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• **Mesch, Norbert**
32549 Bad Oeynhausen (DE)

(74) Representative: **Ganguillet, Cyril**
ABREMA
Agence Brevets & Marques Ganguillet
Avenue du Théâtre 16
P.O. Box 5027
1002 Lausanne (CH)

(71) Applicant: **Invacare International Sàrl**
1196 Gland (CH)

(72) Inventors:
• **Strothmann, Thomas**
49565 Bramsche (DE)

(54) **Method for securitizing the lifting operation of a wheelchair seat and Lifting Device fo a wheelchair**

(57) The invention concerns a method for securitizing the lifting operation of a wheelchair seat, comprising the following steps:
a) detecting a presence or a motion inside an area (A1,

A2, A3, A4) surrounding at least partially a lifting means (2) of the wheelchair seat,
b) if a presence or a motion is detected in said area (A1, A2, A3, A4), deactivating actuating means (7) controlling the lifting means (2).

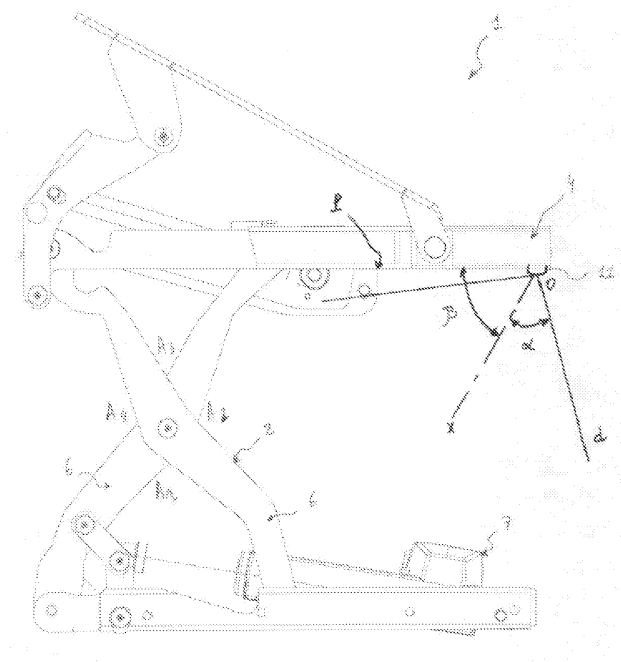


FIG.3

Description

FIELD OF THE INVENTION

[0001] The present invention relates to a method for securitizing the lifting operation of a wheelchair seat and to a lifting device for a wheelchair seat.

BACKGROUND OF THE INVENTION

[0002] In a wheelchair, it is often necessary to raise and lower the seat so as to adapt the position of the wheelchair seat to the personal needs of the user. Generally, for doing this lifting operation, the existing wheelchairs include specific means for easily adjusting the position of the seat. One of these means consists for instance in a hinged structure arranged between the base body of the wheelchair and the seat. Such a lifting means is revealed in the European Patent Application EP 1523971.

[0003] However, in these existing wheelchairs, there is a problem of security during the lifting operation of the seat. Indeed, in general, the actuation of the lifting means is done automatically by actuators controlled by the user. So when the user activates the actuators so as to raise or lower the seat, it is too late for stopping the movement of lifting means. Therefore, there is a potential risk that somebody hurts himself if he introduces one part of his body into the hinged structure when the lifting means is operating.

[0004] The aim of the present invention is therefore to provide a method for securitizing the lifting operation of a wheelchair seat and a lifting device for a wheelchair seat avoiding such a problem.

SUMMARY OF THE INVENTION

[0005] In this view the present invention is concerned with a method for securitizing the lifting operation of a wheelchair seat as claimed in claim 1. Important features of the method are defined in the dependent claims 2 to 4. The present invention also concerns a lifting device for a wheelchair seat as claimed in claims 5 to 9.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] Other features and advantages of the present invention will appear more clearly from the detailed description of embodiments of the invention which are presented solely by way of a non-restricted example and illustrated by the attached drawings in which:

Figure 1 is a perspective three quarter front view of a lifting device according to the invention;
Figure 2 is a perspective underneath view of the device of Figure 1;
Figure 3 is a lateral view of the device of Figure 1;
Figure 4 is a rear view of the device of Figure 1;

DETAILED DESCRIPTION OF EMBODIMENTS OF THE INVENTION

[0007] In reference to Figure 1, one can see a lifting device according to the present invention.

[0008] This lifting device 1 comprises a lifting means 2 arranged between a lower frame 3 and an upper frame 4, said frames 3 and 4 having a rectangular form. The lower frame 3 is intended to be connected to a base body of the wheelchair and the upper frame 4 is intended to be connected to the underneath face of the wheelchair seat. In the configuration illustrated in Figure 1, the upper frame 4 supports also a mechanical structure defining an inclining device 5. Said device 5 is intended to modify the inclination of the wheelchair seat. Said lifting means 2 consists in a hinged structure defining a scissors joint with swing arms 6. In order to raise or lower the seat, one needs to push or pull one of the swing arms 6. This operation is done by an actuating means 7. In this specific case, the actuating means 7 consists in a piston acting on said swing arm 6 via a connecting rod 8. The activation of said actuating means 7 is controlled by a controller 9. In general, said controller 9 receives input command signals Ci from the user via an input command device 10. Such a device 10 can consist in a keyboard or a joystick for instance. In addition, said controller 9 receives also output signals Si from one or more sensors 11 configured to detect the thermal infrared radiation emitted by an area surrounding the lifting means 2. In a preferred embodiment of the present invention, said sensors 11 consist in thermopiles.

[0009] A thermopile is a sensor which use a serially-interconnected array of thermocouples, each of which consists of two dissimilar materials with a large thermoelectric power and opposite polarities. The thermocouples are placed across the hot and cold regions of a structure and the hot junctions are thermally isolated from the cold junctions. The cold junctions are typically placed on a silicon substrate to provide effective heat sink. In the hot regions, there is a black body for absorbing the infrared radiation, which raises the temperature according to the intensity of the incident infrared radiation. These thermopiles employ two different thermoelectric materials which are placed on a thin diaphragm having a low thermal conductance and capacitance. The temperature difference between the hot and cold regions generates a voltage, which is proportional to said difference of temperature.

[0010] Thus, when somebody penetrates into the surrounding area of the lifting means 2 via one of his body part, the thermal infrared radiations emitted by said area increase. Therefore, the sensors 11 generate a higher difference of temperature between the hot and cold regions and the voltage S1 generated by the sensors 11 is different from the voltage S0 generated by the sensors 11 before the body part penetrates inside said area. The comparison between said voltage S1 and said reference voltage S0 is done continuously by the controller 9 so

that it can detect at any time the presence of a hot body inside the surveillance area of the sensors 11. Therefore, when the controller 9 detects that the voltage S1 is different from the voltage S0, it deactivates the actuating means 7 so that the lifting means 2 can no longer move. Such a deactivation consists for instance in interrupting the electric power of the actuating means 7 or, in case of a piston, in interrupting the hydraulic source feeding in fluid said piston.

[0011] In reference to Figures 2 to 4, one can see that the lifting device 1 comprises at least four sensors 11 positioned at the four corners of the upper frame 4. These sensors 11 are orientated so that the lifting means 2 is at least partially covered by the sensing areas of said sensors 11. In particular, these sensing areas should be configured so as to cover the free spaces A1, A2, A3 and A4 existing between two hinged swing arms 6. In the specific case of a thermopile sensor, said sensing area consists generally in a circular conical area in which the apex of the cone corresponds to the position of the thermopile sensor. Therefore, considering that the position of the thermopile sensor is O and the axis of rotation is (Ox), it is important to correctly choose firstly the angle β between (Ox) and the plane P defined by the upper frame 4 and secondly the angle α between (Ox) and the directrix (Od) so as to completely cover the free spaces A1, A2, A3 and A4.

[0012] Of course, the invention is not limited to the embodiment described and illustrated with the annexed drawings. Changes remain possible, particularly from the point of view of the sensors used or the position of these sensors with regard to the lifting means. In particular, it could be advantageous to use other sensors in replacement to the thermopiles. Such sensors should be adapted to detect a presence or a motion inside an area surrounding at least partially the lifting means of the wheelchair seat. Thus, such sensors could be adapted to detect other physical parameters existing inside said area. For instance, microwave sensors, optical sensors, capacitive sensors and pyroelectric sensors could constitute alternative solutions for detecting a presence or a motion.

Claims

1. Method for securitizing the lifting operation of a wheelchair seat, comprising the following steps:
 - a) detecting a presence or a motion inside an area (A1, A2, A3, A4) surrounding at least partially a lifting means (2) of the wheelchair seat,
 - b) if a presence or a motion is detected in said area (A1, A2, A3, A4), deactivating actuating means (7) controlling the lifting means (2).
2. Method according to claim 1, wherein the steps a) and b) correspond to the following steps:

- detecting the thermal infrared radiation emitted by an area (A1, A2, A3, A4) surrounding at least partially a lifting means (2) of the wheelchair seat,
- converting said thermal infrared radiation in an output signal S1,
- comparing said output signal S1 with a reference signal S0,
- if S1 is different from S0, deactivating actuating means (7) controlling the lifting means (2).

3. Method according to claim 2, wherein the detection of the infrared radiation is done by at least one thermopile (11).
4. Method according to claim 3, wherein the detection of the infrared radiation is done by at least four thermopiles (11) configured and positioned so as to define a sensing area surrounding at least partially the lifting means (2).
5. Lifting device (1) for a wheelchair seat, comprising :
 - lifting means (2) for lifting up or down a wheelchair seat,
 - actuating means (7) for controlling said lifting means (2),
 - at least one sensor (11) adapted to detect a physical parameter existing inside an area (A1, A2, A3, A4) surrounding at least partially said lifting means (2) and convert said physical parameter in an output signal S1,
 - a controller (9) adapted to receive said output signal S1 from said at least one sensor (11), compare said output signal S1 with a reference signal S0 and deactivate said actuating means (7) if S1 is different from S0.
6. Lifting device (1) according to claim 5, wherein said at least one sensor (11) is adapted to detect the thermal infrared radiation emitted by said area (A1, A2, A3, A4).

7. Lifting device (1) according to claim 6, wherein said at least one sensor (11) is a thermopile.
8. Lifting device (1) according to claim 7, wherein it comprises at least four thermopiles (11) configured and positioned so as to define a sensing area surrounding at least partially said lifting means (2).
9. Lifting device (1) according to claim 8, wherein said thermopiles (11) are positioned at the four corners of a rectangular upper frame (4) supported by said lifting means (2) and connected to the underneath face of the wheelchair seat.

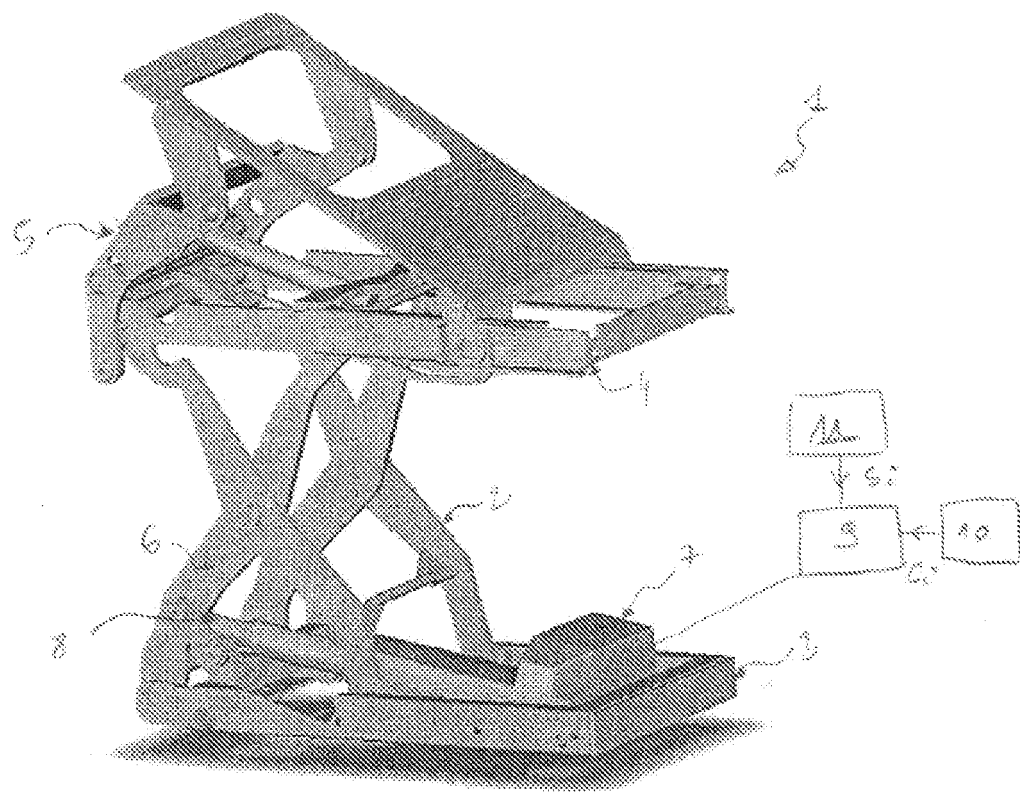


FIG.1

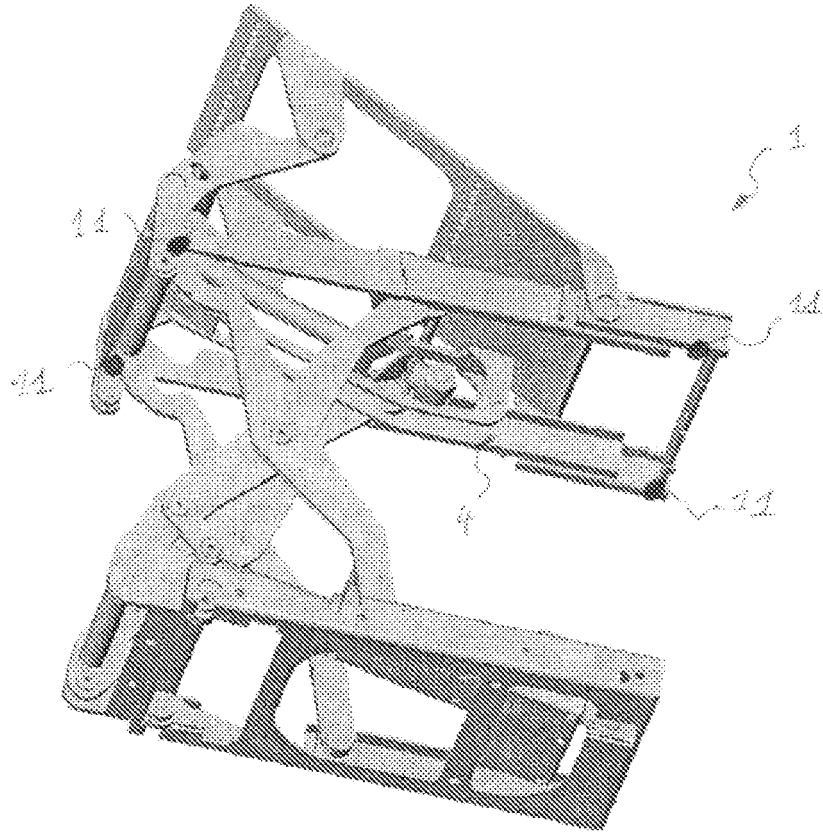


FIG.2

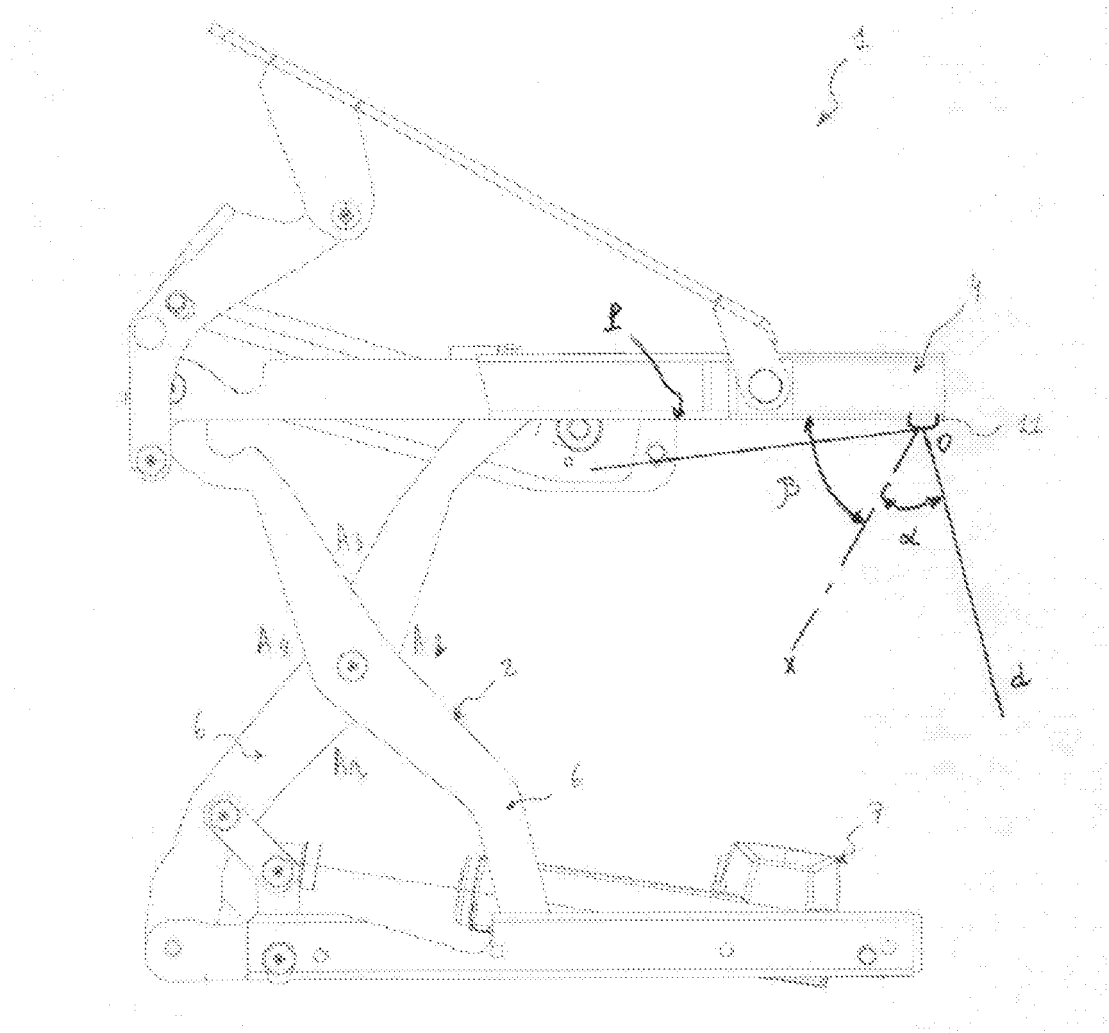


FIG.3

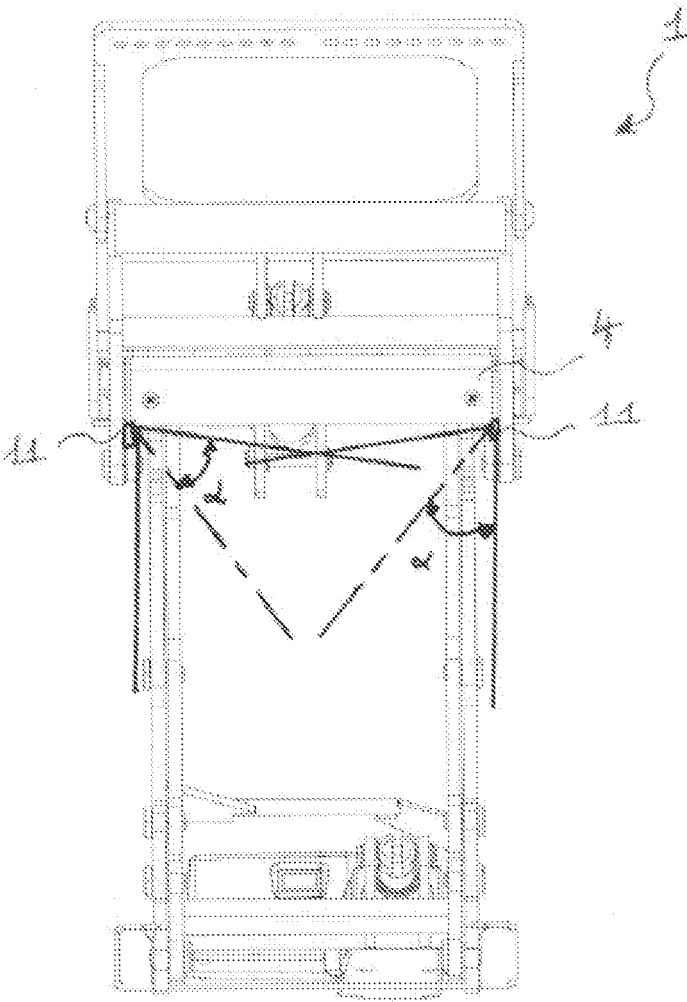


FIG.4



EUROPEAN SEARCH REPORT

Application Number
EP 09 18 0467

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Y	* column 3, lines 9-31 * -----	2-4,6-9	
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The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
			A61G
Place of search		Date of completion of the search	Examiner
The Hague		7 May 2010	Birlanga Pérez, J
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 09 18 0467

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07-05-2010

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