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(11) **EP 0 982 439 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
01.03.2000 Bulletin 2000/09

(51) Int. Cl.⁷: **E02F 3/34**

(21) Application number: **99115855.1**

(22) Date of filing: **12.08.1999**

(84) Designated Contracting States:
**AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
MC NL PT SE**
Designated Extension States:
AL LT LV MK RO SI

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(30) Priority: **25.08.1998 GB 9818515**

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(54) **Front loader boom**

(57) A front loader consists of two loader arms (1, 18) laterally spaced apart, and which can be hinge-mounted on a carrier vehicle about a horizontal axis. Each arm comprises first and second arm elements (2, 3) and a parallel guide linkage (11-17) to control movement of a work tool (10) when the loader arm is pivoted.

In order to accommodate different chordal measurements (S1, S2) whilst retaining the largest possible number of common parts, it is proposed that the loader

arms (1, 18) of a range have a common vehicle-end element (3) and the differing chordal measurement (S1, S2) is set by means of elements (2, 19) of differing lengths at the tool-end, the angle subtended by the first joint (7, 22), the second joint (13, 23) and the third joint (14, 20) being of the same size for all loader arms (1, 18) in the range.

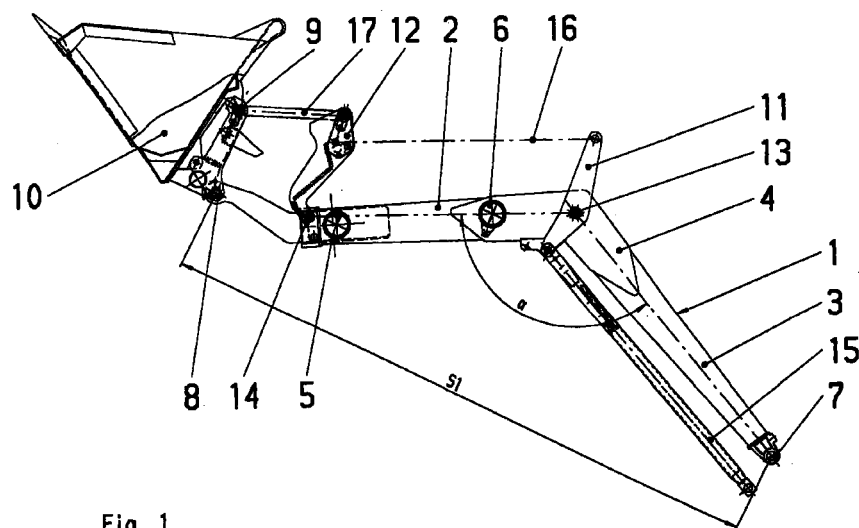


Fig. 1

EP 0 982 439 A1

Description

[0001] The invention relates to a front loader range 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 range 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 ranges 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 range requires a plurality of different reversing levers, which makes rationalised manufacture of the front loader more difficult.

[0004] The objective of the invention is to provide a range 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.

[0005] This objective is achieved by providing the loader arms of a range with a common arm element at the vehicle end and by arranging for the different chordal measurement to be set by arm elements of differing lengths at the tool end, the angle subtended at the first, second and third joints being the same in all loader arms of any one range.

[0006] By applying this approach, the front loaders of

a range 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 range.

[0007] 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 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.

[0008] 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;

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.

[0009] 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.

[0010] 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.

[0011] 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.

[0012] 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 embodi-

ment of the invention.

[0013] 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.

[0014] 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.

[0015] 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.

[0016] 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.

[0017] 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 front loader series for a vehicle, comprising two loader arms laterally spaced apart and adapted to differing chordal measurements, the loader being arranged for coupling to
 - a carrier vehicle via a first pivotal connection, each arm comprising an arm element at the vehicle end, and an arm element inclined with respect thereto at the tool end, the arms being adapted to support a working tool at the tool end, said working tool being guided by means of a parallel guide-linkage, the parallel guide-linkage comprising front and rear reversing levers joined to one another by means of a tipping ram, the rear reversing lever being mounted via a second pivotal connection at the junction of the arm elements, and the front reversing lever being mounted via a third pivotal connection at tool-end of the arms, wherein the loader arms have a common vehicle-end arm element, and the chordal measurement is set by means of tool-end arm element of suitable length, the angle subtended by the first, second, and the third connections being substantially the same regardless of the length of the tool-end arm element.

2. A front loader series as claimed in Claim 1, wherein the tool-end arm element is connected to the vehicle end arm element in a relative position such that the linkage line of the joints (7, 22; 13, 23; 14, 20) runs essentially parallel with the longitudinal axis of the tipping cylinder (16) when the work tool (10) is located in the position in which it is required to exhibit the smallest parallel guide error 5
3. A front loader series as claimed in Claims 1 and 2 10 characterised in that the tool-end arm element (26) consists of a member (27), which is of the same construction for all loader arms (25) of any one series, connected to the vehicle-end arm element (3) and an end piece (28), which is of the same construction for all loader arms of any one series, co- 15 operating with the tool frame (9) receiving the work tool (10), which together form a loader arm (25) with the smallest possible chordal measurement (S3), whereby in order to obtain a loader arm (25) 20 with a larger chordal measurement (S3) an intermediate member (30) adapted in terms of length to suit the desired chordal measurement (S3) can be arranged between the spar member (27) and the end-piece (28). 25
4. A front loader series as claimed in Claim 3, characterised in that the components (27, 28, 30) of the tool-end element (26) are detachably joined to one another. 30
5. A front loader series as claimed in Claim 4, characterised in that the components (27, 28, 30) of the tool-end element (26) are detachably joined to one another by means of flanges (27a, 28a, 30a, 30b). 35

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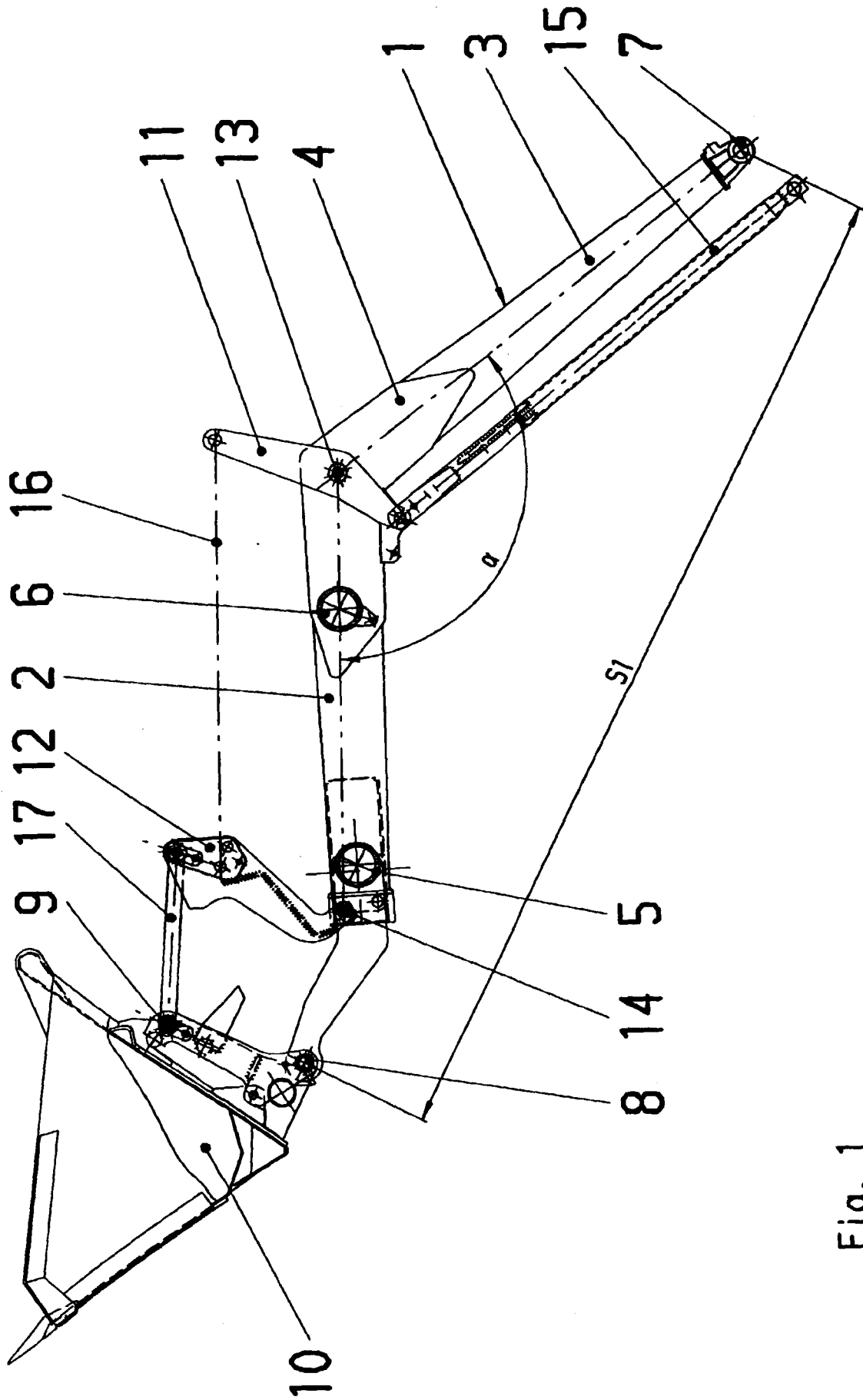


Fig. 1

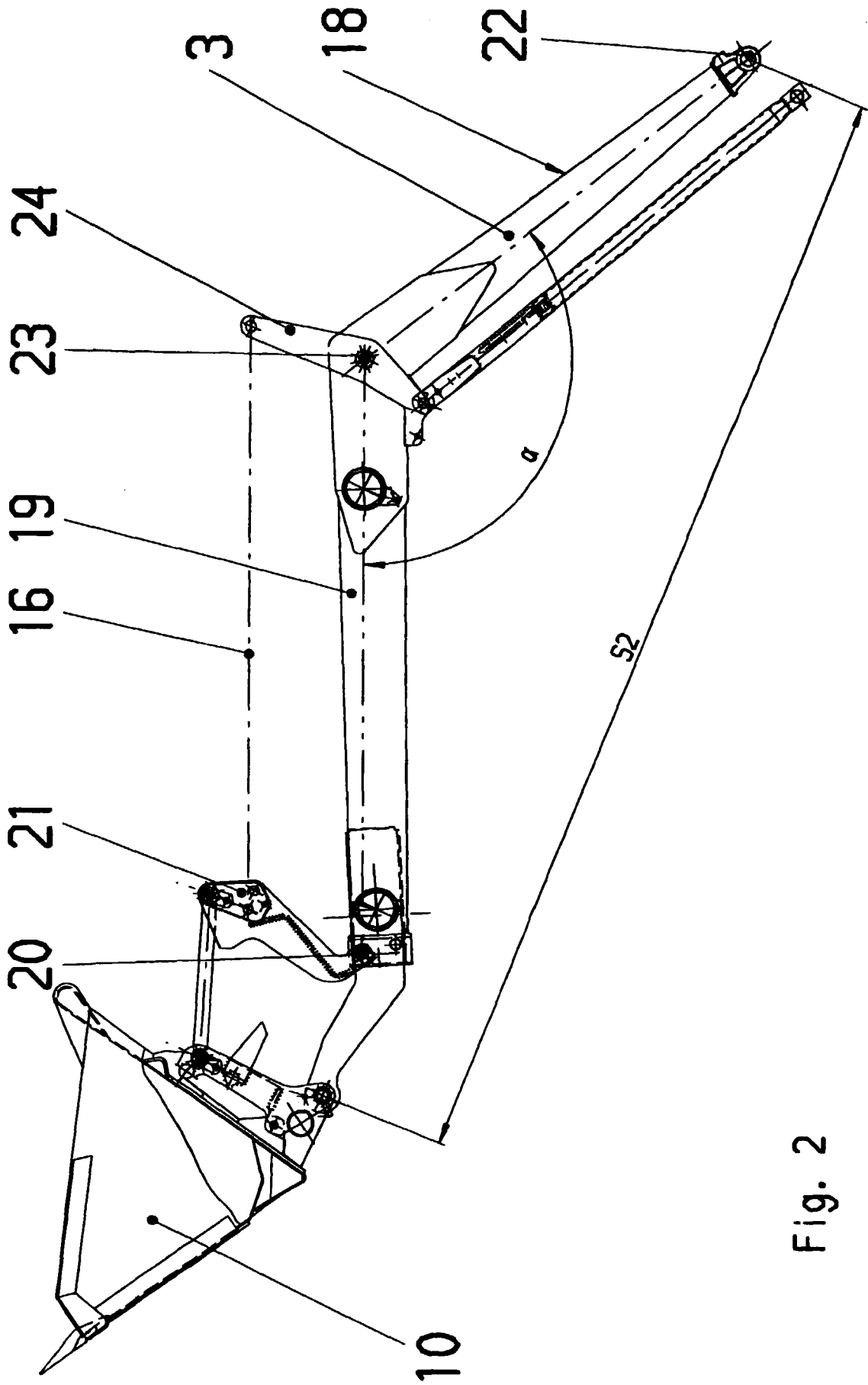


Fig. 2

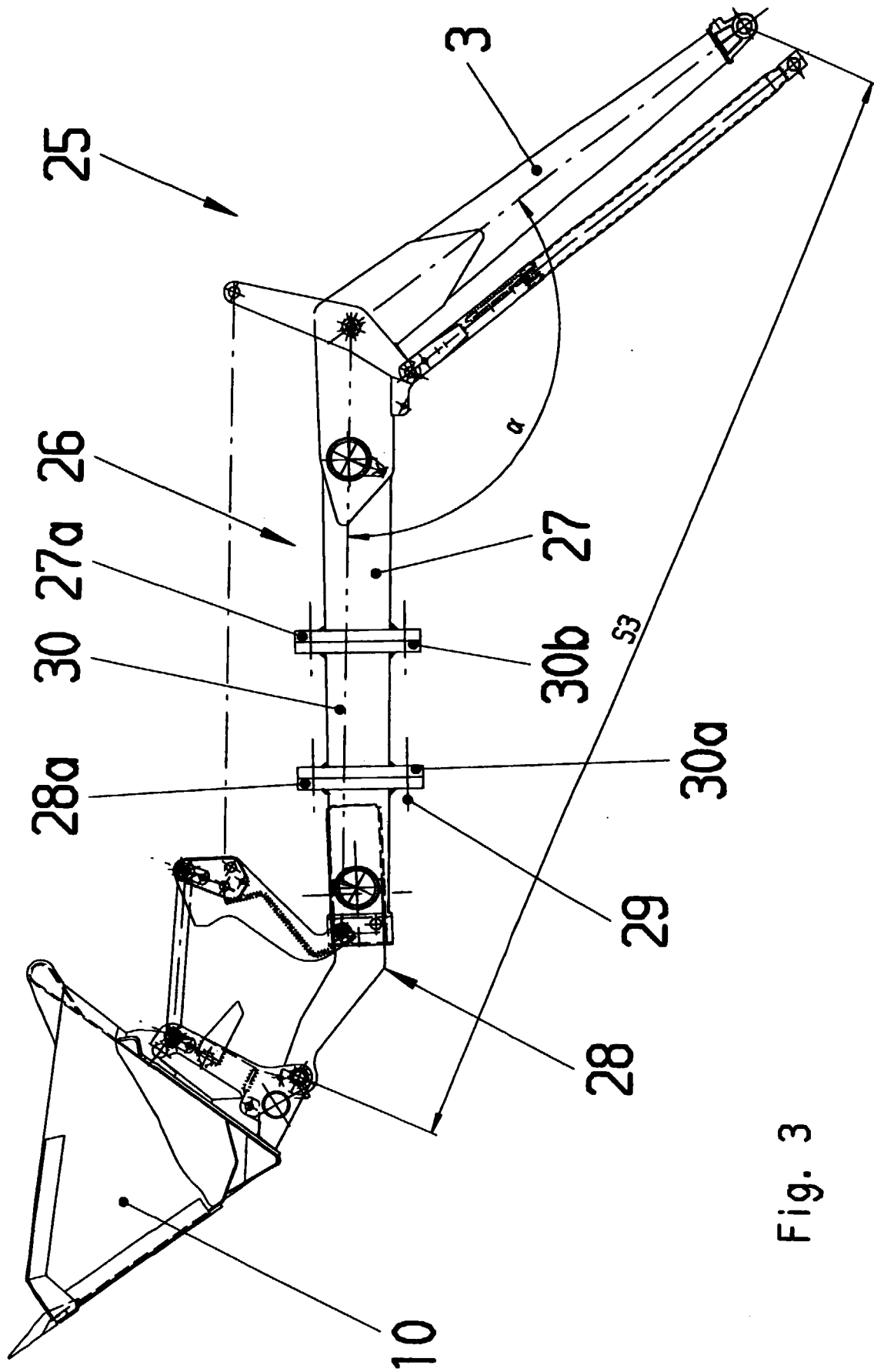


Fig. 3



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EUROPEAN SEARCH REPORT

Application Number
EP 99 11 5855

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
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A	US 3 844 370 A (BELKOVICZ J ET AL) 29 October 1974 (1974-10-29) * figures 2,7,8 * * column 2, line 52 - line 60 * ---	1,3	
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A	US 4 034 876 A (YANCEY JOHN W) 12 July 1977 (1977-07-12) * figure 2 * -----	1	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.Cl.7) E02F
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CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03.82 (F04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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