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(54) **Powered wheelchair**

Motorisierter Rollstuhl

Fauteuil Roulant Motorisé

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Description

[0001] The present invention relates to a self-balancing motorized wheelchair for the transportation of at least one person.

[0002] It is known the existence of self-balanced motorized wheelchairs for people with reduced, even only partially, lower limbs mobility. In particular, it is known the existence of a motorized wheelchair for the transportation of a sitting person which comprises a base operable by the user for activating said motorized wheelchair, two wheels both disposed at the sides of said base, resting on a slide surface, and a supporting frame integrally constrained to said base and provided with a seat. In particular, such a typology of motorized wheelchair also comprises means for self-balancing the weight thereof in any working condition, also employed in the device known with the name of SEGWAY(R) for the transportation of people. Such means for self-equilibrating, or balancing, wheelchair weight are housed inside said base together also with further means for varying the wheelchair forward movement direction. In this type of wheelchair the forward and/ or backward movement is obtained by means of the front and/ or back unbalancing of the user's body. Further, the wheelchair activation is obtained as soon as a person seats on the wheelchair seat and his/ her weight is used to detect the user's presence and activate the wheelchair electrical operation. Such a wheelchair typology has, however, the drawback of being not stable when not operating, that is to say when the inner electrical motor is no longer operative, the wheelchair being provided with only two wheels placed parallel and opposite one to each other. In such regard the wheelchair is, however, provided with means for supporting said wheelchair on the slide surface when in not operative conditions. Such means consist in a stand, disposed in the front, and able to support the wheelchair in equilibrium on the slide surface for the two wheels.

[0003] Document US20110204592 describes a mobility device comprising a self-balancing mechanism and at least one wheel operatively coupled to the self-balancing mechanism. A mounting frame can be coupled to the self-balancing mechanism and an outrigger system can be at least partially supported by the mounting frame.

[0004] Such above described solution, unfortunately, is not particularly suited in the case the slide surface is not perfectly horizontal, or has rather pronounced front and back unevenness with respect to the wheelchair or is particularly soft as, for example, in the case the wheelchair rests in not operating conditions on sand. In such situations, with the simple use of a stand the wheelchair could remain in instable equilibrium then tipping over, or it could not be perfectly horizontally placed, thus making difficult the wheelchair user's him/herself getting in and out.

[0005] Another solution is disclosed in document WO98/02122, which describes an anti-tipping mechanism for a vehicle that provides a strut actively deployed by rotation from a retracted position so as to bring a wheel into ground contact to inhibit tipping of the vehicle.

[0006] It is therefore object of the present invention to realize a motorized wheelchair that can be supported in substantially horizontal position even when left on a not perfectly planar slide surface, or even tilted or having unevenness or being soft.

[0007] Further object of the present invention is to realize a motorized wheelchair which allows to solve the known art problems without introducing complex electrical control systems, but only through mechanical elements.

[0008] These object are obtained by the present self-balancing motorized wheelchair for the transportation of at least one person, according to the preamble of claim 1, further comprising the features of the characterizing part of claim 1.

[0009] In such a way, the motorized wheelchair, when not in operation, stays perfectly in equilibrium, regardless of the condition of the slide surface on which the two wheels rest. In fact, said at least one foot is lowered till it reaches the slide surface, even if it is tilted, keeping the wheelchair in stable and horizontal position. In fact, when said at least one foot reaches the slide surface, it remains blocked resting on such slide surface. Therefore, based on the slide surface, the said at least one foot can lower at a higher or lower level, but ensuring resting stability when contacted with the constraint surface. Thus, even in case of soft surface such as, for example, in the case of sand, the foot lowers and remains blocked in position only after encountering an actual resistance offered by the more consistent layer of sand.

[0010] To obtain this configuration, the displacing and blocking means comprise at least one cam rotatably constrained to said supporting frame between a start and limit position, and vice versa, to drive the displacement of said at least one foot between said raised position and said lowered position, and vice versa, wherein said at least one foot is slidingly constrained to said at least one cam between said start and limit positions. In practice, when in lowered position, said at leas one foot, advantageously having an arched shape, encounters the slide surface which exerts a strength opposing to the further lowering of the said at least one foot. In this step, therefore, the cam continues, however, to rotate with respect to the frame and to slide with respect to the foot till reaching its limit position. In this way, the lowering run of said at least one foot varies based on the type of encountered constraining surface, the constraining surface tilt or present unevenness or the softness of the slide surface itself.

[0011] Again, still according to an embodiment of the invention, said displacing and blocking means comprise, as well, at least one elastic element to retain said at least one foot pressed against said at least one cam between said start and limit positions for said at least one cam. Substantially, said at least one elastic element has the function of pressing said at least one foot towards the

lowered position, keeping it slidingly constrained, at the same time, to said at least one cam.

[0012] Advantageously, said motorized wheelchair comprises at least one actuator to drive, directly or indirectly, the rotation of said at least one cam between said start and limit position.

[0013] Furthermore, said displacing and blocking means comprise at least one pawl, disposed integrally with said supporting frame, and at least one toothing integral with said at least one foot, said at least one pawl being movable between an engagement position with said at least one toothing, to prevent the slide of said at least one foot between said lowered position and said raised position, and a disengagement position with said at least one toothing, to allow the slide of said at least one foot between said lowered position and said raised position.

[0014] Substantially, said at least one foot remains blocked in its lowered position without the possibility of coming back to the raised position till said at least one pawl is brought in the disengagement position with said at least one toothing. In detail, said displacing and blocking means comprise, as well, at least one mechanism to drive the activation of said at least one pawl between said disengagement position and said engagement position, said at least one drive mechanism being synchronized mechanically with said at least one actuator at least during the displacement of said at least one cam between said limit position and said start position. In this way, when said at least one foot is called back towards the raised position, that is when the actuator operation is reversed, said at least one pawl is mechanically disengaged from said at least one toothing, thus leaving said at least one foot free to come back to the start raised position since dragged by said at least one cam.

[0015] Still according to the invention, said wheelchair also comprises auxiliary means to activate said displacing and blocking means of said at least one foot, at least when said at least one wheelchair is still in operating conditions. Substantially, said activating auxiliary means comprise at least one pressure rod, operable on said base of said motorized wheelchair, and at least one handle rotatably constrained to said seat between a first position, wherein said at least one pressure rod is in contact with said base, to keep said wheelchair in operating conditions, and a second position wherein said at least one pressure rod is far away from said base to deactivate the operation of said motorized wheelchair. Such auxiliary means allow to stop the wheelchair operation at any time by electrically interrupting the connection between wheelchair power supply and motor. This is obtained by displacing said at least one pressure rod from its normal position contacting with the base, when subjected to a user weight. The base, in fact, at certain regions, is sensitive to the user weight and thus able to activate, or deactivate, the motorized wheelchair operation. When said wheelchair reached the not-operating condition, said at least one foot is brought in its lowered position due to the activation of said displacing and blocking means. Always according to a further embodiment of the invention, said activating auxiliary means comprise, as well, at least one tappet rod to connect, or disconnect, mechanically said at least one actuator to said at least one cam, at least when said handle is in its first position, or in its second position. In this way any type of mechanical connection between actuator and cams can be eliminated and the unwanted feet rising without the handle being reported in the their first position, which is also the normal operation position, can be avoided.

[0016] According to a preferred embodiment of the invention, said wheelchair comprises at least one further foot, wherein said at least one foot and said at least one further foot are disposed, respectively, in the front and the back of said wheelchair. In this way said displacing and blocking means also have the function of displacing said at least one further foot between said raised position and said lowered position, and vice versa, said at least one further foot being blocked in said lowered position at least when in contact with said slide surface for resting said motorized wheelchair in substantially horizontal position. Substantially, said at least one foot and said further foot are displaced in front of and behind said supporting frame of the wheelchair, also at differing heights, till touching the slide surface of the wheelchair. In this way the overall stability of the wheelchair is ensured, both in the back and front, meanwhile the wheelchair remaining in horizontal position.

[0017] Furthermore, said displacing and blocking means comprise at least one further cam rotatably constrained to said supporting frame between a start and a limit position to drive the displacement of said at least one further foot between said raised position and said lowered position, said at least one cam and said at least one further cam being able to be mutually activated. This allows to synchronize the start of the displacement of said at least one cam and said at least one further cam to each other and, thus, of said at least one foot and said at least one further foot, bringing them almost concurrently in contact with the slide surface.

[0018] Obviously, in this embodiment said displacement and blocking means also comprise at least one further elastic element acting on said at least one further foot and/ or at least one further pawl, integrally disposed with said supporting frame, and at least one further toothing, integral with said at least one further foot. Said at least one further pawl is movable between an engagement position with said at least one further toothing, to prevent the slide of said at least one further foot between said lowered position and said raised position, and a disengagement position with said at least one further toothing, to allow the slide of said at least one further food between said lowered position and said raised position.

[0019] For purposes of illustrations and not limitative, more particular preferred embodiments of the present invention will be now provided with reference to the accompanying figures, in which:

figure 1 is a perspective view of a motorized wheelchair according to the present invention wherein two feet in raised position are comprised;
figure 2 is an overall view of said displacing and blocking means for the two feet;
figure 3a is a side view of said wheelchair when the two feet are in lowered position on a substantially horizontal slide surface;
figure 3b is a side view of said wheelchair when the two feet are in lowered position on a substantially tilted slide surface;
figure 4 is a simplified schematic view of said displacing and blocking means;
figures 5, 6 and 7 are simplified schematic views of said displacing and blocking means, when the two cams connected to the two feet are in position between the start and limit position;
figures 8, 9 and 10 are schematic views of auxiliary means for activating said displacing and blocking means between said first and said second position for said at least one handle;
figure 11 is a detail view of a rotation sensor placed in proximity of one of the two wheels.

[0020] Referring in particular to such figures, a motorized wheelchair for the transportation of a sitting person has been denoted with 1.

[0021] Such a wheelchair for the transportation of a person comprises a base 2 operable by the user to activate the motorized wheelchair itself, two wheels 3, 4 both disposed at the sides 2a, 2b of said base 2 resting on a slide surface T, a supporting frame 5 integrally constrained to said base 2, above it, and provided with seat 6, and means 7 to support said wheelchair 1 on said slide surface T at lest when in not-operating condition, i.e. when the electrical motor housed in the above mentioned base 2 is not more powered. Note that such a wheelchair 1, which allows the sliding only on two wheels 3 and 4, opposite one to each other, is self-balancing. According to known art, such a wheelchair employs self-equilibration means (herein not shown) of the wheelchair weight housed inside said base 2 together with further means (herein not shown) to vary the forward movement of the wheelchair. Such weight self-equilibration means exploit well known load balancing systems that, for this reason, are not further described hereinafter. In this type of wheelchair the forward and/ or backward movement is obtained by means of the front and/ or back unbalancing of the user's body. Further, the activation of the wheelchair 1 is obtained at the moment a person seats on the seat 6 of the wheelchair 1 such that his/her weight can be used to detect the user's presence and activate the wheelchair electrical operation. This is allowed through two suitable pressure rods 23, as it will be better explained hereinafter, which lower till touching the base 2, at suitable regions 2c, 2d thereof, activating the electrical operation of the wheelchair 1 itself.

[0022] Said supporting means 7 comprise a foot 8 and a further foot 9, both arched and able to be rested on the ground, respectively, in front of and behind said wheelchair 1. Such feet 8 and 9 are provided with suitable resting elements 70, 71, respectively, placed at an end 8a, 9a of said foot 8 and said further foot 9. Furthermore, said wheelchair 1 also comprises means 10 for displacing and blocking said foot 8 and said further foot 9 between a raised position H (see figures 1 and 5), wherein said foot 8 and said further foot 9 do not touch the slide surface T, and a lowered position L (see figures 3a, 3b and 7), and vice versa. Advantageously, said foot 8 and said further foot 9 remain blocked in said lowered position when in contact with said slide surface T for resting said motorized wheelchair 1 in substantially horizontal position. However note that, despite not shown herein, a solution providing the employ of only one foot 8 still falls within the protection scope of the present invention.

[0023] As clearly visible from figures 3a and 3b, whichever the type of slide constraint T for the wheelchair 1 is, the two feet 8 and 9 are able to adapt and allow the wheelchair 1 to remain in horizontal position. In fact, the two feet 8 and 9 are blocked at least when at the resting position T, also at differing heights with respect to the supporting frame 5, as in the case of tilted slide constraint T (see figure 3b), without causing particular problems for the equilibrium of the motorized wheelchair 1.

[0024] According to the particular embodiment herein shown, said displacing means 10 comprise a cam 11 and a further cam 12 rotatably constrained to said supporting frame 5 between a start S and a limit E position to drive, respectively, the displacement of said foot 8 and said further foot 9 between said raised position H and said lowered position L, and vice versa. Figures 5, 6 and 7 show the cams 11 and 12 between said start position (figure 5), when said feet 8 and 9 are fully raised, and said limit position (figure 7), when said feet 8 and 9 are fully lowered, passing through an intermediate position (figure 6). Furthermore, said foot 8 and said further foot 9 are slidably constrained, respectively, to said cam 11 and to said further cam 12 between said start S and limit E position, and vice versa. According to the invention, in fact, the two feet 8 and 9 are controlled by the respective cams 11 and 12, when these latter move between said start S and limit E position, such that they can freely slide on the surface 11a and 12a of the cams 11 and 12 by the employ of suitable little wheels 51 and 52 (not visible) placed, respectively, at the ends 8b and 9b (not visible) of said feet 8 and 9. The lowering of the feet 8 and 9 occurs both by exploiting the weight of each foot 8 and 9 and due to the presence of a first elastic element 13 and a second elastic element 14, of the spring type, for example, to retain said foot 8 and said further foot, respectively, pressed against said cam 11 and said further cam 12 between said start and limit positions for said cam 11 and said further cam 12. When, in fact, said foot 8 and said further foot 9 encounter the slide surface T, event at differing times and differing heights, the respective spring 13 and 14, still retains the foot 8 and 9 pressed

against the respective cam 11 and 12, keeping it slidably constrained with the respective cam 11 and 12. It has to be noted that the two cams 11 and 12 are shaped in a closed ring, wherein thus the surfaces 11a and 12a for the sliding of the little wheels 51 and 52 are not open. Such a solution allows to ensure a greater safety to the operation of said displacing and blocking means 10. In fact, in case wherein, for mechanical reasons, despite upon the activation of the actuator 15, the two feet 8 and 9 could not be able to lower, the two cams 11 and 12, just for the way they are shaped, would be able to force the lowering since in proximity of their limit E position they would come anyway in abutment with the ends 8b, 9b of the two feet 8 and 9.

[0025] Note that each foot 8 and 9 is driven during its own displacement by four bearings 80, arranged two by two at the sides 8c, 8d and 9c, 9d of each foot 8 and 9, to ensure the sliding of the feet 8 and 9 along a predetermined pathway.

[0026] According to the embodiment herein shown, said cam 11 and said further cam 12 are mutually operable due to the presence of suitable connecting elements 60, herein represented by a rigid lever hinged on the two cams 11 and 12, which allow to synchronously transmit the rotation movement between the two cams 11 and 12. Advantageously the wheelchair 1 comprises an actuator 15 to drive the rotation of said further cam 12 between said start S and limit E position, and vice versa. The cam 11 is directly moved by the actuator 15 due to its connection with said cam 12. Note that said further cam 12 too is indirectly moved by said actuator 15 since it is connected thereto through a clutch element (herein not shown) which allows, as it will be seen hereinafter, the connection, or the disconnection, of said actuator 15 with said further cam 12 and, thus, said cam 11. Note that an embodiment comprising an actuator 15 indirectly connected to said cam 11, rather than said further cam 12, still falls within the protection scope of the present invention, as well as an actuator directly connected to said cam 11 or to said further cam 12 falls within the protection scope of the present invention.

[0027] Furthermore, said displacing and blocking means 10 comprise a pawl 17 and a further pawl 18 (herein not shown), integrally disposed with said supporting frame 5, and a toothing 19 and a further toothing 20 integral, respectively, with said foot 8 and said further foot 9. While operating, said pawl 17 and said further pawl 18 are rotationally movable between an engagement position, respectively, with said toothing 19 and said further toothing 20, to prevent the slide of said foot 8 and said further foot 9 between said lowered position L and said raised position H, and a disengagement position with said toothing 19 and said further toothing 20, to allow the slide of said foot 8 and said further foot 9 between said lowered position L and said raised position H. In this way, as long as each pawl 17, 18 is prevented from displacing to the disengagement position with the respective toothing 19, 20, the two feet 8 and 9 are prevented from returning in their raised position S. This, therefore, prevents the feet 8 and 9 from freely displace towards their own raised position this implying that the feet 8 and 9 remain blocked in their lowered position. This ensures a greater safety grade against possible wheelchair swings in cases wherein the user wants to get out or get in from the same, avoiding the abrupt failure of one of the two feet 8 or 9.

[0028] Again, still according to the embodiment herein shown, said displacing and blocking means 10 comprise a mechanism 21 for rotationally driving, in the specific case, the activation of said pawl 17 and said further pawl 18 between said disengagement position and said engagement position. Such a control mechanism 21, comprising a plurality of levers, is mechanically synchronized with said actuator 15, at least during the displacement of said cam 11 and said further cam 12 between said limit E position and said start position S. Therefore, each foot 8 and 9 can be released only after the actuator drives the inverse rotation of the two cams 11 and 12.

[0029] According to a further embodiment of the invention, said motorized wheelchair 1 comprises auxiliary means 22 to activate said means 10 for the displacing and blocking of said first foot 8 and said further foot 9, at least when said wheelchair 1 is in operating condition.

[0030] Such auxiliary activating means 22 comprise two pressure rods 23 (of which one not visible in the attached figures), already above mentioned, operable on said base 2 of said motorized wheelchair 1, at said operation regions 2c and 2d of the wheelchair, and two handles 24 combined with said pressure rods 23 and rotatably constrained to said seat 6 between a first position, wherein said pressure rods 23 are in contact with said base 2, or more conveniently with said activation regions 2c and 2d of the wheelchair 1, to keep said wheelchair 1 in operating conditions, and a second position, wherein said pressure rods 23 are far away from said base 2 to deactivate the operation of said motorized wheelchair 1. Note that the number of pressure rods 23, as well as the number of handles 24 rotatably constrained and combined with said pressure rods, can also vary, for example, there can also be a single pressure rod 23 and a single handle 24 rotatably constrained to said seat, however falling within the protection scope of the present invention.

[0031] Such a solution allows, almost immediately, to obtain the switching off of the wheelchair 1, for example, when in dangerous circumstances or when in critical operating conditions of the wheelchair 1. In these cases, the displacing and blocking means 10 intervene by bringing said two feet 8 and 9 from the raised position H to the lowered position S, since their intervention is conditioned by the wheelchair 1 switching off, that is when the wheelchair is in its not-operating condition. Furthermore, said activation auxiliary means 22 comprise, as well, a tappet rod 25 to mechanically connect, or disconnect, said actuator 15 to said further cam 12, at least when said handle 24 is in its first position, or in its second position. Therefore, when the handle 24 is in its second

position, that is outwardly tipped over (see figure 10), the actuator 15 is mechanically disconnected to the said further cam 12 and, thus, both the further cam 12 and the cam 11, due to gravity of the two feet 8 and 9, as well as the force exerted by the respective springs 13 and 14 acting on said feet 8 and 9, rotate freely from the start position to the limit position, thus bringing the feet 8 and 9 from the raised position H to the lowered position L. The intervention of the tappet rod 25 occurs at the said clutch element (herein not shown) that is rotated by said actuator 15 and that, in its turn, rotates said further cam 12. Such a clutch element is coupled to said further cam 12 only when a tooth 90, present in said tappet rod 25, is coupled with a matching seat 91 obtained in said clutch element. When the tappet rod 25 is mechanically displaced, with the rotation of the said handle 24 from its first position to its second position, the above mentioned tooth 90 gets out from the seat 91 of the clutch element, thus causing the mechanical disconnection between actuator 15 and cam 12. When the handle 24 is returned in its first position, the tooth 90 is re-entered in its seat 91, since the tappet rod 25 is displaced again in its engagement start position. Such operation is done only after the actuator 15 has rotated idly the clutch element till the tooth 90 become aligned with the respective recess 91.

[0032] Eventually, said motorized wheelchair 1 comprises a sensor 30 integral with said supporting frame 5 and adapted to detect the rotation of said wheel 3. Substantially, such a sensor 30 allows to detect the possible rotation of the wheel 3 subjected to measuring and, thus, to inform if the wheelchair 1 is moving or not. In this way, such a signal can be used by a control unit (herein not shown) to control the operation of said actuator 15 based on just the signal coming from said rotation sensor 30. For example, due to this signal, the actuator 15 can be prevented from operating when the displacement of the wheelchair 1 is sensed and, therefore, preventing the lowering of the feet 8 and 9 while running.

[0033] Finally, it has to be pointed out that, despite not described herein, however a wheelchair embodiment comprising a single foot 8, rather than two feet, and whose displacing and blocking means 10 comprise only a single cam 11, a single elastic element 13 acting on said foot 8, a single pawl 17, a single toothing 19, and wherein there is one actuator 15 directly or indirectly acting on said cam 11, still falls within the protection scope of the present invention.

Claims

1. Self-balancing motorized wheelchair (1) for the transportation of at least one person, comprising a base (2) operable to activate said motorized wheelchair, two wheels (3, 4) both disposed at the sides (2a, 2b) of said base resting on a slide surface (T), a supporting frame (5) integrally constrained to said base and provided with a seat (6), and means (7) to support said wheelchair on said slide surface at least when in not-operating conditions, said supporting means comprising at least one foot (8) restable on the ground, and by comprising means (10) for displacing and blocking said at least one foot between a raised position (H) and a lowered position (L), and vice versa,
characterized in that said at least one foot is blocked in said lowered position at least when in contact with said slide surface for resting said motorized wheelchair in a substantially horizontal position,
said displacing and blocking means comprising at least one cam (11) rotatably constrained to said supporting frame between a start (S) and limit (E) position, and vice versa, to drive the displacement of said at least one foot between said raised position and said lowered position, and vice versa, wherein said at least one foot is slidingly constrained to said at least one cam between said start and limit positions.

2. Motorized wheelchair according to claim 1, **characterized in that** said displacing and blocking means comprise, as well, at least one elastic element (13) to retain said at least one foot pressed against said at least one cam between said start and limit positions for said at least one cam.

3. Motorized wheelchair according to claim 1, **characterized by** comprising at least one actuator (15) to drive, directly or indirectly, the rotation of said at least one cam between said start and limit position, and vice versa.

4. Motorized wheelchair according to one or more of the claims 1 to 3, **characterized in that** said displacing and blocking means comprise at least one pawl (17), disposed integrally with said supporting frame, and at least one toothing (19) integral with said at least one foot (8), said at least one pawl being movable between an engagement position, respectively, with said at least one toothing, to prevent the slide of said at least one foot between said lowered position and said raised position, and a disengagement position with said at least one toothing, to allow the slide of said at least one foot between said lowered position and said raised position.

5. Motorized wheelchair according to claim 4, **characterized in that** said displacing and blocking means comprise, as well, at least one mechanism (21) to drive the activation of said at least one pawl between said disengagement position and said engagement position, said at least one drive mechanism being synchronized mechanically with said at least one actuator at least during the displacement of said at least one cam between said limit position (E) and said start position (S).

6. Wheelchair according to one or more of the claims 1 to 5, **characterized by** comprising auxiliary means (22) to activate said displacing and blocking means of said at least one foot, at least when said wheelchair is in operating conditions.

7. Wheelchair according to claim 6, **characterized in that** said auxiliary means comprise at least one pressure rod (23), operable on said base of said motorized wheelchair, and at least one handle (24) rotatably constrained to said seat between a first position, wherein said at least one pressure rod is in contact with said base to maintain said at least one wheelchair in operating conditions, and a second position wherein said at least one pressure rod is far away from said base to deactivate the operation of said motorized wheelchair.

8. Wheelchair according to claim 7, **characterized in that** said activating auxiliary means comprise, as well, at least one tappet rod (25) to connect, or disconnect, mechanically said at least one actuator to said at least one cam, at least when said at least one handle is in its first position, or in its second position.

9. Wheelchair according to one or more of the preceding claims, **characterized by** comprising a sensor (30) integral with said supporting frame and adapted to detect the rotation of at least one of said two wheels.

10. Wheelchair according to the claim 9, **characterized by** comprising at least one control unit to control the operation of said at least one actuator (15) based on the signal coming from said at least one rotation sensor.

11. Wheelchair according to one or more of the preceding claims, **characterized by** comprising at least one further foot (9), wherein said at least one foot and said at least one further foot are disposed, respectively, in the front and the back of said wheelchair.

12. Wheelchair according to claim11, **characterized in that** said displacing and blocking means (10) comprise at least one further cam (12) rotatably constrained to said supporting frame between a start (S) and a limit (E) position to drive the displacement of said at least one further foot between said raised position and said lowered position, said at least one cam (11) and said at least one further cam (12) being able to be mutually activated.

13. Wheelchair according to one or more of the preceding claims, **characterized in that** said at least one foot and / or said at least one further foot has/ have an arched shape.

Patentansprüche

1. Selbstausgleichender motorisierter Rollstuhl (1) für den Transport von mindestens einer Person, umfassend eine zum Aktivieren des motorisierten Rollstuhls betreibbare Basis (2), zwei Räder (3, 4), die beide an den Seiten (2a, 2b) der auf einer Gleitfläche (T) ruhenden Basis angeordnet sind, einen integral mit der Basis verschränkten und mit einem Sitz (6) ausgestatteten Tragrahmen (5), und Mittel (7) zum Stützen des Rollstuhls auf der Gleitfläche zumindest in Zuständen des Nicht-Betriebs, wobei die Stützmittel mindestens einen auf dem Boden abstützbaren Fuß (8) umfassen, und Mittel (10) zum Verlagern und Blockieren des mindestens einen Fußes zwischen einer angehobenen Position (H) und einer abgesenkten Position (L) und umgekehrt umfassen,
dadurch gekennzeichnet, dass der mindestens eine Fuß in der abgesenkten Position blockiert ist, zumindest wenn er in Kontakt mit der Gleitfläche ist, um den motorisierten Rollstuhl in einer im Wesentlichen horizontalen Position abzustützen,
wobei die Mittel zum Verlagern und Blockieren mindestens eine Kurvenscheibe (11) umfassen, die drehbar verschränkt mit dem Tragrahmen zwischen einer Start- (S) und Endposition (E) und umgekehrt ist, um die Verlagerung des mindestens einen Fußes zwischen der angehobenen Position und der abgesenkten Position und umgekehrt anzutreiben, wobei der mindestens eine Fuß gleitend verschränkt mit der mindestens einen Kurvenscheibe zwischen den Start- und Endpositionen ist.

2. Motorisierter Rollstuhl nach Anspruch 1, **dadurch gekennzeichnet, dass** die Mittel zum Verlagern und Blockieren ebenfalls mindestens ein elastisches Element (13) umfassen, um den mindestens einen Fuß gegen die mindestens eine Kurvenscheibe zwischen den Start- und Endpositionen für die mindestens eine Kurvenscheibe gedrückt zu halten.

3. Motorisierter Rollstuhl nach Anspruch 1, **dadurch gekennzeichnet, dass** er mindestens ein Stellglied (15) umfasst, um direkt oder indirekt die Drehung der mindestens einen Kurvenscheibe zwischen der Start- und Endposition und umgekehrt anzutreiben.

4. Motorisierter Rollstuhl nach einem oder mehreren der Ansprüche 1 bis 3, **dadurch gekennzeichnet, dass** die Mittel zum Verlagern und Blockieren mindestens eine Sperrklinke (17) umfassen, die integriert am Tragrahmen angeordnet ist, und mindestens eine Verzahnung (19), die am mindestens einen Fuß (8) integriert ist, wobei die mindestens eine Sperrklinke zwischen einer jeweiligen Eingriffsposition beziehungsweise mit der mindestens einen Verzahnung bewegbar ist, um das Gleiten des mindestens einen Fußes zwischen der abgesenkten Posi-

tion und der angehobenen Position zu verhindern, und eine Ausrückposition mit der mindestens einen Verzahnung, um das Gleiten des mindestens einen Fußes zwischen der abgesenkten Position und der angehobenen Position zu ermöglichen.

5. Motorisierter Rollstuhl nach Anspruch 4, **dadurch gekennzeichnet, dass** die Mittel zum Verlagern und Blockieren ebenfalls mindestens einen Mechanismus (21) umfassen, um die Aktivierung der mindestens einen Sperrklinke zwischen der Ausrückposition und der Eingriffsposition anzutreiben, wobei der mindestens eine Antriebsmechanismus mechanisch mit dem zumindest einen Stellglied zumindest während der Verlagerung der mindestens einen Kurvenscheibe zwischen der Endposition (E) und der Startposition (S) synchronisiert wird.

6. Rollstuhl nach einem oder mehreren der Ansprüche 1 bis 5, **dadurch gekennzeichnet, dass** er Hilfsmittel (22) umfasst, um die Mittel zur Verlagerung und Blockierung des mindestens einen Fußes zu aktivieren, zumindest wenn sich der Rollstuhl in Zuständen des Betriebs befindet.

7. Rollstuhl nach Anspruch 6, **dadurch gekennzeichnet, dass** die Hilfsmittel mindestens eine Druckstange (23) umfassen, die auf der Basis des motorisierten Rollstuhls betreibbar ist, und mindestens einen Griff (24), der drehbar mit dem Sitz verschränkt ist, zwischen einer ersten Position, wobei die mindestens eine Druckstange in Kontakt mit der Basis ist, um den mindestens einen Rollstuhl in Zuständen des Betriebs zu halten, und einer zweiten Position, wobei die mindestens eine Druckstange weit entfernt von der Basis ist, um den Betrieb des motorisierten Rollstuhls zu deaktivieren.

8. Motorisierter Rollstuhl nach Anspruch 7, **dadurch gekennzeichnet, dass** die Aktivierungshilfsmittel ebenfalls mindestens eine Stößelstange (25) umfassen, um das mindestens eine Stellglied mechanisch mit der mindestens eine Kurvenscheibe zu verbinden oder davon zu trennen, zumindest wenn sich der mindestens eine Griff in seiner ersten Position oder in seiner zweiten Position befindet.

9. Rollstuhl nach einem oder mehreren der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** er einen Sensor (30) umfasst, der am Tragrahmen integriert ist und geeignet ist, die Drehung von mindestens einem der zwei Räder zu erkennen.

10. Rollstuhl nach Anspruch 9, **dadurch gekennzeichnet, dass** er mindestens eine Steuereinheit zur Steuerung des Betriebs des mindestens einen Stellglieds (15) basierend auf dem von dem mindestens einen Rotationssensor stammenden Signal umfasst.

11. Rollstuhl nach einem oder mehreren der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** er mindestens einen weiteren Fuß (9) umfasst, wobei der mindestens eine Fuß und der mindestens eine weitere Fuß an der Vorder- beziehungsweise der Rückseite des Rollstuhls angeordnet sind.

12. Rollstuhl nach Anspruch 11, **dadurch gekennzeichnet, dass** die Mittel (10) zum Verlagern und Blockieren mindestens eine weitere Kurvenscheibe (12) umfassen, die drehbar verschränkt mit dem Tragrahmen zwischen einer Startposition (S) und einer Endposition (E) ist, um die Verlagerung des mindestens einen weiteren Fußes zwischen der angehobenen Position und der abgesenkten Position anzutreiben, wobei die mindestens eine Kurvenscheibe (11) und die mindestens eine weitere Kurvenscheibe (12) wechselweise aktiviert werden können.

13. Rollstuhl nach einem oder mehreren der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** der mindestens eine Fuß und/oder der mindestens eine weitere Fuß eine gewölbte Form hat/haben.

Revendications

1. Fauteuil roulant motorisé auto-équilibré (1) pour le transport d'au moins une personne, comprenant une base (2) servant à actionner ledit fauteuil roulant motorisé, deux roues (3, 4) situés aux côtés (2a, 2b) de ladite base, en appui sur une surface de roulement (T), un châssis support (5) solidarisé à ladite base et muni d'un siège (6), et des moyens (7) de support dudit fauteuil roulant sur ladite surface de roulement au moins en état de repos, lesdits moyens de support comprenant au moins un pied (8) pouvant venir en appui sur le sol, et comprenant des moyens (10) de déplacement et de blocage dudit au moins un pied entre une position relevée (H) et une position abaissée (L) et inversement,
caractérisé en ce que ledit au moins un pied est bloqué dans ladite position abaissée au moins quand il est en contact avec ladite surface de roulement pour permettre l'appui dudit fauteuil roulant motorisé en position sensiblement horizontale,
lesdits moyens de déplacement et de blocage comprenant au moins une came (11) liée de manière rotative audit châssis support entre une position de départ (S) et une position de fin de course (E) et inversement, pour entraîner le déplacement dudit au moins un pied entre ladite position relevée et ladite position abaissée et inversement, dans lequel ledit au moins un pied est lié de manière coulissante à ladite au moins une came entre lesdites positions de

départ et de fin de course.

2. Fauteuil roulant motorisé selon la revendication 1, **caractérisé en ce que** lesdits moyens de déplacement et de blocage comprennent par ailleurs au moins un moyen élastique (13) pour retenir ledit au moins un pied pressé contre ladite au moins une came entre lesdites positions de départ et de fin de course pour ladite au moins une came.

3. Fauteuil roulant motorisé selon la revendication 1, **caractérisé en ce qu'**il comprend au moins un actionneur (15) pour entraîner directement ou indirectement la rotation de ladite au moins une came entre lesdites positions de départ et de fin de course, et inversement.

4. Fauteuil roulant motorisé selon une ou plusieurs des revendications 1 à 3, **caractérisé en ce que** lesdits moyens de déplacement et de blocage comprennent au moins un cliquet (17), solidarisé audit châssis support, et au moins une denture (19) d'un seul tenant avec ledit au moins un pied (8), ledit au moins un cliquet étant mobile respectivement entre une position d'engagement avec ladite au moins une denture, pour empêcher le glissement dudit au moins un pied entre ladite position abaissée et ladite position relevée, et une position de désengagement de ladite au moins une denture, pour permettre le glissement dudit au moins un pied entre ladite position abaissée et ladite position relevée.

5. Fauteuil roulant motorisé selon la revendication 4, **caractérisé en ce que** lesdits moyens de déplacement et de blocage comprennent par ailleurs au moins un mécanisme (21) d'entraînement de l'actionnement dudit au moins un cliquet entre ladite position de désengagement et ladite position d'engagement, ledit au moins un mécanisme d'entraînement étant synchronisé mécaniquement avec ledit au moins un actionneur au moins pendant le déplacement de ladite au moins une came entre ladite position de fin de course (E) et ladite position de départ (S).

6. Fauteuil roulant selon une ou plusieurs des revendications 1 à 5, **caractérisé en ce qu'**il comprend des moyens auxiliaires (22) d'actionnement desdits moyens de déplacement et de blocage dudit au moins un pied, au moins quand le fauteuil roulant est en état de fonctionnement.

7. Fauteuil roulant selon la revendication 6, **caractérisé en ce que** lesdits moyens auxiliaires comprennent au moins une tige de pression (23) agissant sur ladite base dudit fauteuil roulant motorisé, et au moins une poignée (24) solidarisée de manière rotative audit siège entre une première position, dans laquelle ladite au moins une tige de pression est en contact avec ladite base pour maintenir ledit au moins un fauteuil roulant en état de fonctionnement, et une seconde position dans laquelle ladite au moins une tige de pression et éloignée de ladite base pour désactiver le fonctionnement dudit fauteuil motorisé.

8. Fauteuil roulant selon la revendication 7, **caractérisé en ce que** lesdits moyens auxiliaires d'activation comprennent par ailleurs au moins un bras de renvoi (25) pour relier ou séparer mécaniquement ledit au moins un actionneur à ou de ladite au moins une came, au moins quand ladite au moins une poignée est dans sa première position, ou dans sa seconde position.

9. Fauteuil roulant selon une ou plusieurs des revendications précédentes, **caractérisé en ce qu'**il comprend un capteur (30) d'un seul tenant avec ledit châssis support, et apte à détecter la rotation d'au moins une desdites deux roues.

10. Fauteuil roulant selon la revendication 9, **caractérisé en ce qu'**il comprend au moins une unité de commande pour commander le fonctionnement dudit au moins un actionneur (15) sur la base du signal provenant dudit au moins un capteur de rotation.

11. Fauteuil roulant selon une ou plusieurs des revendications précédentes, **caractérisé en ce qu'**il comprend au moins un pied supplémentaire (9), dans lequel ledit au moins un pied et ledit au moins un pied supplémentaire sont agencés respectivement à l'avant et à l'arrière dudit fauteuil roulant.

12. Fauteuil roulant selon la revendication 11, **caractérisé en ce que** lesdits moyens de déplacement et de blocage (10) comprennent au moins une came supplémentaire (12) liée de manière rotative audit châssis support entre une position de départ (S) et une position de fin de course (E), pour entraîner le déplacement dudit au moins un pied supplémentaire entre ladite position relevée et ladite position abaissée, ladite au moins une came (11) et ladite au moins une came supplémentaire (12) pouvant être mutuellement activées.

13. Fauteuil roulant selon une ou plusieurs des revendications précédentes, **caractérisé en ce que** ledit au moins un pied et/ou ledit au moins un pied supplémentaire a /ont une forme arquée.

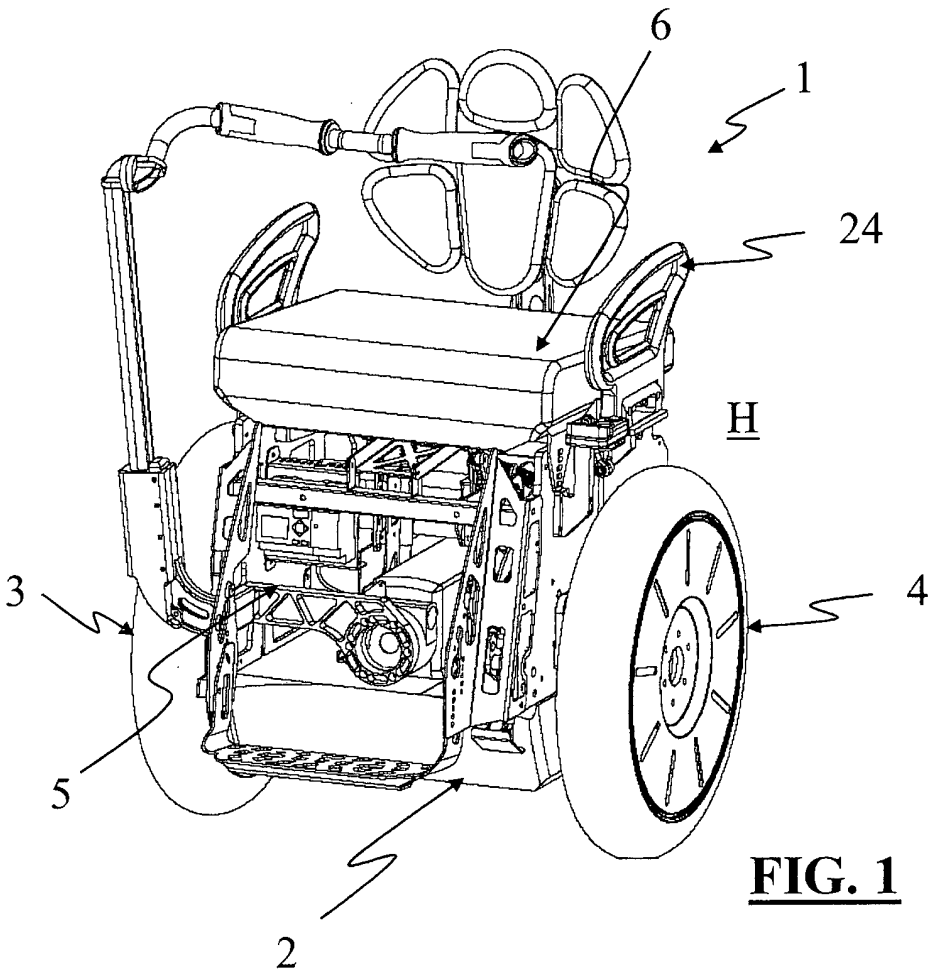


FIG. 1

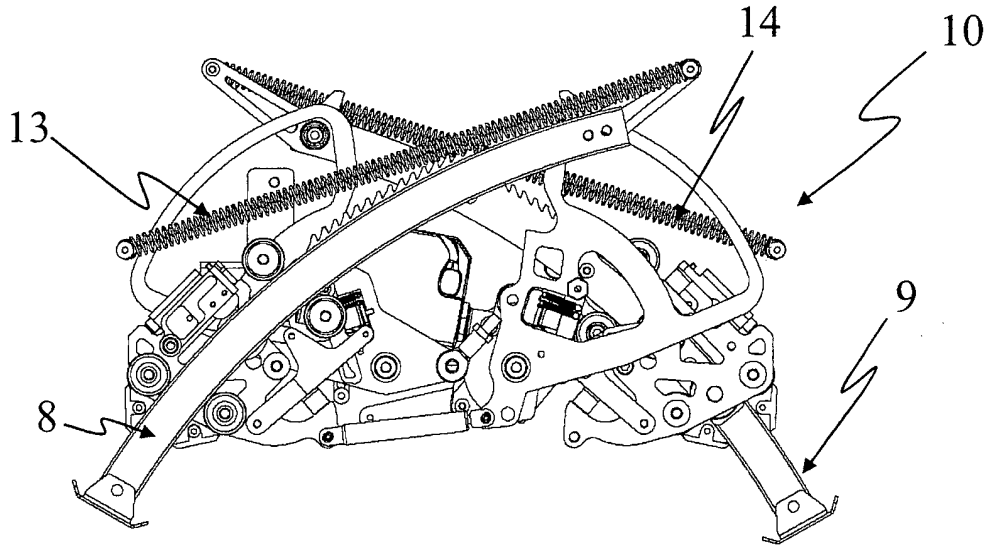


FIG. 2

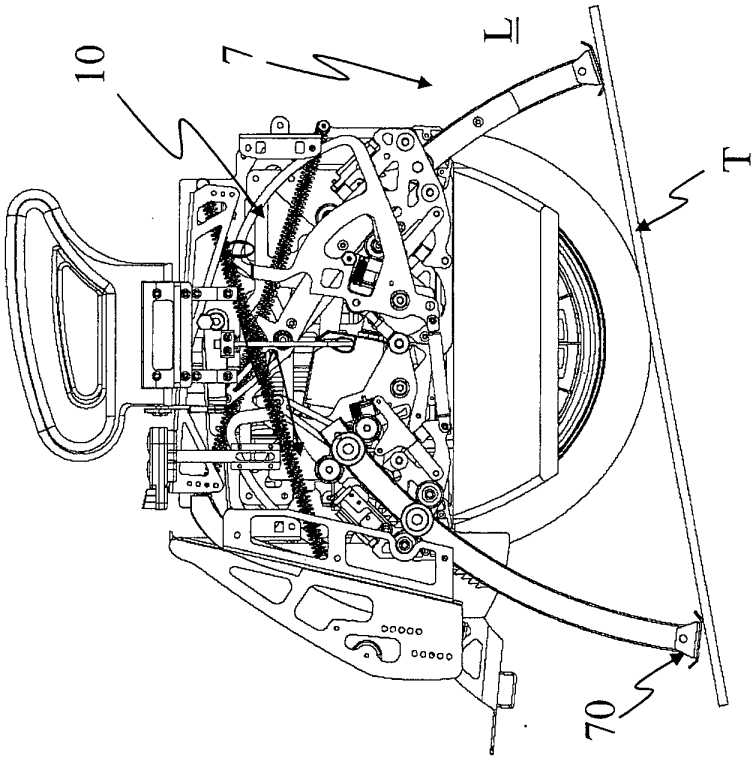


FIG. 3b

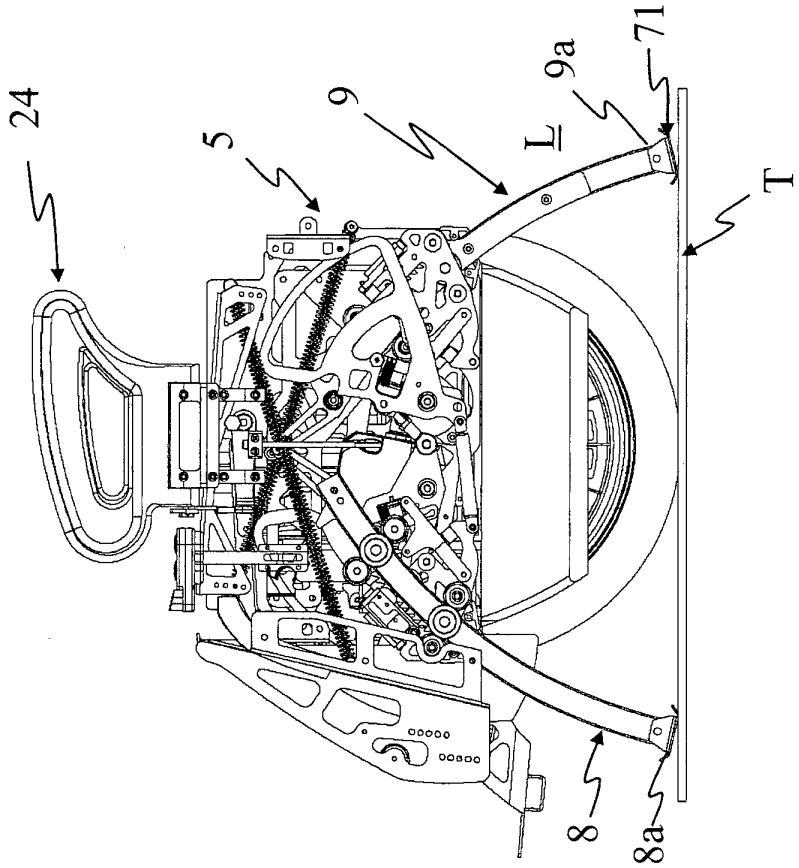


FIG. 3a

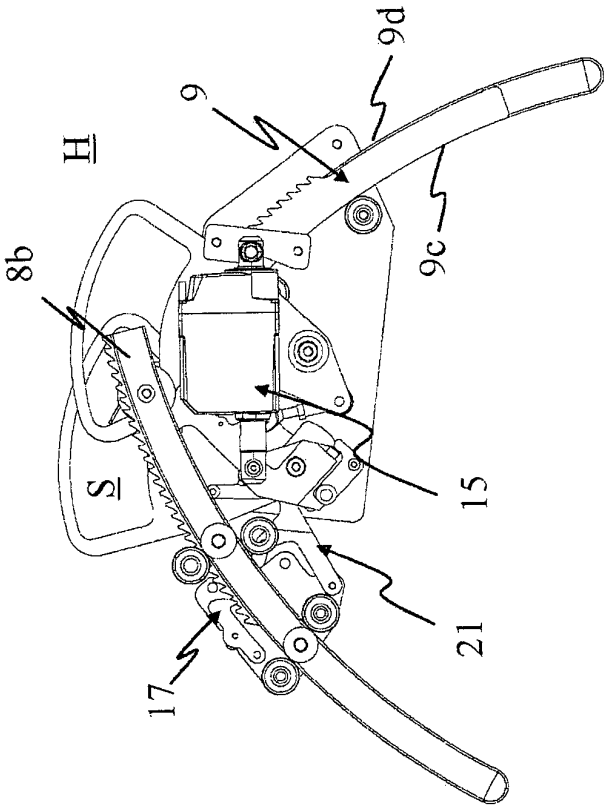


FIG. 5

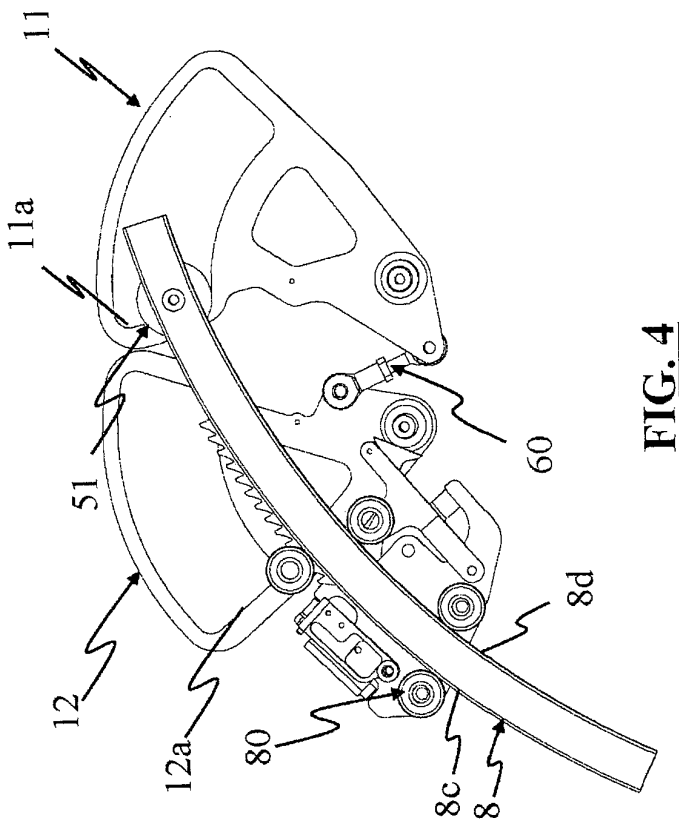


FIG. 4

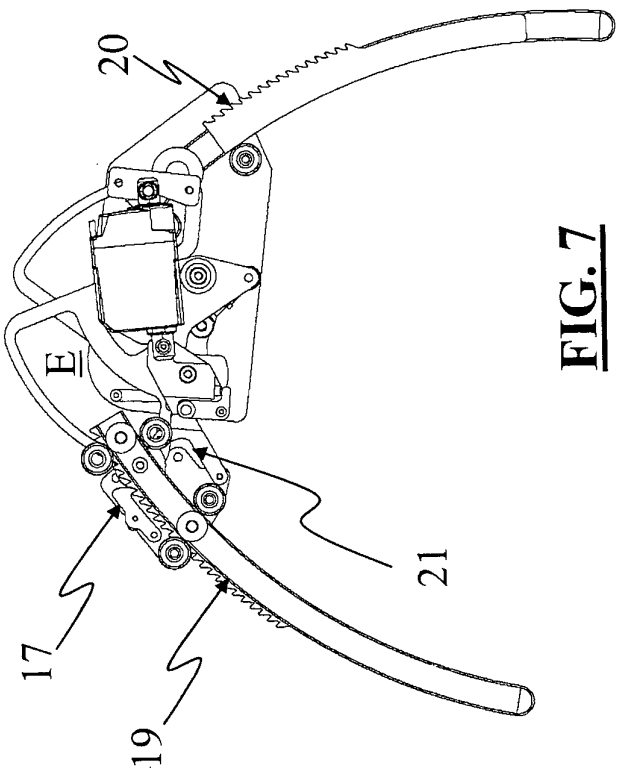


FIG. 7

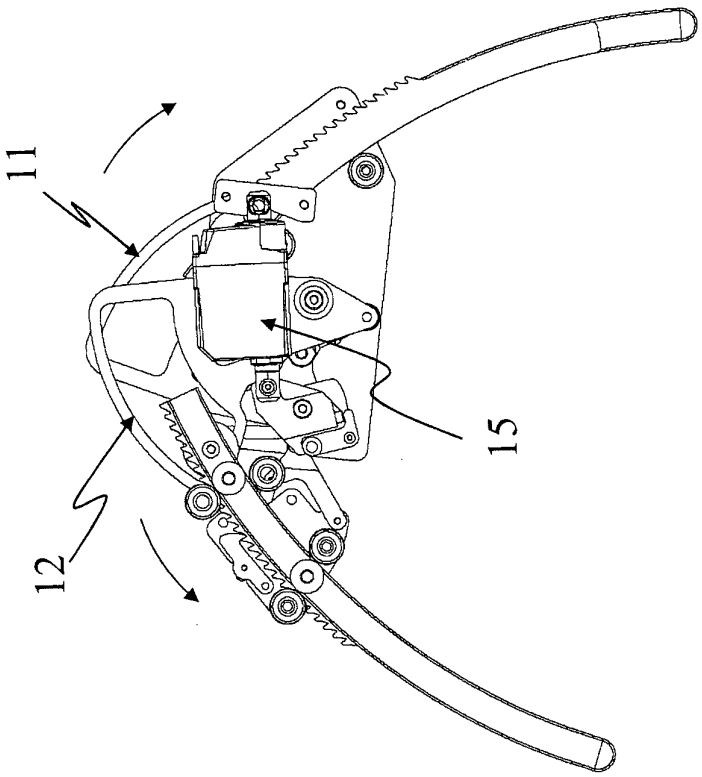


FIG. 6

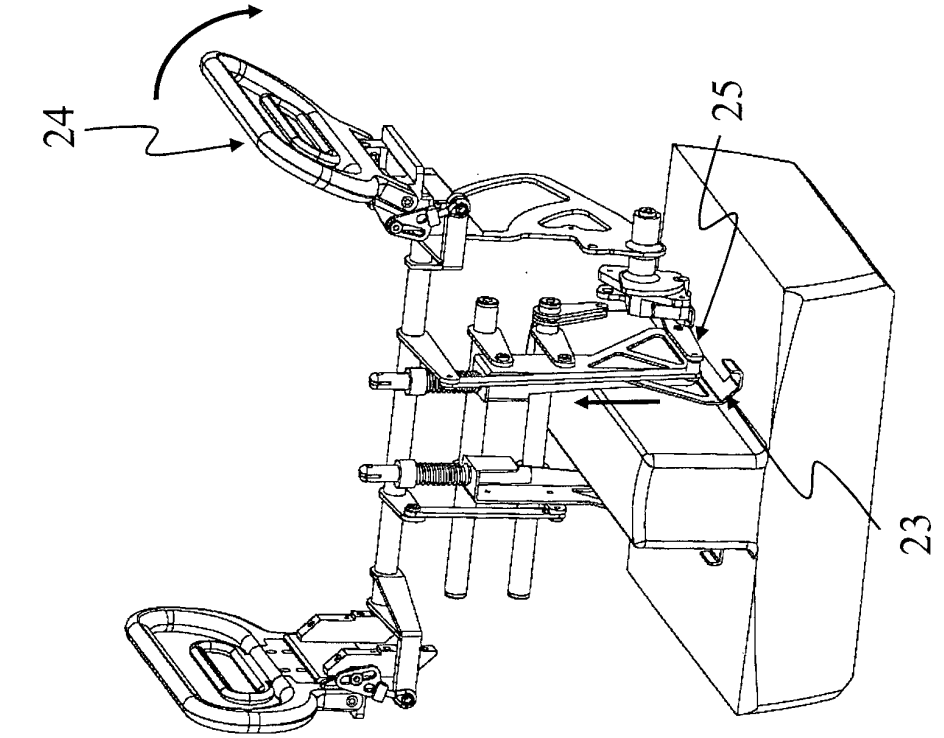


FIG. 9

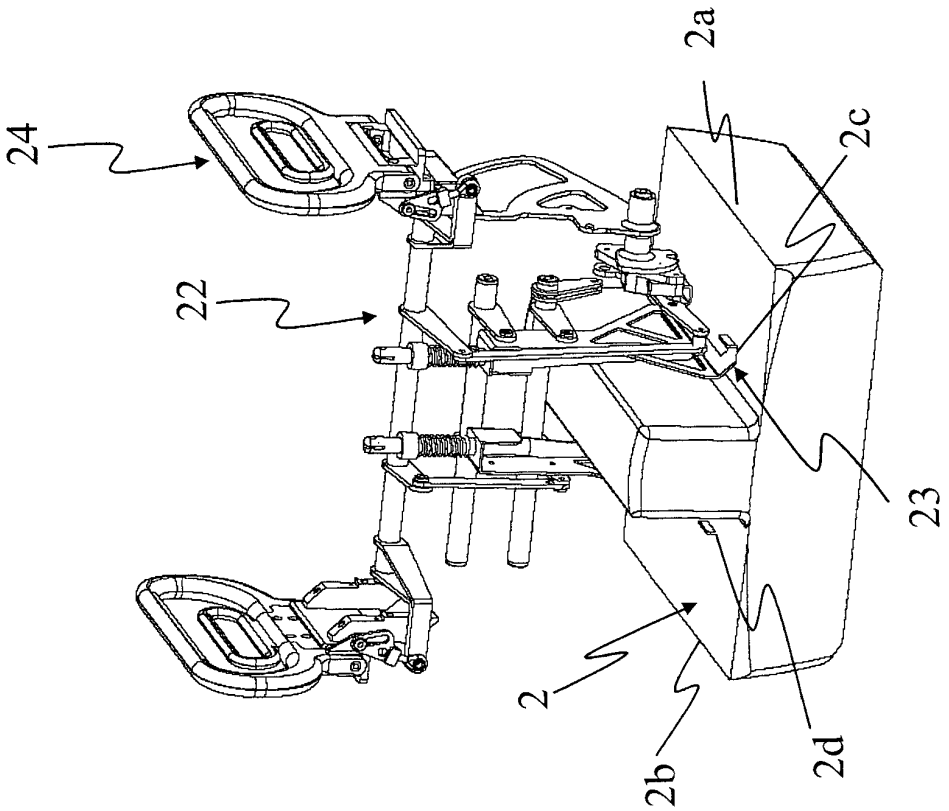


FIG. 8

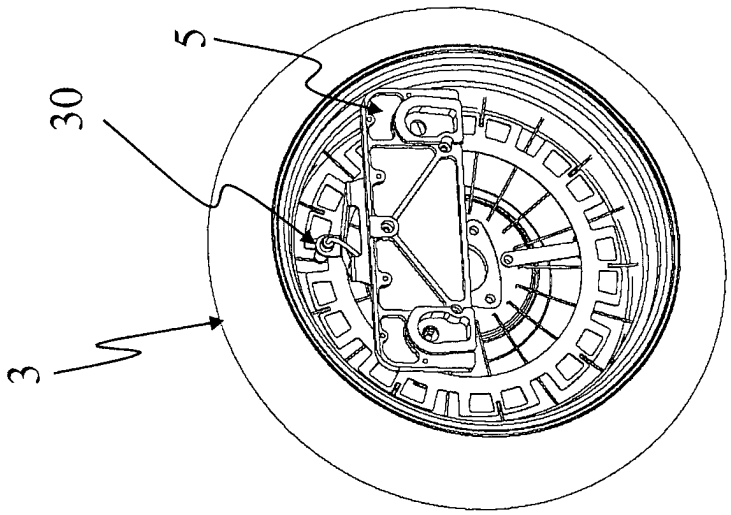


FIG. 11

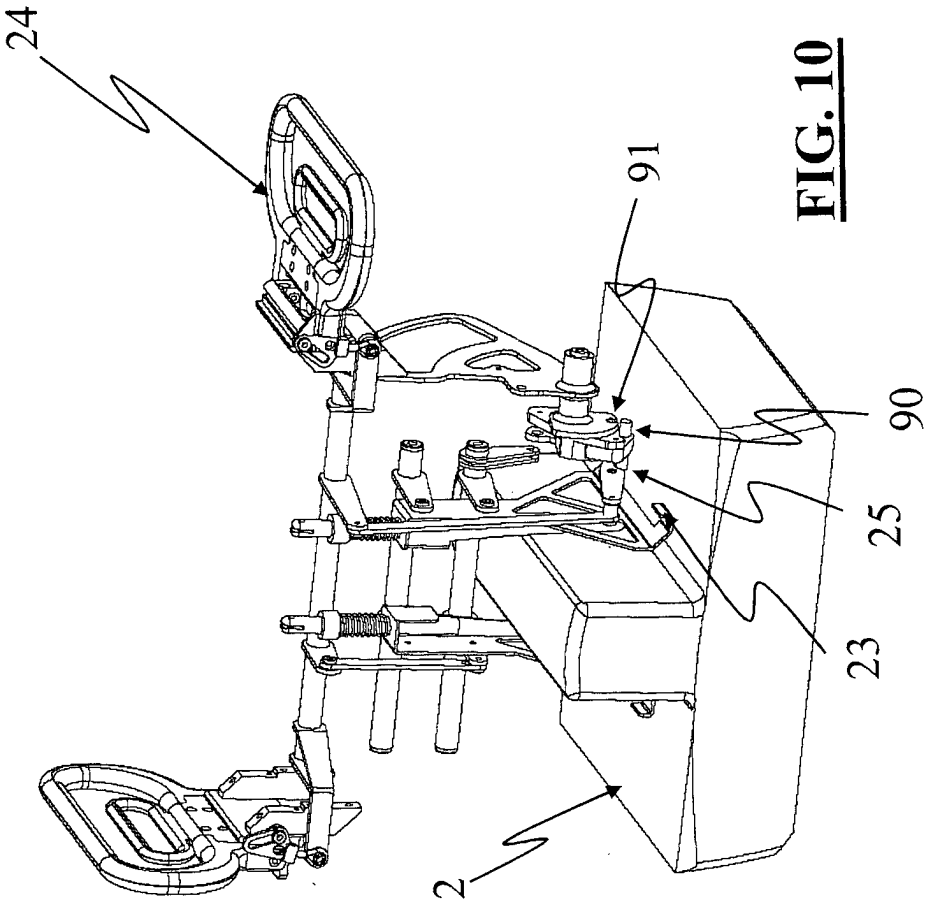


FIG. 10

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 20110204592 A **[0003]**
- WO 9802122 A **[0005]**