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(54) **A WHEELCHAIR FOR TRANSPORTING PERSONS HAVING REDUCED MOBILITY AND A
RELATIVE TRANSPORT SYSTEM**

(57) A wheelchair (300) for transporting persons having reduced mobility which comprises a bearing frame (301) defining a seat (302), at least a pair of wheels (306), height-adjustable with respect to the seat (302) and rotatably associated to the bearing frame (301) by means of at least a horizontal rotating pivot (309), in which the bearing frame (301) comprises at least a pair of structural members (301 C), rigidly connected to the seat (302) and located below the seat (302), each provided with at least an elongate slot (308) inclined with respect to the plane defined by the seat (302) in which the at least a rotating pivot (309) is able to slide for a relative height-adjustment of the wheels (306) with respect to the seat (302).

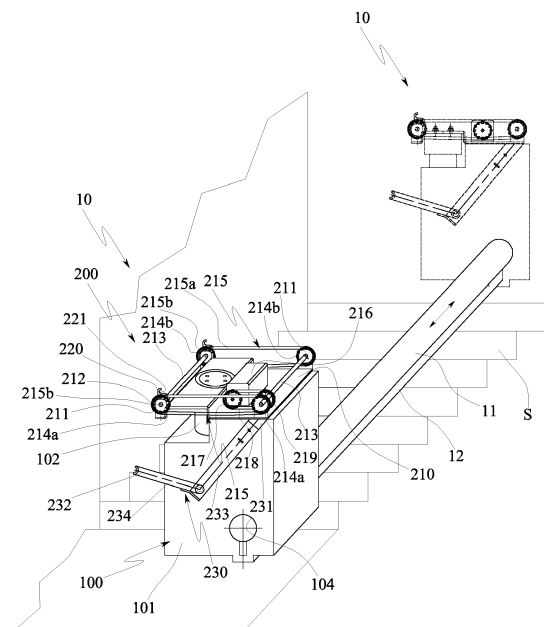


FIG.1

Description

TECHNICAL FIELD

[0001] The present invention relates to a wheelchair for transport of persons having reduced mobility, such as for example disabled, elderly or the like, and a transport system for persons having reduced mobility, for example provided with a stair-lift device for example for wheelchairs.

PRIOR ART

[0002] As is known, for transport of persons having reduced mobility, such as the elderly and other like social groups, the use of mobility vehicles can become necessary, also known as wheelchairs.

[0003] Wheelchairs of known type comprise a bearing frame, generally tubular, defining a substantially horizontal seat and a plurality of wheels, of which two wheels of small dimensions located anteriorly and pivotingly associated to the bearing frame, and two larger-dimension wheels rotatably associated posteriorly of the bearing frame with respect to a horizontal rotating axis. The rear wheels are often used for pushing the wheelchair by the user and/or for adjusting a height and/or inclination of the seat of the support frame.

[0004] In practice, the rotating pivots of the rear wheels can selectively engage an inclined upright (substantially vertical) of the bearing frame for regulating the height of the rear wheels with respect to the seat of the bearing frame.

[0005] As is known, in order to enable persons using wheelchairs to overcome any obstacles or architectural barriers, such as for example flights of stairs or the like, use is also known, where possible, of inclined ramps or stair-lift devices. Amongst these devices, fixed-guide stair-lift devices are known, also known as platform lifts.

[0006] Fixed-guide stair-lifts generally comprise a mobile frame which is slidable, by translating parallel to itself, along one or more guide bars which are fixed on steps of a flight of stairs or to a fixed structure located by a side of the level-change to be negotiated, for example a wall or a railing located flanked to a staircase.

[0007] A known type of stair-lift device, described in patent no. EP 2 650 247 in the name of the present Applicants, includes a stair-lift device comprising a support frame provided with a box casing able to slide along at least a guide bar, and lifting means fixed to the support frame superiorly of the casing for loading and unloading a carriage to and from the support frame between a first unloading position therefrom and a second loading position, in which the wheelchair is substantially superposed in plan view on the casing.

[0008] In this way, the wheelchair can be solidly supported superposed in plan view above the mobile casing of the stair-lift device, giving the user a good degree of comfort and sensation of safety, as well as enabling in-

stallation of stair-lift devices, which maintain the user on his or her wheelchair, exhibit a small size and are easy to install and use.

[0009] To raise the wheelchair onto the stair-lift and superpose it in plan view on the casing, the lower and rear dimensions of the wheelchair must be reduced, for example by removing the rear wheels, so that the wheels do not interfere with the guide bar of the stair-lift during the lifting and the transport of the wheelchair along the guide bar.

[0010] In practice, once the wheelchair is positioned on the stair-lift device, the user must remove the rear wheels from the wheelchair and retain them during the transport step along the pathway determined by the guide bar, then replace the wheels on the wheelchair at the end of the trajectory.

[0011] An aim of the present invention is to provide a wheelchair and a more comfortable stair-lift device offering greater comfort for the user with respect to prior-art devices, with a solution that is simple, rational and relatively inexpensive.

[0012] The aims are attained by the characteristics of the invention reported in the independent claim. The dependent claims delineate preferred and/or particularly advantageous aspects of the invention.

DESCRIPTION OF THE INVENTION

[0013] The invention in particular relates to a wheelchair for transport of persons having reduced mobility, which comprises a bearing frame defining a seat, at least a pair of height-adjustable wheels with respect to the seat and rotatably associated with respect to the bearing frame by means of at least a horizontal rotating pivot.

[0014] In the invention, the bearing frame comprises at least a pair of structural members, by way of an example rigidly connected to the seat and located below the seat, each provided with at least an elongate slot that is inclined with respect to the plane defined by the seat in which the at least a rotating pin can slide (directly or indirectly), moving along the trajectory defined by the elongate slot, for adjusting the relative height of the wheels with respect to the seat.

[0015] In this way, the rear wheels can be height-adjusted (continuously and without having to remove them) so as to reduce the lower and rear dimensions of the wheelchair, for example during the loading, unloading and transport steps in relation to a stair-lift device (for example the device described in patent EP 2 650 247, which is incorporated herein for purposes of reference), which can therefore be easily loaded on an appropriate stair-lift device without any removal of the rear wheels from the wheelchair being necessary.

[0016] In a further aspect of the invention, each elongate slot exhibits a longitudinal development which is inclined with respect to the horizontal by a predetermined angle.

[0017] With this solution, the elongate slots define a

rising and inclined pathway for the rotating pivots so as to pass from a maximum vertical height of the wheelchair, in which the rear wheels (i.e. the rotating pivots thereof) are distal from the seat, to a minimum vertical height, in which the rear wheels (i.e. the rotating pivot thereof) are proximal to the seat.

[0018] The longitudinal development of each elongate slot advantageously defines a sliding pathway for the rotating pivot lacking in horizontal tangential points, opposite ends of each elongate slot respectively define a first endrun position and a second endrun position, in which the first endrun position is located at a lower level than the second endrun position.

[0019] With this solution, the rear wheels can be brought from a second upper position to a first lower position by means of only the weight force thereof (gravity) acting on the rear wheel.

[0020] The wheelchair advantageously comprises at least a blocking element associated to the bearing frame able to removably constrain the position of the at least a rotating pivot in a predetermined position along the elongate slots.

[0021] In particular, the blocking element is configured so as to block the at least a rotating pin along the slots, enabling in any case the rotation of the rear wheels in the first endrun position.

[0022] In this way, the rotating pin of the rear wheels, and therefore the rear wheels themselves, can be fixed in a predetermined position along the pathway defined by the slots so as to enable the wheels to support the weight of the carriage and, at the same time, to rotate for the movement of the wheelchair. The blocking element is advantageously configured such as to block the at least a rotating pin at the first endrun position.

[0023] In a further aspect of the invention, the wheelchair comprises a pair of the rotating pivots, each associated to a respective wheel and coupled in a respective elongate slot, for example so as to be able to slide parallel to itself along the slot.

[0024] With this solution, the mounting and the maintenance of the wheelchair are facilitated and the dimensions of the wheelchair are contained.

[0025] A further aspect of the invention further provides a transport system for persons having reduced mobility, which comprises:

a wheelchair, as described above, and
a stair-lift device comprising at least a fixed guide bar and at least a support frame mobile along the guide bar and provided with lifting means able to lift the wheelchair for loading and unloading the wheelchair onto and off the support frame.

[0026] With this solution the wheelchair can be loaded on the stair-lift device with the possibility of reducing the dimensions of the wheelchair, in particular the rear wheels thereof, so as to prevent accidental contacts with the guide bar and without any need to remove the rear

wheels.

[0027] The support frame of the stair-lift device advantageously comprises at least an abutting element able to enter into contact with the at least a rotating pivot of the rear wheels during the lifting of the wheelchair by the lifting means of the wheelchair and able to slidably activate the at least a rotating pivot along the elongate slots.

[0028] Note that this concept, applied here for the rear wheels of the wheelchair, might easily be applied to any part of the wheelchair (parts of the frame, front wheels or other parts) which, once loaded on the stair-lift device, might interfere with the guide bar.

[0029] With this solution, the activating of the at least a rotating pivot of the wheelchair in such a way as to reduce the lower and rear dimensions of the wheelchair is substantially automated and does not require (if not minimally) the intervention of the user or auxiliary personnel.

[0030] The at least an abutting element advantageously comprises an arm provided with a first end constrained to the casing and a second free end.

[0031] In this way, the device is easy and economical to realize.

[0032] In an aspect of the invention, the free end of the arm is substantially cradle-formed and is able to grip at least a part of the at least a rotating pivot of the wheelchair.

[0033] In this way, the abutting element is able to interact with the at least a pivot of the wheelchair, easily accommodating it so as to activate it slidably along the elongate slots.

[0034] In a further aspect of the invention, the at least an abutting element is provided with a first portion comprising the first end constrained to the casing and a second portion comprising the free end of the arm in which the second portion is hinged to the first portion with respect to a substantially-horizontal hinge axis.

[0035] In this way, the free end of the arm is able to vertically accompany the at least a rotating pivot of the wheelchair (remaining mechanically engaged thereto) during the sliding along the elongate slides, easily following the profile thereof.

[0036] The device advantageously comprises a plurality (for example two in number) of abutting elements.

[0037] In this way, the abutting devices can act contemporaneously on a plurality of pivots or a single rotating pivot, gripping the pivot at separate points and guaranteeing a better balancing and sliding activation of the pivot or pivots.

[0038] In a further aspect of the invention, the support frame can comprise entry means for the wheelchair, in which the entry means comprise one or more (for example a pair) of guide borders converging towards the support frame. In this way, the wheelchair can be neared to the stair-lift device in a guided way by the guide borders, in order to enable the abutting elements and the lifting means to interact adequately with the corresponding elements of the wheelchair.

[0039] The stair-lift device can preferably exhibit a box-type casing (for internally containing the organs required for moving along the guide bar), of any shape, which slides along the guide bar: the lifting means are fixed to the support frame superiorly of the casing for loading and unloading a wheelchair to and from the mobile support frame, i.e. so as to carry the wheelchair between a first position, in which the wheelchair is resting on the ground surface, and a second position, in which the wheelchair (or rather the seat of the wheelchair) is located on-board the mobile support frame substantially superposed in plan view on the casing.

[0040] With this solution the person having reduced mobility can be transported along the slope, while remaining on the wheelchair.

[0041] Further, the movement of the wheelchair, with the user on-board, can be done automatically and without the aid of auxiliary personnel and without its being necessary to remove the rear wheels.

[0042] In an advantageous aspect, in the second loading position the wheelchair exhibits a centre of gravity that is vertically aligned with the box casing.

[0043] With this solution, the wheelchair or the lifting means (once the wheelchair is on-board the support frame) are not highly stressed, for example all flexion stresses on the wheelchair and on the lifting means are removed; also, the user, who is not unsupported but is seated on a material element (the box casing) that can be judged as stable, perceives the device as being safe and stable, with undoubted advantages in terms of safety and comfort, including mental comfort.

[0044] In a further advantageous aspect of the invention, a shaft superiorly projects from the box casing, on which shaft a plate lying on a horizontal plane is associated, for example rotatingly; the wheelchair in the loaded position is resting on the plate.

[0045] In this way, the wheelchair, being able to rotate together with the plate with respect to the vertical axis of the stair-lift device in such a way as to determine a lower encumbrance on the width of the pathway, can be used autonomously by the persons having reduced or limited motor ability, even on stairways having dimensions of smaller than one metre, with a limit at 75 cm.

BRIEF DESCRIPTION OF THE DRAWINGS

[0046] Further characteristics and advantages of the invention will emerge from a reading of the description that follows, provided by way of non-limiting example, with the aid of the figures of the accompanying tables.

Figure 1 is an axonometric view of a stair-lift device according to the invention.

Figure 2 is a frontal view of the stair-lift device of figure 1.

Figure 3 is a view from III of a detail of figure 2.

Figure 4 is a plan view of figure 2.

Figure 5 is a rear view of a wheelchair for transport

of persons having reduced mobility, according to the invention.

Figure 6 is a lateral view of figure 5.

Figure 7 is a lateral view of a transport system for persons having reduced mobility composed by the stair-lift device of figure 1 and the carriage of figure 6, in a first operating configuration.

Figure 8 is a lateral view of the transport system of figure 7 in a second operating configuration.

Figure 9 is a lateral view of the transport system of figures 7-8 in a third operating configuration.

Figure 10 is a lateral view of the transport system of figures 7-9 in a fourth operating configuration.

Figure 11 is a lateral view of the transport system of figures 7-10 in a fifth operating configuration.

Figure 12 is a lateral view of the transport system in the first and the fifth (represented with a broken line) operating configuration.

BEST WAY OF CARRYING OUT THE INVENTION

[0047] The characteristics and advantages of the present description are illustrated and described herein with reference to example embodiments. This description of examples of embodiments is to be taken in connection with the accompanying figures, which are to be considered an integral part of the whole description. Consequently the present description should not be expressly limited to some possible non-limiting combinations of characteristics which can exist alone or in other combinations of characteristics; the scope of protection of the claimed invention being defined in the appended claims.

[0048] In the description of the embodiments included herein, any reference to the direction or orientation is to be understood merely for ease of description, with no intention at all to limit the scope of protection of the present invention. Relative terms such as "lower", "upper", "horizontal", "vertical", "above", "below", "up", "down", "high", "low", and derived terms (for example "horizontally", "downwards", "upwards", etc.), should be interpreted as indicating the orientation as described or as shown in the figure under discussion.

[0049] These relative terms are used only for ease of description and do not require the apparatus to be constructed or used in a particular orientation. Terms such as "attached", "coupled", "fixed", "connected", "interconnected", "associated" and the like refer to a relationship in which the structures are fixed or attached to one another, directly or indirectly by means of intermediate structures, if it is not expressly indicated differently.

[0050] With particularly reference to the figures, in particular to figures from 5 to 12, reference numeral 300 denotes in its entirety a mobility vehicle, also known as a wheelchair, for transport of persons having reduced mobility, such as disabled persons, elderly persons or the like.

[0051] The wheelchair 300 comprises a bearing structure 301, for example tubular, which defines a seat 302,

for example substantially horizontal.

[0052] The bearing structure 301 can further define a footrest 303 and/or a backrest 304, for example provided with handles for activating the wheelchair 300, respectively falling and rising on opposite sides of the seat 302.

[0053] As is known, front wheels 305 are rotatably associated to the bearing frame 301, for example of the pivoting type, and two rear walls 306, for example rotatably associated to the bearing frame 301 with respect to a substantially-horizontal rotation axis.

[0054] The rear wheels 306 (and/or the front wheels 305) are advantageously height-adjustable with respect to the seat 302 of the bearing frame 301.

[0055] The rear wheels 306 can further comprise circular handles 307 activatable manually by the user for activating the rear wheels in rotation.

[0056] The bearing frame 301 comprises, for example, a pair of vertical front uprights 301 A and for example symmetrical with respect to a median plane M (shown in figure 5) of the wheelchair 300.

[0057] Each front wheel 305 is pivotably associated (and/or rotatably associated) to one of the front uprights 301 A.

[0058] The bearing frame 301 comprises, for example, a pair of inclined rear uprights 301 B (for example vertical) with respect to the plane defined by the seat 302, which for example are always symmetrical with respect to the median plane M of the wheelchair 300.

[0059] The front uprights 301 A and rear uprights 301 B are able to support the seat 302.

[0060] The rear uprights 301 B exhibit an upper end fixed to the seat 302.

[0061] The bearing frame 301 comprises, for example, a pair of transversal structural members 301C, for example also inclined with respect to the plane defined by the seat 302 (horizontal).

[0062] In particular, the transversal structural members 301C exhibit at least a rear portion (proximal to the rear walls 306) provided with a rising inclination towards the front portion.

[0063] For example each transversal structural member 301C is associated for example rigidly connected in proximity of a front end and a front upright 301 A (for example at the upper end thereof), and in proximity of a rear end to a rear upright 301 B (for example at the lower end thereof).

[0064] Further, each transversal structural member 301C is arranged inferiorly of the seat 302 and for example define two lateral flanks of the wheelchair which for example leave the space underlying the seat 302 of the wheelchair 300 free. Further, the transversal structural members 301C are also symmetrical with respect to the median plane M of the wheelchair 300.

[0065] The bearing frame 301 comprises a pair of elongate slots 308 arranged parallel to one another and for example facing.

[0066] In practice, the elongate slots 308 are identical and also symmetrical with respect to the median plane

M of the wheelchair 300.

[0067] Each elongate slot 308 is afforded, for example, in a transversal structural member 301C, for example in the inclined rear portion (inclined upwards) of the rear structural members 301C.

[0068] The through-axis of each elongate slot 308 is substantially horizontal and the two elongate slots 308 are aligned with respect to the through-axis.

[0069] Each elongate slot 308 comprises a longitudinal development (straight or curved) substantially inclined with respect to the horizontal, for example by a predetermined angle comprised between 1° and 90°.

[0070] Each elongate slot 308 comprises a first end 308A and a second end 308B located at different heights.

[0071] In particular, in the illustrated embodiment, the first end 308A of each slot 308 is located lower with respect to the second end 308B and is proximal to the respective rear upright 301 B (i.e. the rear end of the transversal structural member 301 C), while the second end 308B is proximal to the front upright 301 A, for example about halfway along the longitudinal development of the transversal structural member 301C (for example at a higher point than the rear end of the transversal structural member 301 C).

[0072] In the embodiment illustrated in the figures, the inclination of the longitudinal development of each elongate slot 308 is variable along the respective elongate slot, for example is greater in proximity of the first end 308A and smaller in proximity of the second end 308B.

[0073] In any case, the longitudinal development of each elongate slot 308 is free of non-tangent points, either defining a progressively rising profile (from the first end 308A to the second end 308B) or progressively descending profile (from the second end 308B to the first end 308A).

[0074] For example, each elongate slot 308 is conformed substantially in an arc shape with a concavity facing downwards.

[0075] The rear wheels 306 are rotatably associated to the bearing frame 301, for example to the transversal structural member 301C, by means of at least a rotating pivot 309 with a (horizontal) axis parallel to the plane of the seat 302. In the preferred embodiment, illustrated in the figures, the wheelchair 300 comprises a rotating pivot 309 for each rear wheel 306.

[0076] For example, each rotating pivot 309 is substantially cylindrical and comprises a first longitudinal end 309A (free) rotatably associated to the bearing frame 301 and a second longitudinal end 309B associated to a respective rear wheel 306.

[0077] In particular, the first longitudinal end 309A of each rotating pivot 309 is insertable in a respective elongate slot 308 (for example so as to project beyond the transversal upright 301C substantially below the seat 302 and be blocked there by reversible anti-deinserting means known in the sector) and the second longitudinal end 309B is arranged in a distal and external position with respect to the bearing frame 301 in such a way that

an intermediate portion 309C of the rotating pivot 309 is substantially internal of the through-slot 308 maintained in a horizontal position by the internal walls thereof.

[0078] In a further embodiment, not illustrated in the figures, the wheelchair 300 can comprise a single rotating pin 309 housed, in proximity of the longitudinal ends thereof, in both the elongate slots and associated to both the rear wheels 306.

[0079] The rotating pivots 309 are able to slide in the elongate slots 308 for adjusting the relative height of the wheels with respect to the plan defined by the seat 302 of the bearing frame 301.

[0080] Each rotating pivot 309 is able to slide (while remaining substantially parallel to the horizontal) in a respective elongate slot 308.

[0081] In particular, each elongate slot 308 defines a sliding pathway (and/or rolling pathway) for the respective rotating pivot 309, comprising a first endrun position, corresponding to the first end 308A of the elongate slot, and a second endrun position substantially corresponding to the second end 308B of the elongate slot.

[0082] Each elongate slot 308 further defines a progressively-rising sliding pathway for the rotating pivot 309 inserted therein between the first endrun position and the second endrun position.

[0083] The wheelchair 300 comprises a blocking element 314 for each rotating pivot 309 able to reversibly block the rotating pin 309 in at least a fixed position along the respective elongate slot 308.

[0084] Each blocking element 314 is for example configured such as to block the rotating pivot 309 in a proximal position to the first endrun position.

[0085] The blocking element 314 is selectively operable from a blocked configuration, in which it blocks the position of the rotating pin 309 with respect to the elongate slot 308, and an unblocked position, in which it frees the rotating pin 309 which can therefore slide (freely) along the pathway defined by the elongate slot 308.

[0086] Each blocking element 314 is shown by way of example in the drawings as a small blocking cylinder 314A (having a broadened head) associated movably to the bearing frame 301, for example to the transversal structural member 301C thereof.

[0087] The blocking cylinder 314A is insertable for example in a complementary engaging seating 314B fashioned in the bearing frame 301, for example in the transversal structural member 301C (i.e. the same structural member the elongate slot 308 is fashioned in).

[0088] The engaging seating 314B is for example a cylindrical seating with a transversal axis with respect to the through-slot 308, so as to cross the through-slot from side to side, for example at a portion thereof proximal to the first end 308A and distant therefrom by a distance that is such as to substantially snugly accommodate (between the first end and the blocking cylinder 314A inserted in the engaging seating 314B) the rotating pivot 309 (i.e. the intermediate portion thereof 309C).

[0089] The blocking cylinder 314A is able to slide along

a parallel direction to the axis thereof between a blocking position in which it is at least partly housed internally of the respective engaging seating 314B, in which it prevents the sliding of the rotating pivot 309 along the elongate slot 308, retaining it between the first end 308A and the blocking cylinder, and an unblocking position in which it is extracted (for example retained in the user's hands) from the engaging seating 314B and enables the rotating pivot 309 to slide along the elongate slot 308.

[0090] The blocking cylinder 314A (in any case the blocking element 314) is configured so as to limit (block) the travel of the rotating pivot 309 along the elongate slot 308, leaving however the rotating pivot 309 (and therefore the rear wheel 306) free to rotate with respect to the rotating axis thereof.

[0091] Each blocking element 314 is advantageously of the manual unblocking type. For example, the blocking cylinder 314A can be activated from the blocking position to the unblocking position only by manually raising the blocking cylinder 314A.

[0092] Each blocking element 314 can advantageously be for example of the automatically-blocking type.

[0093] In particular, the blocking cylinder 314A can be a part of a bolt activated from the unblocking position to the blocking position automatically, for example by gravity or by effect of elastic elements of known type and not illustrated in the figures or activatable by means of lever systems associable to the bearing frame 301 provided with command means (for example by interference or another method) the blocking element 314 to pass from the unblocking position to the blocking position.

[0094] The wheelchair 300 might also comprise a plurality of blocking elements 314 for each rotating pin 309, arranged along the elongate slot 308, so as to enable the respective rotating pivot 308 to assume a plurality of fixed positions along the sliding pathway defined by the elongate slot.

[0095] The wheelchair 300 further advantageously exhibits a substantially empty space in the zone underlying the seat 302 and comprised between the two rear wheels 306.

[0096] In particular, the wheelchair 300 comprises a first rigid pivot 310, substantially undeformable, which is fixed to the bearing frame 301, for example at the edge between the seat 302 and the backrest 304 and arranged posteriorly of the wheelchair with a longitudinal axis thereof substantially horizontal (parallel to the edge between the backrest and the seat).

[0097] In the illustrated example, the first pivot 310 is fixed by two forks 311 to a horizontal bar of the bearing frame 301, though it can be the same horizontal bar of the bearing frame 301 or can be welded or realised in a single piece therewith.

[0098] The wheelchair 300 further comprises a second rigid pivot 312, substantially undeformable, which is fixed to the bearing frame 301, for example at the edge between the seat 302 and the backrest 304 and arranged posteriorly of the wheelchair with the longitudinal axis

thereof substantially horizontal (parallel to the edge between the backrest and the seat).

[0099] In practice, the first and the second pivot 310 and 312 are parallel to one another, arranged coplanarly on a substantially horizontal plane and distanced so as to define a gap 313 interposed there-between.

[0100] Further, the wheelchair 300 comprises a pair of profiled elements 320, shown in figure 5, which exhibit a longitudinal development that is substantially straight and a transversal section that is substantially C-shaped.

[0101] The profiled elements 320 are fixed to the bearing frame 301 below the seat 302.

[0102] In practice, the profiled elements 320 are fixed to the bearing frame 301, substantially parallel to one another and distanced, with longitudinal axes perpendicular to the first pivot 310 and lying on a substantially parallel plane to the plane of the seat 302, which can be parallel or advantageously slightly inclined, for example by about 3° with respect to the plane of the seat 302 (as visible in figure 6).

[0103] The profiled elements 320 are located laterally with respect to the first pivot 310, for example at the lateral flanks of the wheelchair 300, and are located in the empty zone located below the seat 302.

[0104] At least the rear end of the profiled elements 320 is open and appropriately conformed such as to facilitate the insertion therein of guide means 400 of a stair-lift device 10 which in the following will be described in detail.

[0105] With particular reference to figures 1-4 and 7-12, 10 denotes in its entirety a stair-lift device, used for the transport of persons having reduced mobility, such as persons with disabilities or elderly people, so as to overcome changes of levels (architectural barriers) of any type, such as stairs, steps, ramps, bridges and the like.

[0106] In the illustrated example the stair-lift device 10 is used to climb a staircase S (visible in figure 1) by a side of or above which, for example at a vertical wall or railing, a guide bar 11 is fixed, which for example exhibit an inclination that is identical to or even smaller or greater than the inclination of the portion of staircase on which it is superposed.

[0107] The device 10 comprises a mobile support frame 100, which is for example provided with a motor located on-board thereof and arranged internally, for example, of a closed casing 101 (for example a box casing of any shape), from which a rigid vertical shaft 102 superiorly exits and on which a plate 103 is (for example) rotatably associated, which plate 103 can be arranged substantially horizontally.

[0108] The casing 101 further defines, in a zone located below the horizontal plane defined by the plate 103, a space 104 which can be inserted on the guide bar 11 (and able to slide along the bar 11), which guide bar 11 defines a translation pathway of the support frame 100, as known to a technical expert in the sector.

[0109] The guide bar 11, for example, has a circular

section and exhibits a rack 12, located inferiorly, enmeshing, as known to a technical expert in the sector, with one or more pinions coupled to the motor located internally of the casing 101 and able to move, as is known, the support frame 100 along the guide bar 11.

[0110] The guide bar 11 is continuous along the longitudinal development and is able to connect at least two distant points, for example located at different levels to one another.

[0111] The guide bar 11 can be realised by several portions associated to one another with no break in continuity which exhibit different inclinations or curves and which follow the longitudinal progression of the staircase S.

[0112] With particular reference to figures 1-4, the device 10 comprises lifting means, denoted in their entirety by reference numeral 200, which are associated to the support frame 100; in particular they are fixed (superiorly) to the plate 103, in such a way that they can be variously orientated with respect to the casing 101, being able to rotate with respect to a vertical axis. The lifting means 200 comprise a plane 210 that can be bolted to the plate 103 and provided with four lateral lugs 211 rising vertically from the plane 210 and defining respective portions of lateral flanks arranged two-by-two and facing and distanced from one another.

[0113] Through-holes 212 are afforded in each of the lateral lugs 211, two-by-two and aligned and able to rotatably support a pair of revolving pivots 213. Two pinions are splined on each revolving pivot, of which a right pinion 214a and a left pinion 214b, distanced along the axis of the revolving pivot 213. Each pair of right pinions 214a and left pinions 214b is able to support, substantially in tension, a respective looped chain 215.

[0114] An electric motor 216 is fixed on the plane 210, for example the drive shaft of which (for example associated to an appropriate gear reducer, as known to the technical expert in the sector) is arranged parallel to the revolving pivots 213 and supports a drive pinion 217 connected by means of a further chain 218 (or a belt) with a respective drive pinion 219 splined on one of the revolving pivots 213 in an intermediate zone between the right pinion 214a and the left pinion 214b so as to draw the revolving pivot 213 in rotation and therefore the chains 215.

[0115] In practice, the two chains 215, which are arranged parallel with each thereof lying on a vertical plane, are motorized in synchrony and can be selectively activated in both rotation directions by activation in rotation commanded by the motor 216.

[0116] The chains 215 exhibit at least an upper portion 215a that is straight and parallel to the plane 210, which portion defines an active portion of the chains 215, as will emerge more clearly in the following.

[0117] Further, the chains 215 exhibit two descending connecting curved portions 215b, located on opposite sides of the straight portion and located by a side of the pinions 214a and 214b.

[0118] A hooking element 220 is fixed to each chain 215, for example a hook, provided with a cradle-shaped concave portion 221 having a perpendicular axis to the lie plane of the chain 215 and located externally thereof.

[0119] The two hooking elements 220 are such as to be arranged substantially aligned along a parallel direction to the axes of the revolving pivots 213; in practice the concave portions 221 of the hooking elements 220 are coaxial to one another.

[0120] In the illustrated example, a single curved portion 215b (front), in which the hooking element 220 is arranged with the concave portion 221 facing upwards, as will more fully emerge from the following, and defines a front hooking zone of the device 10, opposite a rear zone in which the hooking element 220 is at the opposite end of the upper portion 215a with respect to the above-mentioned curved portion 215b.

[0121] Each hooking element 220 is therefore able to move in the two advancement directions (activated by the motor 216) along the front curved portion 215b and the upper portion 215a between two endrun positions (shown for example respectively in figure 7 and figure 11), of which a front endrun, in which the concave portion 221 is substantially facing forwards (frontally accessible) and the hooking element 220 is in the curved portion 215b, and a rear endrun, in which the concave portion 221 is facing backwards and is substantially aligned vertically with the revolving pivot 213 located in the rear zone of the device 10.

[0122] In practice, when the hooking element 220 is in the front endrun position the chains 215 are stationary with the hooking element located in the front curved portion 215b in an angular position inclined by a negative angle (for example by about 20°) with respect to the horizontal plane, so that the concave portion 221 is frontally accessible (on a horizontal plane).

[0123] The chains 215 (in particular the respective upper portions 215a) define a sliding direction (horizontal) for the hooking elements 220 with respect to the casing 101.

[0124] The hooking elements 220 are able to hook the wheelchair 300 for raising and loading the wheelchair 300 on the casing 101 of the device 10.

[0125] In particular, the first pivot 310 of the wheelchair 300 can be arranged internally of the concave portion 221 of the hooking elements 220, such that the free end (which exhibits a rounded external profile parallel to the concave portion 221) of the hooking elements inserts substantially snugly in the gap 313.

[0126] When the hooking element 220 is in the front endrun position the first pivot 210 can be arranged aligned in plan view with the concave portion 221 (on the circular trajectory which the concave portion 221 follows along the curved portion 215b) simply by translating (backwards) the wheelchair in a perpendicular direction to the first pivot.

[0127] In practice, the lifting means 200 comprise gripping means (defined for example by the hooking ele-

ments (220) able to retain the wheelchair 300 and movement means (defined for example by the chains 215 and the motor 216) which move the gripping means and are associated to the support frame 100 for moving the wheelchair 300, alternatively, for loading and unloading the wheelchair 300 to and from the support frame.

[0128] These movement means comprise lifting means (defined for example by the curved portion 215b of the chains 215) able to at least partially lift the wheelchair 300, and translation means (defined for example by the upper portions 215a of the chains 215) able to translate the wheelchair 300 which has been lifted along a substantially horizontal direction (the displacement direction) for the superposing of the wheelchair 300 on the support frame 100.

[0129] The operating steps of the loading and unloading of the wheelchair 300 on and off the device 10 are described more fully in the following.

[0130] With reference to figures 3-4, the device 10 comprises guide means 400 able to guide the wheelchair 300 once the wheelchair 300 has been connected to the lifting means 200 providing a stable rest surface for the wheelchair 300. The guide means 400, for example, co-operate with the profiled elements 320.

[0131] The guide means 400 comprise a plurality of wheels 401 a, 401 b associated rotatably idle to lateral flanks 402 rising from the plane 210 in an external zone with respect to the lateral lugs 211 thereof.

[0132] The wheels 401 a, 401 b exhibit rotation axes parallel to the rotation axis of the revolving pivots 213 and are sub-divided into a first series of right wheels 401 a aligned with one another and defining a first substantially horizontal upper rest surface and a second series of left wheels 401 b aligned to one another and defining a second upper rest surface that is substantially horizontal and coplanar to the first rest surface.

[0133] The right and left wheels 401 a, 401 b are, for example, respectively coaxial and aligned two-by-two.

[0134] In practice, each series (right or left) of wheels 401 a, 401 b is able to insert internally of a profiled element 320 of the wheelchair 300, so as to guide the wheelchair along a perpendicular direction to the rotation axis of the wheels. The upper internal surface of the profiled elements 320 can be stably rested on the rest surfaces defined by the wheels 401 a, 401 b, which therefore support the weight of the wheelchair 300.

[0135] Further, the profiled elements 320 can prevent vertical translation (in both directions) of the wheelchair 300 with respect to the device 10, once the wheels 401 a, 401 b are arranged internally of the profiled elements 320. Further, the wheels 401 a, 401 b facilitate the translation of the wheelchair 300 along the horizontal direction imparted on the wheelchair 300 by the chains 215, by means of the hooking elements 220.

[0136] In particular for the aims of the present invention, the device 10 comprises at least an abutting element 230 associated to the support frame 100, for example the casing 101, for example in such a way as to project

therefrom (or equivalently being a part thereof) and able to enter into contact with the at least a rotating pivot 309 of the wheelchair 300, so as to activate the rotating pivot 309 in movement along the elongate slot 308.

[0137] The device 10 preferably comprises a pair of abutting elements 230 distanced from one another and for example substantially parallel.

[0138] In practice, each abutting element 230 can come into contact with a respective rotating pivot 309 of the wheelchair 300.

[0139] In practice, when the wheelchair 300 is aligned with the casing 101 in order to be hooked thereto by the lifting means 200, the abutting elements 230 are substantially symmetrical with respect to a median plane of the wheelchair 300.

[0140] The abutting elements 230 are (always) advantageously symmetrical with respect to a plane (vertical) parallel to the lie plane of the chains 215 and intermediate between them (the plane of symmetry thereof).

[0141] Each abutting element 230 comprises an arm 233, 234 provided with a first end 231 constrained to the casing 101 and a second free end 232.

[0142] The second end 232 of each (arm) abutting element 230 is substantially cradle-conformed, with a concavity facing (forwards) on the opposite side with respect to the casing 101 and is able to grasp at least a part of a respective rotating pivot 309.

[0143] In practice, the second end 232 of each (arm) abutting element 230 exhibits a concavity able to at least partly accommodate a portion of the rotating pivot 309 which projects from the elongate slot 308, for example a portion interposed between the intermediate portion 309C and the second longitudinal end 309B of the rotating pivot 309.

[0144] The second end 232 of each (arm) abutting element 230 projects frontally of the casing 101 by a limited axial portion.

[0145] The abutting element 230, i.e. the arm 233, 234 is advantageously made up of at least two portions, respectively a first portion 233 and a second portion 234, hinged to one another as described in the following.

[0146] In particular, the first portion 233 of the arm comprises the first end 231 constrained (for example fixed) to the casing 101; the second portion 234 comprises the second end 231 free and it is hinged to the first portion 233 with respect to a substantially horizontal hinge axis.

[0147] In particular, the first portion 233 of each abutting element 230 comprises an end, opposite the first end 231, which is hinged to an end of the second portion 234 opposite the second end 232 of the abutting element.

[0148] In practice, the first portion 233 of the abutting element 230 is constrained to the casing 101 and the second portion 234 can perform oscillations about the hinge axis with the first portion.

[0149] Each abutting element 230 further comprises a support bracket 235 constrained to the end of the first portion 233 opposite the first end 231, and defining a support shelf for the second portion 234 in a stable po-

sition of equilibrium (or rest).

[0150] In practice, the second portion 234 of each abutting element 230 can be supported by the support shelf 235 in a rest position in which the longitudinal axis of the second portion 234 is inclined with respect to the horizontal and in which the second end of the abutting element 230 is located at a substantially corresponding height to that of the rotating pivot 309 of the wheelchair 300 (blocked in the first endrun position) resting on the ground. The (each) abutting element 230 can be advantageously rotatably associated to the casing 101 with respect to an axis of revolution parallel to and/or coinciding with the rotating axis of the plate 103 on the vertical shaft 102 (for example the plate 103 and the abutting element 230 being solidly constrained in rotation), so that according to the orientation of the plate 103 (and therefore the displacement direction imparted by the lifting means 200 to the wheelchair 300) the abutting element 230 can in any case be aligned (along the displacement direction) with a portion of the rotating pivot 309.

[0151] In practice, the first portion 233 of the abutting element 230 can be constrained to a bush rotatably associated to a vertical axis (parallel and coinciding with the rotation axis of the plate 103) to the casing 101.

[0152] The device 10 further comprises entry means for the wheelchair 300, which for example can comprise a pair of opposite guide borders, depicted only with a broken line in figure 4 and denoted by reference numeral 500 (separate and symmetrical with respect to the plane of symmetry of the chains 215) which are associated to the casing 104 and are inclined in such a way as to be convergent towards the casing 104.

[0153] The entry means, in practice, guide the wheelchair 300 along the displacement direction nearingly to the casing 101, so as to align, along that direction, the rotating pivots 309 to the abutting elements 230 and the first pivot 210 to the hooking element 220.

[0154] The guide borders 500 can advantageously be associated rotatably to the casing 101 with respect to a revolution axis that is parallel to and/or coinciding with the rotation axis of the plate 103 on the vertical shaft 102 (for example the plate 103 and the guide borders 500 being solidly constrained in this revolution), so that according to the orientation of the plate 103 (and therefore to the displacement direction imparted by the lifting means 200 on the wheelchair 300) the guide borders 500 can in any case align (along the displacement direction) the wheelchair 300 to the casing 101.

[0155] In practice, the guide borders 500 can be constrained to a bush (for example the same bush as described above) rotatably associated with respect to a vertical axis (parallel and coinciding with the rotation axis of the plate 103) to the casing 101.

[0156] The guide borders 500 can advantageously be fixed (or realized together with) to the abutting element 230, for example at the second end 232.

[0157] In practice, as shown in figure 4, the abutting elements 230 define, in plan view (dotted line in the fig-

ure), a V-configuration tapering towards the casing 101.

[0158] With reference to figures from 7 to 11, a description follows of the procedural operating steps of the functioning of the transport system composed of the wheelchair 300 and the stair-lift device 10 (with particular reference to the loading and/or unloading the wheelchair 300 onto/off the stair-lift device 10). The wheelchair 300 is alternatively mobile between a first position, shown in figure 7, in which the wheelchair rests on the ground on all wheels, i.e. the front wheels 305 and the rear wheels 306, and a second position, shown in figure 11, in which it is positioned on-board the support frame 100 and completely raised from the ground, and for example aligned in plan view with the casing 101.

[0159] In the example, the lifting means 200 described above can take the wheelchair 300 and transport it alternatively between the first position and the second position.

[0160] In practice, to lift the wheelchair 300 from the first position to the second position, the procedure is as follows.

[0161] With the wheelchair 300 in the first position (and with the rotating pivots 309 blocked along the elongate slot 308 by the respective blocking elements 314 in the first endrun position), there is a nearing thereof, proceeding in reverse, to the front zone of the device 10, as shown in figure 7, so as to near the first pivot 310 to the hooking element 210 as much as possible.

[0162] The guide borders 500 facilitate this alignment.

[0163] The hooking element 220, which is at the front endrun, has the concave portion 221 thereof located substantially below the first pivot 310, and in such a way as to near the rotating pivots 309 to the abutting elements 230, which are in the rest position, so that the second ends 232 of the abutting elements can grasp the rotating pivots 309 following a translation of the wheelchair 300 in the displacement direction towards the casing 101.

[0164] From this position, for example using controls operable by the wheelchair 300 user, which controls can be arranged in proximity of the armrests of the wheelchair 300, provided with batteries and able to give a wireless command of the motor 216, the rotation of the chains 215 is activated so that the concave portion 221 embraces the first pivot 310 and enters into contact therewith; from here the hooking elements 220 lift the first pivot 310, for example, by a few centimetres.

[0165] In practice, the hooking element 220, as it proceeds along the curved portion 215b, substantially vertically raises the wheelchair 300, by a few centimetres, bringing the wheelchair 300 into a first raised position, in which at least the rear wheels 306 are raised from the ground, as visible in figure 9.

[0166] In this first raised position a temporary endrun can be set, in which the motor 216 is commanded to halt the rotation of the chains 215 in such a way as to stop the run of the wheelchair 300 hooked to the hooking elements 220.

[0167] For example, between the front endrun and the

temporary endrun the hooking element 220 will have travelled by an angle substantially comprised between 30° and 50°.

[0168] With the wheelchair 300 in this temporary endrun position, the wheelchair 300 user can comfortably unblock the blocking elements 314 retaining the rotating pivots 309, and the respective rear wheels 306, in a fixed position along the respective elongate slots 308.

[0169] When the blocking elements 314 are unblocked, for example the blocking cylinders 314A are removed from the respective engaging seatings 314B, the user can command the resuming of rotation of the chains 215 by means of the motor 216 which then draws the wheelchair 300 along the displacement direction.

[0170] The hooking element 220, continuing to move along the curved portion 215b, continues to raise the wheelchair 300 up to a second raised position, shown in figure 10, in which the first pivot 210 is substantially aligned in plan view with the revolving pivot 213 located at the front zone of the device 10. Further, in this position the open end of the profiled elements 320 is aligned (horizontally) with the series of wheels 401 a, 401 b, which can insert on profiled elements. During the raising of the wheelchair 300 the abutting elements 230 of the device 10 begin activating (in practice by placing them in relative motion with respect to the bearing frame 301) the rotating pivots 309 to slide along the elongate slots 308 from the first endrun position towards the second endrun position.

[0171] Further, during the raising of the wheelchair 300 the second portion 24 of each abutting element 230 rotates about the hinge axis thereof with the first portion 233 together with the sliding of the respective rotating pivot 309.

[0172] On conclusion of the travel along the curved portion 215b the hooking element 220 follows on its path, moving along the upper portion 215a and drawing (horizontally) with it the wheelchair 300.

[0173] In practice, the wheels 401 a, 401 b insert gradually internally of the profiled elements 320, keeping the wheelchair 300 resting thereon, guiding it and facilitating translation thereof.

[0174] While the hooking elements 220 travel along the upper portion 215a, the rotating pivots 309 pushed by the abutting elements 314 slide along the elongate slots 309 (towards the second endrun position), drawing the rear wheels 306 to move into a raised position with respect to the seat 302 proximal thereto.

[0175] The sliding of the rotating pins 309, and at the same time of the rear wheels 306, enables the rear and lower dimensions of the wheelchair 300 to be gradually considerably reduced in size and prevents the rear wheels from entering into contact with the guide bar 11 in all the possible orientations of the device 10.

[0176] Further, as the hooking element 220 gradually advances from the front zone to the rear zone of the device 10, the front wheels 305 of the wheelchair 300 are also raised from the ground, so that at the end of the travel along the upper portion 215a of the hooking ele-

ment, i.e. when the first pivot 310 is substantially aligned in plan view with the revolving pivot 213 located in the rear zone of the device 10 (the rear endrun position), the wheelchair 300 is in the second position (shown in figure 11), i.e. it is completely on-board the device 10.

[0177] The slight inclination of the profiled elements 320 with respect to the plane of the seat 302 is advantageously such as to facilitate the raising from the ground of the front wheels 305 during the travel of the hooking element 220 from the front zone to the rear zone.

[0178] In this position, as in any intermediate position between the first position and the second position, the hooking element 220, being inserted substantially snugly in the gap 313 between the first pivot 310 and the second pivot 312, prevents the de-inserting of the wheelchair 300 from the device 10, in particular the de-inserting of the wheels 401 a, 401 b from the profiled elements 320.

[0179] When the wheelchair 300 is in the second position, the rotating pivots 309 are substantially in the second endrun position of the pathway defined by the elongate slots 308 and the rear wheel 306 are in a completely raised position (with respect to the plane of the seat 302) which frees the rear and lower dimensions of the wheelchair 300, to a sufficient distance from the guide bar 11 so as not to enter into contact there-with in any relative position permitted by the device 10.

[0180] Further, when the wheelchair 300 is in the second position, the rotating pivots 309 are supported in the second endrun position by the respective abutting elements 230, which prevent the rotating pivots 309 from travelling backwards along the elongate slots 308 by force of gravity when the wheelchair 300 is in the loaded position.

[0181] Only when the wheelchair 300 is located on-board the device 10 is it possible to command the translation thereof along the guide bar 11 for going up or down the staircase S.

[0182] To bring the wheelchair 300 from the second position to the first position, using the controls available to the user, the motor 216 is commanded to invert the rotation motion of the chains 215 and, therefore, the hooking elements 220 will in succession travel along the upper portion 215a and the curved portion 215b, in reverse order of the steps described above.

[0183] In particular, the external flank of the hooking element 220 is able to come into contact with the second pivot 312 in the reverse motion from the second position to the first position, pushing the second pivot 312 (and therefore the wheelchair 300) from the rear zone to the front zone of the device 10.

[0184] During the reverse motion of the wheelchair 300 from the second position to the first position, the rotating pivots 309 slide, from the second endrun position to the first endrun position of the pathway defined by the elongate slots 308, by force of gravity, i.e. the weight force of each rear wheel 306 defines a thrust on the rotating pivot 309 such as to push it along the elongate slot 308 towards the first endrun position (contemporaneously the

abutting element 230 will return into the stable equilibrium position thereof - or rest position - for example activated by the force of gravity.

[0185] It is possible for the reverse movements of the rotating pivot 309 and/or of the abutting element 230 to be commandable by automated command means.

[0186] Further, a temporary endrun is important, subject to informed consent at the first raised position (shown in figure 9) also during the performing of a return step, so as to enable the user to bring the blocking elements 314 from the unblocked position to the unblocked position so as to fix the rear wheels 306 in a fixed position along the elongate slot 308 (first endrun position) before the elongate slot is freed from the hooking elements 220 which have reached the front endrun position, in the front zone of the device 10.

[0187] The wheelchair 300 can alternatively comprise blocking elements 314 of the rotating pivots 309 of an automatically blocking type, as described above, so as to enable automatic blocking of the rear wheels 306 (in the first endrun position) before the wheelchair 300 is freed from the hooking elements 220. To guarantee the halting of the motor 216 in the endrun positions (front, rear and temporary), the device 10 can comprise a control and command unit operatively connected to the motor 216 and sensor means, such as microns or other position or proximity sensors, connected to the control and command unit and able to detect the position of the hooking element 220 and/or the position of the rear wheels 306 of the wheelchair 300, such that the control and command unit can generate an enable signal and the commands located on-board the wheelchair 300 can command the rotation of the chains 215 if the circumstances permit.

[0188] The lifting means 200 can advantageously be different and of an equivalent type with respect to what is illustrated.

[0189] For example, the lifting means 200 might include gripping means variously configured according to needs, which can be different with respect to the above-described hooking elements 22 and which are in any case able to stably grip a portion of the wheelchair 300.

[0190] Further, the lifting means might include, for example, movement means of the gripping means, variously configured so as to lift and place the wheelchair 300 on-board the device 10 according to constructional needs. The invention as it is conceived is susceptible to numerous modifications and variants, all falling within the scope of the inventive concept.

[0191] Further, all the details can be replaced by other technically-equivalent elements.

[0192] In practice, the materials used, as well as the contingent shapes and dimensions, can be any according to requirements, without forsaking the scope of protection of the following claims.

Claims

1. A wheelchair (300) for transporting persons having reduced mobility which comprises a bearing frame (301) defining a seat (302), at least a pair of wheels (306), height-adjustable with respect to the seat (302) and rotatably associated to the bearing frame (301) by means of at least a horizontal rotating pivot (309), **characterised in that** the bearing frame (301) comprises at least a pair of structural members (301 C), rigidly connected to the seat (302) and located below the seat (302), each structural member being provided with at least an elongate slot (308) inclined with respect to the plane defined by the seat (302) in which the at least a rotating pivot (309) is able to slide for a relative height-adjustment of the wheels (306) with respect to the seat (302). 5
2. The wheelchair (300) of claim 1, **characterised in that** each elongate slot (308) exhibits a longitudinal development which is inclined with respect to the horizontal by a predetermined angle. 10
3. The wheelchair (300) of claim 1 or 2, wherein the longitudinal development of each elongate slot (308) defines a sliding pathway for the rotating pivot (309) lacking in horizontal tangent points, opposite ends of each elongate slot (308) respectively defining a first endrun position and a second endrun position, in which the first endrun position is located at a lower level than the second endrun position. 15
4. The wheelchair (300) of any one of the preceding claims, wherein the at least a rotating pivot (309) is mobile from the second endrun position to the first endrun position moved by the force of gravity. 20
5. The wheelchair (300) of any one of the preceding claims, **characterised in that** it comprises a blocking element (314) associated to the bearing frame (301) able to removably constrain the position of the at least a rotating pivot (309) in a predetermined position along the elongate slots (308). 25
6. The wheelchair (300) of claim 5, wherein the blocking element (314) is configured so as to block the at least a rotating pin (309) at the first endrun position. 30
7. The wheelchair (300) of any one of the preceding claims, comprising a pair of the rotating pivots (309), each associated to a respective wheel (306) and coupled to a respective elongate slot (308). 35
8. A transport system for persons having reduced mobility which comprises: 40

a wheelchair, according to any one of the preceding claims, and
- a stair-lift device (10) comprising at least a fixed guide bar (11) and at least a support frame (100) mobile along the guide bar (11) and provided with lifting means (200) able to lift the wheelchair (300) for loading and unloading the wheelchair (300) onto and off the support frame (100). 45
9. The system of claim 8, wherein the support frame (100) comprises at least an abutting element (230) able to enter into contact with the at least a rotating pivot (309) during the lifting of the wheelchair (300) by the lifting means (200) of the wheelchair (300) and able to slidably activate the at least a rotating pivot (309) along the elongate slots (308). 50
10. The system of claim 9, **characterised in that** the at least an abutting element (230) comprises an arm provided with a first end (231) constrained to the casing (101) and a second free end (232). 55
11. The system of claim 10, **characterised in that** the second free end (232) is substantially cradle-formed and is able to grip at least a part of the at least a rotating pivot (309) of the wheelchair (300).
12. The system of any one of claims from 10 to 11, **characterised in that** the at least an abutting element (230) is provided with a first portion (233) comprising the first end (231) constrained to the casing (101) and a second portion (234) comprising the second free end (232) in which the second portion (234) is hinged to the first portion (233) with respect to a substantially-horizontal hinge axis.
13. The system of any one of the preceding claims from 8 to 13, wherein the support frame (301) comprises entry means for the wheelchair (300), where the entry means comprise a pair of guide borders (500) converging towards the support frame (301).

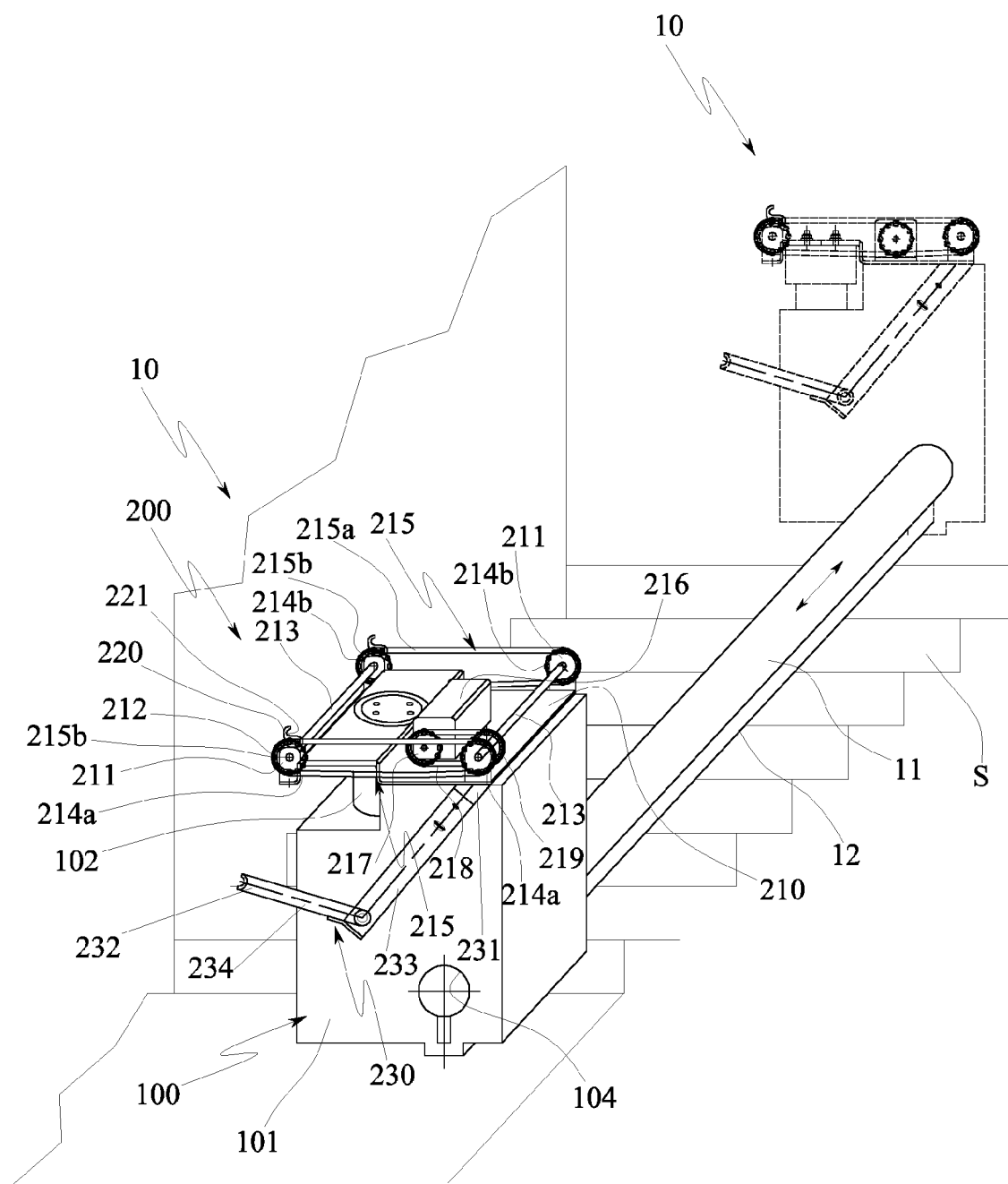


FIG.1

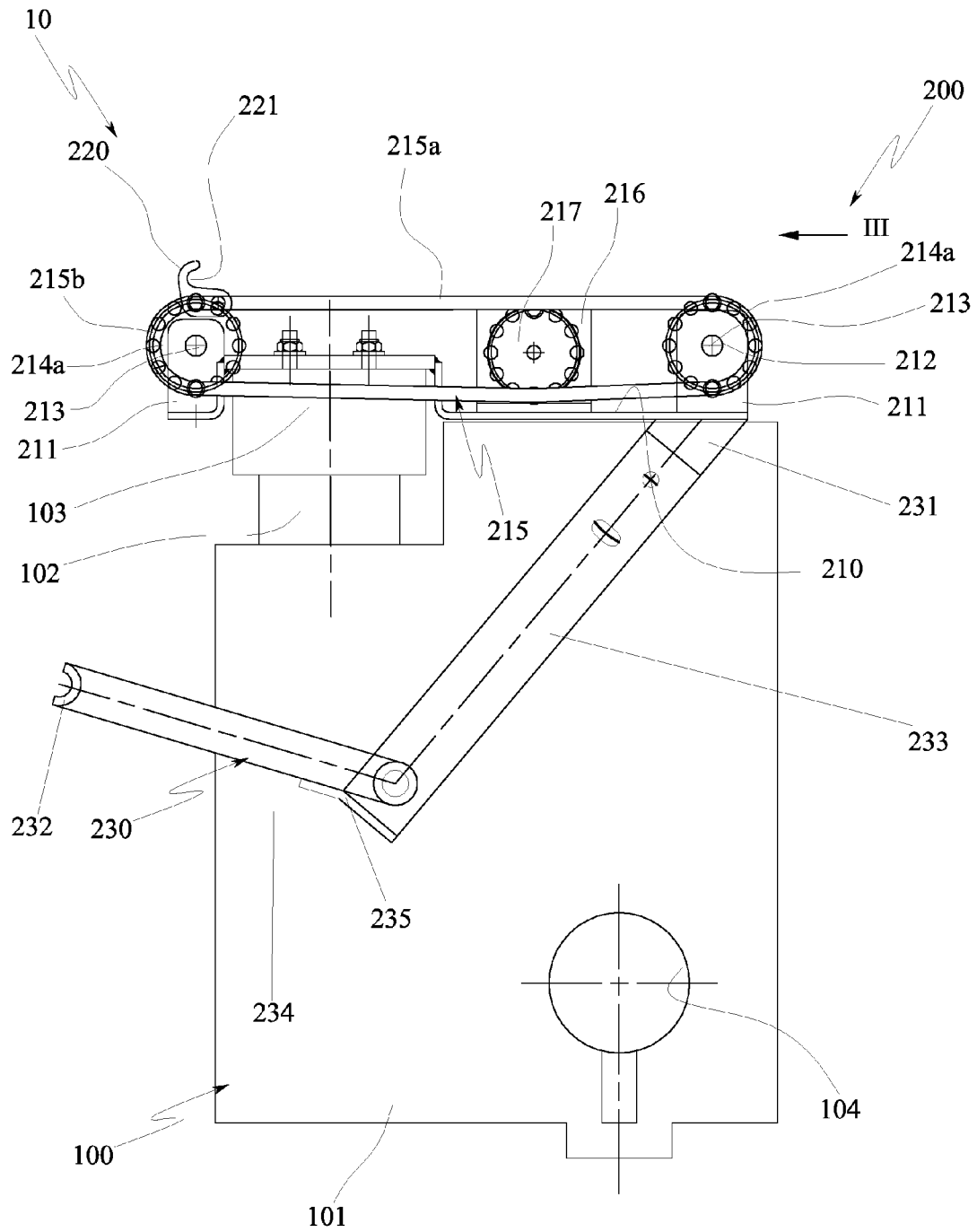


FIG.2

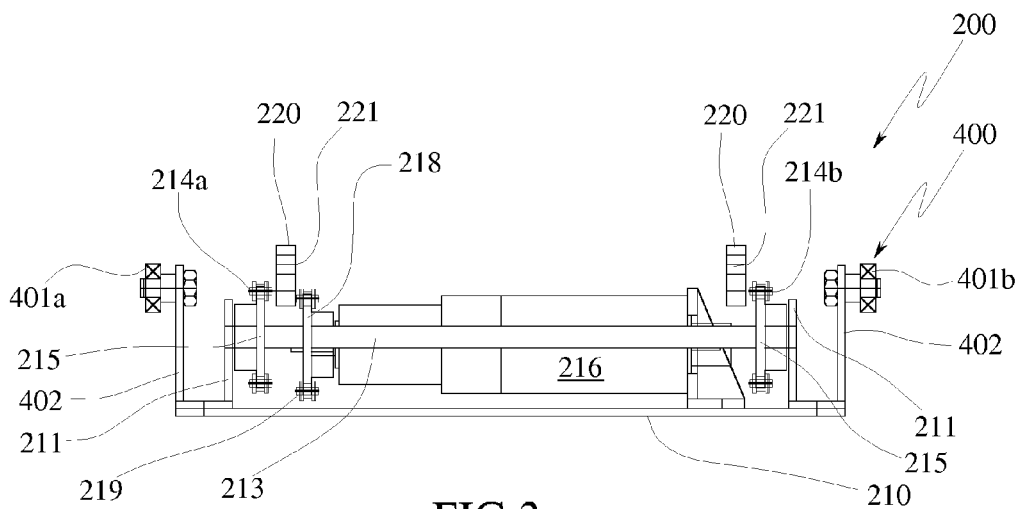


FIG.3

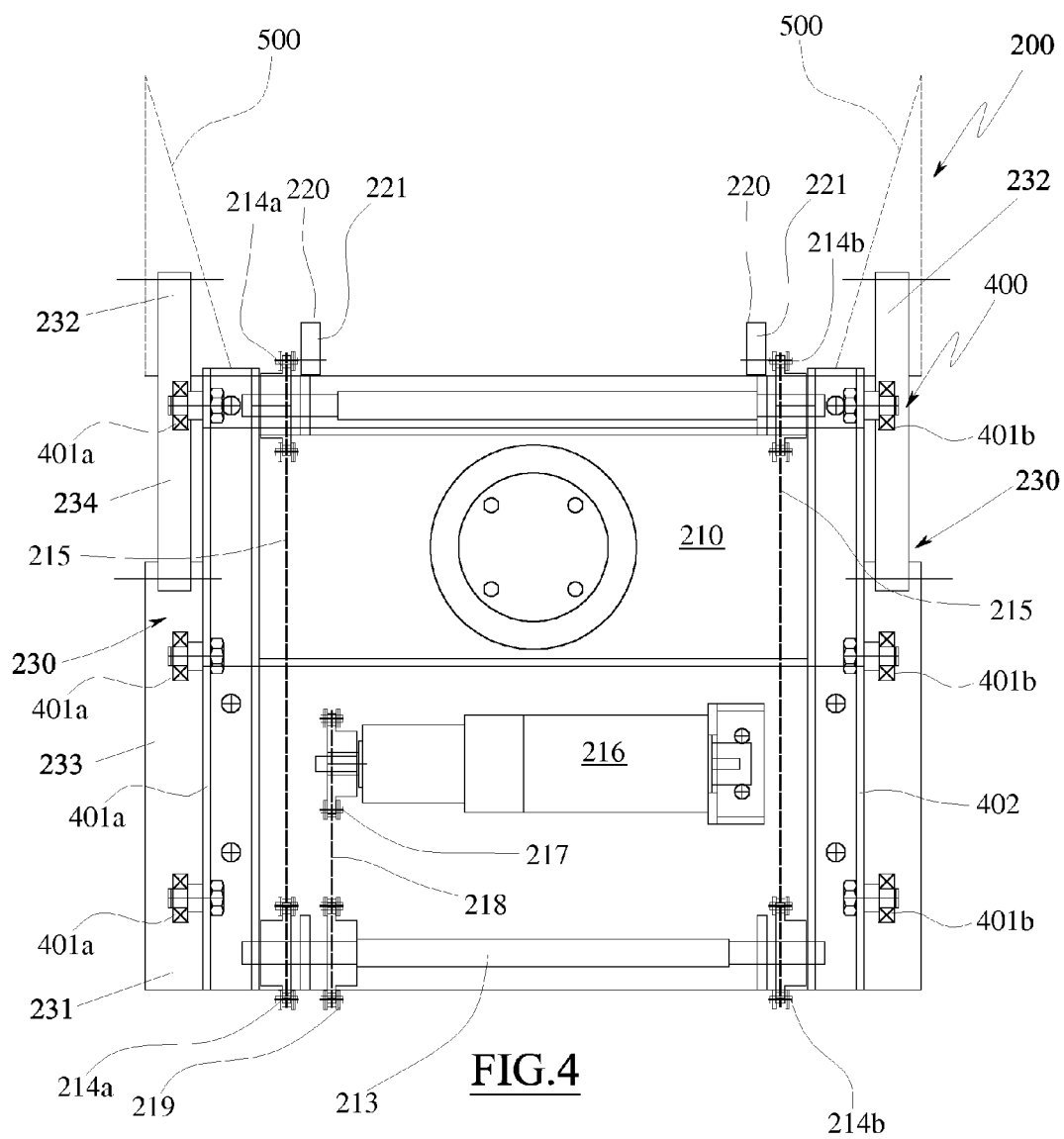
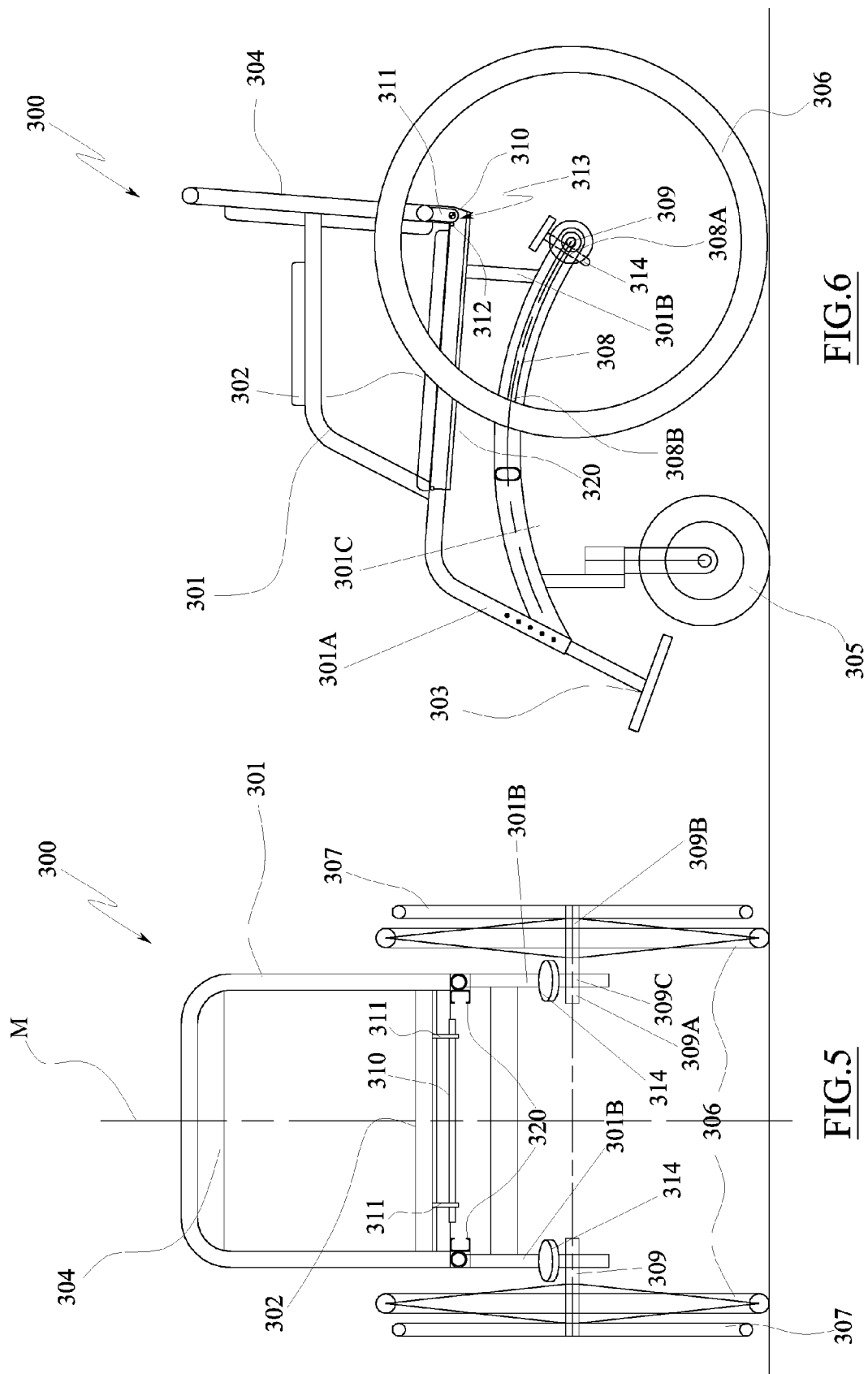
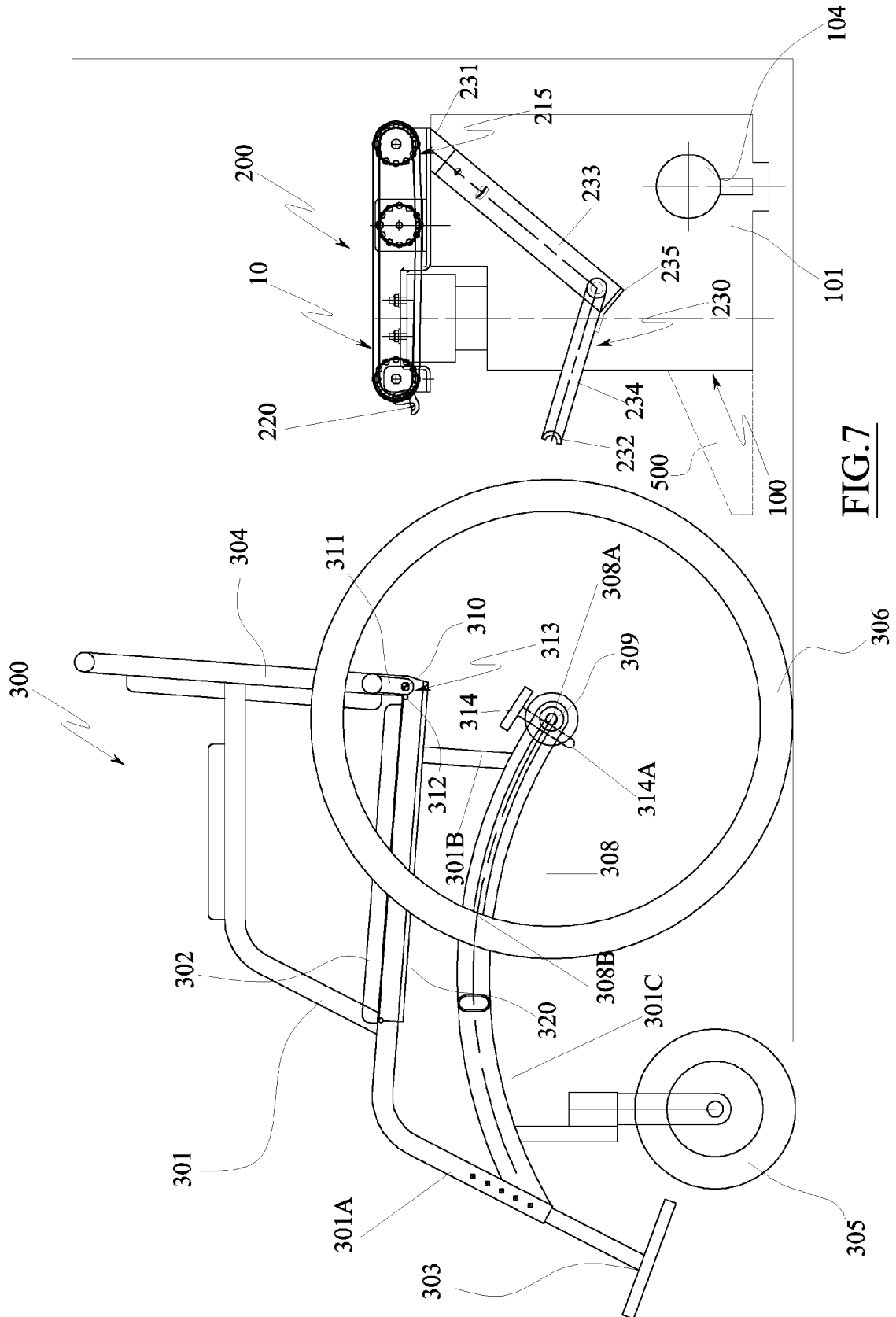
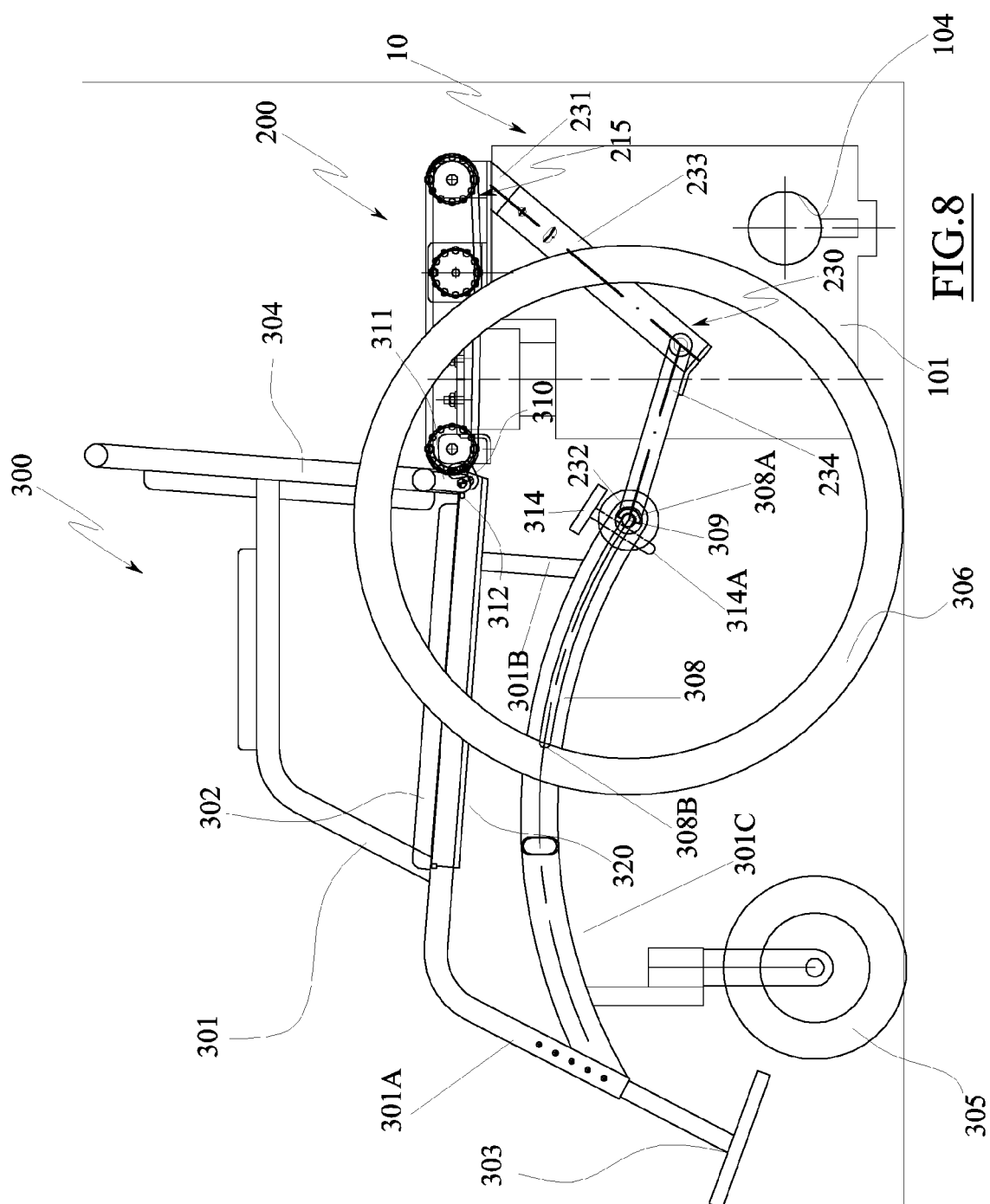


FIG.4







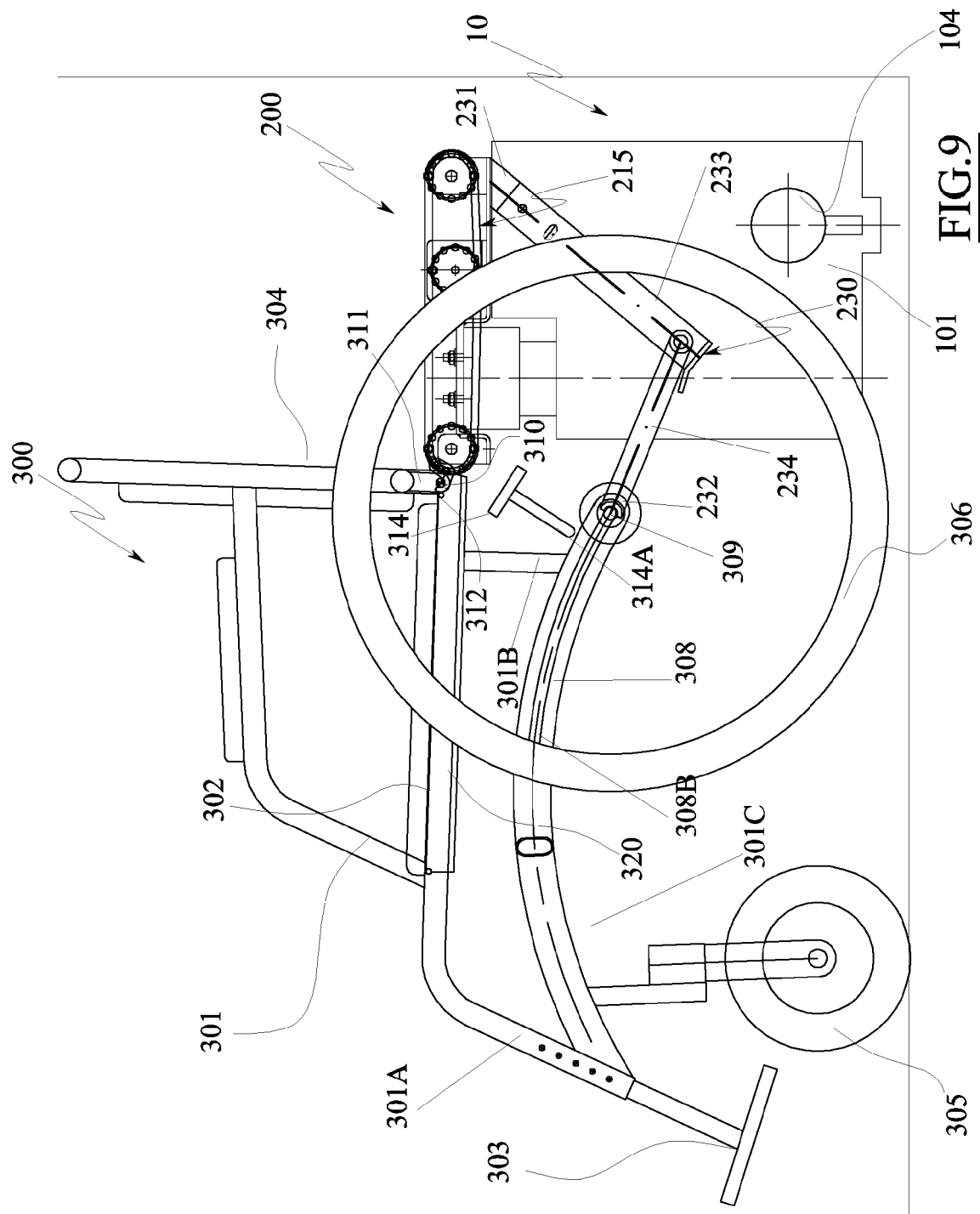
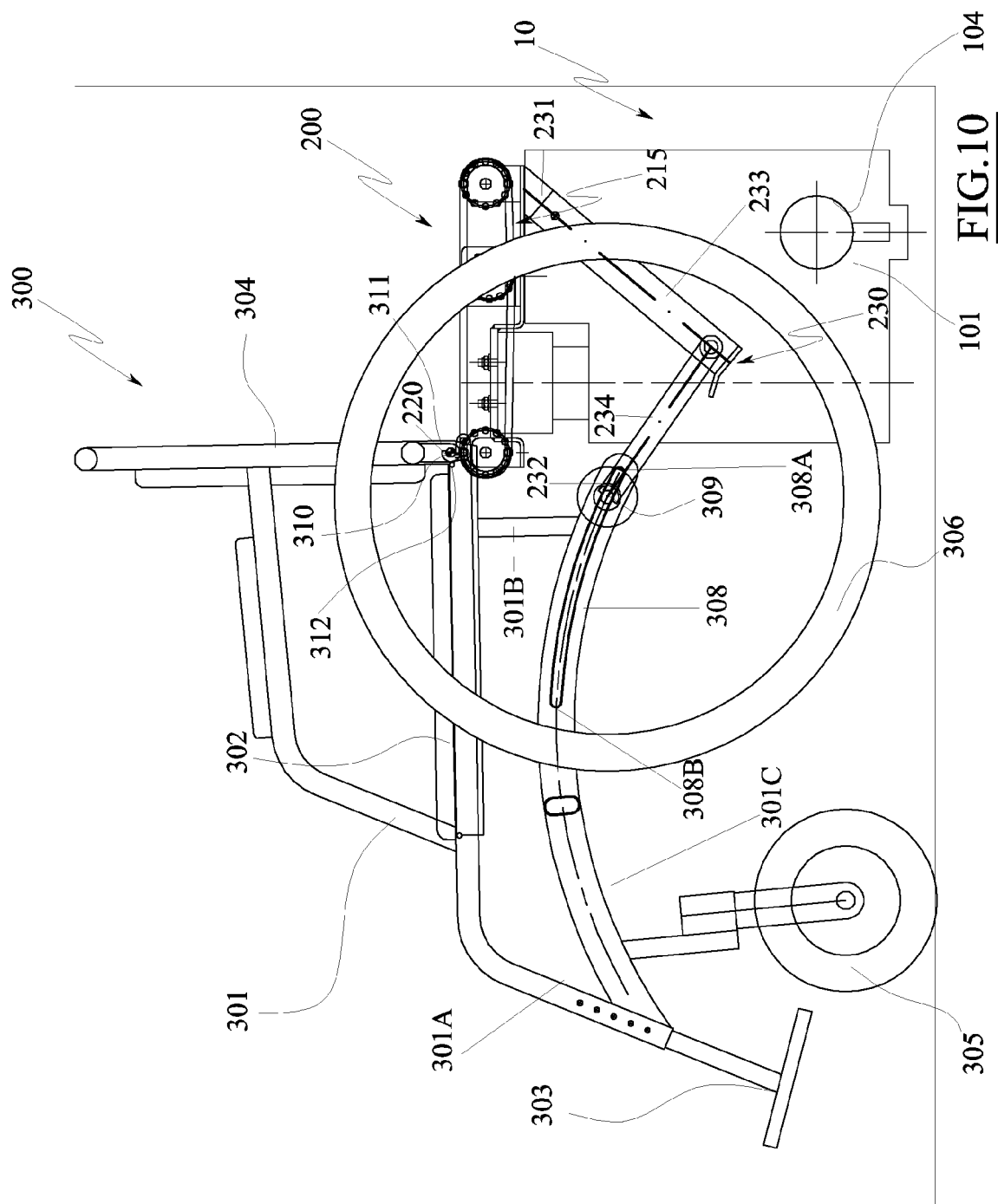
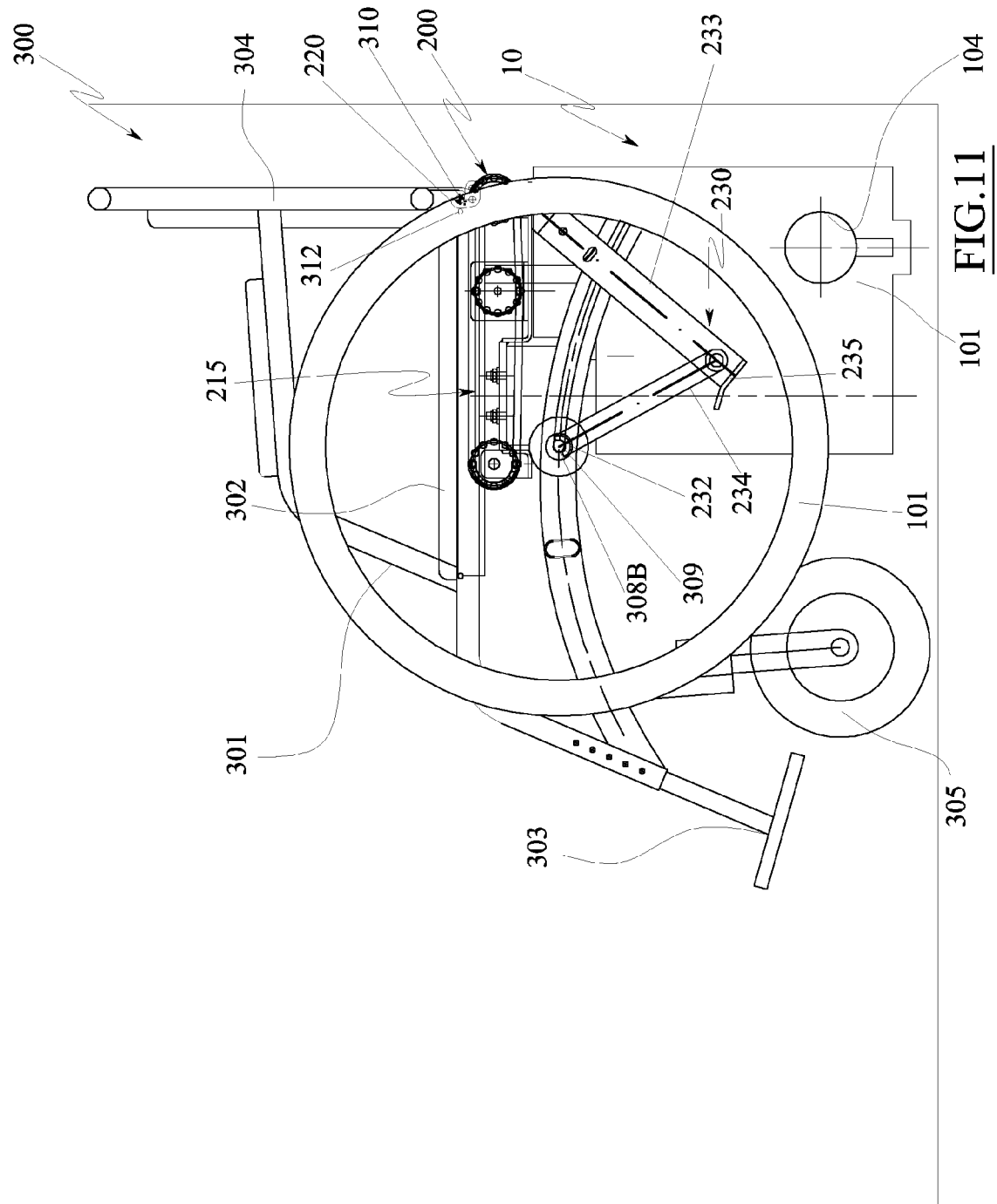


FIG. 9





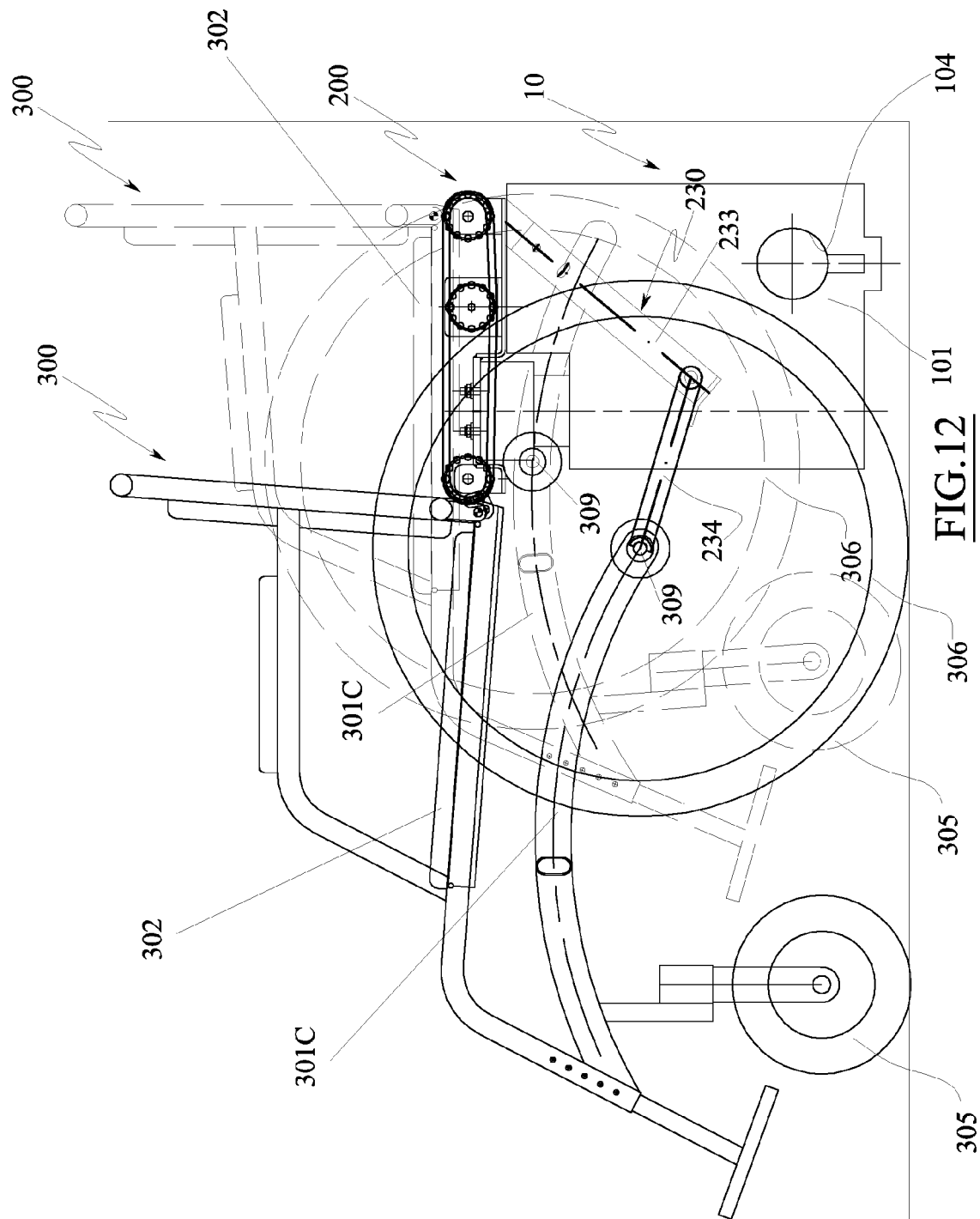


FIG. 12



EUROPEAN SEARCH REPORT

Application Number
EP 15 18 4374

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