



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:  
**27.05.2009 Bulletin 2009/22**

(51) Int Cl.:  
**A61G 5/12 (2006.01)**

(21) Application number: **07022740.0**

(22) Date of filing: **23.11.2007**

(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**

(71) Applicant: **Sunrise Medical GmbH & Co. KG**  
**69254 Malsch/Heidelberg (DE)**

(72) Inventor: **Knopf, Michael**  
**69234 Dielheim (DE)**

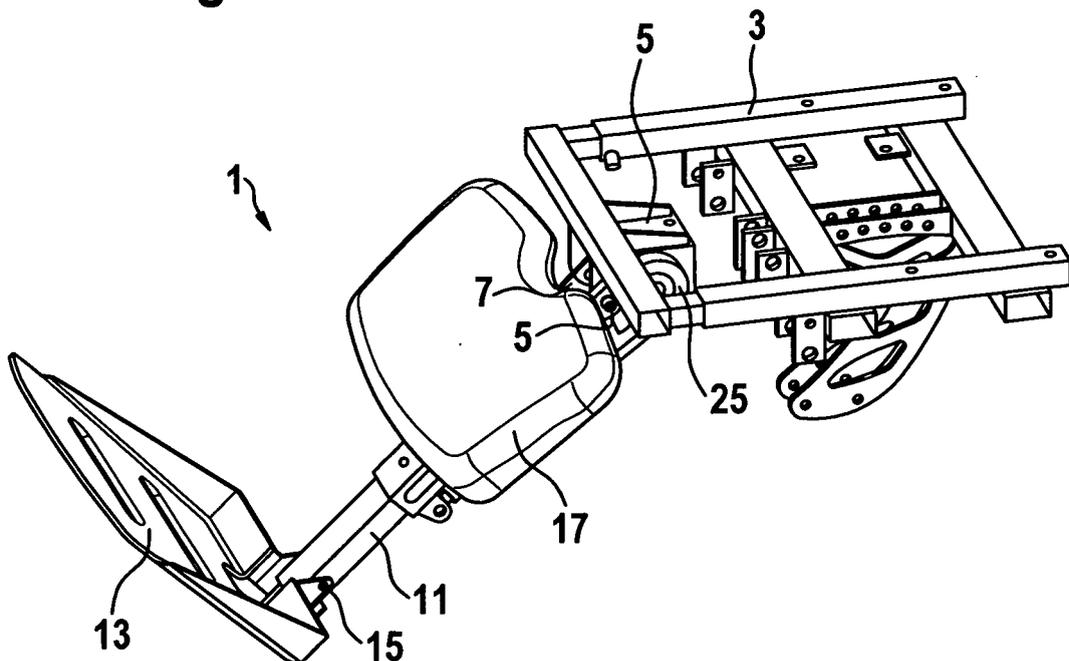
(74) Representative: **Weber-Bruls, Dorothee**  
**Forrester & Boehmert**  
**Pettenkofenstrasse 20-22**  
**80336 München (DE)**

(54) **Leg rest with length compensation, personal mobility vehicle and method for adapting the length of a leg rest**

(57) The invention relates a leg rest (1) for a personal mobility vehicle, comprising at least one guide member (7) being pivotable about a first pivot point to at least one pivot position with respect to at least one seating area of the personal mobility vehicle and at least one extension member (11) being telescopically movable with respect to the guide member, the leg rest (1) further comprising at least one pull and/or push device at least indirectly

connected to the extension member (11) for controlling at least one extension position of the extension member (11) with respect to the guide member (7), wherein the pull and/or push device is movable by at least one drive device comprising at least one rotating guide device guiding the pull and/or push device, wherein the rotating guide device is eccentrically supported as well as a personal mobility vehicle and a method for adapting the length of a leg rest (1).

**Fig. 8**



## Description

**[0001]** This invention relates to a leg rest for a personal mobility vehicle, comprising at least one guide member being pivotable about a first pivot point to at least one pivot position with respect to at least one seating area of the personal mobility vehicle and at least one extension member being telescopically movable with respect to the guide member, the leg rest further comprising at least one pull and/or push device at least indirectly connected to the extension member for controlling at least one extension position of the extension member with respect to the guide member, wherein the pull and/or push device is movable by at least one drive device comprising at least one rotating guide device guiding the pull and/or push device as well as a personal mobility vehicle comprising an inventive leg rest and a method for adapting the length of a leg rest.

**[0002]** Personal mobility vehicles, especially manual and/or power wheelchairs, advantageously have the capacity to tilt and recline a leg rest and/or a foot rest area of a seat. To increase the comfort it is known to provide a leg rest which is angle adjustable to give the user most possible comfort while sitting and/or laying in the personal mobility vehicle. For this reason the leg rest is pivotable about a pivot point with respect to a main frame and/or a seating area of the personal mobility vehicle. When pivoting the leg rest while a person is sitting in the personal mobility vehicle the following problem arises:

**[0003]** Due to the fact that the pivot point of the leg rest is displaced from a knee pivot point of a knee of a person sitting in the personal mobility vehicle, for example the pivot point of the leg rest may be 12 cm behind and below the knee pivot point of the person, when pivoting the leg rest the knees and/or calves of the person do not stay in contact with the leg rest but are lifted upwards. By this effect the legs of a person sitting in the personal mobility vehicle can be for example pushed up by about 7 cm when the leg rest is pivoted about an angle of 45°.

**[0004]** To overcome such an uncomfortable situation DE 42 33 811 A1 proposes a leg rest with height adjustment for a wheelchair. The leg rest comprises two telescopically movable tubes, one of which is pivotable with respect to the wheelchair. The other tube is connected to a foot rest and is connected to a push/pull device. The push/pull device is rollable onto a winding device which is connected via a planetary gear mechanism to the pivotable tube. When pivoting the leg rest the other tube is moved with respect to the pivotable tube to adapt a length of the leg rest.

**[0005]** However the leg rest disclosed in DE 42 33 811 A1 has amongst others the drawback that it can not secure that the legs or the calves of a person sitting in the personal mobility vehicle stay in contact with the leg rest and simultaneously in contact with the foot rest. The reason for this is that the length of the leg rest is changed proportionally to a pivot angle of the leg rest. However the feet of a person sitting in the personal mobility vehicle

does not follow the arc that is passed through by the foot rest so that depending on the gear ratio of the planetary gear mechanism the feet of the person lose the contact with the foot rest or the knees of the person are lifted up from the leg rest.

**[0006]** It is known from DE 20 2005 004 933 U1 to provide a support for a furniture with a length adjustment wherein the length of the support is changed non-proportional to a pivot angle of the support. A drive slider of the support is connected via a drive coupling to a coupling lever which in turn is connected to a steering lever. This steering lever is pivotable connected at one end to a cross strut whereas the opposite end of the steering lever is guided within a steering cam. When pivoting the support a movement of the steering lever is transmitted to an extension member of the support to adjust the length of the support. The described mechanism leads to a complicated construction of the support making the support more expensive in production and fault prone.

**[0007]** Thus it is the object of the present invention to further develop a leg rest for a personal mobility vehicle and the known personal mobility vehicle as well as the method to adapt the length of a leg rest to overcome the disadvantages known in the state of the art, especially to provide a leg rest having a simple construction and simultaneously providing highest possible comfort for a person using the personal mobility vehicle.

**[0008]** The object with regard to the leg rest is reached in that the rotating guide device is eccentrically supported.

**[0009]** For the invention it is furthermore proposed that the guide member is pivotable connected to at least one seat, at least one seat frame and/or at least one support frame of the personal mobility vehicle.

**[0010]** In the above two described embodiments it is preferred that the guide member is pivotable between at least one first pivot position, in which the leg rest is preferably in at least one folded in position, and at least one second pivot position, in which the leg rest is preferably in at least one unfolded position, wherein especially the guide member is lockable in the first pivot position, the second pivot position and/or at least one third pivot position located between the first pivot position and the second pivot position.

**[0011]** For this leg rest the invention proposes that the guide member is movable into the direction of the second pivot position by at least one first biasing force generated by at least one first biasing device, wherein preferably the guide member is movable into the direction of the first pivot position, especially against the first biasing force, by at least one first gravitational force and/or by at least one manual force generated by a user of the personal mobility vehicle.

**[0012]** It is furthermore preferred that the extension position of the extension member is controllable depending on the pivot position of the guide member, especially the pivot position of the guide member with respect to the seating area.

**[0013]** An inventive leg rest can be characterized in that the extension member is movable between at least one first extension position, in which the leg rest has a first length, and at least one second extension position, in which the leg rest has a second length, wherein preferably the second length is greater than the first length and/or wherein the first extension position complies with the first pivot position of the guide member and/or the second extension position complies with the second pivot position of the guide member.

**[0014]** The above mentioned alternative can be furthermore characterized in that the extension member is movable into the direction of the second extension position by at least one second gravitational force and/or at least one second biasing force generated by at least one second biasing device, wherein preferably the extension member is movable into the direction of the first extension position by the pull and/or push device.

**[0015]** An inventive leg rest can be furthermore characterized by at least one foot rest member, especially in form of at least one foot rest plate, at least indirectly connected to the extension member, wherein preferably the foot rest member is movable, especially pivotable about at least one second pivot point with respect to the extension member.

**[0016]** In this embodiment the invention furthermore proposes that the foot rest member is connected to the extension member via at least one mounting member, wherein the mounting member is, especially telescopically, movable with respect to the extension member and/or securable at at least two different positions, especially by at least one securing member, with respect to the extension member, preferably to adjust a length of the leg rest, preferably the length of the leg rest in the first pivot position of the guide member.

**[0017]** Also it is preferred that the pull and/or push device comprises at least one bendable pull and/or push member, preferably comprising at least one belt, at least one strap and/or at least one, especially twisted, wire, wherein preferably the pull and/or push member comprises at least partly at least one structured surface area, especially comprising at least one tooth element.

**[0018]** The invention also proposes that the drive device comprises at least one winding device comprising the rotating guide device, wherein the push and/or pull member is especially rollable onto the winding device, preferably onto the rotating guide device, and/or the drive device comprises at least one redirection device comprising the rotating guide device, wherein the push and/or pull member is especially guidable by the redirection device.

**[0019]** Also an inventive leg rest can be characterized in that the rotating guide device comprises at least one drum, at least one roller and/or at least one disc and/or the rotating guide device has at least partly a circular, elliptical, rectangular, triangular and/or quadratic cross sectional form and/or comprises at least one surface being at least partly complementary to the structured sur-

face area of the pull and/or push member.

**[0020]** In an advantageous embodiment of the invention the leg rest has the feature that the drive device, especially the winding device, the redirection device and/or the rotating guide device, is/are in working relationship with the guide member, especially via at least one gear mechanism.

**[0021]** For this embodiment of the invention it is proposed that the gear mechanism comprises at least one first gear segment and/or at least one first sprocket at least indirectly connected to the guide member and/or at least one second gear segment and/or at least one second sprocket at least indirectly connected to the drive device, especially the winding device, the redirection device and/or the rotating guide device.

**[0022]** Another preferred embodiment of the invention can be characterized in that the gear mechanism provides a gear ratio step up of a pivoting of the guide member into a rotating of the drive device, especially the winding device, the redirection device and/or the rotating guide device.

**[0023]** Finally it is proposed for the leg rest that the first biasing device and/or the second biasing device comprise(s) at least one pneumatic spring, at least one coil spring, at least one helical spring and/or at least one torsion spring.

**[0024]** The object with regard to the personal mobility vehicle is reached by a personal mobility wheelchair comprising at least one inventive leg rest.

**[0025]** It is especially preferred that a personal mobility vehicle is realized in form of a wheelchair, especially a manual wheelchair and/or a power wheelchair.

**[0026]** The object with regard to the method for adapting the length of the leg rest is reached by a method for adapting the length of the leg rest, especially an inventive leg rest, of a personal mobility vehicle, especially an inventive personal mobility vehicle, wherein at least one extension member of the leg rest is moved with respect to a guide member of the leg rest by a push and/or pull device depending on a pivoting position of the guide member and wherein the pivot movement of the guide member is transmitted onto the pull and/or push device via at least one drive device comprising at least one rotating guide device being eccentrically supported and guiding the pull and/or push device.

**[0027]** For the method it is furthermore proposed that the movement of the guide member is transmitted via at least one gear mechanism onto the drive device, especially the rotating guide device.

**[0028]** In this embodiment of the invention it is furthermore proposed that the gear mechanism gears up the pivoting of the guide member with a ratio of at least 1:3, preferably at least 1:4, more preferably at least 1:5 and most preferably at least 1:6.

**[0029]** Finally the inventive method can be characterized in that the method further comprises the variation of a length of the extension member and/or the variation of a mounting position of a foot rest member mounted to

the extension member, wherein preferably the length of the extension member and/or the mounting position of the foot rest member is/are fixed during a pivoting of the guide member.

**[0030]** Thus the invention is based on the astonishing perception that by providing a drive device having an eccentrically supported rotating guide device a leg rest for a personal mobility vehicle, especially a wheelchair, may be provided that has a less complex construction but simultaneously allows a highest possible comfort for a person using the personal mobility vehicle, especially allowing a pivoting of a leg rest during which a pushing up of the legs of the person using the personal mobility vehicle is avoided and wherein it is secured that the feet of the person are all the time in contact with a foot rest member of the leg rest during the pivoting. An eccentric support means that the guide device is supported at an axis or at a point that is displaced with respect to an axis of symmetry of the guide device. The less complex construction reduces the costs for the leg rest so that it maybe for example used in power wheelchairs having an electric driven leg rest to reduce the costs for the wheelchair without reducing the comfort for a user.

**[0031]** The leg rest according to the invention allows it to be set to a first pivot position, for example perpendicular to a ground on which the personal mobility vehicle is staying, when a user of the personal mobility vehicle is transferring into the personal mobility vehicle, especially a wheelchair, and may be set to a second pivot position, for example to about 30° to 50° with respect to the first pivot position, when the user is sitting in the personal mobility vehicle. Especially the leg rest is mounted under a seat of the personal mobility vehicle, for example under the upper legs of the user, so that it is out of the way when the user is transferring into the personal mobility vehicle. The leg rest is adjustable in length so that the feet of the user are in contact with a foot rest member, for example a foot rest board or footplate, and simultaneously the calves of the legs of the user stay in contact with the leg rest, for example a calf pad, when the leg rest is angled to the second pivot position, for example up to 90°.

**[0032]** In case the leg rest is pivoted about a pivot point a guide member and an extension member are telescopically moving with respect to each other. Both the guide member as well as the extension member can be formed in form of tubes which are telescopically moving within each other so that an inner telescoping leg rest tube is guided by an outside tube. Inside the outside tube a push and/or pull device is connected to the inner tube. Especially the pull and/or push device may be formed by a belt. On the opposite side the pull and/or push device is connected to a rotating guiding device, for example in form of an eccentric drum. This eccentrically supported drum is driven by a gear mechanism which is mounted and/or connected to the guide member. Moving or pivoting the guide member makes the drum turn at a predefined ratio, for example 1:5. This will let the extension

member and thus the foot rest member move out of the guide member by a predefined distance, for example 7 cm, when the guide member is pivoted, for example by 45°, out of the first pivot position. Due to the eccentric support of the drum the movement of the extension member is not proportional to a pivot angle of the guide member. This secures that during a pivoting of the leg rest the feet of the person using the personal mobility vehicle are all the time in contact with the foot rest member, wherein simultaneously it is secured that the calves of the person stay in contact with the leg rest, especially a calf cushion.

**[0033]** Further features and advantages of the invention will become evident from the following description in which preferred embodiments of the invention in form of a central leg rest with length compensation for a wheelchair are explained by way of examples with reference to schematic drawings in which:

Figure 1: is a perspective view onto a leg rest according to the invention in a first or transfer position;

Figure 2: is another perspective view onto the leg rest of figure 1;

Figure 3: is a side view onto the leg rest of the figures 1 and 2;

Figure 4: is a detailed view onto a drive device of the leg rest of figure 3;

Figure 5: is a perspective view onto the drive device of figure 4 in a second or relaxed position;

Figure 6: is a perspective view onto a drum of the drive device of figure 5;

Figure 7: is a graph showing a length change of the leg rest depending on a pivot angle of the leg rest;

Figure 8: is a perspective view onto the leg rest of figure 1 in the second or relaxed position;

Figure 9: is another perspective view onto the leg rest of figure 8; and

Figure 10: is a side view onto the leg rest of figure 9.

**[0034]** In figure 1 a leg rest 1 is shown. The leg rest 1 is pivotable connected to a support frame 3 of a personal mobility vehicle in form of a wheelchair. The leg rest 1 is connected to the support frame 3 via a drive device 5, the function of which will be explained later in detail. The leg rest 1 comprises a guide member in form of an outer tube 7 being pivotable about a first pivot point 9 with respect to the support frame 3. Within the outer tube 7 an extension member in form of an inner tube 11 is tele-

scopically movable. A foot rest member in form of a foot rest plate 13 is connected to the inner tube 11 wherein the foot rest plate 13 is pivotable about a second pivot point 15.

**[0035]** As shown for example in figure 2, being another perspective view onto the leg rest 1 of figure 1, a calf cushion 17 is mounted to the outer tube 7 via mounting devices 19. As it can be especially taken further from figure 2 the foot rest plate 13 is connected to the extension member or the inner tube 11 via a mounting member in form of a third tube 21. The third tube 21 is telescopically moveable with respect to the inner tube 11 and can be secured in different positions with respect to the inner tube 11 via a securing member in form of a not shown screw screwed into a threaded opening 23. A movement of the tube 21 with respect to the inner tube 11 allows an adjustment of the length of the leg rest 1 to the leg length of a person using the personal mobility vehicle. In this way the leg rest is once configured to the needs of a user of the personal mobility vehicle.

**[0036]** In figure 3 the leg rest 1 of figures 1 and 2 is shown in a side view. As shown in figure 3 the leg rest 1 is in the figures 1 to 3 in a first pivot position or so-called transfer position. That means that the leg rest is in a folded in position that means in a position allowing a person to move onto or to leave the personal mobility vehicle. In this position the leg rest 1 is out of the way for the person when moving onto the seat of the wheelchair. In this transfer position the guide member in form of the outer tube 11 is in a first pivot position. For example an angle  $\alpha$  representing a pivot angle of the outer tube 7 with respect to a position perpendicular to a seating plane S or the seat frame or support frame 3 is  $-5^\circ$ . The extension member in form of the inner tube 11 is in a first extension position, especially the inner tube 11 is completely inside the outer tube 7 and the foot rest plate 13 is in an upmost position.

**[0037]** In the following the functionality of the drive device 5 is explained with the help of figures 4 to 7. In figure 4 a schematic view onto the drive device 5 is shown when the leg rest 1 is in the first or transfer position. The drive device 5 comprises a winding device in form of a drum 25. By means of the drum 25 a pull and/or push member in form of a belt 27 can be wound up. The belt 27 is connected to the inner tube 11. The drum 25 is connected to the outer tube 7 via a gear mechanism 29. The gear mechanism 29 comprises a first gear segment in form of a gear rim 31 mounted to the outer tube 7. Furthermore the gear mechanism 29 comprises a second gear segment in form of a sprocket 33 connected to the drum 25.

**[0038]** The gear mechanism 29 leads to the effect that a movement of the outer tube 7, that means a pivoting of the outer tube 7 about the first pivot point 9, will be transmitted via the gear rim 31 to the sprocket 33 so that the sprocket 33 is rotated about a rotating point 35. Due to the connection of the sprocket 33 to the drum 25 also the drum 25 is rotated. In figure 4 the belt 27, that pulls the foot rest plate 13 via the inner tube 11, is at an end

position of the drum 25. The drum 25 is rotated in a counter-clockwise direction in figure 4 when the outer tube 7 is pivoted about the first pivot point 9 in a clockwise direction. The clockwise pivoting of the outer tube 7 about the first pivot point 9 is supported in this embodiment by a first biasing device in form of a gas spring 37. This pivoting of the outer tube 7 effects that the belt 27 is unrolled from the drum 25. Due to a gravitational force, which can be supported by a biasing force generated by a not shown second biasing device, the inner tube 11 will move with respect to the outer tube 7, especially into a second extension position. Especially the inner tube 11 will move out of the outer tube 7 thus increasing the distance of the foot rest plate 13 and the first pivot point 9. Thus the length of the leg rest 1 is increased due to the pivoting of the outer tube 7.

**[0039]** Hence the leg rest 1 can be transferred into the position shown in figure 5 by pivoting the outer tube 7 into a second pivot position. In this position the leg rest 1 is in a so-called relax position. That means that the legs of a person using the personal mobility vehicle are in a lifted up position. The leg rest 1, especially the outer tube 7, may be lockable in the first and/or the second pivot position by a not shown locking device. In preferred embodiments the leg rest 1, especially the outer tube 7 may be further locked in at least one third intermediate pivot position to meet the requirements of a user of the wheelchair.

**[0040]** As can be taken from figure 5 the belt 27 is unrolled of the drum 25. The unrolling of the belt 27 of drum 25 allows the inner tube 11 to move a predetermined distance out of the outer tube 7. This distance could be for example 7 cm. This predetermined distance is mainly given by the extent of rotation of the drum 25 from the position shown in figure 4 to the position shown in the figure 5. For example drum 25 may rotate  $208^\circ$  around the rotating point 35. In the position shown in figure 5 the inner tube 11 has been for example pivoted around the pivot point 9 to an angle  $\alpha$  of  $45^\circ$ . To reach a rotation of drum 25 around  $208^\circ$  and pivoting the outer tube 7 from  $\alpha = -5^\circ$  to  $\alpha = 45^\circ$ , that means a pivoting about  $50^\circ$ , a gear mechanism 29 has a predetermined gear rate. For example this rate maybe 1:4,16. To reach this rate the gear rim 31 may have for example 50 teeth per  $360^\circ$  circumference whereas the sprocket may have 12 teeth per  $360^\circ$  circumference. Also other gear ratios can be used. In case it is wanted that the drum 25 should rotate  $270^\circ$  when pivoting the outer tube 7 from the first pivot position to the second pivot position by a pivoting of only  $45^\circ$  a gear ratio of 1:6 would be desirable. Thus the gear rim 31 may have 72 teeth per  $360^\circ$  circumference and the sprocket 33 may comprise 12 teeth per  $360^\circ$  circumference. A pivoting of the gear rim 31 about  $45^\circ$  will than turn the drum 25 via sprocket 33 about  $270^\circ$  allowing the belt 27 attached to the drum 25 to unroll and thus allowing the inner tube 11 to move downwards a predetermined distance defined by the circumference length of the drum 25, for example 70 mm. Thus the foot

rest plate 13 may be extended 70 mm outside the outer tube 7 for a length compensation. Setting the leg rest 1 back to the position shown in figures 1 to 4 will than turn the drum 25 backwards and the belt 27 will pull up the inner tube 11 within the outer tube 7.

**[0041]** In figure 6 drum 25 is shown in detail. Drum 25 comprises an opening 39 for a rotation of drum 25 about the rotating point 35. Furthermore drum 25 comprises an opening 41 to secure the belt 27 to the drum 25 by threading one end of the belt 27 through a slot 43 of the drum 25 to secure the belt 27 via a not shown securing device within the opening 41.

**[0042]** As further shown in figure 6 the opening 39 is according to the invention eccentrically located within drum 25. This leads to the result that a rotation of drum 25 from the position shown in figure 4 into the position shown in figure 5 unrolls belt 27 non-proportional from drum 25. Especially when starting the rotation from the position shown in figure 4 a smaller amount of the belt 27 is unrolled from drum 25 in comparison to the last part of the rotation before arriving at the position shown in figure 5. Thus the length of the leg rest 1 is increased less at the beginning of the rotation when compared to the increase of a length before arriving at the position shown in figure 5. A relationship between the change of length of the leg rest 1 in dependency on the angle  $\alpha$  is shown in figure 7.

**[0043]** For example the length of the foot rest 1 is extended by 12 mm when  $\alpha$  is increased from  $-5^\circ$  to  $5^\circ$ , is additionally increased by 14 mm to a total of 26 mm when the outer tube 7 is further pivoted to an increased angle  $\alpha$  of  $15^\circ$ . A further pivoting of the outer tube 7 to an angle  $\alpha = 30^\circ$  increases the length of the leg rest 1 by 19 mm to a total of 45 mm and an increase of angle  $\alpha$  to  $45^\circ$  increases the length of the leg rest 1 to a total of 70 mm by an increase of 25 mm. To reach such a stroke the opening 39 of drum 25 may be eccentric by 6 mm that means opening 39 is displaced by 6 mm from the axis of symmetry of the drum 25. This helps to achieve the needed reduced stroke stating at  $-5^\circ$  and the increased stroke towards  $45^\circ$ .

**[0044]** By this course of the stroke the inner tube 11 and the foot rest plate 13 move with respect to the outer tube 7 such that in every position during a pivoting of the leg rest 1 the feet of a user are supported by the foot rest plate 13 and simultaneously the calves of the user are supported by the leg rest 1. In figures 8 to 10 the leg rest 1 is shown in the second or relaxed position wherein the angle  $\alpha$  is  $+45^\circ$ . As can be seen by a comparison of figures 1 and 8, 2 and 9 and 3 and 10 respectively the inner tube 11 has been moved out of the outer tube 7. Especially in figure 9 the position of the inner tube 11 within the outer tube 7 can be seen. Especially the end of inner tube 11 opposite the foot plate 13 has moved downwards within the outer tube 7. In figure 10 the angle  $\alpha$   $45^\circ$  is drawn in.

**[0045]** In figures 8 to 10 the outer tube 7 is in a second pivot position, whereas the inner tube 11 is in a second

extension position. In the second extension position the length of the foot rest 1, wherein the length may be defined by the distance of the foot rest plate 13 and the first pivot point 9, is increased in comparison to the length of the foot rest 1 when the inner tube 11 is in the first extension position.

**[0046]** In another not shown embodiment a belt forming a pull and/or push member may be guided over a redirection device being eccentrically supported instead of being rolled on a eccentrically supported winding device like the drum 25. In this embodiment the movement of the pull and/or push member may be proportional to a movement of the guide member by winding the pull and/or push member onto a winding device linearly connected to the guide member. The eccentric support of the redirection device would allow that the extension member is moved in a non-proportional manner with regard to the movement of the guide member. Especially in this embodiment it is preferred that the redirection device and the pull and/or push member have complementary surface structures to avoid a slipping between the pull and/or push member and the redirection device that may be freely rotatable supported, especially not mechanically connected to the guide member and/or the winding device.

**[0047]** The features of the invention as disclosed in re-above description, in the drawings and in the claims may be essential for the implementation of a varying embodiments of the invention individually or in any desired combination.

#### Reference sign list

##### **[0048]**

1	leg rest
3	support frame
5	drive device
7	outer tube
9	pivot point
11	inner tube
13	foot rest plate
15	pivot point
17	calf cushion
19	mounting device
21	tube
23	threaded opening
25	drum
27	belt
29	gear mechanism
31	gear rim
33	sprocket
35	rotating point
37	gas spring
39	opening
41	opening
43	slot
S	seating plane

## Claims

1. Leg rest (1) for a personal mobility vehicle, comprising at least one guide member (7) being pivotable about a first pivot point (9) to at least one pivot position with respect to at least one seating area of the personal mobility vehicle and at least one extension member (11) being telescopically movable with respect to the guide member (7), the leg rest (1) further comprising at least one pull and/or push device (27) at least indirectly connected to the extension member (11) for controlling at least one extension position of the extension member (11) with respect to the guide member (7), wherein the pull and/or push device (27) is movable by at least one drive device (5) comprising at least one rotating guide device (25) guiding the pull and/or push device (27), **characterized in that**  
the rotating guide device (25) is eccentrically supported.
2. Leg rest according to claim 1, **characterized in that** the guide member (7) is pivotable connected to at least one seat, at least one seat frame and/or at least one support frame (3) of the personal mobility vehicle.
3. Leg rest according to claim 1 or 2, **characterized in that** the guide member (7) is pivotable between at least one first pivot position, in which the leg rest (1) is preferably in at least one folded in position, and at least one second pivot position, in which the leg rest (1) is preferably in at least one unfolded position, wherein especially the guide member (7) is lockable in the first pivot position, the second pivot position and/or at least one third pivot position located between the first pivot position and the second pivot position.
4. Leg rest according to claim 3, **characterized in that** the guide member (7) is movable into the direction of the second pivot position by at least one first biasing force generated by at least one first biasing device (37), wherein preferably the guide member (7) is movable into the direction of the first pivot position, especially against the first biasing force, by at least one first gravitational force and/or by at least one manual force generated by a user of the personal mobility vehicle.
5. Leg rest according to one of the preceding claims, **characterized in that** the extension position of the extension member is controllable depending on the pivot position of the guide member (7), especially the pivot position of the guide member (7) with respect to the seating area.
6. Leg rest according to one of the preceding claims, **characterized in that** the extension member (11) is movable between at least one first extension position, in which the leg rest (1) has a first length, and at least one second extension position, in which the leg rest (1) has a second length, wherein preferably the second length is greater than the first length and/or wherein the first extension position complies with the first pivot position of the guide member (7) and/or the second extension position complies with the second pivot position of the guide member (7).
7. Leg rest according to claim 6, **characterized in that** the extension member (11) is movable into the direction of the second extension position by at least one second gravitational force and/or at least one second biasing force generated by at least one second biasing device, wherein preferably the extension member (11) is movable into the direction of the first extension position by the pull and/or push device (27).
8. Leg rest according to one of the preceding claims, **characterized by** at least one foot rest member, especially in form of at least one foot rest plate (13), at least indirectly connected to the extension member (11), wherein preferably the foot rest member (13) is movable, especially pivotable about at least one second pivot point (15) with respect to the extension member (11).
9. Leg rest according to claim 8, **characterized in that** the foot rest member (13) is connected to the extension member (11) via at least one mounting member (21), wherein the mounting member (21) is, especially telescopically, movable with respect to the extension member (11) and/or securable at at least two different positions, especially by at least one securing member (23), with respect to the extension member (11), preferably to adjust a length of the leg rest (1), preferably the length of the leg rest (1) in the first pivot position of the guide member (7).
10. Leg rest according to one of the preceding claims, **characterized in that** the pull and/or push device comprises at least one bendable pull and/or push member, preferably comprising at least one belt (27), at least one strap and/or at least one, especially twisted, wire, wherein preferably the pull and/or push member (27) comprises at least partly at least one structured surface area, especially comprising at least one tooth element.
11. Leg rest according to one of the preceding claims, **characterized in that**

- the drive device (5) comprises at least one winding device comprising the rotating guide device (25), wherein the push and/or pull member (27) is especially rollable onto the winding device, preferably onto the rotating guide device (25), and/or the drive device comprises at least one redirection device comprising the rotating guide device, wherein the push and/or pull member is especially guidable by the redirection device.
12. Leg rest according to claim 11, **characterized in that**  
the rotating guide device comprises at least one drum (25), at least one roller and/or at least one disc and/or the rotating guide device has at least partly a circular, elliptical, rectangular, triangular and/or quadratic cross sectional form and/or comprises at least one surface being at least partly complementary to the structured surface area of the pull and/or push member (27).
13. Leg rest according to one of the preceding claims, **characterized in that**  
the drive device (5), especially the winding device, the redirection device and/or the rotating guide device (25), is/are in working relationship with the guide member (7), especially via at least one gear mechanism (29).
14. Leg rest according to claim 13, **characterized in that**  
the gear mechanism (29) comprises at least one first gear segment (31) and/or at least one first sprocket at least indirectly connected to the guide member (7) and/or at least one second gear segment and/or at least one second sprocket (33) at least indirectly connected to the drive device, especially the winding device, the redirection device and/or the rotating guide device (25).
15. Leg rest according to claim 13 or 14, **characterized in that**  
the gear mechanism (29) provides a gear ratio step up of a pivoting of the guide member (7) into a rotating of the drive device, especially the winding device, the redirection device and/or the rotating guide device (25).
16. Leg rest according to one of the preceding claims, **characterized in that**  
the first biasing device and/or the second biasing device comprise(s) at least one pneumatic spring (37), at least one coil spring, at least one helical spring and/or at least one torsion spring.
17. Personal mobility vehicle comprising at least one leg rest (1) according to one of the preceding claims.
18. Personal mobility vehicle according to claim 17 realised in form of a wheelchair, especially a manual wheelchair and/or a power wheelchair.
19. Method for adapting the length of a leg rest (1), especially a leg rest (1) according to one of the claims 1 to 16, of a personal mobility vehicle, especially a personal mobility vehicle according to claim 17 or 18, wherein at least one extension member (11) of the leg rest (1) is moved with respect to at least one guide member (7) of the leg rest (1) by a pull and/or push device (27) depending on a pivoting position of the guide member (7)  
**characterized in that**  
the pivot movement of the guide member (7) is transmitted onto the pull and/or push device (27) via at least one drive device (5) comprising at least one rotating guide device (25) being eccentrically supported and guiding the pull and/or push device (27).
20. Method according to claim 19, **characterized in that**  
the movement of the guide member (7) is transmitted via at least one gear mechanism (29) onto the drive device (5), especially the rotating guide device (25).
21. Method according to claim 20, **characterized in that**  
the gear mechanism (29) gears up the pivoting of the guide member (7) with a ratio of at least 1:3, preferably at least 1:4, more preferably at least 1:5 and most preferably at least 1:6.
22. Method according to one of the claims 19 to 21, **characterized in that**  
the method further comprises the variation of a length of the extension member (11) and/or the variation of a mounting position of a foot rest member (13) mounted to the extension member (11), wherein preferably the length of the extension member (11) and/or the mounting position of the foot rest member (13) is/are fixed during a pivoting of the guide member (7).

Fig. 1

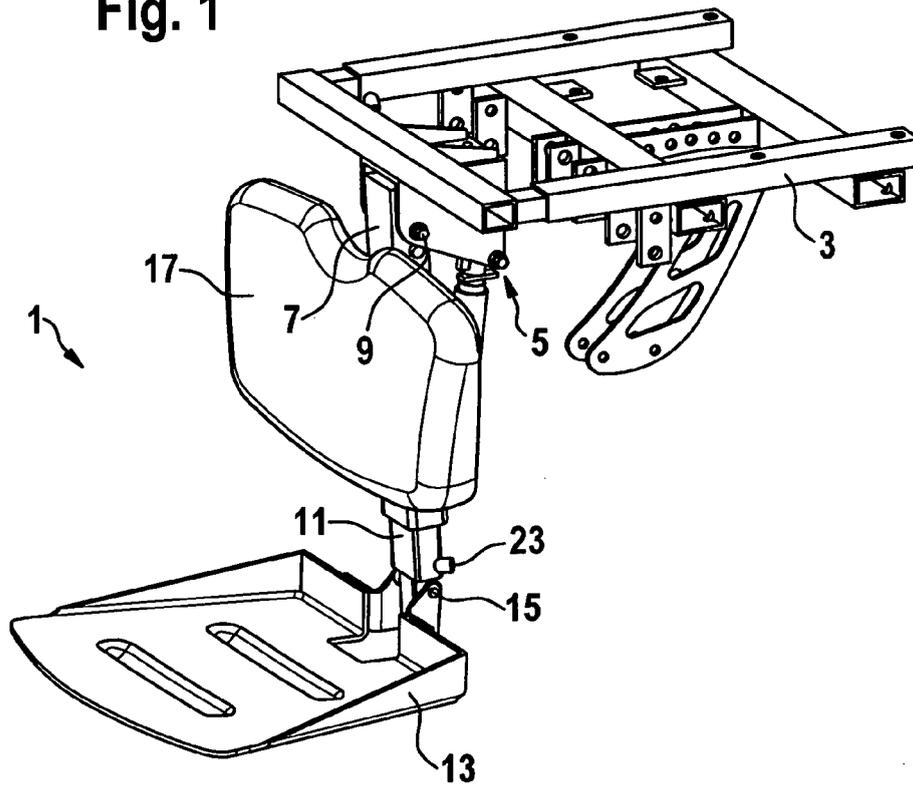


Fig. 2

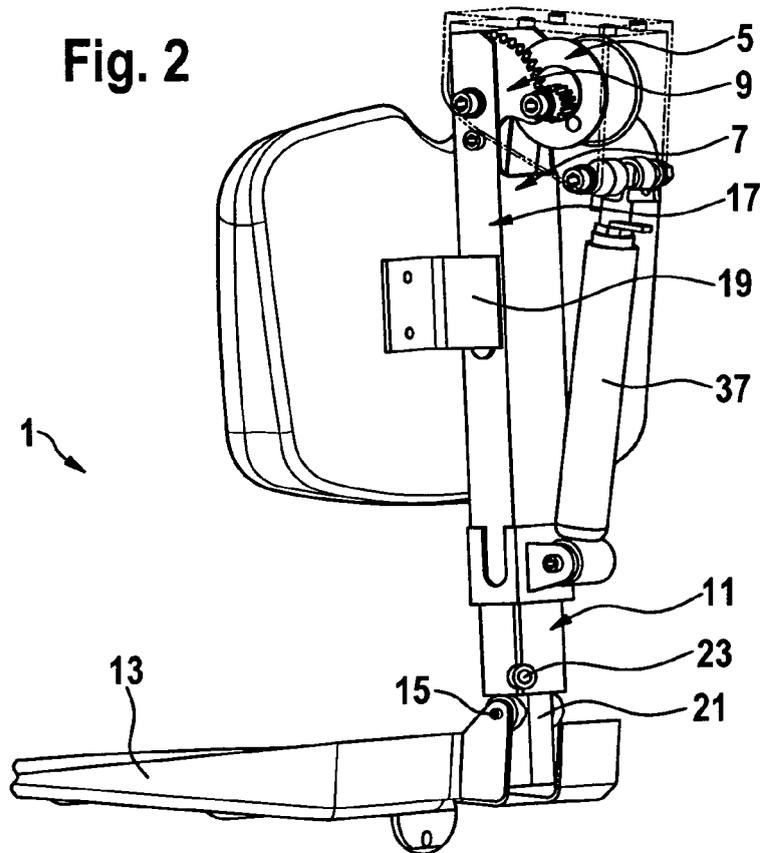


Fig. 3

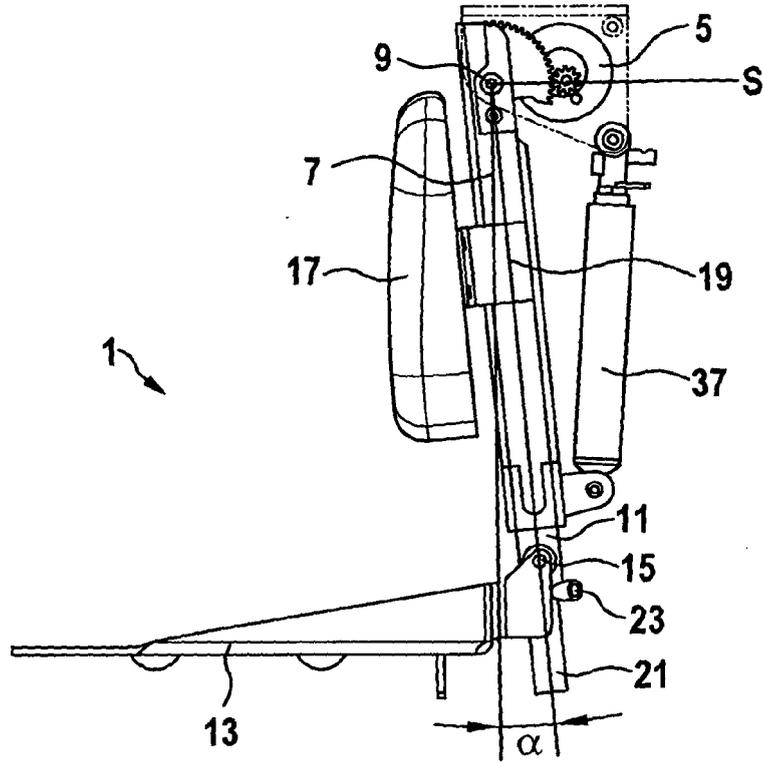
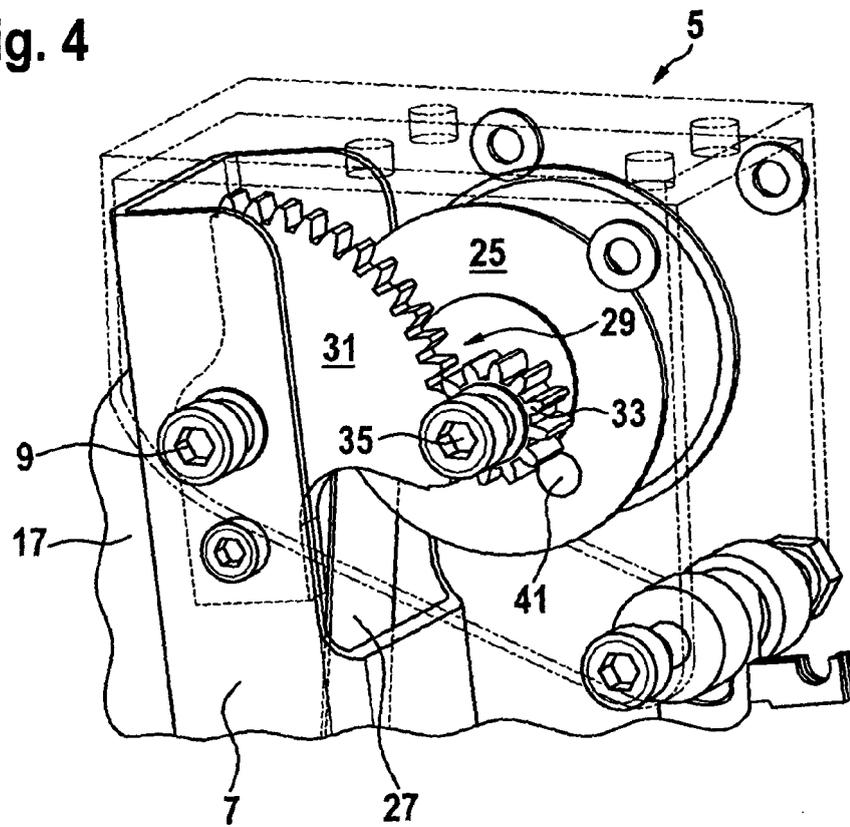
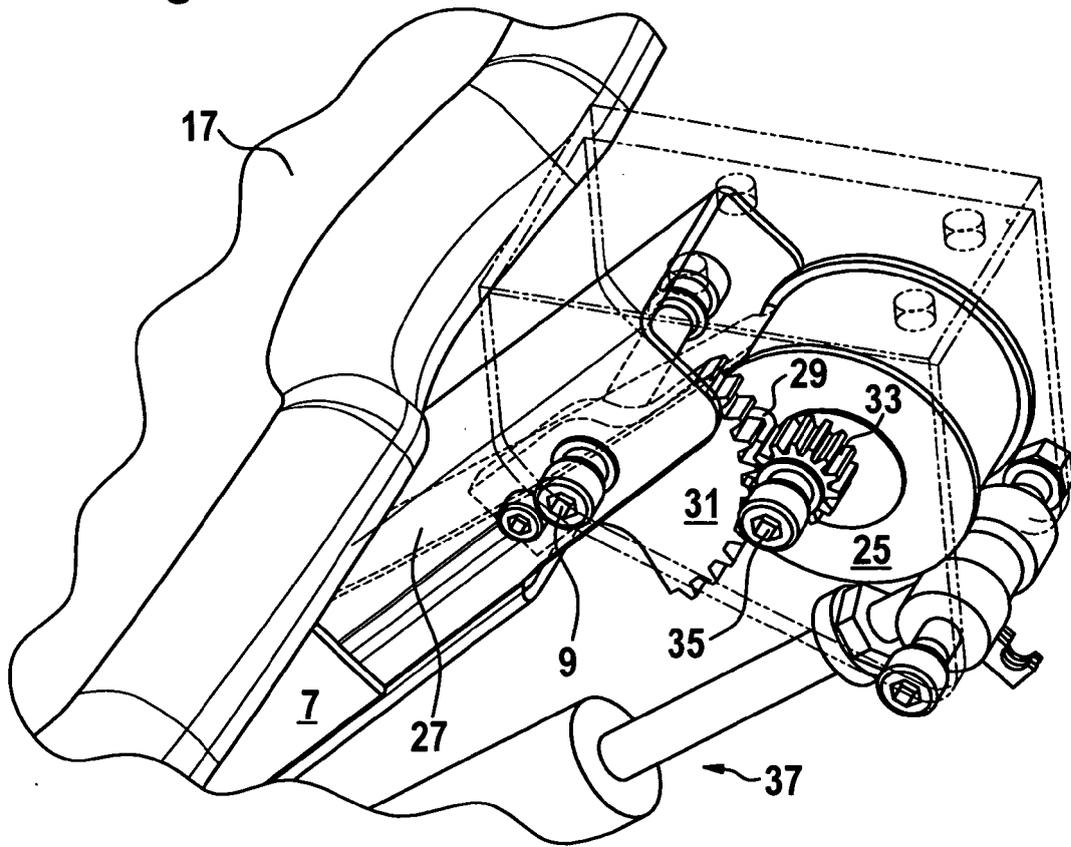


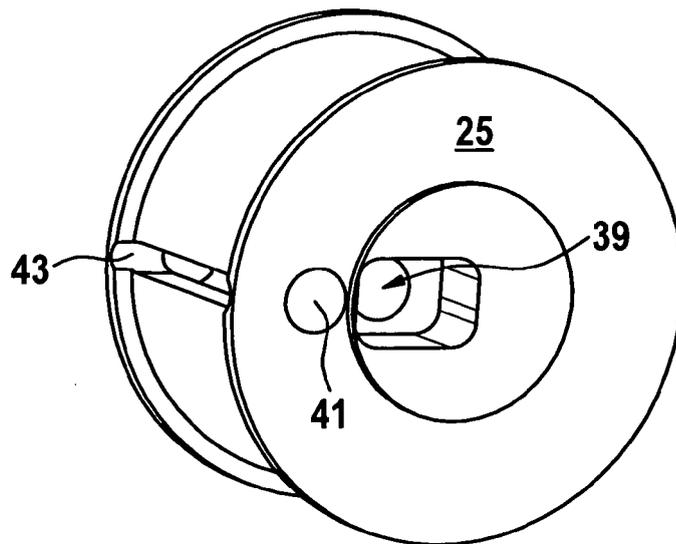
Fig. 4



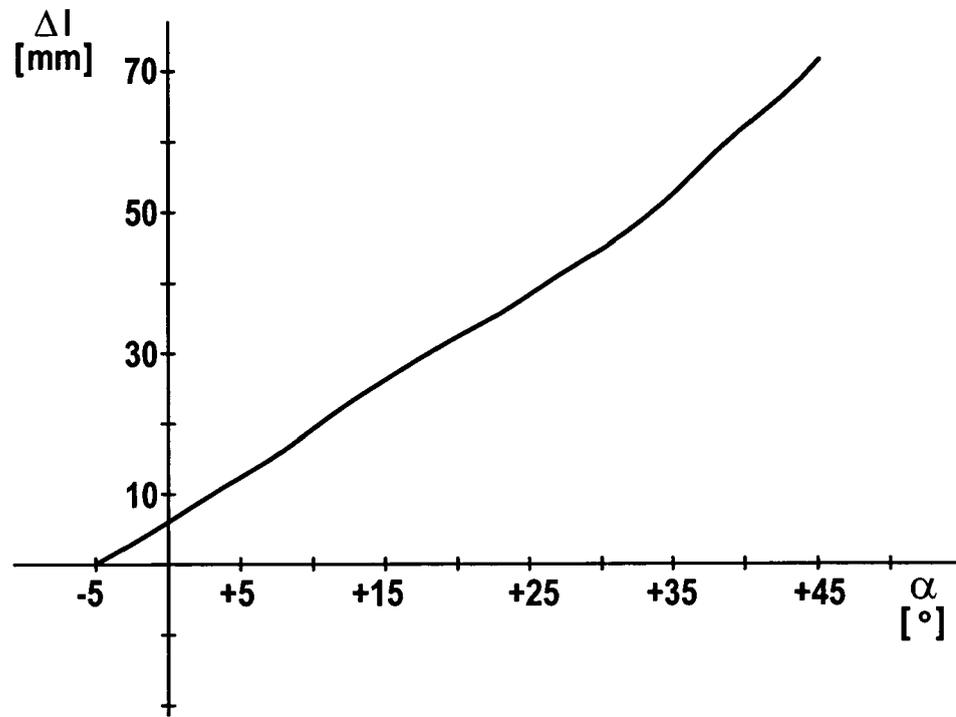
**Fig. 5**



**Fig. 6**



**Fig. 7**



**Fig. 8**

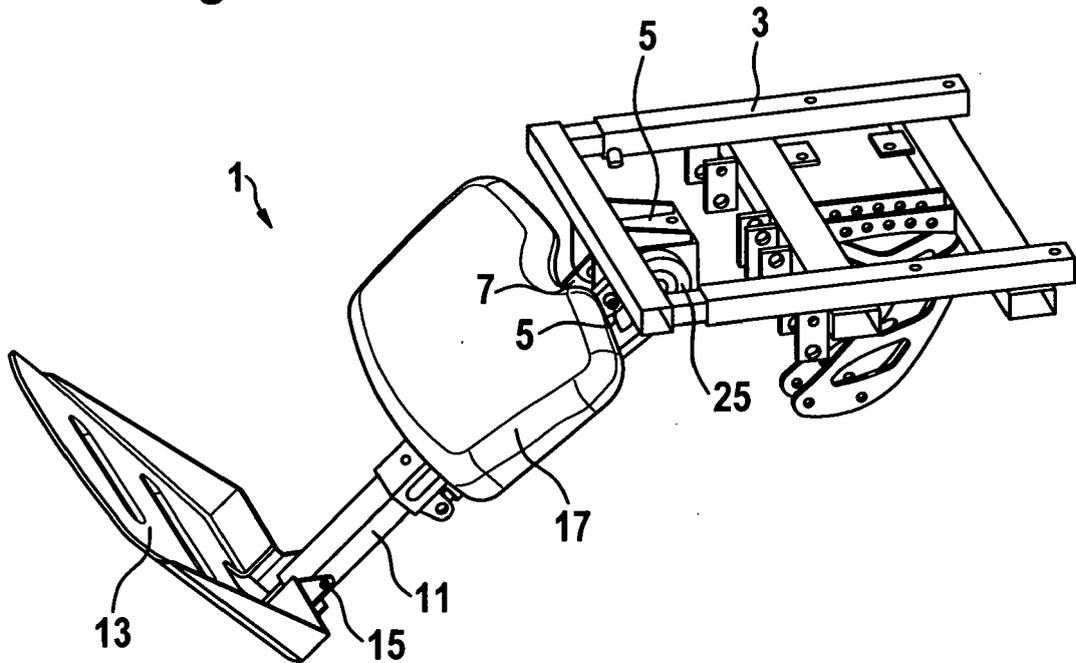


Fig. 9

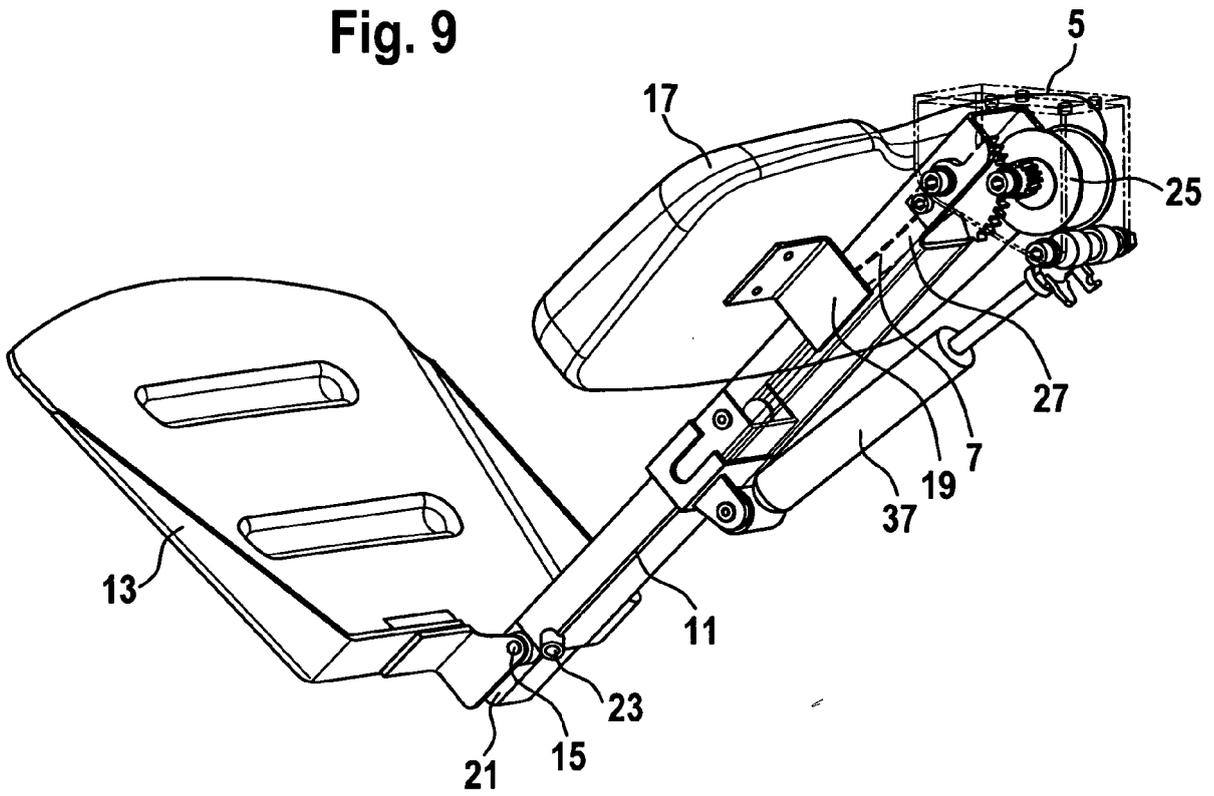
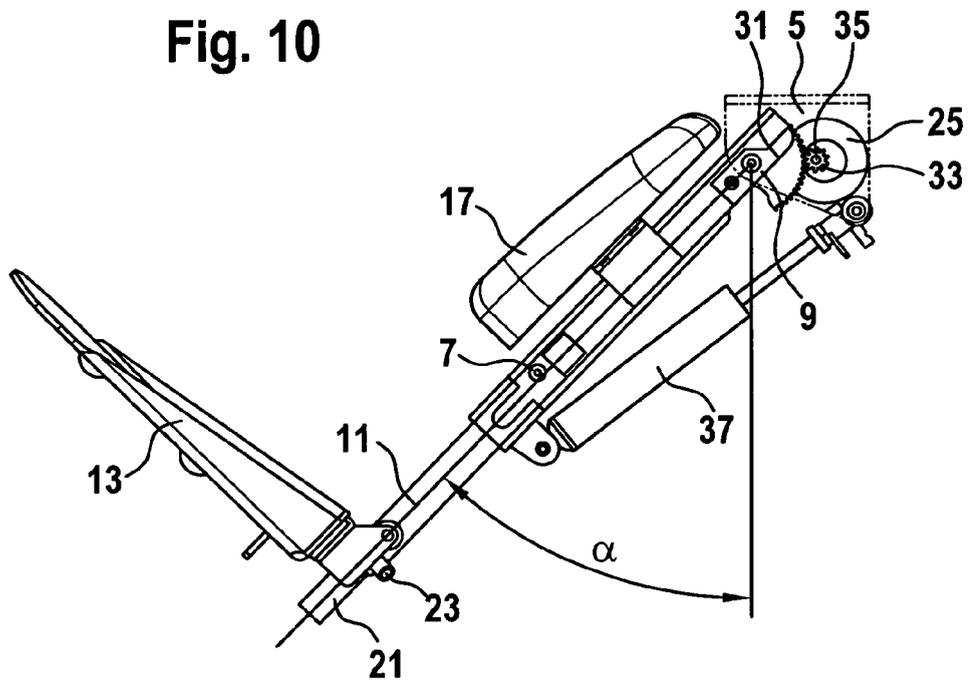


Fig. 10





DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 5 259 664 A (COTTLE DAVID [US]) 9 November 1993 (1993-11-09) * column 2, line 51 - column 4, line 3; figures 2-4 *	1-9, 16-22	INV. A61G5/12
A,D	DE 20 2005 004933 U1 (ELASTOFORM POLSTERMOEBELWERKE [DE]) 16 June 2005 (2005-06-16) * the whole document *	1-22	
A,D	DE 42 33 811 A1 (ORTOPEDIA GMBH [DE]) 14 April 1994 (1994-04-14) * the whole document *	1-22	
A	US 5 181 762 A (BEUMER ANTON H [NL]) 26 January 1993 (1993-01-26) * column 3, line 55 - column 4, line 38; figures 7-9 *	1-22	
A	US 2005/077701 A1 (BARLOW RICHARD T [US] ET AL) 14 April 2005 (2005-04-14) * the whole document *	1-22	
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		15 April 2008	Godot, Thierry
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	

EPO FORM 1503 03 82 (P04G01)

**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 07 02 2740

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on  
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

15-04-2008

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5259664 A	09-11-1993	NONE	
-----			
DE 202005004933 U1	16-06-2005	NONE	
-----			
DE 4233811 A1	14-04-1994	NONE	
-----			
US 5181762 A	26-01-1993	EP 0463652 A1	02-01-1992
		JP 5103818 A	27-04-1993
		NL 9001053 A	02-12-1991
-----			
US 2005077701 A1	14-04-2005	CA 2484429 A1	08-04-2005
		EP 1522297 A2	13-04-2005
-----			

**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**

- DE 4233811 A1 [0004] [0005]
- DE 202005004933 U1 [0006]