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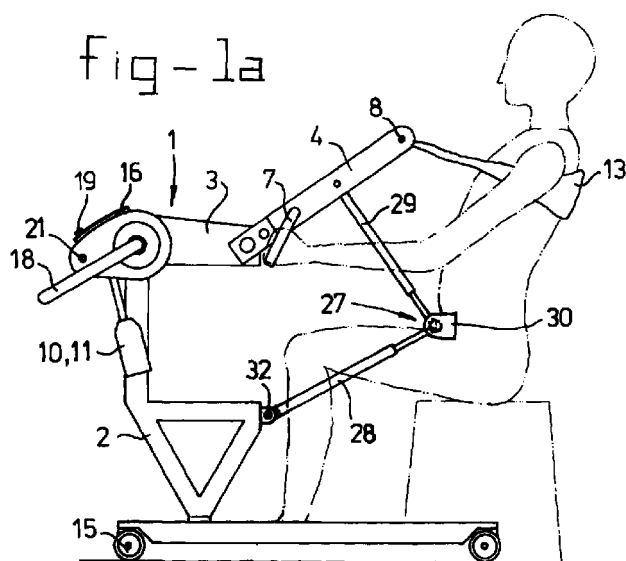
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(54) **Lift with pelvic support**

(57) Lift for raising persons from a seated position to a standing position and vice versa. This lift consists of a frame which extends essentially vertically and is of mobile construction. A lifting arm which is driven by a motor is located close to the top end. A support belt, support vest or the like is, on the one hand, attached to the free end of the lifting arm and, on the other hand, is arranged beneath the armpits or around the chest of the user. To enable the movement from the seated to the standing position to proceed with the maximum possible control it is proposed to fit a pelvic support which moves with the lifting arm during the standing movement.



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## Description

**[0001]** The present invention relates to a lift for raising persons from a seated position to a standing position and vice versa, comprising a frame which extends vertically in the use position and is provided close to the top end with a lifting arm, which lifting arm is mounted on the frame such that it is movable and is connected to motor means, the free end of the lifting arm being provided with a connection for a support belt, support vest or the like, said lift being provided with support means for supporting the body of said person during said lifting movement, which support means are mounted such that they are movable relative to said frame.

**[0002]** A lift of this type is disclosed in DE-A 1 944 764. This publication describes a construction with which the disabled person is supported with the aid of a movable knee support during movement from the seated to the standing position.

**[0003]** A lift with which a fixed knee support is used is described in European Patent EP 0 782 430 in the name of the Applicant.

**[0004]** Such knee supports are necessary when replacing the armpit support of the person concerned, consisting of a rigid metal construction, by more flexible support straps. Such support straps do not exert force on the region under the arms of the patient concerned but, on the other hand, introduce a certain instability. Therefore, it is proposed to use knee supports by which means the person to be lifted does not experience any unsteadiness during the lifting movement.

**[0005]** However, it has been found that as a result of the use of such a knee support a large group of patients cannot be lifted using such a support because of physical complaints. Examples of patients with such complaints are disabled persons with rheumatism, leg sores, poor circulation, rigid legs and stiff legs, however, it is precisely this group for which such lifts are intended.

**[0006]** In order to avoid this problem, in practice the knee support is frequently removed or a cushion or other soft object is placed between the knee support and the patient's knee.

**[0007]** It will be understood that this has the effect of restoring the unsteady position of the person to be lifted, caused by the support belt not being rigid. Moreover, it has been found that support at the knees does not approach the natural standing movement, that is to say does not stimulate the disabled person to stand up using his or her own strength as much as possible. This is partly caused because an appreciable force is exerted by the knee support on the patient. Some of this force is transmitted via the femur to the back of the disabled person and can give rise to further discomfort.

**[0008]** The aim of the present invention is further to improve the lift described above in such a way that this lift has a broader range of application and, moreover, as far as possible maintains the original impulses to stand up, that is to say stimulates the disabled person as far

as possible to perform him or herself the movements of which he/she is still capable or to expand this range of movement.

**[0009]** This aim is achieved with a lift as described above in that said support means comprise a pelvic support.

**[0010]** By engaging at the transition between the lower abdomen and the bottom of the hips, which is indicated above as pelvic support, the stress on the disabled person during lifting is appreciably less. Patients with the conditions described above can be lifted without any problem. It has also been found that if patients have a stoma or the like, these patients are not troubled, or are barely troubled, by the pelvic support according to the invention. The force exerted on the pelvic support during lifting is appreciably lower. Measurements have shown that this is at most 25 kg. Moreover, the distance from the vertebrae is appreciably smaller and transmission of the forces takes place through an appreciably stronger part of the body, as a result of which complaints by disabled persons are appreciably reduced.

**[0011]** Because the pelvic support, or the point of engagement thereof on the human body, moves with the patient during lifting, this gives a safe sensation. Moreover, the pelvic support engages on the patient approximately "halfway" between the rest point of the patient's feet and the point of engagement of the support belt, support vest or the like. That is to say a more stable support is obtained than is the case with the knee support with which, although the lower leg was supported particularly well, the portion between the knee and the armpits was able to execute a free movement and did execute such a movement in the case of weak patients.

**[0012]** The support means or pelvic support described above can comprise any construction which can be envisaged in the state of the art. Preferably, the various features are constructed as a support arm. This can be constructed as a single or double arm. In the former case this arm will preferably extend between the legs of the patient to be lifted and in the latter case the two arms will extend on either side of the patient's legs. Movement of the support arm can be realised by any means known in the prior art. For instance, it is possible to fit a motor or to couple the movement of the support arm with the movement of the lifting arm with the aid of some sort of transmission. According to an advantageous embodiment of the invention, the position of the support arm is determined with the aid of spring pressure, said arm striving, in particular, to assume the position for sitting the patient down. Consequently, on standing up a certain opposing force will be generated, which provides the disabled person with precisely the stability that is desired.

**[0013]** According to an advantageous embodiment of the invention, a support body is mounted at the end of the support arm described above. This support body can comprise any construction known in the prior art

which bears on the user's body. In the case of a single support arm this support body can be, for example, a horizontal transverse bar which is provided with a strap at the front, that is to say on the side facing the person to be lifted. However, a cushion-like component can also be present.

**[0014]** According to a further advantageous construction, the support arm is hingeably mounted on the frame and the hinge point is lower than or at the same height as the seat of the patient concerned. This means that the support arm extends somewhat obliquely upwards even in the seated position, so that movement to a more vertical position is possible fairly simply, which movement takes place when the patient stands up. The support arm can have any desired shape and in a preferred embodiment is constructed as a curved arm. With this arrangement a more vertical section extends from the frame, on to which more vertical section a horizontal section abuts which is optionally connected to the support body described above.

**[0015]** According to a further variant of the invention, the support arm is connected to an auxiliary arm. This auxiliary arm can, for example, be connected to the lifting arm. By this means it is possible to achieve a more forced movement of the support body, which is optionally mounted close to the end of the support arm or auxiliary arm.

**[0016]** Furthermore, it is possible, both in the first embodiment described above and in the embodiment described thereafter, to construct the support arm, and in the last embodiment also the auxiliary arm, as a telescopic arm. If, moreover, the aim is for a resilient nature, it is particularly simple to construct these components as a gas spring.

**[0017]** The invention also relates to a support vest which in a particularly effective manner engages both on the connection of the lifting arm of the lift and on the pelvic support according to the invention. By this means the position of the person to be lifted is virtually completely fixed and a particularly broad support on the body of such a person is obtained.

**[0018]** The invention also relates to a method for moving a person from a seated to a standing position and vice versa, comprising engaging said patient around the back by means of a strap, vest or the like and moving the person from a seated to a standing position, and vice versa, by moving said strap, vest or the like forwards and upwards, the feet of said person resting on the ground and a further part of the body being supported, characterised in that during lifting the body is supported close to the transition from thigh to lower abdomen.

**[0019]** According to an advantageous embodiment, this support takes place dynamically, that is to say the support moves at least partially with the movement of the strap, vest or the like.

**[0020]** The invention will be explained in more detail below with reference to illustrative embodiments shown

in the drawing. In the drawing:

Fig. 1a shows, diagrammatically, a side view of a first embodiment of the invention with the patient seated;

Fig. 1b shows, in perspective, a detail of the support body according to Fig. 1a;

Fig. 2 shows the lift according to Fig. 1 with the patient in the standing position;

Fig. 3 shows a further embodiment of the lift according to the invention with the patient in the seated position; and

Fig. 4 shows the lift according to Fig. 3 with the patient in the standing position.

**[0021]** In Fig. 1 a lift is indicated in its entirety by 1. For details of such a lift reference is made to EP 0 782 430 B1. The embodiments described in the latter patent are applicable in full to the present application with the exception of the knee support shown in that patent. According to the invention this knee support is now replaced by a pelvic support to be described below.

**[0022]** The device indicated by 1 is provided with a frame 2 which extends in the vertical direction and is mounted on a mobile sub-frame, the wheels of which are indicated by 15. Two parts of a lifting arm are indicated by 3 and 4. Movement of lifting arm 3 is controlled by motor 10, whilst the movement of lifting arm 4 is controlled by motor 11. Details of the transmission from lifting arm 4 to motor 11 can be seen from European Patent 0 782 430 B1 described above. The disabled person can place his or her feet either on the existing floor or on a footplate which is mounted on the frame.

**[0023]** 7 shows a grab bar which can be gripped by the disabled patient. It must be understood that gripping with the hands is not necessary for the lift to function. A connection for a strap 13 is indicated by 8. This connection can consist of pins, hooks and the like. Furthermore, it is possible to use a safety closure, such as is found with safety belts in cars. Operation of lift 1 takes place with the aid of a control 16 mounted on a console 19. This control comprises a memory in which manipulations possibly related to the patient can be stored. Moreover, it is possible to store operating data in the event of malfunction. The results can be read out with the aid of a read-out socket 21 to which a PC can be connected. A handle for moving the device is indicated by 18.

**[0024]** The pelvic support according to the invention is indicated in its entirety by 27. This support consists of two arms; a support arm 28 and an auxiliary arm 29. Support arm 28 is hingeably attached to the frame at 32. Both arms consist of telescopic gas springs and the ends are connected to a support 30. The support 30 extends over the width of the front of the patient's body and is provided at the front, that is to say on the side facing the patient, with a strap 26 which is in contact with the patient's lower abdomen or thighs, as shown in Fig.

1. The strap 26 can be depressed approximately 5 cm with respect to the connections at the ends of support 30.

**[0025]** If the patient is moved from the seated position shown in Fig. 1 to the standing position shown in Fig. 2, the lifting arm assembly 3, 4 will execute a complex movement as described in the abovementioned European Patent 0 782 430 B1. It must be understood that auxiliary arm 29 can be connected to any lifting arm known from the prior art for any lift. As arm 4 moves upwards auxiliary arm 29 will move upwards with it and support 30 will be pulled to the left in the drawing, as can be seen from Fig. 2. By constructing the arms as a resilient construction, geometrical differences can easily be taken up. The construction is designed such that on standing up the patient will always experience a certain support, ranging from a few kilograms to approximately 25 kg, by the support 30 and more particularly by the belt 26 attached thereto.

**[0026]** A further variant of the invention is shown in Figs 3 and 4. With this variant there is no auxiliary arm and the pelvic support 37 consists of a curved support arm 38 made up of arm sections 39 and 40, arm section 39 being hingeably joined to frame 2 at 41, whilst arm section 40 is fixed to support 30, which can be constructed in a manner corresponding to that in Fig. 1a. Arrow 42 shows the effect of a spring, which is not shown, which drives pelvic support 37 towards the patient. Because of the presence of the pelvic support, on standing up the patient will experience an opposing force, by which means stabilisation is provided. It is, of course, possible to fit the motorised construction, optionally coupled with the effect of the operating motors 10 and 11, instead of or as well as the spring construction, which is not shown.

**[0027]** In the embodiment according to Figs 3 and 4 the support strap is indicated by 34. This strap can be provided with linking strap 35, which in turn can be connected to a flexible hip strap 36. Hip strap 36 is connected to the support 30. A sort of support vest is produced by this means. It is, of course, possible to make linking strap 35 a rigid construction. The only essential aspect of this construction is that a sort of vest is obtained by means of which the patient can be brought from a seated to a standing position. It is, of course, possible to provide further support at the front of the body of the disabled person by suitable design of the vest.

**[0028]** It has been found that a particularly large number of disabled patients with a wide variety of complaints are moved from a seated to a standing position using the above construction and in doing so are always stimulated to be as active as possible themselves. It will be understood that the construction of the pelvic support described above can be employed with any other type of lift that is known from the prior art without going beyond the scope of the claims as appended.

## Claims

1. Lifting device (1, 31) for raising persons from a seated position to a standing position and vice versa, comprising a frame (2) which extends vertically in the use position and is provided close to the top end with a lifting arm (3, 4), which lifting arm is mounted on the frame such that it is movable and is connected to motor means (10, 11), the free end of the lifting arm being provided with a connection (5) for a support belt (13), support vest (33) or the like, said lift being provided with support means for supporting the body of said person during said lifting movement, which support means are mounted such that they are movable relative to said frame, characterised in that said support means comprise a pelvic support (27, 37).
2. Lift according to Claim 1, wherein said pelvic support comprises a support arm (28, 38).
3. Lift according to Claim 2, wherein said support arm is spring-loaded in such a way that it biases the free end in the horizontal direction.
4. Lift according to Claim 2 or 3, wherein the end of said support arm comprises a support body (26, 30).
5. Lift according to one of Claims 2 - 4, wherein said support arm is hingeably (32, 42) mounted on said frame at a point at the same height as or lower than the height of the seat.
6. Lift according to one of Claims 2 - 5, wherein the support arm comprises a curved arm, that part of which that is joined to the frame extending more vertically than the part located close to the free end of the arm.
7. Lift according to one of the preceding claims, wherein said support comprises a support arm and an auxiliary arm (29) which is joined to said support and influences the movement of said support arm (28).
8. Lift according to Claim 7, wherein the end of said support arm comprises a support body, which support body is mounted such that it is movable relative to said support arm.
9. Lift according to Claim 8, wherein said support body is mounted such that it is telescopic with respect to said support arm.
10. Lift according to one of Claims 7 - 9, wherein said auxiliary arm is attached to said lifting arm.

11. Lift according to one of Claims 7 - 10, wherein said auxiliary arm is attached to said support body.
12. Support vest to be used in a lift according to one of the preceding claims, which support vest comprises a support strap (34) to be fitted beneath the armpits of the user and to be fixed to the lifting arm of the lift, a hip strap (36) to be fitted around the hips of the user and to be attached to the pelvic support of the lift and a component (35) which links the hip strap and support strap. 5 10
13. Method for moving a person from a seated to a standing position and vice versa, comprising engaging said patient around the back by means of a strap, vest or the like and moving the person from a seated to a standing position, and vice versa, by moving said strap, vest or the like forwards and upwards, the feet of said person resting on the ground and a further part of the body being supported, characterised in that during lifting the body is supported close to the transition from thigh to lower abdomen. 15 20
14. Method according to Claim 13, wherein said support takes place dynamically. 25

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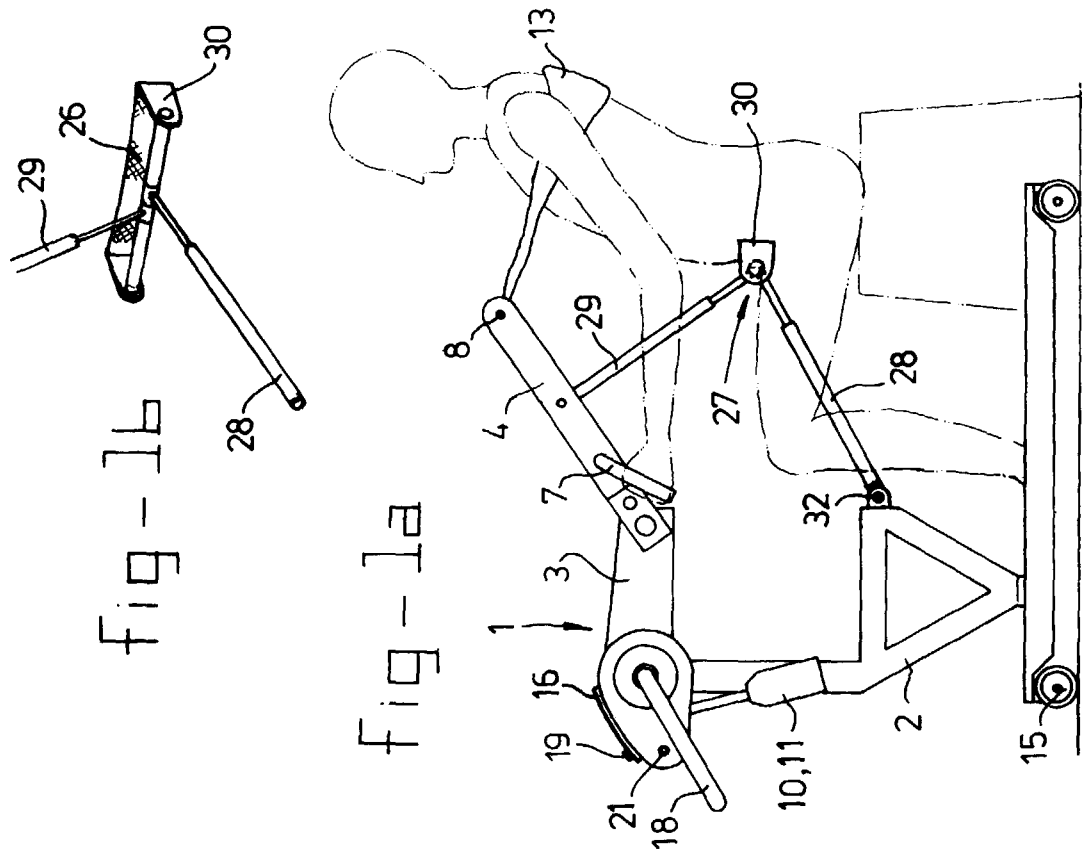
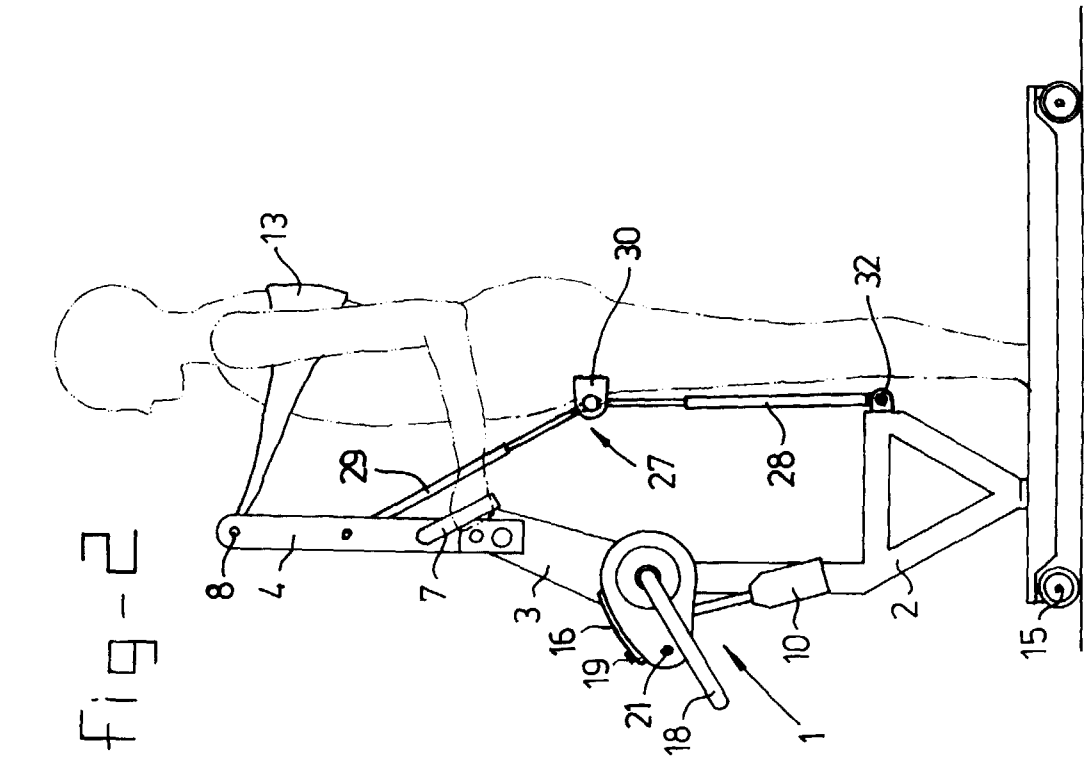


fig-4

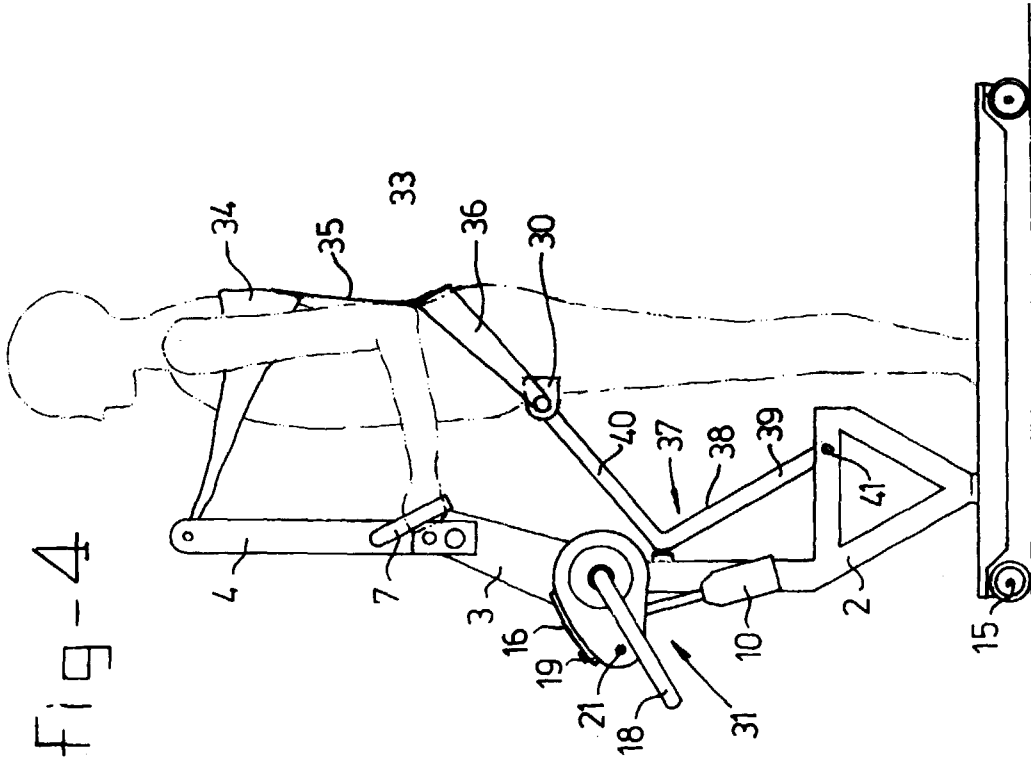
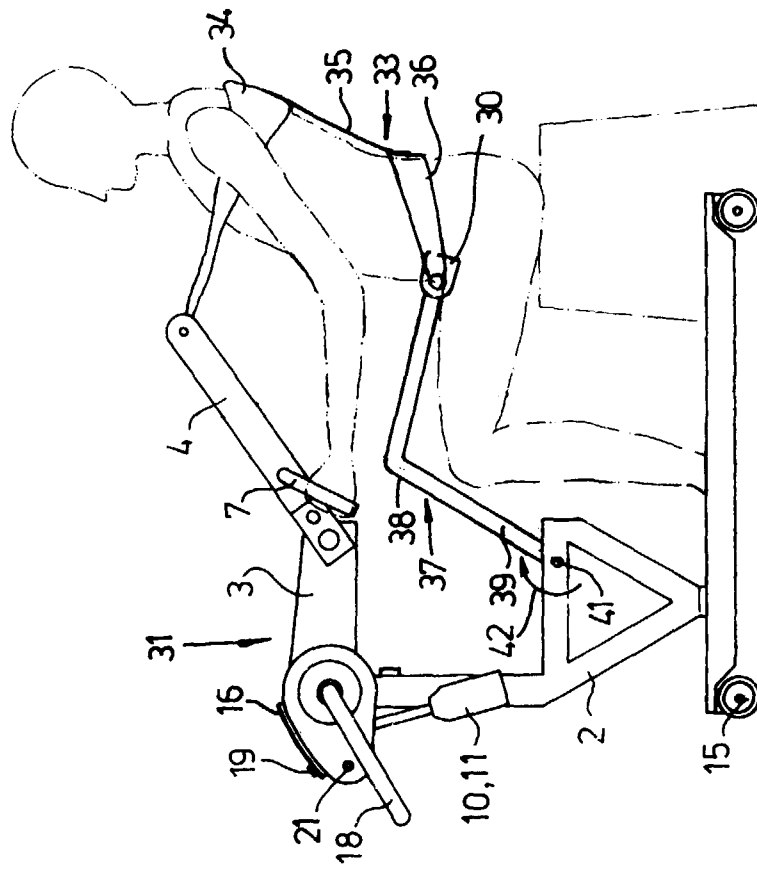


fig-3





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# EUROPEAN SEARCH REPORT

Application Number  
EP 00 20 0953

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A	WO 96 11658 A (IKEDAMOHANDO CO LTD ;FUNAKI MISAKO (JP)) 25 April 1996 (1996-04-25) * page 15, line 19 - page 17, line 22; figures 1,3,7-9 * * page 11, line 9 - line 17 *	1, 12, 13	A61G7/10
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D	& EP 0 782 430 A 9 July 1997 (1997-07-09)		
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
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The present search report has been drawn up for all claims			
Place of search <b>THE HAGUE</b>		Date of completion of the search <b>22 June 2000</b>	Examiner <b>Baert, F</b>
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  
ON EUROPEAN PATENT APPLICATION NO.**

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
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