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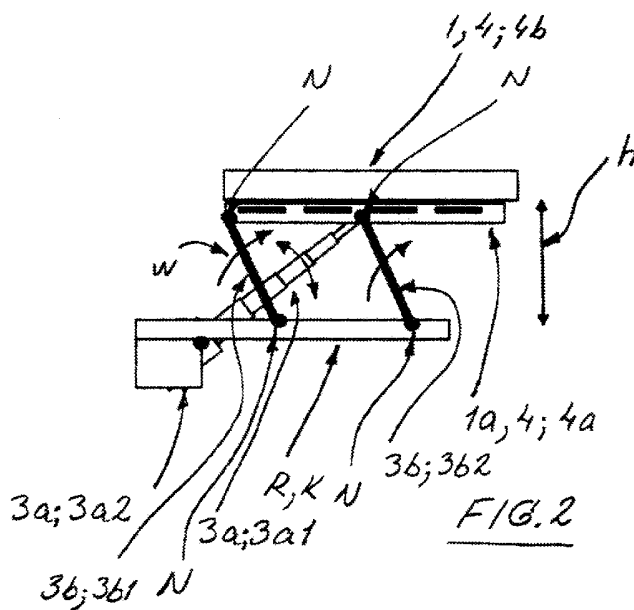


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(54) Title: LIFTING DEVICE FOR A WHEELCHAIR



(57) Abstract: The invention relates to a lifting device, which is meant to be used particularly in connection with a wheelchair (p) or like and, which comprises a seat part (1) that is movable with respect to the wheelchair (p) or like in a height direction (h). In order to enable use of the lifting device as a separate accessory, it comprises a frame part (R) to be coupled by fastening means (K) immovably in connection with the wheelchair (p) or like, whereby the seat part (1) is coupled with the frame part (R) movably at least in the height direction (h) by means of a lifting assembly, such as an articulation mechanism to be used by mechanically, pressure medium and/or electrically operated actuator means (3a).

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## Lifting device for wheelchair

The invention relates to a lifting device, which is meant to be used particularly in connection with a wheelchair or like and, which comprises a seat part that is movable with respect to the wheelchair or like in a height direction.

The purpose of the lifting device is to aid e.g. moving a person sitting on a wheelchair e.g. to a bed in a way that the person sitting on the wheelchair is raised upward, moved sideways and/or when necessary, rotated e.g. 45° - 90° around an essentially vertical rotation axis with the lifting device.

E.g. in patent publication No. JP 2001070350 is presented an actuator in a wheelchair with which it is possible to move a person in a wheelchair e.g. in the ways described above. The actuator described in this context comprises a seat part, a slide assembly that moves the person in horizontal direction, an articulated lifting mechanism that moves the person in a vertical direction, a lifting motor and a control device.

Further, in publication KR 1020070098777 is presented an actuator in a wheelchair for moving a person from the wheelchair to bed. The actuator comprises a seat part, a slide assembly for moving a person in horizontal direction, an articulated lifting mechanism for lifting the person who is sitting, a lifting system and a control device.

Further, in publication US 5,669,620 is presented an actuator in a wheelchair for moving a person from a wheelchair to another seat. The solution presented in this context comprises a seat part, a slide assembly for moving a person in horizontal direction, an articu-

lated lifting mechanism for lifting the person upwards and a motor.

5 All the lifting and moving assemblies presented in the publications above are fully based on mechanisms arranged in an integrated manner in the frame structures of the wheelchair, therefore all the solutions in question are thus specially crafted wheelchairs equipped with lifting or moving functions. When choosing one of the  
10 above wheelchairs with a view to a wheelchair user's preferences regarding e.g. the wheelchair's structures, materials and/or ergonomics, it is not possible for the wheelchair user to exploit the variety of common wheelchairs. In addition, in all the above solutions, the  
15 movement of the seat part in height direction is achieved by a usual scissor lifter, for which there is an extra "scissor joint" under the seat part on both sides, which when being uncovered may cause a safety risk.

20 The purpose of the lifting device according to the present invention is to provide a conclusive improvement to the problems described above and thereby substantially raise the present level of technique in the field. To fulfil this purpose, the lifting device according to the invention is characterized in that, in order to enable use of the lifting device as a separate accessory, it comprises a frame part to be coupled by fastening means immovably in connection with the wheelchair or like, whereby the seat part is coupled with  
25 the frame part movably at least in a height direction by means of a lifting assembly, such as an articulation mechanism that is to be used by mechanically, pressure medium and/or electrically operated actuator means.

35 The most important advantages of the lifting device according to the invention are its simple and steady structures and functioning and also the safe usage of

the wheelchair provided therewith. Because the lifting device according to the invention is suited to be used in a post-installed manner, there is no need to order e.g. a complete wheelchair, when there is only a need for a lifting or moving function, in which case just  
5 e.g. the existing wheelchair may be updated with a lifting device according to the invention that has the best suited functions for use at any given time, e.g. a composition allowing horizontal movement or turning  
10 around a rotation axis in addition to the lifting movement. The wheelchair may be updated e.g. by removing the original seat plane by replacing it e.g. with a lifting device that is attached removably e.g. by a screw attachment or by a suitable quick coupling to the  
15 wheelchair's structures. In addition to being removable, the lifting device according to the invention has an advantage in that, when any of its functions need service, it is easy to change the lifting device to another one or remove only the part that is in need  
20 of service and yet the other functions of the lifting device remain fully working. Therefore, the lifting device according to the invention also allows an optimum implementation with a view to service and maintenance due to its replacement readiness.

25 Other advantageous embodiments according to the invention are presented in the dependent claims related thereto.

30 In the following description, the invention is demonstrated in detail concurrently referring to the appended drawings, in which

in figure 1  
35 is shown as an example a wheelchair suited for the use of the lifting device according to the invention,

in figure 2

5 is shown as an example an advantageous embodiment of the lifting device according to the invention in a profile view,

in figure 3

10 is shown as an example the embodiment according to figure 2 in a view from above, and

in figure 4

15 is shown furthermore as an example an advantageous embodiment of the lifting device according to the invention in a profile view and in a view from above.

20 The invention relates to a lifting device to be used particularly in connection with a wheelchair p or like and which comprises a seat part 1 coupled movably at least in a height direction h in relation to the wheelchair p or like. In order to enable use of the lifting device as a separate accessory, it comprises a frame part R to be coupled by fastening means K immovably in connection with the wheelchair p or like, whereby the seat part 1 is coupled with the frame part R movably at least in the height direction h by means of a lifting assembly, such as an articulation mechanism to be used  
25 by mechanically, pressure medium and/or electrically operated actuator means 3a.  
30

35 As an advantageous embodiment of the lifting device according to the invention, the articulation mechanism 3b of the lifting assembly is arranged on quadrangle joint -principle. With reference to the embodiments shown in figures 2 and 4, the articulation mechanism 3b operating on quadrangle joint principle comprises at

least two pairs of articulated arms 3b1, 3b2 turning w  
essentially in a vertical plane in the same direction,  
which pairs of articulated arms are coupled with the  
frame part R by joints N that exist, when viewed from  
5 above, on opposite sides of the frame part R with res-  
pect to the centre line thereof or in other words most  
advantageously by joints N on opposite outer sides of  
the seat part 1.

10 E.g. according to the principle shown in figure 2, the  
lifting assembly's movement is generated by an actuator  
3a1 e.g. a spindle, a cylinder arm or telescopic arm or  
like that is fastened rotatively to the frame part R  
and operable by auxiliary power generated from an ener-  
15 gY source 3a2, the movement being typically in practice  
around 150 - 250 mm in the height direction h, which  
means that the person sitting on the seat part 1 rises  
at least on the level of e.g. the handles of the type  
of a wheelchair p shown in figure 1. The extra "scissor  
20 joint" is avoided thanks to the articulation mechanism  
3b described above functioning on quadrangle joint -  
principle, the joints N of the articulation mechanism  
3b being on the sides of the frame part R and the seat  
part 1. In addition, as shown especially in figure 2,  
25 the quadrangle joint function moves the seat part 1  
outward from the wheelchair's p back rest simultaneous-  
ly when lifting the seat part 1 upward, which aids the  
person sitting on the wheelchair p getting up from the  
same. The forward movement makes the wheelchair even  
30 steadier when the centre of gravity of the person being  
raised up moves closer to the wheelchair's centre of  
gravity between its back and front wheel axles. In the  
normal situation, the centre of gravity is typically  
very close to the back axle's front side (which causes  
35 a risk of the chair falling on its back, whereby ree-  
ling, however, is easier due to the front wheels being  
"lightened" by moving the centre of gravity).

Furthermore, according to the advantageous embodiments shown in figures 2-4, the lifting assembly, being coupled by its first end with the frame part R, is coupled by its second end with an auxiliary frame 1a that is arranged in connection with the seat part 1.

As a further advantageous embodiment of the invention, especially as shown in figure 3, the seat part 1 is, in addition, arranged movable x in an essentially horizontal plane. Therefore between the seat part 1 and the auxiliary frame 1a is arranged a movement assembly 4, such as counterpart surfaces 4a, 4b operable by a slide rail assembly, a groove guide assembly or like, in order to enable movement x of the seat part 1 horizontally.

Furthermore according to figures 3 and 4, the seat part 1 is arranged advantageously rotateable z around an essentially vertical rotation axis. The seat part 1 then consists of two parts 1', 1" on top of each other in the height direction h, between of which is arranged a rotation mechanism 5 in order to enable rotation z of the seat part 1. In this context as an advantageous embodiment e.g. as shown in figure 4, the seat part 1 consists of a bottom 1" provided with a second counterpart surface 4b of the movement assembly 4 and a middle axle 5a, and a seat surface 1' coupled rotatively z with the bottom 1". The bottom 1" is preferably round, when viewed from above, which allows free rotation z of the seat part 1 in a way that the bottom 1" beneath the seat surface does not prevent the movement in any situation.

As a further advantageous embodiment of the invention, especially as shown in figure 4, the lifting device is provided with mechanically, pressure medium and/or electrically operated auxiliary actuator means 4c and/or 5b, in order to use the movement assembly 4

and/or the rotation mechanism 5. In addition, in connection with the lifting device are advantageously arranged control means 6 in order to use the actuator means and/or the auxiliary actuator means 3a, 4c and/or 5b, the above means being driven by auxiliary power, such as by pressure medium and/or electricity. The control means 6 in question are furthermore advantageously arranged, as shown in figure 4, operable on remote control principle in a wired manner, such as with a control device coupled removably with a wire to the lifting device, or wirelessly, such as optically and/or in a radio frequency operated manner.

It is clear that the invention is not limited to the embodiments described or explained above, but it may be adjusted in various ways within the limits of its basic idea depending on e.g. the platform with which the lifting device is used at any given time. Firstly, in the appended drawings, the fastening means for the fastening of the lifting device to a wheelchair or in connection with a corresponding sitting platform are not explained further, because the way of implementing the same depends on the supporting structures of the sitting platform. In this respect, the lifting device may be supplied e.g. with quick coupling means to make faster coupling of the same to e.g. a wheelchair. It is also clear that the lifting device according to the invention may be used in connection with any type of seat meant to aid a person sitting on the same to be risen upward. One this kind of a use could be in a suitably modified manner e.g. a car seat. The articulation mechanism of the lifting device according to the invention is also possible to be carried out e.g. with a scissor lifter common as such, in addition to which, the seat part may, when needed, be supplied with e.g. side covers that may be drawn forth or opened (which cover the area between the arm rests and the seat



part), with arm rests and/or a back rest rising with it etc.

Claims:

1. Lifting device, which comprises a seat part  
(1) to be used particularly in connection with a wheel-  
5 chair (p) or like and, whereby in order to enable use  
of the lifting device as a separate accessory, it  
comprises a frame part (R) to be coupled by fastening  
means (K) immovably in connection with the wheelchair  
(p) or like, whereby the seat part (1) is coupled with  
10 the frame part (R) movably at least in a height direc-  
tion (h) by means of a lifting assembly, such as an  
articulation mechanism that is to be used by  
mechanically, pressure medium and/or electrically operated  
actuator means (3a), **characterized** in that, the  
15 articulation mechanism (3b) of the lifting assembly is  
arranged on quadrangle joint -principle, wherein it  
comprises a pair of articulated arm (3b1, 3b2) consisting  
of two successive articulated arms turning (w)  
essentially in a vertical plane in the same direction,  
20 by means of which the seat part (1) moves forward in  
the direction of the articulated arm's turning movement  
simultaneously when the seat part gets lifted upward.

2. Lifting device according to claim 1, **character-**  
25 **ized** in that, the articulation mechanism consists of  
two pairs of articulated arms (3b1, 3b2), being coupled  
with the frame part (R) by joints (N) that exist, when  
viewed from above, on opposite sides of the frame part  
(R) with respect to the centre line thereof.

3. Lifting device according to claim 1 or 2,  
**characterized** in that, the articulation mechanism (3b),  
being coupled by its first end with the frame part (R),  
35 is coupled by its second end with an auxiliary frame  
(1a) that is arranged in connection with the seat part  
(1).

4. Lifting device according to claim 3, wherein the lifting device's seat part (1) is arranged movable (x) in an essentially horizontal plane, **characterized** in that, between the seat part (1) and the auxiliary frame (1a) is arranged a movement assembly (4), such as counterpart surfaces (4a, 4b) operable by a slide rail assembly, a groove guide assembly or like, in order to enable movement (x) of the seat part (1) horizontally.
- 5
- 10 5. Lifting device according to any of the preceding claims 1-4, whereby the seat part (1) of the lifting device is arranged to rotate (z) around an essentially vertical rotation axis, **characterized** in that, the seat part (1) consists of two parts (1', 1'') on top of each other in the height direction (h), between of which is arranged a rotation mechanism (5) in order to enable rotation (z) of the seat part (1).
- 15
6. Lifting device according to claim 5, **characterized** in that, the seat part (1) consists of a bottom (1'') provided with a second counterpart surface (4b) of the movement assembly (4), the shape of the counterpart surface being, when seen from above, preferably round, and a seat surface (1') coupled rotatively (z) with the bottom.
- 20
7. Lifting device according to any of the preceding claims 1-6, **characterized** in that, it is provided with mechanically, pressure medium and/or electrically operated auxiliary actuator means (4c and/or 5b) in order to use the movement assembly (4) and/or the rotation mechanism (5).
- 30
8. Lifting device according to any of the preceding claims 1-7, **characterized** in that, the same is provided with control means (6) in order to use the actuator means and/or the auxiliary actuator means (3a,
- 35

4c and/or 5b) that are run by auxiliary power, such as by pressure medium and/or electricity.

5 9. Lifting device according to claim 8, **characterized** in that, the control means (6) are arranged operable on remote control principle in a wired manner or wirelessly, such as optically and/or in a radio frequency operated manner.

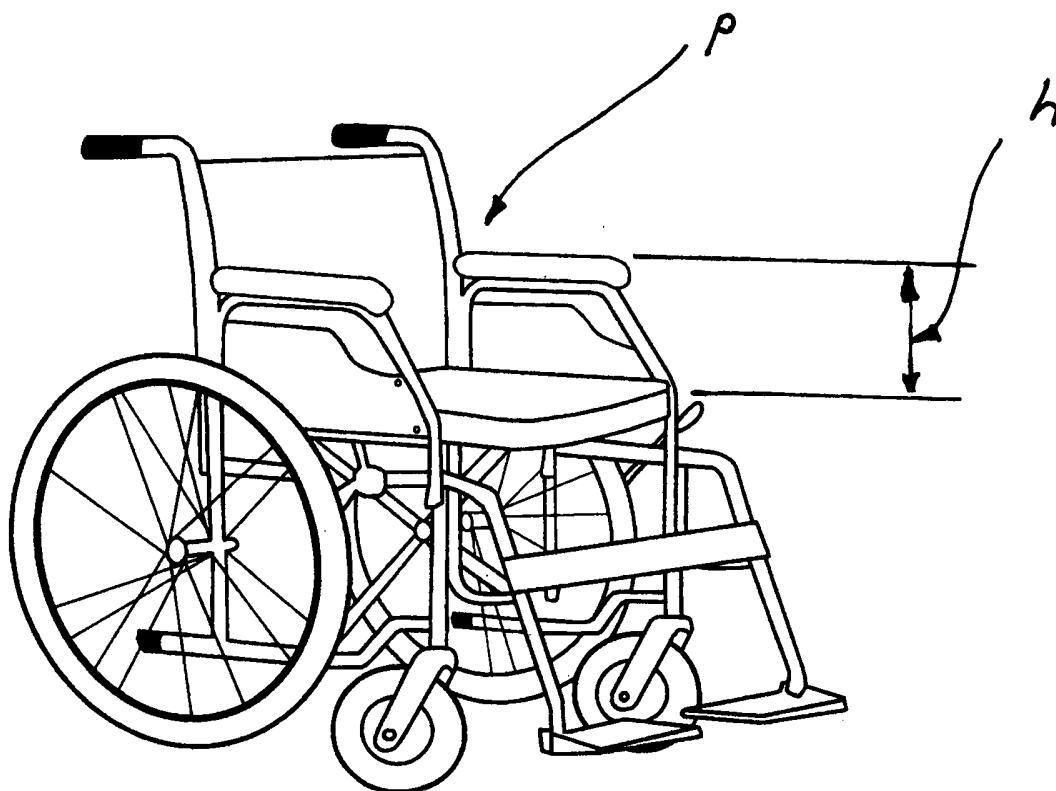
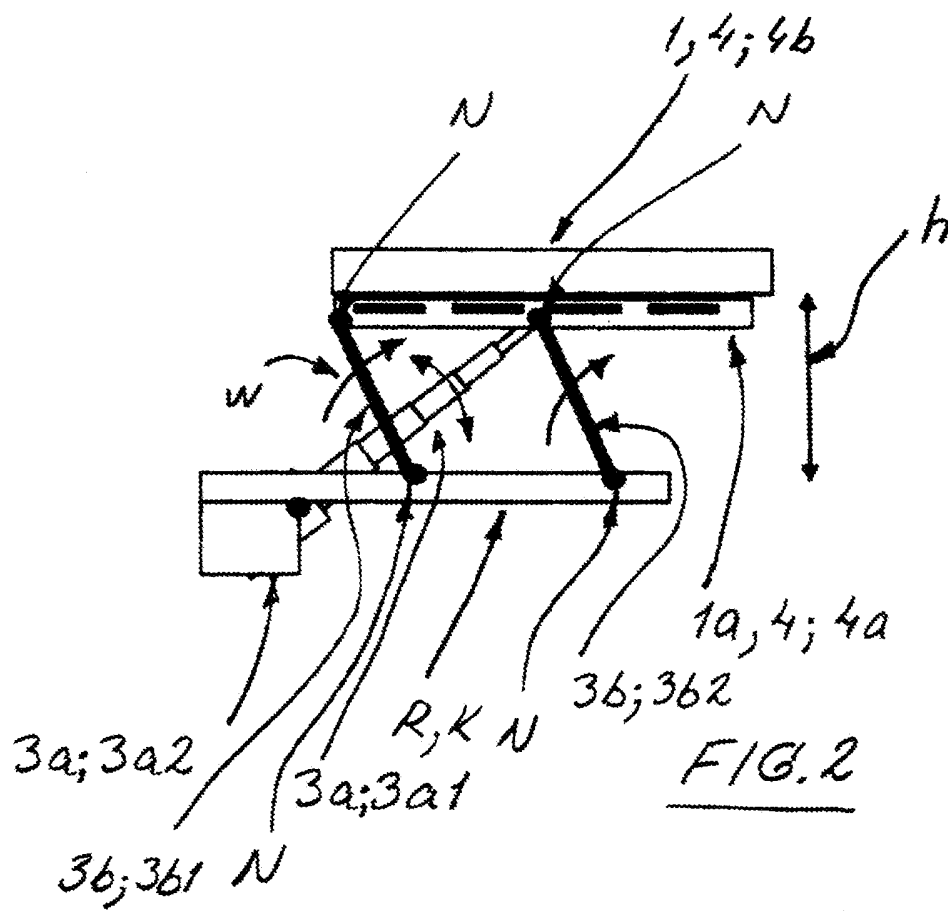


FIG. 1



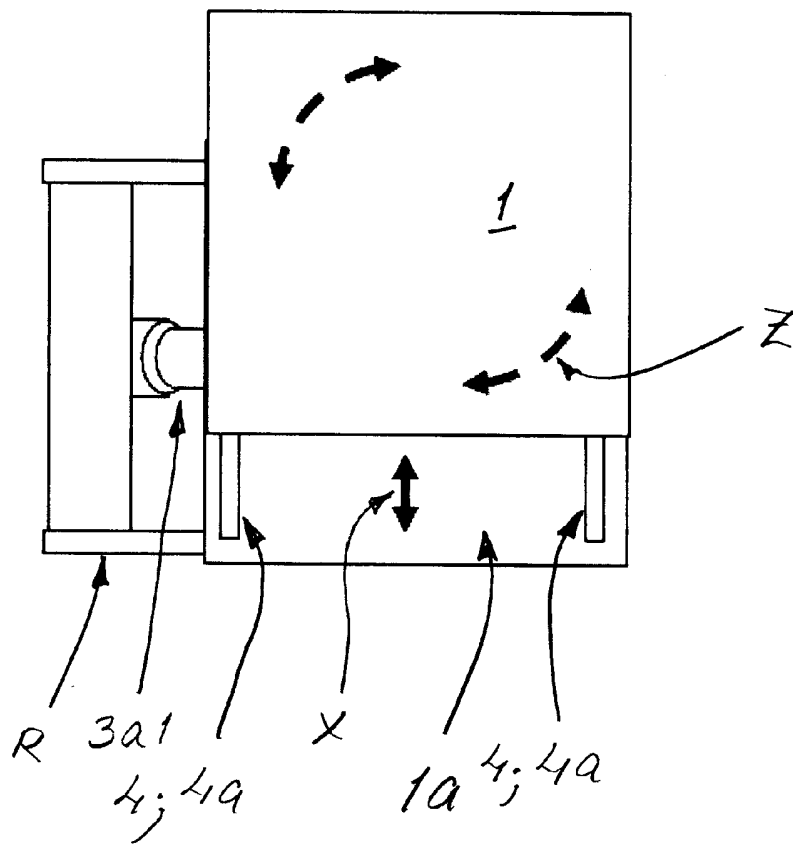


FIG. 3

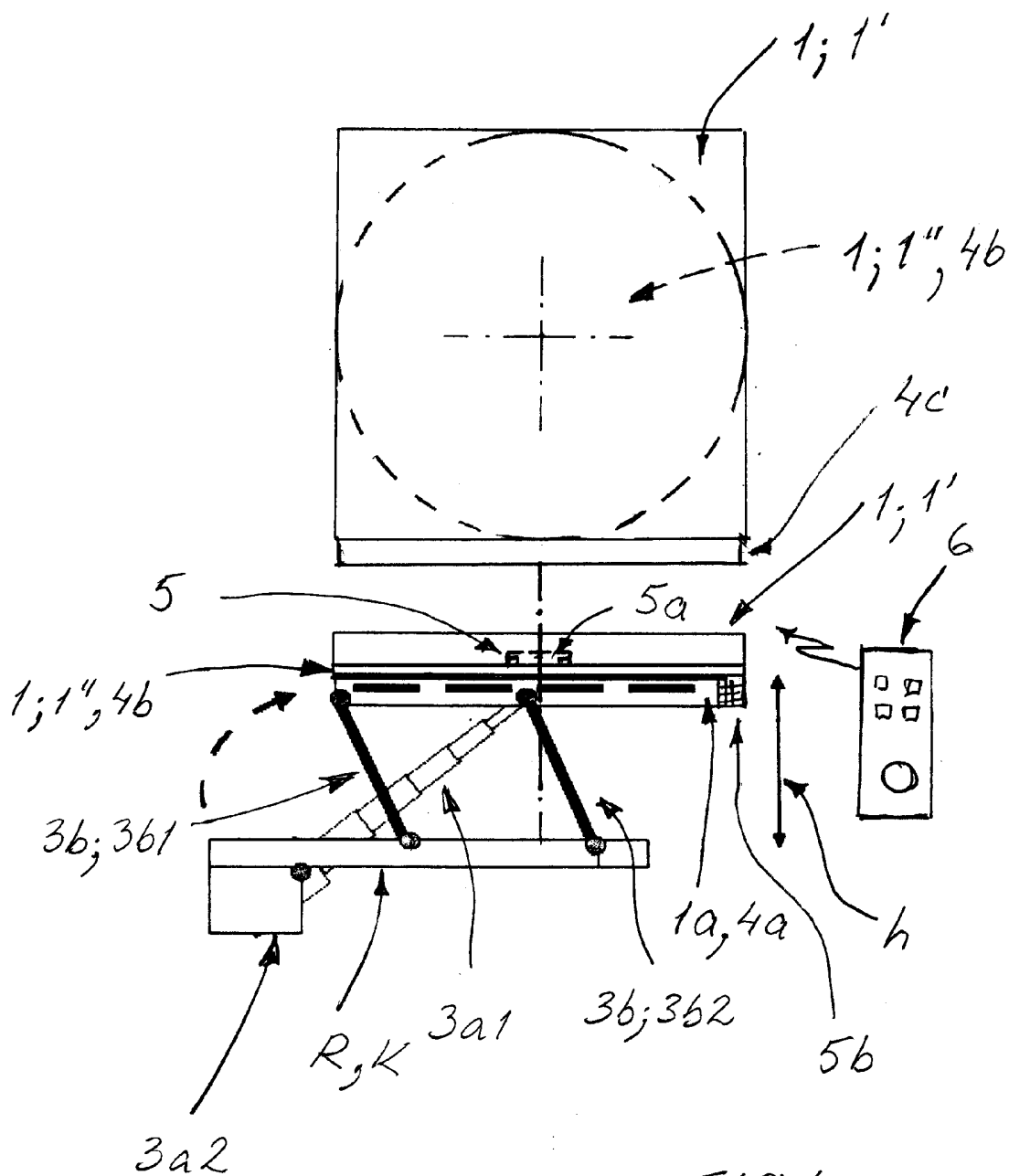


FIG. 4



**INTERNATIONAL SEARCH REPORT**

International application No.  
PCT/FI2011/050428

**A. CLASSIFICATION OF SUBJECT MATTER**  
**IPC: see extra sheet**  
 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)  
**IPC: A61G**

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched  
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Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)  
**EPO-Internal, PAJ, WPI data**

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 20030038518 A1 (WILLIAMS JERRY WAYNE), 27 February 2003 (2003-02-27); abstract; paragraphs [0030]-[0031]; figures 8-9	1-3, 7-9
Y	--	1-3, 7-9
Y	US 7594698 B1 (PALMER MARGE), 29 September 2009 (2009-09-29); abstract; column 5, line 55 - column 6, line 2; figure 2A	1-3, 7-9
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A	US 20030154550 A (MURPHY STEPHEN P ET AL), 21 August 2003 (2003-08-21); abstract; figure 2	1-3, 7-9
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Further documents are listed in the continuation of Box C.       See patent family annex.

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Date of the actual completion of the international search <b>16-08-2011</b>	Date of mailing of the international search report <b>17-08-2011</b>
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**INTERNATIONAL SEARCH REPORT**

International application No.  
PCT/FI2011/050428

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5884929 A1 (KINCAID DAVID W), 23 March 1999 (1999-03-23); abstract; figures 1-4  -- -----	4-6

**Continuation of:** second sheet

**International Patent Classification (IPC)**

**A61G 5/14** (2006.01)

**A61G 5/10** (2006.01)

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Cited literature, if any, will be enclosed in paper form.

**INTERNATIONAL SEARCH REPORT**

Information on patent family members

International application No.

PCT/FI2011/050428

US	20030038518 A1	27/02/2003	US	6637818 B2	28/10/2003
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US	5884929 A1	23/03/1999	NONE		