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(54) Benævnelse: **INTEGRERET JORDBEARBEJDNINGSINDRETNING TIL VENDEPLOVE**

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EP-B1- 0 857 407
DE-A1- 2 051 599
DE-A1- 4 408 715

Description

[0001] The invention relates to an integrated soil tillage unit for reverse ploughs according to the preamble of claim 1.

[0002] Integrated soil tillage unit for reverse ploughs are mounted and carried on reverse plough devices that work the ploughed soil of the reverse plough, and may remain on the reverse plough during the turning process on the headland and for transport on trails and roads. They do not need to be uncoupled before the turning process and attached again after the turning process during working and also do not need to be transported separately. Such integrated soil tillage units generally have means to avoid interfering with the integrated soil tillage units for the first pass or the first plough furrow at the field edge by being pivoted or swivelled. Typically, such an integrated soil tillage unit comprises tine-shaped or ring-shaped tools, which are arranged on their support to be pivoted forwards and backwards and laterally to the plough frame, while being adjustable in their longitudinal direction. European patent EP 428 087 B1 discloses an integrated soil tillage unit, which is equipped with knife-like tools, but that may also be equipped, for example, with profiled rods or disc wheels. The longitudinal part of the integrated soil tillage unit can be swivelled with its tools into different longitudinal positions via parallel supports that are designed to pivot forwards or rearwards. The integrated soil tillage unit may be clamped or bolted to an existing plough frame via length-adjustable supports with mounts. Depending on the design of the plough frame, the supports may be pushed into an appropriate position and then fixed on the plough frame. The longitudinal part of the integrated soil tillage unit is displaced in the longitudinal direction to enable adjustment of the tool position of the tools. A part of the longitudinal frame can be swivelled for the first furrow at the edge of the field so that it does not protrude and allows the soil to be worked right to the edge of the field. In fact, the soil in this area is repeatedly worked in succession by all the swivelled front work tools. The additional joint in the longitudinal frame weakens the longitudinal frames or involves additional construction costs. European Patent EP 857 407 B1 discloses a similar device wherein the longitudinal frame may also be pivoted or displaced parallel to the longitudinal direction. In contrast to EP 428 087 B1, knife-shaped tools that are rotatably arranged on a longitudinal shaft may also be used here. An embodiment of this patent discloses pulley wheels in the form of tools that may be pivoted horizontally via the parallel arranged support. For example, when the first groove of the

longitudinal frame is pivoted or pushed backwards, the lifting force of the reverse plough is increased. If the longitudinal frame is again pivoted forwards into a favourable centre of gravity position after the first pass at the edge of the field, then the soil is partially processed twice. This is generally undesirable.

[0003] The object of the invention is to provide an integrated soil tillage unit which may be easily swivelled and largely avoids double working of the soil, wherein the integrated soil tillage unit changes sides easily and without trouble during rotation of the reverse plough, and wherein the pressure load on the ring-shaped tools may be easily adjusted.

[0004] This problem is solved with the features of the characterizing part of claim 1.

[0005] The position of the rear tool remains practically unchanged, or only insignificantly changed, through this type of changeover with respect to the furrow edge of the last furrow. If, after the first pass at the edge of the field, the backwards tilted longitudinal frame is pivoted back into its forwards working position with a favourable centre of gravity position, it directly and precisely matches the edge of the first pass. Double working or multiple workings of the soil are thus very effectively prevented.

[0006] In a preferred embodiment, it is provided that the levers are designed as double levers with upper levers and lower levers which are arranged to lie approximately mutually parallel in the working position, and can be brought into a central extended position via an adjustment centre for the turning process and loaded with a downward compressive force for the ploughing work, wherein the compressive force is preferably adjustable. This design of the levers causes the integrated soil tillage unit to be guided vertically parallel upon vertical pivoting movements. In addition, the integrated soil tillage unit is brought into a symmetrical firmly-guided central position for the turning process which prevents uncontrolled swinging and oscillation of the longitudinal frame during the turning process. A compressive load may also be generated on the ring-shaped tools via the adjustment centre that comprises a double-acting hydraulic cylinder, thus ensuring good soil working and re-compacting of the soil.

[0007] Further details of the invention are disclosed in the figures and the figure descriptions:

Fig. 1 shows the integrated soil tillage unit mounted on a reverse plough in a working position with a favourable centre of gravity,

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Fig. 2 shows the integrated soil tillage unit in a working position with a favourable centre of gravity that is intended for the first plough furrow, and

Fig. 3 shows a double lever with the adjustment centre of the integrated soil tillage unit.

[0008] Fig. 1 shows a reverse plough 2, which can be connected with its headstock 30 via the pivot points 31, 32 and 33 with the three-point linkage of a tractor, not shown, and comprising a support wheel 36 in the rear region 35. The reverse plough 2 has a lever mechanism 34, with which, inter alia, the front furrow width as well as the traction point and the plough frame 5 may be changed, but which is not discussed in more detail in the remainder of this description of the figures. The reverse plough 2 further comprises the plough frame 5, on which the plough body 37 is directly mounted via the swivel bracket 40 and that can be adjusted in its working width about the pivot axis 39. The adjustment of the working width of the plough body 37 and thus of the entire reverse plough 2 takes place via the hydraulic cylinder 38. The pivot brackets 40 of the individual plough bodies 37 are interconnected via a control rod 41. Pivot bearings 44 are arranged on both the swivel brackets 40 of the first plough body 45 and on the swivel brackets 40 of the rear plough body 46. The pivot bearings 44 here each have a link 4 which is horizontally pivotable. The control levers 4 have ball joints 23 or universal joints 24 at the ends, via which they are connected to the longitudinal frame 3 of the integrated soil tillage unit 1 via the stay bolts 65. Ring-shaped tools 6 are arranged on the longitudinal frame 3 to limit pivoting about the vertical hinge axes 16. At a distance from the vertical joint axes 16, the arms 47 comprise pivot points 15, which are connected with one another in groups via connecting levers 14. The ring-shaped tools 6 are formed as pairs of rings 13, whose horizontal axes 17 and 18 are offset to one another in the working direction 7. The offset arrangement of the ring-shaped tools 6 prevents clogging of the ring-shaped tools 6, in particular in the case of sticky soil conditions. The connecting rods 14 ensure that the ring pairs are 13 guided smoothly. As can be seen in the working direction 7, the bracket 21, on which the hydraulic cylinder engages 20, is located at the front of the plough frame 5. The hydraulic cylinder 20 also engages with a lever 22, which is braced against the control lever 4 and is pivotally connected to the longitudinal frame 3 via the tie member 19. The longitudinal frame 3 with the ring-shaped tools 6 can be pivoted into the working position according to Fig. 1 via the hydraulic cylinder 20, or into the position for the first ploughing at the field edge according to Fig. 2. In this case, only the front part 29 of the longitudinal frame of the reverse plough 2 is pivoted for the first plough furrow, while the

distance 9 of the rear ring-shaped tools 8 from the furrow edges 10 of the rear plough furrow 11 remains approximately the same. The control levers 4 are formed as a double levers 12, which allow parallel pivoting of the integrated soil tillage unit in the vertical direction during working, which, however, may also be brought into a fixed central position or extended position via the adjustment centre 42 for the turning process, and may even be adjusted differently during ploughing for the re-compacting of the soil. This can be seen, in particular, by the description of Fig. 3. The pivotability of the longitudinal frame 3 in both the vertical and horizontal directions is enabled by the ball joints 23 or universal joints 24 of the control lever 4 or double lever 12, which are connected with the stay bolts 65 of the longitudinal frame 3.

[0009] The working position of the integrated soil tillage unit 1 is shown in Fig. 2 for the first plough furrow at the edge of the field. In this case, the front section 29 has been pivoted to the rear of the longitudinal frame 3 and towards the plough frame. The distance 9 from the rear ring-shaped tool 8 to the furrow edge 10 of the rear plough furrow 11 has not, or has only slightly, changed. The control lever 4 or the double lever 12 are arranged to converge so that these two working positions for the first plough furrow and for the remaining plough furrows may be adjusted in an advantageous manner.

[0010] Fig. 3 shows the control lever 4 or the double lever 12, consisting of the pivot support 51 as well as of the upper control lever 53 and the lower control lever 54, which are connected by the joints 55 with the pivot support 51, in this case on the left side, while the pivot support 51 comprises a horizontal pivot bearing 44 at its opposite end, in this case, the right end. The pivot support 51 with an upper control lever 53 and a lower control lever 54 practically forms the control lever 4 and the double lever 12. This control lever 4 or double lever 12 is connected to the plough frame 5 and the pivot brackets 40 of the reverse plough 2 in order to be horizontally pivotable in the working position via the pivot bearing 44. The upper lever 53 and the lower lever 54 and hence the longitudinal frame 3 are vertically pivotally connected to the pivot support 51 via the joints 55. The upper lever 53 and the lower lever 54 are connected with the stay bolts 65 of the longitudinal frame 3 via ball joints 23. The double-acting hydraulic cylinder 50 is connected to the pivot support 51 via the hinge axis 48. The integrated soil tillage unit 1 is brought into a straight position for the turning process or loaded with pressure during the ploughing by means of the cylinder fork with stop bush 59 and the pulling lever 57. If the double-acting hydraulic cylinder 50 is extended, it brings the upper lever 53 and the lower lever 54 in

parallel with the bottom extended position. The double-acting hydraulic cylinder 50 then travels until it abuts the pressure stop 56 of the second stop plate 49 and the first stop plate 52. The integrated soil tillage unit 1 is now firmly fixed and can not swing back and forth in an uncontrolled manner during the turning process. After the turning process of the plough frame 5, the double-acting hydraulic cylinder 50 is retracted, wherein the longitudinal frame 3 or the ring-shaped tools 6, 8 are lowered again. The upper lever 53 is moved downwards via the tie member 57 and the first stop plate 52 as a function of the adjusted force of the double-acting hydraulic cylinder 50. The upper lever 53 presses the longitudinal frame 3 with the ring-shaped tools 6, 8 towards the soil, which is crumbled and then re-compacted. After the turning process, the tie member 57, the upper lever 53 and the lower lever 54 lie in an opposite working position. The lower lever 54 is then in the position of the upper lever 53 and vice versa. When the double-acting hydraulic cylinder 50 is subjected to tension, it alternately pulls the pulling lever 57 against the extension stop 64 of the first stop plate 52, or against the cable stop 64 of the second stop plate 49.

Patentkrav

1. Integreret jordbearbejdningsindretning (1) til vendeplove (2), som er indrettet med længderammen (3) vandret svingbar via et styr (4) på siden af plovrammen (5), hvor der på længderammen (3) er anbragt ringformede værktøjer (6), som bearbejder den allerede pløjede jord,

kendetegnet ved,

at der er forudset mindst to styr (4), som er udformet med begrænset vandret og lodret svingbarhed, og som i vendeplovens (2) arbejdsstilling set ovenfra er anbragt konvergerende mod hinanden på en sådan måde, at den integrerede jordbearbejdningsindretning (1), med udgangspunkt i en første arbejdsstilling, fortil kan svinges bagud til en anden arbejdsstilling mod arbejdsretningen (7) i retning af plovrammen (5) på en sådan måde, at bearbejdning af jorden tæt ved grænsen muliggøres, og at den integrerede jordbearbejdningsindretning (1) bagtil kan svinges således, at den integrerede jordbearbejdningsindretnings (1) bageste ringformede værktøj (6, 8) i størst muligt omfang bevarer den sideværts afstand (9) til den bageste plovfures (11) furekant (10).

2. Integreret jordbearbejdningsindretning ifølge krav 1,

kendetegnet ved,

at styrene (4) er udformet som dobbeltstyr (12) med et øverste styr (53) og et nederste styr (54), som i arbejdsstilling befinder sig tilnærmelsesvist parallelt over hinanden og via et indstillingscentrum (42) kan bringes i en central udstrakt position med henblik på drejeprocessen og kan belastes med en nedadrettet trykkraft med henblik på pløjearbejdet, hvor trykkraften fortrinsvis er regulerbar.

3. Integreret jordbearbejdningsindretning ifølge krav 1,

kendetegnet ved,

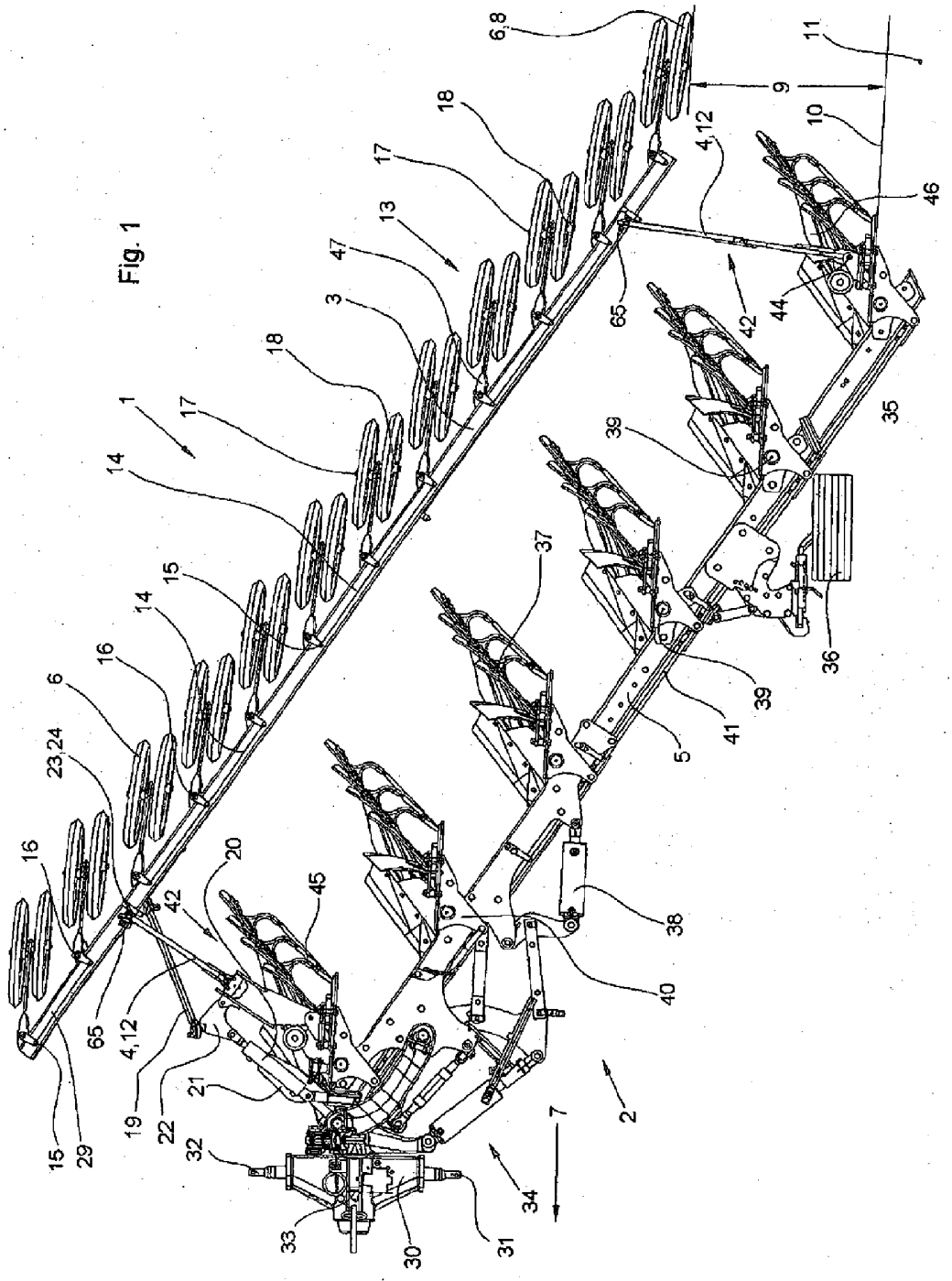
at det øverste styr (53) og det nederste styr (54) på leddelt vis er forbundet med en svingstøtte (51), som selv er forsynet med et vandret svingleje (44) i sin modsatte

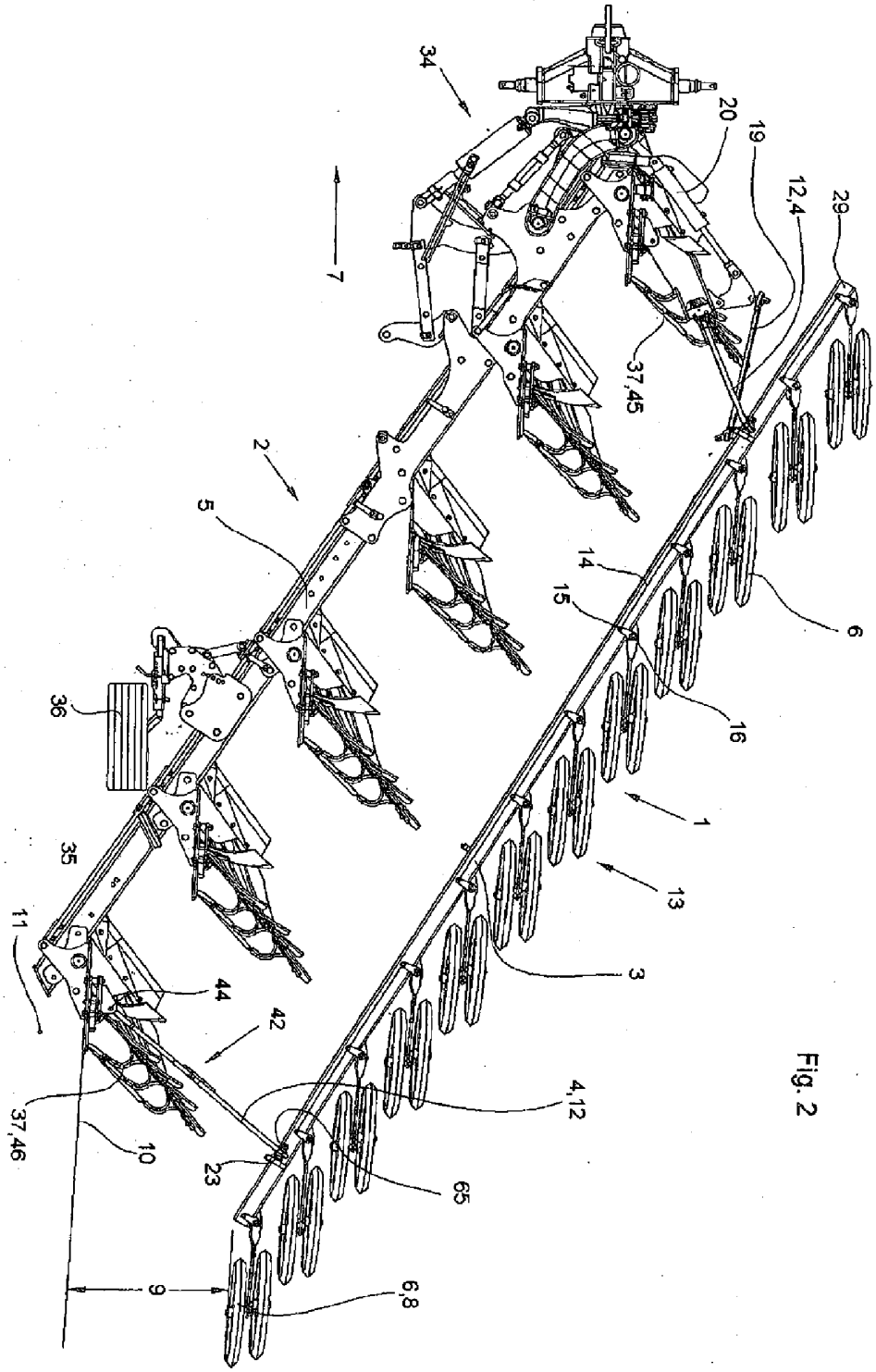
ende.

4. Integreret jordbearbejdningsindretning ifølge krav 1,
kendetegnet ved,
at det øverste styr (53) og det nederste styr (54) er forbundet med længderammens (3) støttebolt (65) via kugleled (23).

Drawings

Fig. 1

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65
9
6,8

Fig. 2

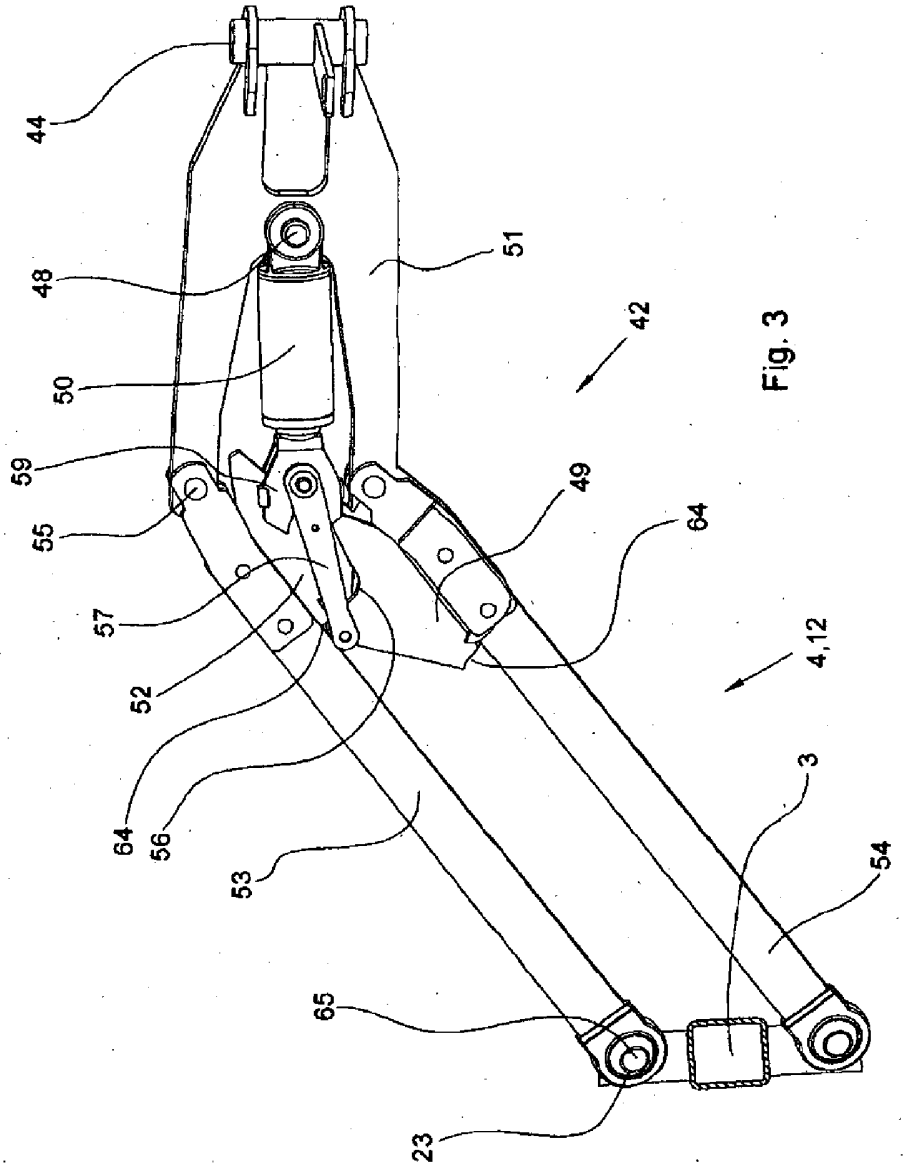

Fig. 3