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(54) Concrete supply arm with articulated sections

(57) The invention relates to a concrete supply arm, to be mounted in particular on vehicle-transported concrete pumps, having several sections (11,12) and articulating joints between said sections. In this arm the relative movement of the sections (11,12) is performed, in correspondence of at least some of the articulating joints of the arm, by means of actuator mechanisms (23) consisting of a worm gear actuated by a hydraulic motor. Conveniently said actuators also comprise a locking brake.

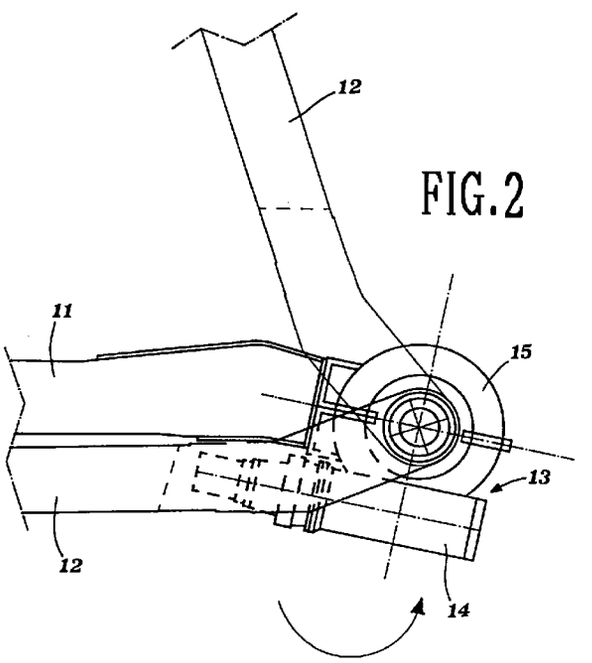

FIG.2

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Description

[0001] The present invention relates to concrete supply arms - in particular arms mounted on vehicle-transported concrete pumps - having several sections and articulating joints between said sections.

[0002] Various types of multiple-section concrete supply arms are already well known, said arms being of the kind in which the relative movement of the sections is performed, in correspondence of the articulating joints, by means of kinematic mechanisms with articulated rods connected to the sections and double-acting hydraulic cylinders controlling them.

[0003] These constructions, however, have the drawback that the angular velocities at which the arm sections are moved are not constant (the angles of relative movement of the sections are not proportional to the stroke of the cylinder) and the significant limitation that, even when using complicated kinematic mechanisms, the angle of maximum relative rotation of the sections is generally not greater than 280°.

[0004] It can be easily understood how important it is to avoid the abovementioned drawback and limitation of the known constructions, in order to achieve greater operational efficiency and safety and have a greater degree of manoeuvrability and versatility during use of the concrete supply arms, in particular along the sections and at the articulating joints closest to the delivery end of the arms themselves.

[0005] The present invention considers and solves these problems by providing a concrete supply arm - to be mounted in particular on vehicle-transported concrete pumps - having several sections and articulating joints between said sections, characterized in that the relative movement of the sections is performed, in correspondence of at least some of the articulating joints of the arm, by means of actuator mechanisms consisting of a worm gear actuated by a hydraulic motor.

[0006] Preferably said actuators also comprise a locking brake.

[0007] Conveniently in the arm according to the invention the relative movement of the sections is performed by means of actuator mechanisms consisting of a worm gear actuated by a hydraulic motor only at the articulating joints close to the delivery end of the arm.

[0008] With arms constructed in this manner, the angular velocity at which the relative movement of the sections takes place may be kept constant, without difficulty, over the entire amplitude of the relative angular displacements and the latter may also be much greater than 280°, with obvious advantages for the operators and improvement in the quality of the work.

[0009] The invention is now described in greater detail with reference to the accompanying drawings which relate to some preferred embodiments of the arm according to the invention as defined above and in which:

Fig. 1 is a schematic view of the articulation between two end sections of a concrete supply arm according to the prior art;

Figs. 2 and 3 are two schematic views - a side view and a plan view - of an articulating joint between two sections of a concrete supply arm equipped, according to a first embodiment of the invention, with an internal actuator;

Figs. 4 and 5 are two similar schematic views of a different embodiment of the solution according to Figs. 2 and 3;

Figs. 6 and 7 are two similar schematic views of a further embodiment of the solution according to Figs. 2 and 3;

Figs. 8 and 9 are two schematic views - a side view and a plan view - of an articulating joint between two sections of a concrete supply arm equipped, according to another embodiment of the invention, with an external actuator; and

Fig. 10 shows in detail a sectional view of a possible construction of one of the actuators applied to the embodiments of Figs. 2 to 9 of the invention.

[0010] With reference to the drawings, Fig. 1 shows a schematic view of the construction of an articulation or articulating joint between two end sections of a concrete supply arm according to the prior art: the two sections 1 and 2 are connected by a kinematic mechanism comprising two connecting rods 3 and 4 which are pivotably hinged at 5, 6 and 7 to the two sections 1 and 2 and to one another and a double-acting hydraulic cylinder-piston unit 8, the cylinder of which is pivotably hinged at the closed end at 9 to a lug 1A of the section 1 and the piston of which is pivotably hinged at 10 with its outer end to the connecting rod 3, so as to control the movement of the section 2 with respect to the section 1. It is obvious from this figure that the maximum angle by which the section 2 is able to be rotated with respect to the section 1 does not exceed 280° (it is equivalent to about 270°), while the angular velocities at which the sections of the arm may be moved are not constant, but continuously variable, since the angles of relative movement of the sections are not proportional to the stroke of the cylinder.

[0011] According to the invention, these drawbacks - which result, as already mentioned, in the poor operational efficiency and safety and in particular in a degree of manoeuvrability and versatility far inferior to that which is desirable in the use of the concrete supply arms - are eliminated by performing the relative movement of the sections, in correspondence of at least some of the articulating joints of the arm, by means of actuator mechanisms consisting of a worm gear actuated by a hydraulic motor and applied in various ways, as illustrated in Figs. 2 to 10.

[0012] In the embodiment according to Figs. 2 and 3 of the invention, an internal actuator 13, in line with both the sections 11 and 12 of the arm, is used. The actuator

comprises a worm gear consisting of a worm screw housed in a casing 14 and of a wheel in engagement with said screw, housed inside a casing 15, the latter being located in a special seat 16 formed at the end of the section 11 of the arm. The casing 14 also houses a hydraulic motor which - suitably energised - causes rotation of the the worm screw of the actuator and produces the rotations, in either direction, of the associated wheel, moving the section 12 with respect to the section 11. The actuator also comprises preferably parking brake means so as to lock as securely as possible the two sections 11 and 12 in the desired position. It can be clearly seen that it is possible to exceed without difficulty, using this solution, an angle of movement of the section 12 with respect to the section 11 which is far greater than 280° and it is obvious that, by using the actuator 13, it is possible to achieve a constant angular velocity during the movement.

[0013] In the embodiment according to Figs. 4 and 5, the actuator 13 is again internal and in line with both the sections, but the rest position of the latter, which in the preceding case consisted in the elements resting on top of each other (section 12 folded underneath the section 11), in this case consists in the elements being aligned with each other, with the section 12 which is at rest being arranged aligned as a continuation of the section 11.

[0014] In the embodiment according to Figs. 6 and 7, on the other hand, the actuator 13 is again internal, but is in line with only one of the sections of the arm to be moved relative to one another, for example with the section 11. With this construction it is possible to obtain a continuous rotary movement of the section 12 with respect to the section 11 and the locking of the former with respect to the latter in any position over the entire angle of 360°.

[0015] In the embodiment according to Figs. 8 and 9 of the invention, an actuator 23 which is located outside both the sections 21 and 22 of the arm is used. The actuator comprises a worm screw housed in a casing 24 and a wheel in engagement with said screw, housed in a casing 25. The casing 24 also houses a hydraulic motor which - suitably energised - causes rotation of the worm screw of the actuator and produces rotations, in either direction, of the associated wheel, moving the section 22 with respect to the section 21. The actuator is arranged alongside the ends of the sections 21 and 22 which are articulated with one another and is connected to the section 21 by an anti-torsional bar 21A and to the section 22 by the output shaft moved by the wheel housed inside the casing 25. In this case, also, the actuator preferably comprises locking brake means, so as to lock as securely as possible the two sections 21 and 22 in the desired position. In this case also it is possible to exceed, without difficulty, an angle of movement of the section 22 with respect to the section 21 which is far greater than 280° with a constant angular-velocity movement.

[0016] Fig. 10 illustrates a possible construction of an actuator 30 to be applied to any one of the embodiments according to Figs. 2 and 9 of the concrete supply arm according to the invention. The actuator illustrated comprises, inside a casing 31 to be associated with the arm by means of the lug 31A, a transmission consisting of a worm screw 32 and of a wheel 33 housed respectively in the parts 34 and 35 of the casing 31, with which there are also associated an orbital hydraulic motor 36, which causes rotation, whenever suitably energised, of the worm screw 32 and a lamellar brake 37 intended to lock in the desired position the shaft of the screw 32 and hence the two sections of the arm on the articulating joint of which the actuator 30 is mounted.

[0017] It is understood that the construction of the concrete supply arm according to the invention may differ from those described and illustrated. In particular different actuators may be used, being differently driven or differently arranged with respect to that described, without thereby departing from the protective scope of the invention.

Claims

1. Concrete supply arm - to be mounted in particular on vehicle-transported concrete pumps - having several sections and articulating joints between said sections, characterized in that the relative movement of the sections is performed, in correspondence of at least some of the articulating joints of the arm, by means of actuator mechanisms consisting of a worm gear actuated by a hydraulic motor.

2. Arm as claimed in Claim 1, in which said actuators also comprise a locking brake.

3. Arm as claimed in Claims 1 and 2, in which said locking brake is a lamellar brake associated with the actuator mechanism.

4. Arm as claimed in Claims 1 to 3, in which said hydraulic motor is an orbital motor.

5. Arm as claimed in Claims 1 to 4, in which the relative movement of the sections is performed by means of actuator mechanisms consisting of a worm gear actuated by a hydraulic motor only in correspondence of the articulating joints close to the delivery end of the arm.

6. Arm as claimed in Claim 3, in which the relative movement of the sections is performed by means of actuator mechanisms consisting of a worm gear actuated by a hydraulic motor only in correspondence of the last articulating joint close to the delivery end of the arm.

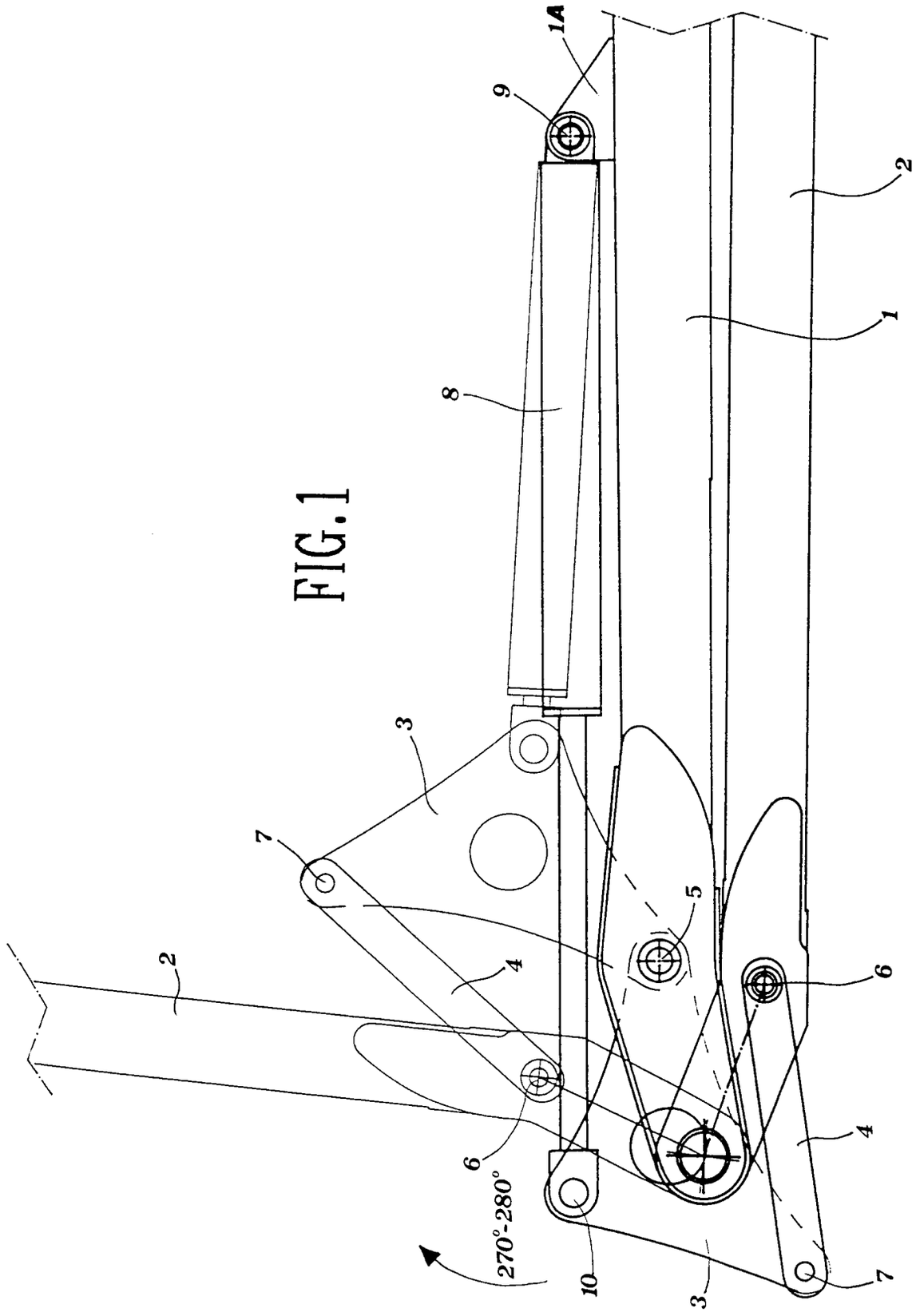

FIG.1

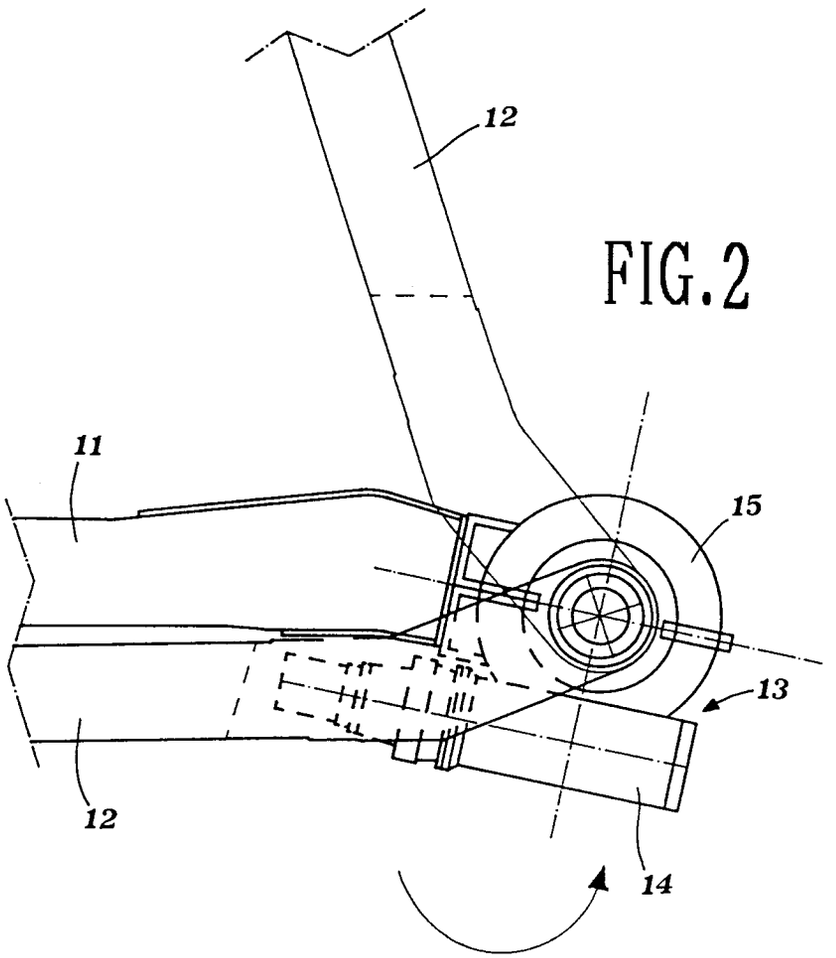

FIG.2

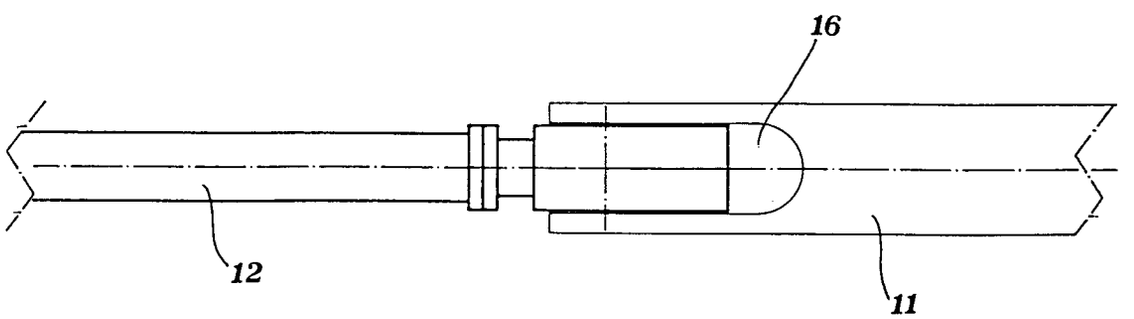

FIG.3

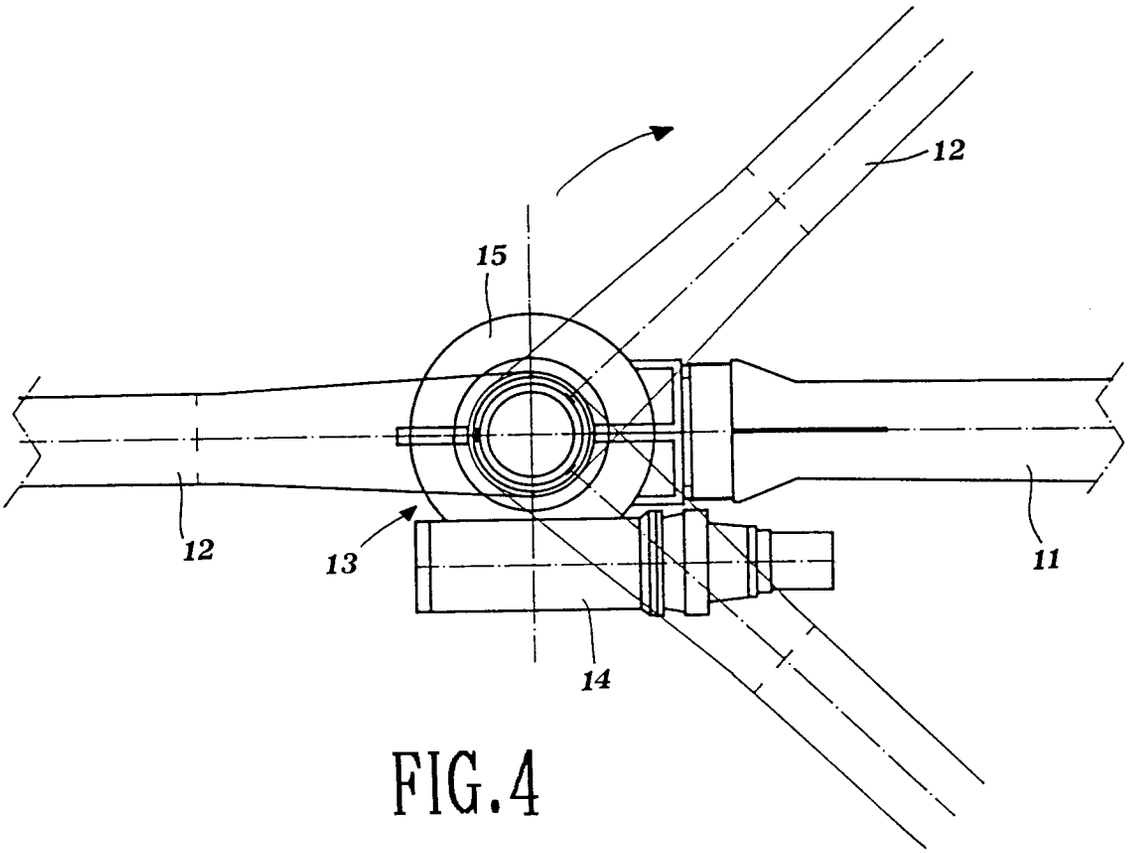

FIG.4

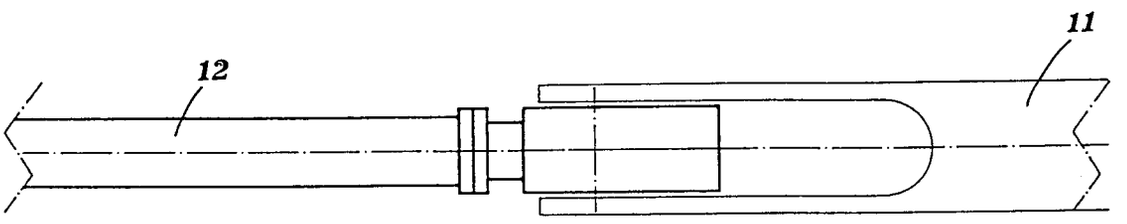

FIG.5

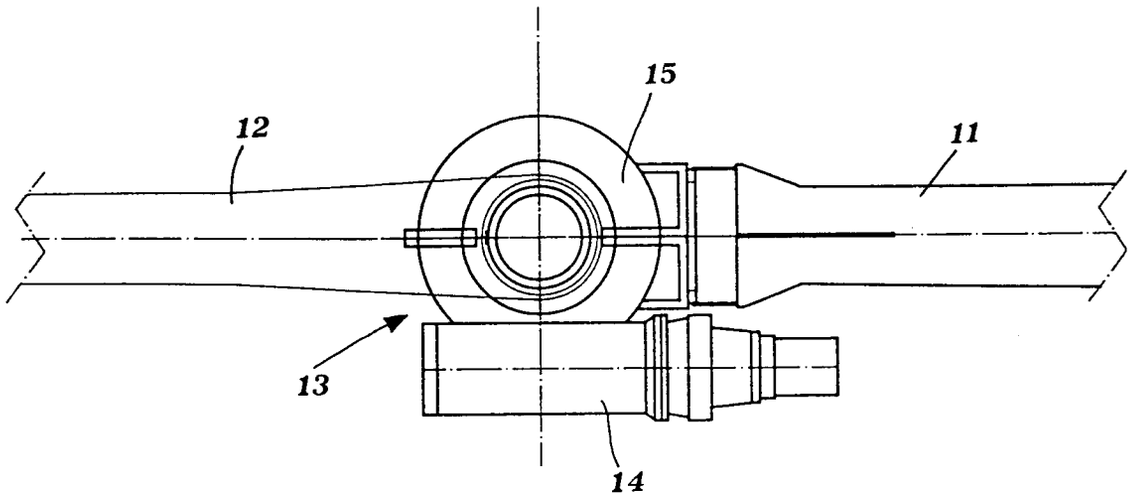

FIG.6

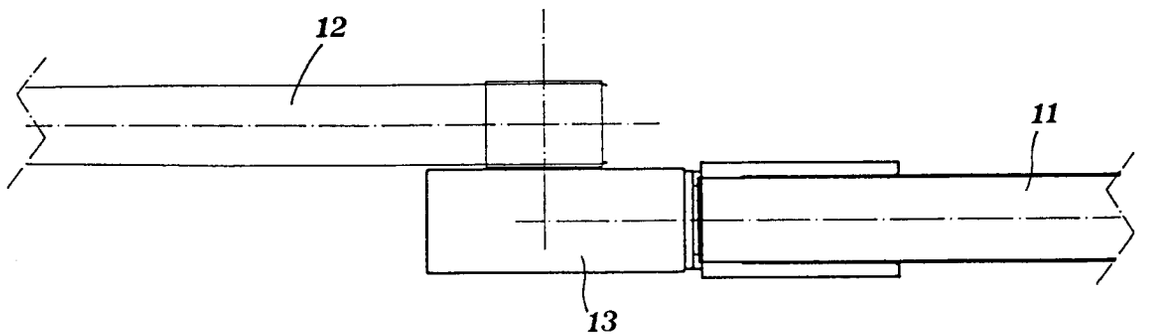

FIG.7

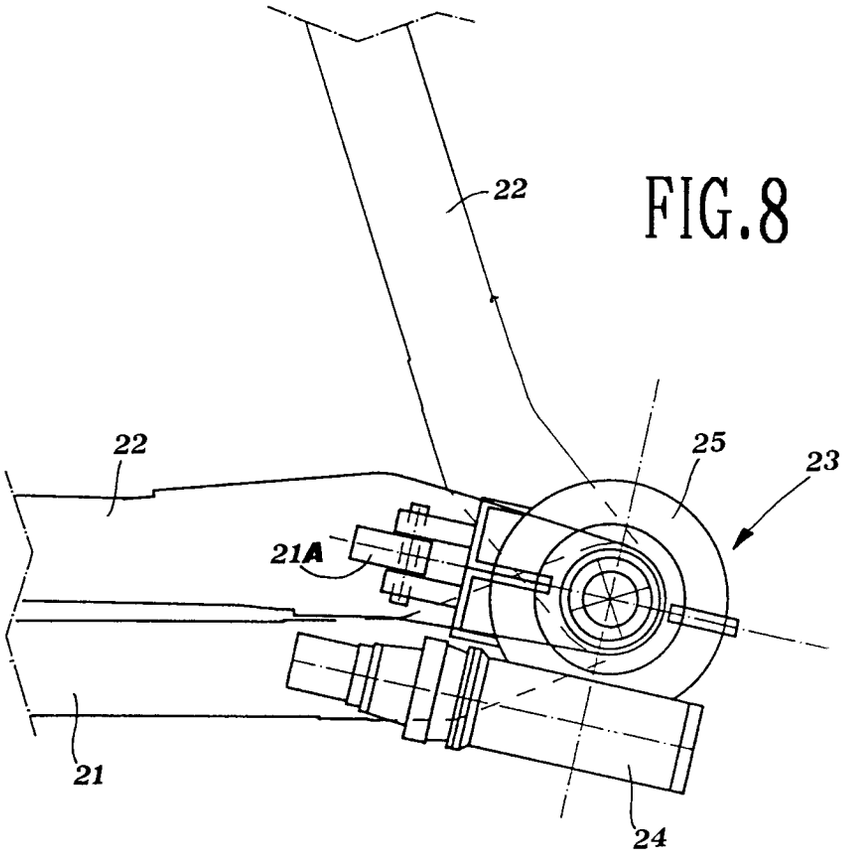

FIG.8

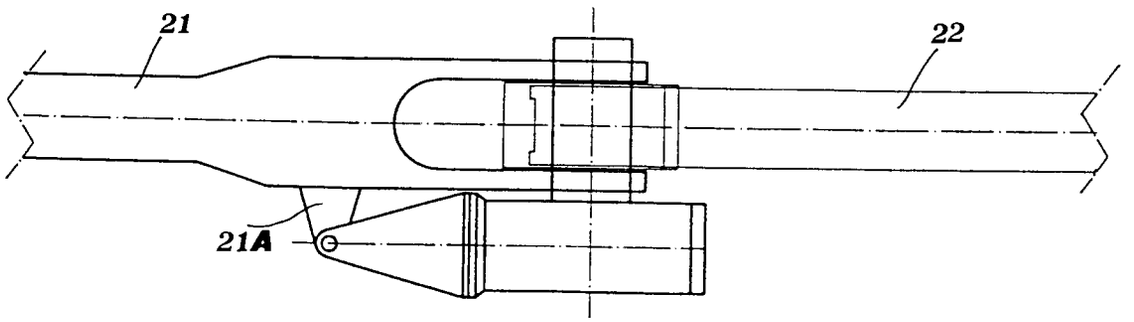

FIG.9

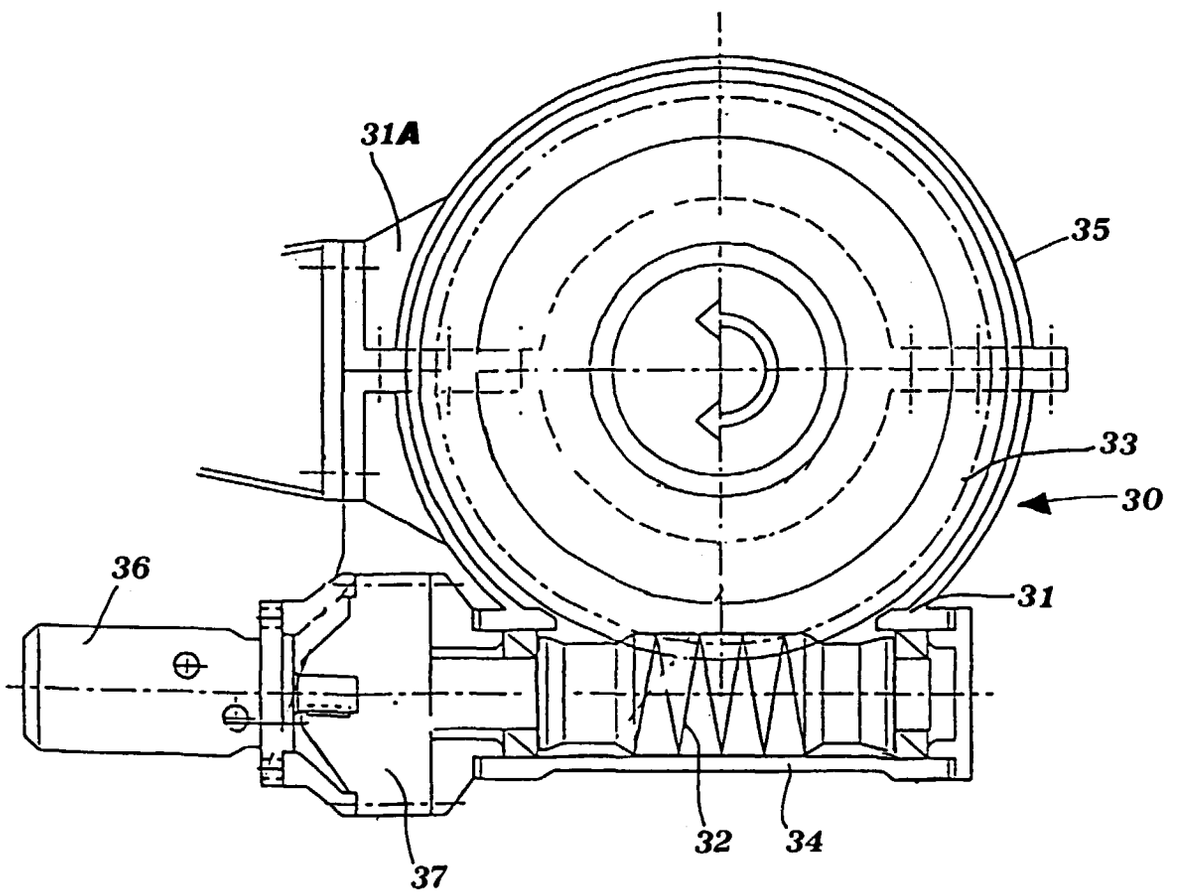

FIG.10

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EUROPEAN SEARCH REPORT

Application Number
EP 98 10 1317

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.6)
Y	GB 2 132 676 A (TAKENAKA KOMUTEN CO.) 11 July 1984 * page 2, line 16 - line 113; claims; figures *	1,5,6	E04G21/04
Y	US 3 572 380 A (JACKSON) 23 March 1971 * column 2, line 29 - column 3, line 47; claims; figures *	1,5,6	
A	DE 17 59 404 A (SCHWING) 23 September 1971		

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

E04G

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	5 November 1998	Vijverman, W

CATEGORY OF CITED DOCUMENTS

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