



(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
22.04.2009 Bulletin 2009/17

(51) Int Cl.:
A61G 5/10 (2006.01)

(21) Application number: **07803634.0**

(86) International application number:
PCT/ES2007/000447

(22) Date of filing: **19.07.2007**

(87) International publication number:
WO 2009/010600 (22.01.2009 Gazette 2009/04)

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU LV MC MT NL PL PT RO SE SI SK TR
Designated Extension States:
AL BA HR MK RS

- **OLARRA URBERUAGA, Aitor**
E-20600 Eibar (guipuzcoa) (ES)
- **EGAÑA FARIZO, Fernando**
E-20600 Eibar (guipuzcoa) (ES)

(71) Applicant: **FUNDACION TEKNIKER**
20600 Eibar-Guipuzcoa (ES)

(74) Representative: **Carpintero Lopez, Francisco et al**
Herrero & Asociados, S.L.
C/ Alcala, 35
E-28014 Madrid (ES)

(72) Inventors:
• **SAN MARTIN PALACIOS, Manex**
E-20600 Eibar (guipuzcoa) (ES)

(54) **WHEELCHAIR**

(57) The wheelchair comprises a mobile seat part (100) with respect to a lower part (200) of the chair, by means of a coupling mechanism comprising at least two arms (1, 1') which, to elevate the chair, rotate in opposite directions. Each arm can pivot with respect to the lower part (200) and the angular positions of the arms (1, 1') with respect to their coupling points (1A, 1A') for coupling to the lower part (200) determine both the height position and the tilting of the seat part (100) with respect to the lower part (200).

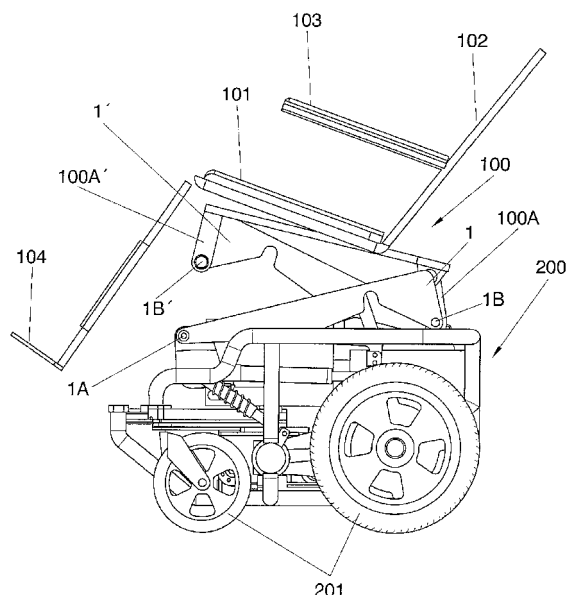


FIG. 1A

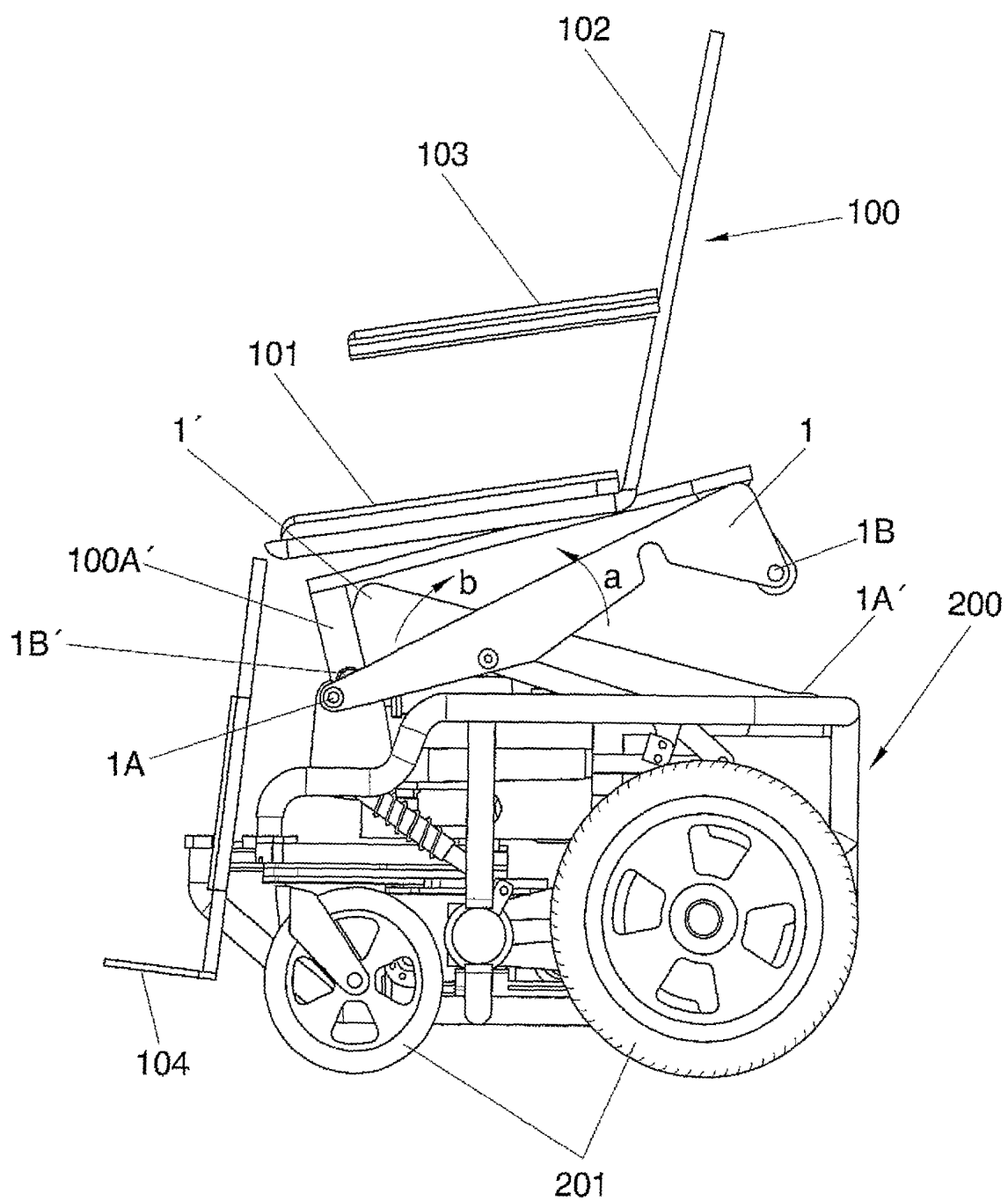


FIG. 1B

Description

Technical Field of the Invention

[0001] The invention is comprised in the field of wheelchairs and, more specifically, in that of adjustable wheelchairs with regard to their height and/or tilting.

Background of the Invention

[0002] There exist height-adjustable wheelchairs (for example, to facilitate the access of the user to objects located at a certain height) and wheelchairs allowing the tipping of the seat, backwards (for example, to provide a more comfortable position for the user) and/or forwards (for example, to facilitate the movement of the user from the chair to a bed, to a seat or to a vehicle).

[0003] The chairs normally only incorporate some of the mentioned functionalities since different mechanisms are required for each of them (namely, tilting mechanisms and elevation mechanisms), which increase the cost of the chair, its weight, its size and/or its complexity.

[0004] Examples of known wheelchairs with some type of tipping and/or height movement mechanism of the seat are described in, for example, WO-A-03/086261, WO-A-2004/021953, WO-A-01/32120, WO-A-01/91688, WO-A-01/91687, WO-A-02/26186, WO-A-03/034967, WO-A-2005/007498, WO-A-99/17699, WO-A-98/52509 and WO-A-97/23187.

Description of the Invention

[0005] The invention relates to a wheelchair, comprising a seat part (which can comprise the seat properly speaking, a backrest, armrest and/or footrest) and a lower part (which basically can comprise the frame of the wheelchair, the wheels allowing the chair to roll on a surface, and several transmission mechanisms, motors, etc.). The seat part is assembled on the lower part and coupled thereto by means of a coupling mechanism configured such that, when the lower part is located on a horizontal surface,

- the height of the seat part can be regulated with respect to the lower part, and
- the tilting of the seat part can be regulated in the vertical plane which extends in the longitudinal direction of the chair (longitudinal direction is understood to be the direction going forwards and backwards, from the point of view of the user), by means of said coupling mechanism.

[0006] According to the invention, the coupling mechanism comprises at least two arms which are articulated to the seat part and to the lower part, each of said arms being articulated to said lower part, at a corresponding articulation point (and according to a corresponding pivoting shaft), pivotably with respect to the lower part, such

that, to elevate the seat part to a maximum height position from a minimum height position with respect to the lower part, one of said arms must pivot, with respect to its articulation point or articulation pin and viewed from a side of the wheelchair, in a first direction (for example, clockwise), and another of said arms must pivot, with respect to its articulation point or articulation pin and viewed from the same side of the wheelchair, in a second direction (for example, counter-clockwise) opposite said first direction, such that the angular positions of the arms with respect to their coupling points for coupling to the lower part (for example, the orientation of the arms in the vertical plane which contains them) determine both the height position and the tilting of the seat part, with respect to the lower part.

[0007] A simple mechanism in which by means of only two pivotable arms (or, if greater stability is desired, two pairs of arms like that which has been described), which can modify, fairly freely, both the height of the seat and its tilting forwards or backwards, is thus achieved. All of this can be controlled from an electronic control system which can have a control located in correspondence with, for example, an armrest of the chair, and which can act on electric motors associated to the arms, such that they can control and drive their angular movement.

[0008] One of the arms can have its coupling point for coupling to the lower part located in correspondence with a front part of the lower part (for example, at a distance from the front end of the lower part the distance of which can be less than a quarter -or eighth- of the length of the lower part) and in correspondence with a first side of the lower part (for example, at a distance from said first lower side the distance of which is less than a quarter -or eighth- of the width of the lower part), and in which another of said arms has its coupling point for coupling to the lower part located in correspondence with a rear part of the lower part (for example, at a distance from the rear end of the lower part the distance of which can be less than a quarter -or eighth- of the length of the lower part) and in correspondence with a second side of the lower part opposite said first side of the lower part (for example, at a distance from said second side the distance of which is less than a quarter - or eighth- of the width of the lower part). Said coupling points can be located in diagonally opposite areas of said lower part.

[0009] Thus, by thus distributing the coupling points, a good stability of the wheelchair can be obtained.

[0010] Each arm can be articulated to the seat part by means of at least one pivoting link. For example, at least one of the arms can be articulated to said seat part by means of said pivoting link between said arm and a connecting rod, bar or the like, said connecting rod or bar in turn being coupled to said seat part by means of another pivoting link, such that said connecting rod or bar can pivot with respect to the seat part. This can facilitate the conversion of the angular movement of the arms into an elevation movement of the seat part without causing a tipping of the seat part, i.e., its tilting being maintained.

Another of the arms can be linked to said seat part by means of its pivoting link directly between said arm and an element rigidly linked to or integrated into the seat part.

[0011] Each arm can be angularly moveable by means of an actuator, for example, by means of an electric linear actuator. Said actuator can be coupled to the corresponding arm by means of a transmission mechanism which can comprise a first transmission element or lever coupled by means of a pivoting link to a mobile part of the actuator, and a second transmission element or bar can be linked by means of a first pivoting link to said first transmission element or lever and by means of a second pivoting link to said arm.

[0012] In such a case, the first transmission element or lever can be provided with a rotating element (for example, a pulley or wheel) configured such that it is supported on a lower surface of the arm for at least one part of the angular movement of the arm with respect to its articulation point for articulating to the lower part, whereby it can serve to discharge the forces exerted on the actuator for at least one part of the movement. Said first pivoting link between the first transmission element and the second transmission element can be located in an area of the first transmission element located between the pivoting link between the first transmission element and the mobile part of the actuator, and the rotating element or pulley.

[0013] The first pivoting link between the first transmission element and the second transmission element can be located in an area of the first transmission element located between the pivoting link between the first transmission element and the mobile part of the actuator, and a connection area of the first transmission element for connecting to a spring (which can coincide with the position of the rotating element), in which case the wheelchair can also include said spring.

[0014] The actuator can be assembled pivotably on a third transmission element in turn assembled pivotably. The arm can be assembled pivotably on this third transmission element.

[0015] The first and the second transmission elements can be configured such that, from a certain angular position of the arm in an elevation movement of the seat part, the first transmission element abuts against the second transmission element, such that the pivoting or rotation between the first transmission element and the second transmission element is prevented from continuing, such that one of said elements can "push" the other without there being rotation between the elements.

[0016] A first of said arms can have its articulation point located further forwards in the lower part than the articulation point of a second of said arms, said first arm being extended backwards from its articulation point and said second arm being extended forwards from its articulation point. Thus, viewed "from the side", the two arms can form an "X" in at least some positions of the seat part.

[0017] Said at least two arms can, for example, improve the stability of the system, comprise four arms,

which can make up two pairs of arms, each pair of arms comprising two arms according to what has been described above. Each "pair" can correspond to a diagonal of the wheelchair, viewed from above.

Description of the Drawings

[0018] To complement the description being made and for the purpose of aiding to better understand the features of the invention according to a preferred practical embodiment thereof, a set of drawings is attached as an integral part of this description in which the following has been depicted with an illustrative and non-limiting character:

Figures 1A and 1B show two side schematic views of part of the structure of the wheelchair according to a preferred embodiment of the invention, with the seat tilted backwards and forwards, respectively.

Figures 2A-2C show three perspective schematic views of part of the structure of said wheelchair, with the seat part placed at different heights.

Figure 3 shows a schematic view of the seat part and of its coupling components for coupling to the arms, in correspondence with different heights of the seat.

Figures 4A-4D show schematic side views of the wheelchair, corresponding to different lifting and tilting positions of the seat part.

Figures 5A-5D show four schematic views of the movement transmission system for transmitting movement to the arms.

Figure 6 shows a conceptual diagram of the movement transmission mechanism.

Figures 7A and 7B shows the horizontal (x) and vertical (y) orientation of the diagram of Figure 6, in different operational phases of the system.

Figure 8 shows a view from behind of the wheelchair.

Preferred Embodiment of the Invention

[0019] Figures 1A and 1B show side elevational side views of the wheelchair according to an embodiment of the invention, with the seat part 100 in two different positions, namely, tilted backwards (Figure 1A) and forwards (1B). Figures 2A-2C show the same wheelchair, in perspective view, with the seat part 100 in its lower position (Figure 2A), in an optimal intermediate position to be driven (Figure 2B) and in an elevated position (Figure 2C) (in Figures 2A-2C, some transmission elements have been eliminated to facilitate the view of other ele-

ments).

[0020] As can be observed in these Figures, the wheel-chair comprises a seat part 100 (which, as is conventional, can comprise the seat 101 properly speaking, a backrest 102, armrest 103 and footrest 104) and a lower part 200 which basically corresponds to the base of the chair, i.e., to the general frame and to the elements associated to said frame, including wheels 201, shafts, damping elements, motors, etc.

[0021] The seat part 100 is coupled to the lower part 200 by means of a coupling mechanism comprising the two arms 1, 1', each of which is articulated to the seat part by means of a pivoting link 1 B, 1 B', and to the lower part by means of other pivoting links located in correspondence with the articulation points 1 A, 1 A' which are basically located diagonally opposite, viewed from above. In other words, as can be seen in the figures, one of the arms 1 has its articulation point 1 A for articulating to the lower part located in correspondence with a front part of the lower part 200 and in correspondence with the left side (from the point of view of the user) of the lower part 200, and the other arm 1' has its coupling point 1 A' for coupling to the lower part located in correspondence with the rear part of the lower part and in correspondence with the right side of the lower part (viewed from the point of view of the user). In an alternative embodiment of the invention, this can comprise another two arms opposite one another, placed in the free diagonal in Figures 1A-2C.

[0022] Therefore, each arm can pivot around its corresponding rotation shafts associated to said coupling points 1 A, 1 A', such that the opposite ends of the arms 1, 1', i.e., the ends articulated to the seat part 100, are located at a height depending directly on the angular position of the arm with respect to its rotation shaft or pivoting shaft.

[0023] As can be observed in Figures 2A-2C, to elevate the chair from the lower position (Figure 2A) to the upper position (Figure 2C), one of the arms 1 rotates in a first direction "a" (viewed from the left side of the chair, counter-clockwise), and the other arm 1' rotates in the opposite direction "b" (in this case, and viewed from the left side of the chair, clockwise).

[0024] Depending on the ratio between the angular movement of one arm and another, the seat part can rise without modifying its tilting, but it is also possible to rotate only one of the arms, or one more than the other, whereby the corresponding variation in the tilting of the seat part 100 is caused, as is made clear in Figures 1A and 1B.

[0025] Therefore, the angular positions of the arms 1, 1' with respect to their coupling points 1A, 1A' for coupling to the lower part 200 determine both the height position and the tilting of the seat part 100 with respect to the lower part 200.

[0026] Figure 3 schematically illustrates the seat part 100 with its lower part, which is provided with a connecting rod or bar 100A linked pivotably to the frame of the seat part 100, and with an arm 100A' linked fixedly to the

frame. The bar 100A is linked by means of the pivoting link 1 B to one of the arms 1 (see, for example, Figures 1A and 1B and also Figure 8), and the arm 100A' is linked by means of the pivoting link 1 B' to the other of the arms 1', as can be seen in, for example, Figures 4A, 4C and 4D (these Figures illustrate, respectively, the seat part at its maximum height, the seat part at its minimum height, the seat part tilted backwards and the seat part tilted forwards).

[0027] This configuration serves, as is shown in Figure 3 in which the lines "c" and "d" show the movement of the pivoting links 1 B and 1 B' during the upward movement of the seat part, to maintain the seat in its horizontal position during said upward movement (when this is considered desirable), despite the movement of the pivoting links 1 B and 1 B' is not exactly vertical. In other words, as can be seen in Figure 3, the vertical paths of each mobile end (basically, corresponding to the pivoting links 1B, 1B') of each "quadrilateral" (system of arms/levers which can be seen in, for example, Figures 5A-5D) are not entirely vertical, so that the relative distance in the longitudinal direction (i.e., in the forward-moving direction of the chair) is not constant during the entire vertical path. To compensate for those small differences in the longitudinal direction and to not introduce stresses in the structure, a system capable of absorbing said movements has been introduced. Therefore, point 1 B linked to the seat in the front lever is linked directly to the seat by means of a link allowing rotation, whereas the other linking point 1 B' is linked to the seat by means of a link rod or rocker 100A which is what allows absorbing said difference of movement of the linking points for linking to the seat. Rather than that link rod with two rotation points, another mechanism fulfilling the corresponding function can be used, for example, a linear slide in the plate of the seat and a rotation point in the quadrilateral. As is seen in Figure 3, the longitudinal distance in the plate of the seat does not vary, whereas by virtue of the rotation of the linking rod 100A, along the vertical path the variation in the longitudinal distance of point 1 B to point 1 B' can be absorbed without introducing deformations in the structure.

[0028] Figures 5A-5D show the movement mechanism of one of the arms 1 (the other arm can have an identical or similar movement mechanism). As can be observed, arm 1 is associated, by means of a transmission mechanism, to an electric linear actuator 11 linked by means of a pivoting link 12A to an end of a lever 12, at the opposite end of which a pulley 14 is placed which is supported against a lower surface 10 of the arm 1 for part of its angular movement (see Figures 5A-5C). On the other hand, at an intermediate point between the pivoting link 12A and the pulley 14, the lever 12 is coupled, by means of a pivoting link 13A, to a second connecting rod or bar 13 which in turn is articulated with the arm 1 by means of another pivoting link 13B. On the other hand, a spring (for example, a gas spring) 15 cooperates with the end of the lever 12 in which the pulley 14 is located.

[0029] Point 1A corresponds to the coupling point for coupling between the arm 1 and the lower part 200, and point 1 B to the pivoting link between the arm 1 and the seat part 100.

[0030] Furthermore, there is a bar or transmission element 16 arranged pivotably around point 1 A. The actuator 11 is articulated in this transmission element 16 (alternatively, the actuator can be assembled directly on the lower part). The spring 15 is also coupled pivotably to the transmission element 16.

[0031] For the purpose of optimising the transmission of forces from the actuator 11 to the securing point 1 B of the seat part, as well as minimising the forces to which the actuator is subjected in the drive position (which is seen in Figure 2B), the mechanism consists of two operational phases, as will be described below.

[0032] In the first part of the path, i.e. from the position called the drive position for driving towards lower positions (corresponding to the section between the position which is seen in Figure 5C and that which is seen in Figure 5A), the arm 1 rests (through its lower surface 10) on the pulley 14 bearing the lever or bar 12. It is thus possible to work in the lower part of the path without demanding very strong forces from the actuator 11. Furthermore, there exists a point of the path at which the actuator 11 'does not see' the loads that the transmission system bears. This point is especially suitable for bearing strong forces or impacts, so that it can be selected as the drive position (Figure 2B, Figure 5C).

[0033] Figure 5B shows an intermediate position between the lower position (Figure 5A) and the drive position (Figure 5C). In this phase the movement of the actuator 11 makes the lever 12 rotate, such that the pulley 14 rolls on the lower surface 10 of the arm, transmitting vertical movement to point 1 B where the arm 1 is coupled to the seat part 100.

[0034] Figure 5C shows the drive position. From this position, the lever 12 makes contact with the bar 13 in correspondence with an abutting surface 13C of said bar 13, forcing the bar 13 to rotate, whereby losing contact between the pulley 14 and the lower surface 10 of the arm 1, such that the rotation of the bar 13 is what finally transmits movement to point 1 B, as can be seen in Figure 5D. In other words, from the drive position (Figure 5C), the lever 12 directly pushes the bar or lever 13.

[0035] As is inferred from what has been previously described, each of the arms 1 is associated to an articulated quadrilateral which moves by means of the electric linear actuator 11, and each of the quadrilaterals consists of the bar 13, the element 16, the arm 1 properly speaking, the lever 12, the pulley 14, the linear actuator 11 and, optionally, the gas spring 15. The main elements of this mechanism are shown in Figure 6:

- Point 13A: fixed point of the bar 13 and rotation shaft of the lever 12, which bears the pulley 14
- Point 13B: mobile end of the bar and articulation point between the bars 12 and 13

- Point 16A: fixed point of the element 16
- Point 1 A: mobile end of the element 16 and articulation point between the element 16 and the arm 1
- Point 16B: linking point of the actuator 11 on the element 16
- Point 12A: linking point of the actuator 11 on the lever 12
- Point 14A: rotation shaft of the pulley 14 on the lever 12 and linking point of the compensator/spring 15 on the lever 12
- Point 15A: linking point of the compensator/spring 15 on the element 16
- Point 1 B: application point of the load of the seat part
- Point 14B: contact point of the pulley 14 on the lower face 10 of the arm 1

[0036] The linear actuator 11 can float between the lever 12 and the element or arm 16, or between the lever 12 and a fixed point of the lower part 200, whereas the gas spring 15, if it is used, can be placed between the lever 12 and the arm 16. The spring 15 can allow reducing the power (and, therefore, the size) of the actuator 11.

[0037] Figures 7A and 7B schematically show the general structure of Figure 6, in two different operational positions.

[0038] In this text, the expression "pivoting link" means a link between two elements allowing a rotation or pivoting of one of the elements with respect to the other.

[0039] In this text, the word "comprise" and its variants (such as "comprising", etc.) must not be interpreted exclusively, i.e., they do not exclude the possibility that what is described includes other elements, steps, etc.

[0040] In addition, the invention is not limited to the specific embodiments which have been described but rather it also comprises, for example, the embodiments which can be carried out by a person skilled in the art (for example, with regard to the choice of materials, dimensions, components, configuration, etc.), within what is inferred from the claims.

Claims

1. Wheelchair, comprising a seat part (100) and a lower part (200) on which the seat part (100) is assembled, the lower part (200) comprising a frame and a plurality of wheels (201) associated to the frame such that the chair can roll on a surface, the seat part (100) being coupled to the lower part (200) by means of a coupling mechanism (1, 1') configured such that when the lower part (200) is located on a horizontal surface,

- the height of the seat part (100) can be regulated with respect to the lower part (200), and
- the tilting of the seat part (100) can be regulated at least in the vertical plane which extends in the

longitudinal direction of the chair by means of said coupling mechanism (1, 1');

characterised in that

said coupling mechanism comprises

at least two arms (1, 1') articulated to the seat part (100) and to the lower part (200), each of said arms (1, 1') being articulated to said lower part (200), at a corresponding articulation point (1 A, 1 A'), pivotably with respect to the lower part (200), such that to elevate the seat part (100) to a maximum height position from a minimum height position with respect to the lower part (200), one of said arms (1) must pivot, with respect to its articulation point (1A) and viewed from a side of the wheelchair, in a first direction (a), and another of said arms (1') must pivot, with respect to its articulation point (1A') and viewed from the same side of the wheelchair, in a second direction (b) opposite to said first direction, such that the angular positions of the arms (1, 1') with respect to their coupling points (1A, 1 A') for coupling to the lower part (200) determine both the height position and the tilting of the seat part (100) with respect to the lower part (200).

2. Wheelchair according to claim 1, wherein one of said arms (1) has its coupling point (1A) for coupling to the lower part (200) located in correspondence with a front part of the lower part and in correspondence with a first side of the lower part, and wherein another of said arms (1') has its coupling point (1A') for coupling to the lower part (200) located in correspondence with a rear part of the lower part and in correspondence with a second side of the lower part opposite said first side of the lower part.
3. Wheelchair according to claim 1 or 2, wherein, viewed from above, said coupling points (1 A, 1 A') are located in diagonally opposite areas of said lower part (200).
4. Wheelchair according to any of the previous claims, wherein each arm (1, 1') is articulated to the seat part (100) by means of at least one pivoting link (1 B, 1 B').
5. Wheelchair according to claim 4, wherein at least one of said arms (1) is articulated to said seat part (100) by means of said pivoting link (1 B) between said arm (1) and a bar (100A), said bar (100A) being coupled to said seat part (100) by means of a pivoting link, such that said bar can pivot with respect to the seat part.
6. Wheelchair according to claim 5, wherein at least one of said arms (1') is linked to said seat part by means of its pivoting link (1 B') directly between said arm (1') and an element (100A') rigidly linked to the

seat part (100).

7. Wheelchair according to any of the previous claims, wherein each arm (1, 1') is angularly moveable by means of an actuator (11).
8. Wheelchair according to claim 7, wherein said actuator (11) is an electric linear actuator.
9. Wheelchair according to any of claims 7 and 8, wherein said actuator (11) is coupled to the corresponding arm (1) by means of a transmission mechanism comprising a first transmission element (12) coupled by means of a pivoting link (12A) to a mobile part of the actuator (11), and a second transmission element (13) linked by means of a first pivoting link (13A) to said first transmission element (12) and by means of a second pivoting link (13B) to said arm (1).
10. Wheelchair according to claim 9, wherein said first transmission element is provided with a rotating element (14) configured such that it is supported on a lower surface (10) of the arm for at least one part of the angular movement of the arm with respect to its articulation point (1A) for articulating to the lower part (200).
11. Wheelchair according to claim 10, wherein said first pivoting link (13A) between the first transmission element (12) and the second transmission element (13) is located in an area of the first transmission element (12) located between
 - the pivoting link (12A) between first transmission element (12) and the mobile part of the actuator (11), and
 - the rotating element (14).
12. Wheelchair according to any of the previous claims, wherein said first pivoting link (13A) between the first transmission element (12) and the second transmission element (13) is located in an area of the first transmission element (12) located between
 - the pivoting link (12A) between the first transmission element (12) and the mobile part of the actuator (11), and
 - a connection area for connecting the first transmission element (12) to a spring (15), said wheelchair further comprising said spring (15).
13. Wheelchair according to any of claims 9-12, wherein the actuator (11) is assembled pivotably on a third transmission element (16) in turn assembled pivotably.
14. Wheelchair according to any of claims 9-13, wherein the first transmission element (12) and the second

transmission element (13) are configured such that, from a certain angular position of the arm (1) in an elevation movement of the seat part (100), the first transmission element (12) abuts (13C) against the second transmission element, such that the pivoting in correspondence with the pivoting link (13A) between the first transmission element (12) and the second transmission element (13) is prevented from continuing.

10

- 15.** Wheelchair according to any of the previous claims, wherein a first of said arms (1) has its articulation point (1 A) located further forwards in the lower part than the articulation point (1A') of a second of said arms (1'), said first arm (1) being extended backwards from its articulation point (1A) and said second arm (1') being extended forwards from its articulation point (1A').
- 16.** Wheelchair according to any of the previous claims, wherein said at least two arms comprise four arms, which make up two pairs of arms, each pair of arms comprising two arms (1, 1') according to what is defined in any of the previous claims.

15

20

25

30

35

40

45

50

55

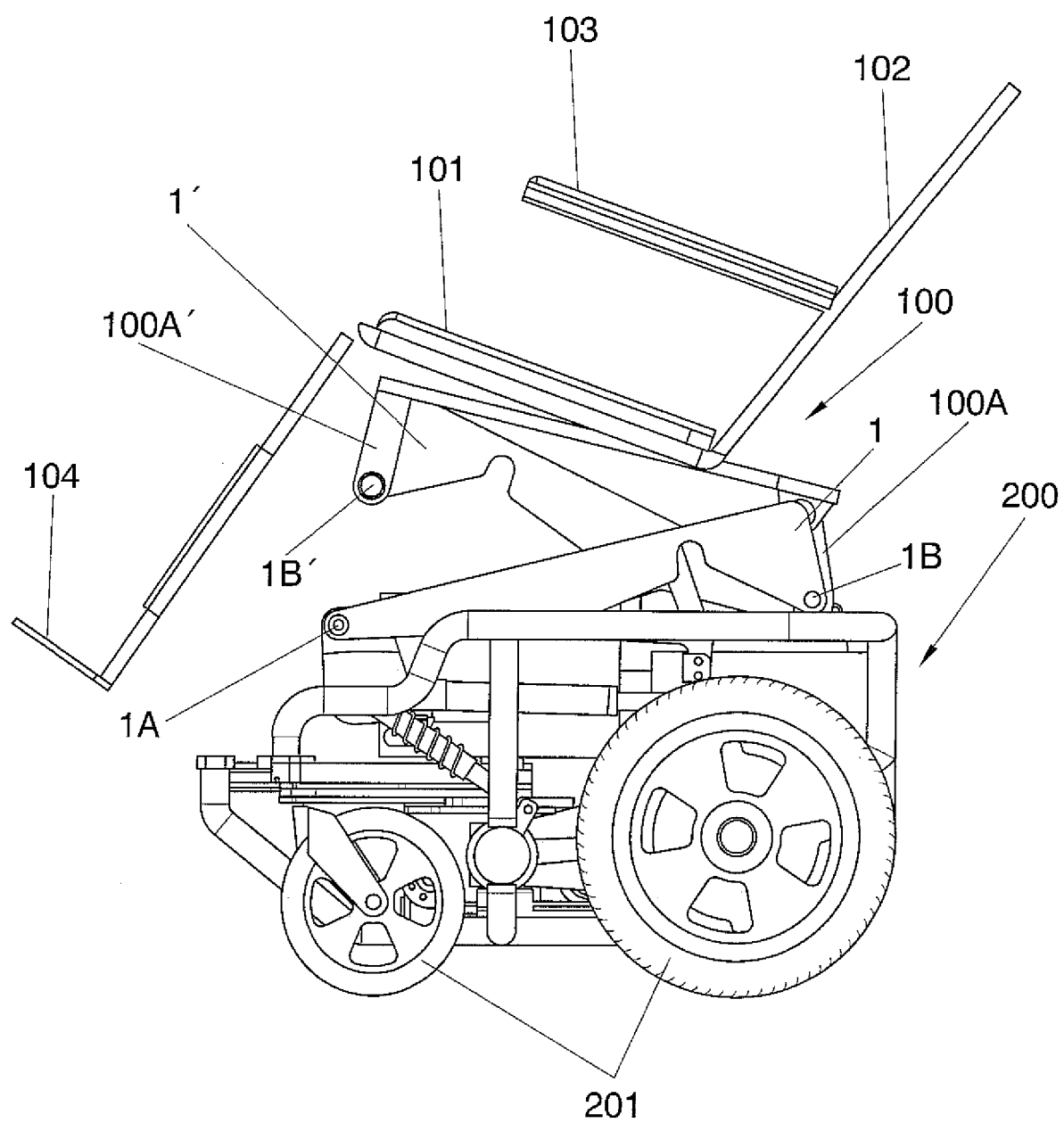


FIG. 1A

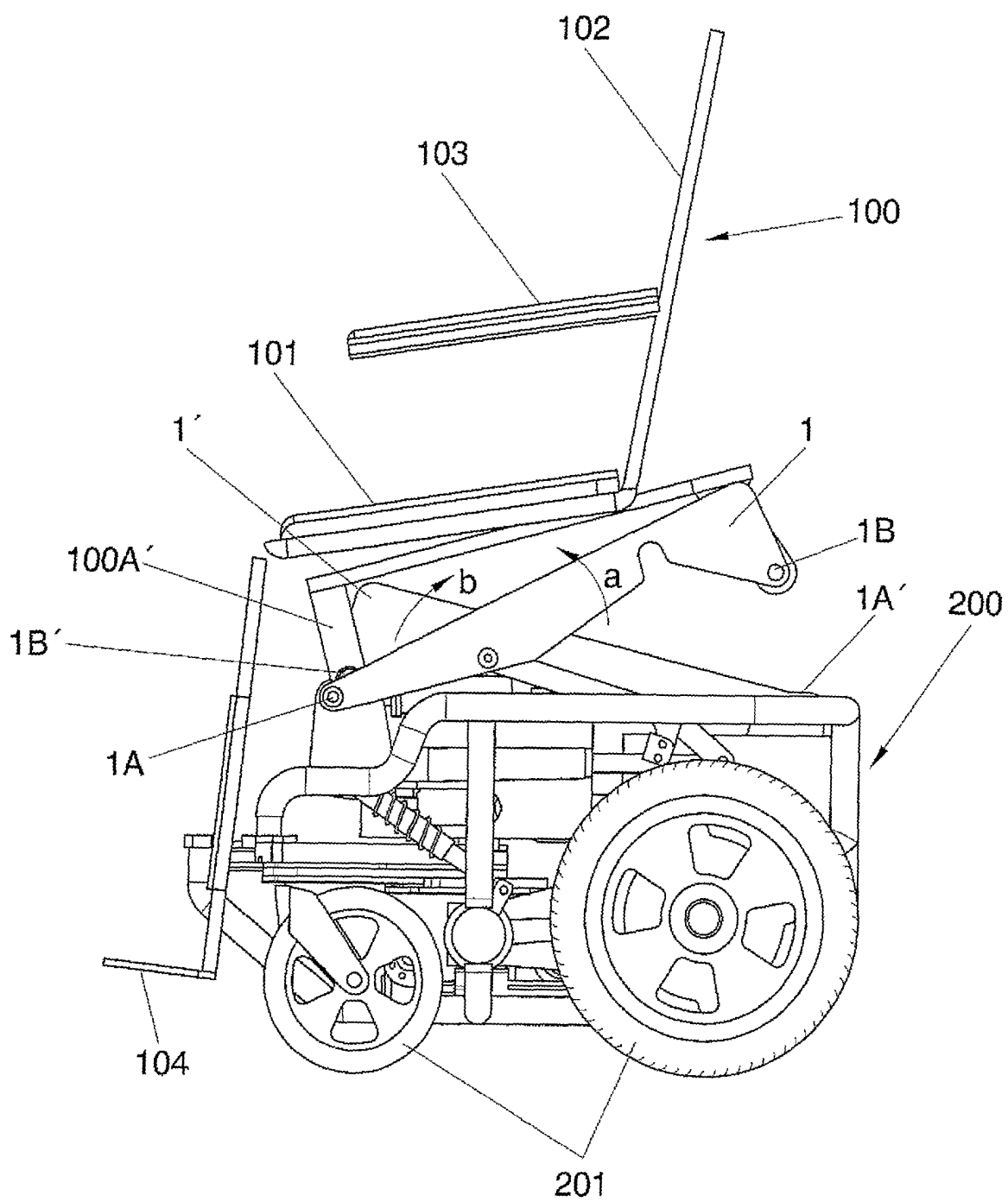


FIG. 1B

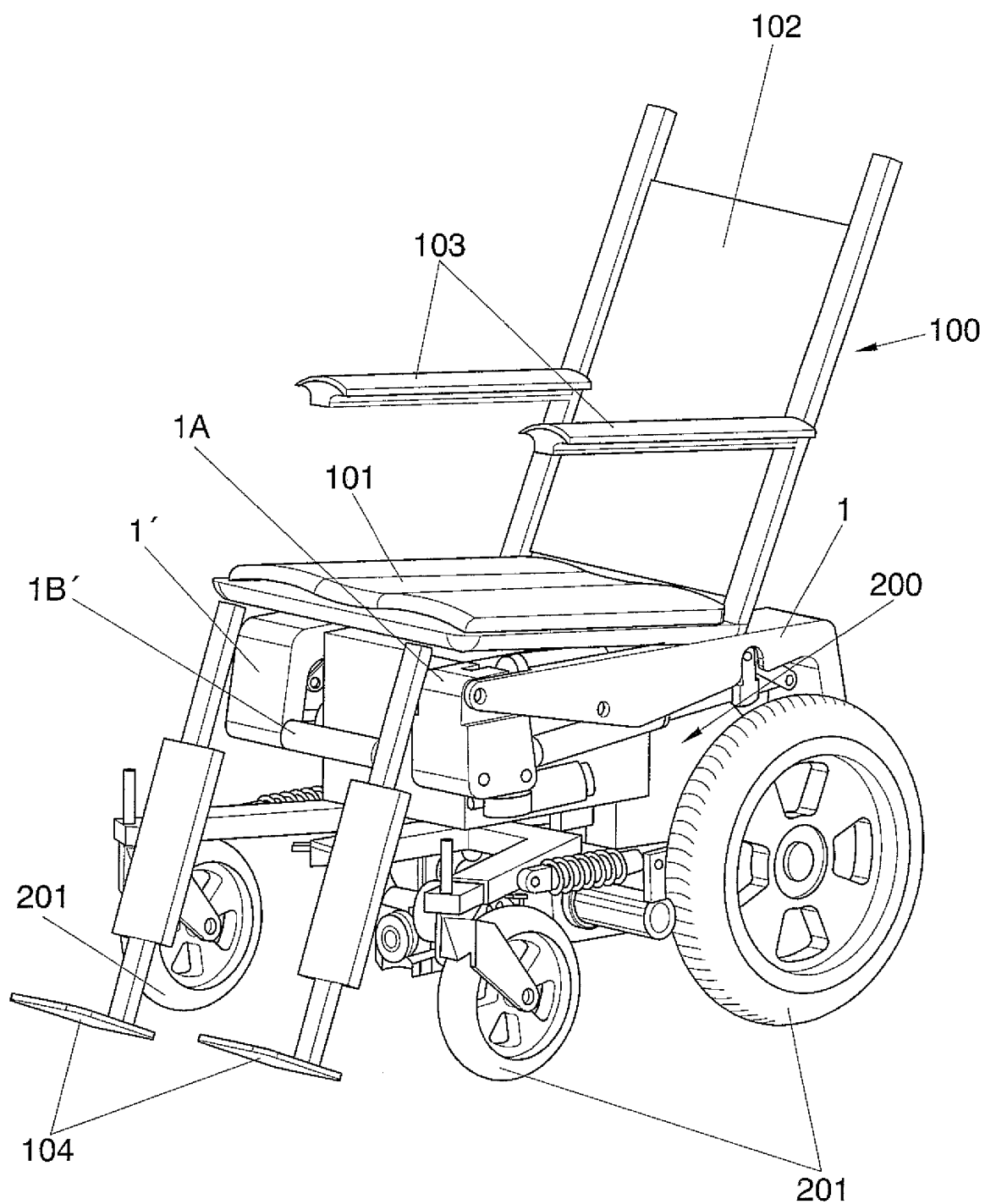


FIG. 2A

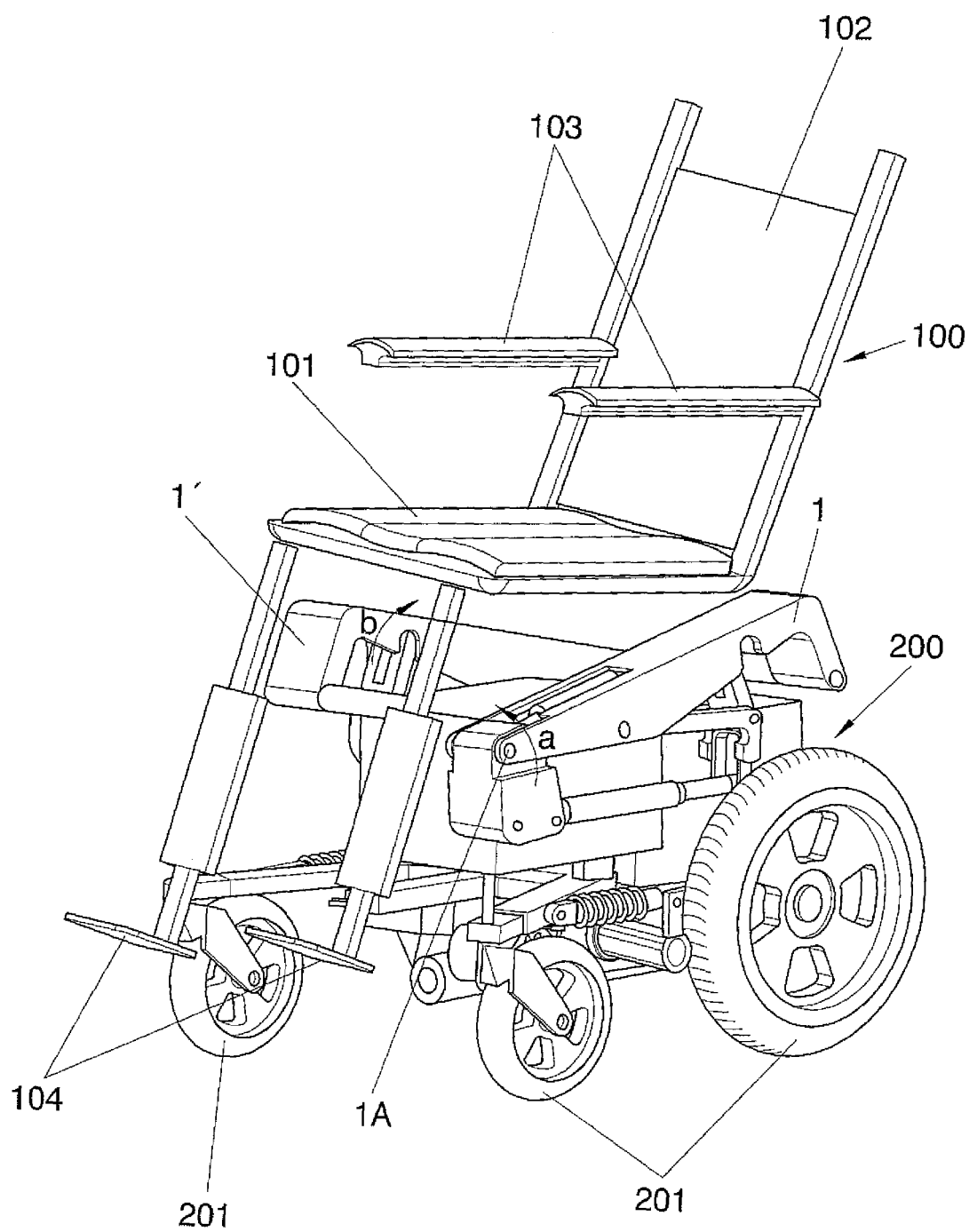


FIG. 2B

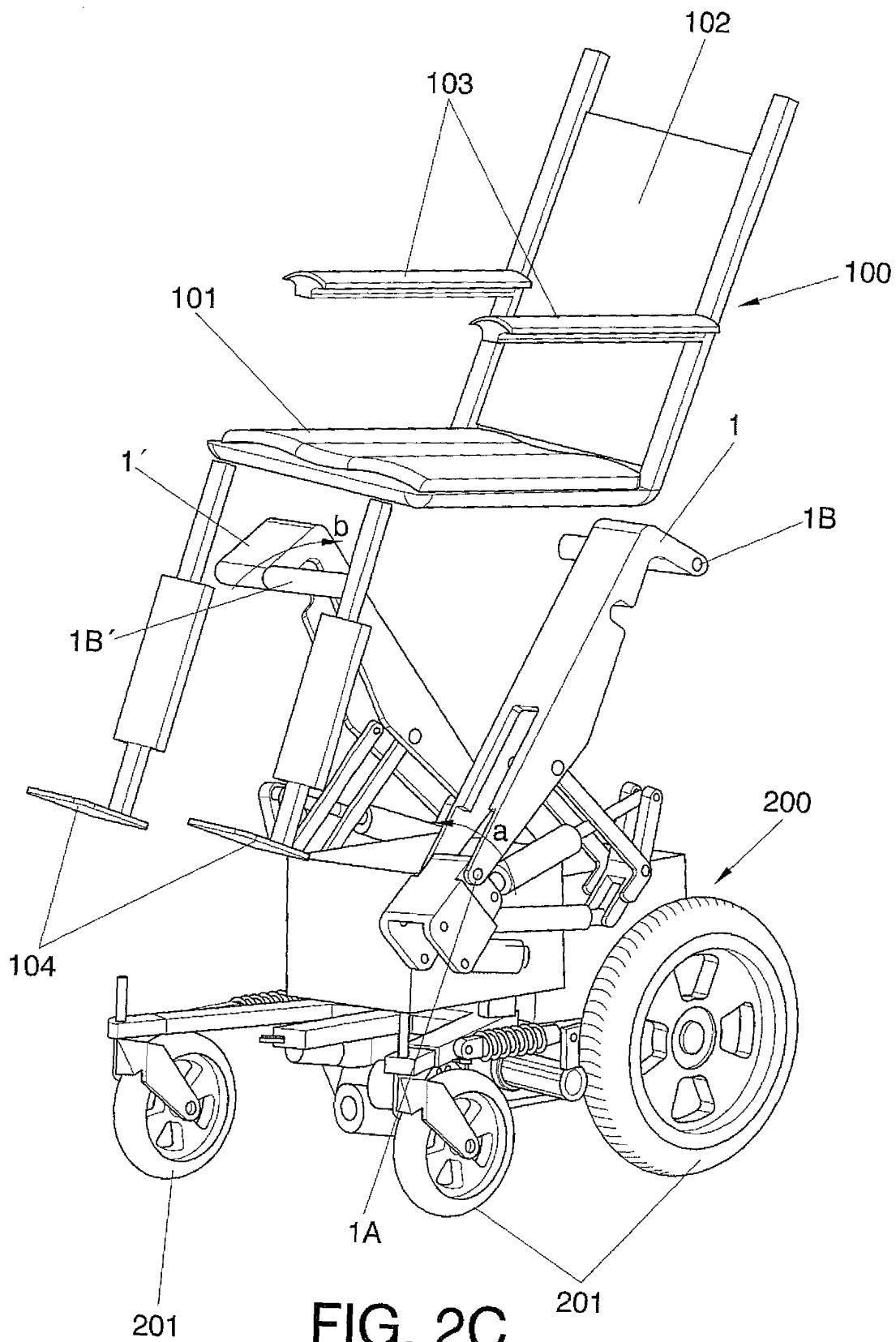


FIG. 2C

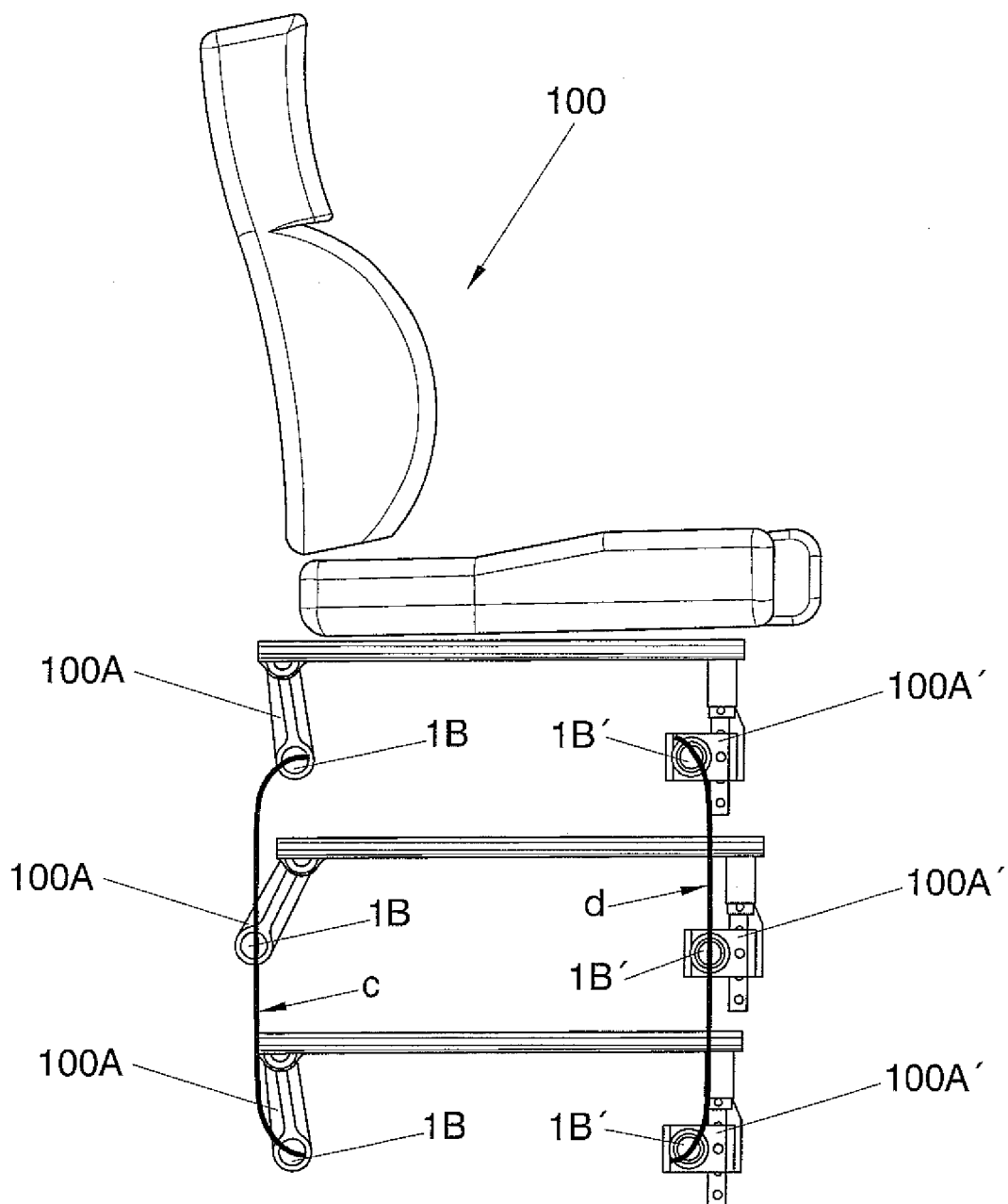


FIG. 3

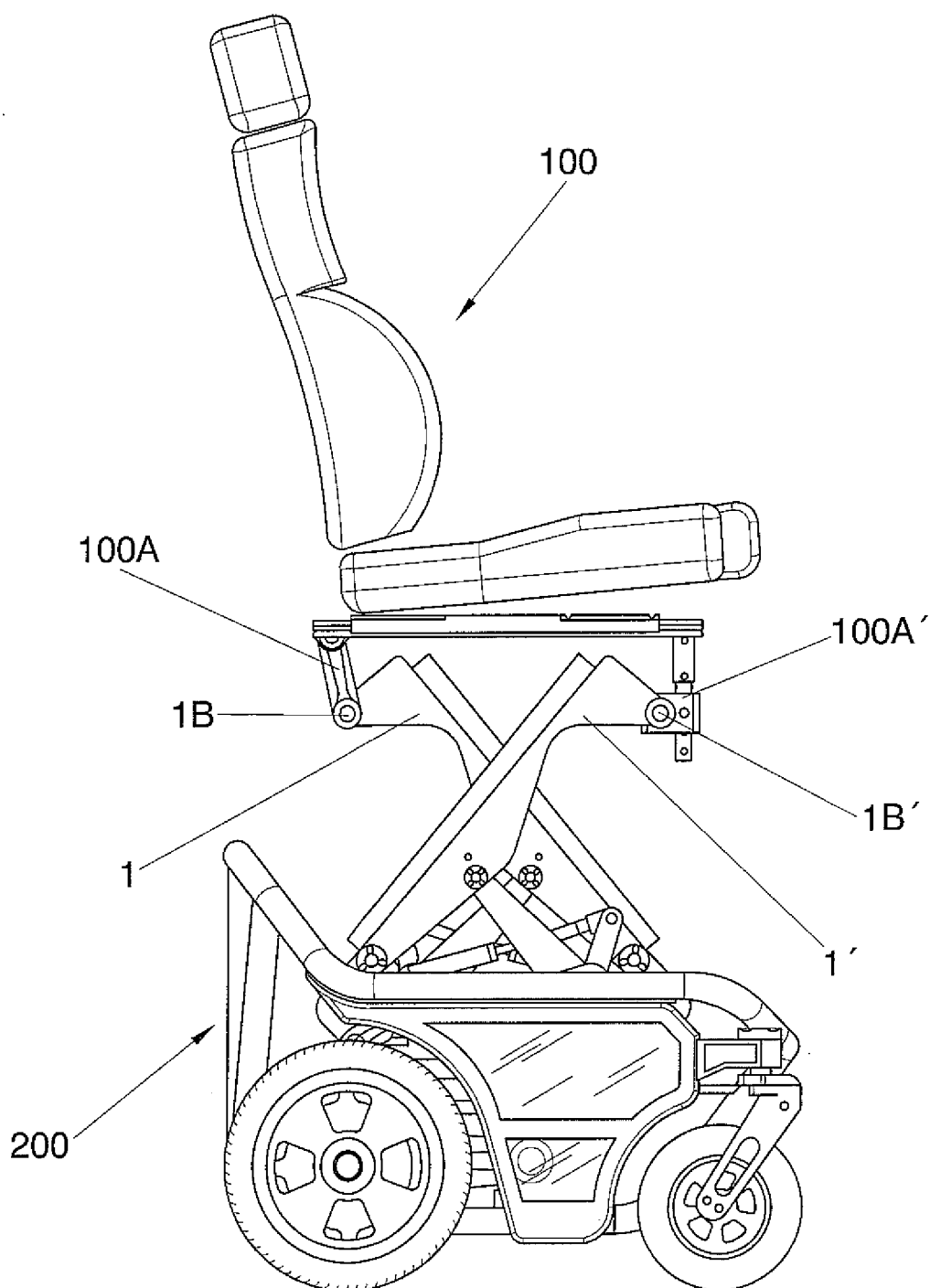


FIG. 4A

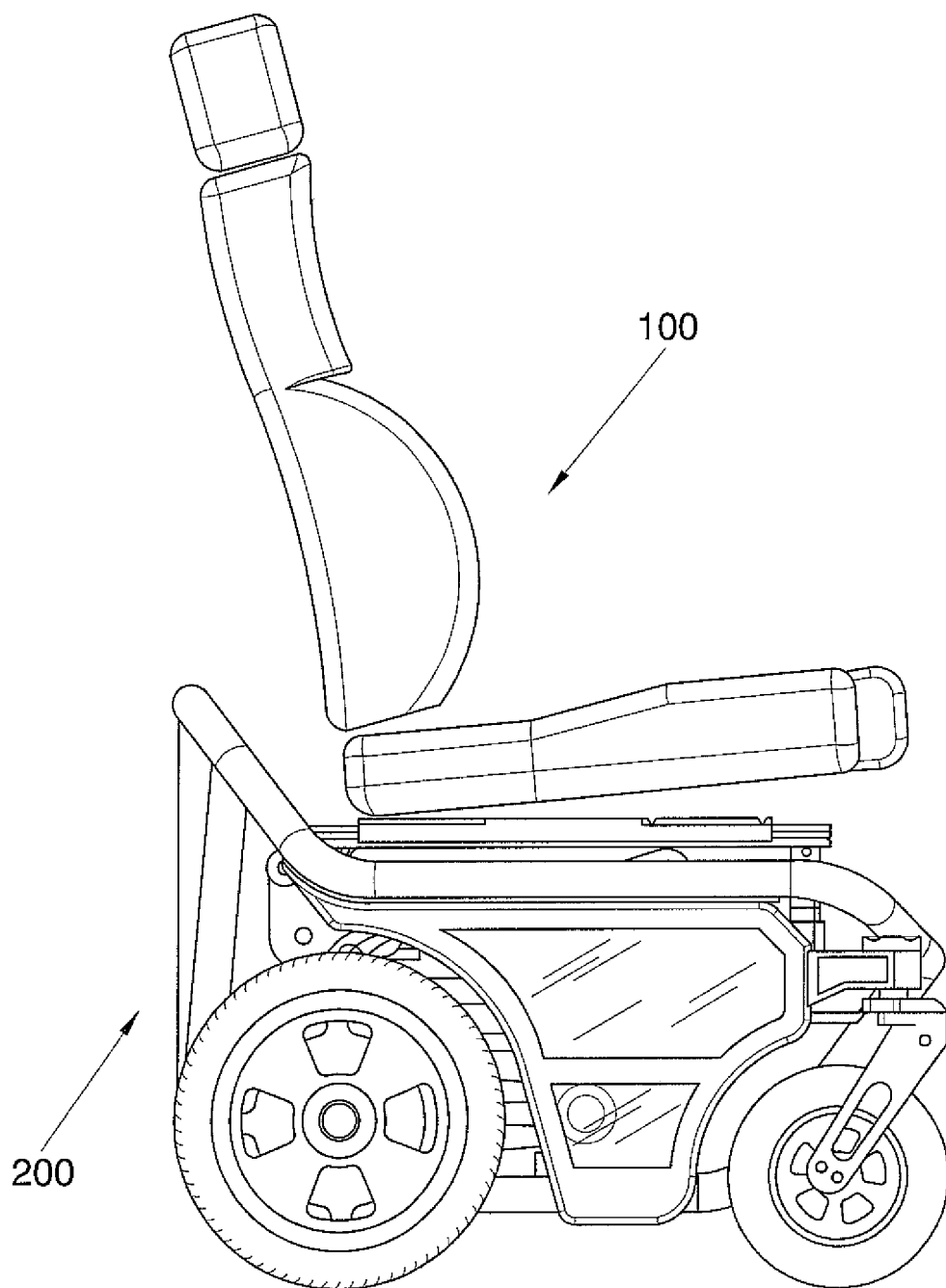


FIG. 4B

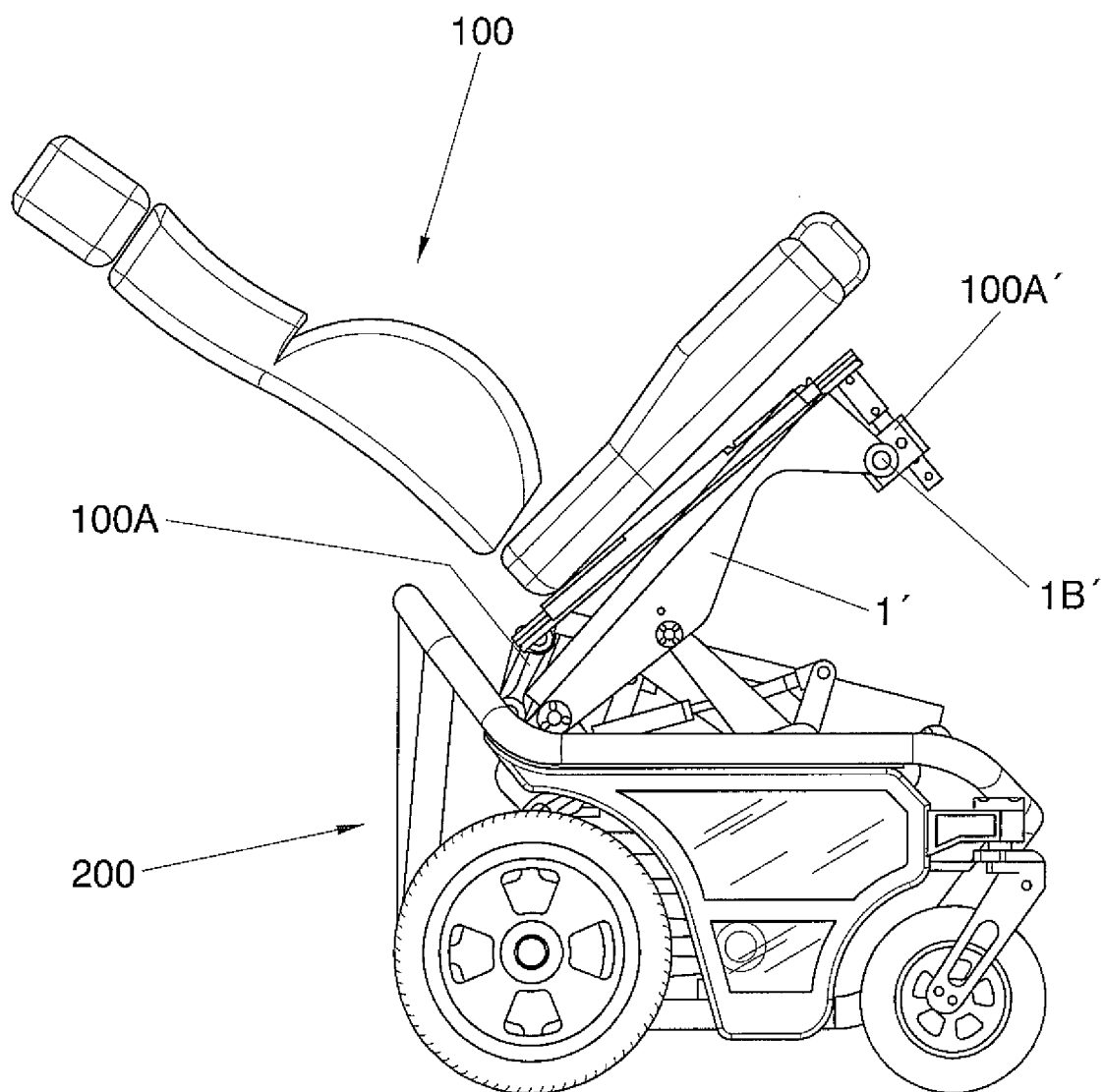


FIG. 4C

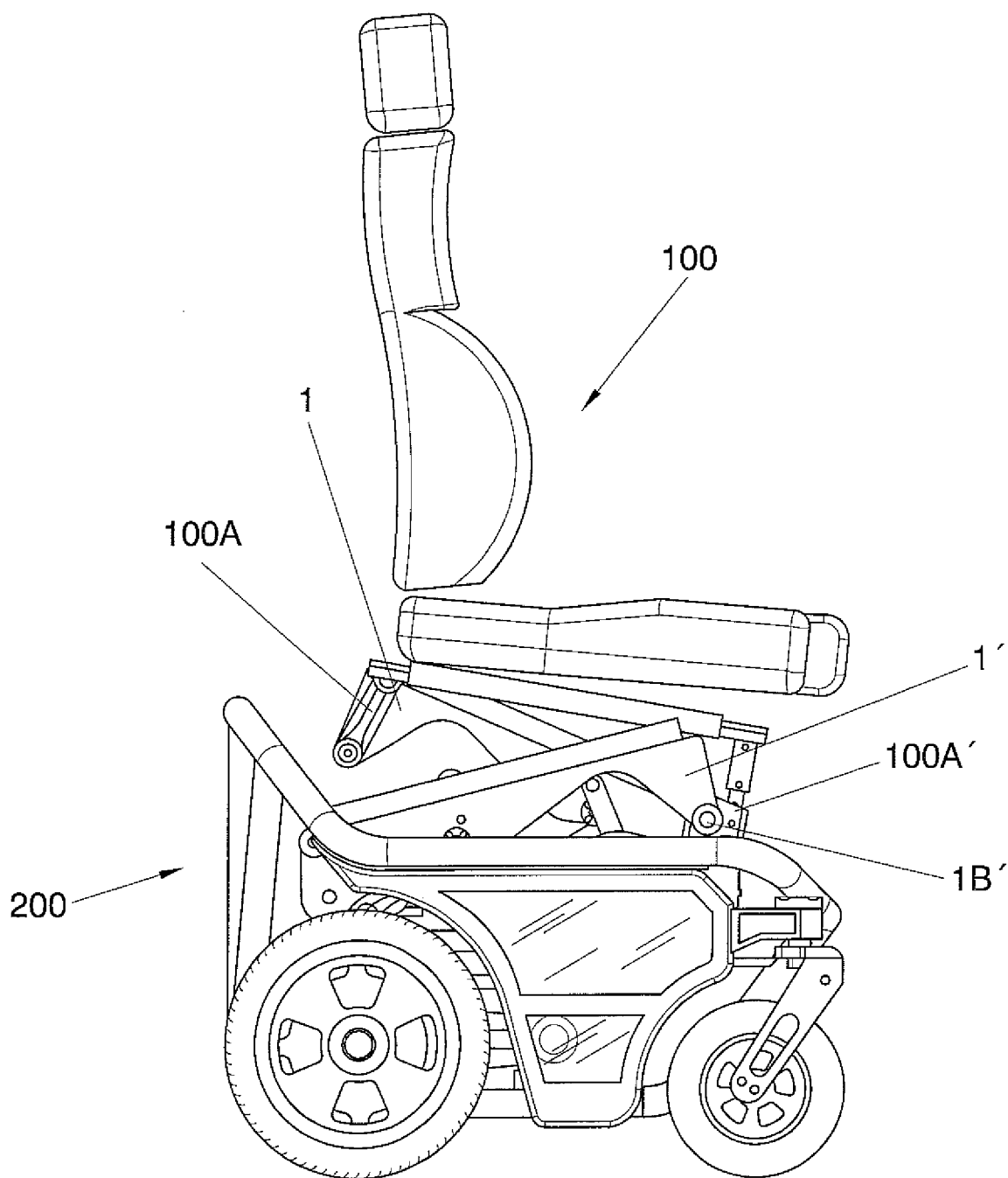


FIG. 4D

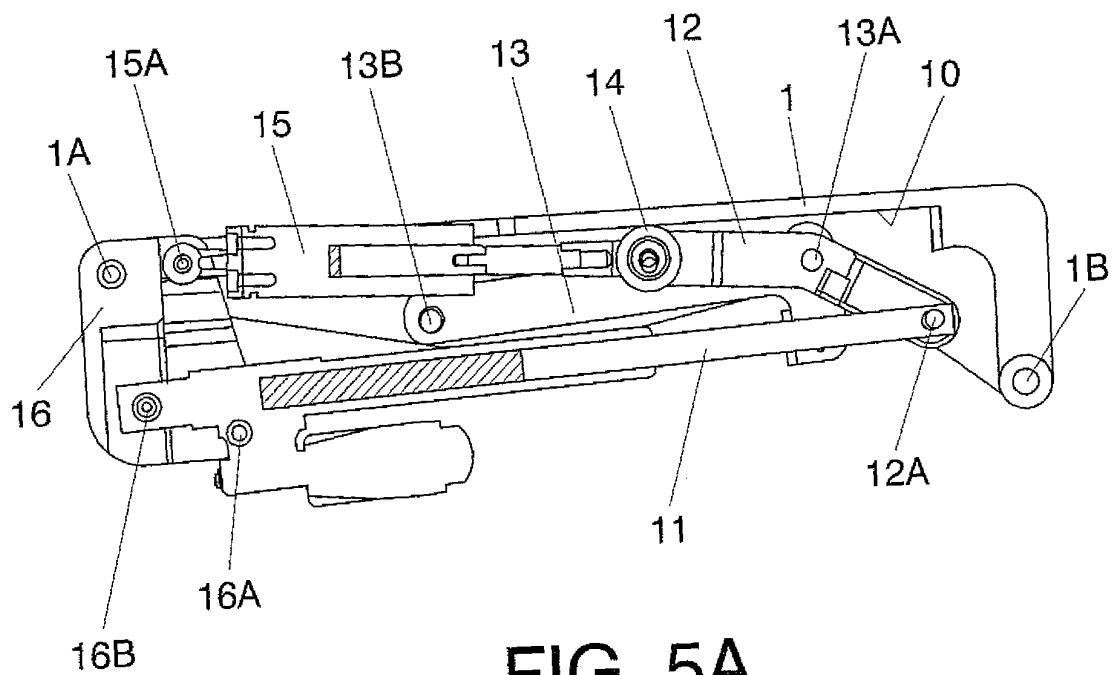


FIG. 5A

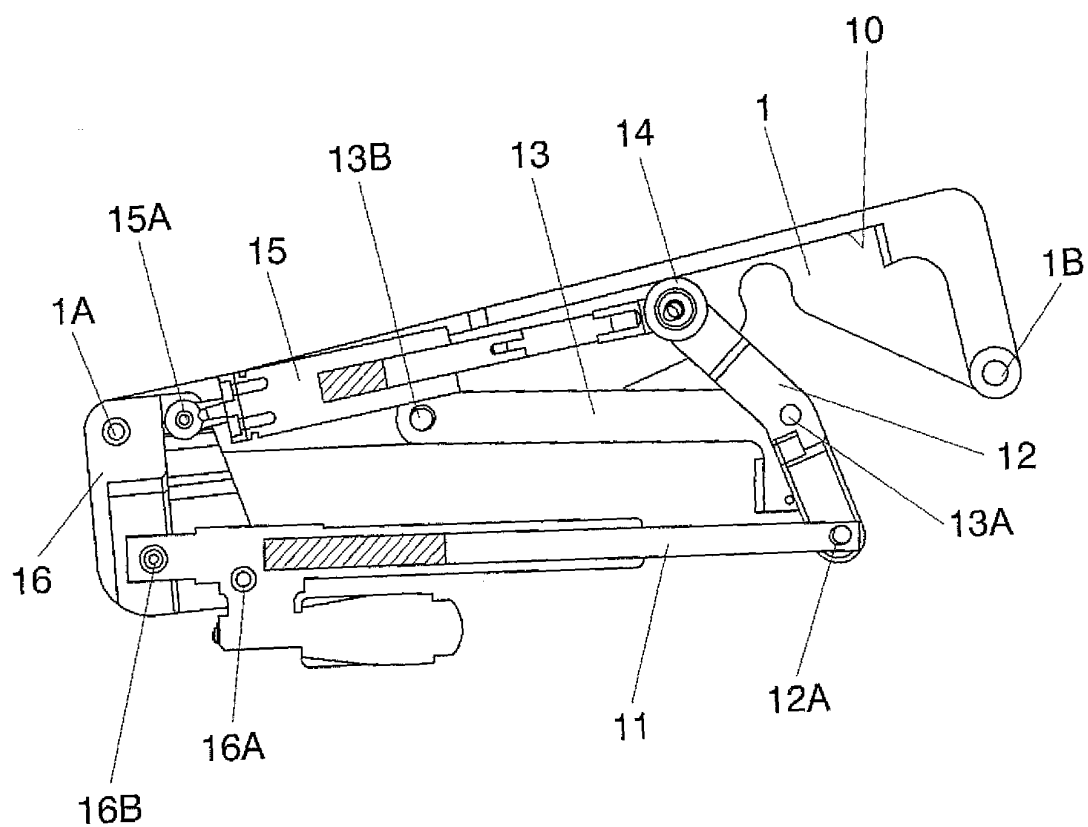
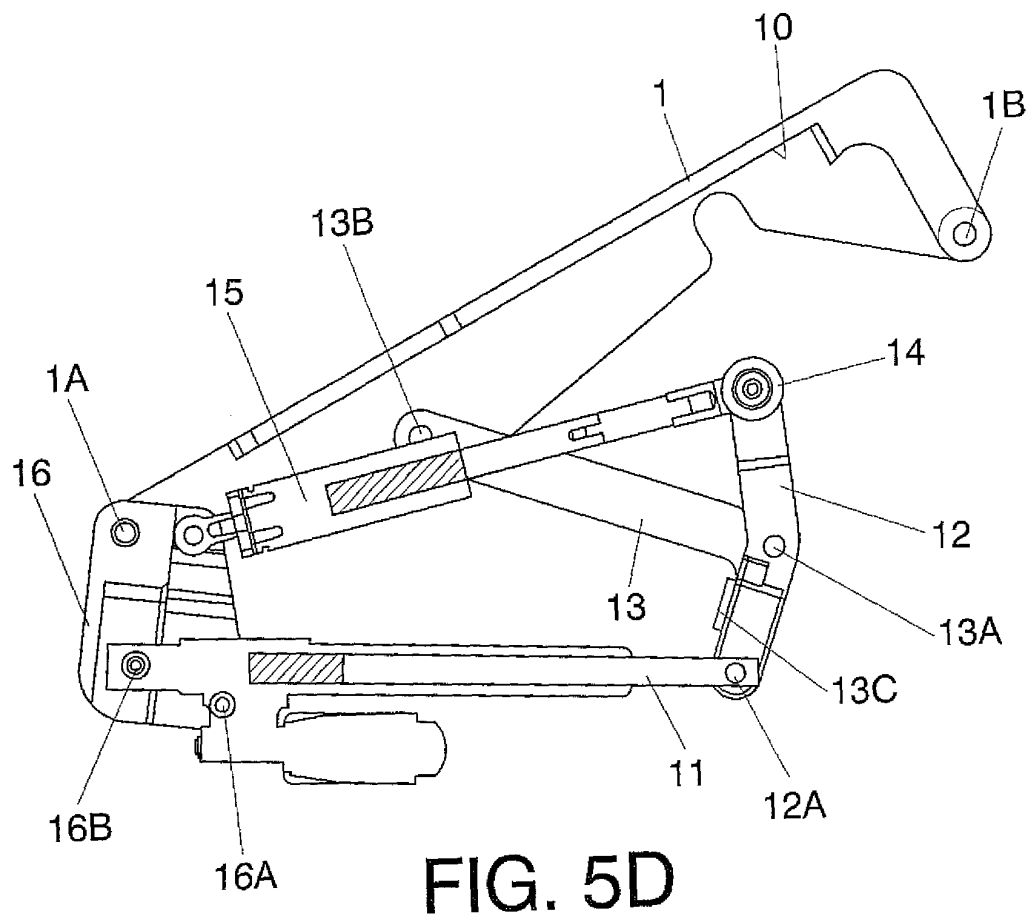
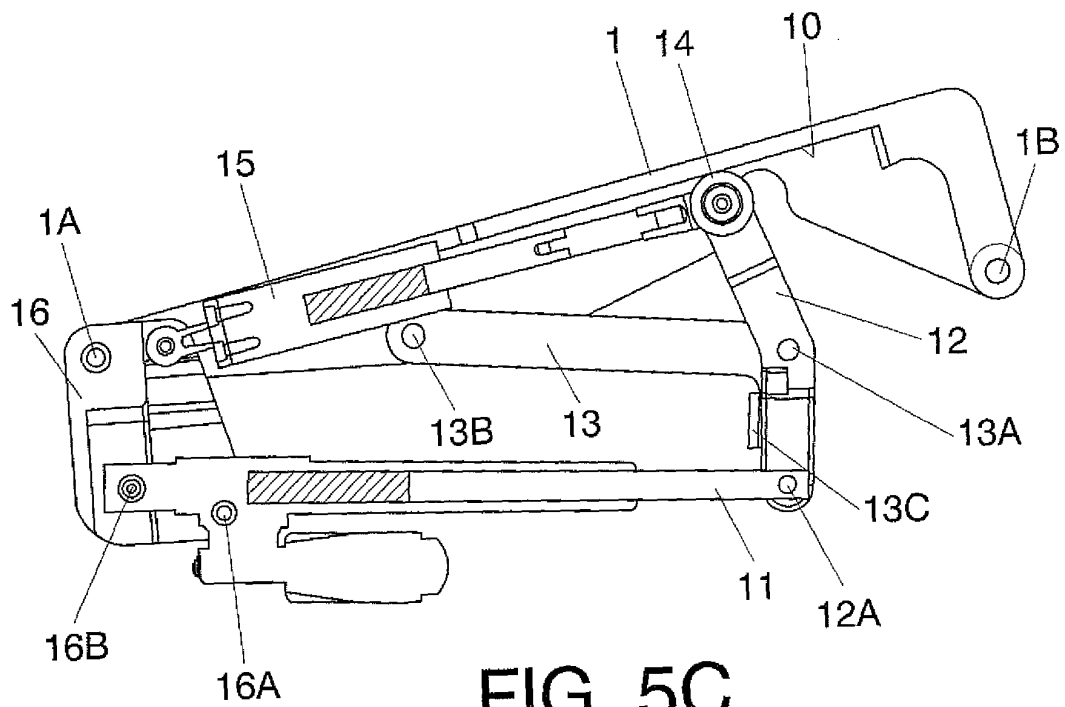


FIG. 5B



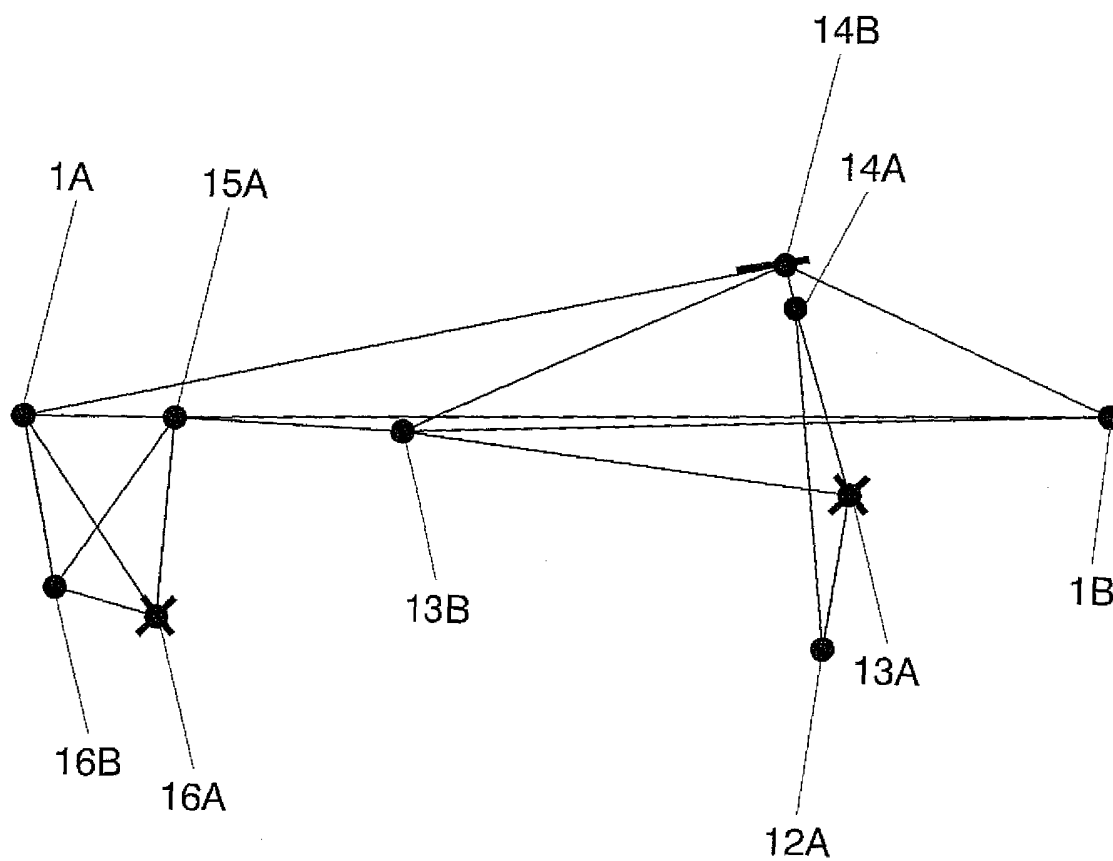


FIG. 6

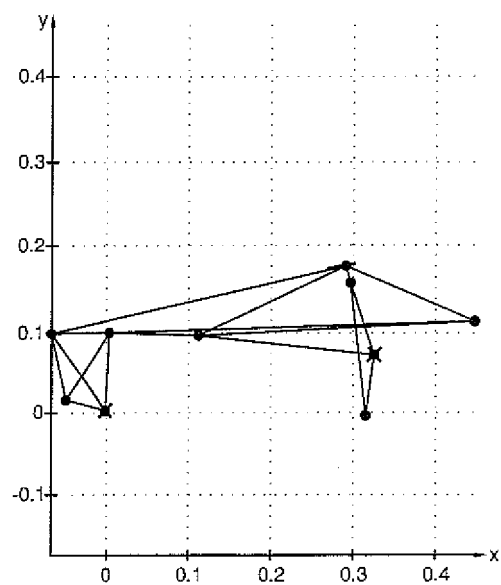


FIG. 7A

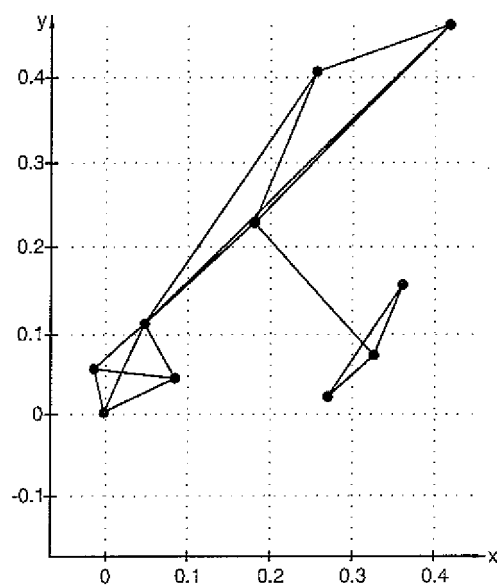


FIG. 7B

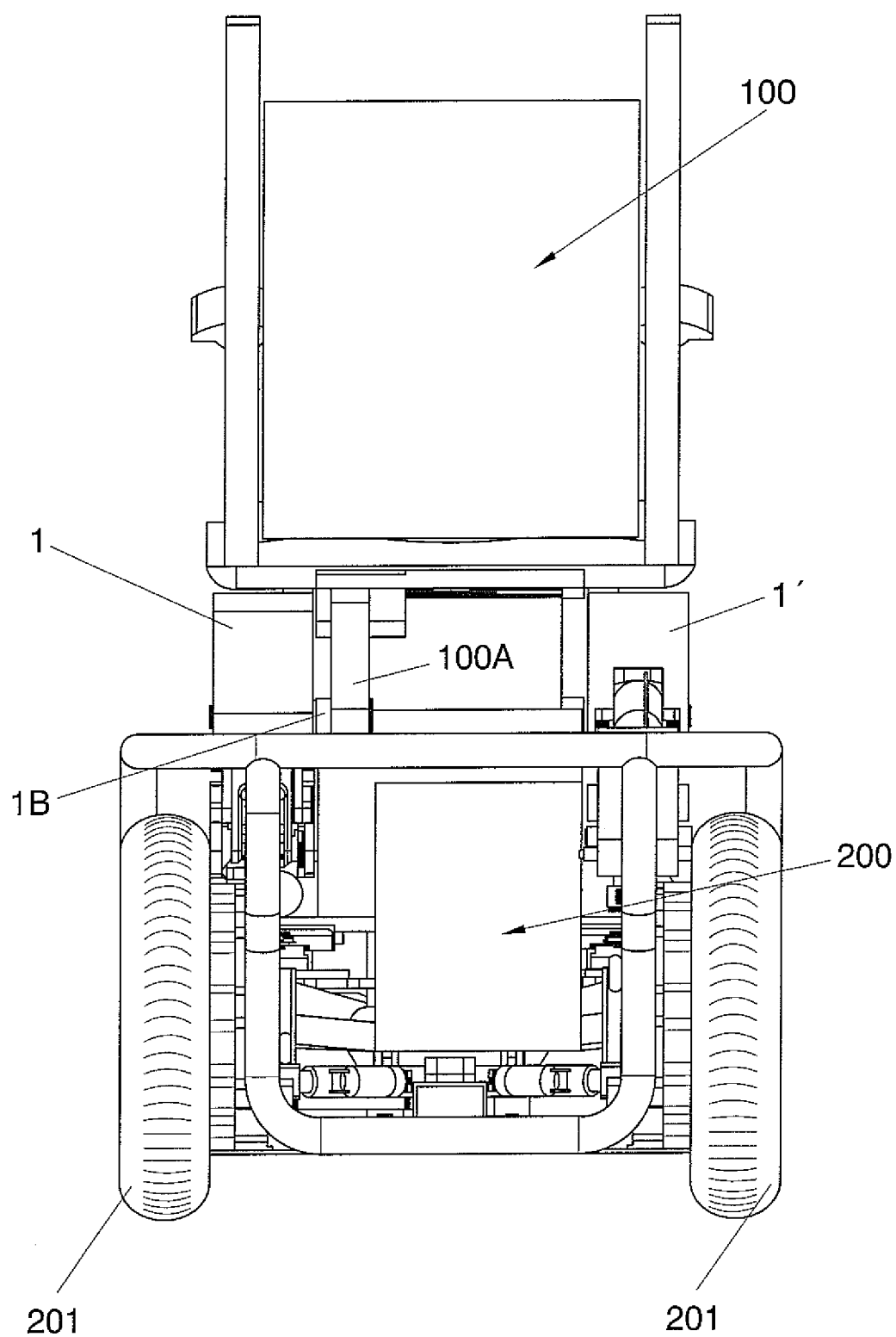


FIG. 8

INTERNATIONAL SEARCH REPORT

International application No.
PCT/ES 2007/000447

A. CLASSIFICATION OF SUBJECT MATTER

A61G 5/10 (2006.01)

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A61G5

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CIBEPAT, EPODOC, WPI

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4614246 A (MASSE et al.) 30.09.1986, column 4, line 63 - column 10, line 7; figures 1-4	1-16
A	US 5996716 A (MONTIGLIO et al.) 07.12.1999, column 3, line 58 - column 6, line 17; figures 1-6.	1-16
A	NL 1026117 C2 (MOVINGPEOPLE NET INTERNAT B V) 20.02.2007, page 1, line 5 - page 6, line 14; figures 1-5.	1-16
A	DE 20303000 U1 (SANDER WOLFGANG) 17.07.2003, the whole document.	1-16

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance.		
"E" earlier document but published on or after the international filing date		
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"O" document referring to an oral disclosure use, exhibition, or other means	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other documents, such combination being obvious to a person skilled in the art
"P" document published prior to the international filing date but later than the priority date claimed		
	"&"	document member of the same patent family

Date of the actual completion of the international search

04.April.2008 (04.04.2008)

Date of mailing of the international search report

(08/04/2008)

Name and mailing address of the ISA/
O.E.P.M.Paseo de la Castellana, 75 28071 Madrid, España.
Facsimile No. 34 91 3495304

Authorized officer

I. Rodríguez Goñi

Telephone No. +34 91 3493447

Form PCT/ISA/210 (second sheet) (April 2007)

INTERNATIONAL SEARCH REPORT

International application No.

PCT/ES 2007/000447

C (continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of documents, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	GB 2125285 A (PHILLIPS TERENCE) 07.03.1984, the whole document.	1-16
A	DE 102004026632 A1 (HOFFMANN WINFRIED) 29.12.2005, the whole document.	1-16
A	DE 19649576 A1 (KUGLE JENS) 26.06.1997, the whole document.	1-16
A	WO 2006047123 A2 (SUNRISE MEDICAL HHG INC ; LE DAVID ; STEVENS REX W ;) 04.05.2006, the whole document.	1-16
A	US 6113188 A (STEWART et al.) 05.09.2000, the whole document.	1-16

Form PCT/ISA/210 (continuation of second sheet) (April 2007)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/ ES 2007/000447

Patent document cited in the search report	Publication date	Patent family member(s)	Publication date
US 4614246 A	30.09.1986	NONE	-----
US 5996716 A	07.12.1999	CA 2219430 A	25.04.1998
NL 1026117 C	20.02.2007	NL 1026117 A	08.11.2005
DE 20303000 U U	17.07.2003	NONE	-----
GB 2125285 A	07.03.1984	NONE	-----
DE 102004026632 A	29.12.2005	NONE	-----
DE 19649576 A	26.06.1997	DK 146495 A DK 171630 B SE 9604425 A SE 9604425 L NO 965518 A NL 1004736 A NL 1004736 C SE 511624 C	03.03.1997 03.03.1997 23.06.1997 23.06.1997 23.06.1997 24.06.1997 15.07.1998 01.11.1999
WO 2006047123 A	04.05.2006	US 2006097477 A	11.05.2006 11.05.2006 11.05.2006
US 6113188 A	05.09.2000	NONE	-----

Form PCT/ISA/210 (patent family annex) (April 2007)

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- WO 03086261 A [0004]
- WO 2004021953 A [0004]
- WO 0132120 A [0004]
- WO 0191688 A [0004]
- WO 0191687 A [0004]
- WO 0226186 A [0004]
- WO 03034967 A [0004]
- WO 2005007498 A [0004]
- WO 9917699 A [0004]
- WO 9852509 A [0004]
- WO 9723187 A [0004]