(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 4 389 098 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
26.06.2024 Bulletin 2024/26

(21) Application number: **23217687.5**

(22) Date of filing: **18.12.2023**

(51) International Patent Classification (IPC):
A61G 5/06 *(2006.01)*

(52) Cooperative Patent Classification (CPC):
A61G 5/061; A61G 5/043; A61G 2203/42

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC ME MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA
Designated Validation States:
KH MA MD TN

(30) Priority: **19.12.2022 JP 2022202126**

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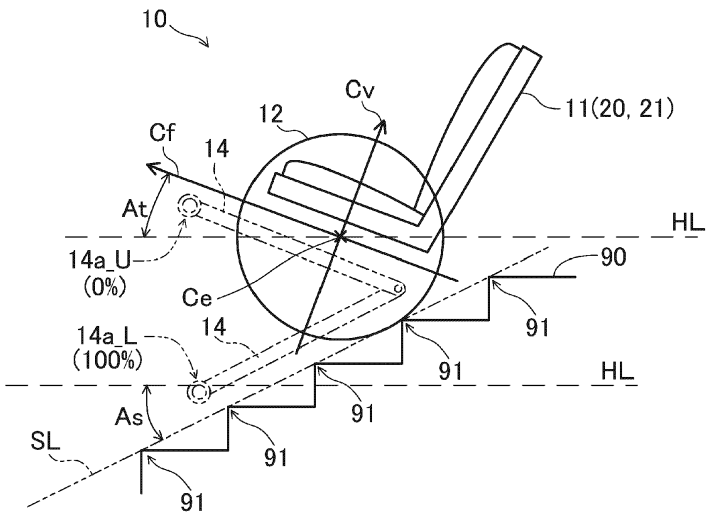
(54) **ELECTRIC WHEELCHAIR**

(57) An electric wheelchair (10) includes: a chair (11); main wheels (12) arranged on both sides of the chair (11) and driven by a motor (13); a front support rod (14) extending frontward from the chair (11) and having a front end part (14a) pivoting up and down; a rear support rod (15) extending rearward from the chair and having a rear end part (15a) pivoting up and down; and a controller (20). When the wheelchair (10) descends stairs (90), the controller (20) determines a position of the front end part (14a) of the front support rod (14) based on one of a slope angle (As) formed by a plane (SL) obtained by connecting edges (91) of steps of the stairs (90) and a horizontal plane (HL) and an edge position angle (Ag) formed by a line connecting the nearest edge (91), from the edges (91) of the steps of the stairs (90), to a center (Ce) of the main wheel (12) and the main wheel center (Ce) and a vertical direction (VL).

FIG. 2



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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] A technology disclosed by the present specification relates to an electric wheelchair.

2. Description of Related Art

[0002] An electric wheelchair in Japanese Unexamined Patent Application Publication No. 2022-95277 can climb and descend stairs. The electric wheelchair in JP 2022-95277 A includes main wheels arranged on both sides of a chair, support rods extending rearward from the chair, and auxiliary wheels positioned rearward of the main wheels. The main wheels are driven by a motor. Rear end parts of the support rods pivot up and down by actuators. The auxiliary wheels also pivot up and down by the actuators. The electric wheelchair can float the auxiliary wheels on the stairs and climb and descend the stairs while supporting the chair with the main wheels and the support rods.

SUMMARY OF THE INVENTION

[0003] One can consider that a front support rod extending frontward is included such that the chair does not undergo forward falling-down during stair descent. The front support rod can support the chair when the chair is inclined frontward. In such a case, there is a concern that, when both the front support rod and the rear support rod result in touching the ground to cause the main wheel to float, the entire electric wheelchair slips on the stairs. The present specification provides a technology that enables, for an electric wheelchair having support rods at the front and the rear of a chair, both supporting rods not to touch the ground during stair descent.

[0004] An electric wheelchair disclosed by the present specification includes: a chair; main wheels arranged on both sides of the chair; a front support rod; a rear support rod; and a controller. The main wheels are driven by a motor. The front support rod extends frontward from the chair and has a front end part that pivots up and down by an actuator. The rear support rod extends rearward from the chair and has a rear end part that pivots up and down by an actuator. When the electric wheelchair descends stairs, the controller determines a position of the front end part of the front support rod as follows. That is, the controller determines the position of the front end part based on one of a slope angle formed by a plane obtained by connecting edges of steps of the stairs and a horizontal plane and an edge position angle formed by a line connecting an edge, out of the edges of the steps of the stairs, that is nearest to a center of the main wheels and the main wheel center and a vertical direction. Each "edge of the steps" denotes a right angle portion at the upper corner of each step of the stairs.

[0005] By the position of the front end part being determined as above, the front end part is held at a position above the edge of the stairs. When the electric wheelchair is inclined frontward to cause the rear support rod to float, the front end part of the front support rod touches the stairs and prevents the chair from rotating frontward. At this time, the front end part and the main wheel touch the ground and the entire electric wheelchair does not slip or fall down the stairs.

[0006] Details of the technology disclosed by the present specification and further improvements are described in "DETAILED DESCRIPTION OF EMBODIMENTS" below.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] Features, advantages, and technical and industrial significance of exemplary embodiments of the invention will be described below with reference to the accompanying drawings, in which like signs denote like elements, and wherein:

FIG. 1 is a lateral view of an electric wheelchair of an embodiment (before climbing steps);
FIG. 2 is a diagram for explaining a target posture angle and a slope angle of a chair;
FIG. 3 is a graph showing an example of the relationship of a front end part position relative to a total value of the target posture angle and the slope angle;
FIG. 4 is a schematic diagram showing the relationship between an edge position angle and a position of a front end part;
FIG. 5 is a graph for determining the position of the front end part with respect to the edge position angle;
FIG. 6A is an example that the front end part position that is determined from the slope angle is selected;
FIG. 6B is an example that the front end part position that is determined from the edge position angle is selected;
FIG. 7 is a schematic diagram showing the relationship between a position of a rear end part of a rear support rod and a touching point angle; and
FIG. 8 is a graph of an example of the relationship between the position of the rear end part of the rear support rod and the touching point angle.

DETAILED DESCRIPTION OF EMBODIMENTS

[0008] An electric wheelchair 10 of an embodiment will be described with reference to the drawings. FIG. 1 shows a lateral view of the electric wheelchair 10 of an embodiment. The electric wheelchair 10 of an embodiment includes a chair 11, main wheels 12, and a motor 13. The main wheels 12 are arranged on both sides of the chair 11 and are driven by the motor 13. Note that, in FIG. 1, for better understanding of the structure of the

electric wheelchair 10, the main wheel 12 is drawn with broken lines, and devices positioned behind the main wheel 12 (devices that are normally hidden by the main wheel 12 and cannot be seen) are drawn with solid lines.

[0009] The electric wheelchair 10 further includes a front support rod 14, a rear support rod 15, and actuators 16, 17. The front support rod 14 extends frontward from the chair 11. A rear end of the front support rod 14 is pivotally supported on a pivot 18. The actuator 16 is attached between the chair 11 and the front support rod 14. The actuator 16 is of linear motion type, and when expanding and contracting, causes a front end part 14a of the front support rod 14 to pivot up and down. To the tip of the support rod 14, a rotatable auxiliary wheel is attached.

[0010] Signs "14a_U" and "14a_L" in FIG. 1 represent a movable range of the front support rod 14. A front end part 14a_U represents the position of an upper limit of the front support rod 14 (that is, an upper limit position of the front end part 14a). A front end part 14a_L represents the position of a lower limit of the front support rod 14 (that is, a lower limit position of the front end part 14a). By the front support rod 14 pivoting, the front end part 14a changes between the position indicated by the front end part 14a_U and the position indicated by the front end part 14a_L in FIG. 1.

[0011] The front support rod 14 is a device for preventing forward falling-down of the electric wheelchair 10 (chair 11). The front end part 14a_L can be positioned below a horizontal floor F such that, when the electric wheelchair 10 is descending a stair, the front end part 14a can be positioned right above the step below the stair.

[0012] The rear support rod 15 extends rearward from the chair 11. A front end of the rear support rod 15 is pivotally supported on the pivot 18. The actuator 17 is attached between the chair 11 and the rear support rod 15. The actuator 17 is of linear motion type, and when expanding and contracting, causes a rear end part 15a of the rear support rod 15 to pivot up and down. The pivot 18 is positioned rearward of a shaft 12a of the main wheel 12 and on the lower side of the shaft 12a. In other words, the pivot 18 is positioned behind and below the shaft 12a.

[0013] The rear end part 15a of the rear support rod 15 has a shape of a sled. The center of gravity (including the weight of a seated user) of the electric wheelchair 10 is positioned rearward of a center (shaft 12a) of the main wheel 12. Therefore, the rear end part 15a of the rear support rod 15 comes into contact with the floor F. By the rear end part 15a being moved up and down, a target posture angle of the chair 11 (rotation angle of the chair 11 around the shaft 12a of the main wheel 12) can be adjusted.

[0014] The motor 13 and the actuators 16, 17 are controlled by a controller 20. The controller 20 is built in the chair 11. Moreover, various sensors 21 are also attached to the chair 11. The sensors 21 include a vehicle speed sensor that measures a speed of the electric wheelchair 10, an angle sensor that measures a posture angle of the chair 11, a road surface sensor that senses a shape of a surface that the electric wheelchair 10 is travelling on, and the like. When the electric wheelchair 10 climbs and descends stairs, the road surface sensor senses a shape of the stairs. Illustration of the individual sensors is omitted.

[0015] The electric wheelchair 10 skillfully uses the front support rod 14 and the rear support rod 15 and can prevent falling-down in descending the stairs.

[0016] When the electric wheelchair 10 descends stairs, the controller 20 determines a position of the front end part 14a based on one of a slope angle and an edge position angle. The controller 20 controls the front support rod 14 (actuator 16) such that the determined position of the front end part 14a is attained. Hereinafter, the position of the front end part 14a is referred to as "front end part position". A position of the rear end part 15a of the rear support rod 15 is referred to as "rear end part position".

[0017] Referring to FIG. 2 and FIG. 3, a front end part position determination process based on the slope angle is described. A slope angle As denotes an angle formed by a plane (slope plane SL) obtained by connecting a plurality of edges 91 of stairs 90 and a horizontal plane HL (refer to FIG. 2). As shown in FIG. 2, each "edge 91 of stairs" denotes a right angle part at an upper corner of each stair of the stairs 90. In FIG. 2, some of the components are omitted for simplified drawing of the electric wheelchair 10.

[0018] A target posture angle At of the chair 11 is herein defined. The target posture angle At denotes an angle formed by an axis (front axis Cf) oriented frontward to be parallel to a seat surface of the chair 11 and the horizontal plane HL. Note that the axis perpendicular to the seat surface is referred to as perpendicular axis Cv (refer to FIG. 2). The origin where the front axis Cf and the perpendicular axis Cv intersect is positioned at a center Ce of the main wheel 12. The front axis Cf and the perpendicular axis Cv constitutes a local coordinate system fixed to the chair 11.

[0019] As mentioned earlier, the posture angle of the chair 11 is adjusted by the position (rear end part position) of the rear end part 15a of the rear support rod 15. The controller 20 controls the rear support rod 15 such that an actual posture angle of the chair 11 coincides with the target posture angle At.

[0020] The controller determines the front end part position, with a total value (As + At) of the slope angle As and the target posture angle At being as a parameter, such that the front end part 14a maintains a predefined distance from the slope plane SL.

[0021] The front end part position that maintains the predetermined distance from the slope plane SL depends on a geometric structure of the electric wheelchair 10. Therefore, the front end part position that maintains the predetermined distance from the slope plane SL is predetermined in a form of a map (or a form of a function)

that outputs the front end part position with respect to an input value (As + At), and is stored in the controller 20. FIG. 3 shows an example of the relationship of the front end part position relative to the total value of the slope angle As and the target posture angle At. The axis of ordinates denotes the front end part position. The front end part position of the axis of ordinates is represented by a percentage with the upper limit position (position of the front end part 14a_U) and the lower limit position (position of the front end part 14a_L) of the front support rod 14 mentioned above being as 0 [%] and 100 [%], respectively. As mentioned earlier, the front end part position that maintains the predetermined fixed distance from the slope plane SL depends on the geometric structure of the electric wheelchair 10, and is predetermined as exemplarily shown in FIG. 3.

[0022] The front end part position is determined with respect to the total value of the target posture angle At and the slope angle As. Therefore, when the actual posture angle of the chair 11 deviates from the target posture angle At and the chair 11 inclines frontward, the front end part 14a touches the stair 90, which prevents forward falling-down of the chair 11.

[0023] Referring to FIG. 4 and FIG. 5, a determination process of the front end part position based on the edge position angle is described. An edge position angle Ag denotes an angle (refer to FIG. 4) formed by a line connecting the nearest edge (edge 91a in FIG. 4) to the center Ce of the main wheel 12 in the horizontal direction and the center Ce and the vertical direction VL. The nearest edge 91a to the center Ce of the main wheel 12 in the horizontal direction is referred to as the near edge 91a for convenience of description. The controller 20 determines the front end part position such that a predetermined distance is maintained between the front end part 14a and the near edge 91a in the vertical direction. This front end part position depends on the edge position angle Ag.

[0024] The front end part position that maintains the predetermined distance from the near edge 91a in the vertical direction depends on the geometric structure of the electric wheelchair 10. The front end part position that maintains the predetermined distance is predetermined in a form of a map (or a form of a function) with the edge position angle Ag being as an input value, and is stored in the controller 20. FIG. 5 shows an example of the relationship of the front end part position with respect to the edge position angle Ag. The numerical values on the axis of ordinates mean the same as those on the axis of ordinates in the graph of FIG. 3.

[0025] During the electric wheelchair 10 descending the stairs, the controller 20 determines the front end part position based on the total value of the target posture angle At and the slope angle As. This front end part position is referred to as slope front end part position. Simultaneously, the controller 20 also determines the front end part position based on the edge position angle Ag. This front end part position is referred to as edge front end part position. The controller 20 compares the slope front end part position and the edge front end part position and selects the higher one. The controller 20 controls the front support rod 14 (actuator 16) such that the selected front end part position is attained. In predetermined control cycles, the controller 20 repeats the determination of the front end part position and the control of the front support rod 14.

[0026] With reference to FIG. 6A and FIG. 6B, examples of the controller 20 selecting one of the slope front end part position and the edge front end part position are described. In FIG. 6A, the near edge 91a is positioned rearward of the center Ce of the main wheel 12, and the edge position angle is an angle Ag_a. The slope angle is the angle As. At this time, the slope front end part position (position of a front end part 14a_sl) is higher than the edge front end part position (position of a front end part 14a_eg). The controller 20 selects the slope front end part position (position of the front end part 14a_sl) and controls the front support rod 14 (actuator 16) such that this position is attained.

[0027] In FIG. 6B, the electric wheelchair 10 advances a little from the state of FIG. 6A, and the near edge moves to an edge 91b. The near edge 91b is positioned frontward of the center Ce of the main wheel 12, and the edge position angle is an angle Ag_b. The slope angle is the angle As. At this time, the edge front end part position (position of the front end part 14a_eg) is higher than the slope front end part position (position of the front end part 14a_sl). The controller 20 selects the edge front end part position (position of the front end part 14a_eg) and controls the front support rod 14 (actuator 16) such that this position is attained. Accordingly, if the posture angle of the chair 11 deviates from the target posture angle, resulting in the frontward inclination, the front end part 14a comes into contact with the stairs, which prevents the forward falling-down.

[0028] With reference to FIG. 7 and FIG. 8, control of the rear support rod 15 is described. In FIG. 7, a rear end part 15a_U denotes the position of an upper limit of the rear support rod 15 (an upper limit position of the rear end part 15a), and a rear end part 15a_L denotes the position of a lower limit of the rear support rod 15 (a lower limit position of the rear end part 15a).

[0029] As mentioned earlier, the position of the rear support rod 15 defines the posture of the chair 11. The controller 20 controls the rear support rod 15 (actuator 17) such that the target posture angle is attained. In place of such control, the controller 20 may determine the rear end part position (position of the rear end part 15a) of the rear support rod 15 based on a touching point angle Ast and may control the rear support rod 15 (actuator 17) such that the determined rear end part position is attained. Here, the touching point angle Ast denotes an angle formed by a line connecting the edge that is in contact with the main wheel 12 (an edge 91c in the case of FIG. 7) and the center Ce of the main wheel 12 and the perpendicular axis Cv. The perpendicular axis Cv de-

notes the axis perpendicular to the seat surface of the chair 11. The edge 91c in contact with the main wheel 12 is referred to as touching edge 91c for convenience of description. The controller 20 determines the rear end part position such that a predetermined distance is maintained between a line that passes through the touching edge 91c and is in contact with the wheel 12 and the rear end part position.

[0030] The rear end part position that maintains the predetermined distance between the line which passes through the touching edge 91c and is in contact with the wheel 12 and the rear end part position depends on the touching point angle Ast. Therefore, such a rear end part position is predetermined in a form of a map (or a form of a function) that outputs the rear end part position with respect to an input value (the touching point angle Ast), and is stored in the controller 20. FIG. 8 shows an example of the relationship of the rear end part position relative to the touching point angle Ast.

[0031] The axis of ordinates in FIG. 8 denotes the rear end part position. The front end part position of the axis of ordinates is represented by a percentage with the upper limit position (position of the rear end part 15a_U) and the lower limit position (position of the rear end part 15a_L) of the rear support rod 15 mentioned above being as 0 [%] and 100 [%], respectively. As mentioned earlier, the rear end part position that maintains the predetermined distance between the line which passes through the touching edge 91c and is in contact with the wheel 12 and the rear end part position depends on the geometric structure of the electric wheelchair 10 and the touching point angle Ast, and is predetermined as exemplarily shown in FIG. 8.

[0032] The rear end part position that is targeted by the controller 20 takes a value obtained by adding "gain $\times$ posture error" to the current rear end part position. The controller 20 controls the rear support rod 15 (actuator 17) such that the targeted rear end part position is attained.

[0033] The electric wheelchair 10 includes a joystick that the seated user manipulates. When the joystick is tilted frontward, the electric wheelchair 10 goes frontward, and when the joystick is tilted rearward, the electric wheelchair 10 goes rearward. When the joystick is at a neutral position, the electric wheelchair 10 stops. When an angle at which the joystick is tilted frontward is increased, an advancing speed increases. When an angle at which the joystick is tilted rearward is increased, a reversing speed of the electric wheelchair 10 increases.

[0034] The electric wheelchair 10 needs to decelerate or stop against manipulation of the user for safety in accordance with the situation. The controller 20 determines the speed of the electric wheelchair 10 with the tilt of the joystick multiplied by predetermined gains. There are some kinds of gains. A gain A is a gain in accordance with a posture control error, and is set to be smaller as the posture control error is larger. A gain B is a gain in accordance with the slope angle, and is set to be smaller as the slope angle is larger. A gain C is a gain in accordance with a control error of the rear support rod 15, and is set to be smaller as the control error is larger. A gain D is a gain in accordance with a roll posture error of the electric wheelchair 10, and is set to be smaller as the posture error is larger. A gain E is a gain in accordance with a height of steps, and is zero when the steps are larger than a predetermined threshold. When the steps are smaller than the threshold, the gain E is set to "1". The controller 20 determines the speed of the electric wheelchair 10 by the tilt of the joystick being multiplied by the aforementioned gains A to E. When the steps are larger than the predetermined threshold, the gain E is zero and the electric wheelchair 10 does not move.

[0035] Points of attention regarding the technology described for the embodiment are mentioned. The shape of stairs can be measured by a LiDAR sensor, a 3D image sensor, a plurality of distance sensors, or the like. LiDAR is an abbreviation of "Light Detection And Ranging". The LiDAR sensor radiates laser in a plurality of directions and measures distances from an obstacle (steps) in the directions. The outer shape of the obstacle (steps) is acquired based on the measured distances in the directions. The 3D image sensor captures images of the stairs with two cameras and measures the shape of the stairs based on the principle of stereoscopy. The shape of the stairs can also be measured by a sensor having a plurality of distance sensors arranged so as to radiate parallel laser beams.

[0036] The controller 20 may estimate the edge positions of the stairs with respect to the body of the electric wheelchair 10, the inclination angle of the stairs (the slope angle mentioned above), and the touching positions of the main wheel, and with a control map for handling those, may control the front support rod 14 and the rear support rod 15.

[0037] The electric wheelchair 10 may have a contact determining apparatus that determines whether the front and rear support rods 14, 15 are in contact with the ground surface, and the controller 20 may change the control depending on whether or not the front and rear support rods 14, 15 are in contact with the ground surface.

[0038] The controller 20 may reduce the speed of the electric wheelchair 10 in accordance with a control error for the posture of the front and rear support rods 14, 15.

[0039] The controller 20 may set the speed of the electric wheelchair 10 to zero when the height of steps in the travelling direction of the electric wheelchair 10 is larger than the radius of the main wheel 12. The "travelling direction" includes the case of advancing and the case of reversing.

[0040] The electric wheelchair 10 carries a power supply for the motor 13, the actuators 16, 17, the controller 20, and the sensors 21 beneath the chair 11 (or in the back of the chair 11), illustration of the power supply being omitted.

[0041] The front support rods 14 may be provided on

both sides of the chair 11, or only on one side of the chair 11, the front support rod 14 may be provided. In the latter case, a crossbar is attached to the tip part of the front support rod, and thereby, the main wheels are stably floated with the front support rod and the rear support rod. The rear support rods may also be disposed on both sides of the chair 11, or at the center of the chair 11 in the right-left direction, one rear support rod may be disposed.

[0042] Some specific examples of the present invention have been described above in detail, but these examples are merely exemplary illustrations, and do not limit the accompanying claims. The technology disclosed with the claims includes variations, alterations, and modifications of the specific examples exemplarily illustrated above. A single one or various combinations of the technical elements described in the present specification or the drawings may exhibit technical usefulness, which is not limitedly exhibited only by the combination in the claims on filing. Moreover, the technology exemplarily illustrated in the present specification or the drawings may attain a plurality of objects simultaneously, and sufficiently exhibits the technical usefulness just by attaining one of the objects.

Claims

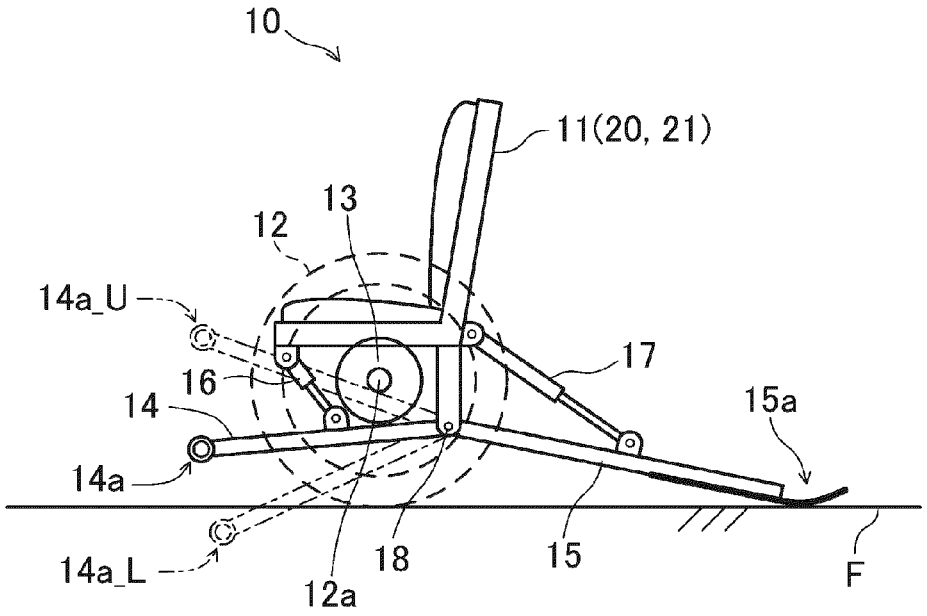
1. An electric wheelchair (10) comprising:

a chair (11);
main wheels (12) that are arranged on both sides of the chair (11) and are configured to be driven by a motor (13);
a front support rod (14) extending frontward from the chair (11) and having a front end part (14a) that pivots up and down;
a rear support rod (15) extending rearward from the chair (11) and having a rear end part (15a) that pivots up and down; and
a controller (20) for controlling the front support rod (14), the rear support rod (15), and the main wheels (12), wherein:

a center of gravity of the electric wheelchair is positioned rearward of a shaft (12a) of the main wheels (12); and
the controller (20) is configured so that, when the electric wheelchair (10) descends stairs (90), the controller (20) determines a position of the front end part (14a) based on one of a slope angle (As) formed by a plane (SL) obtained by connecting edges (91) of steps of the stairs (90) and a horizontal plane (HL) and an edge position angle (Ag) formed by a line connecting an edge (91), out of the edges (91) of the steps of the stairs (90), that is nearest to a center (Ce) of the main wheels (12), and the center (Ce) of the main wheels (12), and a vertical direction (VL).

2. The electric wheelchair (10) according to claim 1, wherein the controller (20) is configured so that, out of a position of the front end part (14a) determined based on the slope angle (SL) and a position of the front end part (14a) determined based on the edge position angle (Ag), the controller (20) selects a higher position.

FIG. 1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16
15a
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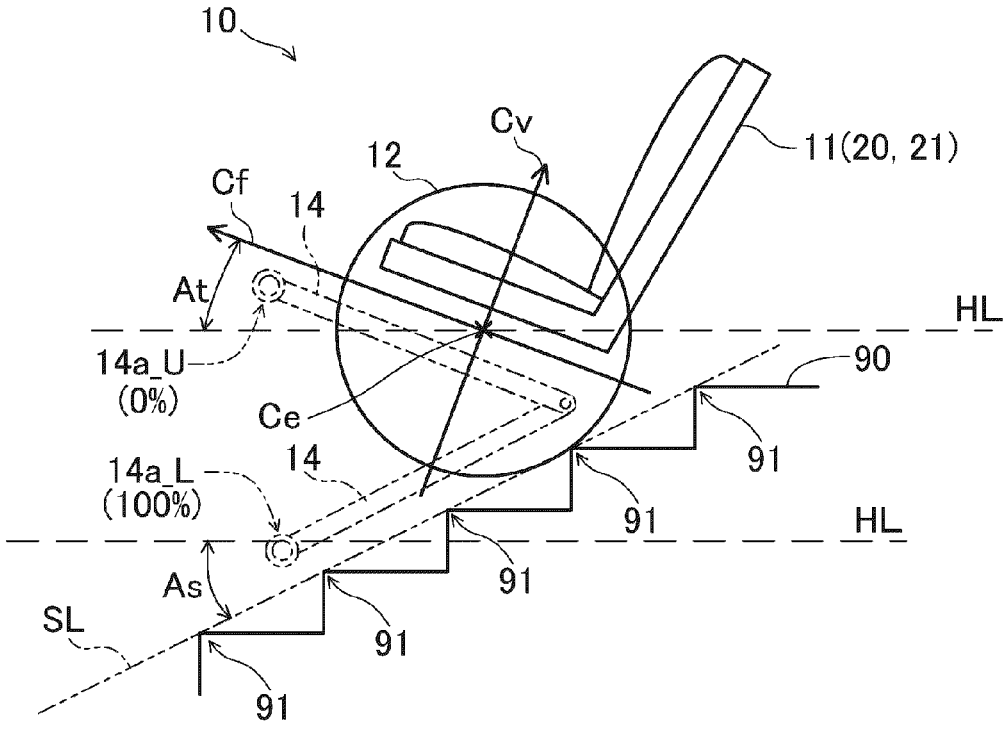
14a
14a_L
18
15
F
12a

FIG. 2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Cv
11(20, 21)
12
Cf
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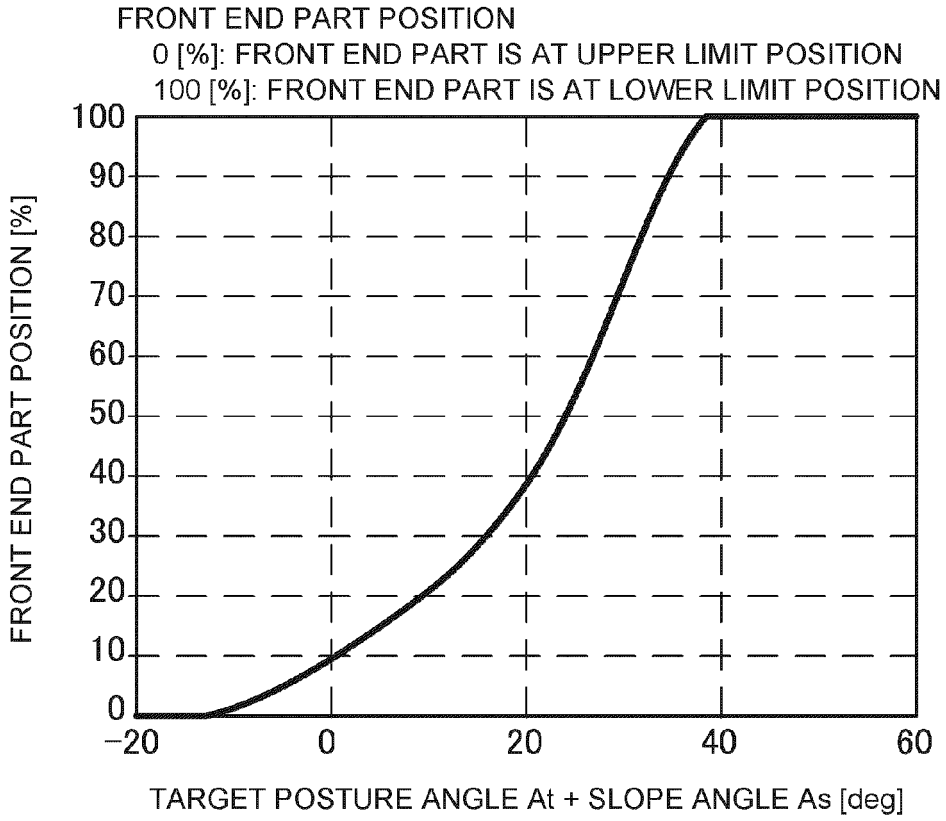
SL
91
91

FIG. 3


FRONT END PART POSITION
0 [%]: FRONT END PART IS AT UPPER LIMIT POSITION
100 [%]: FRONT END PART IS AT LOWER LIMIT POSITION
FRONT END PART POSITION [%]
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80
70
60
50
40
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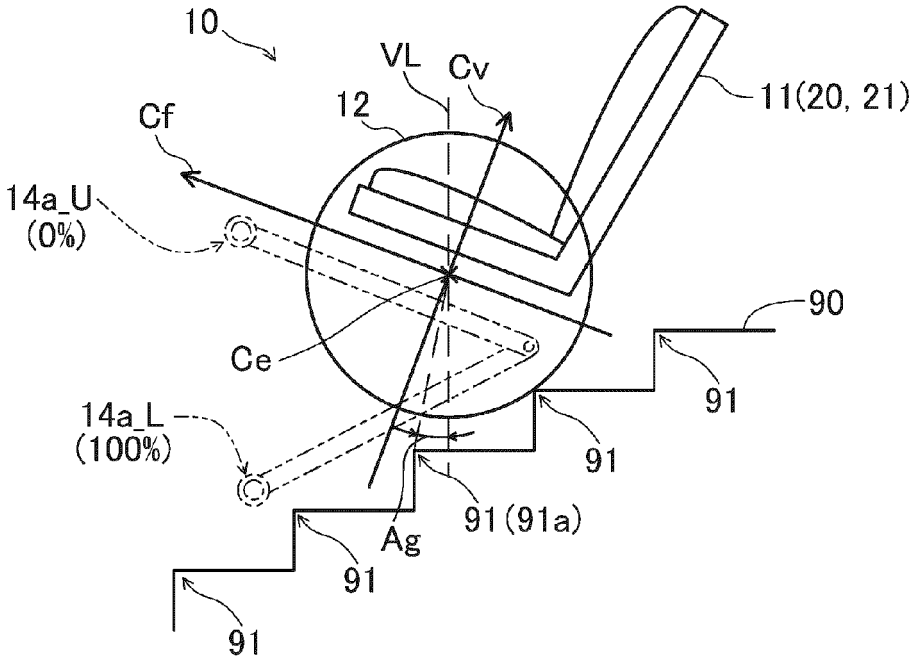
20
10
0
−20
0
20
40
60
TARGET POSTURE ANGLE At + SLOPE ANGLE As [deg]

FIG. 4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Cv
12
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Cf
14a_U
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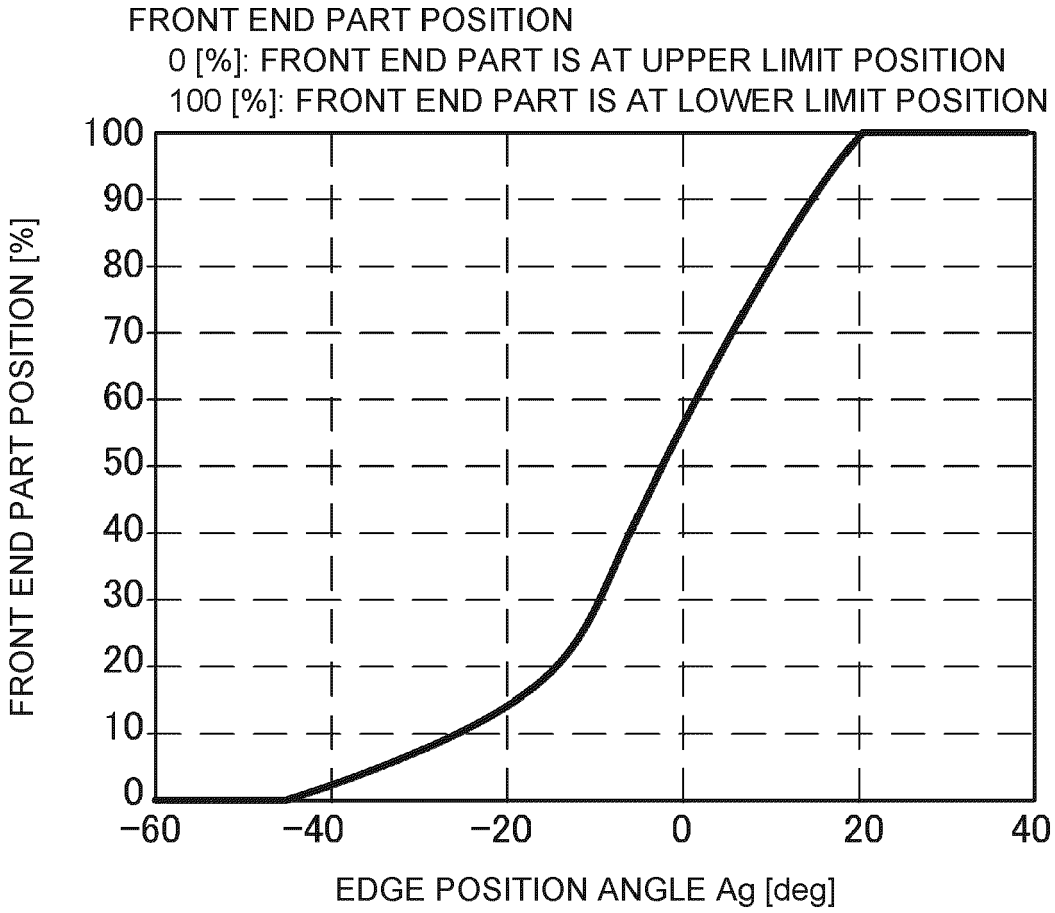
90
Ce
91
14a_L
(100%)
91
91(91a)
Ag
91
91

FIG. 5


FRONT END PART POSITION
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100 [%]: FRONT END PART IS AT LOWER LIMIT POSITION
FRONT END PART POSITION [%]
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70
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−20
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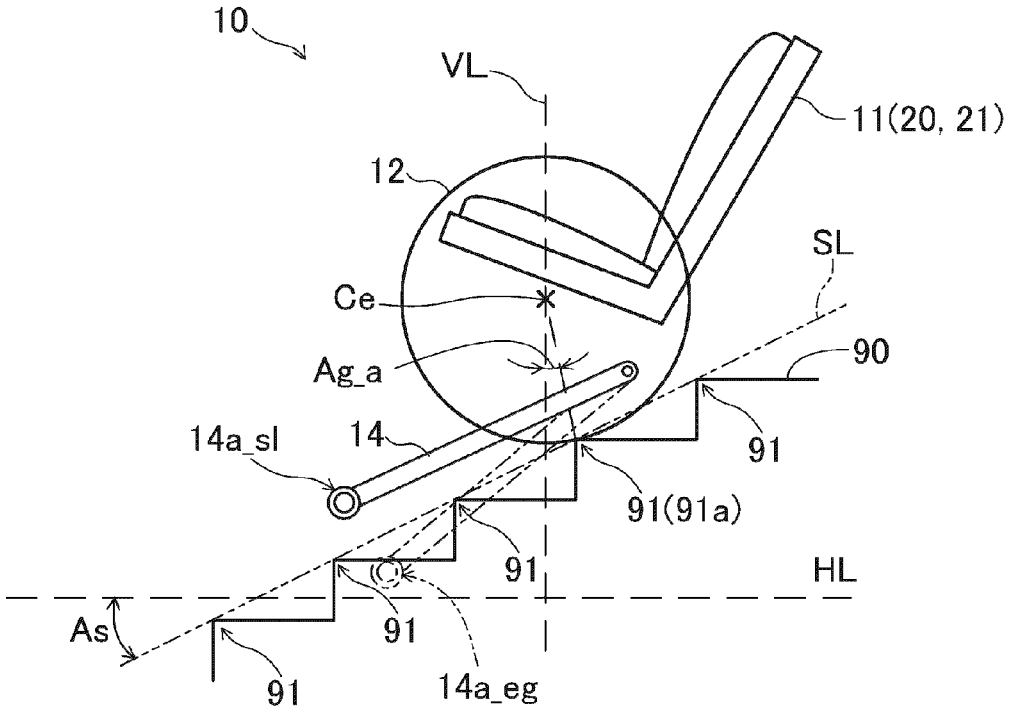
20
40
EDGE POSITION ANGLE Ag [deg]

FIG. 6A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HL
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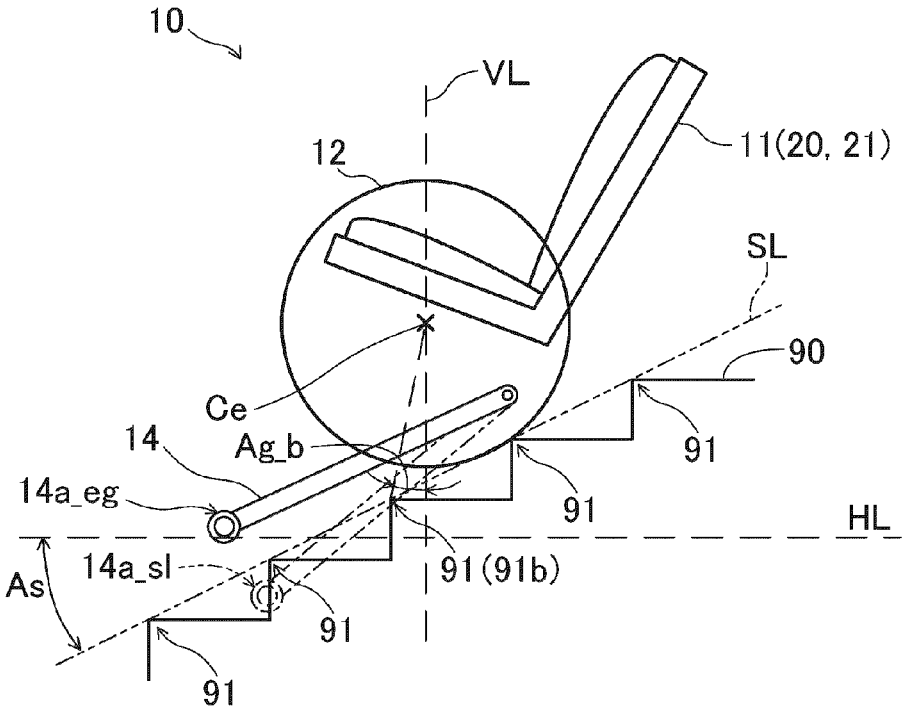
91
91
14a_eg

FIG. 6B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SL
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Ce
14
Ag_b
91
14a_eg
91
HL
14a_sl
91(91b)
As
91
91

FIG. 7

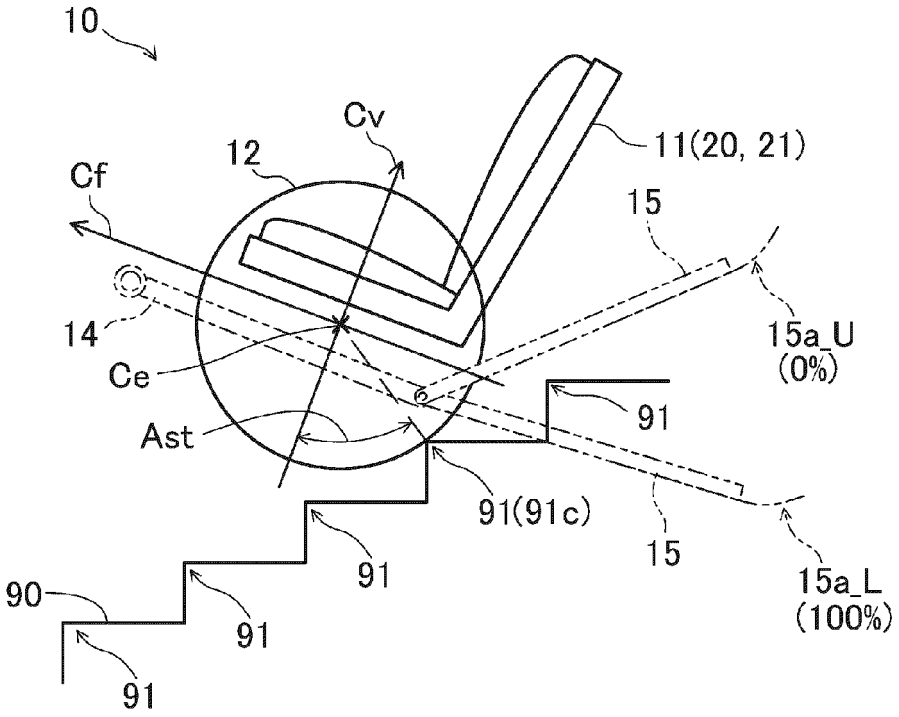
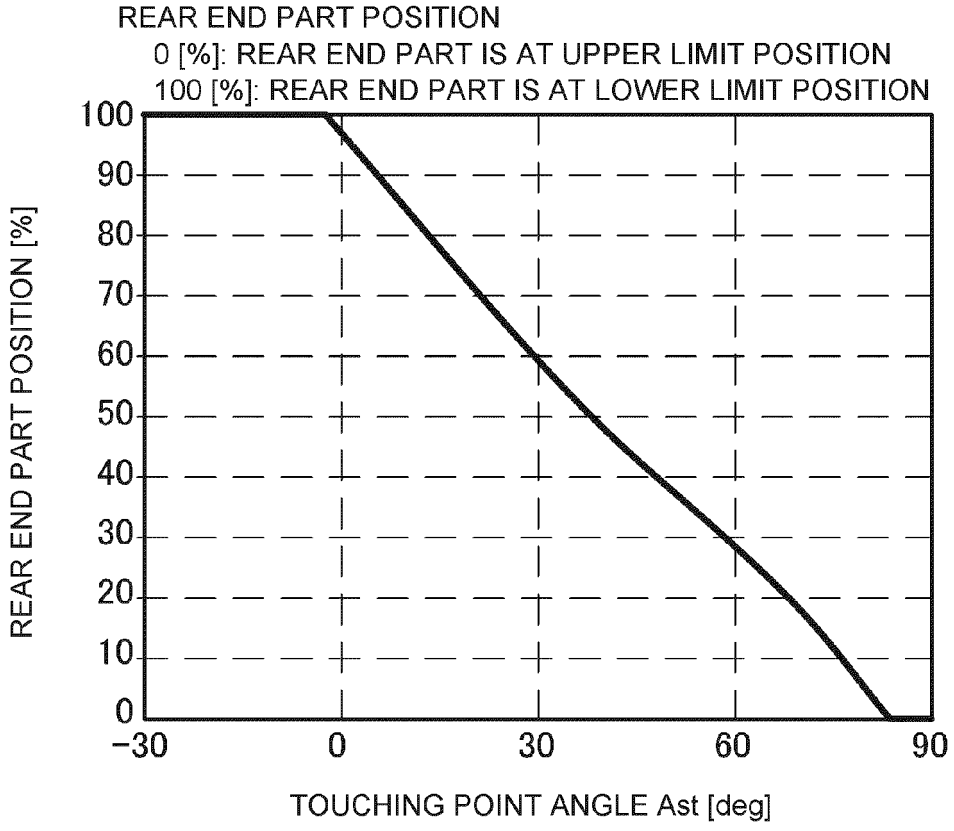

10
Cv
12
11(20, 21)
Cf
15
14
15a_U
(0%)
Ce
91
Ast
91(91c)
15
91
15a_L
(100%)
90
91
91

FIG. 8


REAR END PART POSITION
0 [%]: REAR END PART IS AT UPPER LIMIT POSITION
100 [%]: REAR END PART IS AT LOWER LIMIT POSITION
REAR END PART POSITION [%]
100
90
80
70
60
50
40
30
20
10
0
-30
0
30
60
90
TOUCHING POINT ANGLE Ast [deg]

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EUROPEAN SEARCH REPORT

Application Number
EP 23 21 7687

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A,D	JP 2022 095277 A (SOKEN INC; TOYOTA MOTOR CORP) 28 June 2022 (2022-06-28) * figures 1-13 * * paragraphs [0012] - [0026] *	1,2	INV. A61G5/06
A	US 10 806 649 B1 (COX KENNETH RAY [US]) 20 October 2020 (2020-10-20) * figures 11, 12A-B, 14A-B * * column 2, line 43 - column 3, line 10 *	1,2	

TECHNICAL FIELDS SEARCHED (IPC)

A61G

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	16 April 2024	Koszewski, Adam

CATEGORY OF CITED DOCUMENTS

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US 10806649 B1	20-10-2020	NONE	

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