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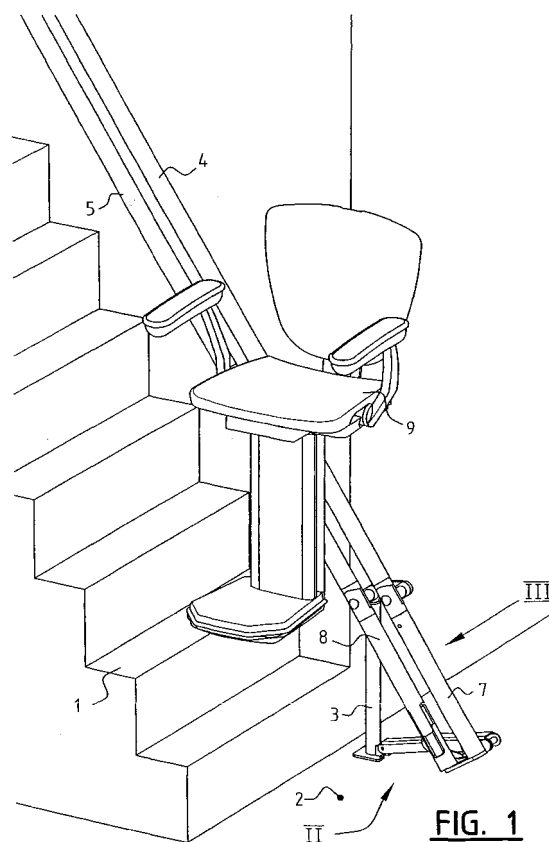
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(54) **Railsystem for a staircase elevator with movable rail portion**

(57) A rail system for a staircase elevator, which rail system comprises a rail to be fixedly mounted with respect to a staircase and a movable rail portion, which can be mounted above a floor near the bottom side of the staircase, which rail portion is pivot-mounted at its upper side, in such a manner that the rail portion can be pivoted from a first position, in which the rail portion extends in line with the fixed rail, almost to the floor level, to a second downward, substantially vertical position, during which movement the rail portion can telescope.



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Description

[0001] The invention relates to a rail system for a staircase elevator, which rail system comprises a rail to be fixedly mounted with respect to a staircase and a movable rail portion, which can be mounted above a floor near the bottom side of the staircase. A system of this type is known from NL-A-1002392.

[0002] A staircase elevator comprising such a rail system may be provided with an elevator in the form of a chair, on which a disabled person can move up and down along a staircase in a seated position. In order to be able to move such an elevator to a position near the floor at the bottom side of the staircase, it is necessary for the rail of the rail system to extend beyond said staircase, and that above said floor, at the bottom side of the staircase.

[0003] The rail of such a rail system may obstruct the passage at the bottom side of the staircase or be in the way in any other manner, and consequently it is customary to embody the lower end of the rail as a rail portion that can be swung or moved aside. Said swinging or moving aside may take place in upward or in lateral direction, for example in the manner described in EP-B-04008716, or in rearward direction, for example as described in NL-A-1002392.

[0004] The drawback of the aforesaid solutions is that they either require a great deal of free space or that they constitute a complex and/or costly solution to the problem as described above. The object of the invention is to provide an inexpensive, efficient and user-friendly rail system, in which the movable rail portion can be efficiently moved to a position in which it does not obstruct the way.

[0005] In order to accomplish that object, the rail portion is pivot-mounted at its upper side, in such a manner that the rail portion can be pivoted from a first position, in which the rail portion extends in line with the fixed rail, almost to the floor level, to a second downward, substantially vertical position, during which movement the rail portion can telescope. The use of a telescopic rail portion enables easy pivoting of the rail portion in downward direction, without the rail portion striking against the floor.

[0006] Preferably, the rail portion comprises two extensible tube members of substantially identical cross-section, which tube members are provided at the facing ends thereof with tube portions capable of longitudinal sliding movement past one another, which jointly form a substantially complete tube surface in the telescoped position. In the extended position, the tube surface that is formed at the connection between the tube members in this way is not complete, to be true, but it offers sufficient support for guiding the elevator chair.

[0007] Preferably, the rail portion is provided with an actuator capable of telescoping the rail portion in and/or out and/or of pivoting the rail portion. Preferably, said actuator is electrically operated. In the embodiments to

be described below, the specific construction thereof enables pivoting of the rail portion as a result of the rail portion being telescoped in or out by the actuator.

[0008] In a preferred embodiment, the rail system comprises a second rail to be fixedly mounted with respect to the staircase and a second rail portion, which can be pivot-mounted above the floor near the bottom side of the staircase, which rail and which rail portion are mounted above the first rail and the first rail portion, substantially parallel thereto, with the two rail portions being rigidly interconnected near their ends. Many staircase elevators have such a double rail system, and the invention aims to provide a solution for such a system as well. The advantage of this construction is that the two rail portions are pivoted about their respective pivot axes by operating the aforesaid actuator by means of which the lower rail portion is telescoped in and out.

[0009] Preferably, the system comprises a connecting element which is pivotally connected to one of the pivotable rail portions, near the lower end thereof, on the one hand and which can be connected to a fixed point of the surrounding structure on the other hand. A pivotable connecting element is a simple construction for guiding the lower end of a rail portion.

[0010] In the first preferred embodiment, the connecting element comprises a first portion and a second portion, which portions are pivotally interconnected, wherein the end of the first portion is pivotally connected to the rail portion and the end of the second portion can be pivotally connected to the surrounding structure. In a second preferred embodiment, a first end of the connecting element is pivotally connected to the rail portion, and the system comprises a rod that is fixedly connected to the surrounding structure, to which rod the second end of the connecting element is connected, in such a manner that the second end is capable of movement along said rod. The connecting element is preferably connected to spring means, which are capable of urging the rail portion to the first position. In this way a counterpressure is at least partially provided against the force of gravity that urges the rail portion towards the second position. In this way, the aforesaid actuator needs to exert less force.

[0011] The invention also relates to a method for moving a rail portion of a rail system for a staircase elevator, which rail portion is mounted above a floor near the bottom side of the staircase, wherein the rail portion is pivot-mounted at its upper side, being pivoted from a first position, in which the rail portion extends in line with a rail that is fixedly mounted with respect to the staircase, almost reaching the floor, to a second downward, substantially downward position, during which movement the rail portion is telescoped.

[0012] The invention will now be explained in more detail by means of embodiments illustrated in the figures, in which:

Fig. 1 is a perspective view of a staircase elevator

with a rail system;

Fig. 2 is a perspective front view of a first embodiment of the lower part of the rail system;

Figs. 3A and 3B are perspective rear views of the rail system of Fig. 2, showing the rail system in two different positions thereof;

Fig. 4 is a perspective bottom plan view of a detail of the rail system of Fig. 2;

Figs. 5A and 5B are perspective rear views of a second embodiment of the lower part of a rail system, showing two different positions thereof; and

Figs. 6A and 6B are partially cut-away front views of the rail system of Figs. 5A and 5B.

[0013] The figures are merely schematic representations of the embodiments, in which like parts are indicated by the same numerals.

[0014] Fig. 1 shows a staircase elevator comprising steps 1 and a floor 2 at the bottom side. A rail of the rail system is mounted at the side of the staircase, for example near a wall along which the staircase is installed, by means of posts 3. The rail may also be directly attached to the wall. The lowermost post 3 is supported on the floor 2.

[0015] Mounted along the staircase is a fixed rail, which comprises an upper fixed tube 4 and a lower fixed tube 5. The two tubes are engaged by guide wheels of the elevator chair 9, with the tubes 4, 5 serving to guide the elevator chair 9 along the staircase as well as to maintain the elevator chair in a fixed vertical position. A rack (not shown) is mounted along the lower tube 5, which rack is capable of meshing with a driven gear of the elevator chair 9, thus enabling the elevator chair 9 to move along the rail. The manner in which the elevator chair 9 moves along the rail is not elaborated in the present description.

[0016] Near the bottom side of the staircase, the rail system is furthermore provided with a movable rail portion comprising an upper tube 7 and a lower tube 8, which lower tube 8 is likewise fitted with the aforesaid rack. As Fig. 1 shows, said lower rail portion extends from the staircase above the floor 2, which is undesirable in practice, since there is often little space available. When the elevator is not in use said lower rail portion can be pivoted down to a vertical position, therefore, so that said portion extends along the lowermost post 3. A problem that would occur if no further measures were taken is that the end of the lower tube 8 striking against the floor 2, as a result of which the rail portion cannot be completely pivoted to the vertical position.

[0017] Figs. 2, 3A and 3B show a first embodiment of the movable rail portion. The upper tube 7 is pivot-mounted to the post 3. The lower tube 8 can be tele-

scoped, and comprises an upper tube portion 8a, which is likewise pivot-mounted to the post 3, and a lower tube portion 8b. The upper pivot-mounted ends of the tubes 7, 8 are each semicircular in shape, as are the complementary lower pivot-mounted ends of the tubes 4, 5, jointly forming continuous round tube guides in the extended position.

[0018] At their facing ends, the two tube portions 8a, 8b are provided with two longitudinally extending tube segments 81a, 81b, which each take up a quarter of the circumference of the tube, which engage each other and which can be slid one into another along their entire length. In the extended position as shown in Figs. 2 and 3A, the tube 8 thus exhibits openings in its surface, but they do not stand in the way of providing sufficient support and grip on the tube for the guide wheels of the elevator chair 9. The lower tube portion 8b is fixedly connected to the upper movable tube 7 by means of a connecting element 10.

[0019] In order to maintain the movable rail portion in the illustrated extended position when the elevator chair 9 is supported thereon, the end of the rail portion is connected to the base of the post 3 by means of an articulated arm 11. The articulated arm 11 comprises two arm portions 11a, 11b consisting of two U-shaped sections, whose ends fit into each other and which are pivotally interconnected in such a manner that the arm portions can only pivot in one direction from the extended position. The end of the arm portion 11a is pivotally connected to the post 3 and the end of the arm portion 11b is pivotally connected to the end of the upper tube 7.

[0020] In the extended position, the arm portions 11a, 11b are preferably slightly "overextended", so that the arm 11 is locked in this position by the pushing force that is exerted by the movable rail portion. The arm 11 can be pushed out of the locked position and the movable rail portion can be pivoted downwards by exerting an upward force on the pivot point between the two arm portions 11a, 11b, for example, or by exerting a moment on one of the other pivot points.

[0021] Fig. 4 shows an extension spring 12 mounted in the pivot point between the two arm portions 11a, 11b, which extension spring is capable of urging the articulated arm 11 to the extended position, so that the force of gravity of the movable rail portion is slightly compensated and less force is required for pushing the rail portion to the extended position. Furthermore, the spring 12 functions to urge the articulated arm to the overstretched, locked position. The spring 12 also prevents the rail portion from smashing down due to the force of gravity when the articulated arm 11 is moved out of the overstretched, locked position.

[0022] A third arm portion 11c is pivotally connected to the arm portion 11b and can be moved by a pawl 13 of an electrically operated actuator 14 that is mounted in the tube 8. Said arm portion pushes against a pawl on the side of the arm portion 11b, as a result of which the arm 11 is pushed out of the locked, overstretched

position. The actuator 14 is shown in more detail in Figs. 6A and 6B.

[0023] Figs. 5A, 5B, 6A and 6B show a second embodiment of the movable rail portion. Figs. 5A and 5B show the adjoining rack portions 6, which are mounted on the lower tube 5 and the tube portion 8a and which have been left out of the other figures for the sake of simplicity. The length of the lower rack portion 6 is such that it extends to a level just above the floor 2 in the vertical position. Figs. 6A and 6B, in which the tube portion 8a is shown in cutaway view, furthermore show the electrically operated actuator 14, which is capable not only of moving the arm 11 but also of telescoping the two portions 8a, 8b of the telescopic tube 8 in and out.

[0024] In this embodiment, the arm 11 comprises a single section, which is pivot-mounted to the tube 7 on one side and to a guide unit 17, which can roll over the post 3 via guide wheels 15, 16, on the other side. In the lowermost position of the guide unit 14, in which the arm 11 includes an angle with the post 3, the arm 11 is locked in position by the pushing force of the movable rail portion, as in the previously described embodiment. Also in this case the actuator 14 can move the arm 11 out of the locked position by means of a pawl 13 and an arm portion 11c.

[0025] The actuator 14 inter alia comprises a motor, a reduction mechanism and a screwed spindle, and it is constructed in such a manner that the telescopic tube 8 is not telescoped until the pawl 13 has been moved so as to release the locking engagement of the arm 11. Conversely, the pawl 13 is not moved for locking the arm 11 in position until the telescopic tube 8 is fully extended.

[0026] The elevator chair 9 is secured in such a manner that it cannot be moved along the rail until the movable rail portion is in the extended position and the arm 11 is locked. This can be effected by means of a switch, for example.

[0027] Although the invention has been described herein by means of an embodiment in which the rail comprises two tubes, it is also possible to use the invention with staircase elevators in which the rail comprises only one tube or essentially one tube.

Claims

1. A rail system for a staircase elevator, which rail system comprises a rail to be fixedly mounted with respect to a staircase and a movable rail portion, which can be mounted above a floor near the bottom side of the staircase, which rail portion is pivot-mounted at its upper side, in such a manner that the rail portion can be pivoted from a first position, in which the rail portion extends in line with the fixed rail, almost to the floor level, to a second downward, substantially vertical position, during which movement the rail portion can telescope.

2. A rail system according to claim 1, wherein the rail portion comprises two extensible tube members of substantially identical cross-section, which tube members are provided at the facing ends thereof with tube portions capable of longitudinal sliding movement past one another, which jointly form a substantially complete tube surface in the telescoped position.

3. A rail system according to claim 1 or 2, wherein the rail portion is provided with an actuator capable of telescoping the rail portion in and/or out and/or of pivoting the rail portion.

4. A rail system according to claim 1, 2 or 3, wherein the rail system comprises a second rail to be fixedly mounted with respect to the staircase and a second rail portion, which can be pivot-mounted above the floor near the bottom side of the staircase, which rail and which rail portion are mounted above the first rail and the first rail portion, substantially parallel thereto, with the two rail portions being rigidly interconnected near their ends.

5. A rail system according to any one of the preceding claims 1 - 4, wherein the system comprises a connecting element which is pivotally connected to one of the pivotable rail portions, near the lower end thereof, on the one hand and which can be connected to a fixed point of the surrounding structure on the other hand.

6. A rail system according to claim 5, wherein the connecting element comprises a first portion and a second portion, which portions are pivotally interconnected, wherein the end of the first portion is pivotally connected to the rail portion and the end of the second portion can be pivotally connected to the surrounding structure.

7. A rail system according to claim 5, wherein a first end of the connecting element is pivotally connected to the rail portion, and the system comprises a rod that is fixedly connected to the surrounding structure, to which rod the second end of the connecting element is connected, in such a manner that said second end is capable of movement along said rod.

8. A rail system according to claim 5, 6 or 7, wherein the connecting element is connected to spring means, which are capable of urging the rail portion to the first position.

9. A method for moving a rail portion of a rail system for a staircase elevator, which rail portion is mounted above a floor near the bottom side of the staircase, wherein the rail portion is pivot-mounted at its

upper side, being pivoted from a first position, in which the rail portion extends in line with a rail that is fixedly mounted with respect to the staircase, almost reaching the floor, to a second downward, substantially downward position, during which movement the rail portion is telescoped. 5

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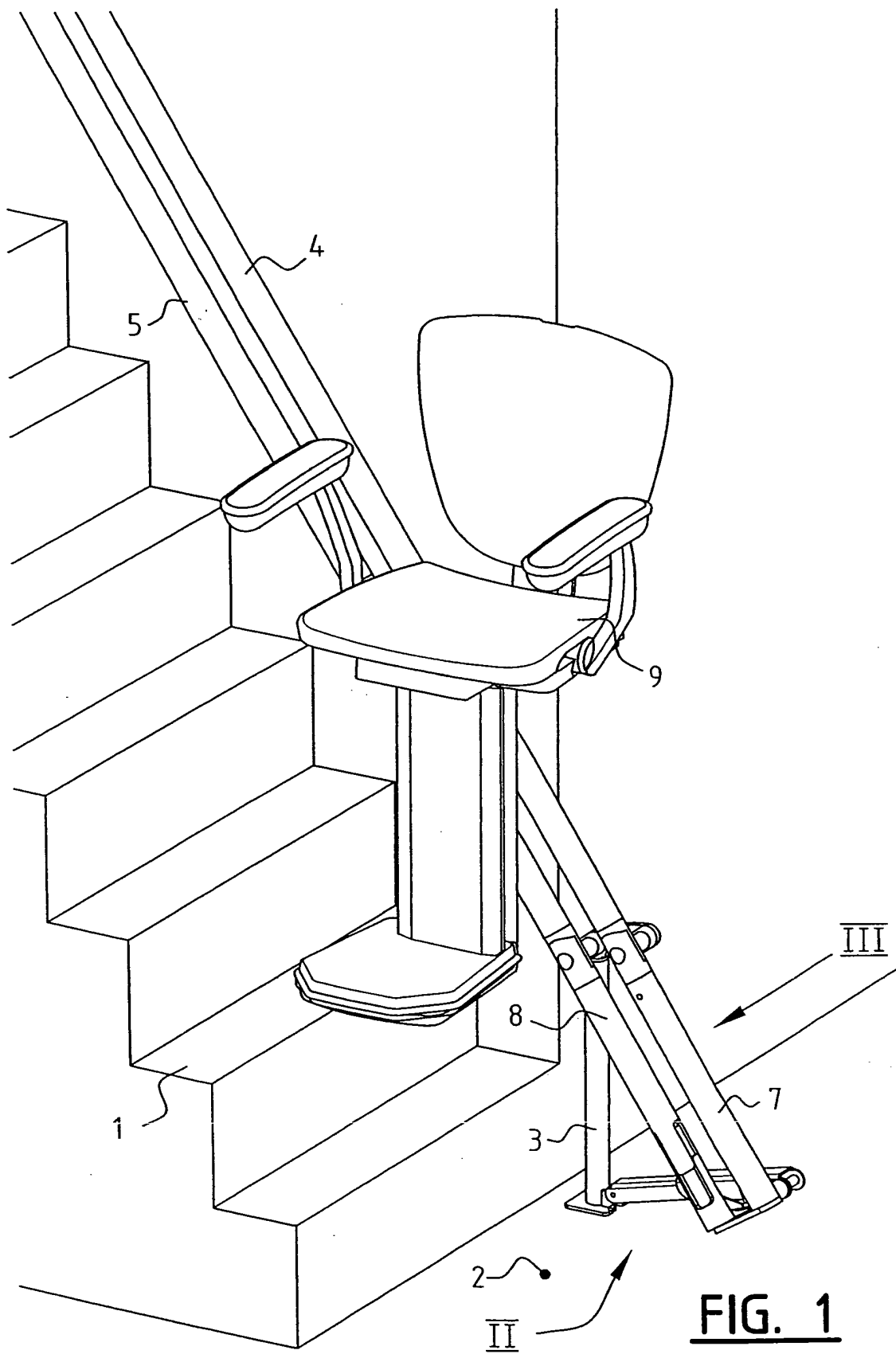
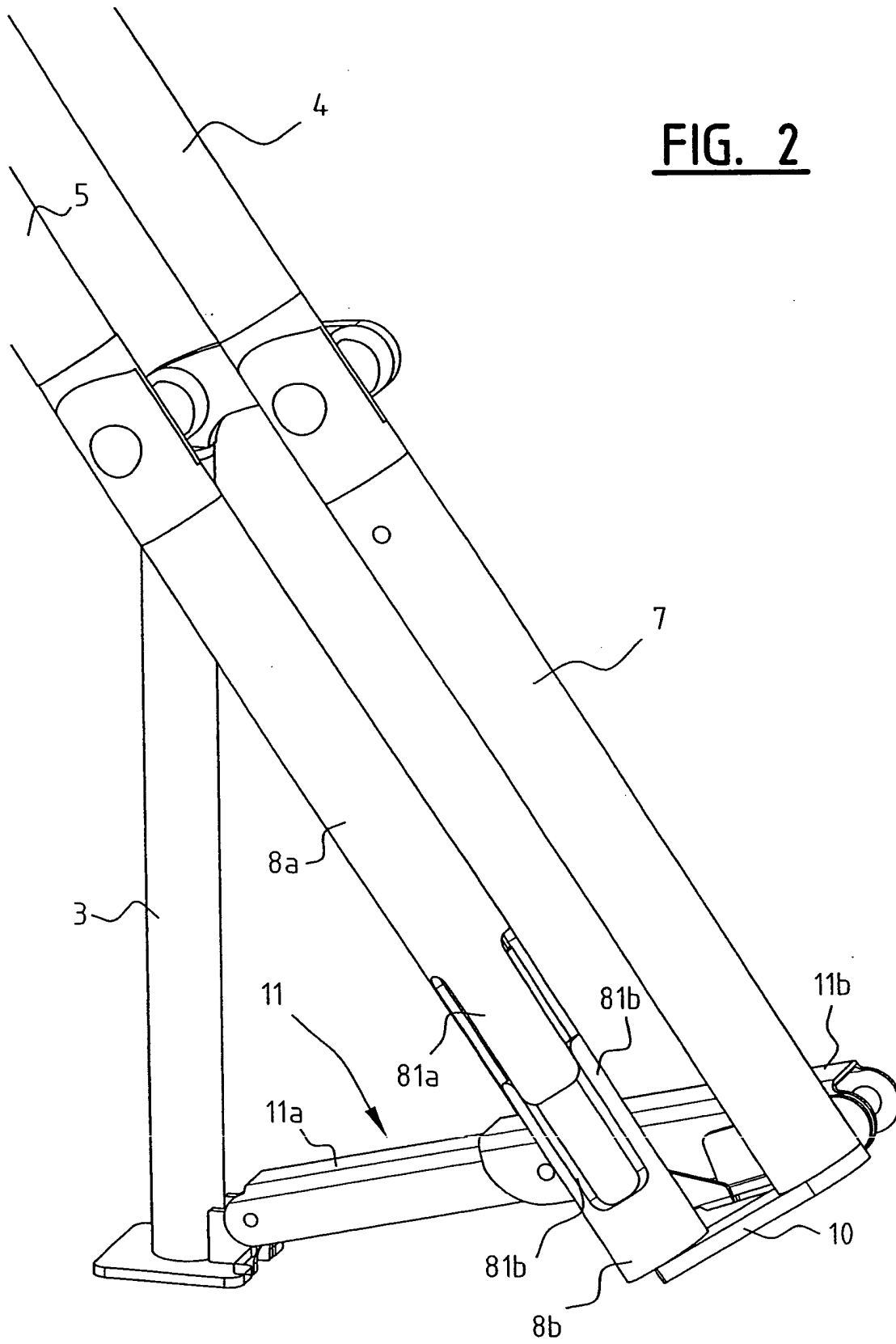


FIG. 2



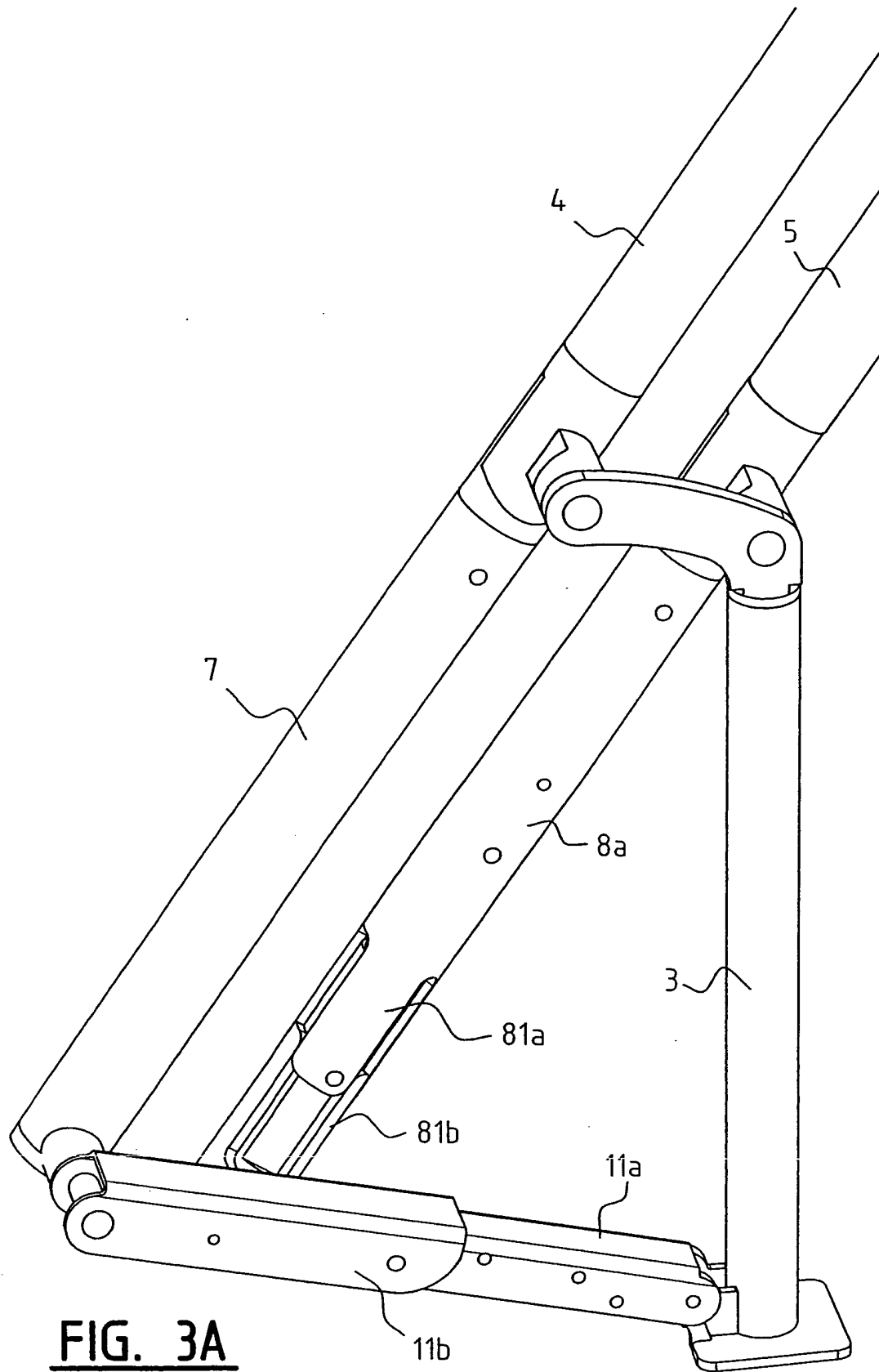


FIG. 3A

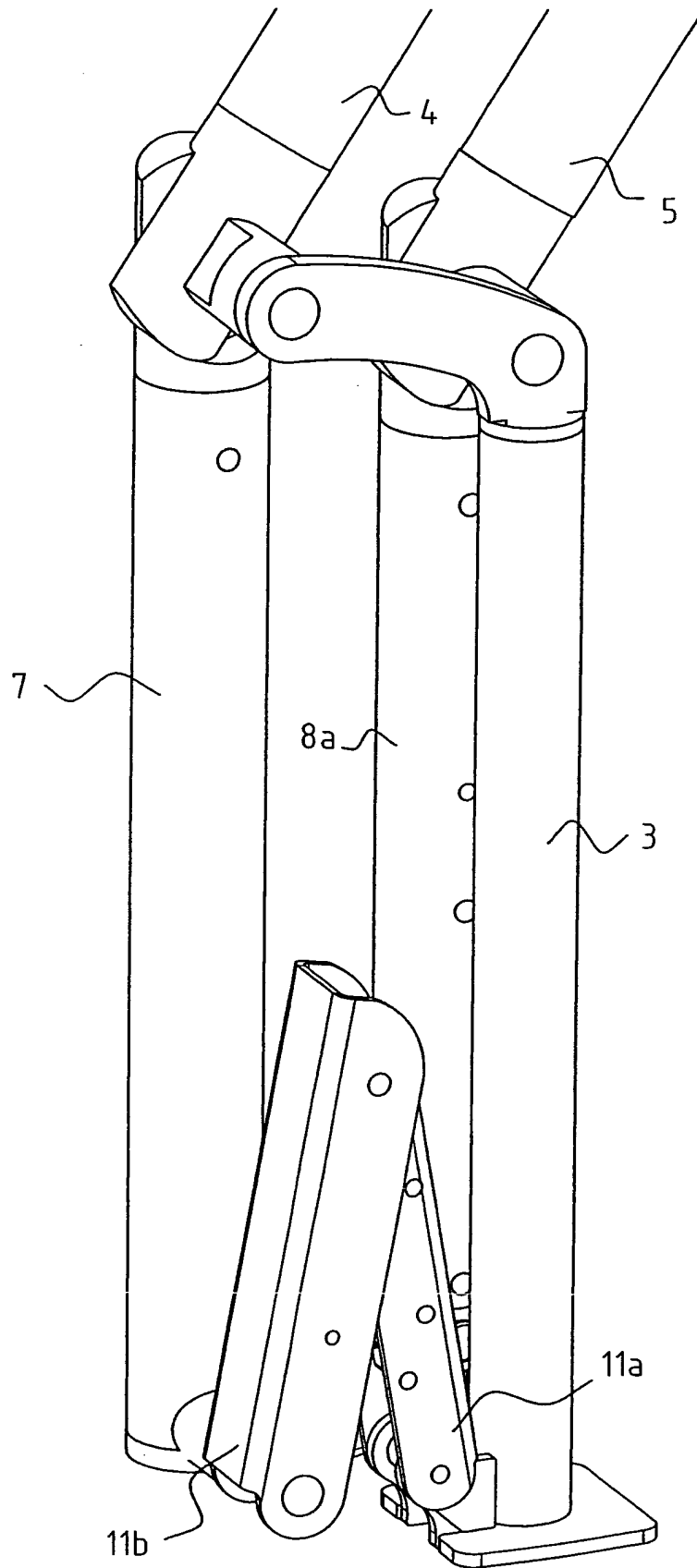


FIG. 3B

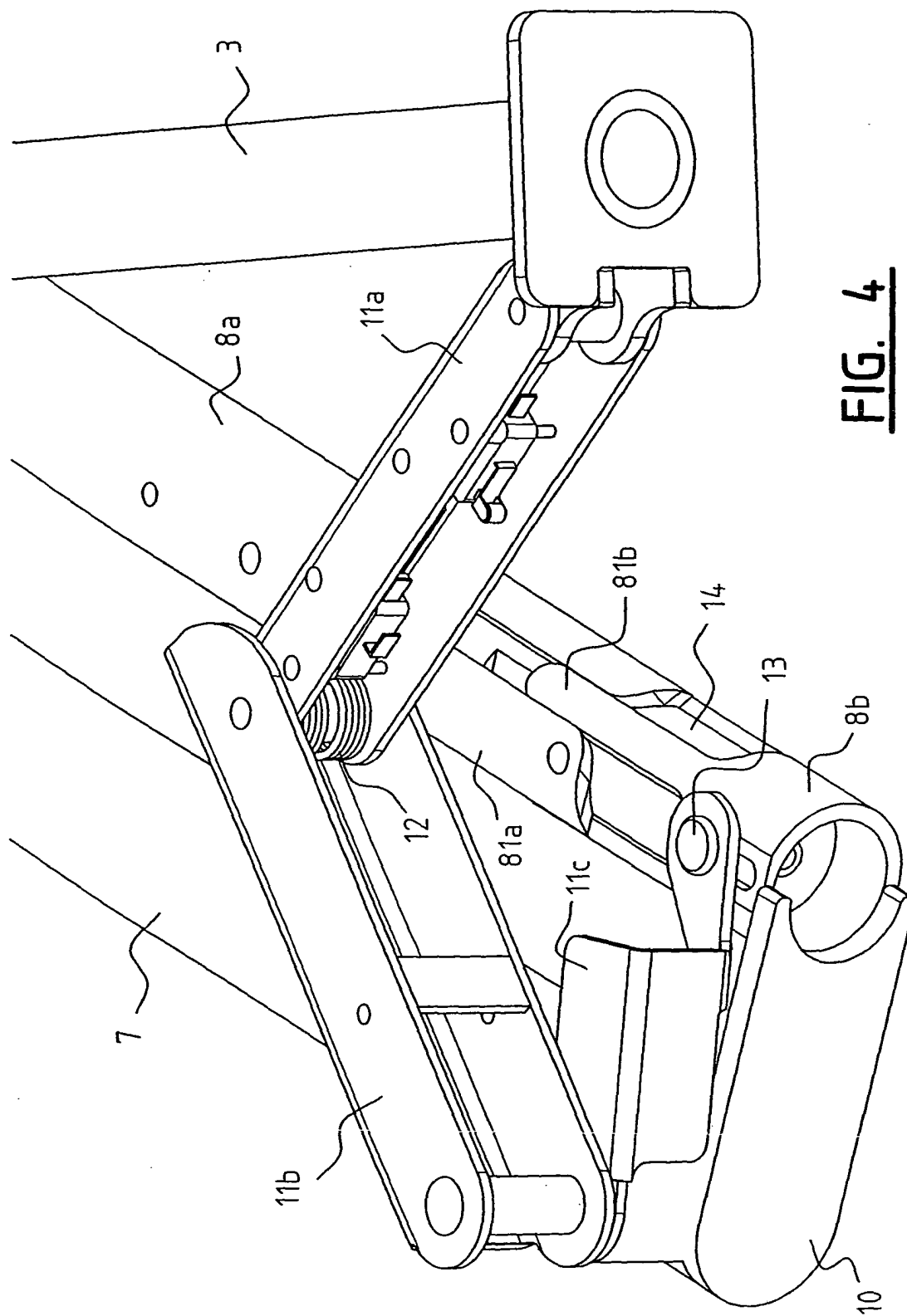


FIG. 4

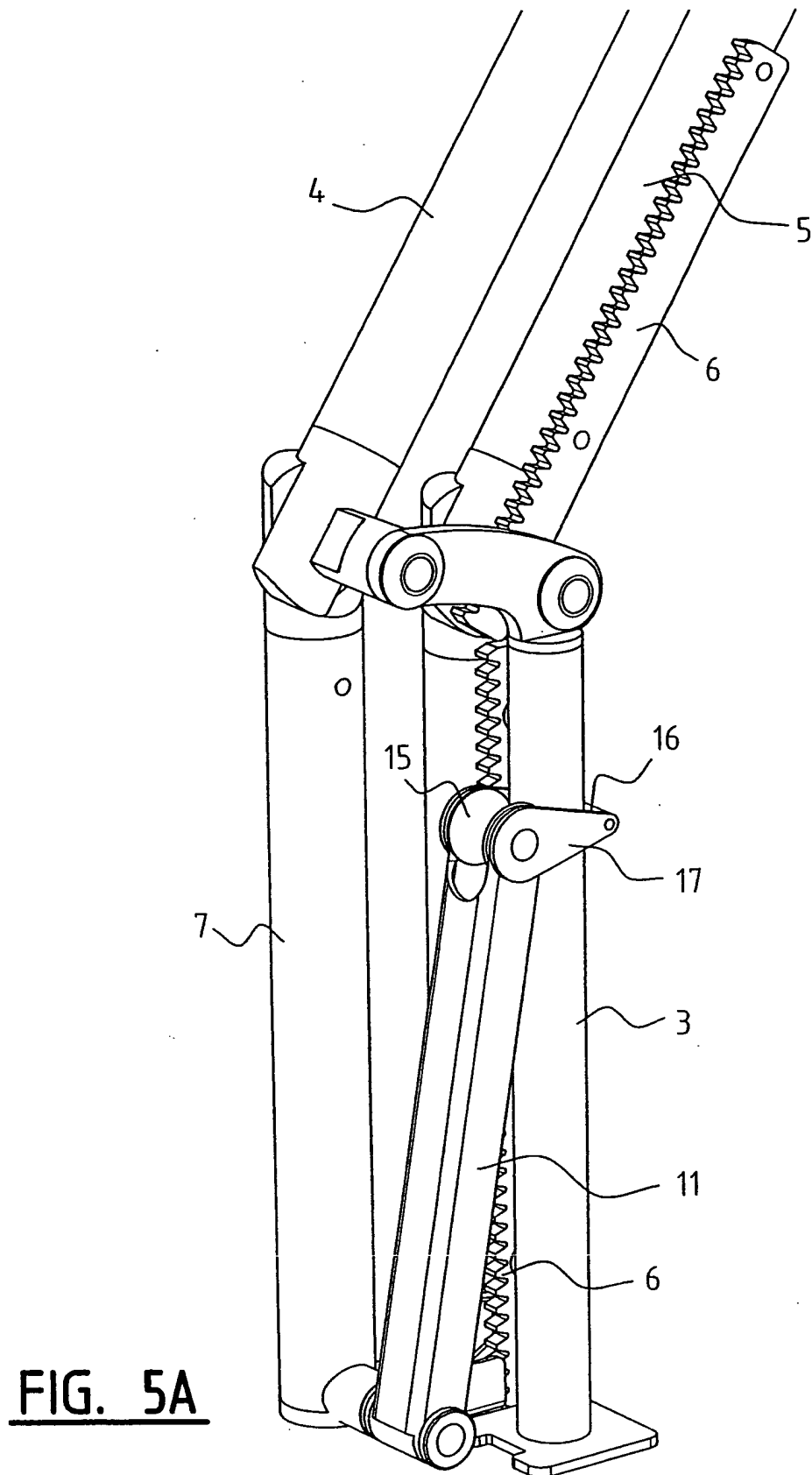


FIG. 5A

