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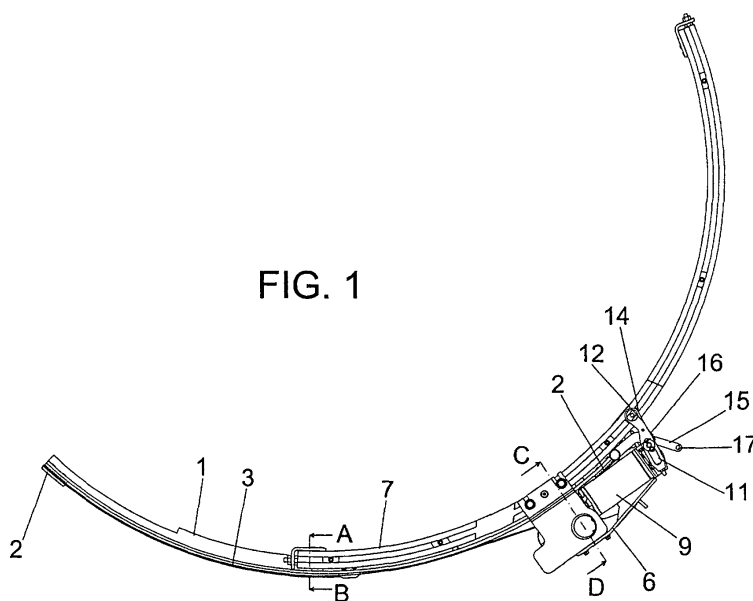
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(54) **MECHANISM FOR ACTUATING SLIDING DOORS**

(57) It comprises a carriage (1), meant to be attached to one of the edges of the door and following the same trajectory as it, which carriage may travel by means of rollers along a support rail (7), which incorporates, suitably attached to its ends, the ends of a toothed belt (3) which passes through a set of rolls (4-5-5') mounted on a support (6) that is joined to the support rail (7), one of which rolls (4) receives the motion of an electric motor (9) which is also mounted on the support

(6), so that a rotation in one sense of the rotor of the motor (9) will cause a motion in one sense of the carriage (1), and therefore of the door connected to it, and vice versa. A movable arm (12) mounted on the support (6) causes the door to lock in its final closed position, as it locks in a housing (14) of the carriage (1), which carriage can be released from this locked position automatically by the rotation of the stator of the motor (9), or manually with the aid of a cam (15), both of which act on the arm (12).

FIG. 1



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Description

OBJECT OF THE INVENTION

[0001] The present invention relates to a mechanism specifically designed to mobilise sliding doors, and particularly well suited for use in railroad car doors, but also useful in any other situation in which a sliding door must be operated remotely, both for opening or closing it, which also requires a closed position that is stable against manual and unauthorised operations on said door, but allows a manual actuation in an emergency situation, such as in the event of a power failure of the motor or a failure in the motor itself.

BACKGROUND OF THE INVENTION

[0002] Within the preferred scope of application of the invention, that of railroad cars and the like, the use of sliding doors is known, in some cases with hydraulic or pneumatic drive systems and in others with electrical drive systems.

[0003] In this last sense are known sliding doors which are provided with a rack, on which through a suitable gear acts the shaft of an electric motor which, aided by ends of stroke generates the specific required motions for moving the door.

[0004] This type of transmission is excessively rigid, so that it is the motor itself in a resting situation which operates simultaneously as a locking element for the door both when it is open and closed, so that in the event of a power failure the door is immobilised in whichever position it may be, and it is necessary to resort to complex and expensive mechanisms to manually uncouple it and, for example, open the door such as in an emergency situation.

DESCRIPTION OF THE INVENTION

[0005] The mechanism taught by the invention belongs to the type which employ an electric motor as the driving means and solves the aforementioned problems to a full satisfaction, so that by means of a simple and effective structure it allows in addition to an optimal opening and closing of the door, to perfectly lock it in its closed position and the possibility of a manual opening in an extremely simple and quick manner, such as by actuating a simple handle suitably provided for such purpose.

[0006] For this purpose and more specifically, the mechanism disclosed comprises a carriage which is attached to one of the edges of the door, preferably to its top edge, which carriage slides along a support rail with suitable rolling means such as adequately distributed rollers, and which carriage incorporates joined to its ends a toothed belt which passes through a set of three rolls, one of which is a drive roll and the other two tension rolls, with all three mounted on a support fixed on the

aforementioned support rail, and as the latter joined to the fixed structure of the railroad car, with the drive roll receiving the motion in either sense for the longitudinal displacement of the door, also in either sense, by means of a motor also mounted on the support, all of this so that the actuation of said motor results in a longitudinal displacement of the toothed belt on the aforementioned support with the resulting and parallel displacement of the door connected to it.

[0007] In accordance with the characteristics of the invention, the motor stator is mounted so that it is free to rotate on said support and is provided with an actuator that moves within a slit of an arm which ends in a roller, with this roller capable of inserting in a housing previously established for this purpose in the carriage, causing the automatic locking of said carriage when it and the associated door reach the closed position, and so that in this end position the door cannot be manually opened as it is locked on the support; this situation is automatically changed to an unlocked position when the electric motor is actuated, as when its rotor is locked its stator turns and thereby acts through its actuator on the aforementioned arm, extracting the operational end of the arm from its housing and unlocking the carriage, so that the rotor is also released and may carry out the opening manoeuvre.

[0008] Finally, and in accordance with another characteristic of the invention, together with the aforementioned actuator associated to the motor stator is a cam which can also carry the arm to its unlocked position. This cam is mounted so that it may swivel on the support and can be actuated against the action of a spring from any suitable position, such as with a handle connected to the cam by a transmission cable, which handle only maintains the door unlocked while it is actuated, so that the door itself must be simultaneously acted upon in order to open it manually.

DESCRIPTION OF THE DRAWINGS

[0009] The present description of the invention and the characteristics thereof will be made clearer in view of the accompanying drawings of a preferred embodiment, where for purposes of illustration only and not meant as a definition of the limits of the invention the following is shown:

Figure 1 shows a schematic plan view of a sliding door provided with the door driving mechanism which is the object of the present invention.

Figure 2 shows, also in a plan view, a partial and enlarged detail of the previous figure.

Figure 3 shows a cross sectional detail of the assembly of Figure 1, along the line A-B of said figure.

Figure 4 shows a further cross sectional detail of

the assembly of Figure 1, now along the line C-D of said figure.

Figure 5 shows, finally, a plan view detail of the support for the motor assembly, without the cover, so that the position of the drive and tension rolls can be seen clearly.

PREFERRED EMBODIMENT OF THE INVENTION

[0010] In view of the aforementioned figures the door driving mechanism disclosed by the invention can be seen to comprise a carriage (1), which in the chosen embodiment follows a curved configuration, as it is designed for a circular door, but which may have a straight configuration when provided for a straight door, and which may be also coupled to a horizontal or vertical edge of the door depending on the type of drive intended, which carriage (1) in any case and with the aid of end bindings (2) receives and is joined to the ends of a toothed belt (3) which in its path, which is clearly parallel to that of the carriage (1), passes through a set of three rolls, specifically a drive roll (4) toothed in correspondence with the belt and a pair of tension rolls (5-5') which define bends in the path of the toothed belt (3) to achieve a full adaptation of this path to the drive roller (4) and thereby ideal transmission conditions, as can be seen in Figure 5.

[0011] These rolls (4) and (5) are mounted on a support (6) which is in turn joined to a support rail (7) that, having the same configuration as the carriage (1), that is curved in the embodiment example shown in the figures or straight in other cases, allows the motion of the carriage (1) suspended from it by rollers (8) preferably aided by bearings.

[0012] The drive roll (4) receives the motion from a drive unit (9) which includes an electric motor, also mounted on the support (6) so that the rotation in one sense of the aforementioned motor (9) causes the motion of the door associated to the carriage (1) in one sense, and vice versa.

[0013] The motor (9) is mounted on the support (6) so that its stator, also corresponding to the label (9), can turn about its rotor when the latter is locked, with said stator (9) being provided with an actuator (10) which through a slit (11) made in the arm (12) acts on this arm (12), which is in turn provided in its free end with a roller (13) on which slides the carriage (1), but with this carriage having a housing (14) which is operationally placed opposite the arm (12) in the end closed position of the door, in which position the roller (13) and therefore the end of the arm (12) locks in the housing (14), blocking the mechanism and therefore preventing a manual opening of the door. However, this locked position is released automatically when the motor (9) is actuated as since its rotor is immobilised in this position by the toothed roll (4) the stator (9) will rotate, so that the actuator (10) associated to the latter will pull axially on the

arm (12), releasing it from the carriage (1), at which time the motor rotor is released and the door opening operation begins.

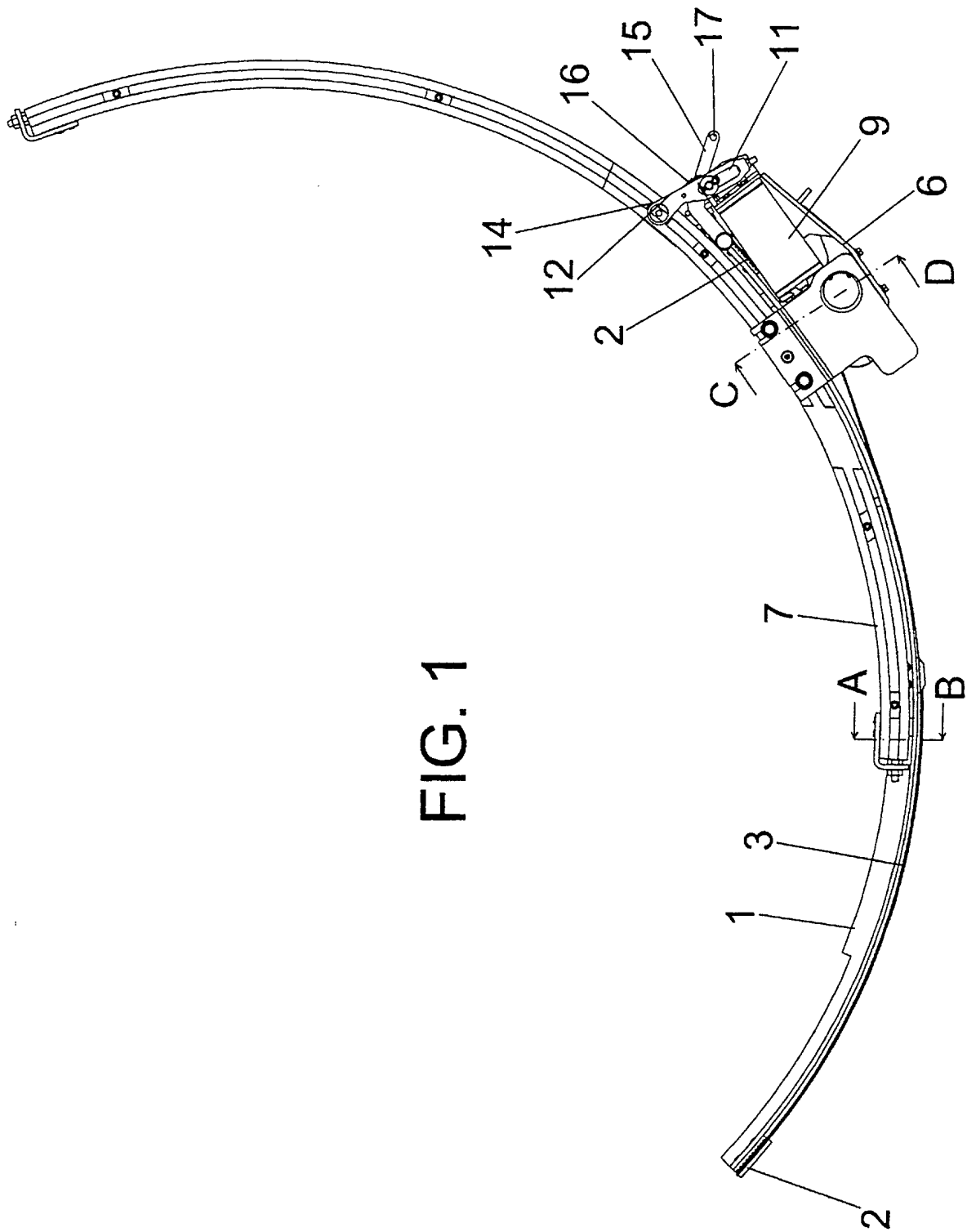
[0014] Furthermore, this unlocking operation may be performed manually, such as in an emergency situation in which the motor (9) has lost its power supply, for which the actuator (10) associated to the stator of the motor (9) is connected to a cam (15) mounted so that it may swivel on the support (6) and which may be moved towards the actuator (10) against the action of a spring (16), so that the cam (15) can longitudinally displace the arm (12) towards its unlocked position when its free end (17) is acted upon by any suitable means, such as with the aid of a cable and a handle operationally established for such purpose.

Claims

1. Driving mechanism for sliding doors, particularly applicable to railroad cars and other cases which require an automatic and remote operation of the doors and a locked position of the closed door, of the type which incorporate as the driving means an electric motor, **characterised in that** it comprises a carriage (1) meant to be attached to one of the edges of the door which is to be mobilised, and with a configuration in accordance with the shape of the edge of said door, which carriage (1) by means of rollers (8) can travel along a support rail (7), which has a like configuration and is suitably joined to the fixed part of the railroad car on which the door must slide, having the special characteristic that fixed to the ends of said carriage (1) are the ends of a toothed belt (3) which follows the same path as the carriage and which passes through a set of rolls (4-5-5') operationally established on a support (6) that is suitably joined to the support rail (7), so that one of these rolls (4) is a drive roll which receives the motion from a motor unit (9) mounted on said support (6), while the other two rolls (5-5') act as tensioning means for the toothed belt (3).
2. Driving mechanism for sliding doors, as claimed in claim 1, **characterised in that** on the support (6), in correspondence with the end of the motor (9) opposite the area where the rollers (4-5) are provided, is mounted an arm (12) which ends in a roller (13) that may travel along the lateral surface of the carriage (1) and which by the action of a spring (16) tends to move towards a locked position inside a housing (14) that is operationally provided in said carriage, which is left opposite the roller (13) in the end closed position of the door, resulting in an automatic locking of said door when this position is reached.
3. Driving mechanism for sliding doors, as claimed in

claim 2, **characterised in that** the stator (9) of the electric motor is mounted so that it may swivel about the support (6) and incorporates an actuator (10) that moves within a slit (11) of the arm (12), so that when the door opening operation begins, that is, when the electric motor (9) is powered and as its rotor is locked by the drive roll (4), the stator of the motor (9) will turn and the arm (12) will move longitudinally towards its unlocked position by means of the aforementioned actuator (10).

4. Driving mechanism for sliding doors, as claimed in claims 2 and 3, **characterised in that** on the support (6) is mounted a cam (15) so that it may swivel, which can be manually actuated by any suitable means against the action of the spring (16), which cam (15) acts on the actuator (10) associated to the stator of the motor (9) and therefore on the arm (12) itself, in order to release it in the event of a failure of the electric motor (9) .



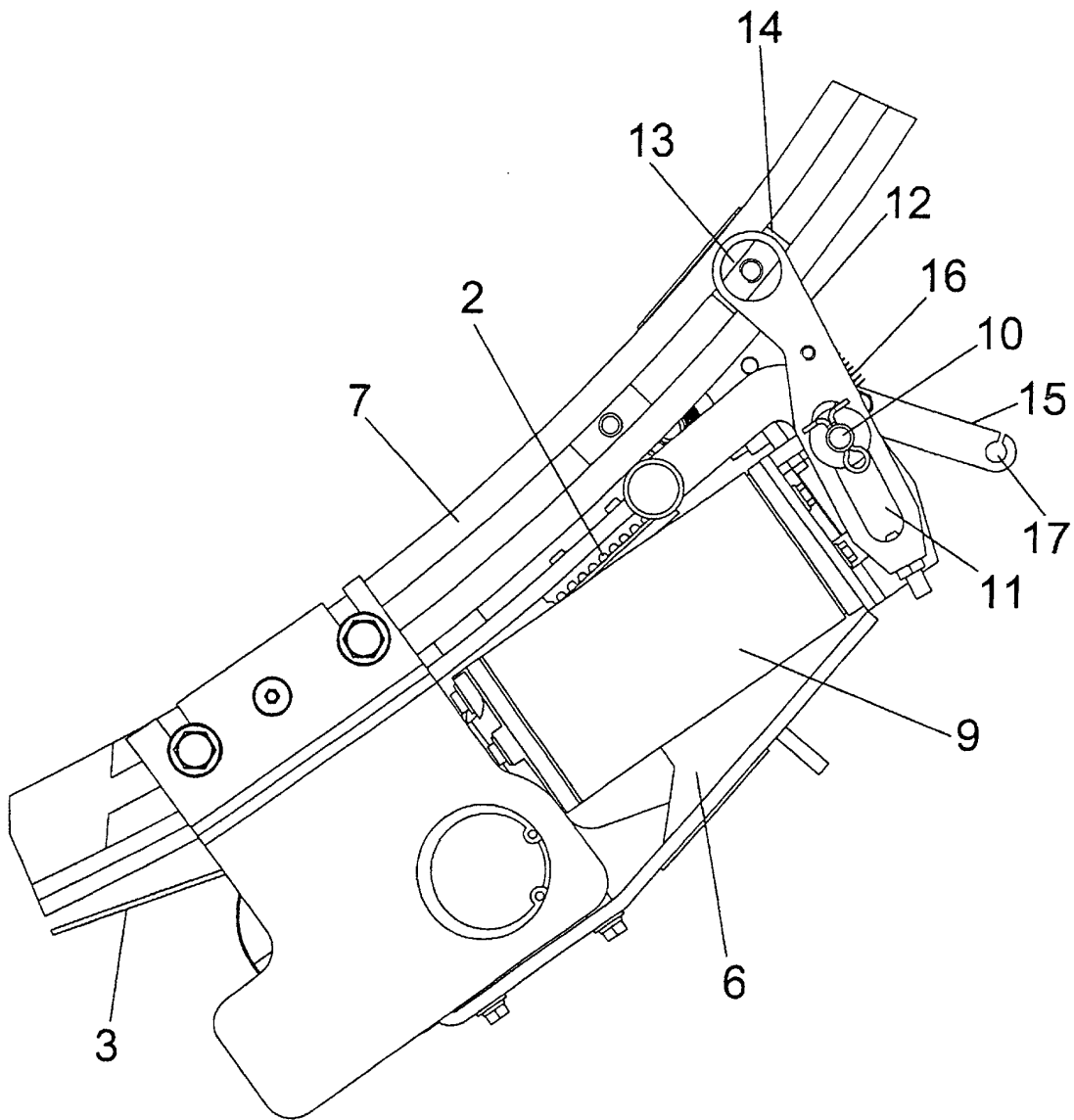


FIG. 2

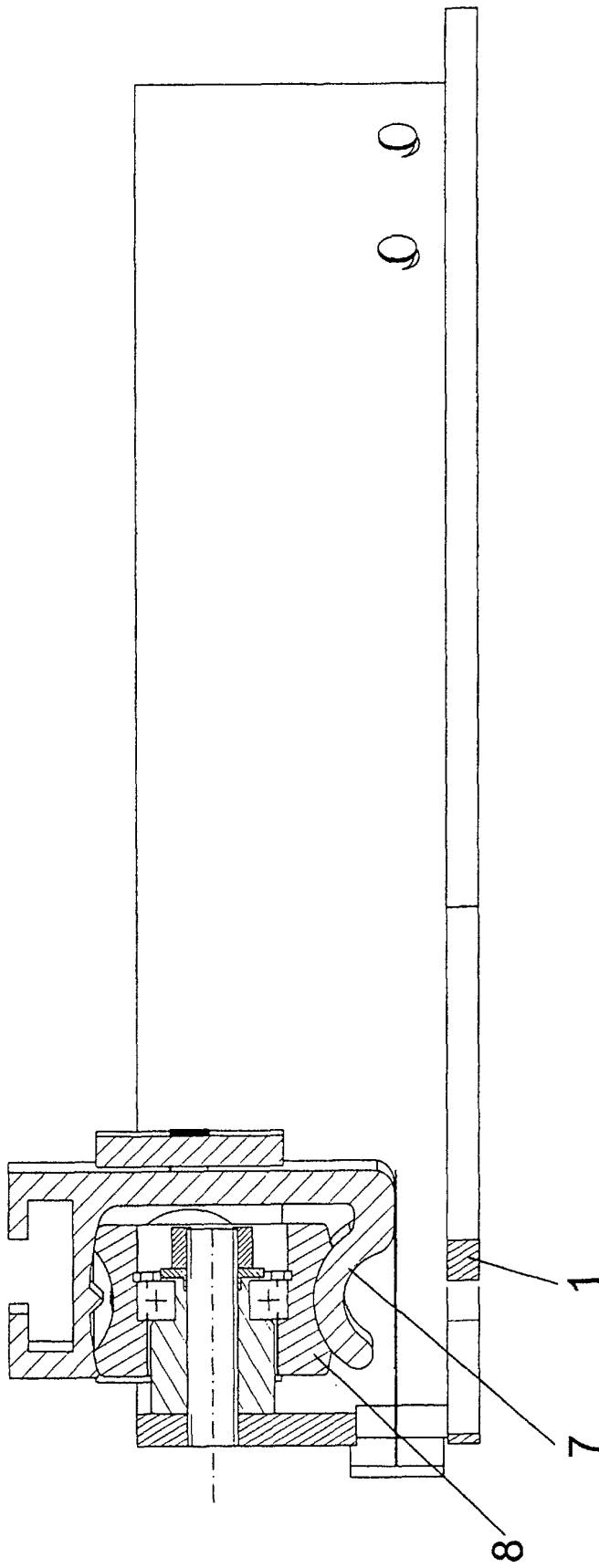
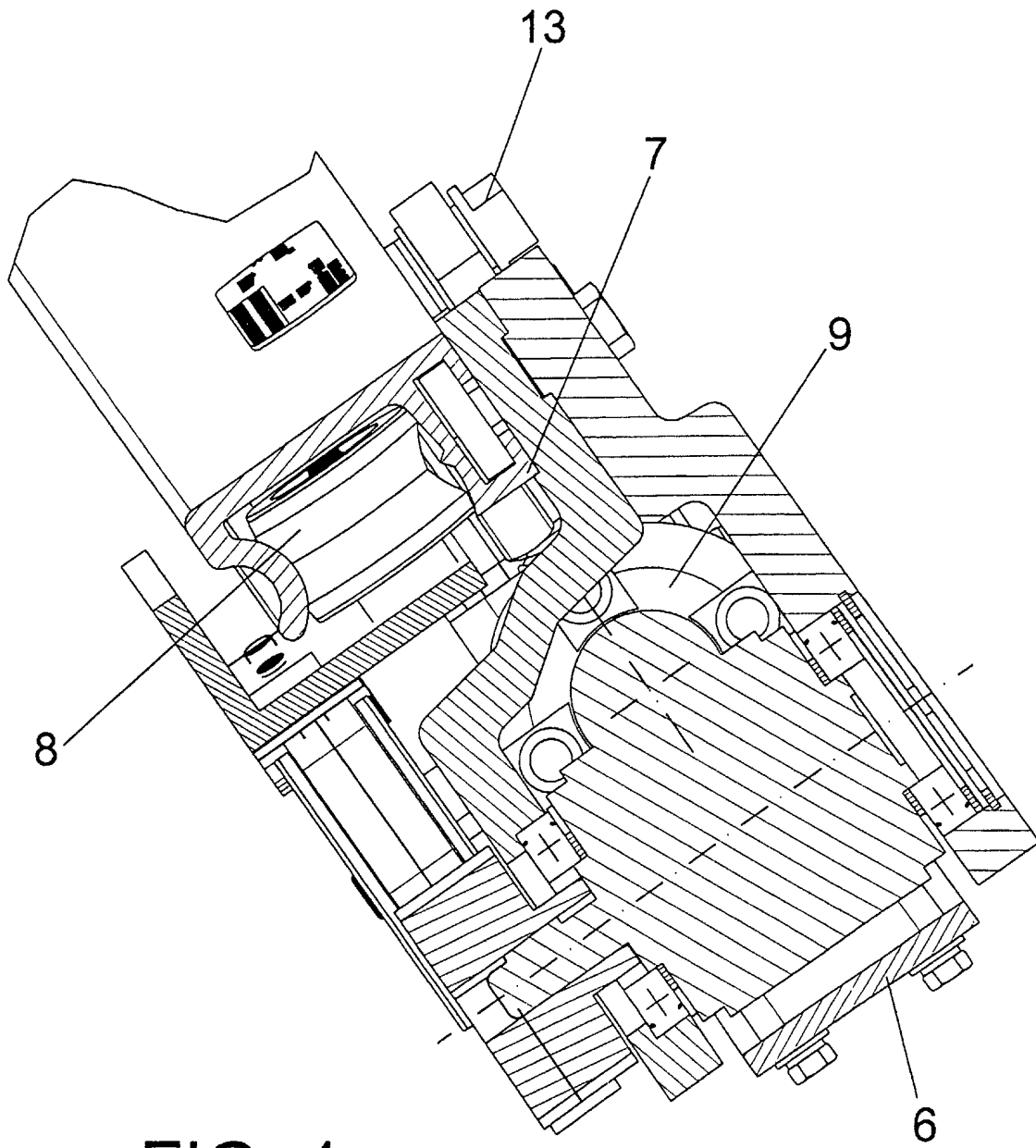


FIG. 3
A-B



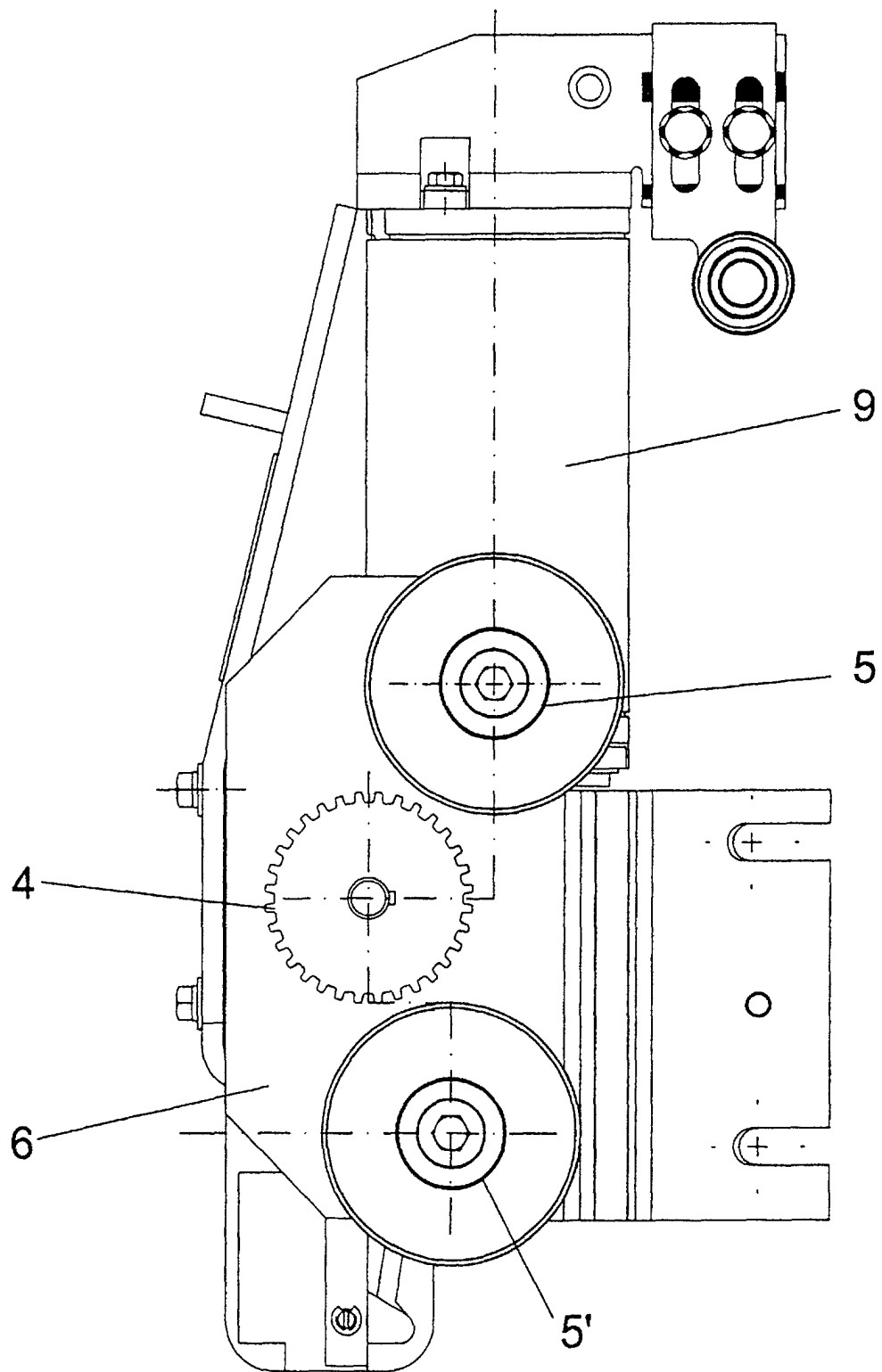


FIG. 5

INTERNATIONAL SEARCH REPORT

International application No.
PCT/ ES 00/00183

A. CLASSIFICATION OF SUBJECT MATTER IPC 7 :E05F15/14 ; B61D19/00 ;B61D19/02 According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols) IPC 7 :E05F ; B61D		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practical, search terms used) REGISTRY, HCAPLUS, BEILSTEIN, SITADIX, CIBEPAT, EPODOC, WPI		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 19626934 A (DORMA GmbH & Co) 22 January 1998, (22.01.1998), the whole document.	1
A	GB 2201192 A (Westinghouse Brake and Signal Company Ltd) 24 August 1988 (24.08.1988), the whole document.	1-3
A	GB 1080573 A (G.D Peters & Co) 23 August 1967 (23.08.1967), the whole document.	1-3
A	GB 616461 A (C.A.V. Limited) 21 January 1947 (21.01.1947), the whole document	1-3
☐ Further documents are listed in the continuation of box C. ☐ Patent family members are listed in annex.		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 5 August 2001 (05.08.2001)		Date of mailing of the international search report 18 August 2001 (18.08.2001)
Name and mailing address of the ISA/ SPTO		Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International Application No
PCT/ ES00/00183

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 19626934 A	22.01.1998	NONE	
GB 2201192 A	24.08.1988	NONE	
GB 1080573 A	23.08.1967	NONE	
GB 616461 A	21.01.1947	NONE	

Form PCT/ISA/210 (patent family annex) (July 1992)