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(54) **Drive for a stair lift**

Antrieb für Treppenlift

Motorisation pour monte-escalier

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Description

[0001] The invention relates to an apparatus for transporting a load from a first to a second level, in particular a stairlift, comprising a frame which is displaceable along a rail and on which a load carrier is mounted and which is provided with support and guide means engaging round at least a part of the rail and with drive means co-acting with a propelling part of the rail. Such a stairlift is described in EP 125 882, and is furthermore generally known, for instance from EP 0 560 433, EP 0 738 232 or EP 1 119 513.

[0002] In these known stairlifts use is made of a frame from which is suspended a load carrier such as a chair. The chair is pivotable here about a horizontal axis so as to be able to keep the seat part thereof horizontal under all circumstances. The frame itself is suspended via support or guide rollers or wheels from a rail which follows the course of the staircase. When the stairlift is displaced the guide rollers or wheels run along the upper and/or lower side of the rail. For displacing purposes the known stairlifts are provided with a drive, generally a motor which drives a toothed wheel which engages in a gear rack along the rail.

[0003] The known stairlifts have the drawback that, when the rail goes through a bend in the vertical and/or horizontal plane, the guide rollers or wheels and the toothed wheel of the drive will not follow the same path because they engage at different positions on the rail and the gear rack respectively. There is therefore the risk of the toothed wheel moving out of engagement with the gear rack, whereby without special measures driving becomes impossible. The differences in the path followed by the separate parts of the stairlift moreover make a stable control of the position of the seat part of the chair using an electronic control practically impossible.

[0004] The invention therefore has for its object to provide a transporting apparatus of the above described type wherein these drawbacks do not occur, or at least do so to a lesser extent. According to the invention this is achieved in such an apparatus in that the drive means are arranged in the frame for movement relative to the support and guide means substantially transversely of the direction of displacement of the frame. In this manner the drive means can remain in contact with the propelling part, for instance the gear rack of the rail, even in bends, while the support and guide means continue to follow the rail precisely. Differences in distance from the centre line of the rail can thus be compensated in inside and outside bends.

[0005] Such a movement can be obtained in simple manner when the drive means are connected to the support and guide means for pivoting on at least one axis running substantially in the direction of displacement of the frame. For a substantially linear movement of the drive means it is recommended that these are pivotable on a number of axes substantially parallel to each other. The drive means can for instance be connected to the

frame via a member pivotable on two sides or a linkage.

[0006] Another manner of achieving the desired movements is for the drive means to be connected to the support and guide means for sliding in at least one direction. For optimal mobility in different directions the drive means are in this case preferably slidable along at least two guides enclosing a mutual angle.

[0007] Since the drive means according to the invention are not mounted fixedly on the frame, the transporting apparatus preferably has movable means arranged between the drive means and the frame for transmitting drive forces generated by co-action of the drive means with the propelling part of the rail.

[0008] A structurally simple solution is obtained when the force-transmitting means comprise at least two co-acting pushing members freely movable transversely of the direction of displacement of the frame. Conversely, it is also conceivable for the force-transmitting means to comprise at least one elongate pulling and pushing element.

[0009] A compact drive is obtained when the drive means comprise at least one motor and an output shaft which is connected thereto and on which is arranged a rotatable drive member co-acting with the propelling part of the rail. For an optimal transmission of the drive forces without slip, it is recommended that the drive member is a toothed wheel and the propelling part of the rail comprises a gear rack.

[0010] In order to prevent users of the transporting apparatus unintentionally coming into contact with the gear rack, this latter is preferably arranged on the side of the rail remote from the frame, and the output shaft of the drive means extends beyond the rail transversely of the direction of displacement of the frame.

[0011] During the displacement along the rail of the transporting apparatus with the user thereon, forces and moments occur which must be absorbed in the apparatus. An effective and stable construction is obtained when these forces and moments are distributed uniformly over the apparatus. The drive means are preferably adapted for this purpose to absorb a moment directed round the direction of displacement of the frame, while the support and guide means are adapted to absorb moments directed transversely of the direction of displacement of the frame.

[0012] In this case the transporting apparatus is preferably provided with at least one support wheel which is mounted on the output shaft of the drive means and which engages on a protruding part of the rail. This shaft is thus used for driving as well as for transmitting the moment.

[0013] In order to absorb the moments, the support and guide means preferably comprise at least two guide rollers arranged with interspacing in the direction of displacement of the frame and engaging on the rail. In order to be able to follow the course of the rail optimally in the horizontal and vertical plane, the support and guide means advantageously further comprise a number of pairs of guide rollers arranged distributed in peripheral

direction of the rail. The guide rollers are here preferably mounted in at least one roller carrier tiltable transversely of the direction of displacement of the frame. Bends in the rail can thus be easily followed. When the roller carrier takes the form of a ring segment with at least partly spherical outer surface, it can be readily received in the frame with the desired mobility. The same degree of mobility can also be achieved when the roller carrier comprises two forks together forming a cardan suspension. A stable guiding of the vertical transporting apparatus along the rail is achieved when there are at least two roller carriers which are arranged with interspacing in the direction of displacement of the frame and between which the drive means are arranged.

[0014] In order to prevent the seat part of the chair inclining in bends in the rail, whereby a user could slide off the chair, the transporting apparatus is preferably provided with means for maintaining the load carrier in a determined position, which position-maintaining means comprise at least one adjusting motor connected to the load carrier, a system for controlling the adjusting motor and sensors connected for signal generation to the control system for sensing the position of the load carrier. The position-maintaining means are preferably adapted to place the load carrier in a desired position prior to the transporting and to adjust the position thereof at a bend in the rail. Control is thus simplified, since no intervention will after all be necessary during transport along straight parts of the rail.

[0015] The sensors are advantageously adapted herein to sense the position of the support and guide means relative to the frame and/or to sense the position of the drive means relative to the support and guide means. In this manner movements in the stairlift itself can be used to determine the position of the load carrier, and the sensing is therefore wholly independent of the rail.

[0016] The sensors are preferably contactlessly operating sensors, such as for instance optical or electronic sensors. Wear of the sensors is hereby avoided and settings can be modified using software instead of manually.

[0017] The invention further relates to an installation for transporting a load from a first to second level, in particular a stairlift installation, comprising at least one rail with a propelling part enclosing an angle with the horizontal and a transporting apparatus as described above displaceable therealong.

[0018] The propelling part of the rail can advantageously comprise a gear rack which preferably has a substantially round cross-section. An optimum engagement of the driving toothed wheel in the gear rack is hereby ensured under all conditions, irrespective of the position of the drive means relative to the rail.

[0019] A strong, rigid but nevertheless relatively light rail is obtained when this latter likewise has a substantially round cross-section. Furthermore, an optimal contact between the support and guide means and the rail is then also ensured in bends.

[0020] In order to be able to absorb moments around

the rail in effective manner, the rail is preferably provided with a protruding part running therealong for co-action with the support wheel.

[0021] The invention is now elucidated on the basis of two embodiments, wherein reference is made to the annexed drawing in which corresponding components are designated with reference numerals increased by 100, and in which:

Fig. 1 shows a perspective front view of a stairlift installation according to a first embodiment of the invention,

Fig. 2 shows a partly broken-away, perspective rear view of a part of the stairlift installation of fig. 1,

Fig. 3 shows a side view according to arrow III in fig. 2,

Fig. 4 is a partly broken-away, perspective rear view of the stairlift installation of fig. 1 in a bend of the rail,

Fig. 5 is a partly broken-away, perspective rear view of an alternative embodiment of the stairlift installation,

Fig. 6 is a perspective front view of the stairlift installation of fig. 1-4 with a number of sensors for determining the position of the load carrier, and

Fig. 7 shows a block diagram of a system for maintaining the position of the load carrier.

[0022] An installation 1 for transporting a load from a first to a second level (fig. 1), in the shown embodiment a stairlift installation, comprises a rail 3 which is placed along a staircase 2 and which encloses an angle α with the horizontal H, and an apparatus 4 movable along rail 3 for transporting the load between the different levels, here therefore a stairlift. Rail 3, which in the shown embodiment has a round cross-section, is supported by a number of posts 5 which are arranged distributed along staircase 2 and which are fixed to a protruding part 6 extending along rail 3 (fig. 2). The function of this protruding part 6 is elucidated hereinbelow. Rail 3 is further provided with a propelling part 7, here in the form of a gear rack 8, which has a round cross-section.

[0023] Stairlift 4 comprises a frame 9 which is displaceable along rail 3 and on which a load carrier 10 is mounted, here in the form of a chair with a seat 11, back rest 12, armrests 13 and a footrest 14. Chair 10 is connected to frame 9 for pivoting on a horizontal shaft 45 (fig. 3), and arranged in frame 9 is a maintaining mechanism 70 to be elucidated further hereinbelow and consisting of, among other parts, of an adjusting motor 71 connected to shaft 45 so that the position of chair 10 can be kept constant at all times irrespective of the inclination of rail 3.

[0024] Frame 9 of stairlift 4 is further provided with support and guide means 15 which engage round a part of the periphery of rail 3. For this purpose the frame 9 is given a substantially L-shaped form with an upright back 38 and two feet 26 engaging under rail 3. The support and guide means 15 are adapted to absorb moments directed transversely of the direction of displacement of

stairlift 4. To this end the support and guide means 15 comprise a number of guide rollers 17 which are arranged with interspacing in the direction of displacement and which engage on rail 3. In the shown embodiment there are even a plurality of pairs of guide rollers 17, which are moreover arranged distributed in peripheral direction of rail 3. By making use of a large number of guide rollers 17, they can each be given a relatively small form, thereby achieving a compact construction. The loads of stairlift 4 are moreover thus spread uniformly over rail 3 and the resistance is minimized. Guide rollers 17 are each rotatable on a shaft 18 and received per pair in a recess in a roller carrier 20. The outer recesses are covered with a closing plate 19.

[0025] In the shown embodiment roller carrier 20 takes the form of a ring segment open to one side and having a spherical outer surface 21. The open side serves to allow the ring segment to engage round the protruding part 6 of rail 3. In the shown embodiment there are two roller carriers 20 present, in each of which three pairs of roller 17 are arranged with a mutual spacing of 120° in peripheral direction. Each roller carrier 20 is mounted at two diametrically opposite points in bowl-shaped dishes 24 connected to frame 9 such that it is in principle movable in all directions. Dishes 24 are fixed with a number of screws 25 to the foot 26 protruding under rail 3 and to a part 27 of frame 9 engaging over rail 3. An imaginary line connecting the roller carriers 20 encloses a small angle β with the vertical V.

[0026] In order to limit the mobility of roller carrier 20 to two mutually perpendicular directions transversely of the direction of displacement of the stairlift, thus a tilting movement transversely of rail 3, there are formed in the outer surface 21 thereof two grooves 22 which run practically in the direction of displacement and in which a pin 23 engages in each case. This pin 23 protrudes out the bowl-shaped dish 24 in the middle. Through sliding of pins 23 in grooves 22 a rotating movement of roller carrier 20 about a practically horizontal axis is thus allowed, while a rotation of roller carrier 20 on pins 23 is also possible. On the other hand, the pins 23 prevent a tilting movement on the longitudinal axis of rail 3. In this manner bends in staircase 2, and thus also in rail 3, which generally cause rotations in both the horizontal and vertical plane (fig. 4), can be followed extremely well.

[0027] Stairlift 4 is also provided with drive means 16 which co-act with the propelling part 8 of rail 3. These drive means 16 are accommodated in a sub-frame 28 which here has a reverse L-shape and which is formed between the feet 26 of frame 9. A roller 29 is mounted in sub-frame 28 for rotation on a shaft 30, whereby sub-frame 28 supports on rail 3. Drive means 16 comprise a motor 31 with an output shaft 32 on which a rotatable drive member 33 is arranged which engages on the propelling part 8 of rail 3. For power supply to motor 31 in the shown embodiment, two batteries 34 are arranged at the top of sub-frame 28 in the shown embodiment.

[0028] As stated, in the shown embodiment the pro-

PELLING part 8 is a gear rack and drive member 33 is thus embodied as a toothed wheel. Since gear rack 8 is arranged on the side of the rail 3 remote from frame 9, an output shaft 32 driven by motor 31 extends transversely of the direction of displacement under rail 3.

[0029] In the shown embodiment the output shaft 32 even extends beyond gear rack 8 and toothed wheel 33 as far as the protruding part 6 of rail 3. Mounted on the protruding part of shaft 32 is a support wheel 35 which engages on the protruding part or strip 6 of rail 3. A moment directed round rail 3, which is the result of the weight of load carrier 10 and the load carried thereby, can hereby be absorbed by drive means 16.

[0030] In order to ensure an optimal engagement of toothed wheel 33 in gear rack 8, a further closing roller 36 is mounted rotatably on a shaft 37 opposite support wheel 35. The reverse L-shaped sub-frame 28 with the closing roller 36 mounted therein and the protruding shaft 32 with support wheel 35 thus form a unit almost wholly enclosing rail 3.

[0031] Because the support and guide means 15 and drive means 16 are offset as seen in the direction of displacement of stairlift 4 and because the propelling part 8 does not coincide with rail 3, guide rollers 17 and toothed wheel 33 will not display the same displacement when rail 3 goes through a bend. There is therefore the danger of the toothed wheel 33 moving out of engagement with propelling part 8 of rail 3, whereby stairlift 4 could come to a stop or at least move in jolting manner. Such differences would also disrupt the electronic control of the position-maintaining means 70. The invention therefore provides that drive means 16 are received in frame 9 for movement relative to support and guide means 15.

[0032] In the shown embodiment the sub-frame 28 with drive means 16 therein is movable relative to frame 9 substantially transversely of the direction of displacement of stairlift 4, whereby differences in distance from the centre line of rail 3 can be compensated in inside and outside bends. Sub-frame 28 is connected for this purpose to the back 38 of frame 9 via a member 39 which has a pivot shaft 40 respectively 41 on either side. The pivot shafts 40, 41 are herein oriented substantially in the direction of displacement of stairlift 4. Making use of two parallel pivot shafts 40, 41 achieves that sub-frame 28 is movable transversely of rail 3 in two mutually perpendicular directions.

[0033] In order to enable transmission to frame 9 of stairlift 4 of the drive forces generated by engagement of toothed wheel 33 in gear rack 8, force-transmitting means 42 are arranged in the shown embodiment between the sub-frame 28 of drive means 16 and the frame 9. These force-transmitting means 42 must be movable to be able to follow the movements between sub-frame 28 and frame 9. In the shown embodiment the force-transmitting means 42 comprise for this purpose two co-acting pushing members or slide bearings 43, 44, one on sub-frame 28 and one on frame 9, which are freely movable transversely of the direction of displacement of

stairlift 4. During a relative movement of frame 9 and sub-frame 28 these pushing members 43, 44 slide along each other, roughly in the manner of buffer stops on mutually coupled railway carriages. The drive forces can thus be transmitted at all times from rail 3 to stairlift 4, irrespective of the relative position of sub-frame 28 and frame 9.

[0034] In an alternative embodiment of the stairlift 104 (fig. 5), the sub-frame 128 in which drive means 116 are arranged is movable relative to frame 109 by means of two linkages 150 on either side thereof. Each linkage 150 comprises a substantially vertically directed bar 139 which is pivotally connected at the top and bottom via shafts 140, 141 to in each case two pivoting bars 151, 152 directed toward and away from rail 103 and oriented obliquely upward. The bars 151 directed toward rail 3 are herein pivotally connected at their other end to sub-frame 128 via a shaft 153, while the bars 152 directed away from rail 103 are connected to frame 109 via a pivot shaft 154. Achieved once again in this manner is that relative to frame 109 the sub-frame 128 is movable transversely of rail 3 in two mutually perpendicular directions.

[0035] In order to transmit the drive forces from drive means 116 to frame 109, use is made in this embodiment of force-transmitting means 142 in the form of two pull and push rods or Panhard rods 155, an end 156 of which is connected to sub-frame 128 via for instance a hinge 157, while the other end 158 can likewise be connected via a hinge 159 to a spacer bar 160 of frame 109.

[0036] In this embodiment the support and guide means 115 otherwise comprise two relatively large guide rollers 117 on either side of rail 103 which are mounted directly in frame 109.

[0037] As stated above, stairlift 4, 104 comprises a position-maintaining means 70, 170 which consists of an adjusting motor 71, 171 which is connected drivingly to pivot shaft 45, 145 of chair 10. The construction and operation of this mechanism 70 is elucidated on the basis of the first embodiment of stairlift 4 and with reference to fig. 6 and 7. The operation of adjusting motor 71 is controlled by an electronic control system 72 which receives signals from a number of, in the shown embodiment six, motion sensors 73L, 73R, 74L, 74R, 75R. In addition, control system 72 receives a further signal 76 from a sensor which senses the position of chair 10 when stairlift 4 is at rest, thus at the beginning or end of rail 3.

[0038] Control system 72 can optionally further receive a number of secondary signals, such as a signal from an acceleration sensor or electronic spirit level 77 connected to chair 10, and a signal 78 from sensors which sense a great resistance, an indication that something or someone is impeding the operation of stairlift 4. Finally, a further signal 79 indicating the speed of adjusting motor 71 is fed back to the control system. All these signals are processed in control system 71 and on the basis thereof a control signal 80 is generated to adjusting motor 71. The rotation of this adjusting motor 71 is transmitted to shaft 45 by a transmission 72 which is preferably self-locking, such as for instance a worm wheel transmission.

[0039] In the shown embodiment the motion sensors 73, 74, 75 are embodied as contactlessly operating sensors. It is possible here to envisage optical sensors, such as CCD elements, or electronic sensors such as inductive elements. In both cases sensors 73, 74, 75 co-act with target members 81, 82, 83 arranged opposite. In the case of optical sensors the target members can be sensed optically, for instance in the form of a pattern of marks, while use can be made in inductive sensors of target members in the form of metal plates. In the shown embodiment the sensors 73, 74 are fixed to frame 9, while the associated target members 81, 82 are arranged on the outer surface of roller carrier 20. Sensor 75 is here also fixed to frame 9, while its associated target member 83 is arranged on sub-frame 28.

[0040] In order to limit the control activities, prior to transport, so at the upper or lower end of rail 3, the position of chair 10 is set in the correct manner on the basis of the rest position signal 76. Thereafter this position is modified only when stairlift 4 reaches a bend in rail 3. It is after all only there that the position of stairlift 4 will change. Reaching a bend is sensed by motion sensors 73, 74, 75 on either side of stairlift 4. Sensors 73, 74 are herein adapted to sense movements of the support and guide means 15, more particularly roller carriers 20, relative to frame 9 respectively in the direction of rail 3 and transversely thereof. Sensor 75 is adapted to sense movements of drive means 16, here therefore the sub-frame 28, relative to support and guide means 15, here therefore roller carriers 20. By using the movements in the construction of the stairlift 4 itself to determine the progress of rail 3, no use need be made of separate sensors guided along rail 3, as described for instance in the older patent application EP 1 119 513 of applicant. The structure of the position-maintaining means 70 is hereby simplified considerably.

[0041] Although the invention is described above on the basis of a number of embodiments, it will be apparent that the invention is not limited thereto. Instead of being pivotable, the drive means could therefore also be slidable, for instance along two guides enclosing a mutual angle. There could also be provided only one sub-frame with at least two guide rollers, whereby a more compact but more heavily loaded construction is obtained. The guide rollers could also be mounted in the frame in a different way, for instance by means of a cardan suspension or a linkage, while the force-transmitting means could also take another form. It is possible here to envisage balls or flexible elements rotatable in all directions, such as pulling cables, springs and the like. It would even be possible to dispense with the use of separate force-transmitting means if the connection between the drive means and the support and guide means is rigid enough. The form and location of the drive could of course also be varied, for instance by applying a straight gear rack or a worm wheel. Nor does the support wheel have to be combined with the drive, but it could be mounted separately on the frame or sub-frame. In addition, there could

also be a different choice in the distribution of the loads over the support and guide means on the one hand and the drive means on the other. The position-maintaining mechanism could also be embodied differently. More or fewer sensors could be used, and the sensors used could also be of electromechanical nature, for instance in the form of encoders which convert a mechanical movement into an electric signal. Finally, the position-maintaining mechanism as described here could also be applied in combination with another type of stairlift.

[0042] The scope of the invention is therefore defined solely by the appended claims.

Claims

1. Apparatus (4) for transporting a load from a first to a second level, in particular a stairlift, comprising a frame (9) which is displaceable along a rail (3) and on which a load carrier (10) is mounted and which is provided with support and guide means (15) engaging round at least a part of the rail (3) and with drive means (16) co-acting with a propelling part (8) of the rail (3), **characterized in that** the drive means (16) are arranged in the frame (9) for movement relative to the support and guide means (15) in a direction which is substantially transverse from the direction of displacement of the frame (9).
2. Transporting apparatus (4) as claimed in claim 1, **characterized in that** the drive means (16) are connected to the support and guide means (15) for pivoting on at least one axis running substantially in the direction of displacement of the frame (9).
3. Transporting apparatus (4) as claimed in claim 2, **characterized in that** the drive means (16) are pivotable on a number of axes substantially parallel to each other.
4. Transporting apparatus (4) as claimed in claim 3, **characterized in that** the drive means (16) are connected to the frame (9) via a member (139) pivotable on two sides.
5. Transporting apparatus (4) as claimed in claim 3, **characterized in that** the drive means (16) are connected to the frame (9) via a linkage (150).
6. Transporting apparatus (4) as claimed in claim 1, **characterized in that** the drive means (16) are connected to the support and guide means (15) for sliding in at least one direction.
7. Transporting apparatus (4) as claimed in claim 6, **characterized in that** the drive means (16) are slidable along at least two guides enclosing a mutual angle.
8. Transporting apparatus (4) as claimed in any of the foregoing claims, **characterized by** movable means (43,44) arranged between the drive means (16) and the frame (9) for transmitting drive forces generated by co-action of the drive means (16) with the propelling part (8) of the rail (3).
9. Transporting apparatus (4) as claimed in claim 8, **characterized in that** the force-transmitting means (43,44) comprise at least two co-acting pushing members freely movable transversely of the direction of displacement of the frame (9).
10. Transporting apparatus (4) as claimed in claim 8, **characterized in that** the force-transmitting means (43,44) comprise at least one elongate pulling and pushing element.
11. Transporting apparatus (4) as claimed in any of the foregoing claims, **characterized in that** the drive means (16) comprise at least one motor (31) and an output shaft (32) which is connected thereto and on which is arranged a rotatable drive member (33) co-acting with the propelling part (8) of the rail (3).
12. Transporting apparatus (4) as claimed in claim 11, **characterized in that** the drive member (33) is a toothed wheel and the propelling part (8) of the rail (3) comprises a gear rack.
13. Transporting apparatus (4) as claimed in claim 12, **characterized in that** the gear rack (8) is arranged on the side of the rail (3) remote from the frame (9), and the output shaft (32) of the drive means (16) extends beyond the rail (3) transversely of the direction of displacement of the frame (9).
14. Transporting apparatus (4) as claimed in any of the foregoing claims, **characterized in that** the drive means (16) are adapted to absorb a moment directed round the direction of displacement of the frame (9).
15. Transporting apparatus (4) as claimed in claims 13 and 14, **characterized by** at least one support wheel (35) which is mounted on the output shaft (32) of the drive means (16) and which engages on a protruding part (6) of the rail (3).
16. Transporting apparatus (4) as claimed in any of the foregoing claims, **characterized in that** the support and guide means (15) are adapted to absorb moments directed transversely of the direction of displacement of the frame (9).
17. Transporting apparatus (4) as claimed in claim 16, **characterized in that** the support and guide means (15) comprise at least two guide rollers (17) arranged

with interspacing in the direction of displacement of the frame (9) and engaging on the rail (3).

18. Transporting apparatus (4) as claimed in claim 17, **characterized in that** the support and guide means (15) comprise a number of pairs of guide rollers (17) arranged distributed in peripheral direction of the rail (3). 5
19. Transporting apparatus (4) as claimed in claim 17 or 18, **characterized in that** the guide rollers (17) are mounted in at least one roller carrier (20) tiltable transversely of the direction of displacement of the frame (9). 10
20. Transporting apparatus (4) as claimed in claim 19, **characterized in that** the roller carrier (20) takes the form of a ring segment with at least partly spherical outer surface (21). 15
21. Transporting apparatus (4) as claimed in claim 20, **characterized in that** the roller carrier (20) comprises two forks together forming a cardan suspension. 20
22. Transporting apparatus (4) as claimed in any of the claims 19-21, **characterized by** at least two roller carriers (20) which are arranged with interspacing in the direction of displacement of the frame (9) and between which the drive means (16) are arranged. 25
23. Installation (1) for transporting a load from a first to a second level, in particular a stairlift installation, comprising at least one rail (3) with a propelling part (8) enclosing an angle with the horizontal and a transporting apparatus (4) as claimed in any of the foregoing claims displaceable therealong. 30
24. Transporting installation (1) as claimed in claim 23, **characterized in that** the propelling part (8) of the rail comprises a gear rack. 35
25. Transporting installation (1) as claimed in claim 24, **characterized in that** the gear rack (8) has a substantially round cross-section. 40
26. Transporting installation (1) as claimed in any of the claims 23-25, **characterized in that** the rail (3) has a substantially round cross-section. 45
27. Transporting installation (1) as claimed in claim 26, **characterized by** a protruding part (6) running along the rail (3) for co-action with the support wheel (35). 50

Patentansprüche

1. Vorrichtung (4) zum Transportieren einer Last von einem ersten zu einem zweiten Niveau, insbeson-

dere ein Treppenlift, aufweisend einen Rahmen (9), welcher entlang einer Schiene (3) verschiebbar ist und an dem ein Lastenträger (10) montiert ist und der mit Stütz- und Führungsmitteln (15), welche zumindest einen Teil der Schiene (3) umgreifen, und mit Antriebsmitteln (16) bereitgestellt ist, welche mit einem Antriebsteil (8) der Schiene (3) zusammenwirken, **dadurch gekennzeichnet, dass** die Antriebsmittel (16) in dem Rahmen (9) angeordnet sind zur Bewegung relativ zu den Stütz- und Führungsmitteln (15) in eine Richtung, welche im Wesentlichen quer zu der Richtung der Verschiebung des Rahmens (9) ist.

2. Transportvorrichtung (4) wie in Anspruch 1 beansprucht, **dadurch gekennzeichnet, dass** die Antriebsmittel (16) mit den Stütz- und Führungsmitteln (15) zum Schwenken um zumindest eine Achse, welche im Wesentlichen in der Richtung der Verschiebung des Rahmens (9) verläuft, verbunden sind. 15
3. Transportvorrichtung (4) wie in Anspruch 2 beansprucht, **dadurch gekennzeichnet, dass** die Antriebsmittel (16) um eine Zahl von Achsen schwenkbar sind, welche im Wesentlichen parallel zueinander sind. 20
4. Transportvorrichtung (4) wie in Anspruch 3 beansprucht, **dadurch gekennzeichnet, dass** die Antriebsmittel (16) mittels eines Elements (139) mit dem Rahmen (9) verbunden sind, welches auf zwei Seiten schwenkbar ist. 25
5. Transportvorrichtung (4) wie in Anspruch 3 beansprucht, **dadurch gekennzeichnet, dass** die Antriebsmittel (16) mittels eines Gestänges (150) mit dem Rahmen (9) verbunden sind. 30
6. Transportvorrichtung (4) wie in Anspruch 1 beansprucht, **dadurch gekennzeichnet, dass** die Antriebsmittel (16) mit den Stütz- und Führungsmitteln (15) zum Verschieben in zumindest eine Richtung verbunden sind. 35
7. Transportvorrichtung (4) wie in Anspruch 6 beansprucht, **dadurch gekennzeichnet, dass** die Antriebsmittel (16) verschiebbar entlang zumindest zweier Führungen sind, welche einen gegenseitigen Winkel einschließen. 40
8. Transportvorrichtung (4) wie in einem der vorangehenden Ansprüche beansprucht, **gekennzeichnet durch** bewegbare Mittel (43, 44), welche zwischen den Antriebsmitteln (16) und dem Rahmen (9) angeordnet sind, zum Übertragen von Antriebskräften, welche **durch** Zusammenwirken der Antriebsmittel (16) mit dem Antriebsteil (8) der Schiene (3) erzeugt werden. 45

9. Transportvorrichtung (4) wie in Anspruch 8 beansprucht, **dadurch gekennzeichnet, dass** die Kraftübertragungsmittel (43, 44) zumindest zwei zusammenwirkende Schiebeelemente aufweisen, welche quer zu der Richtung der Verschiebung des Rahmens (9) frei bewegbar sind.
10. Transportvorrichtung (4) wie in Anspruch 8 beansprucht, **dadurch gekennzeichnet, dass** die Kraftübertragungsmittel (43, 44) zumindest ein längliches Zug- und Schiebeelement aufweisen.
11. Transportvorrichtung (4) wie in einem der vorangehenden Ansprüche beansprucht, **dadurch gekennzeichnet, dass** die Antriebsmittel (16) zumindest einen Motor (31) und eine Ausgangswelle (32), welche mit diesem verbunden ist und an der ein drehbares Antriebselement (33) angeordnet ist, welches mit dem Antriebsteil (8) der Schiene (3) zusammenwirkt, aufweisen.
12. Transportvorrichtung (4) wie in Anspruch 11 beansprucht, **dadurch gekennzeichnet, dass** das Antriebselement (33) ein Zahnrad ist und der Antriebsteil (8) der Schiene (3) eine Zahnstange aufweist.
13. Transportvorrichtung (4) wie in Anspruch 12 beansprucht, **dadurch gekennzeichnet, dass** die Zahnstange (8) auf der Seite der Schiene (3) angeordnet ist, welche abseitig des Rahmens (9) ist, und sich die Ausgangswelle (32) der Antriebsmittel (16) über die Schiene (3) hinaus erstreckt, quer zu der Richtung der Verschiebung des Rahmens (9).
14. Transportvorrichtung (4) wie in einem der vorangehenden Ansprüche beansprucht, **dadurch gekennzeichnet, dass** die Antriebsmittel (16) angepasst sind, um ein Moment zu absorbieren, welches um die Richtung der Verschiebung des Rahmens (9) herum gerichtet ist.
15. Transportvorrichtung (4) wie in Ansprüchen 13 und 14 beansprucht, **gekennzeichnet durch** zumindest ein Stützrad (35), welches an der Ausgangswelle (32) der Antriebsmittel (16) montiert ist und das mit einem vorstehenden Teil (6) der Schiene (3) im Eingriff ist.
16. Transportvorrichtung (4) wie in einem der vorangehenden Ansprüche beansprucht, **dadurch gekennzeichnet, dass** die Stütz- und Führungsmittel (15) angepasst sind, um Momente zu absorbieren, welche quer zu der Richtung der Verschiebung des Rahmens (9) gerichtet sind.
17. Transportvorrichtung (4) wie in Anspruch 16 beansprucht, **dadurch gekennzeichnet, dass** die Stütz- und Führungsmittel (15) zumindest zwei Führungsrollen (17) aufweisen, welche mit Zwischenraum in der Richtung der Verschiebung des Rahmens (9) angeordnet sind und mit der Schiene (3) in Kontakt sind.
18. Transportvorrichtung (4) wie in Anspruch 17 beansprucht, **dadurch gekennzeichnet, dass** die Stütz- und Führungsmittel (15) eine Zahl von Paaren von Führungsrollen (17) aufweisen, welche in Umfangsrichtung der Schiene (3) verteilt angeordnet sind.
19. Transportvorrichtung (4) wie in Anspruch 17 oder 18 beansprucht, **dadurch gekennzeichnet, dass** die Führungsrollen (17) in zumindest einem Rollenträger (20) montiert sind, welcher quer zu der Richtung der Verschiebung des Rahmens (9) kippbar ist.
20. Transportvorrichtung (4) wie in Anspruch 19 beansprucht, **dadurch gekennzeichnet, dass** der Rollenträger (20) die Form eines Ringsegments mit zumindest teilweise sphärischer Außenfläche (21) hat.
21. Transportvorrichtung (4) wie in Anspruch 20 beansprucht, **dadurch gekennzeichnet, dass** der Rollenträger (20) zwei Gabeln aufweist, welche zusammen eine kardananische Aufhängung bilden.
22. Transportvorrichtung (4) wie in einem der Ansprüche 19-21 beansprucht, **gekennzeichnet durch** zumindest zwei Rollenträger (20), welche mit Zwischenraum in der Richtung der Verschiebung des Rahmens (9) angeordnet sind und zwischen denen die Antriebsmittel (16) angeordnet sind.
23. Installation (1) zum Transport einer Last von einem ersten zu einem zweiten Niveau, insbesondere eine Treppenlift-Installation, aufweisend zumindest eine Schiene (3) mit einem Antriebsteil (8), welche einen Winkel mit der Horizontalen einschließt, und eine Transportvorrichtung (4) wie in einem der vorangehenden Ansprüche beansprucht, welche entlang derselben verschiebbar ist.
24. Transportinstallation (1) wie in Anspruch 23 beansprucht, **dadurch gekennzeichnet, dass** der Antriebsteil (8) der Schiene eine Zahnstange aufweist.
25. Transportinstallation (1) wie in Anspruch 24 beansprucht, **dadurch gekennzeichnet, dass** die Zahnstange (8) einen im Wesentlichen runden Querschnitt hat.
26. Transportinstallation (1) wie in einem der Ansprüche 23-25 beansprucht, **dadurch gekennzeichnet, dass** die Schiene (3) einen im Wesentlichen runden Querschnitt hat.
27. Transportinstallation (1) wie in Anspruch 26 beansprucht, **gekennzeichnet durch** einen vorstehen-

den Teil (6), welcher zum Zusammenwirken mit dem Stützrad (35) entlang der Schiene (3) verläuft.

Revendications

1. Dispositif (4) destiné à transporter une charge à partir d'un premier vers un second niveau, en particulier, un monte-escalier, comprenant un châssis (9) qui peut être déplacé le long d'un rail (3) et sur lequel un élément porteur de charge (10) est monté, et qui comporte des moyens de support et de guidage (15) couplés autour d'au moins une partie du rail (3) et des moyens d'entraînement (16) coopérant avec une partie de propulsion (8) du rail (3), **caractérisé en ce que** les moyens d'entraînement (16) sont agencés sur le châssis (9) afin d'assurer un mouvement par rapport aux moyens de support et de guidage (15) suivant une direction qui est sensiblement transversale à la direction de déplacement du châssis (9).
2. Dispositif de transport (4) selon la revendication 1, **caractérisé en ce que** les moyens d'entraînement (16) sont reliés aux moyens de support et de guidage (15) de manière à pivoter sur au moins un axe s'étendant sensiblement dans la direction du châssis (9).
3. Dispositif de transport (4) selon la revendication 2, **caractérisé en ce que** les moyens d'entraînement (16) peuvent pivoter sur un certain nombre d'axes sensiblement parallèles les uns aux autres.
4. Dispositif de transport (4) selon la revendication 3, **caractérisé en ce que** les moyens d'entraînement (16) sont couplés au châssis (9) par l'intermédiaire d'un élément (139) pouvant pivoter sur deux côtés.
5. Dispositif de transport (4) selon la revendication 3, **caractérisé en ce que** les moyens d'entraînement (16) sont couplés au châssis (9) par l'intermédiaire d'une biellette (150).
6. Dispositif de transport (4) selon la revendication 1, **caractérisé en ce que** les moyens d'entraînement (16) sont couplés aux moyens de support et de guidage (15) de manière à coulisser suivant au moins une direction.
7. Dispositif de transport (4) selon la revendication 6, **caractérisé en ce que** les moyens d'entraînement (16) peuvent coulisser le long d'au moins deux guides formant un angle mutuel.
8. Dispositif de transport (4) selon l'une quelconque des revendications précédentes, **caractérisé par** des moyens mobiles (43, 44) agencés entre les moyens d'entraînement (16) et le châssis (9) afin de

transmettre des efforts d'entraînement produits par l'action conjointe des moyens d'entraînement (16) avec la partie de propulsion (8) du rail (3).

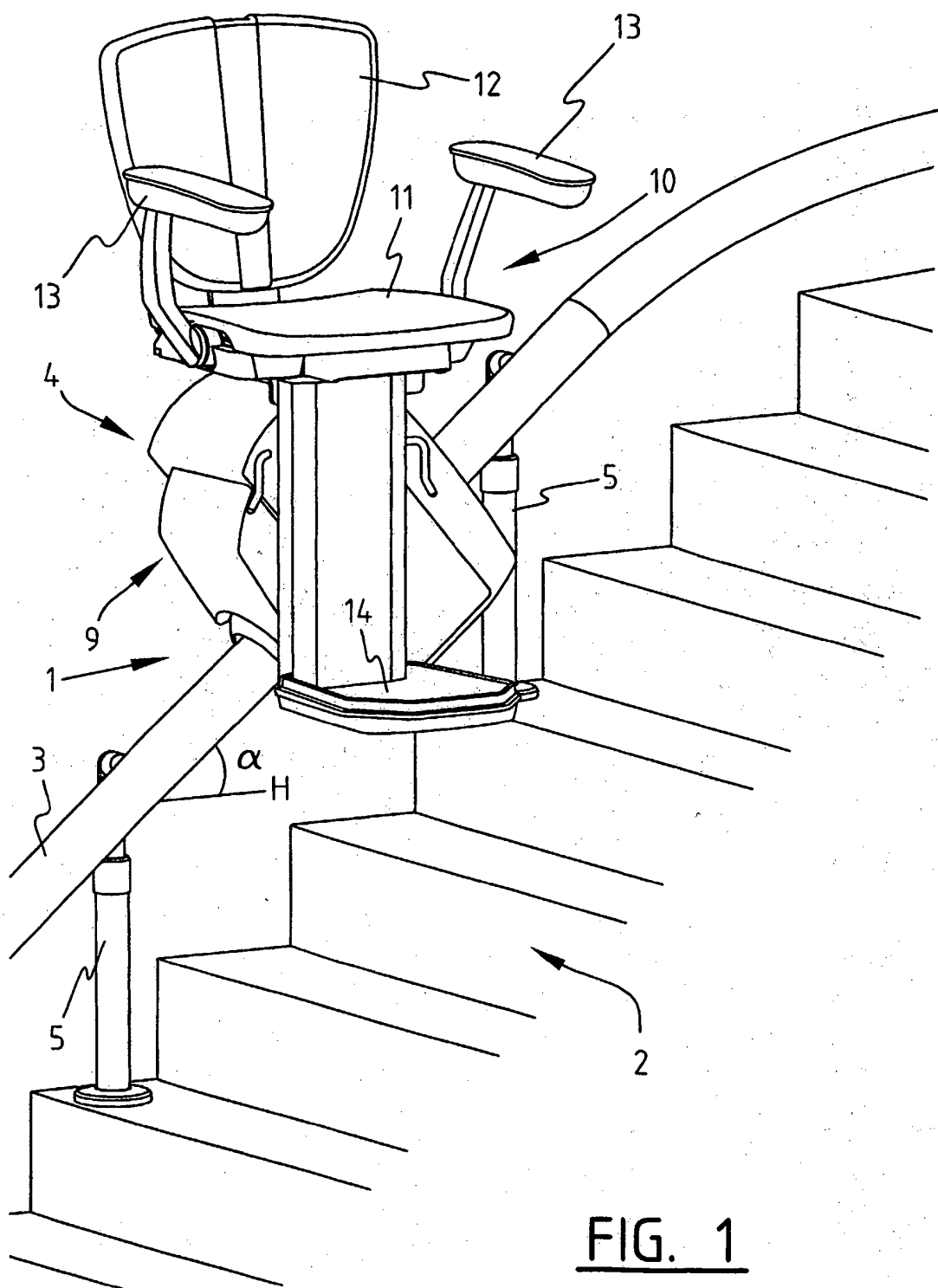
- 5 9. Dispositif de transport (4) selon la revendication 8, **caractérisé en ce que** les moyens de transmission d'effort (43, 44) comprennent au moins deux éléments de poussée coopérant, pouvant se déplacer librement transversalement par rapport à la direction de déplacement du châssis (9).
- 10 10. Dispositif de transport (4) selon la revendication 8, **caractérisé en ce que** les moyens de transmission d'effort (43, 44) comprennent au moins un élément de traction et poussée allongé.
- 15 11. Dispositif de transport (4) selon l'une quelconque des revendications précédentes, **caractérisé en ce que** les moyens d'entraînement (16) comprennent au moins un moteur (31) et un arbre de sortie (32) qui est couplé à ce dernier et sur lequel est agencé un élément d'entraînement pouvant tourner (33) coopérant avec la partie de propulsion (8) du rail (3).
- 20 12. Dispositif de transport (4) selon la revendication 11, **caractérisé en ce que** l'élément d'entraînement (33) est une roue dentée et la partie de propulsion (8) du rail (3) comprend une crémaillère.
- 25 13. Dispositif de transport (4) selon la revendication 12, **caractérisé en ce que** la crémaillère (8) est agencée sur le côté du rail (3) de manière distante par rapport au châssis (9), et l'arbre de sortie (32) du moyen d'entraînement (16) s'étend au-delà du rail (3) transversalement par rapport à la direction de déplacement du châssis (9).
- 30 14. Dispositif de transport (4) selon l'une quelconque des revendications précédentes, **caractérisé en ce que** les moyens d'entraînement (16) sont adaptés afin d'absorber un couple dirigé par rapport à la direction de déplacement du châssis (9).
- 35 15. Dispositif de transport (4) selon les revendications 13 et 14, **caractérisé par** au moins une roue de support (35) qui est montée sur l'arbre de sortie (32) des moyens d'entraînement (16) et qui est couplée à une partie en saillie (6) du rail (3).
- 40 16. Dispositif de transport (4) selon l'une quelconque des revendications précédentes, **caractérisé en ce que** les moyens de support et de guidage (15) sont adaptés afin d'absorber des couples dirigés transversalement par rapport à la direction de déplacement du châssis (9).
- 45 17. Dispositif de transport (4) selon la revendication 16, **caractérisé en ce que** les moyens de support et de
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- 55

guidage (15) comprennent au moins deux rouleaux de guidage (17) agencés avec un espace entre eux dans la direction de déplacement du châssis (9) et couplés sur le rail (3).

18. Dispositif de transport (4) selon la revendication 17, **caractérisé en ce que** les moyens de support et de guidage (15) comprennent un certain nombre de paires de rouleaux de guidage (17) agencées de manière répartie dans la direction périphérique du rail (3). 5
19. Dispositif de transport (4) selon la revendication 17 ou 18, **caractérisé en ce que** les rouleaux de guidage (17) sont montés sur au moins un élément de support de rouleau (20) pouvant basculer transversalement par rapport à la direction de déplacement du châssis (9). 10
20. Dispositif de transport (4) selon la revendication 19, **caractérisé en ce que** l'élément de support de rouleau (20) prend la forme d'un segment de bague avec au moins une surface externe partiellement sphérique (21). 15
21. Dispositif de transport (4) selon la revendication 20, **caractérisé en ce que** l'élément de support de rouleau (20) comprend deux étriers formant ensemble une suspension à cardan. 20
22. Dispositif de transport (4) selon l'une quelconque des revendications 19 à 21, **caractérisé par** au moins deux éléments de support de rouleau (20) qui sont agencés avec un espace entre eux dans la direction de déplacement du châssis (9) et entre lesquels sont agencés les moyens d'entraînement (16). 25
23. Installation (1) destinée à assurer le transport d'une charge d'un premier à un second niveau, en particulier, une installation formant monte-escalier, comprenant au moins un rail (3) avec une partie de propulsion (8) formant un certain angle avec l'horizontale et un dispositif de transport (4) selon l'une quelconque des revendications précédentes, pouvant être déplacé le long de ce dernier. 30
24. Installation de transport (1) selon la revendication 23, **caractérisée en ce que** la partie de propulsion (8) du rail comprend une crémaillère. 35
25. Installation de transport (1) selon la revendication 24, **caractérisée en ce que** la crémaillère (8) présente une section transversale sensiblement circulaire. 40
26. Installation de transport (1) selon l'une quelconque des revendications 23 à 25, **caractérisée en ce que** le rail (3) présente une section transversale sensi- 45

blement circulaire.

27. Installation de transport (1) selon la revendication 26, **caractérisée par** une partie en saillie (6) s'étendant le long du rail (3) afin de coopérer avec la roue de support (35). 50



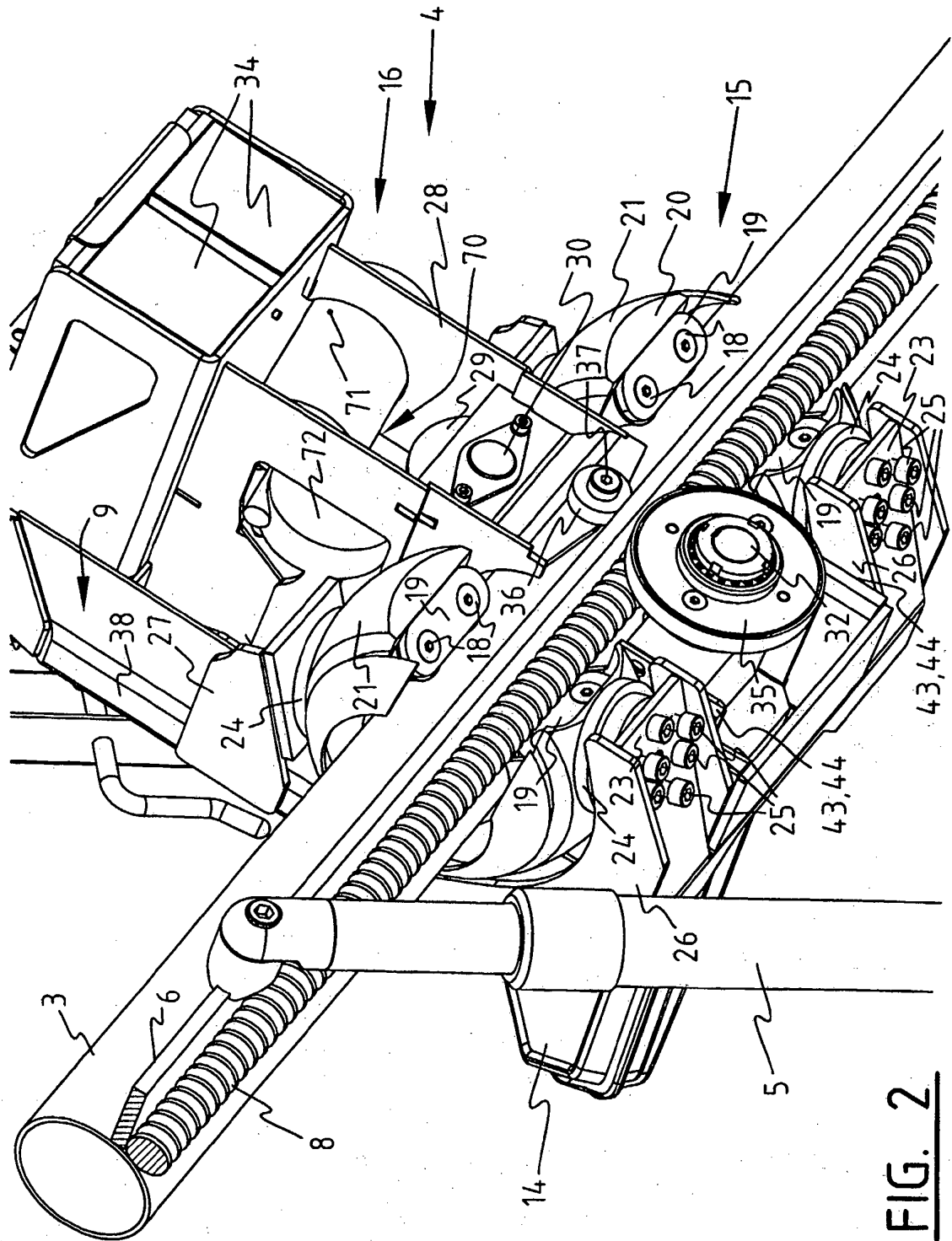
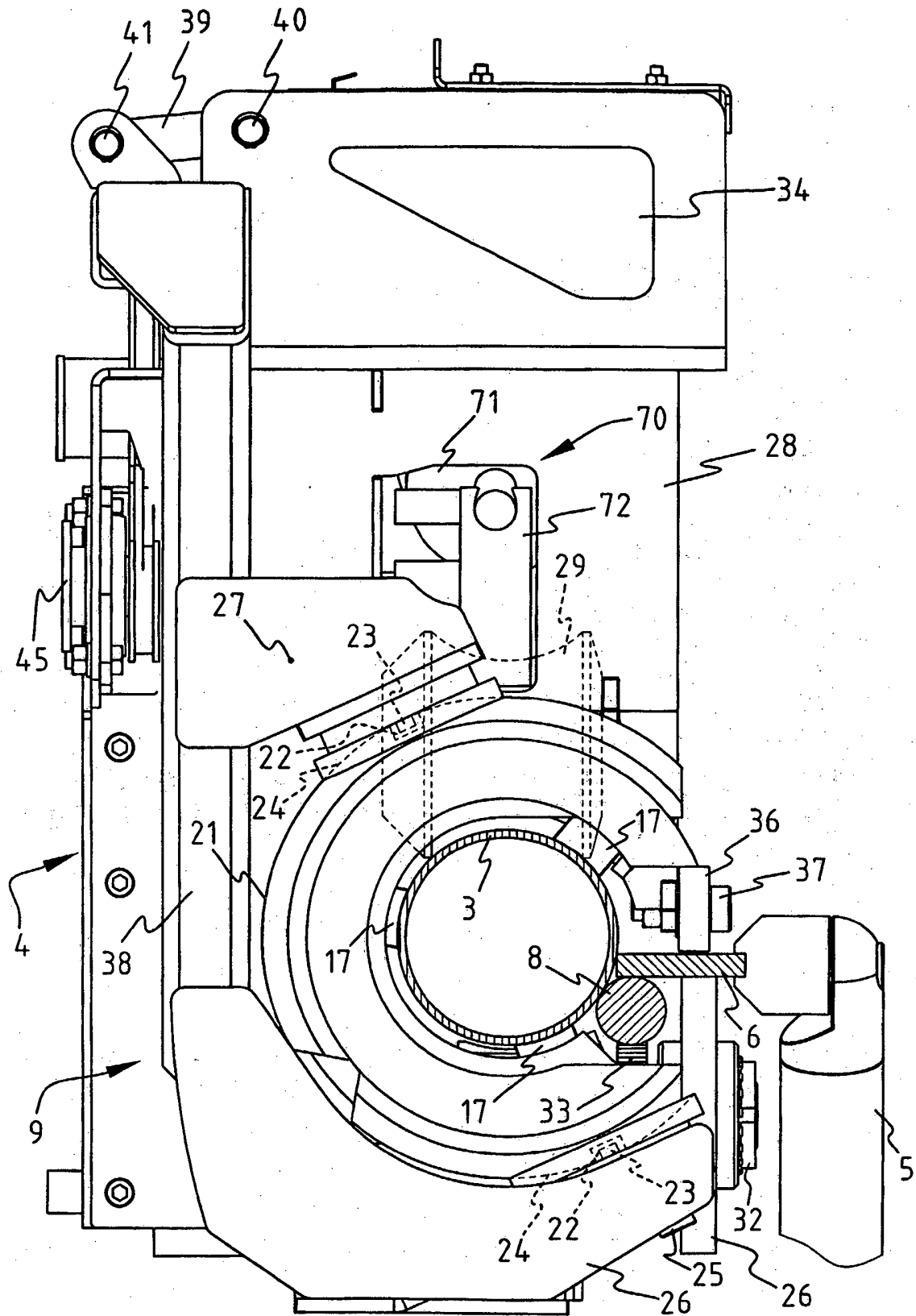


FIG. 2



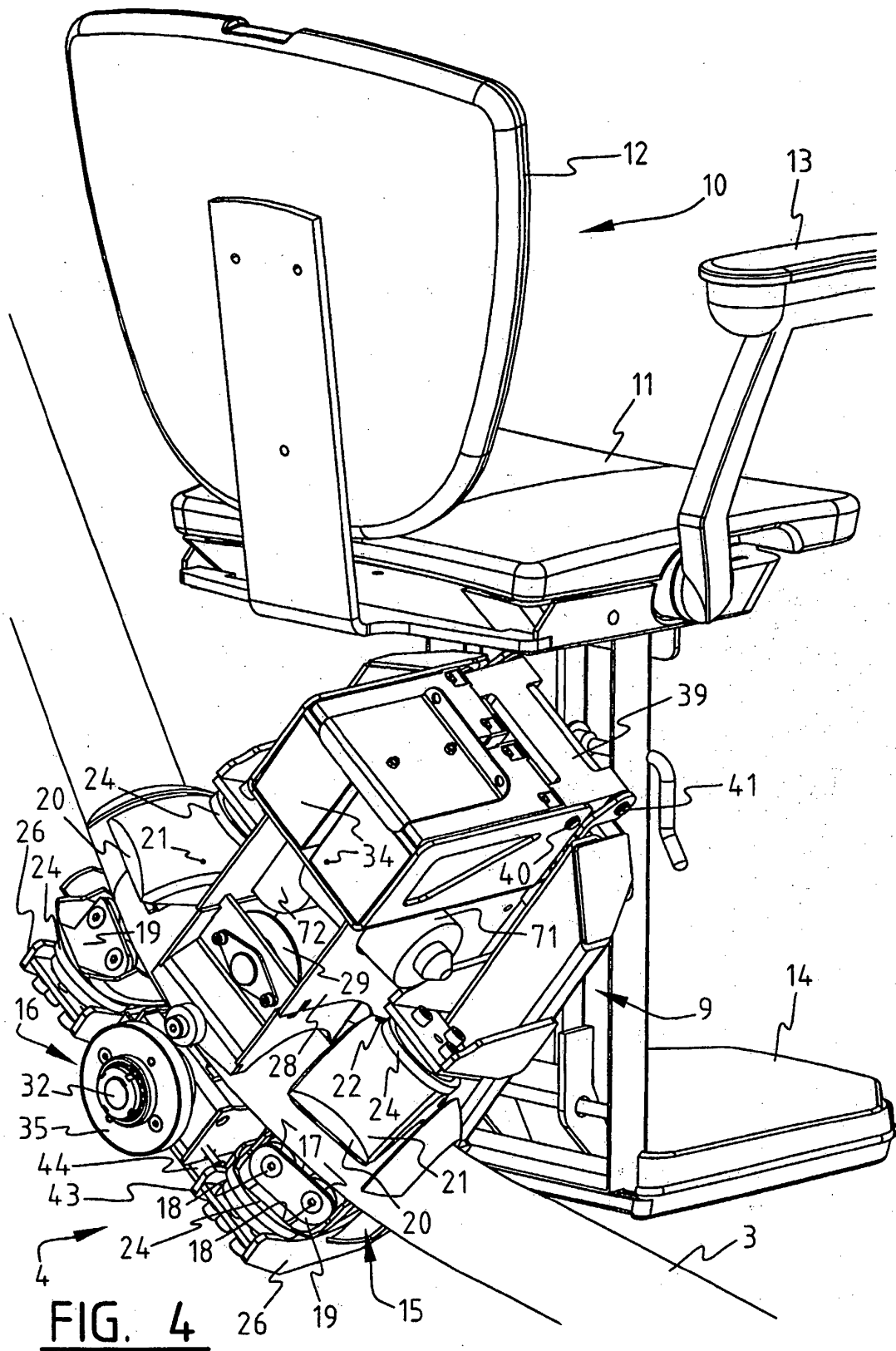
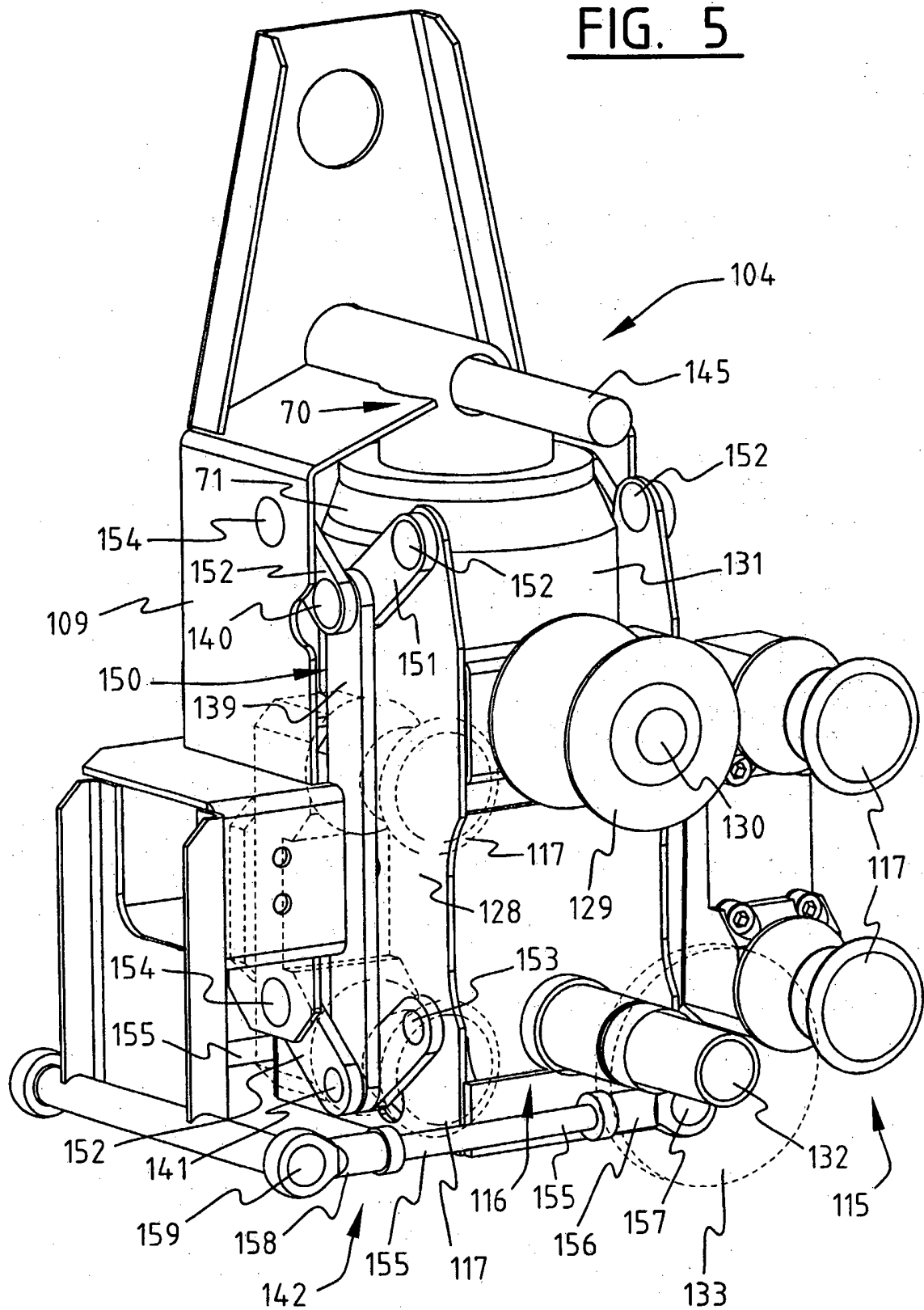


FIG. 5



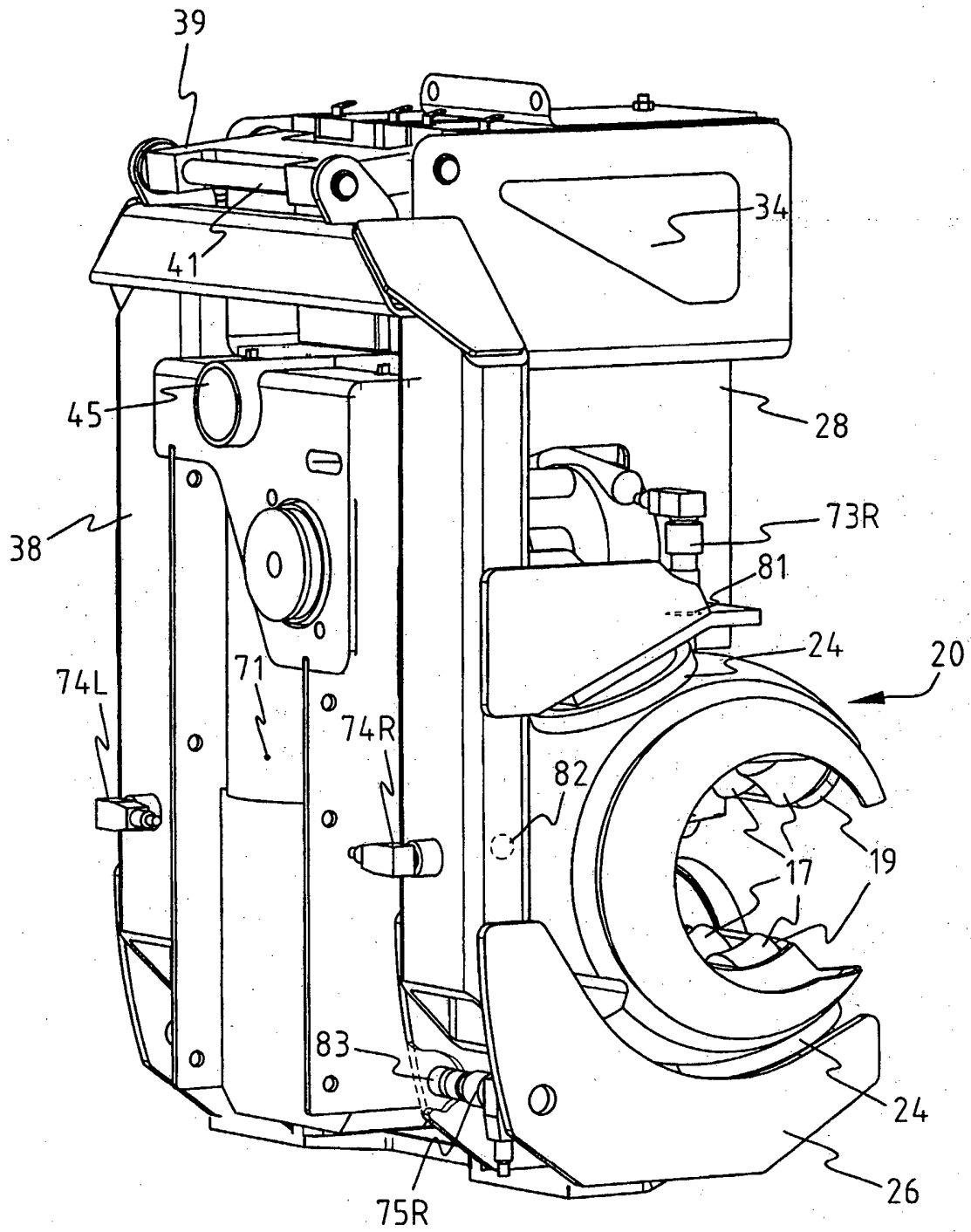


FIG. 6

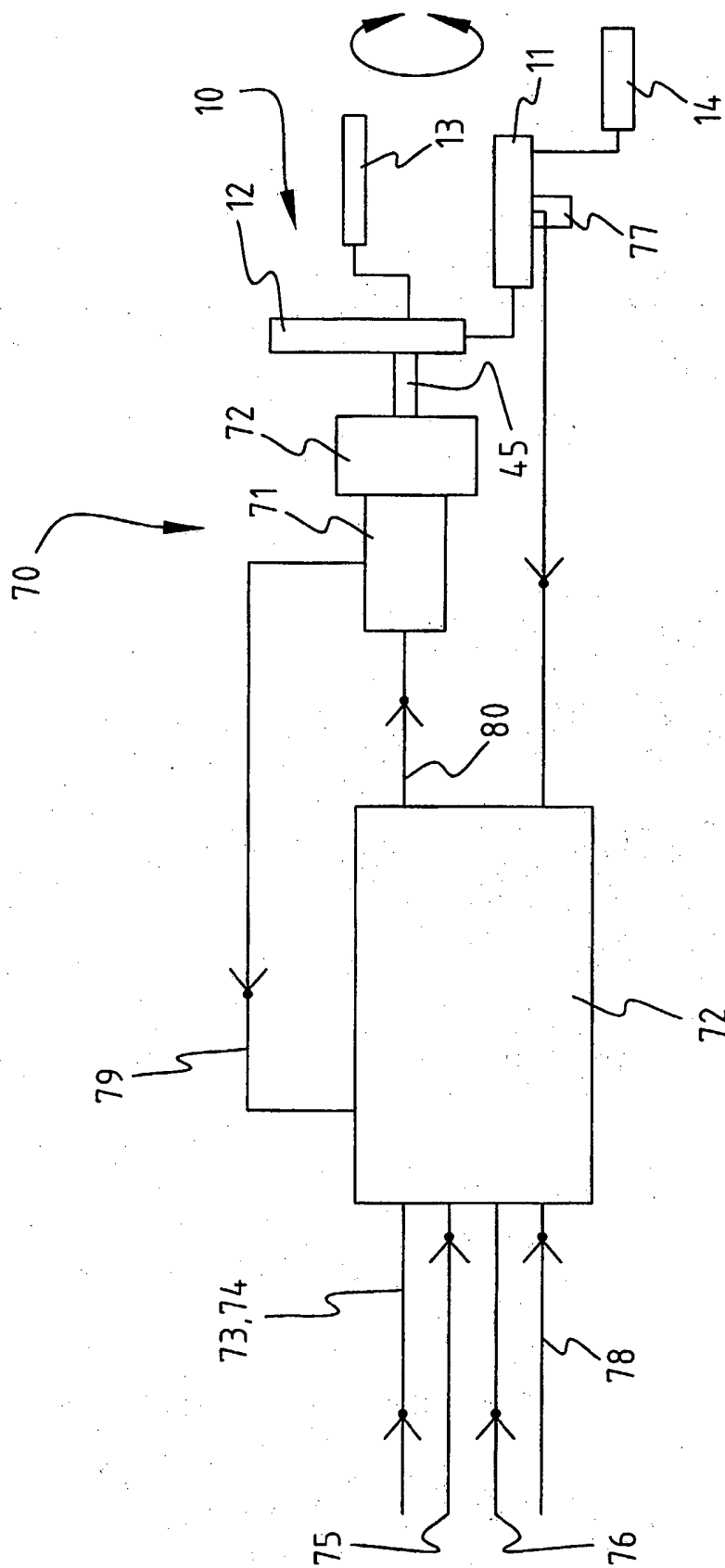


FIG. 7

REFERENCES CITED IN THE DESCRIPTION

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