle, of the front loader rockers in each case, an attachment bracket is provided for mounting onto the vehicle. At the distal end of the front loader rockers, a tool holder is pivotally linked for attaching a tool, such as a bucket for example. Frequently the front loader rockers are formed with a kink, the proximal section of the front loader rocker being described as the upper rocker spar and the distal section as the lower rocker spar.

For pivoting the tool holder a tipping hydraulic cylinder is provided on each front loader rocker, which runs substantially parallel to the lower rocker spar and with a first end is linked to the tool holder. The second end of the tipping hydraulic cylinder is linked to an elbow lever, which in turn is pivotally linked in the vicinity of the kink to the front loader rocker. In addition a linkage, which with a first end is linked to the elbow lever and with the second end is linked to the attachment bracket, is provided for transmitting power between tool holder and attachment bracket.

The linkage in this case is conventionally formed as a substantially linear-running component, which on its two ends in each case has coupling elements for linking to the elbow lever and the attachment bracket. With respect to a mounted position of the front loader the tipping hydraulic cylinder and - in the case of an arrangement with top lying linkage - the linkage each run above the lower or the upper rocker spar. The hydraulic cylinder runs substantially parallel to the lower rocker spar and the linkage runs substantially parallel to the upper rocker spar. The two coupling points of the lifting hydraulic cylinder and the linkage to the elbow lever are each arranged at the kink on the same side in relation to a (lower) third coupling point of the elbow lever, so that the three coupling points substantially form a triangle. This configuration is known below as an "arrangement with top lying linkage".

[0002] Furthermore, a lifting hydraulic cylinder is provided respectively on each front loader rocker, which with a first end is linked to the attachment bracket and with a second end to the front loader rocker in the vicinity of the kink. The lifting hydraulic cylinder in this case runs underneath and substantially parallel to the upper rocker spar. The front loader is raised or lowered by the two lifting hydraulic cylinders. The two lifting hydraulic cylinders and tipping hydraulic cylinder of the front loader in this case are operated by the vehicle hydraulics and ad-

justment of these hydraulic cylinders is controlled from the driver's seat.

[0003] The arrangement of the tipping hydraulic cylinder, the elbow lever, the linkage and the lifting hydraulic cylinder on the respective front loader rocker, and in particular their coupling points, is selected in such a manner that when the front loader is raised or lowered by means of the lifting hydraulic cylinder, the position of the tool mounted on the tool holder relative to the contact plane of the vehicle, that is to say the ground, is virtually not changed when the position of the tipping hydraulic cylinder is unchanged. This arrangement is also called parallel guide. When such a parallel guide is implemented, the front loader can be raised or lowered accordingly, without the previously adjusted position of the tool relative to the contact plane being changed to any large degree.

[0004] The two attachment brackets of the front loader are normally mounted on both sides in the area between the front wheels and the vehicle cab in each case on a prefabricated section of the vehicle connected to the vehicle chassis. In the case of compact vehicles, wherein the area between front wheel and rear wheel is very small, the attachment bracket in this case is arranged very close to the vehicle cab and thus to the windshield of the vehicle cab. When the front loader is raised, accordingly the upper rocker spars of the front loader run very close in front of the vehicle cab. The vehicle cab normally has a hinged windshield, which is opened by lifting upwards and outwards. In this case it is often necessary to open the windshield of the vehicle cab and at the same time to hold the front loader in the raised position. For example the driver has to open the windshield in order to communicate with persons outside the vehicle, for example to instruct the driver when manoeuvring in tight environments or due to a vision-obscuring load on the front loader. Or the windshield must be opened since it is often heavily misted up when driving through farmyards, regardless of the momentary position of the front loader. In the case of the arrangement of a front loader described above with top lying linkage, there is in particular a problem with compact vehicles in that opening of the windshield is obstructed by the linkage (with raised front loader) passing directly in front of the windshield.

[0005] An alternative to the arrangement with top lying linkage described above is the so-called z-kinetics. In contrast to the aforementioned arrangement here the linkage is arranged between the upper rocker spar and the lifting hydraulic cylinder located thereunder and likewise runs substantially parallel to the upper rocker spar. Again an elbow lever is arranged in the vicinity of the kink of the front loader rocker, which is pivotally linked to the front loader rocker. In contrast to the arrangement with top lying linkage the coupling point of the tipping hydraulic cylinder and the coupling point of the linkage are on opposite sides in relation to the coupling point of the elbow lever on the front loader rocker. Thus there is more free space in the area above the upper rocker spar. The z-

kinetics, however, need space for mounting the linkage in the area between the upper rocker spar and the lifting hydraulic cylinder. This space is not always available particularly in the case of compact vehicles.

[0006] Accordingly the object of the present invention consists in providing a front loader and more particularly a linkage for a front loader in such a manner that, particularly in the case of compact vehicles, the windshield of the vehicle cab can also be opened with a raised front loader.

[0007] The object is achieved by a linkage for a front loader according to Claim 1. Further embodiments of the invention are indicated in the sub-claims.

[0008] According to the present invention a linkage for a front loader is made available, which comprises an oblong power transmission section and two coupling elements, which are provided on the ends of the oblong power transmission section in each case. Preferably the linkage is formed by an oblong power transmission section and two coupling elements, which are provided on the ends of the oblong power transmission section in each case. The oblong power transmission section along its longitudinal direction has a recess section and at least one linear section adjoining it, wherein the linear section extends substantially linearly along a connecting line between the two coupling elements, and wherein the recess section is curved in such a manner that it is recessed in the vicinity of the connecting line and extends laterally offset from the connecting line in an extension, as a result of which power is transmitted via the extension in the vicinity of the recess section.

[0009] In contrast to conventional, substantially linear-running linkages, in the case of the linkage according to the invention, an additional free space is created in the vicinity of the recess section. The linkage according to the invention at the same time enables power to be transmitted between the two coupling elements, which form the coupling points of the linkage.

[0010] In this case the recess section can be curved in such a manner that the extension, in a mounted linkage position, extends towards the upper rocker spar of the associated front loader rocker so that additional free space between the front loader and the windshield of the vehicle cab is created in the vicinity of the recess section. Furthermore, the arrangement and dimensioning of the recess section can be adapted to the dimensions of a vehicle in such a manner that the recess section, in the mounted condition of the front loader, is located in the pivoting range of the windshield, over which the windshield is pivoted for opening. Thus, in the case of an arrangement with top lying linkage and vehicles of compact construction it is ensured that the windshield can also be opened unhindered with a raised front loader.

[0011] Preferably, the extension has two extension faces running substantially parallel to each other, which run substantially parallel to the connecting line and which extend laterally away from the connecting line. Particularly in the case of an arrangement with top lying linkage

the dimensions of the extension or the two extension faces, can be adapted in such a manner that the extension extends on both sides of the upper rocker spar and overlaps the upper rocker spar. If, as mentioned, the extension has two extension faces, then both of the extension faces preferably extend on both sides of the upper rocker spar and overlap the upper rocker spar. Furthermore, the dimensions of the recess can be adapted in such a manner that the recess, in the mounted condition of the linkage, extends diagonally to the connecting line substantially to an upper rocker spar of the front loader. Thus, a large free space is created so that (in the mounted condition of the front loader) the pivot movement of the windshield is not restricted by the linkage. Due to the construction of the extension as two extension faces running substantially parallel to each other, a stable arrangement is achieved as a result of which high power can be transmitted between the two coupling elements of the linkage.

[0012] Preferably, linear sections are provided on both sides of the recess section, so that the power transmission section substantially extends along the linear connecting line between the two coupling elements and only has a curve in the vicinity of the recess section. This is advantageous for the transmission of power.

[0013] According to an advantageous further embodiment the at least one linear section is formed by a profile rod with U-shaped cross section, so that high stability of the linear section is ensured. Furthermore such a U-shape for the linear section, in the transition area between linear section and recess section, enables both sides of the U-shaped profile rod to change into the two extension faces of the extension or, in this transition area, the two extension faces to be joined in each case to the exterior of the two sides of the U-shaped profile rod. Thus, the transition area between linear section and recess section is created so as to be particularly stable.

[0014] The advantages, described above, of a front loader rocker with top lying linkage are achieved in particular if use is made of a linkage according to the invention with a recess section. Apart from the different arrangement of the linkage the front loader rocker in this case likewise comprises an upper and a lower rocker spar, an attachment bracket, a tool holder, an elbow lever, a tipping hydraulic cylinder and a lifting hydraulic cylinder, as is explained above with respect to the prior art.

[0015] Furthermore, the advantages described above are achieved with an agricultural vehicle, which has a front loader with two rocker spars, as explained above, wherein the recess of the linkage is arranged in such a manner that a windshield of the vehicle can also be opened unhindered with a raised front loader. For this purpose the linkage and particularly the arrangement and design of the recess section should be adapted accordingly to the dimensions of the remaining parts of the front loader and to the dimensions of the vehicle, in particular the vehicle cab with the pivoting windshield. Preferably, the recess section should be formed in such a manner

that, in the mounted condition of the front loader and with a raised front loader, the recess of the recess section is located in the pivoting range of the windshield of the vehicle cab so that the windshield can be opened unhindered.

[0016] Further features and advantages of the invention will become clear from the description of exemplary embodiments with reference to the appended drawings, wherein:

Fig. 1 shows a perspective view of a linkage according to the present invention;

Fig. 2 shows a side view of the linkage shown in Fig. 1;

Fig. 3 shows a view from above onto the linkage shown in Fig. 1;

Fig. 4 shows a cross sectional view along line I-I in Fig. 3;

Fig. 5 shows a cross sectional view along line II-II in Fig. 3;

Fig. 6 shows a cross sectional view along line III-III in Fig. 3;

Fig. 7 shows a side view of a front loader rocker with a linkage according to the invention;

Fig. 8 shows a cutaway view along line IV-IV in Fig. 7;

Fig. 9 shows a cutaway view along line V-V in Fig. 7;

Fig. 10 shows a cutaway view along line VI-VI in Fig. 9;

Fig. 11 shows a perspective view of a front loader with a linkage according to the present invention;

Fig. 12 shows a view from the front of the front loader shown in Fig. 11;

Fig. 13 shows a view from above onto the front loader shown in Fig. 11;

Fig. 14 shows a sectional side view of a tractor with a mounted front loader, the sectional view showing the vehicle cab and an upper rocker spar of the front loader in the raised condition.

[0017] The directional indications, such as for example "top, bottom etc." used in the preceding and following description, relate to a mounted position of the linkage according to the invention and to a reference system of a driver sitting in the vehicle. These directional indications are not to be interpreted in a restrictive way with regard

to the arrangement of the linkage.

[0018] With reference to Figs. 1 - 6, a linkage 2 according to the invention for a front loader is described below. The linkage 2 is formed by two coupling elements 4 and 6, which in each case are designed as mounting lugs, and by an oblong power transmission section 8, which extends between the two coupling elements 4, 6 and is rigidly connected to these. The oblong power transmission section 8 has a recess section 10 and a linear section 12, 14 on both sides of the recess section 10 in each case.

[0019] As is evident on the basis of Fig. 2 and Fig. 3, the two linear sections 12, 14 each extend substantially linearly along a connecting line 16 between the two coupling elements 4 and 6. The connecting line 16 in Fig. 2 and Fig. 3 is drawn as a dash-dotted line and in each case extends from the centre of the mounting lug of the one coupling element 4 to the centre of the mounting lug of the other coupling element 6. As is evident on the basis of Fig. 2, the recess section is curved in such a manner that it has a recess 18 in the vicinity of the connecting line 16 and extends laterally offset from the connecting line 16 in an extension 20. As is evident on the basis of Fig. 1 to Fig. 3 in particular, the extension 20 is coupled to the two linear sections 12, 14 in such a manner that power is transmitted between the two coupling elements 4 and 6 via the two linear sections 12 and 14 and the extension 20.

[0020] As is evident on the basis of Fig. 1 and Fig. 6, the two linear sections are formed by a profile rod with U-shaped cross section, wherein in the present exemplary embodiment the U-shape is expanded to the open end of the U. Preferably, the longer linear section 12 has a wall thickness in the range of substantially 7 to 9 mm, more preferably in the range of substantially 7.5 to 8.5 mm. The shorter linear section 14 preferably has a wall thickness in the range of substantially 11 to 13 mm, more preferably in the range of 11.5 to 12.5 mm.

[0021] The extension 20 in the exemplary embodiment illustrated is formed by two extension faces 22, 24 running substantially parallel to each other, which, as is evident on the basis of Fig. 2 and Fig. 3, run substantially parallel to the connecting line 16 and extend laterally away from the connecting line 16. The wall thickness of the two extension faces 22, 24 preferably lies in a range of substantially 7 to 9 mm, more preferably in the range of substantially 7.5 to 8.5 mm.

[0022] In the two transition areas 26 and 28 between the linear section 12 and the recess section 10 as well as between the linear section 14 and the recess section 10 the two extension faces 22, 24 are joined in each case to the exterior of the two sides 30, 32 of the U-shaped profile rod of the respective linear section 12, 14. This is evident in particular on the basis of the cross sectional illustration in Fig. 5, which shows the transition area 26. Preferably, the entire linkage 2 is formed from steel and the extension faces 22, 24 are joined to the two sides 30, 32 by welding. In the two transition areas 26, 28 the end of the profile rods of the two linear sections 12, 14 is

tapered and forms an edge running diagonally downwards. The two extension faces 22, 24 also have an edge similarly descending diagonally in the transition areas 26, 28. A base 34 of the U-shaped profile rods of the two linear sections 12, 14 continues within these two transition areas 26, 28 in each case in a cover plate 36, which runs along the diagonally descending edges of the extension faces 22, 24 and the sides 30, 32 and extends between the two extension faces 22, 24. The cover plates 36 each terminate before reaching the deepest point of the recess 18. On reaching the deepest point of the recess 18 the two extension faces 22, 24 run substantially parallel to the connecting line 16, as is evident on the basis of Fig. 2.

[0023] The recess 18 preferably has a depth t in the range of substantially 70 to 85 mm, more preferably in the range of substantially 75 to 79 mm. The depth t in this case is measured between the upper end of the two linear sections 12 and 14 and the deepest point of the recess 18, as illustrated in Fig. 2. The distance T between the upper end of the linear sections 12, 14 and the lower end of the two extension faces 22, 24 preferably lies in the range of substantially 190 to 210 mm, more preferably in the range of substantially 195 to 205 mm. The depth t and the distance T in this case are measured perpendicularly to the connecting line 16.

[0024] As is evident on the basis of Fig. 3, the distance between the two opposite faces increases in the transition areas 26, 28 so that the distance between the extension faces 22, 24, in the vicinity of the recess section 10, is greater than the distance between the sides 30, 32 of the U-shaped profile rod in the vicinity of the linear sections 12, 14.

[0025] Fig. 7 illustrates a front loader rocker 38 of a front loader with a linkage 2 according to the invention in side view. The linkage 2 in this case is formed in such a manner as described with reference to Figs. 1 to 6. The front loader rocker 38 has a rocker spar 40, which is curved in the vicinity of a kink 42 and is divided by this into an upper rocker spar 44 and a lower rocker spar 46. A connecting element 48 is arranged in the vicinity of the kink 42. At the proximal end of the upper rocker spar 44 an attachment bracket 50 is linked to a fulcrum 52. The attachment bracket 50 serves to secure the front loader rocker 38 to a vehicle. At the distal end of the lower rocker spar 46 a tool holder 54 is pivotally linked by means of a fulcrum 56. This serves to attach a tool (not illustrated), such as for example a bucket. In the vicinity of the kink 42 an elbow lever 58 can be pivoted about a fulcrum 60 onto the rocker spars 44, 46 or onto the connecting element 48 connected thereto. The elbow lever 58 in this case is arranged on the side of the rocker spars 44, 46, to which the apex of the kink points in the vicinity of the kink 42, which in a mounted position of the front loader rocker 38 corresponds to the upper side. A lifting hydraulic cylinder 62, which with a first end is pivotally linked to the attachment bracket 50 and with the second end is pivotally linked to the rocker spars 44, 46 in the vicinity

of the kink 42, in particular to the connecting element 48, is provided underneath the upper rocker spar 44. The lifting hydraulic cylinder 62 serves to raise and lower the front loader rocker 38.

[0026] Furthermore a tipping hydraulic cylinder 64 is provided in the vicinity of the lower rocker spar 46, which is linked by means of a bearing 66 to the tool holder 54 and with its second end is linked by means of a bearing 68 to the elbow lever 58. The tipping hydraulic cylinder 64 in this case runs above the lower rocker spar 46 and on the same side of the rocker spars 44 and 46 as the elbow lever 58.

[0027] Furthermore, a linkage 2 according to the invention, which with a first end is linked by means of a bearing 70 to the elbow lever 58 and with a second end is linked by means of a bearing 72 to the attachment bracket 50, is provided. As is evident on the basis of Fig. 7, the two coupling points 68 and 70 of the two bearings of the tipping hydraulic cylinder 64 and the linkage 2 are arranged on the same side of the connecting element 48 in relation to a coupling point 60 of the elbow lever 58. Furthermore, the three coupling points 60, 68 and 70 are configured in the shape of a triangle on the elbow lever 58. As already explained in the introductory part of the description, the configuration illustrated is an arrangement with a top lying linkage 2. As is evident on the basis of Fig. 7 and Fig. 8, the dimensions of the extension 20, and in particular the extension faces 22, 24, are adapted in such a manner that the extension 20 extend on both sides of the upper rocker spar 44 and overlap the upper rocker spar 44. Furthermore, as is evident on the basis of Fig. 8, the dimensions of the recess 18 are adapted in such a manner that the recess extends substantially up to the upper rocker spar 44. In particular the upper ends of the extension faces 22, 24 in the vicinity of the deepest point of the recess 18 are substantially flush with the upper end of the upper rocker spar 44. Accordingly in the vicinity of the recess section 10 the space between the front loader rocker 38 and a vehicle cab (not illustrated) is not additionally restricted by the linkage 2. This is also evident on the basis of the cross sectional view in Fig. 10. As is evident on the basis of Fig. 9, the U-shaped profile rod of the linear section 12 runs above the upper rocker spar 44.

[0028] Figs. 11 - 13 show a front loader, which has two front loader rockers 38, as described with reference to Figs. 7 to 10. The two front loader rockers are formed in mirror-image and connected together by a tie bar 76. The tie bar 76 extends between the two lower rocker spars 46 of the two front loader rockers 38.

[0029] Fig. 14 illustrates part of a vehicle cab 78 of a tractor 80. A front loader 74, as explained above with reference to Figs. 11 - 13, is mounted on the tractor 78. The front loader 74 in this case is in a raised condition. As is evident on the basis of Fig. 14, a windshield 82, which is hinged on the vehicle cab 78, due to provision of the linkage 2 according to the invention, can be opened without this pivot movement being obstructed by the link-

age 2. The windshield 82 can also be opened accordingly with a raised front loader 74 and also in the case of compact vehicles. The recess section 10 of the linkage 2 in this case is located in the area, in which the windshield 82 during its pivot movement approaches closest to the front loader 74.

[0030] The present invention is not limited to the arrangements shown in the exemplary embodiments. More particularly, provision of a recess section is also in principle possible with a bottom lying linkage, which is employed in the case of z-kinetics.

[0031] Furthermore, the design of the coupling elements of the linkage as mounting lugs is not absolutely essential. The coupling elements are only to make pivotal connection of the linkage 2 possible.

Claims

1. Linkage for a front loader, said linkage comprising an oblong power transmission section (8) and two coupling elements (4, 6) which are provided on the ends of the oblong power transmission section (8) in each case, **characterized in that** the oblong power transmission section (8) along its longitudinal direction has a recess section (10) and two linear sections (12, 14), between which the recess section (10) extends, and which on their free end have a coupling element (4, 6) in each case, wherein the linear sections (12, 14) extend substantially linearly along a connecting line (16) between the two coupling elements (4, 6), and wherein the recess section (10) is curved in such a manner that it is recessed in the vicinity of the connecting line (16) and extends laterally offset from the connecting line (16) in an extension (20), as a result of which power is transmitted via the extension (20) in the vicinity of the recess section (10).
2. Linkage according to Claim 1, **characterized in that** the extension (20) has two extension faces (22, 24) running substantially parallel to each other, which run substantially parallel to the connecting line (16) and which extend laterally away from the connecting line (16).
3. Linkage according to any one of the preceding claims, **characterized in that** the two linear sections (12, 14) are formed by a profile rod with U-shaped, V-shaped cross section or any other profile rod opening on one side, which has a base (34) and at least two sides (30, 32), wherein the profile is expanded preferably towards the open end.
4. Linkage according to Claim 3, **characterized in that**, in the transition areas (26, 28) between linear sections (12, 14) and recess section (10), both sides (30, 32) of the profile rod change into the two extension faces (22, 24) of the extension (20), or in the transition areas (26, 28) between linear sections (12, 14) and recess section (10), the two extension faces (22, 24) in each case are joined, preferably welded, to the exterior of the two sides (30, 32) of the profile rod.
5. Linkage according to Claim 4, **characterized in that**, in the transition areas (26, 28) between linear sections (12, 14) and recess section (10), the distance between the two opposite faces increases, so that the distance between the extension faces (22, 24), in the vicinity of the recess section (10), is greater than the distance between the sides (30, 32) of the profile rod in the vicinity of the linear sections (12, 14).
6. Linkage according to Claim 4 or 5, **characterized in that**, in the transition areas (26, 28) between linear sections (12, 14) and recess section (10), the base (34) of the profile rod, which is arranged between the two sides (30, 32), continues in a cover plate (36) running diagonally to the connecting line (16), wherein the cover plate (36) terminates before reaching the deepest point of the recess (18) of the recess section (10).
7. Linkage according to any one of the preceding claims, **characterized in that** the coupling elements (4, 6) are in each case formed by mounting lugs for pivotal connection of the linkage.
8. Linkage according to any one of the preceding claims, **characterized in that** the linkage, in the mounted condition, runs along an upper rocker spar (44) of the front loader (74), wherein the dimensions of the extension (20) are adapted in such a manner that the extension (20) extends on both sides of the upper rocker spar (44) and overlaps the upper rocker spar (44), particularly so that the two extension faces (22, 24) extend on both sides of the upper rocker spar (44) and overlap the upper rocker spar (44).
9. Linkage according to any one of the preceding claims, **characterized in that** the linkage, in the mounted condition, runs along an upper rocker spar (44) of the front loader (74), wherein the dimensions of the recess (18) are adapted in such a manner that the recess (18), in the mounted condition of the linkage, extends diagonally to the connecting line (16), substantially to an upper rocker spar (44) of the front loader (74).
10. Front loader rocker, which comprises: an upper (44) and a lower (46) rocker spar, which are rigidly connected together at a kink (42), an attachment bracket (50), pivotally linked to the free end of the upper rocker spar (44), a tool holder (54), pivotally linked to the free end of the lower rocker spar

(46), an elbow lever (58), pivotally linked in the vicinity of the kink (42) to the rocker spars (44, 46), wherein the elbow lever (58) runs on the side of the rocker spars (44, 46), to which the apex of the kink points, a tipping hydraulic cylinder (64), which with a first end is pivotally linked to the tool holder (54) and with a second end is pivotally linked to the elbow lever (58), wherein the tipping hydraulic cylinder (64) runs on the same side of the rocker spars (44, 46) as the elbow lever (58), a linkage (2) according to any one of the preceding claims, which with a first coupling element (4) is pivotally linked to the elbow lever (58) and with the second coupling element (6) is pivotally linked to the attachment bracket (50), the linkage (2) running on the same side of the rocker spars (44, 46) as the elbow lever (58).

11. Front loader rocker according to Claim 10, **characterized by** a lifting hydraulic cylinder (62), which is arranged lying opposite the linkage (2) in relation to the upper rocker spar (44) and with a first end is pivotally linked to the attachment bracket (50) and with a second end is pivotally linked to the rocker spars (44, 46) in the vicinity of the kink (42).
12. Front loader, which comprises two front loader rockers (38) according to Claim 10 or 11, as well as a tie bar (76) extending crosswise between the two lower rocker spars (46).
13. Agricultural vehicle, in particular a farm tractor, **characterized by** a front loader (74) according to Claim 12, wherein the recess (18) of the linkage (2) is arranged in such a manner that a windshield (82) of the vehicle cab (78) of the vehicle can also be opened unhindered when the front loader (74) is raised.

Patentansprüche

1. Verbindungseinrichtung für einen Frontlader, wobei die Verbindungseinrichtung einen langgestreckten Kraftübertragungsabschnitt (8) und zwei Koppelemente (4, 6) aufweist, die jeweils an den Enden des langgestreckten Kraftübertragungsabschnitts (8) vorgesehen sind, **dadurch gekennzeichnet, dass** der langgestreckte Kraftübertragungsabschnitt (8) entlang seiner Längserstreckung einen Aussparungsabschnitt (10) und zwei gerade Abschnitte (12, 14) aufweist, zwischen denen sich der Aussparungsabschnitt (10) erstreckt und die an ihrem freien Ende jeweils ein Koppelement (4, 6) aufweisen, wobei sich die geraden Abschnitte (12, 14) im Wesentlichen gerade entlang einer Verbindungslinie (16) zwischen den beiden Koppelementen (4, 6) erstrecken, und wobei der Aussparungsabschnitt (10) derart kurvenförmig ist, dass er benachbart der Verbindungslinie (16) eine Aussparung aufweist und sich

mit einem seitlichen Versatz von der Verbindungslinie (16) in einen Fortsatzbereich (20) erstreckt, was dazu führt, dass über den Fortsatzbereich (20) benachbart zu dem Aussparungsabschnitt (10) Kraft übertragen wird.

2. Verbindungseinrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** der Fortsatzbereich (20) zwei im Wesentlichen parallel zueinander verlaufende Fortsatzflächen (22, 24) aufweist, die sich im Wesentlichen parallel zu der Verbindungslinie (16) erstrecken und die sich seitlich von der Verbindungslinie (16) weg erstrecken.
3. Verbindungseinrichtung nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die beiden geraden Abschnitte (12, 14) durch eine Profilstange mit einem U-förmigen oder V-förmigen Querschnitt oder eine beliebige auf einer Seite geöffnete Profilstange gebildet sind, die eine Basis (34) und mindestens zwei Seiten (30, 32) aufweist, wobei sich das Profil vorzugsweise in Richtung auf das offene Ende weitet.
4. Verbindungseinrichtung nach Anspruch 3, **dadurch gekennzeichnet, dass** sich in den Übergangsbereichen (26, 28) zwischen den geraden Abschnitten (12, 14) und dem Aussparungsabschnitt (10) beide Seiten (30, 32) der Profilstange in die beiden Fortsatzflächen (22, 24) des Fortsatzbereichs (20) verwandeln oder in den Übergangsbereichen (26, 28) zwischen geraden Abschnitten (12, 14) und Aussparungsabschnitt (10) die beiden Fortsatzflächen (22, 24) jeweils mit dem Äußeren der beiden Seiten (30, 32) der Profilstange verbunden, vorzugsweise verschweißt, sind.
5. Verbindungseinrichtung nach Anspruch 4, **dadurch gekennzeichnet, dass** sich in den Übergangsbereichen (26, 28) zwischen den geraden Abschnitten (12, 14) und dem Aussparungsabschnitt (10) der Abstand zwischen den beiden gegenüberliegenden Seiten vergrößert, sodass der Abstand zwischen den Fortsatzflächen (22, 24) benachbart zu dem Aussparungsabschnitt (10) größer ist als der Abstand zwischen den Seiten (30, 32) der Profilstange benachbart zu den geraden Abschnitten (12, 14).
6. Verbindungseinrichtung nach Anspruch 4 oder 5, **dadurch gekennzeichnet, dass** sich in den Übergangsbereichen (26, 28) zwischen den geraden Abschnitten (12, 14) und dem Aussparungsabschnitt (10) die Basis (34) der Profilstange, die zwischen den beiden Seiten (30, 32) angeordnet ist, in einer Deckplatte (36) fortsetzt, die diagonal zu der Verbindungslinie (16) verläuft, wobei die Deckplatte (36) endet, bevor sie den tiefsten Punkt der Aussparung (18) des Aussparungsabschnitts (10) erreicht.

7. Verbindungseinrichtung nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** für eine Schwenkverbindung der Verbindungseinrichtung die Koppellemente (4, 6) jeweils durch Montageaugen gebildet sind.
8. Verbindungseinrichtung nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Verbindungseinrichtung im montierten Zustand entlang eines oberen Schwingenholms (44) des Frontladers (74) verläuft, wobei die Maße des Fortsatzbereichs (20) derart angepasst sind, dass sich der Fortsatzbereich (20) auf beiden Seiten des oberen Schwingenholms (44) erstreckt und den oberen Schwingenholm (44) überlappt, insbesondere so, dass sich die beiden Fortsatzflächen (22, 24) auf beiden Seiten des oberen Schwingenholms (44) erstrecken und den oberen Schwingenholm (44) überlappen.
9. Verbindungseinrichtung nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Verbindungseinrichtung im montierten Zustand entlang eines oberen Schwingenholms (44) des Frontladers (74) verläuft, wobei die Maße der Aussparung (18) derart angepasst sind, dass sich die Aussparung (18) im montierten Zustand der Verbindungseinrichtung diagonal zu der Verbindungslinie (16) erstreckt, im Wesentlichen bis zu einem oberen Schwingenholm (44) des Frontladers (74).
10. Frontladerschwinge, mit:
einem oberen (44) und einem unteren (46) Schwingenholm, die an einer Knickstelle (42) starr miteinander verbunden sind, einer Anbaugeräthalterung (50), die schwenkbar an dem freien Ende des oberen Schwingenholms (44) angelenkt ist, einem Werkzeughalter (54), der schwenkbar an dem freien Ende des unteren Schwingenholms (46) angelenkt ist, einem Kniehebel (58), der benachbart zu der Knickstelle (42) schwenkbar an den Schwingenholmen (44, 46) angelenkt ist, wobei der Kniehebel (58) an der Seite der Schwingenholme (44, 46) verläuft, auf die der Scheitelpunkt der Knickstelle zeigt, einem hydraulischen Kippzylinder (64), der mit einem ersten Ende schwenkbar an dem Werkzeughalter (54) angelenkt ist und mit einem zweiten Ende schwenkbar an dem Kniehebel (58) angelenkt ist, wobei der hydraulische Kippzylinder (64) auf derselben Seite der Schwingenholme (44, 46) verläuft wie der Kniehebel (58), einer Verbindungseinrichtung (2) nach einem der vorhergehenden Ansprüche, die mit einem ersten Koppellement (4) schwenkbar an dem Kniehebel (58) angelenkt ist und mit dem zweiten Koppellement (6) schwenkbar an der Anbaugeräthalterung (50) angelenkt ist, wobei die Verbindungseinrichtung (2) auf derselben Seite der Schwingenholme (44, 46) verläuft wie der Kniehebel

(58).

11. Frontladerschwinge nach Anspruch 10, **gekennzeichnet durch** einen hydraulischen Hebezyylinder (62), der relativ zu dem oberen Schwingenholm (44) gegenüberliegend zu der Verbindungseinrichtung (2) angeordnet ist und mit einem ersten Ende schwenkbar an der Anbaugeräthalterung (50) angelenkt ist und mit einem zweiten Ende benachbart der Knickstelle (42) schwenkbar an den Schwingenholmen (44, 46) angelenkt ist.
12. Frontlader mit zwei Frontladerschwingen (38) nach Anspruch 10 oder 11 mit einer Verbindungsstrebe (76), die sich quer zwischen den beiden unteren Schwingenholmen (46) erstreckt.
13. Landwirtschaftliches Fahrzeug, insbesondere ein Traktor, **gekennzeichnet durch** einen Frontlader (74) nach Anspruch 12, wobei die Aussparung (18) der Verbindungseinrichtung (2) derart angeordnet ist, dass eine Windschutzscheibe (82) der Fahrzeugkabine (78) des Fahrzeugs auch dann ungehindert geöffnet werden kann, wenn der Frontlader (74) angehoben ist.

Revendications

1. Dispositif de liaison pour un chargeur frontal, ledit dispositif de liaison comprenant une section de transmission de puissance oblongue (8) et deux éléments de couplage (4, 6) qui sont, dans chaque cas, agencés sur les extrémités de la section de transmission de puissance oblongue (8), **caractérisé en ce que** la section de transmission de puissance oblongue (8), suivant sa direction longitudinale, comporte une section en retrait (10) et deux sections linéaires (12, 14), entre lesquelles s'étend la section en retrait (10), et qui, sur leur extrémité libre, comportent, dans chaque cas, un élément de couplage (4, 6), dans lequel les sections linéaires (12, 14) s'étendent sensiblement linéairement suivant une ligne de liaison (16) entre les deux éléments de couplage (4, 6), et dans lequel la section en retrait (10) est courbée de telle manière qu'elle est en retrait à proximité de la ligne de liaison (16) et s'étend de manière latéralement décalée de la ligne de liaison (16) dans une extension (20), en résultat de quoi la puissance est transmise par l'intermédiaire de l'extension (20) à proximité de la section en retrait (10).
2. Dispositif de liaison selon la revendication 1, **caractérisé en ce que** l'extension (20) comporte deux faces d'extension (22, 24) s'étendant de manière sensiblement parallèle l'une à l'autre qui s'étendent sensiblement en parallèle de la ligne de liaison (16) et qui s'étendent latéralement à l'opposé de la ligne de

liaison (16).

3. Dispositif de liaison selon l'une quelconque des revendications précédentes, **caractérisé en ce que** les deux sections linéaires (12, 14) sont réalisées avec une tige profilée présentant une section transversale en forme de U, en forme de V ou toute autre tige profilée débouchant sur un premier côté, qui comporte une base (34) et au moins deux côtés (30, 32), dans lequel le profil est évasé de préférence vers l'extrémité ouverte. 5
4. Dispositif de liaison selon la revendication 3, **caractérisé en ce que**, dans les zones de transition (26, 28) entre les sections linéaires (12, 14) et la section en retrait (10), les deux côtés (30, 32) de la tige profilée changent sur les deux faces d'extension (22, 24) de l'extension (20), ou dans les zones de transition (26, 28) entre les sections linéaires (12, 14) et la section en retrait (10), les deux faces d'extension (22, 24) sont, dans chaque cas, jointes, de préférence, soudées, sur l'extérieur des deux côtés (30, 32) de la tige profilée. 10
5. Dispositif de liaison selon la revendication 4, **caractérisé en ce que**, dans les zones de transition (26, 28) entre les sections linéaires (12, 14) et la section en retrait (10), la distance entre les deux faces opposées augmente, de sorte que la distance entre les faces d'extension (22, 24), à proximité de la section en retrait (10), est supérieure à la distance entre les côtés (30, 32) de la tige profilée à proximité des sections linéaires (12, 14). 15
6. Dispositif de liaison selon la revendication 4 ou 5, **caractérisé en ce que**, dans les zones de transition (26, 28) entre les sections linéaires (12, 14) et la section en retrait (10), la base (34) de la tige profilée, qui est agencée entre les deux côtés (30, 32), continue sur une plaque de couvercle (36) s'étendant diagonalement par rapport à la ligne de liaison (16), dans lequel la plaque de couvercle (36) se termine avant d'atteindre le point le plus profond de la cavité (18) de la section en retrait (10). 20
7. Dispositif de liaison selon l'une quelconque des revendications précédentes, **caractérisé en ce que** les éléments de couplage (4, 6) sont, dans chaque cas, formés par des pattes de montage afin d'assurer une liaison pivotante du dispositif de liaison. 25
8. Dispositif de liaison selon l'une quelconque des revendications précédentes, **caractérisé en ce que** le dispositif de liaison, dans l'état monté, s'étend le long d'un longeron de dispositif de basculement supérieur (44) du chargeur frontal (74), dans lequel les dimensions de l'extension (20) sont adaptées de telle manière que l'extension (20) s'étend des deux cô- 30

tés du longeron de dispositif de basculement supérieur (44) et recouvre le longeron de dispositif de basculement supérieur (44), en particulier, de telle manière que les deux faces d'extension (22, 24) s'étendent sur les deux côtés du longeron de dispositif de basculement supérieur (44) et recouvrent le longeron de dispositif de basculement supérieur (44).

9. Dispositif de liaison selon l'une quelconque des revendications précédentes, **caractérisé en ce que** le dispositif de liaison, dans l'état monté, s'étend le long d'un longeron de dispositif de basculement supérieur (44) du chargeur frontal (74), dans lequel les dimensions de la cavité (18) sont adaptées de telle manière que la cavité (18), dans l'état monté du dispositif de liaison, s'étend diagonalement par rapport à la ligne de liaison (16), sensiblement par rapport à un longeron de dispositif de basculement supérieur (44) du chargeur frontal (74). 35
10. Dispositif de basculement de chargeur frontal, qui comprend :
des longerons de dispositif de basculement supérieur (44) et inférieur (46), qui sont reliés de manière rigide ensemble à un coude (42), un support de fixation (50), lié avec possibilité de pivotement à l'extrémité libre du longeron de dispositif de basculement supérieur (44), un support d'outil (54), lié avec possibilité de pivotement à l'extrémité libre du longeron de dispositif de basculement inférieur (46), un levier de coude (58), lié avec possibilité de pivotement à proximité du coude (42) aux longerons de dispositif de basculement (44, 46), dans lequel le levier de coude (58) s'étend sur le côté des longerons de dispositif de basculement (44, 46), vers lesquels le sommet du coude sont dirigés, un vérin hydraulique de basculement (64), lequel, par une première extrémité, est lié avec possibilité de pivotement au support d'outil (54) et, par une seconde extrémité, est lié avec possibilité de pivotement au levier de coude (58), dans lequel le vérin hydraulique de basculement (64) s'étend sur le même côté des longerons de dispositif de basculement (44, 46) que le levier de coude (58), un dispositif de liaison (2) selon l'une quelconque des revendications précédentes, qui, avec un premier élément de couplage (4), est lié avec possibilité de pivotement au levier de coude (58) et, avec le deuxième élément de couplage (6) est lié avec possibilité de pivotement au support de fixation (50), le dispositif de liaison (2) s'étendant sur le même côté des longerons de dispositif de basculement (44, 46) que le levier de coude (58). 40
11. Dispositif de basculement de chargeur frontal selon la revendication 10, **caractérisé par** un vérin de levage hydraulique (62), qui est agencé à l'opposé du dispositif de liaison (2) par rapport au longeron de 45

dispositif de basculement supérieur (44) et, par une première extrémité, est lié avec possibilité de pivotement au support de fixation (50) et, par une seconde extrémité, est lié avec possibilité de pivotement aux longerons de dispositif de basculement (44, 46) à proximité du coude (42). 5

12. Chargeur frontal, qui comprend deux dispositifs de basculement de chargeur frontal (38) selon la revendication 10 ou 11, de même qu'une barre de traction (76) s'étendant transversalement entre les deux longerons de dispositif de basculement inférieurs (46). 10

13. Véhicule agricole, en particulier un tracteur agricole, **caractérisé par** un chargeur frontal (74) selon la revendication 12, dans lequel la cavité (18) du dispositif de liaison (2) est agencée d'une telle manière qu'un pare-brise (82) de la cabine de véhicule (78) du véhicule peut aussi être ouvert sans entrave lorsque le chargeur frontal (74) est soulevé. 15 20

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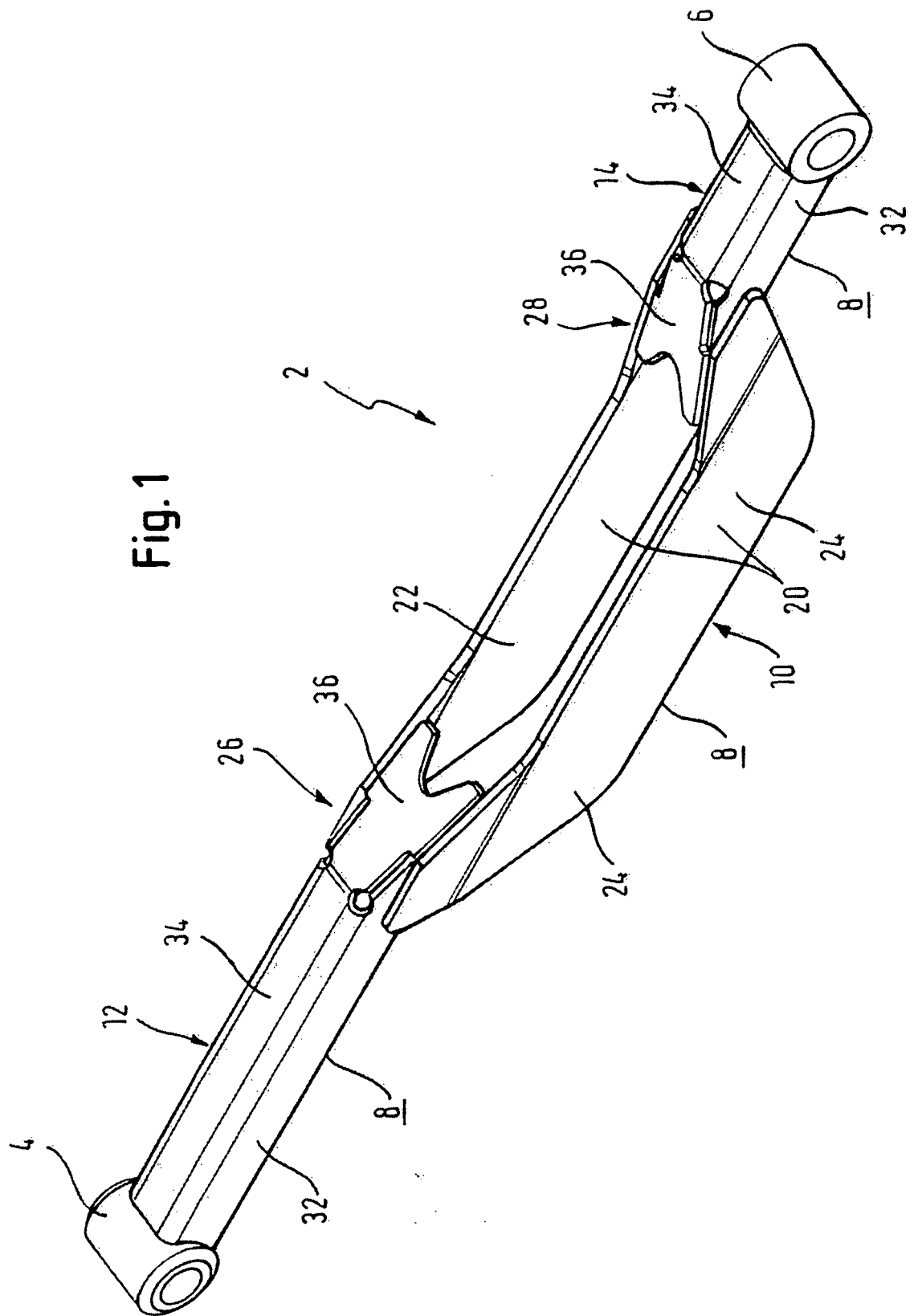


Fig. 2

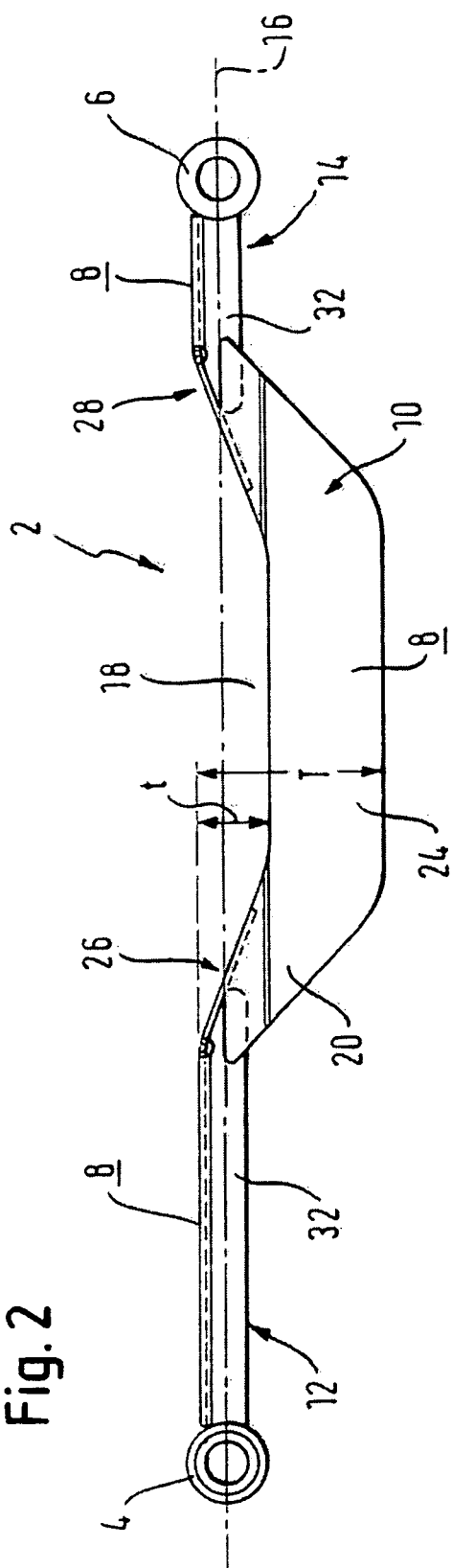


Fig. 3

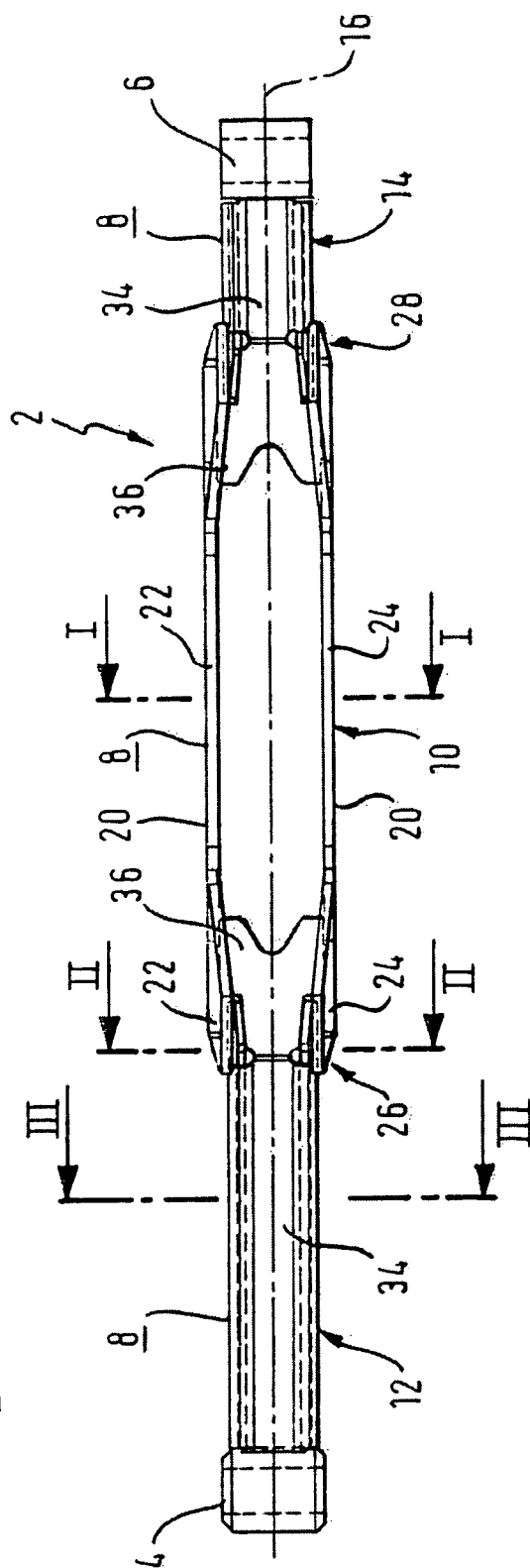


Fig. 4

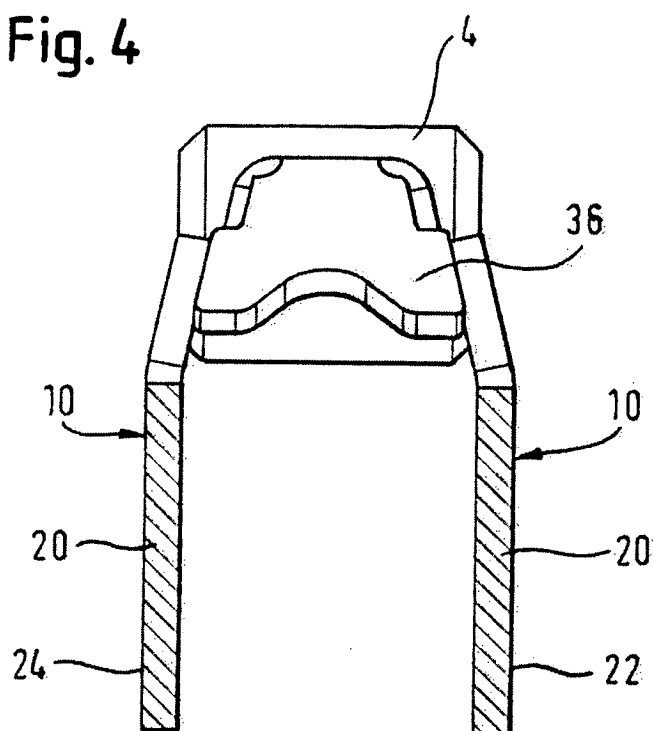


Fig. 5

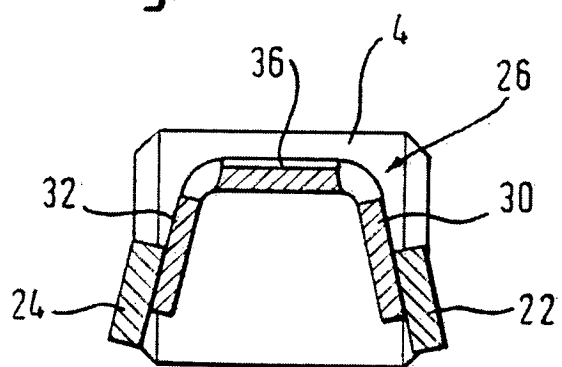


Fig. 6

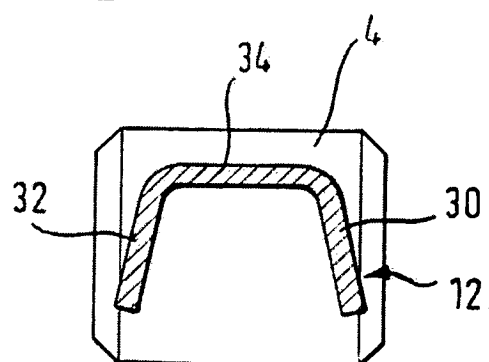


Fig. 7

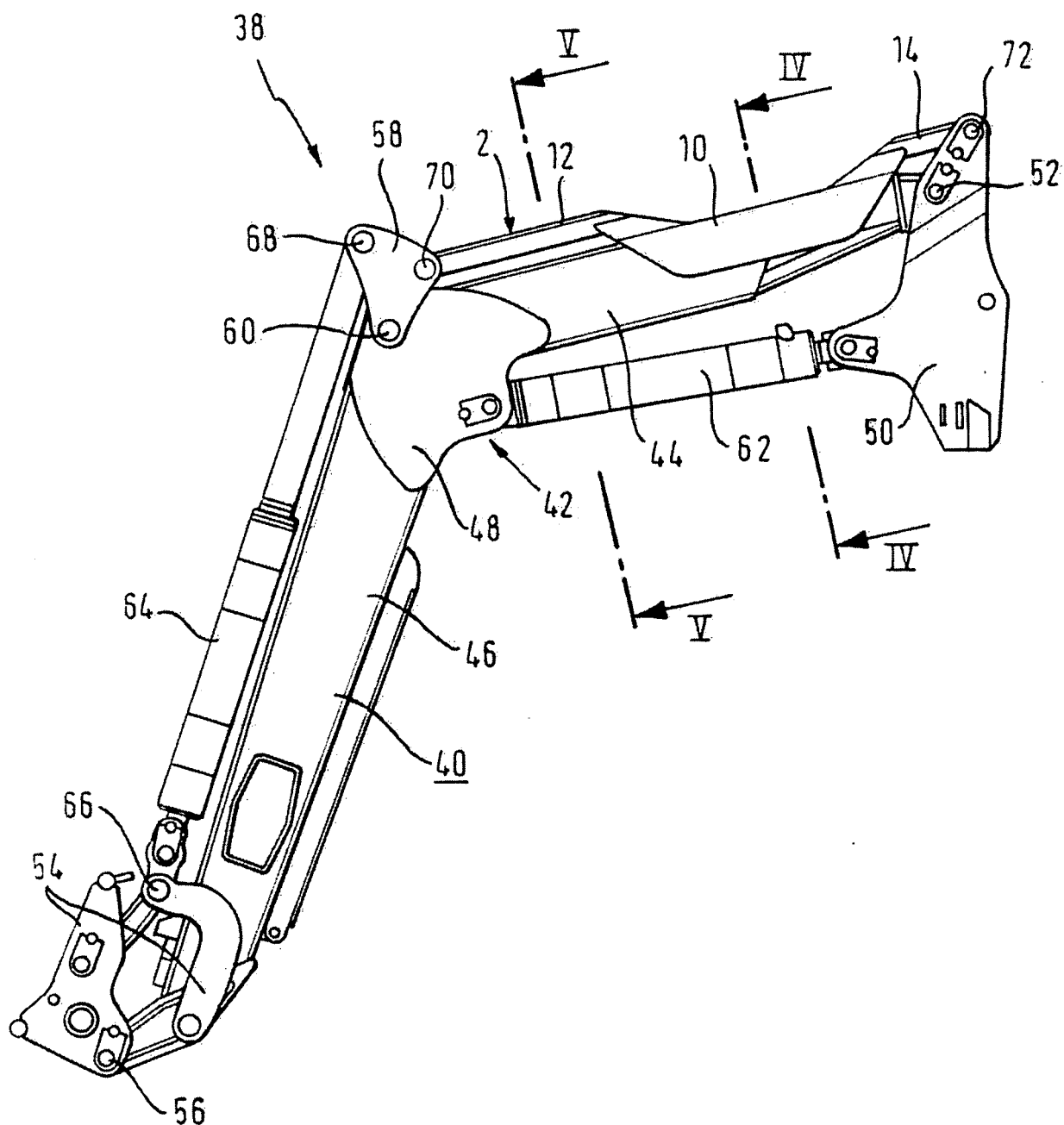


Fig. 8

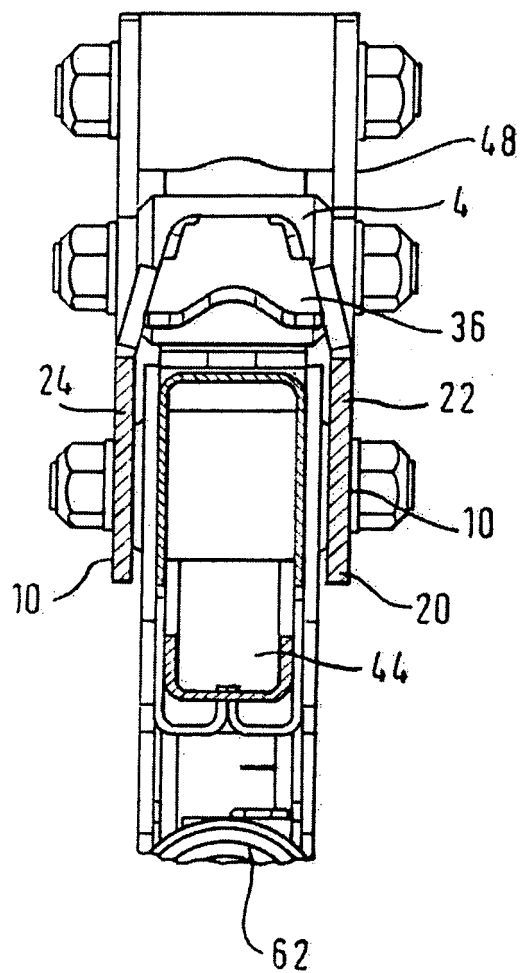


Fig. 9

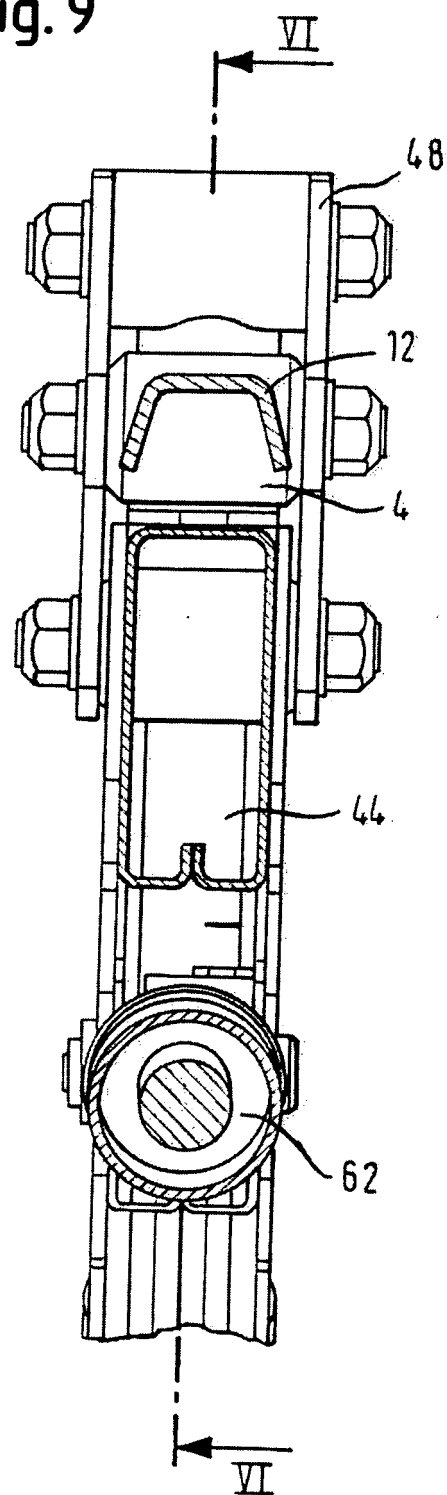


Fig. 10

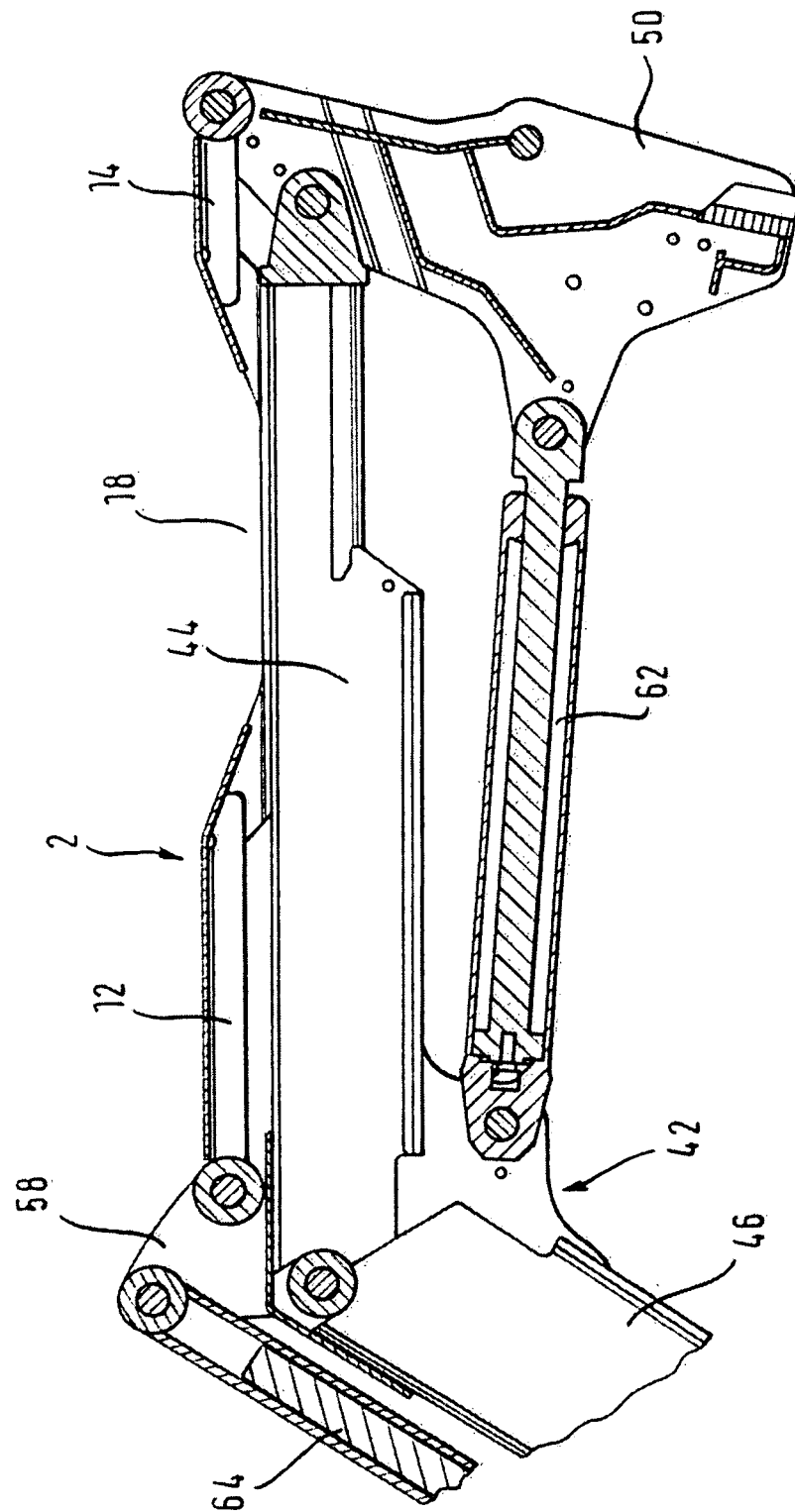


Fig. 11

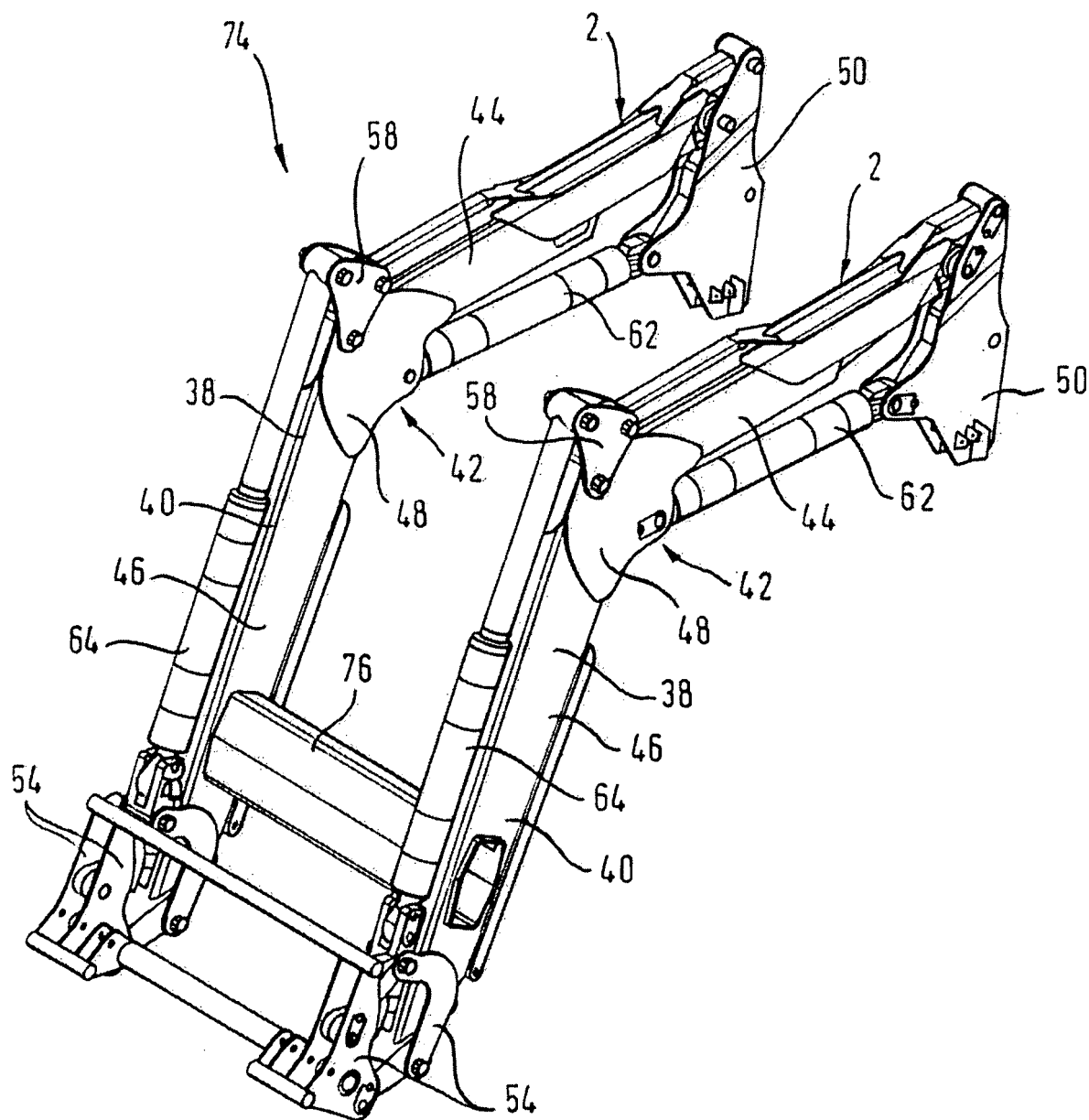


Fig. 12

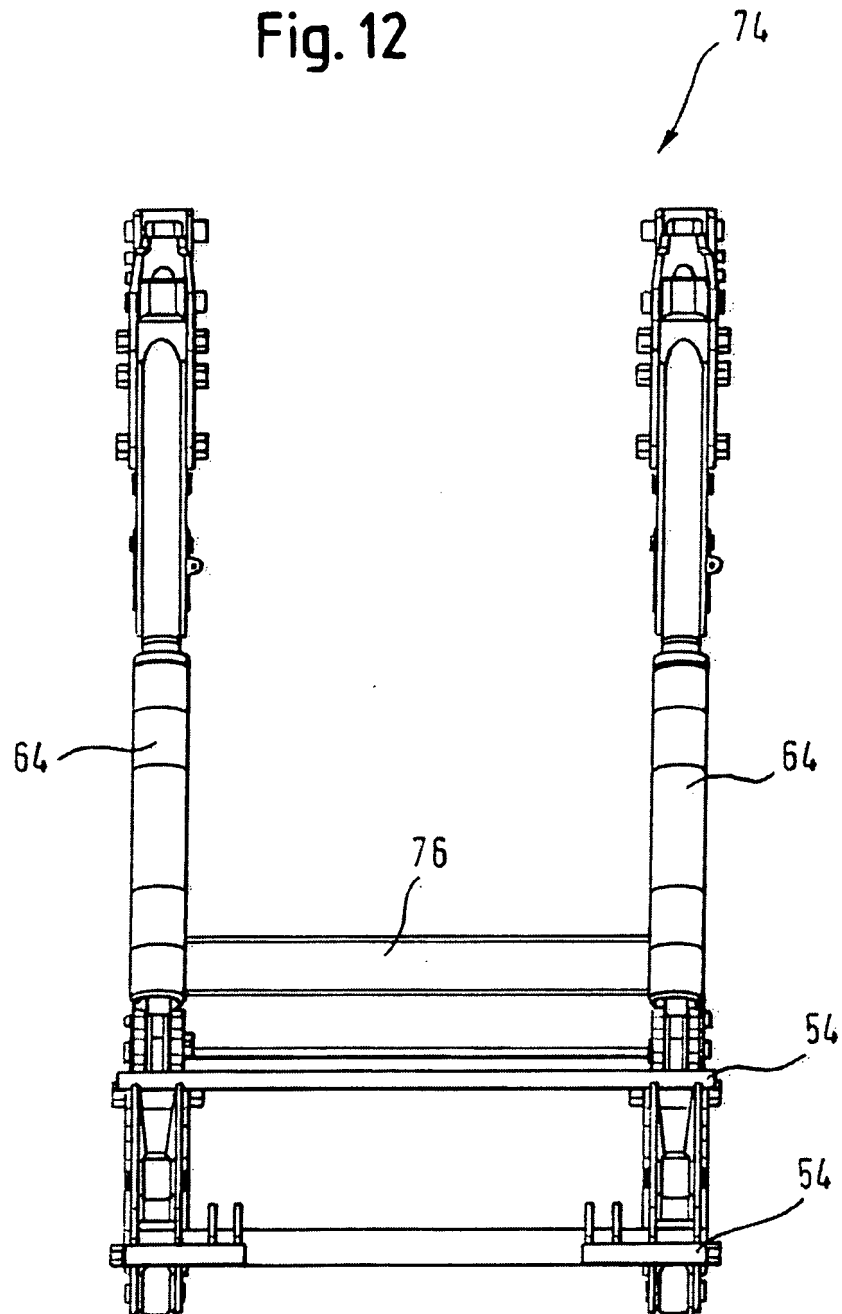


Fig. 13

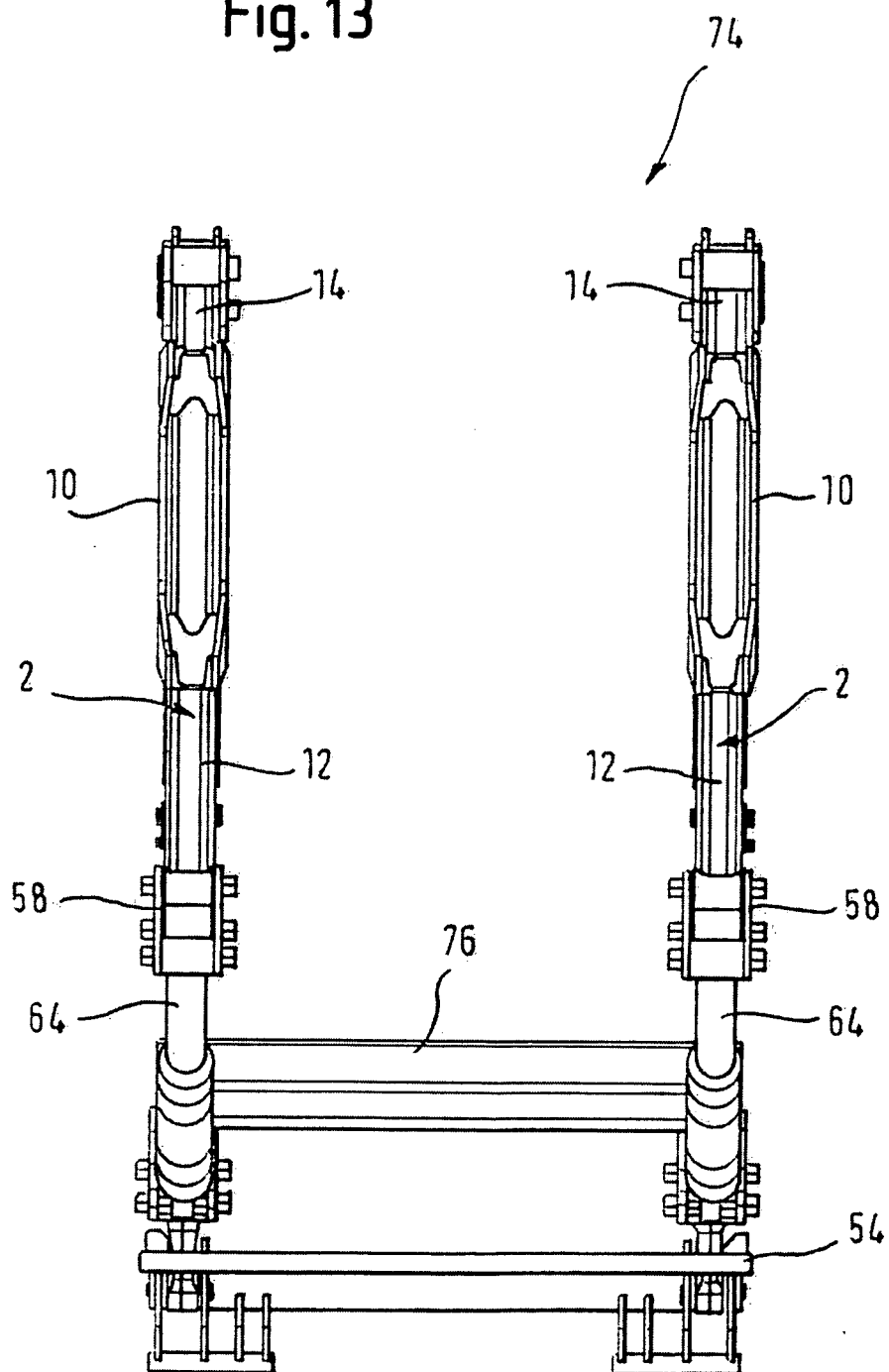
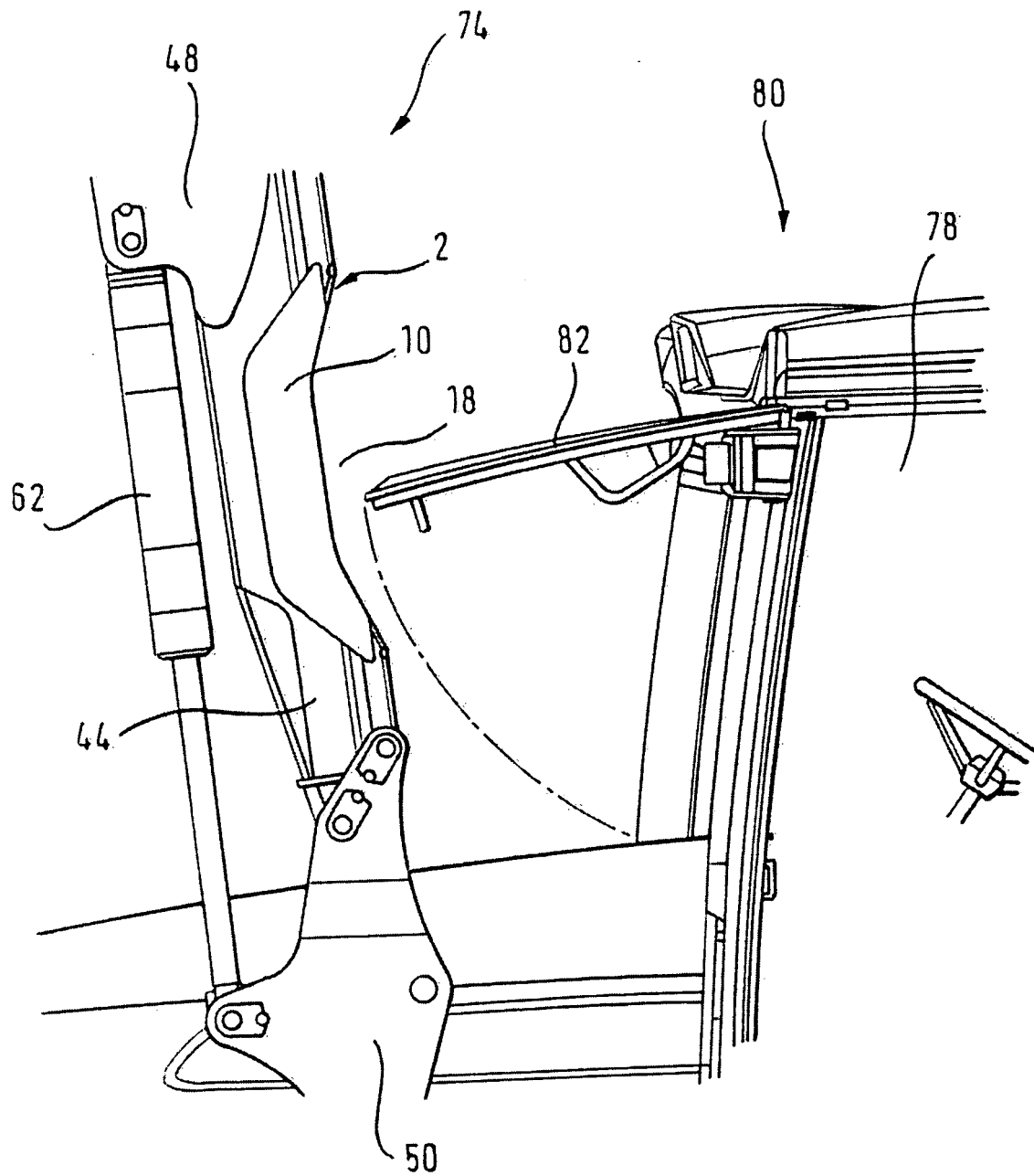


Fig. 14



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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