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(54) **Front loader boom**

Frontladerausleger

Flèche de chargeur frontal

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Description

[0001] The invention relates to a set of front loaders for vehicles, and comprising front loaders consisting of two laterally spaced apart loader arms with differing chordal measurements which

- can be coupled with a carrier vehicle and pivoted vertically about a first articulated joint,
- are made up of a vehicle end arm element and a tool end arm element inclined with respect thereto, and
- support, at the tool end, a work implement, such as a loading shovel, which is guided substantially parallel by means of a parallel guide-linkage when the loader arm is pivoted, the parallel guide linkage have a rear and front reversing lever, these being joined to one another by means of a tipping cylinder and the rear reversing lever being mounted in a second articulated joint arranged in the end region of the vehicle-end arm element remote from the vehicle, and the front reversing lever being mounted in a third articulated joint at the tool end of the tool-end arm element

[0002] A front loader set may comprise several front loaders of differing chordal measurements, which will depend on the size of the carrier vehicle or the intended use. In this description chordal measurement refers to the shortest distance between the joint by which a loader arm is supported on the carrier vehicle, and a joint at the free end region of the loader arm about which a support frame receiving the tool can be pivoted.

[0003] The front loaders of sets known to date consist of loader arms with arm elements of different lengths at the vehicle end and tool end which in addition subtend differing angles. In front loaders which have a parallel guide-linkage for the tool, however, this approach brings with it a disadvantage, since modifications have to be made to the linkage in order to obtain the smallest possible deviations from the parallel motion. This means that each loader in the set requires a plurality of different reversing levers, which makes rationalised manufacture of the front loader more difficult.

[0004] US 5,533,856 describes a front-end loader having a parallelogram linkage, and a hydraulic tilt assembly which serves to maintain the attitude of a loader tool mounted on the front-end loader throughout a lift range.

[0005] The objective of the invention is to provide a set of front-loaders of the type outlined above, the front-loaders of which, and in particular the parallel guide-linkages, are made up of as many common parts as possible.

[0006] The invention provides a set of front-end loaders for carrier vehicles as specified in Claim 1.

[0007] The front-loaders of a set of the invention differ only in terms of the arm element at the tool end and the

tipping cylinders, the length of which will depend on the desired chordal measurement of the respective front-loader. The reversing levers are the same in all front-loaders of the set.

[0008] In order to be able to manufacture front-loaders of this type on an even more rationalised basis, the invention offers another feature whereby the arm element at the tool end consists of an end-piece, which is of the same form for all front-loaders of a set or range, co-operating with the tool frame receiving the tool, and an intermediate piece adjusted to the desired chordal measurement. Consequently, the end region of the loader arms, which is of complex construction, with the articulated joints for the reversing lever and the tool frame, can be designed to fit all front-loaders, whereas only the intermediate pieces will be of differing lengths, these intermediate pieces being relatively simple in construction.

[0009] The invention will be described in more detail below to a preferred embodiment shown in the accompanying drawings, in which:-

Figure 1 is a first front-loader of a first range with a small chordal measurement;

25 Figure 2 is a second front-loader from the same range with a large chordal measurement, and

Figure 3 is a front-loader from another range.

30 **[0010]** In the alternative, as explained below, it may be possible to achieve the object by having arm elements of different length at the vehicle end whilst keeping the length of the tool end arm element constant, and keeping the same angle at the first, second and third joints for each loader arm of the range.

35 **[0011]** The front loader illustrated in Figure 1 consists of two loader arms 1 arranged spaced laterally at a distance apart from one another. Each loader arm is made up of an arm element 2 at the tool end and an arm element 3 inclined relative thereto at the vehicle-end, and is welded in the region between two link plates 4 between which the spars 2, 3 are received.

40 **[0012]** In the region of the tool-end element 2, the two loader arms 1 are joined by means of two tubular members 5, 6 to give a stable unit. Located at the free ends of the element 3 at the vehicle end is a first articulated joint 7 with a horizontal axis, by means of which the loader arm 1 is hinged-mounted on a front loader frame, not illustrated, which is mounted on a carrier vehicle so that the front loader can be pivoted in a vertical plane with the aid of hydraulic positioning cylinders.

45 **[0013]** Located at the other end region of the loader arm 1 is an articulated joint 8 for pivotally mounting a tool frame 9, which will receive the work tool 10 to be used. The distance of this joint 8 from the first joint 7 is defined as chordal measurement S1 of the front loader arm, which is relatively small in this particular embodiment of the invention.

[0014] So that the work tool 10 received in the tool frame 9 remains in its position relative to the surroundings whilst the front loader is being pivoted, as required when conveying loose material in a loader-shovel for example, the front loader is fitted with a parallel guide linkage. This has two reversing levers 11, 12 and of these the dual-arm reversing lever 11 is mounted in a second articulated joint 13 at the link-plate end terminal region of the element 3 at the vehicle end. The reversing lever 12 is mounted in a third articulated joint 14 arranged off-centre in the peripheral region of the element 2 at the tool end. The parallel guide-linkage is completed by a push rod 15 pivotally mounted between the one arm of the reversing lever 11 and the front loader frame (not illustrated) and a tipping ram 16 pivotally mounted between the reversing levers 11, 12. The cylinder 16 pivots the tool frame 9 with the fitted work tool 10 about the joint 8 along with a pivotally mounted push rod 17 arranged between the reversing lever 12 and the tool frame 9. The tipping ram 16 is illustrated schematically by its longitudinal axis only.

[0015] The joints 13, 14 of the reversing levers 11, 12 and the effective dimensions thereof are specified in such a way that when the work tool 10 is tipped, is illustrated in Figure 1, the relative position of the work tool 10 in relation to its surroundings remains substantially constant (to within slight but negligible variances) as the front loader is pivoted about the horizontal axis.

[0016] Like the system described above, the front loader illustrated in Figure 2 is one of a range which differs by their respective chordal measurement. In contrast to that of Figure 1, the front loader illustrated in Figure 2 has a considerably larger chordal measurement S2 and is therefore capable of servicing a significantly broader work range. To accommodate the larger chordal measurement S2, the loader arms 18 of this front loader have elements 19 at the tool end which are longer than those described above and a tipping ram 16 of matching length. All other components are the same as those described with reference to the first front loader described above. This advantage is achieved by an arrangement in which the third joint 20 for the reversing lever 21 subtends with the first joint 22 at the front loader frame end and the second joint 23 for the reversing lever 24 an angle that is the same for all front loaders of a range.

[0017] Figure 3 depicts a front loader which belongs to a different range in which intermediate members are used to adapt to the differing element lengths S3 of the loader arms 25. The element 26 at the tool end includes a member 27, which is the same length for all arms in the range, and which, in the same way as the tool-end element 2 of the front loader illustrated in Figures 1 and 2, is permanently connected to the vehicle-end element 3. In the case of a loader arm 25 with the smallest possible chordal measurement S3, an end-piece 28 at the free end of the member 27 provides a link with the tool frame 9 receiving the tool 10 and is the same size for all tool-end members in this range. At the free ends, the

member 27 is provided with a flange 27a and the end piece 28 is provided with a flange 28a, which enable the two components 27, 28 to be detachably connected to one another. In the case of loader arms 25 having a larger chordal measurement S3, an intermediate member 30 with flanges 30a, 30b at its ends is arranged between the member 27 and the end-piece 28, the length thereof being adjusted to the desired chordal measurement S3.

[0018] Other arrangements are possible within the scope of the claims appended hereto. For example, it is also possible to increase the length of the vehicle end arm-element whilst keeping constant the length of the tool end arm element of the range. This may however be disadvantageous because a long vehicle end arm element is more nearly horizontal when the work implement is on the ground, and accordingly substantial end loads can be transmitted to the region of the vehicle front axle when a load is lifted by the implement. In contrast a short vehicle end arm element is more vertical, and thus the horizontal component of lifting force transmitted to the front axle is reduced. If however, the loading of the front axle is not a critical factor, variation of the length of the vehicle end arm element may be possible in order to vary the chord length of front loaders of a range.

Claims

1. A set of front-end loaders for carrier vehicles, each front-end loader of the set having a different chordal measurement (S1, S2, S3) and wherein each of front-end loader of the set comprises two laterally spaced apart loader arms (1, 18) and is couplable to a carrier vehicle via a first pivotal connection (7), each arm comprising an arm element (3), at the vehicle end, and an arm element (2) inclined with respect thereto at the tool end, the arms being adapted to support at the tool end, a work tool (10), which is guided by means of a parallelogram guide-linkage (11, 12, 15, 16, 17), the parallelogram guide-linkage comprising front (9, 12) and rear (11) reversing levers, joined to one another by means of a tipping ram (16), the rear reversing lever (11) being mounted via a second pivotal connection (13) at the junction of the arm elements (2, 3), and the front reversing lever (12) being mounted via a third pivotal connection (14) at the tool-end of the arms, wherein each front-end loader of the set has either a common vehicle-end arm element (3) or tool end arm element (2, 19, 26), and the chordal measurement (S2) of each loader of the set is set by means of a tool-end arm element respective or vehicle-end arm element of suitable length, and
the angle (α) subtended by the first connection (7), the second connection (13) and the third connection (14) is substantially the same regardless of the length of the common element (2, 19, 26).

2. A set of front-end loaders according to Claim 1, wherein the common element is the vehicle-end arm element (3).
3. A set of front-end loaders according to Claim 1, wherein the common element is the tool-end arm element (2, 19, 26).
4. A set of front-end loaders as claimed in any preceding claims, wherein the tool-end arm element is connected to the vehicle end arm element in a relative position such that the linkage line between the pivot connections (13, 14, 23, 20) of the front and rear reversing levers (11, 12) to the loader arm runs essentially parallel with the longitudinal axis of a tipping ram (16) when the work tool (10) is located in the position in which it is required to exhibit the smallest parallel guide error.
5. A set of front-end loaders as claimed in any preceding claims, wherein a tool-end arm element (26) consists of a member (27), which is of the same construction for all loader arms (25) of any one set, connected to a vehicle-end element (3) and an end piece (28), which is of the same construction for all loader arms of any one set, co-operating with the tool frame (9) receiving the work tool (10), which together form a loader arm (25) with the smallest possible chordal measurement, whereby in order to obtain a loader arm (25) with a larger chordal measurement (S3) an intermediate member (30) adapted in terms of length to suit the desired larger chordal measurement (S3) can be arranged between the spar member (27) and the end-piece (28).
6. A set of front-end loaders as claimed in Claim 5, wherein the components (27, 28, 30) of the tool-end element (26) are detachably joined to one another.
7. A set of front-end loaders as claimed in Claim 6, wherein the components (27, 28, 30) of the tool-end arm element (26) are detachably joined to one another by means of flanges (27a, 28a, 30a, 30b).

Patentansprüche

1. Ein Satz Frontladeausleger für Fahrzeuge, wobei jeder Frontladeausleger des Satzes einen unterschiedlichen Sehnenabstand (S1, S2, S3) aufweist, zwei seitlich beabstandet angeordnete Laderarme (1, 18) besitzt und mit einem Fahrzeug über eine erste Schwenkverbindung (7) kuppelbar ist, jeder Arm ein fahrzeugseitiges Armelement (3) und ein dazu geneigt angeordnetes geräteseitiges Armelement (2) aufweist, die Arme am geräteseitigen Ende ein Arbeitsgerät (10) aufnehmen können, das über Mittel einer parallelogrammartigen Führungs-

verbindung (11, 12, 15, 16, 17) geführt ist, die vordere (9, 12) und hintere Schwenkhebel (11) aufweist, die über eine Kippstange (16) gelenkig miteinander verbunden sind, wobei der hintere Schwenkhebel (11) an einer zweiten Schwenkverbindung (13) an der Verbindungsstelle der Armelemente (2, 3) angeordnet ist und der vordere Schwenkhebel (12) an einer dritten Schwenkverbindung (14) an dem geräteseitigen Ende der Arme angeordnet ist, **dadurch gekennzeichnet, dass** jeder Frontladeausleger des Satzes entweder ein gemeinsames fahrzeugseitiges Armelement (3) oder ein geräteseitiges Armelement (2, 19, 26) aufweist, dass der Sehnenabstand (S2) jedes Auslegers des Satzes durch ein geräteseitiges bzw. fahrzeugseitiges Armelement geeigneter Länge bestimmt ist, und dass der der ersten Schwenkverbindung (7) gegenüberliegende Winkel (α), die zweite Schwenkverbindung (13) und die dritte Schwenkverbindung (14) im wesentlichen übereinstimmen, unabhängig von der Länge des gemeinsamen Elementes (2, 19, 26).

2. Ein Satz Frontladeausleger nach Anspruch 1, **dadurch gekennzeichnet, dass** das gemeinsame Element das fahrzeugseitige Armelement (3) ist.
3. Ein Satz Frontladeausleger nach Anspruch 1, **dadurch gekennzeichnet, dass** das gemeinsame Element das geräteseitige Armelement (2, 19, 26) ist.
4. Ein Satz Frontladeausleger nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** das geräteseitige Armelement mit dem fahrzeugseitigen Armelement in einer solchen Relativlage verbunden ist, dass die Verbindungslinie zwischen den Schwenkverbindungen (13, 14, 23, 20) der vorderen und hinteren Schwenkhebel (11, 12) zu dem Ladearm im wesentlichen parallel zu der Längsachse einer Kippstange (16) verläuft, wenn das Arbeitsgerät (10) in einer Stellung angeordnet ist, in der kleinste Parallelführungsfehler vorliegt.

5. Ein Satz Frontladeausleger nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** ein geräteseitiges Armelement (26) einen Teil (27) aufweist, der für alle Laderarme (25) eines Satzes von gleicher Konstruktion ist, mit einem fahrzeugseitigen Element (3) und einem Endstück (28) verbunden ist, das für alle Laderarme eines Satzes von gleicher Konstruktion ist, mit dem Geräterahmen (9) zur Aufnahme des Arbeitsgerätes (10) zusammenarbeitet, die zusammen einen Laderarm (25) mit kleinstmöglichem Sehnenabstand bilden, wobei zur Schaffung eines Laderarms (25) mit größerem Sehnenabstand (S3) ein längenmäßig an den gewünschten vergrößerten Sehnenabstand

(S3) angepasstes Zwischenelement (30) zwischen dem Teil (27) und dem Endstück (28) angeordnet werden kann.

6. Ein Satz Frontladeausleger nach Anspruch 5, **dadurch gekennzeichnet, dass** die Komponenten (27, 28, 30) des geräteseitigen Elementes (26) lösbar miteinander verbunden sind.
7. Ein Satz Frontladeausleger nach Anspruch 6, **dadurch gekennzeichnet, dass** die Komponenten (27, 28, 30) des geräteseitigen Elementes (26) durch Flansche (27a, 28a, 30a, 30b) lösbar miteinander verbunden sind.

Revendications

1. Gamme de chargeurs frontaux pour véhicules porteurs, chaque chargeur frontal de la gamme ayant une dimension de corde différente (S1, S2, S3) et dans lequel chaque chargeur frontal de la gamme comprend deux bras de chargeur latéralement espacés l'un de l'autre (1, 18) et peut être accouplé à un véhicule porteur via une première connexion pivotante (7), chaque bras comprenant un élément de bras (3) à l'extrémité côté véhicule et un élément de bras (2) incliné par rapport au précédent, à l'extrémité côté outil, les bras étant prévus pour supporter, du côté outil, un outil de travail (10) qui est guidé au moyen d'une liaison de guidage à parallélogramme (11, 12, 15, 16, 17), la liaison de guidage à parallélogramme comprenant des leviers d'inversion avant (9, 12) et arrière (11) reliés les uns aux autres par un vérin de basculement (16), le levier d'inversion arrière (11) étant monté via une deuxième connexion pivotante (13) à la jonction des éléments de bras (2, 3), et le levier d'inversion avant (12) étant monté via une troisième connexion pivotante (14) à l'extrémité côté outil des bras, dans lequel chaque chargeur frontal de la gamme comprend soit un élément de bras côté véhicule commun (3) ou un élément de bras côté outil commun (2, 19, 26), et la dimension de corde (S2) de chaque chargeur de la gamme est fixée au moyen d'un élément de bras côté outil respectif ou d'un élément de bras côté véhicule de longueur appropriée, et l'angle (α) sous-tendu par la première connexion (7), la deuxième connexion (13) et la troisième connexion (14) est sensiblement constant indépendamment de la longueur de l'élément commun (2, 19, 26).
2. Gamme de chargeurs frontaux selon la revendication 1, dans lequel l'élément commun est l'élément de bras côté véhicule (3).
3. Gamme de chargeurs frontaux selon la revendica-

tion 1, dans lequel l'élément commun est l'élément de bras côté outil (2, 19, 26).

4. Gamme de chargeurs frontaux selon une quelconque des revendications précédentes, dans lequel l'élément de bras côté outil est relié à l'élément de bras côté véhicule dans une position relative telle que la ligne de liaison entre des connexions pivotantes (13, 14, 23, 20) des leviers d'inversion avant et arrière (11, 12) au bras de chargeur s'étend sensiblement parallèlement à l'axe longitudinal d'un vérin de basculement (16) lorsque l'outil (10) se trouve à la position à laquelle il doit présenter l'erreur de guidage parallèle la plus petite.
5. Gamme de chargeurs frontaux selon une quelconque des revendications précédentes, dans lequel un élément de bras côté outil (26) comprend une pièce (27), qui est de la même construction pour tous les bras de chargeur (25) d'une gamme quelconque, reliée à un élément côté véhicule (3) et à une pièce d'extrémité (28) qui est de la même construction pour tous les bras de chargeur d'une gamme quelconque et coopère avec le support d'outil (9) qui reçoit l'outil de travail (10), pour constituer ensemble un bras de chargeur (25) ayant la dimension de corde la plus petite possible, de sorte que, pour obtenir un bras de chargeur (25) de plus grande dimension de corde (S3), un élément intermédiaire (30) prévu en termes de longueur pour correspondre à la plus grande dimension de corde désirée (S3) peut être disposé entre la pièce (27) et la pièce d'extrémité (28).
6. Gamme de chargeurs frontaux selon la revendication 5, dans lequel les composants (27, 28, 30) de l'élément côté outil (26) sont reliés les uns aux autres de façon séparable.
7. Gamme de chargeurs frontaux selon la revendication 6, dans lequel les composants (27, 28, 30) de l'élément de bras côté outil (26) sont reliés les uns aux autres de façon séparable au moyen de brides (27a, 28a, 30a, 30b).

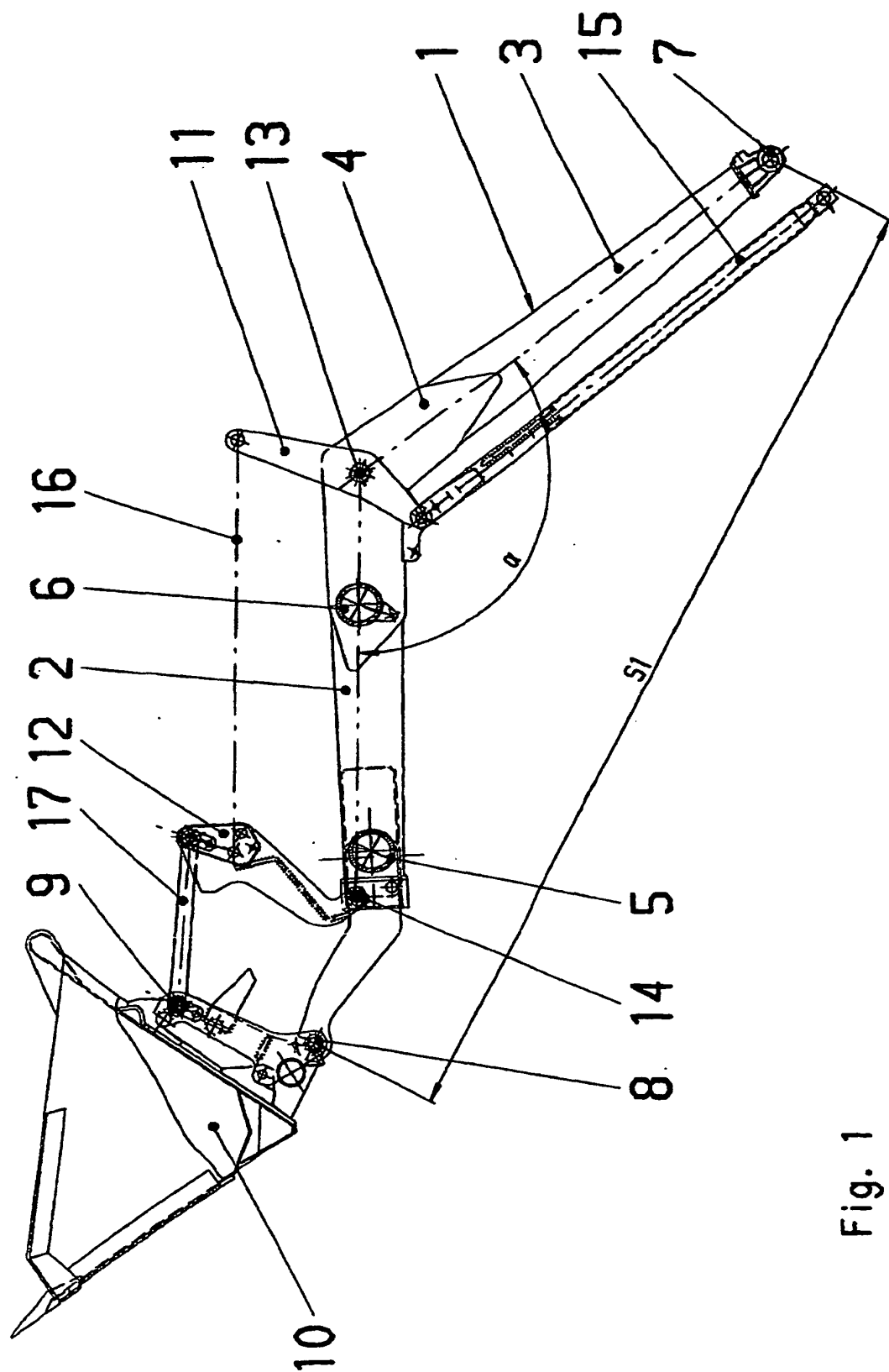


Fig. 1

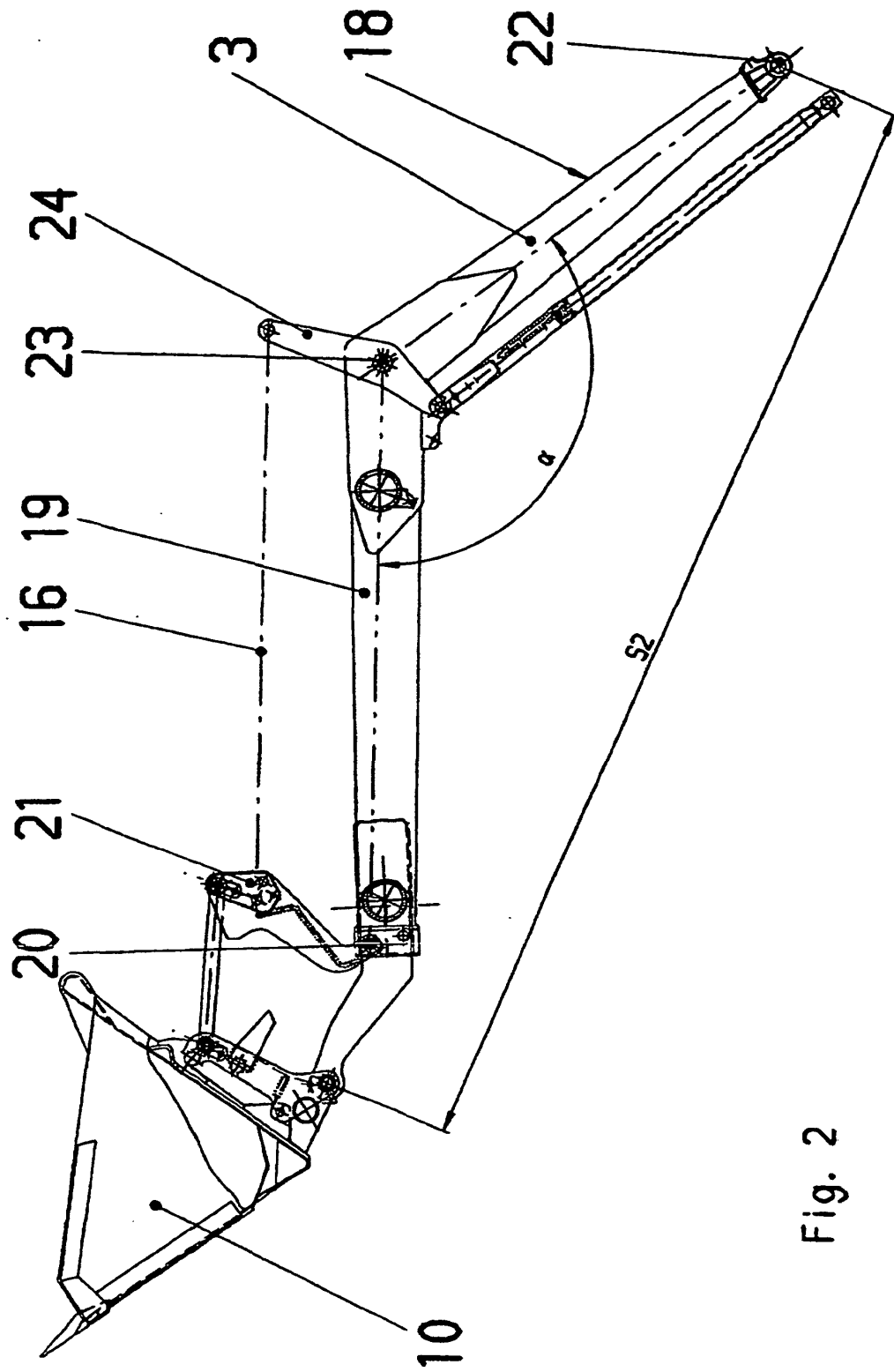


Fig. 2

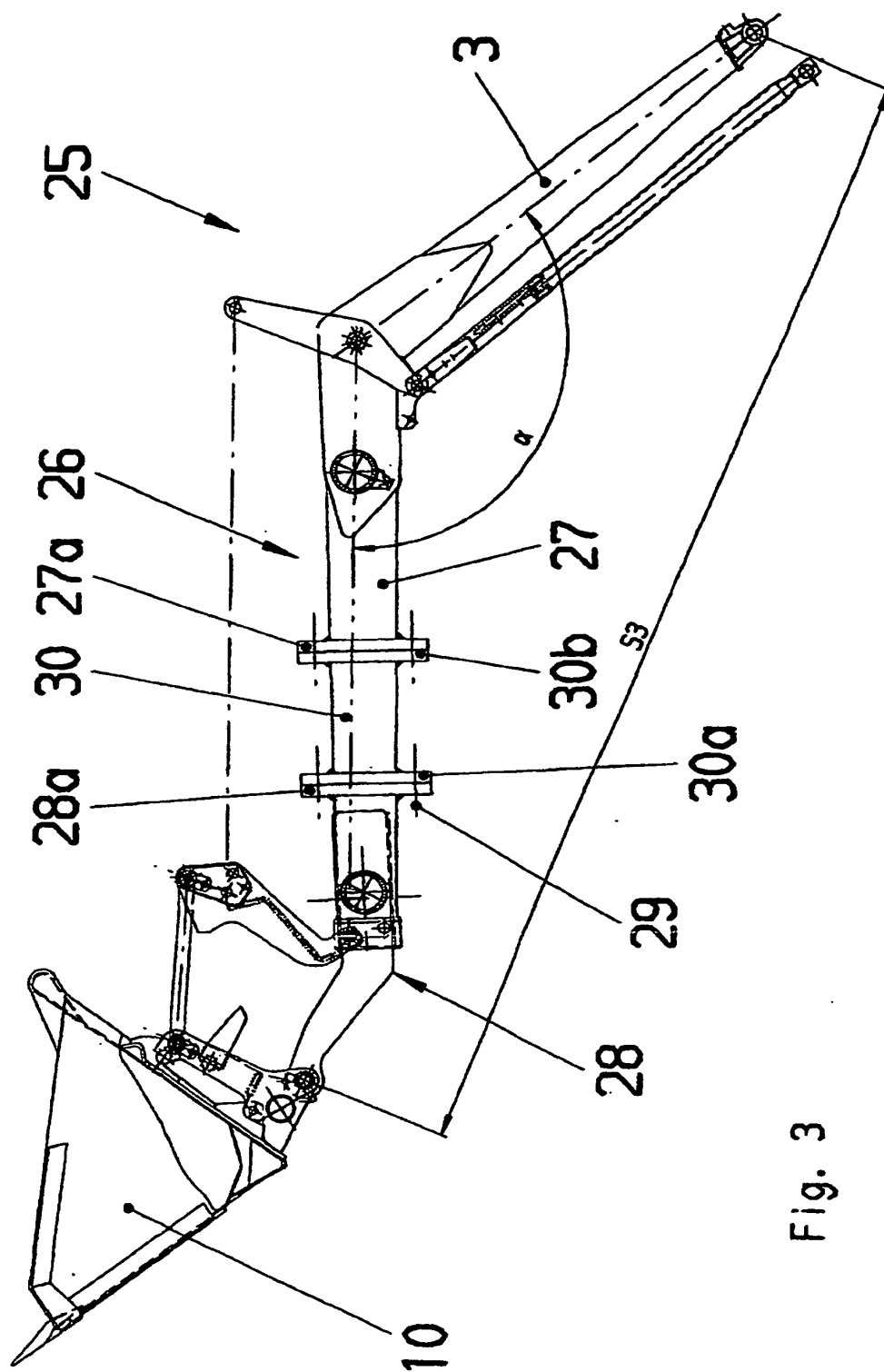


Fig. 3