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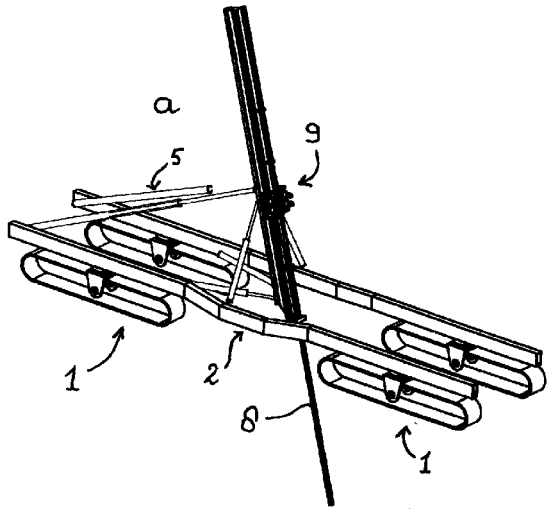
(54) Apparatus with a king post

(57) The invention is concerned with an apparatus with a king post (4), wherein said king post is mounted to the apparatus (1) by virtue of adjustable mounting (5,6,7) means such that, by adjusting said means, the operative position of the king post (4) is adjustable relative to said apparatus (1) according to at least three axes, preferably all six axes selected among the three translational movement axes and three rotational movement axes of the orthogonal coordinate system.

Fig. 4



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Description

[0001] The invention is concerned with an apparatus with a king post. The prior art king post of a pile driver, is positioned while the machine is stationary by swivelling around the vertical axis of the assembly of attendant's cabin and engine compartment, mounted on top of the wheeled undercarriage, which assembly also carries the king post. Small corrections are possible with the aid of hydraulic piston/cylinder assemblies.

[0002] The object of the invention is a versatile system to position a king post or equivalent body.

[0003] According to one aspect of the present invention a system is provided as according to claim 1.

[0004] The field of application is not limited to an apparatus to place a pile body, such as a foundation pile, into the ground, such as inserting a prefabricated pile body, e.g. by ramming with a pile driver or vibrating with a pile vibrator or pushing with a penetration device, or in situ making of a pile body into the ground, e.g. with a screw drill injection machine, but also relates to different apparatus for ground processing, such as a jet grout apparatus or a ground drill apparatus, e.g. for building an underground pipeline by horizontally controlled drilling, or such as an apparatus to place so called drains into the ground. Also applications outside ground processing are feasible.

[0005] The positioning is preferably carried out computer controlled. Preferably use is made of GPS (Global Positioning System) or DGPS (Differential GPS) to locate the position of the king post.

[0006] A presently advantageous, non-limiting embodiment is shown in several orientations in the drawing. For each orientation, each time a perspective view, a side view, a front view and a top view are shown (respectively referred to as "a", "b", "c" and "d"). Fig. 2-8 show different orientations of the king post, to place an object into the ground.

Fig. 1 shows the pile accepting orientation, in which orientation it is advantageous to place into the king post an object, to be placed into the ground;

Fig. 2 shows the orientation with the king post vertical and centred;

Fig. 3 shows the orientation with the king post vertical and displaced aside;

Fig. 4 shows the orientation of fig. 3, but now with the king post leaning back 1:4;

Fig. 5 shows the orientation of fig. 3, but now with the king post leaning forward 1:4;

Fig. 6 shows the orientation of fig. 3, but now with the king post leaning aside 1:4;

Fig. 7 shows the orientation of fig. 3, but now with the king post leaning aside 1:4 and leaning back 1:4;

Fig. 8 shows the orientation of fig. 3, but now with the king post leaning aside 1:4 and leaning forward 1:4;

Fig. 9 shows the transport orientation;

Fig. 10 shows an alternative embodiment, in the orientation similar to fig. 1.

[0007] Illustrated is a wheeled undercarriage 1 of an apparatus to place a pile body into the ground, particularly by pushing (penetration). The undercarriage 1 has tracks 1 or different rolling or sliding members bearing on the underground to advance across the underground. The tracks 1 carry a frame 2 comprising two spaced at least substantially parallel, lying, girders 3. Each track can pivot around the vertical relative to the frame 2.

[0008] Furthermore a king post 4 is shown. The king post has guiding means and/or holding means to hold thereon or guide therealong, respectively, the object 8 to be placed in the ground, such as a prefabricated foundation pile. The apparatus is provided with means 9 to forwardly force the object 8. In this example the means 9 comprise a head, moving along the king post 4, engageing the upper side of the pile 8 and pushing it down.

[0009] The king post 4 is in the manner according to the invention carried by the frame 2. In this embodiment this is such that the king post 4 can be translated and pivoted in all directions relative to the frame 2.

[0010] Accordingly double acting hydraulic piston/cylinder assemblies 5 extend between the frame 2 and the king post 4, with inside the cylinder 6 a piston (not shown), reciprocatively slidable in longitudinal direction, and connected thereto a piston rod 7, the part of it projecting outside the cylinder 6 is extended further from or retracted into the cylinder, respectively, by the forward or backward movement of the piston. The cylinder 6 of the assembly 5 is mounted to the one of the frame 2 and the king post 4, and the piston (via the piston rod 7) is mounted to the other of the frame 2 and king post 4.

[0011] In the illustrated example there are six of these assemblies 5. The mounting to the frame 2 respectively the king post 4 is at least substantially symmetrical relative to the central longitudinal line of the frame 2 respectively king post 4. The assemblies each have a double function: on the one hand they move the king post 4, on the other hand they guide the movement. Each assembly 5 is preferably through pivoting means (e.g. a ball joint or cardan coupling) fixed to the frame 2 respectively the king post 4, such that it can e.g. pivot in all relative directions.

[0012] One or more of the assemblies 5 could be of the pneumatic type. Or could be replaced by one or more equivalent actuators, e.g. with which two parts, such as the part fixed to the frame 2 and the part fixed to the king post 4, can be moved in the longitudinal direction of the actuator toward and from each other. Instead of double acting, the actuator can be of the single acting type. In case of double acting, the actuator actuates the movement in both directions.

[0013] In stead of an actuator, one or more of the assemblies 5 can be a movement guide, e.g. with which a moving part, such as a part fixed to the king post 4, is guided in longitudinal direction while moving to or from another part, such as a part fixed to the frame 2. Said movement guide can e.g. be provided by mutually telescoping extendable and retractable parts. According to an embodiment e.g. all assemblies mounted to the one girder 3 are an actuator, while the others, mounted to the opposite girder 3, are movement guides. By actuating the actuators, the king post 4 is made to move. The manner of movement of the king post 4 is controlled by the way of actuating the actuators and the guidance provided by the movement guides. One or more of the movement guides can alternatively be provided such that they can be locked in one or more of their guiding positions. If it is of the extendable type, such as with mutually telescoping sliding parts, means can be provided to maintain the movement guide in each desired length, e.g. by activatable locking means (such as clamping means) that can selectively mutually fixate the mutually displaceable parts of the movement guide temporarily to keep them mutually immovable.

[0014] Fig. 9 shows that the frame 2 width is made smaller for the purpose of transport in that the girders 3 are brought towards each other. The embodiment according to fig. 10 differs from that of the preceeding embodiment, in that the frame 2 is shorter and the undercarriage 1 smaller.

[0015] Furthermore, the frame 2 can carry auxiliary equipment, such as an hydraulic generator, to supply the piston/cylinder assemblies and the actuation of the tracks 1, a combustion engine to actuate the generator, one or more control members that can be controlled by an operator, a store for a stock of prefabricated pile bodies or other bodies to place into the ground with the king post, a control house for accomodating an operator, and such.

[0016] It is illustrated how the girders 3 run sideways outside midway their length, such that the king post 4 can be moved sideways as far as possible.

Claims

1. An apparatus with a king post (4), wherein said king post is mounted to the apparatus (1) by virtue of adjustable mounting means such that, by adjusting said means, the oparative position of the king post is adjustable relative to said apparatus according to at least three axes, such as at least four axes, preferably at least five axes, selected among the three translational movement axes and three rotational movement axes of the orthogonal coordinate system.

2. An apparatus according to claim 2, wherein said adjustment is provided according to all six said axes.

3. An apparatus according to claim 1 or 2, wherein said means comprise at least one guiding and/or actuating member (5) mounted to the king post, ensuring for said mounting point with said king post a displacement along an at least substantially straight line.

4. An apparatus according to claim 2, wherein said means comprise preferably at least two, more preferably at least three, most preferably at least four, more most preferably at least five, such as at least six guiding members (5).

5. An apparatus according to any of claims 1-4, wherein in an operating orientation of the king post one or more of the following conditions prevail: at least one member (5) extends at least substantially horizontally; at least one member (5) extends upward under an angle between about 45° and about 80°; at least one member (5) extends upward under an angle between about 10° and 40°.

6. An apparatus according to any of claims 1-4, wherein the king post is mounted to the apparatus with the aid of at least one, preferably at least two, more preferably at least three, most preferably at least five or at least six piston/cylinder assemblies, preferably of the hydraulic type.

7. An apparatus according to any of claims 1-6, wherein said king post is constructed to guide an object in a straight line, such as an equipment or an elongated, preferably slender body, such as a prefabricated foundation pile.

8. An apparatus according to any of claims 1-7, wherein the king post is mounted to the apparatus by mounting means such that in its operating orientation the lower end of the king post can be located between the longitudinal ends of the apparatus, or wherein the apparatus is provided with a wheeled undercarriage with wheels rotating around rotation axes, and wherein in its operating orientation the lower end of the king post can be located between the rotation axes closest to the longitudinal ends of the apparatus.

9. An apparatus according to any of claims 1-8, wherein with said adjustable mounting means said king post can be moved between at least a substantially vertical position and at least a substantially horizontal position.

10. An apparatus according to any of claims 1-8, wherein a first member (5) has a first stoke length and a second member (5) has a second stroke length, equal to or larger than the first stroke length, and wherein preferably a third member (5) has a

third stroke length larger than said first and second stroke length.

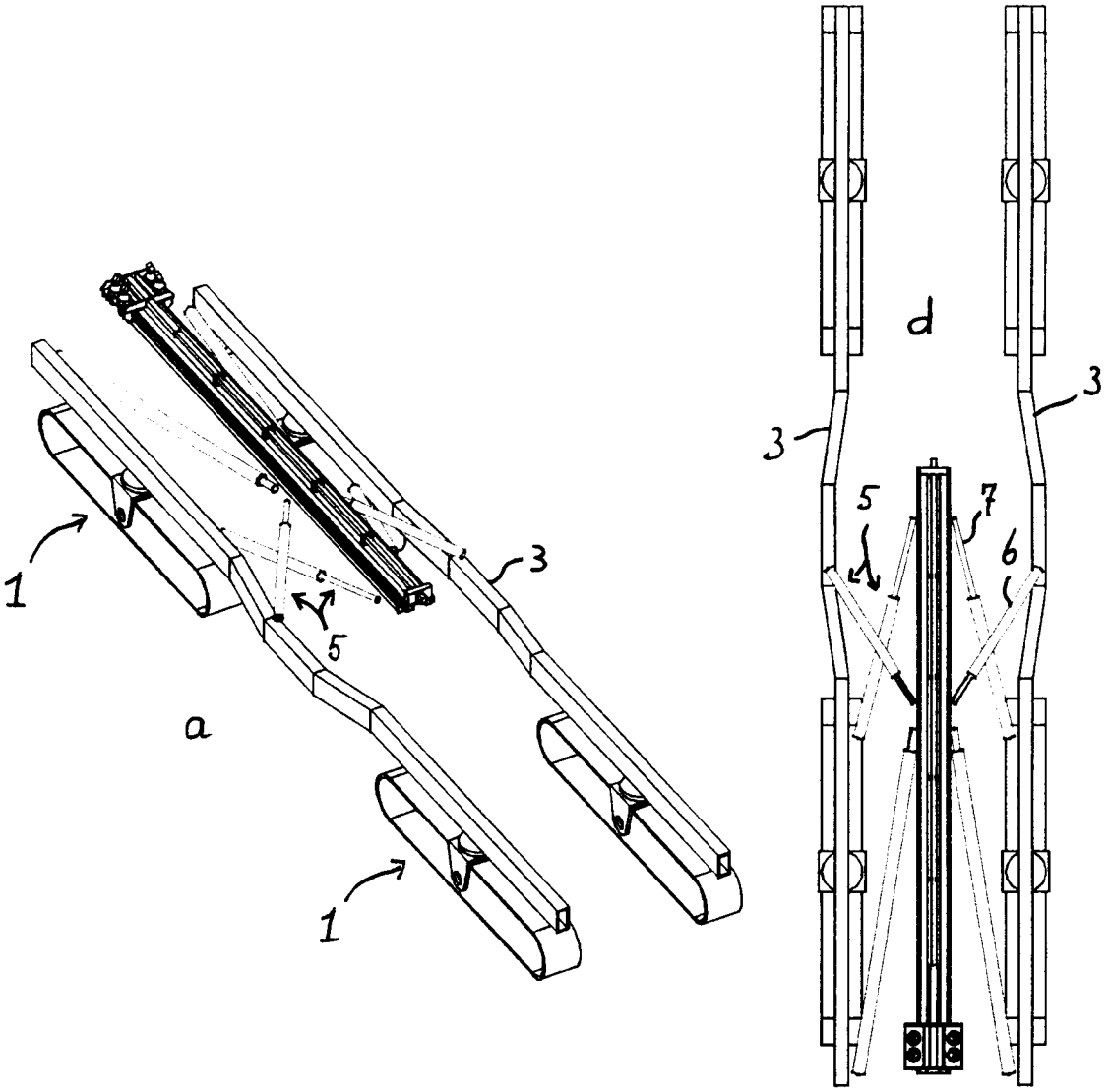
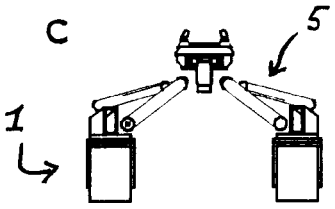
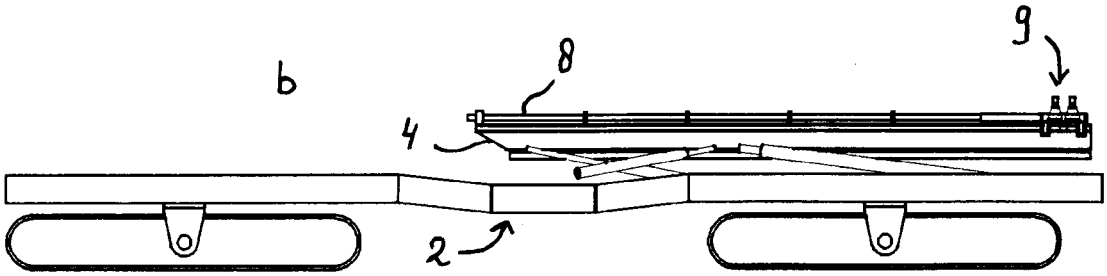
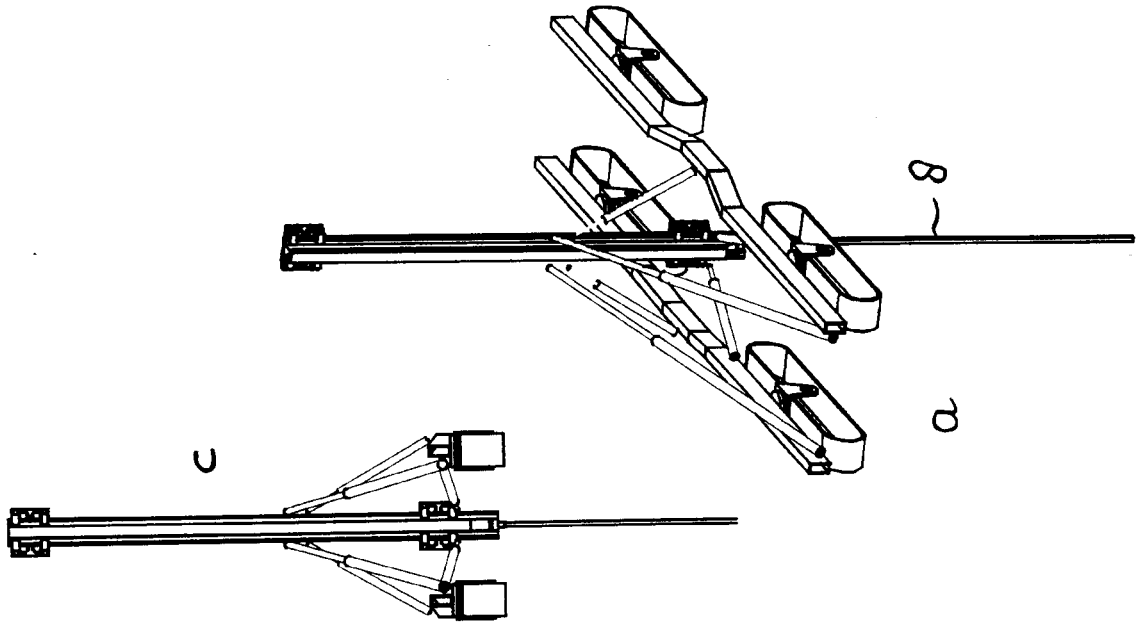


Fig 1







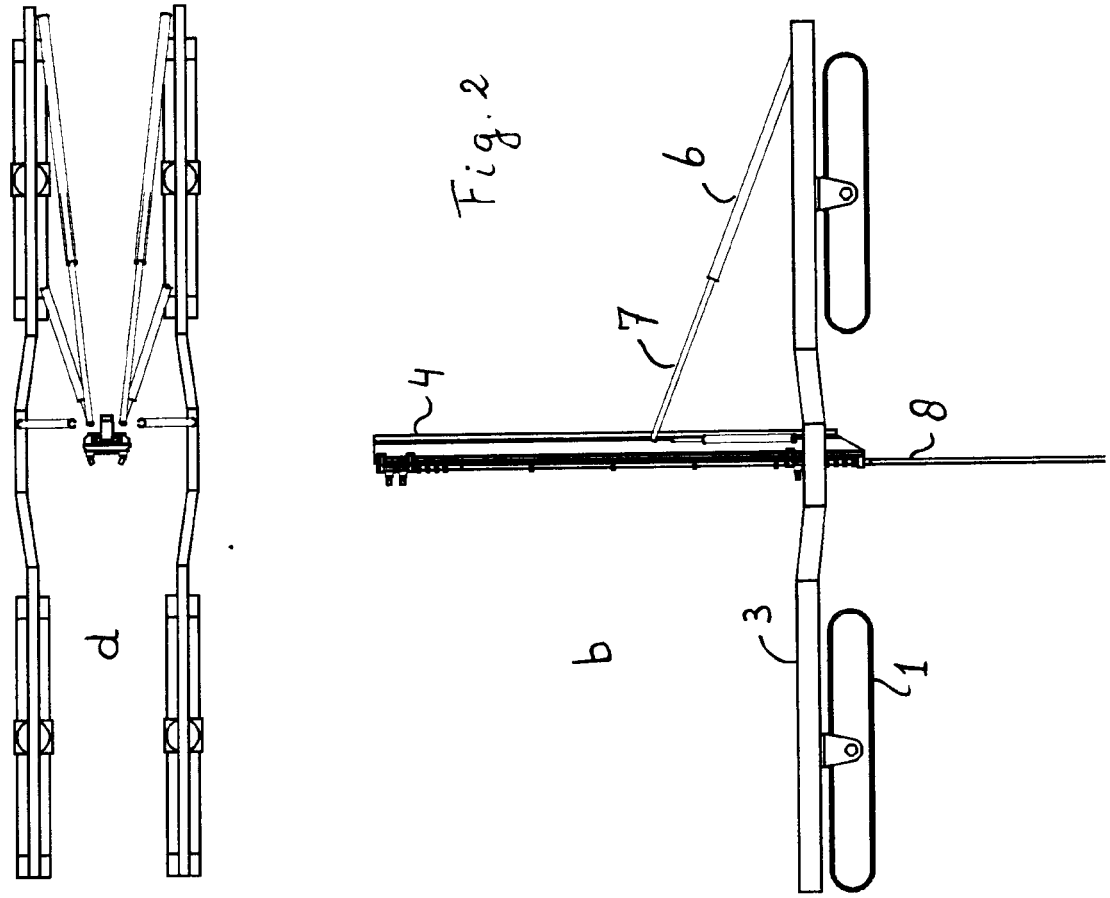
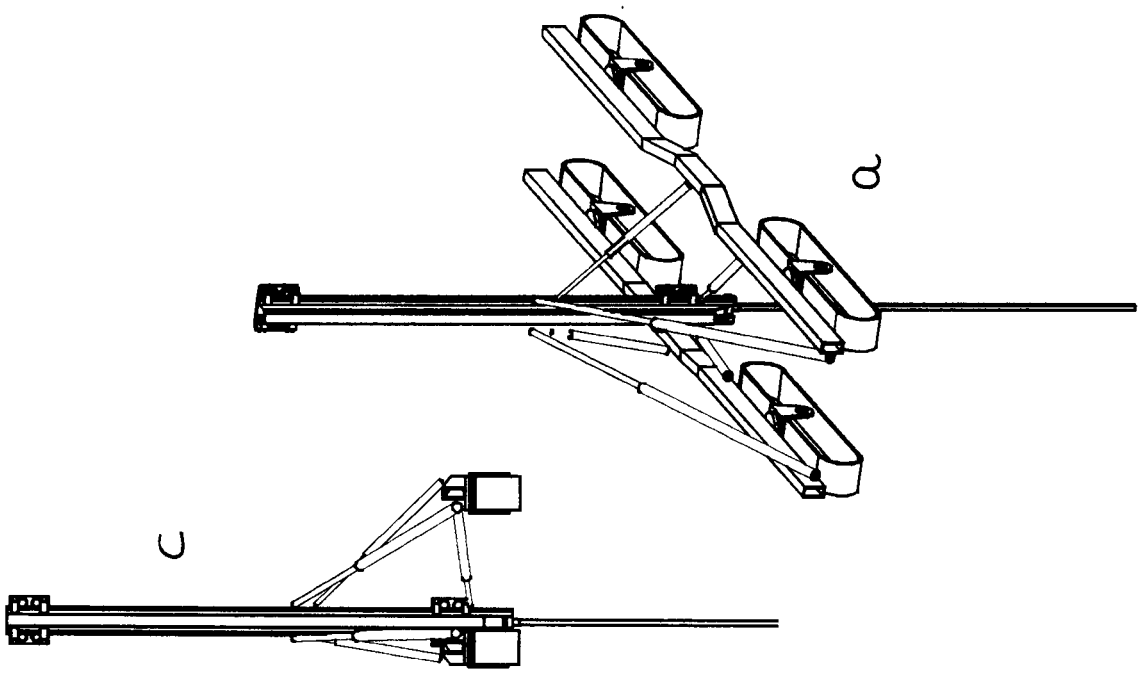


Fig. 2



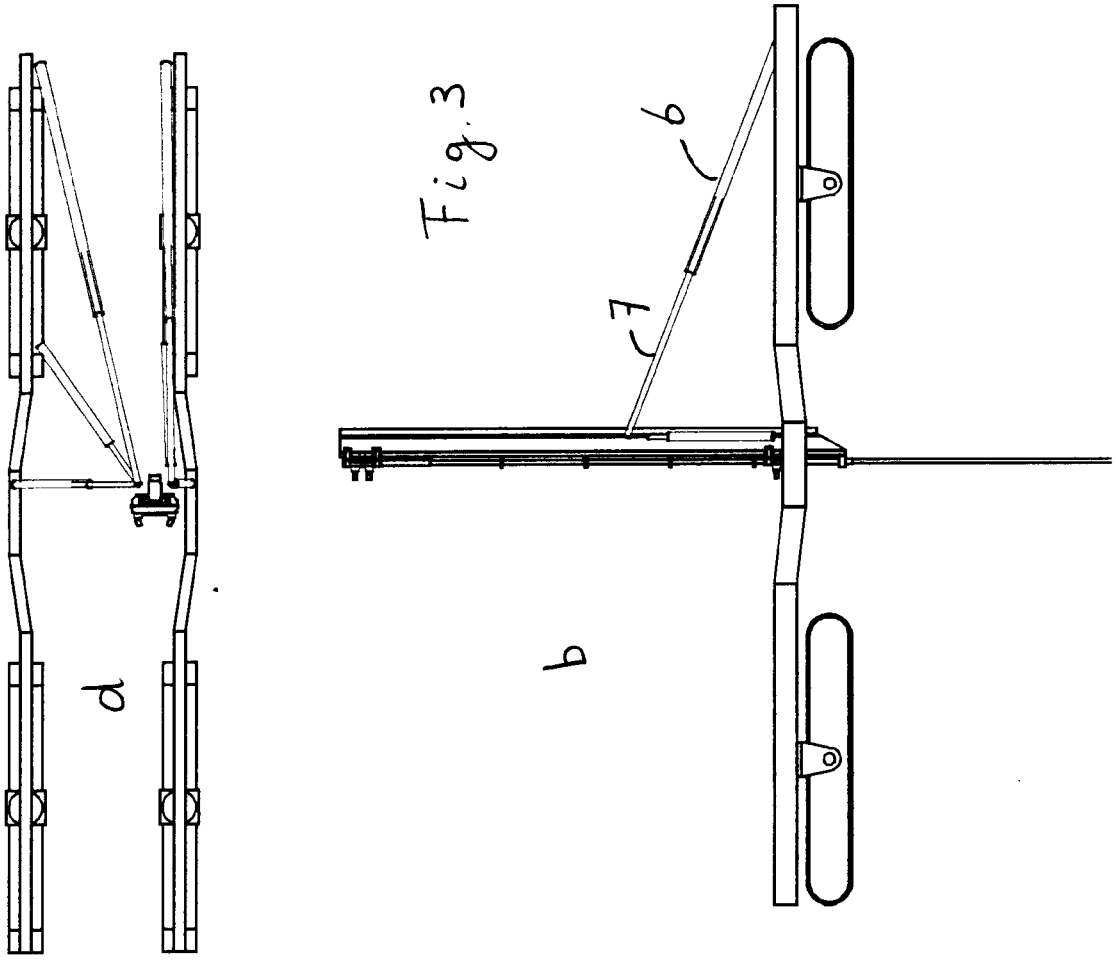


Fig. 3

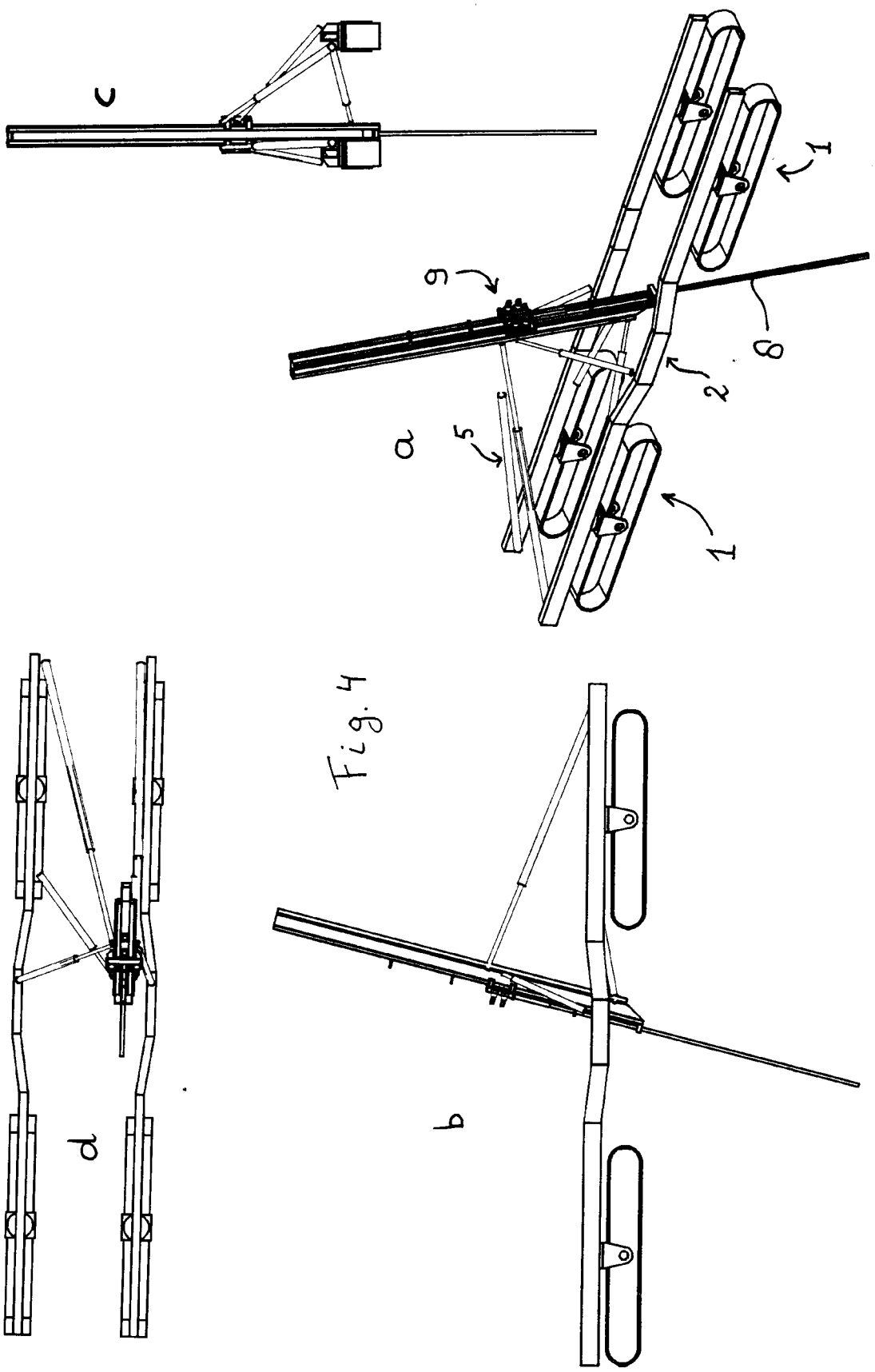
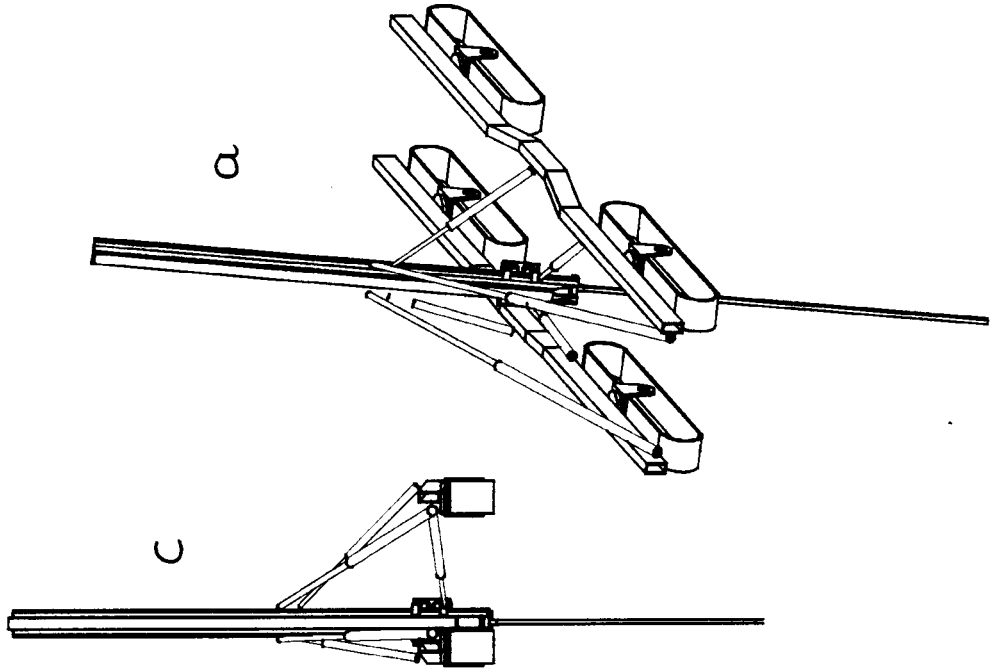


Fig. 4



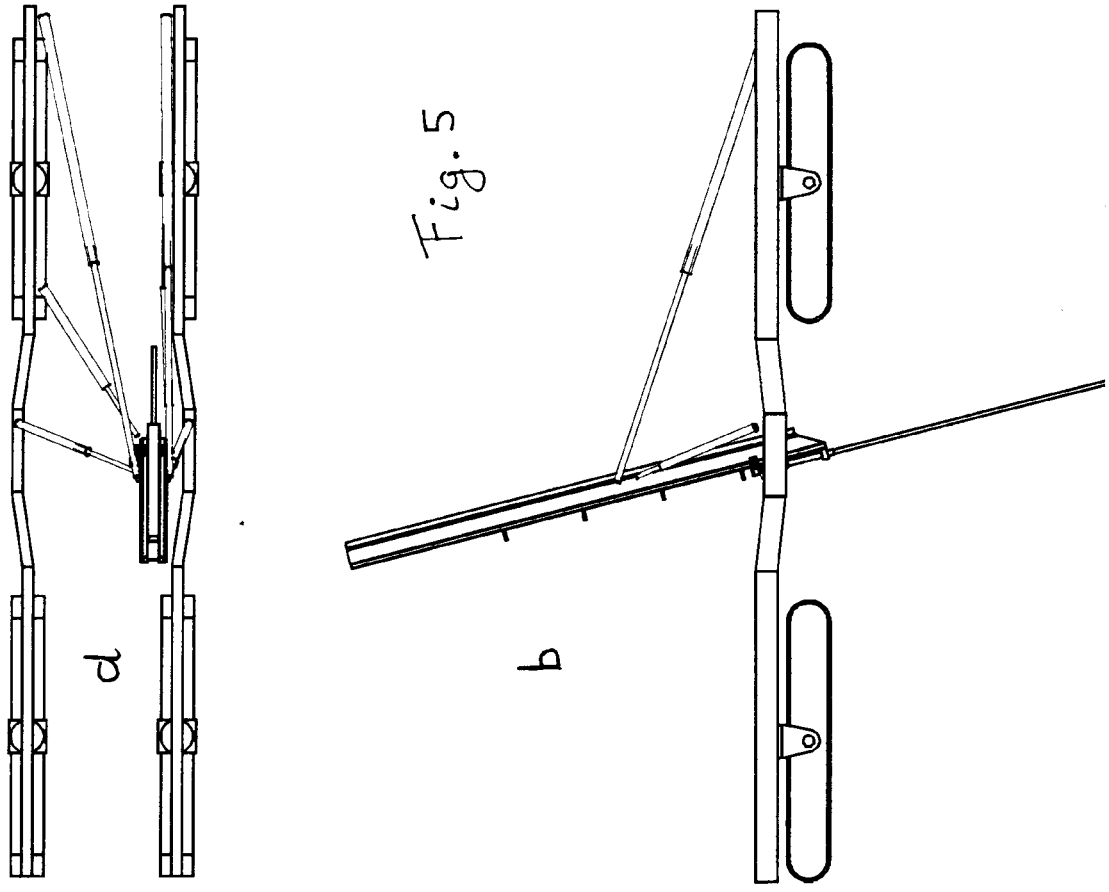


Fig. 5

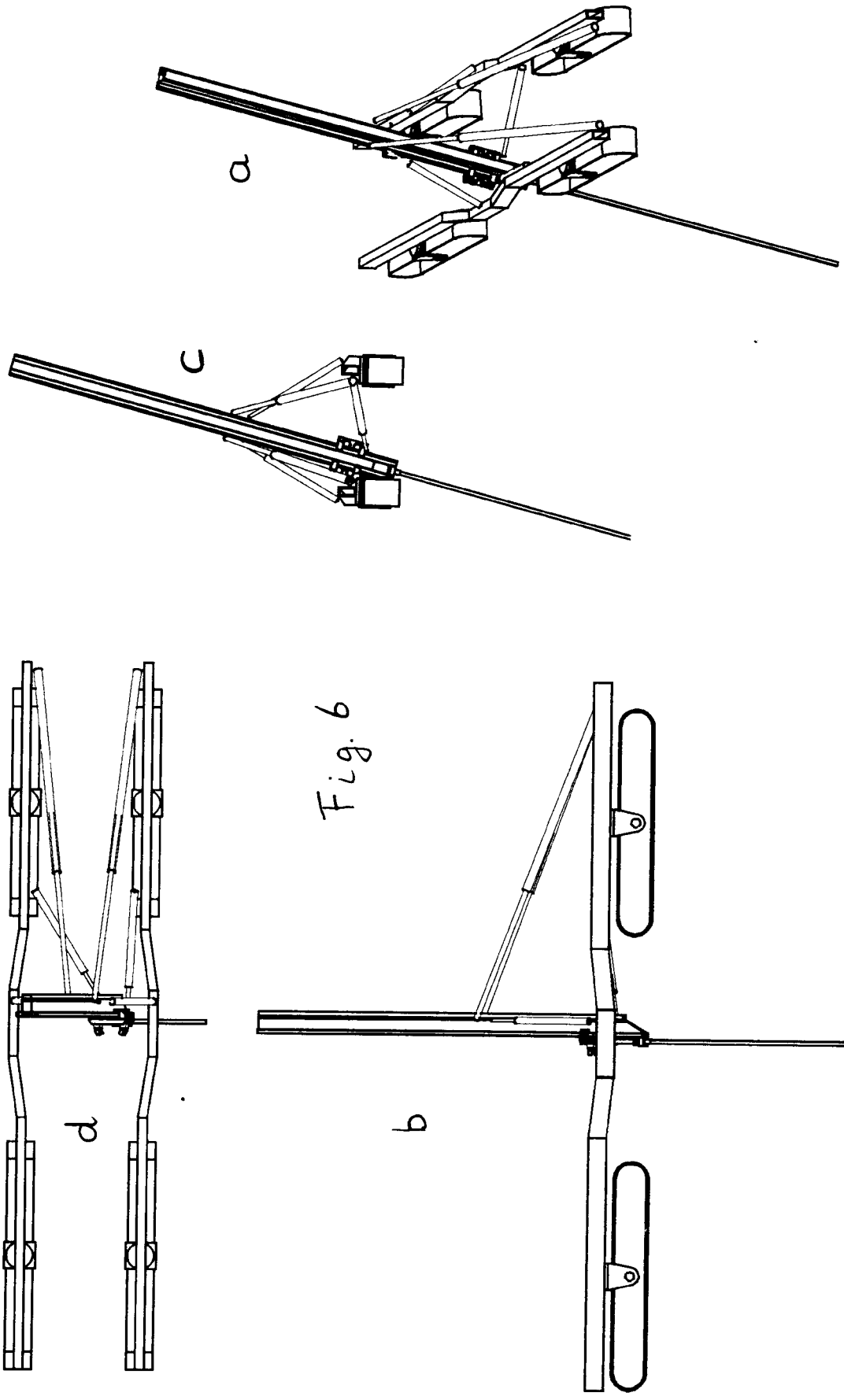


Fig. 6

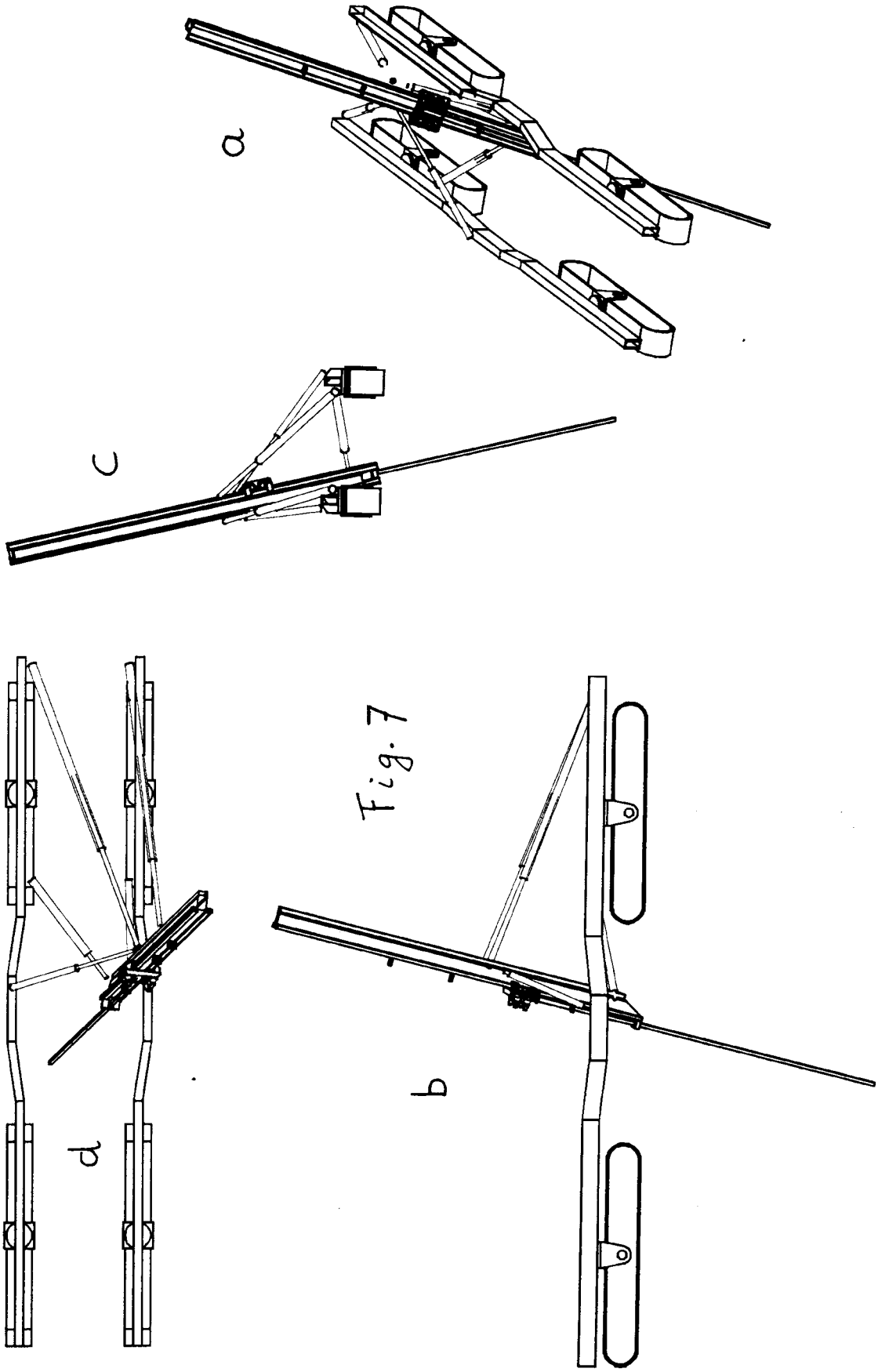


Fig. 7

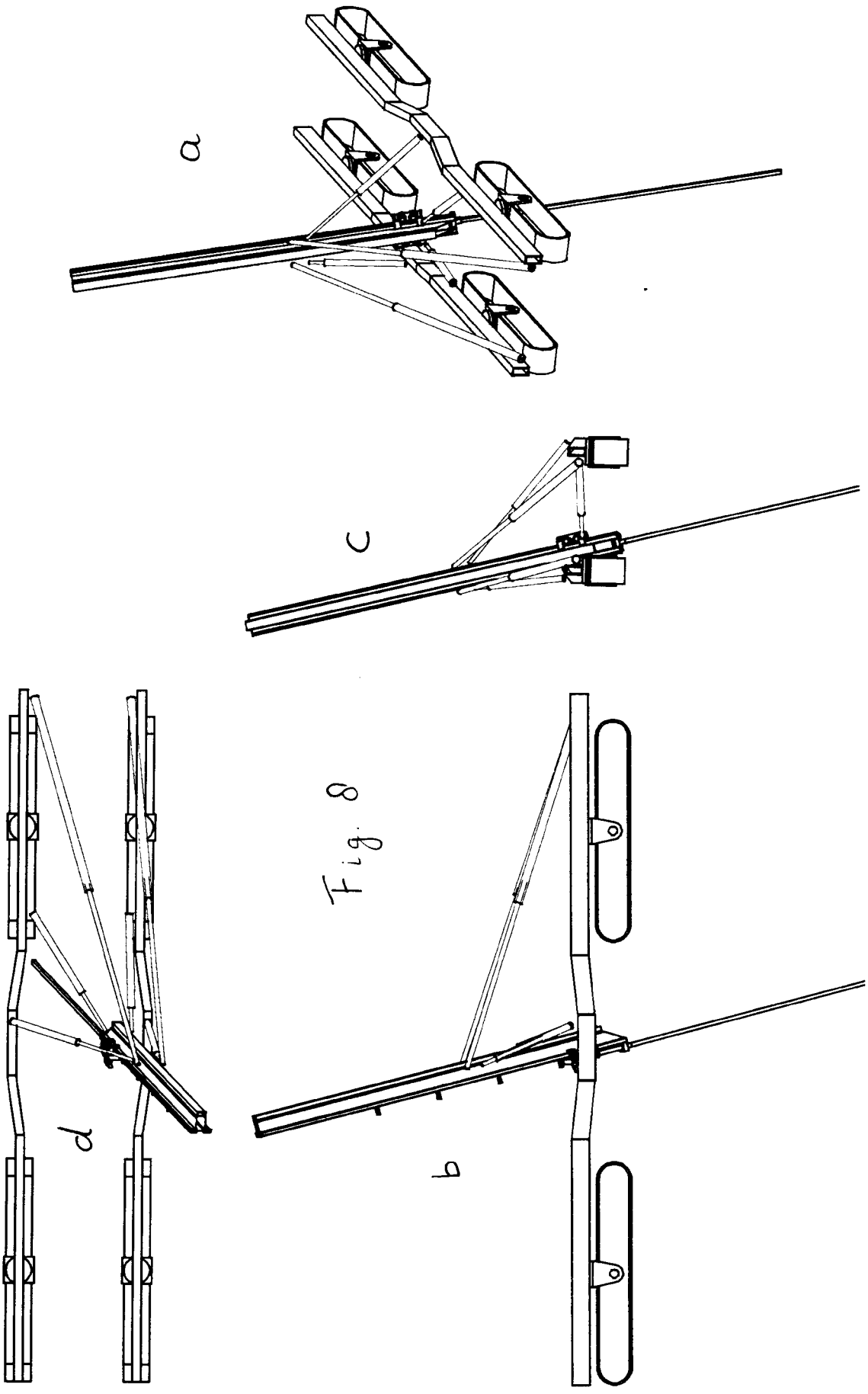


Fig. 8

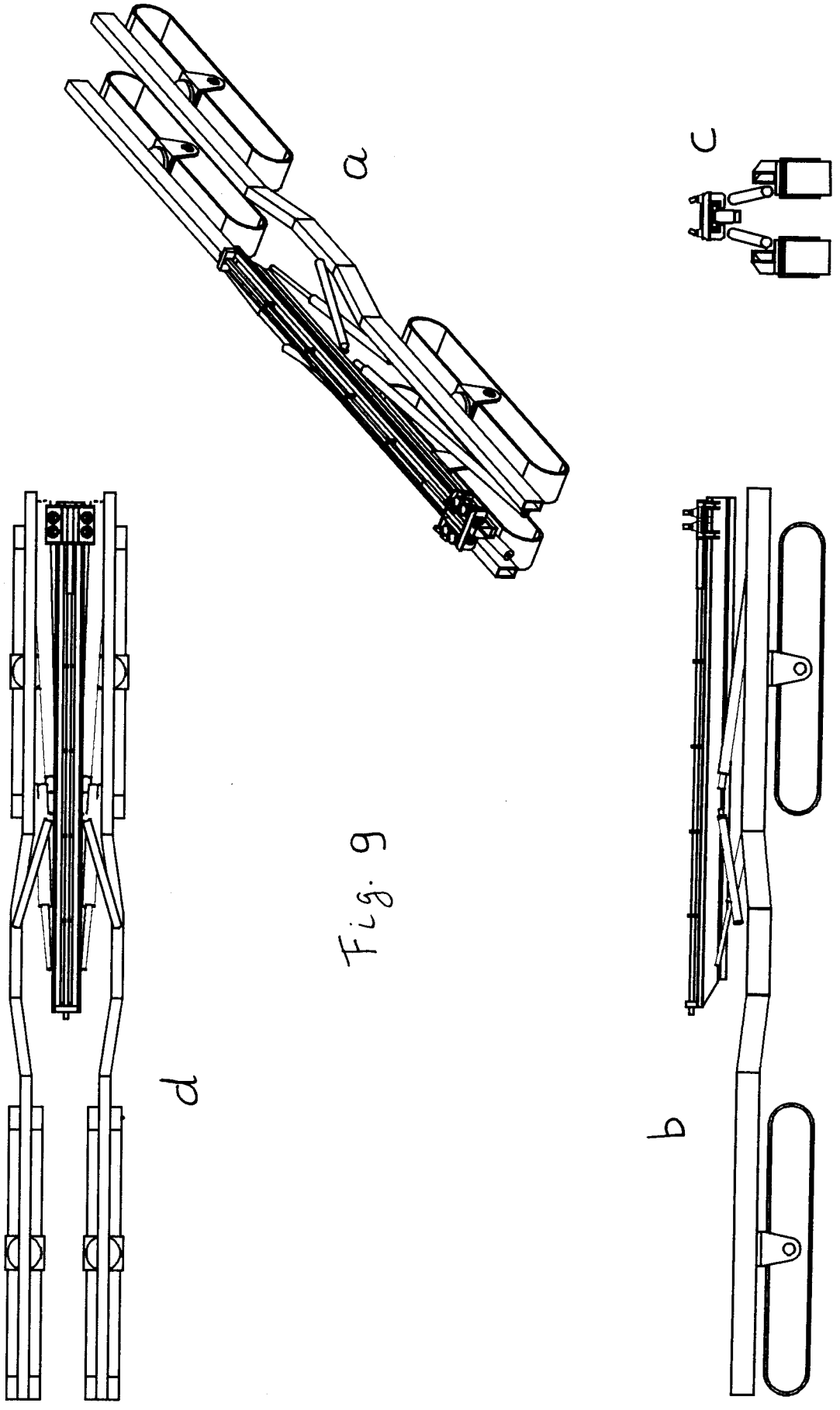


Fig. 9

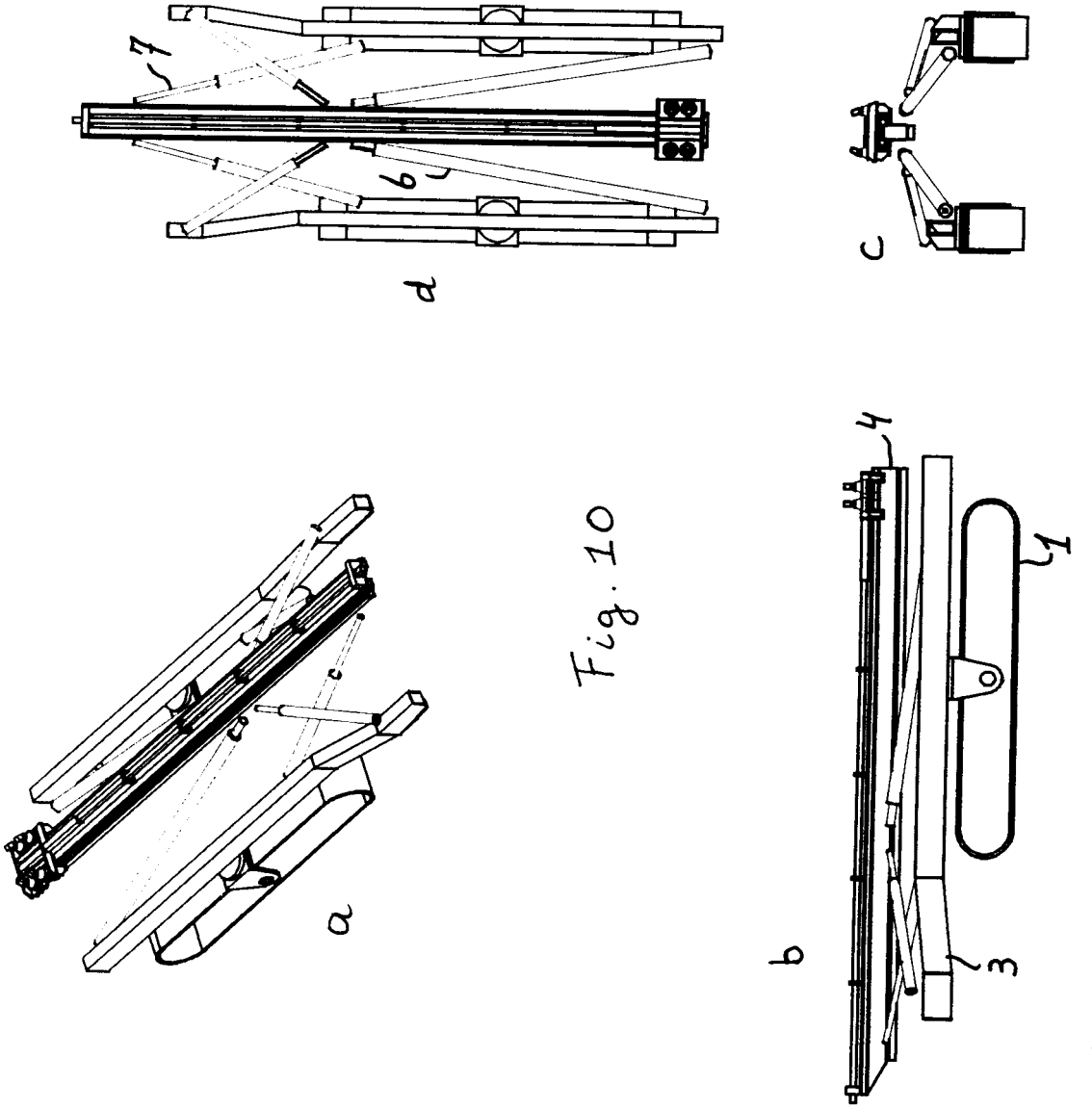


Fig. 10

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EUROPEAN SEARCH REPORT

Application Number
EP 00 20 1017

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	GB 2 084 108 A (STEINER LTD H) 7 April 1982 (1982-04-07) * the whole document *	1,3-10	E02D13/04
X A	GB 1 251 643 A (KING) 27 October 1971 (1971-10-27) * page 2, line 24 - page 3, line 96; figures 1-10 *	1,3-7 8	
X	NL 1 010 069 C (SPLUNDER FUNDERINGSTECHNIEK BV) 12 March 1999 (1999-03-12) * the whole document *	1-10	

TECHNICAL FIELDS SEARCHED (Int.Cl.7)

E02D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	3 July 2000	Tellefsen, J

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 00 20 1017

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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03-07-2000

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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GB 1251643 A	27-10-1971	NONE	
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EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82