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(54) METHOD FOR SECURITIZING THE LIFTING OPERATION OF A WHEELCHAIR SEAT AND LIFTING DEVICE FOR A WHEELCHAIR SEAT

VERFAHREN ZUR SICHERUNG DES ANHEBEBETRIEBS EINES ROLLSTUHLSITZES UND ANHEBEVORRICHTUNG FÜR EINEN ROLLSTUHL

PROCÉDÉ DE SÉCURISATION DE L'OPÉRATION DE LEVAGE D'UN SIÈGE DE FAUTEUIL ROULANT ET DISPOSITIF DE LEVAGE POUR FAUTEUIL ROULANT

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Description

FIELD OF THE INVENTION

[0001] The present invention relates 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 an 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 German patent application DE 199 47 372 A1 discloses a method for securitizing the lifting operation of a wheelchair seat, in which a measuring device is configured to detect the current I supplied to an electric motor serving for the raising or for the lowering of the seat. When the seat hits an obstacle, the measuring device detects a rising in the current I and this rising generates a control signal indicating that the power supply must be de-energized. However, in this prior art, a contact between an obstacle and the seat is needed to be detected by the measuring device. Thus, if an obstacle penetrates inside the area surrounding the lifting means of the wheelchair seat, without contacting said seat, the current I does not rise and, thus, the presence or the motion of said obstacle is not detected by the measuring device.

[0005] 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

[0006] The present invention concerns a lifting device for a wheelchair seat comprising:

- lifting means for lifting up or down a wheelchair seat,
- actuating means for controlling said lifting means,
- at least one sensor adapted to detect a physical parameter existing inside an area surrounding at least partially said lifting means and convert said physical parameter in an output signal S1, said sensor being of non-contact type,
- a controller adapted to receive said output signal S1 from said at least one sensor, compare said output signal S1 with a reference signal S0 and deactivate said actuating means if S1 is different from S0,

wherein said at least one sensor is adapted to detect the thermal infrared radiation emitted by said area.

[0007] According to an embodiment, said at least one sensor may be a thermopile.

[0008] Said lifting device may be comprise at least four thermopiles configured and positioned so as to define a sensing area surrounding at least partially said lifting means, and said thermopiles may be positioned at the four corners of a rectangular upper frame supported by said lifting means and connected to the underneath face of the wheelchair seat.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] 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 EMBODIMENT OF THE INVENTION

[0010] In reference to Figure 1, one can see a lifting device according to the present invention.

[0011] 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 sig-

nals 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 of non-contact type configured to detect a presence or a motion inside an area surrounding the lifting means 2 before said lifting means 2 hits an obstacle. In a preferred embodiment of the present invention, said sensors 11 consist in thermopiles configured to detect the thermal infrared radiation emitted by said area.

[0012] A thermopile is a sensor which uses 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.

[0013] 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.

[0014] 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 sensors. 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 anglo 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.

[0015] Of course, the invention is not limited to the embodiment described and illustrated with the annexes drawings. Charges 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 of non-contact type 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. The invention is limited to at least one sensor being adapted to detect thermal infrared radiation.

Claims

1. 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), **characterized in that** it further comprises

  - 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, said sensor (11) being of non-contact type,
  - 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,

wherein said at least one sensor (11) is adapted to detect the thermal infrared radiation emitted by said area (A1, A2, A3, A4).

2. Lifting device (1) according to claim 1, wherein said at least one sensor (11) is a thermopile.

3. Lifting device (1) according to claim 2, 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).

4. Lifting device (1) according to claim 3, 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.

Patentansprüche

1. Anhebevorrichtung (1) für einen Rollstuhlsitz, die Folgendes umfasst:

   - Anhebemittel (2) zum Anheben oder Runterlassen eines Rollstuhlsitzes,
   - Betätigungsmittel (7) zum Steuern des Anhebemittels (2),

   dadurch gekennzeichnet, dass es ferner Folgendes umfasst:

   - mindestens einen Sensor (11), der dafür ausgelegt ist, einen physikalischen Parameter zu detektieren, der innerhalb eines Gebiets (A1, A2, A3, A4) vorliegt, das das Anhebemittel (2) zumindest teilweise umgibt, und den physikalischen Parameter in ein Ausgangssignal S1 zu wandeln, wobei der Sensor (11) von einem berührungslosen Typ ist,
   - eine Steuerung (9), die dafür ausgelegt ist, das Ausgangssignal S1 von dem mindestens einen Sensor (11) zu empfangen, das Ausgangssignal S1 mit einem Referenzsignal S0 zu vergleichen und das Betätigungsmittel (7) zu deaktivieren, wenn sich S1 von S0 unterscheidet,

   wobei der mindestens eine Sensor (11) dafür ausgelegt ist, die thermische Infrarotstrahlung zu detektieren, die von dem Gebiet (A1, A2, A3, A4) emittiert wird.

2. Anhebevorrichtung (1) nach Anspruch 1, wobei der mindestens eine Sensor (11) eine Thermosäule ist.

3. Anhebevorrichtung (1) nach Anspruch 2, wobei sie mindestens vier Thermosäulen (11) umfasst, die dafür ausgelegt und so positioniert sind, ein Messgebiet zu definieren, das das Anhebemittel (2) zumindest teilweise umgibt.

4. Anhebevorrichtung (1) nach Anspruch 3, wobei die Thermosäulen (11) an den vier Ecken eines rechteckigen Oberrahmens (4) positioniert sind, der von dem Anhebemittel (2) gestützt wird und mit der unteren Fläche des Rollstuhlsitzes verbunden ist.

Revendications

1. Dispositif de levage (1) pour un siège de fauteuil roulant, comprenant :

   - un moyen de levage (2) servant à élever ou abaisser un siège de fauteuil roulant,
   - un moyen d'actionnement (7) servant à commander ledit moyen de levage (2),

   caractérisé en ce qu'il comprend en outre

   - au moins un capteur (11) conçu pour détecter un paramètre physique existant à l'intérieur d'une zone (A1, A2, A3, A4) entourant au moins partiellement ledit moyen de levage (2) et convertir ledit paramètre physique en un signal de sortie S1, ledit capteur (11) étant du type sans contact,
   - un dispositif de commande (9) conçu pour recevoir ledit signal de sortie S1 provenant dudit ou desdits capteurs (11), comparer ledit signal de sortie S1 à un signal de référence S0 et désactiver ledit moyen d'actionnement (7) si S1 est différent de S0,

   ledit ou lesdits capteurs (11) étant conçus pour détecter le rayonnement infrarouge thermique émis par ladite zone (A1, A2, A3, A4).

2. Dispositif de levage (1) selon la revendication 1, dans lequel ledit ou lesdits capteurs (11) sont des thermopiles.

3. Dispositif de levage (1) selon la revendication 2, comprenant au moins quatre thermopiles (11) configurées et positionnées de façon à définir une zone de détection entourant au moins partiellement ledit moyen de levage (2).

4. Dispositif de levage (1) selon la revendication 3, dans lequel lesdites thermopiles (11) sont positionnées aux quatre angles d'un cadre supérieur (4) rectangulaire supporté par ledit moyen de levage (2) et raccordé à la face inférieure du siège de fauteuil roulant.

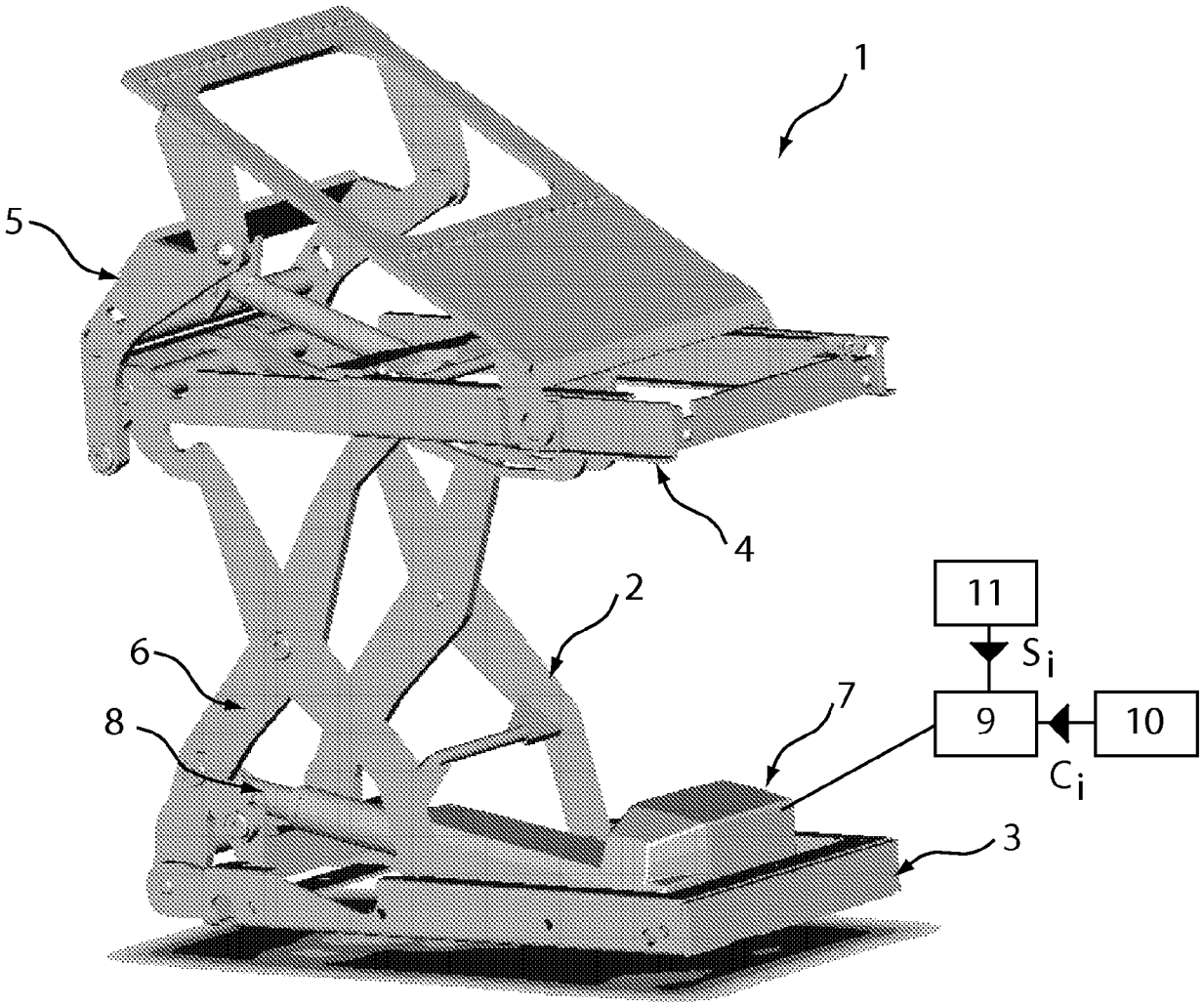

FIG.1

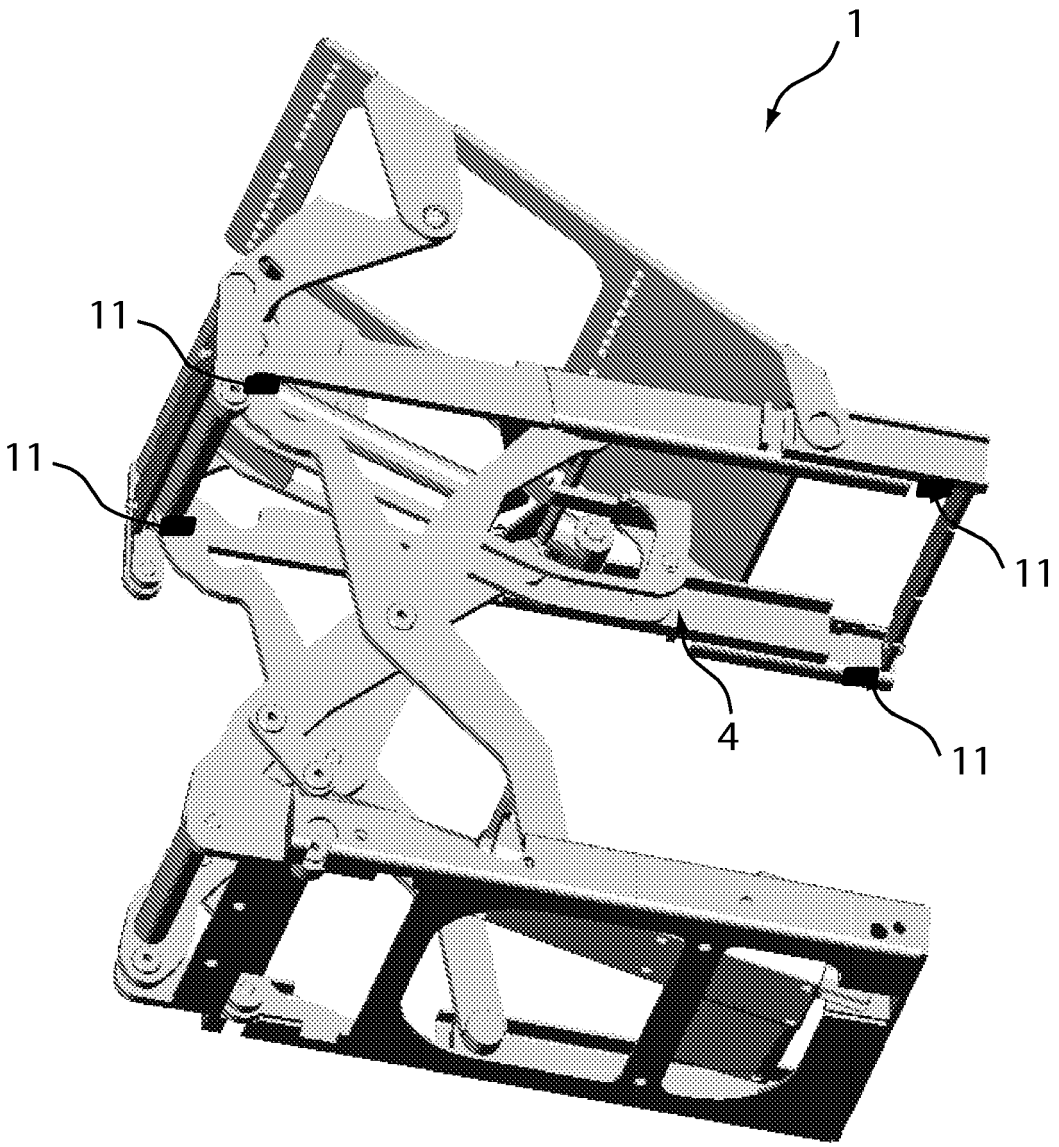

FIG.2

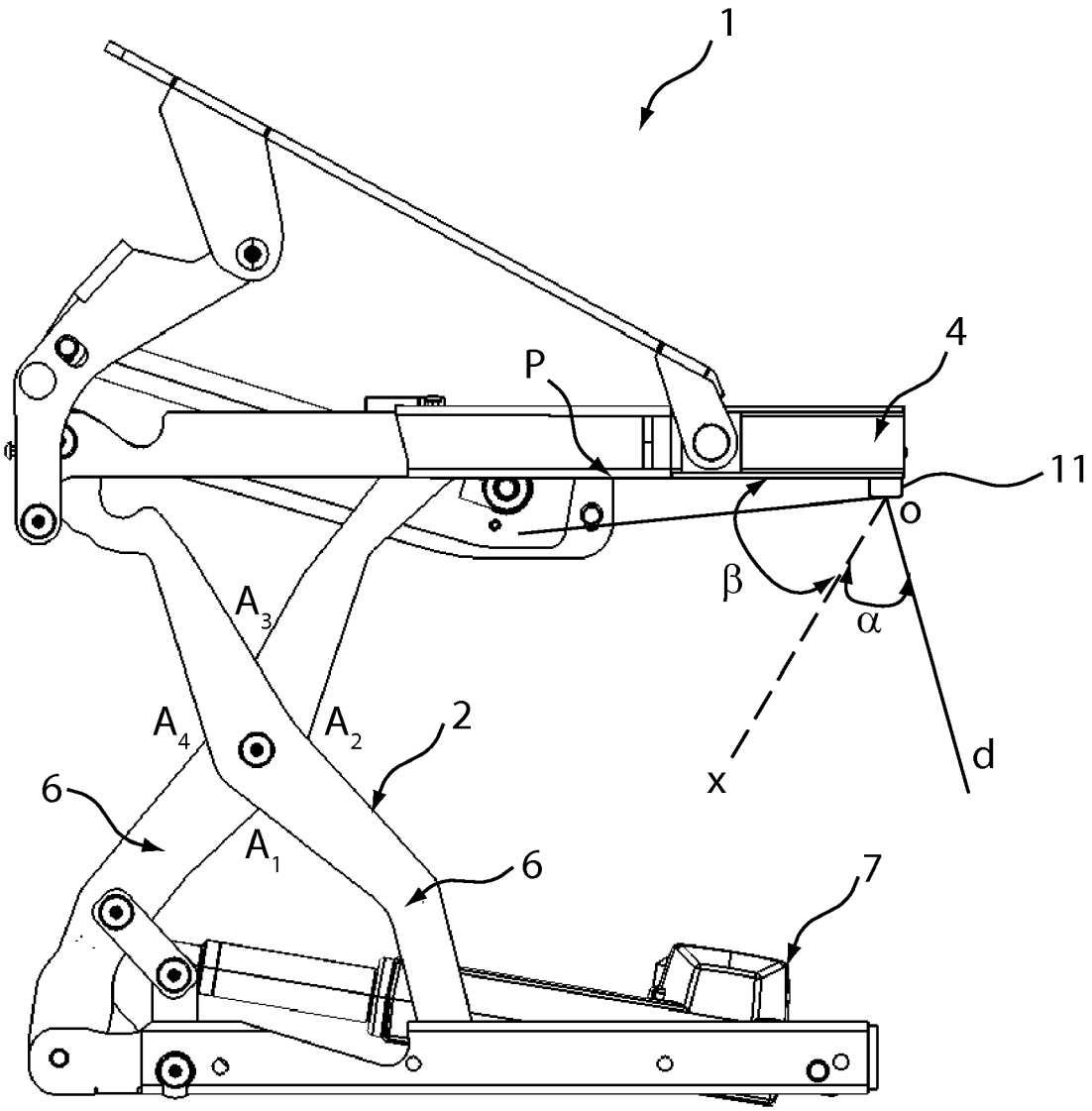

FIG.3

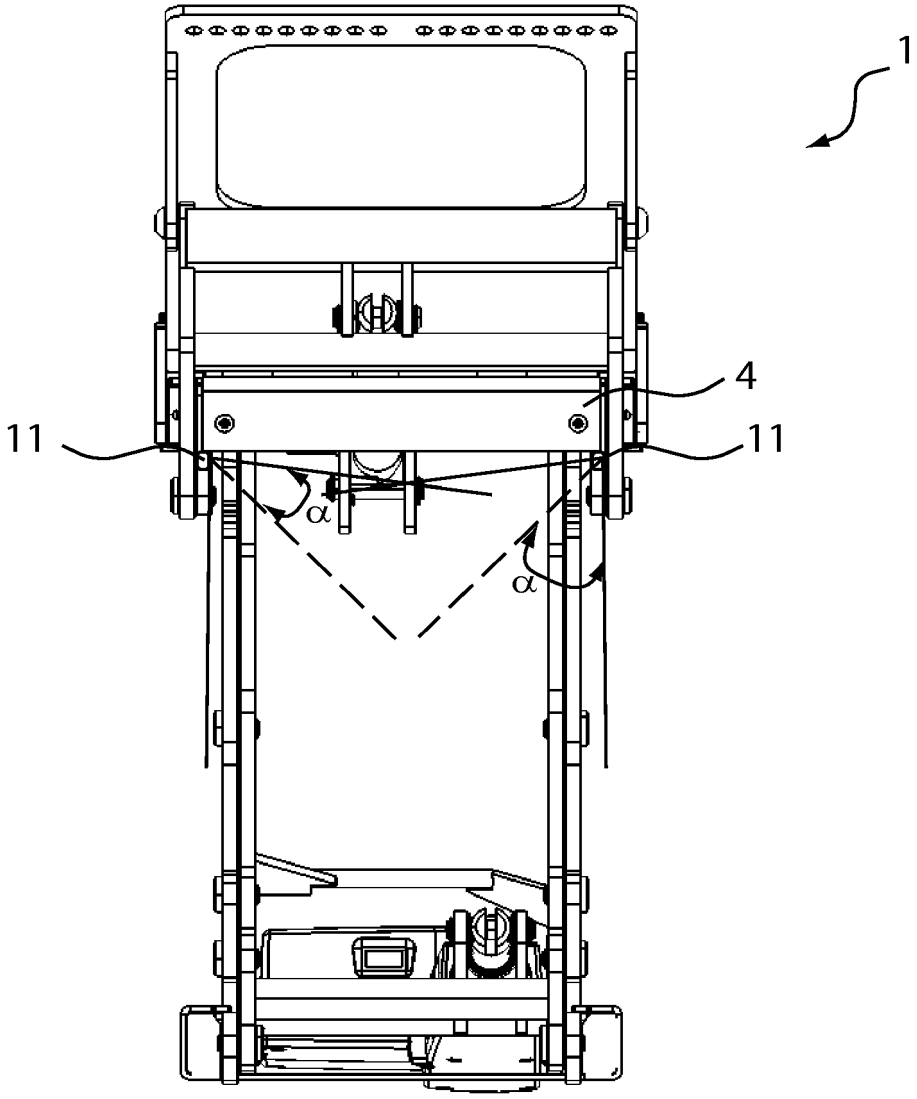

FIG.4

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 1523971 A **[0002]**
- DE 19947372 A1 **[0004]**