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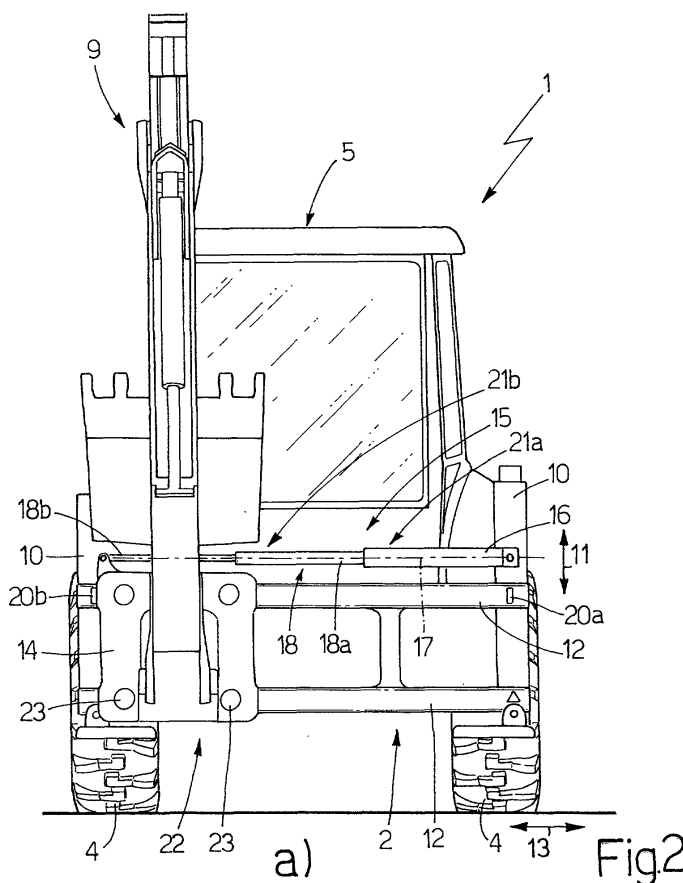
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(54) **Earthmoving machine and actuating device for controlling lateral movement of a loading shovel**

(57) An earthmoving machine has at least one loading backhoe (9) movable along at least one guide rail (12) extending crosswise to a longitudinal axis (3) of the

machine. Displacement of the backhoe (9) along the rail (12) is controlled by at least two telescopic devices (21a, 21b; 24, 25) arranged in series.



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Description

[0001] The present invention relates to an earthmoving machine, more specifically referred to as a tractor loader backhoe (TLB). Traditionally, such vehicle comprises a supporting frame having a given longitudinal axis, provided at the front with a larger loader mechanism and at the rear with a foldable backhoe arm structure having a shovel or bucket of smaller dimensions at its free end. It is known to attach the backhoe structure to the rear of the vehicle either at a central, fixed location (also known as "central pivot" connection), or to attach the structure to a supporting sledge fit for transverse movement along a guide rail extending crosswise to the longitudinal axis of the vehicle (also known as "side shift" connection). In the latter case, actuating means are required for moving the backhoe linearly along the guide rail.

[0002] Typically, such actuating means takes the form of a hydraulic cylinder which is connected to a semi-loop shaped chain guided over oppositely provided guide rollers; the chain in turn being attached to the sledge supporting the backhoe structure. The loop in the chain is provided to double the stroke of the hydraulic cylinder enabling a cylinder of a length equalling only half the width of the vehicle to nevertheless move the backhoe structure fully from one side of the vehicle to the other. Although a complete left to right positional range is available with the above arrangement, it nevertheless suffers from the disadvantage that it requires a lot of expensive components which all need servicing for avoiding malfunctioning of the system.

[0003] In another, less complex embodiment, the actuating means consists of a hydraulic actuator cylinder directly connected to the sledge supporting the backhoe instead of through a chain mechanism. The hydraulic cylinder, which is essentially a telescopic device, is fixed at one end to the vehicle supporting frame, extends parallel to the guide rail, and has an output rod fixed at the free end to the sledge supporting the backhoe. In known manner, the cylinder is movable between an extracted position, in which the output rod is substantially outside the actuator cylinder, and a withdrawn position, in which the output rod is substantially inside the actuator cylinder.

[0004] In the following description, the term "telescopic device" is intended to mean a device comprising at least two members sliding one inside the other.

[0005] Since the length of the actuator cylinder must therefore be at least equal to the desired side-shift travel of the backhoe along the guide rail, it would be impossible with such an arrangement to obtain a full shift of the backhoe from one lateral side to the other without the actuator cylinder sticking out from the side of the vehicle in one of its extreme positions. This of course is not acceptable from a safety point of view and therefore, in the above type of arrangements, less than a full shift over the complete rear width of the vehicle has to be

accepted as a limitation, which naturally reduces the versatility of the TLB in use.

[0006] It is therefore an object of the present invention to provide an earthmoving machine designed to eliminate the aforementioned drawbacks.

[0007] According to the present invention, there is provided an earthmoving machine having a given longitudinal axis, and comprising :

- 10 - at least one guide rail extending crosswise to said axis;
- at least one loading structure operatively connected to said rail and selectively positionable along the rail; and
- 15 - actuating means for moving said loading structure linearly along said rail.

[0008] The earthmoving machine is characterized in that said actuating means comprise at least two telescopic actuating devices arranged in series.

[0009] A non-limiting embodiment of the present invention will now be described by way of example with reference to the accompanying drawings, in which:

25 Figure 1 shows a schematic side view of a preferred embodiment of the earthmoving machine according to the present invention;

Figure 2 shows a rear view of the Figure 1 machine in two different operating positions;

30 Figure 3 shows a part of Figure 2 in more detail and in two different operating positions;

35 Figure 4 is a view similar to Figure 2, showing a further embodiment of the machine according to the present invention in two different operating positions; and

Figure 5 is a view similar to figure 3, showing a part of Figure 4 in further detail and in two different operating positions.

40 **[0010]** Number 1 in Figure 1 indicates as a whole an earthmoving machine or TLB comprising a frame 2 having a longitudinal axis 3, the frame being supported by two conventional axles (not shown) extending perpendicular to axis 3 and each in turn being supported by a pair of wheels 4.

45 **[0011]** Machine 1 further comprises a cab 5 fitted to the frame 2 and having a steering wheel 6 and a seat 7 for the operator of machine 1. Two conventional loading shovels 8, 9 are located on opposite sides of the cab 5 along axis 3; shovel or loader 8 being located on the front side of the machine and shovel or backhoe 9 being located on the rear side of the machine.

50 **[0012]** With reference to Figures 2 and 3, frame 2 comprises two uprights 10 located on opposite sides of axis 3 and extending parallel to a direction 11 perpendicular to axis 3. The uprights 10 house a stabilising mechanism which can be brought into contact with the ground for improving the stability of the vehicle when

operating the backhoe 9. Two guide rails 12 extend between the uprights 10 in a direction 13 perpendicular to direction 11 and to axis 3, and slidably support a sledge 14 forming part of the backhoe 9.

[0013] Sledge 14 is moved linearly along rails 12 in the direction 13 by an actuating device 15 comprising an actuating cylinder 16, which is fixed at the free end to one of the uprights 10. Cylinder 16 has an axis 17 substantially parallel to direction 13 and hence to the sledge 14 and comprises an output rod 18.

[0014] Rod 18 is a telescopic rod coaxial with axis 17 and comprises on the one hand an outer portion 18a mounted to slide inside cylinder 16 and on the other hand an inner portion 18b mounted to slide inside portion 18a. A free end of inner portion 18b is connected to the sledge 14 through a spherical joint 19 for compensating for any impact on slide 14 which, without joint 19, might flex and/or deform rod 18.

[0015] Rod 18 is movable between a withdrawn start position (Figures 2b and 3b), in which rod 18 is housed inside cylinder 16, and sledge 14 is positioned contacting a first stop member 20a, and an extracted end position (Figures 2a and 3a), in which the whole of rod 18 extends outside cylinder 16, and sledge 14 is positioned contacting a second stop member 20b.

[0016] Rod portion 18a therefore defines, together with cylinder 16 and rod portion 18b, a first and, respectively, a second telescopic device 21a, 21b, which in turn define actuating device 15.

[0017] Sledge 14 is provided with a known locking device 22 for maintaining sledge 14, and therefore the backhoe 9, in a given position along the rails 12. The device 22 comprises a number of actuating cylinders 23 (four in the example shown) connected to the sledge 14, parallel to axis 3 and facing the rails 12. The actuating cylinders 23 have respective output rods (not shown), each of which is movable to and from an extracted position in which the output rod engages a respective rail 12, for locking the sledge 14 in position relative to the rails 12.

[0018] As can be observed in Figures 2a and 2b, the sledge 14 occupies approximately one third of the width of the machine 1, while the actuating device 15, in its fully retracted position, is fully contained within the width of the sledge. Due to the provision of the double telescopic actuator 15, the sledge 14 is operable to travel the full width of the machine 1 without any part of the actuator device 15 ever laterally sticking out of the machine 1 in whatever position of the sledge 14. It will be appreciated that if the width of the sledge 14 would be reduced further e.g. to 1/4 of the vehicle width, then a triple telescopic actuator 15 could be employed, obtaining the same result.

[0019] Machine 1 in the Figures 4 and 5 embodiment differs from the Figures 2 and 3 machine by actuating device 15 comprising two actuating cylinders 24, 25, each defining a respective telescopic device, and which have respective axes 26, 27 substantially parallel to

each other and to direction 13, are arranged substantially in series with each other, and are positioned facing respective uprights 10.

[0020] Cylinders 24, 25 have respective output rods 28, 29, which are coaxial with respective axes 26, 27, and are mounted to slide inside respective cylinders 24, 25. More specifically, rod 29 is fixed at the free end to one of uprights 10, while rod 28 is connected at the free end to sledge 14 with the interposition of a spherical joint 30.

[0021] Each rod 28, 29 is movable between on the one hand a withdrawn start position (Figures 4b and 5b), in which rod 28, 29 is housed inside respective cylinder 24, 25, and sledge 14 is positioned contacting stop member 20a and on the other hand an extracted end position (Figures 4a and 5a), in which the whole of rod 28, 29 extends outside respective cylinder 24, 25, and sledge 14 is positioned contacting stop member 20b.

Claims

1. An earthmoving machine having a given longitudinal axis (3), and comprising :

- at least one guide rail (12) extending crosswise to said axis (3);
- at least one loading structure (9) operatively connected to said rail (12) and selectively positionable along the rail (12); and
- actuating means (15) for moving said loading structure (9) linearly along said rail (12); and

characterized in that said actuating means (15) comprise at least two telescopic actuating devices (21a, 21b; 24, 25) arranged in series.

2. A machine according to claim 1, **characterized in that** each said telescopic actuating device (21a, 21b; 24, 25) is defined by an actuating cylinder (24, 25) substantially parallel to said rail (12) and having a respective output rod (28, 29).

3. A machine according to claim 1, **characterized in that** said actuating means (15) comprise an actuating cylinder (16) substantially parallel to said rail (12); said cylinder (16) having a telescopic output rod (18) in turn comprising an outer portion (18a) mounted to slide inside said further actuating cylinder (16), and an inner portion (18b) mounted to slide inside the outer portion (18a); one of said telescopic actuating devices (21a, 21b) being defined by said further actuating cylinder (16) and by said outer portion (18a), and the other of said telescopic actuating devices (21a, 21b) being defined by said outer portion (18a) and by said inner portion (18b).

4. A machine according to any of the preceding

claims, **characterized in that** the machine further comprises a supporting frame (2) in turn comprising said rail (12); at least one of said telescopic actuating devices (21a, 21b; 24, 25) being connected to said frame (2) or to said loading structure (9) by joint means (19; 30). 5

5. A machine according to claim 4, **characterized in that** said joint means (19; 30) are spherical joint means. 10

6. A machine according to any of the preceding claims, **characterized in that** the width of the actuating means (15) in its fully retracted position substantially corresponds to the width of a sledge (14) operatively connecting the loading structure (9) to the at least one guide rail (12). 15

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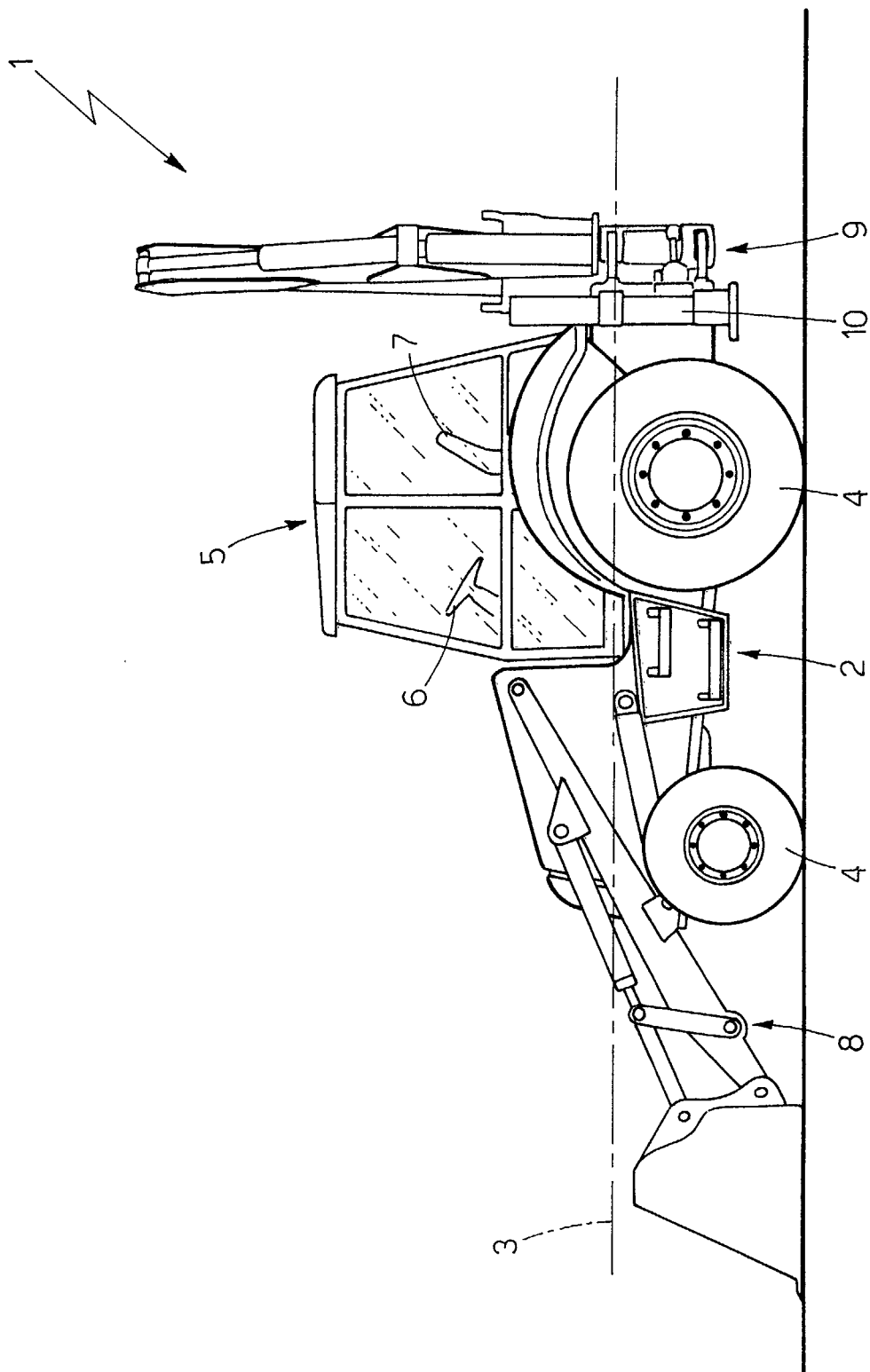


Fig.1

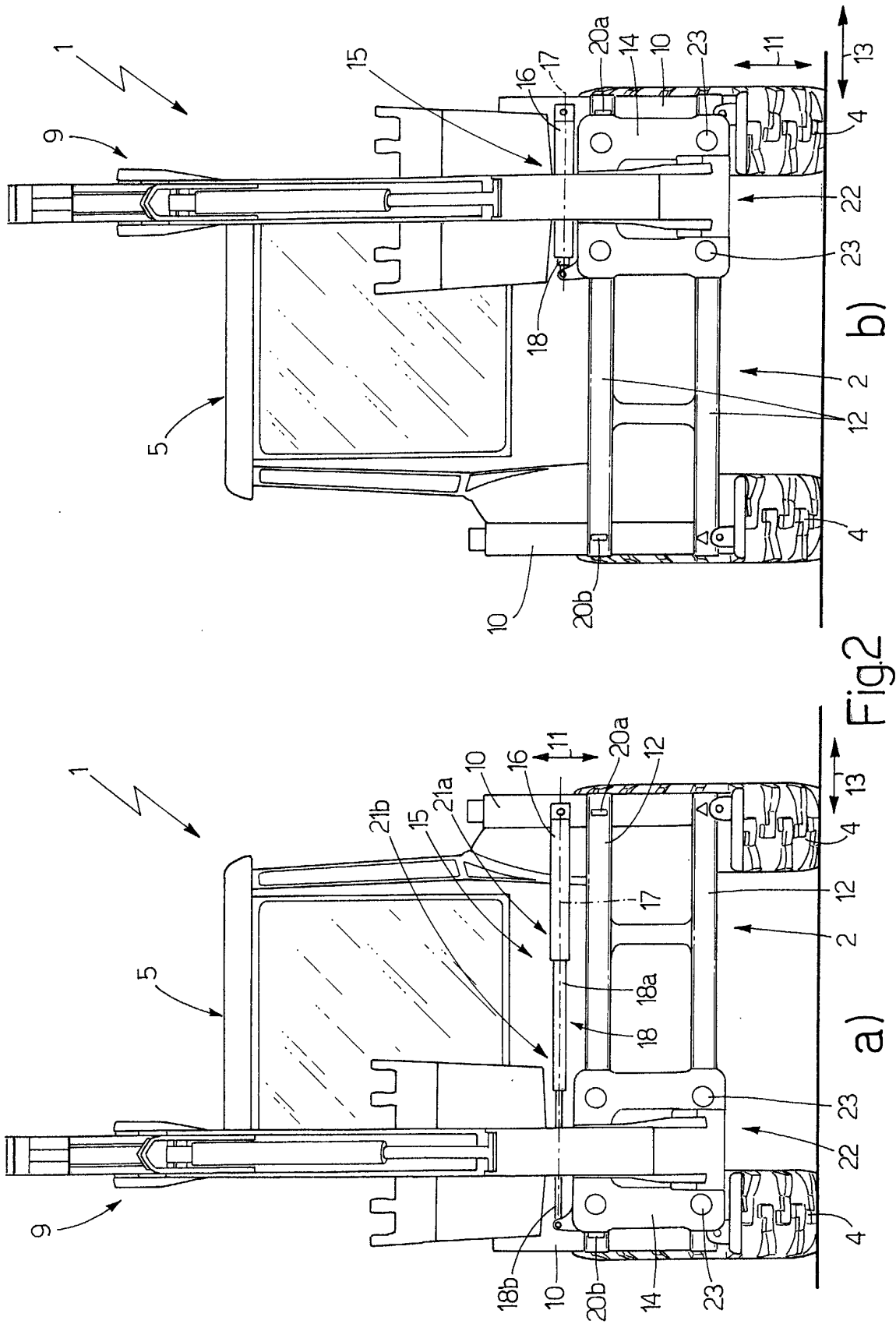
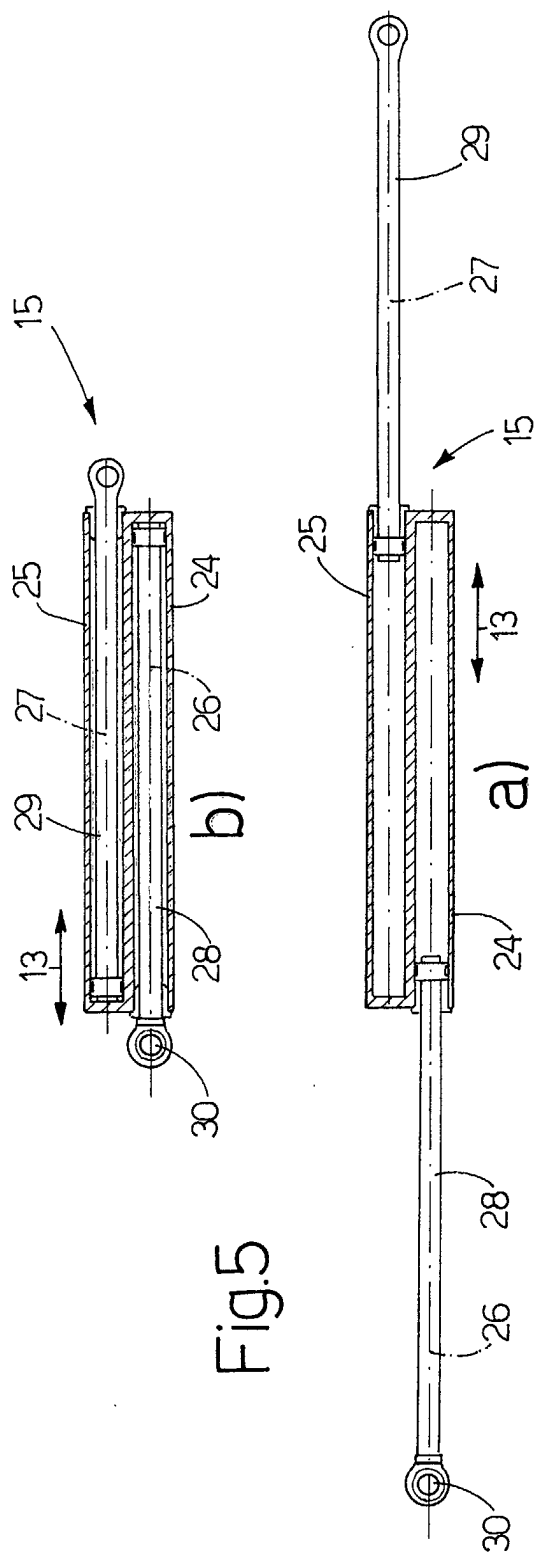
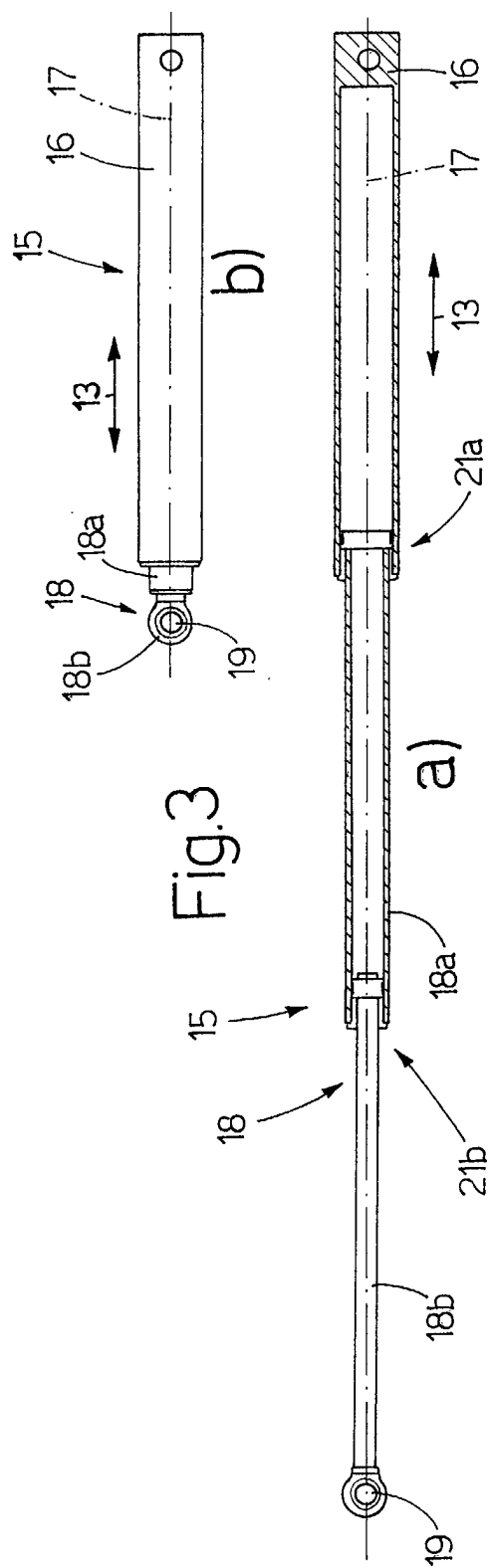


Fig.2



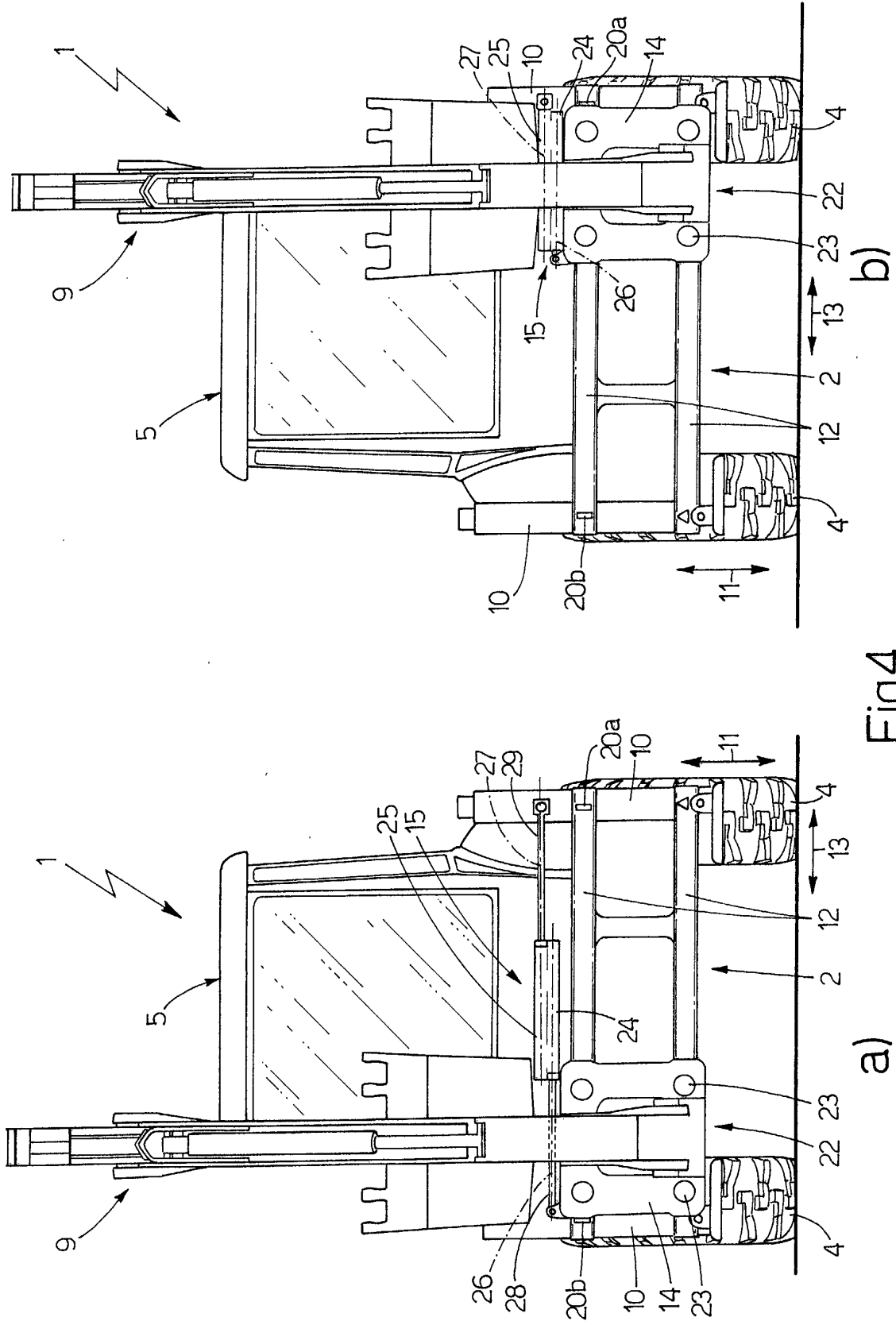


Fig.4



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EUROPEAN SEARCH REPORT

Application Number
EP 02 07 6988

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Place of search THE HAGUE		Date of completion of the search 4 September 2002	Examiner Guthmuller, J
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