(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 031 337 A1

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
30.08.2000 Bulletin 2000/35

(51) Int. Cl.[7]: **A61G 5/14**

(21) Application number: **00200413.3**

(22) Date of filing: **08.02.2000**

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **22.02.1999 NL 1011365**

(71) Applicant: **Soweco N.V.**
7602 PD Almelo (NL)

(72) Inventors:
- **Giesen, Leonardus Henricus Wilhelmus**
  7511 BA Enschede (NL)
- **Nijsen, Andreas Jacobus Louis**
  7521 AT Enschede (NL)

(74) Representative:
Prins, Hendrik Willem
Arnold & Siedsma,
Advocaten en Octrooigemachtigden,
Sweelinckplein 1
2517 GK Den Haag (NL)

(54) **Adjustable chair**

(57) The invention relates to an adjustable chair, which comprises:

- a chassis;
- an adjustable frame arranged on the chassis;
- a seat arranged on the frame such that the seat is translatable and rotatable relative to the chassis;
- a seat back arranged on the frame such that the seat back is translatable and rotatable relative to the seat; and
- blocking means for blocking the frame in a chosen and adjusted position;

wherein the seat is rotatable round a first rotation zone, for instance a rotation axis, relative to the chassis and the seat back is rotatable round a second rotation zone, for instance a rotation axis, relative to the seat,

this such that the rotation zones between upper body and lower body and between upper legs and lower legs of a person sitting in the chair correspond with said respective rotation zones of the chair.

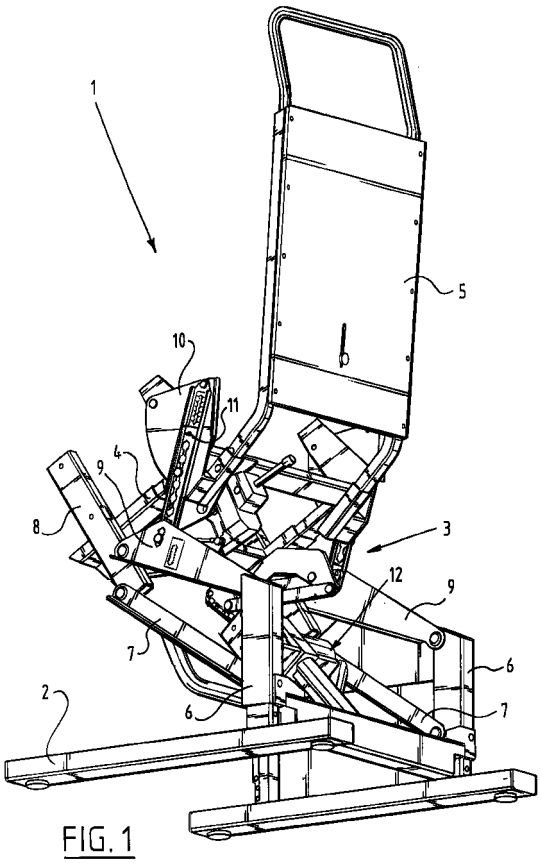


FIG. 1

EP 1 031 337 A1

Description

[0001] The invention relates to an adjustable chair which can be used for instance for people with leg problems. People who are older and the physically disabled may have the limitation that they have difficulty being able to move from a sitting position to a standing position.

[0002] Adjustable chairs are known which can be adjusted between a sitting position and a position wherein the user is assisted in standing up. Such known chairs can also assume a reclining position.

[0003] The known chairs have the drawback however that clothing of the person is shifted during the adjustment, whereby for instance an undershirt is pulled out of the trousers. Adjustment hereby becomes uncomfortable. Particularly in the case of people who sit in the chair for long periods and who cannot shift position easily, there is an additional great drawback here. The shifted clothing causes pressure points on the body which are painful. Decubitus can result from these pressure points.

[0004] It is an object of the invention to prevent the above stated drawbacks. This is achieved with an adjustable chair according to the invention which comprises:

- a chassis;
- an adjustable frame arranged on the chassis;
- a seat arranged on the frame such that the seat is translatable and rotatable relative to the chassis;
- a seat back arranged on the frame such that the seat back is translatable and rotatable relative to the seat; and
- blocking means for blocking the frame in a chosen and adjusted position;
  wherein the seat is rotatable round a first rotation zone, for instance a rotation axis, relative to the chassis and the seat back is rotatable round a second rotation zone, for instance a rotation axis, relative to the seat,

    this such that the rotation zones between upper body and lower body and between upper legs and lower legs of a person sitting in the chair correspond with said respective rotation zones of the chair.

[0005] Because the rotation zones of the chair correspond with the rotation zones of the body, the seat and the seat back will not shift relative to the body during adjustment of the chair. This will prevent clothing for instance being displaced. In addition, a comfortable adjustable chair is hereby obtained, wherein the user can remain seated in the chair, can adjust the chair and, in contrast to known chairs, does not have to change position in order once again to assume a comfortable position in the chair.

[0006] In a preferred embodiment of the invention the chair comprises a lower leg support arranged on the adjustable frame such that the lower leg support is translatable and rotatable relative to the chassis and wherein the lower leg support is rotatable round the first rotation zone. With this lower leg support a comfortable position can be taken up, particularly in a reclining position.

[0007] In a further embodiment the lower leg support comprises a base part, an extending part arranged therein and an upholstery fabric arranged with one side on the top part of the base part, wherein the fabric runs over the free end of the extending part and wherein the other end of the fabric is arranged in spring-loaded manner on the underside of the base part. Because of structural limitations it is not normally possible to give the lower leg support a length such that the whole of the lower legs is supported. In order to obviate this the lower leg support is extensible. In order to minimize the shear forces between the upholstery and the body, the fabric is fixed to the upper part of the base part and unrolls under the lower leg of the user when the lower leg support is extended.

[0008] In a preferred embodiment of the adjustable chair the adjustable frame comprises a rod mechanism. More particularly the adjustable frame comprises a first quadrangular rod mechanism or four-rod mechanism and a second quadrangular rod mechanism or four-rod mechanism, wherein both rod mechanisms have two rod parts in common. Such a rod mechanism can ensure that the rotation zones of the chair correspond with the rotation zones of the body of the person. A rod mechanism has the further advantage that these are simple structural elements with which a complex movement of rotation zones, seat and seat back can be obtained making use of only one driven rod. The necessity for a number of motors with a complex control is hereby obviated.

[0009] In a preferred embodiment of the invention the seat is arranged on a rod part of the first rod mechanism and the seat back is arranged on a rod part of the second rod mechanism.

[0010] It is possible to make any chair to size for a specific person. It is however preferred that the distance between two pivot points of a rod be adjustable. The adjustable chair according to the invention can hereby be adapted to a large number of people of specific sizes.

[0011] In order to facilitate operation, the adjustable chair according to the invention comprises in a preferred embodiment controllable drive means for placing the seat back and the seat in a chosen position. In a specific embodiment of the invention the drive means herein comprise only one motor. It is possible to move the chair with only this single motor. This is very advantageous from an economic viewpoint.

[0012] In further embodiments of the adjustable chair according to the invention, this chair can comprise

height-adjustable armrests, the seat back can comprise an adjustable head rest, or the seat back can comprise an inflatable lumbar support. These specific embodiments increase the sitting comfort of the chair.

[0013] In yet another embodiment of the chair according to the invention the chair can be dismantled into parts. Since such chairs can easily weigh about 50 kg, it is very advantageous if the chair can be dismantled into manageable parts so that the chair can be readily transported.

[0014] In a further preferred embodiment of the adjustable chair according to the invention the first and/or the second rotation zone are virtual. This has the advantage that the physical rotation points of the adjustable frame can be situated for instance under the chair, while the rotation zones of the chair continue to correspond with the rotation zones of the body of a person.

[0015] In yet another preferred embodiment of the chair according to the invention the chair is adjustable such that the net shear force between the seat and the person sitting in the chair is substantially zero. The above mentioned decubitus is a combination of shear forces acting on pressure points on the skin and in the skin. In a normal chair the mass of the upper body of a person tends to press the lower body out of the chair. Since normal chairs are provided with a covering, this will be prevented by friction. This friction does however cause a shear force. By now adjusting the seat and the seat back such that the lower body tends to slide toward the seat back, the shear force resulting from the mass of the upper body is now eliminated. This considerably reduces the chance of decubitus.

[0016] These and other features of the invention will be further elucidated with reference to the annexed drawings.

Figure 1 shows a perspective view of a chair according to the invention;
figures 2, 3 and 4 show the chair of figure 1 in respectively an active sitting position, a "stand-up" position and a reclining position;
figure 5 shows a schematic outline of a second embodiment of a lower leg support;
figure 6 shows a perspective view of a first embodiment of a lower leg support;
figure 7 shows a second embodiment of the chair with dismantled parts; and
figure 8 is a perspective view of the assembled chair of figure 7.

[0017] Figure 1 shows a perspective view of a chair according to the invention. The adjustable chair 1 comprises a chassis 2, an adjustable frame 3, which is further elucidated hereinbelow, a seat 4 and a seat back 5.

[0018] Adjustable frame 3 comprises two rod mechanisms, of which the first rod mechanism is formed by rods 6, 7, 8 and 9. With a view to the stability of the chair, this rod mechanism takes a dual form. Rod 6 of the first rod mechanism forms part of chassis 2. The second rod mechanism is formed by two rod parts of rods 8 and 9 and further rods 10 and 11. The seat is arranged on rod 8 and seat back 5 is arranged on rod 10 of the first respectively the second rod mechanism.

[0019] The chair further comprises a motor 12 with which both the first and the second rod mechanism can be driven. This drive 12 also serves as blocking for blocking the adjustable frame 3 in a desired and set position.

[0020] Figures 2, 3, 4 show three different positions of the chair. These positions are obtained by operating drive 12. Figure 2 shows an active sitting position, figure 3 a "stand-up" position and figure 4 a reclining position. The virtual rotation points V1, V2, which in this embodiment takes a real form, of the adjustable chair are such that they correspond in each position of the chair with the rotation points of the body of a person sitting in the chair. The virtual rotation point V1 herein corresponds with the knee joint and virtual rotation point V2 corresponds with the hip joint.

[0021] As shown inter alia in figure 2 and figure 4, the positions of the seat and the seat back are such that the person in the chair does not slide out of the chair. The mutual positions of seat 4 and seat back 5 are such that no shear forces occur between seat 4 and the lower leg of the person.

[0022] Figure 5 shows a schematic outline of a second embodiment of the lower leg support. This lower leg support 17 comprises a base part 18, an extending part 19 and a fabric 20 which is arranged on the top side of base part 18 and is arranged on the underside under spring load of extending part 19. As extending part 19 slides out the fabric 20 will not now shift relative to the lower leg of a person. Fabric 20 unrolls as it were under the lower leg.

[0023] Figure 6 shows a lower leg support which can be mounted on the chair according to figure 1 and as shown in figures 7 and 8. This lower leg support 13 comprises a cushion 14, a rod mechanism 15 and a drive 16.

[0024] Figure 7 shows a perspective view with dismantled parts of a chair according to the invention, which is fully upholstered. Figure 8 shows the assembled embodiment of the chair according to the invention. Armrests 22 are herein also arranged.

[0025] As can be seen in for instance figure 1, rods 11 are adjustable in length and the height of adjustable frame 3 relative to chassis 2 is adjustable. In addition, the positions of the rotation points are adjustable. It is hereby possible to adapt the chair to the measurements of the specific user.

[0026] According to a further embodiment of the invention the chair can comprise an adjustable head rest and a lumbar support. The rests are further adjustable in height as well as in mutual distance.

[0027] Because the chair, as shown in figure 7, can be dismantled into parts and because the adjustable

frame 3 is adjustable, it is possible with a limited number of components to provide chairs fully made to size for the user. For this purpose the adjustable frame is first adjusted to the measurements of the person. A choice from a limited number of cushions for seat and seat back is then made subject to the measurements. A particular colour can likewise be chosen here.

[0028] Although the chair can support the whole movement of the person standing up, it is desirable from a health viewpoint to limit the standing up setting to a determined maximum. The person will hereby continue to train the muscles needed for standing up. This limitation can be embodied mechanically, but can likewise be arranged in an optional control.

Claims

1. Adjustable chair, which comprises:

- a chassis;
- an adjustable frame arranged on the chassis;
- a seat arranged on the frame such that the seat is translatable and rotatable relative to the chassis;
- a seat back arranged on the frame such that the seat back is translatable and rotatable relative to the seat; and
- blocking means for blocking the frame in a chosen and adjusted position;

wherein the seat is rotatable round a first rotation zone, for instance a rotation axis, relative to the chassis and the seat back is rotatable round a second rotation zone, for instance a rotation axis, relative to the seat,

this such that the rotation zones between upper body and lower body and between upper legs and lower legs of a person sitting in the chair correspond with said respective rotation zones of the chair.

2. Adjustable chair as claimed in claim 1, wherein the chair comprises a lower leg support arranged on the adjustable frame such that the lower leg support is translatable and rotatable relative to the chassis and wherein the lower leg support is rotatable round the first rotation zone.

3. Adjustable chair as claimed in claim 2, wherein the lower leg support comprises a base part, an extending part arranged therein and an upholstery fabric arranged with one side on the top part of the base part, wherein the fabric runs over the free end of the extending part and wherein the other end of the fabric is arranged in spring-loaded manner on the underside of the base part.

4. Adjustable chair as claimed in claim 1, wherein the adjustable frame comprises a rod mechanism.

5. Adjustable chair as claimed in claim 1, wherein the adjustable frame comprises a first quadrangular rod mechanism or four-rod mechanism and a second quadrangular rod mechanism or four-rod mechanism, wherein both rod mechanisms have two rod parts in common.

6. Adjustable chair as claimed in claim 5, wherein the seat is arranged on a rod part of the first rod mechanism and wherein the seat back is arranged on a rod part of the second rod mechanism.

7. Adjustable chair as claimed in claim 3 or 4, wherein the distance between two pivot points of a rod is adjustable.

8. Adjustable chair as claimed in claim 1, which chair comprises controllable drive means for placing the seat back and the seat in a chosen position.

9. Adjustable chair as claimed in claim 8, wherein the drive means comprise only one motor.

10. Adjustable chair as claimed in claim 1, wherein the chair comprises height-adjustable armrests.

11. Adjustable chair as claimed in claim 1, wherein the chair can be dismantled into parts.

12. Adjustable chair as claimed in claim 1, wherein the seat back comprises a head rest.

13. Adjustable chair as claimed in claim 12, wherein the head rest is adjustable.

14. Adjustable chair as claimed in claim 1, wherein the seat back comprises an inflatable lumbar support.

15. Adjustable chair as claimed in claim 1, wherein the first and/or the second rotation zone is virtual.

16. Adjustable chair as claimed in claim 1, wherein the chair is adjustable such that the net shear force between the seat and the person sitting in the chair is substantially zero.

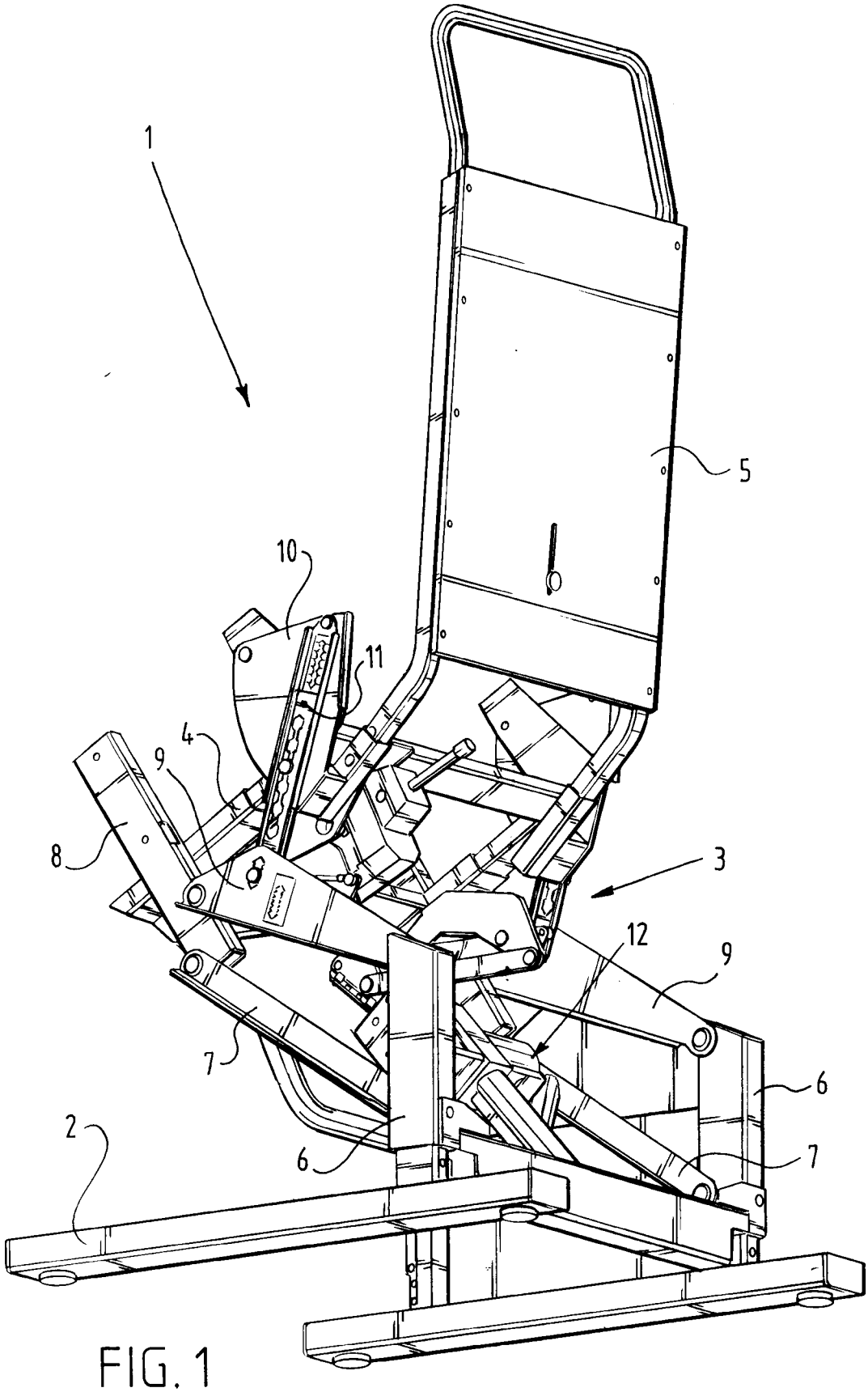
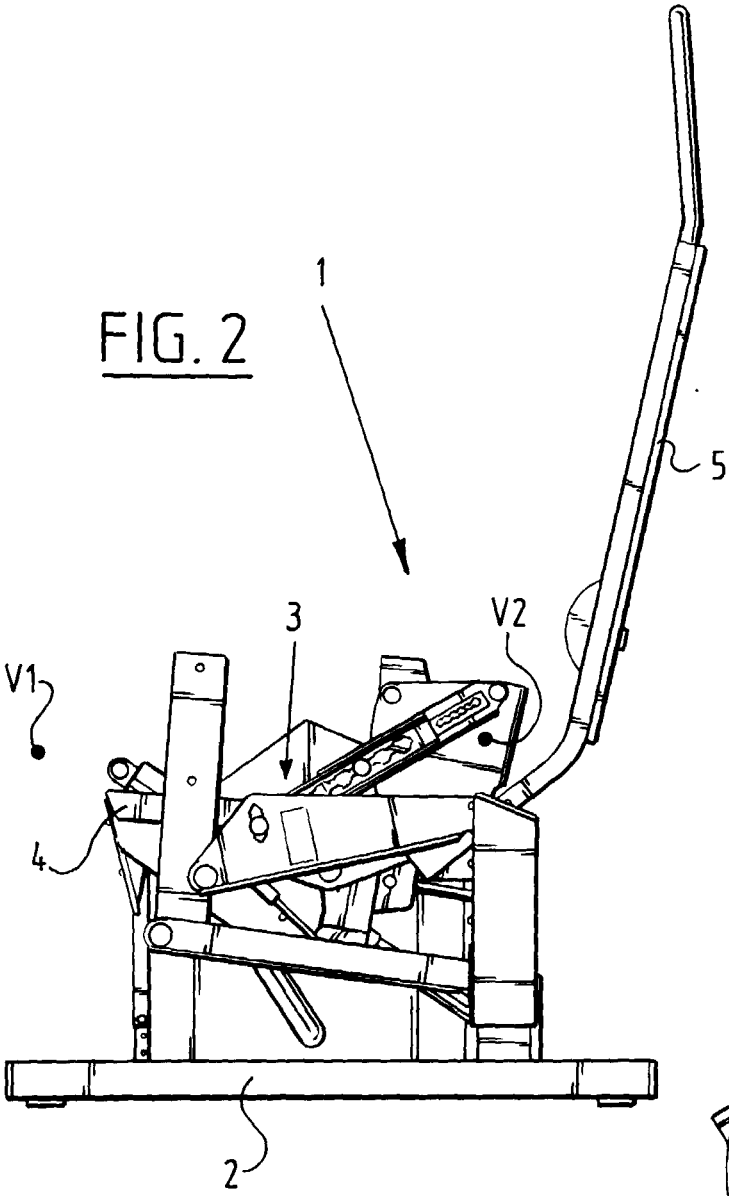


FIG. 1

FIG. 2



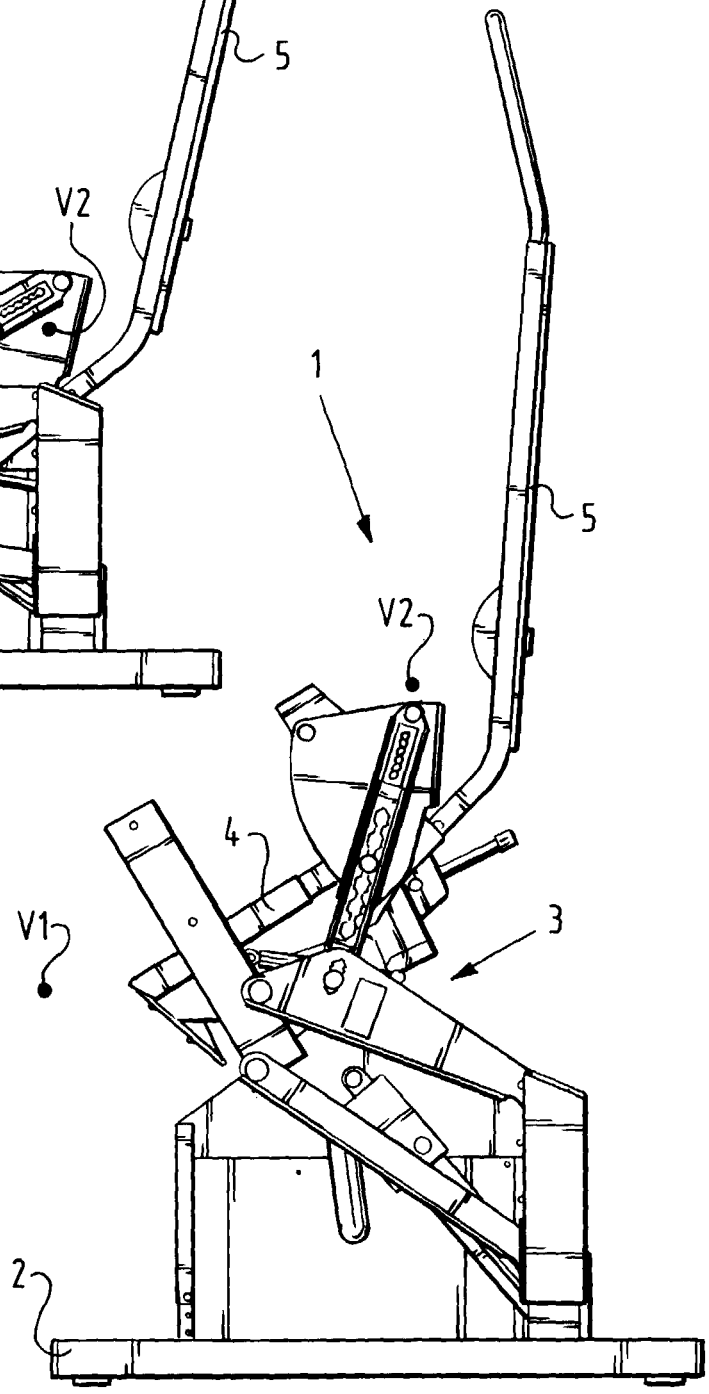


FIG. 3

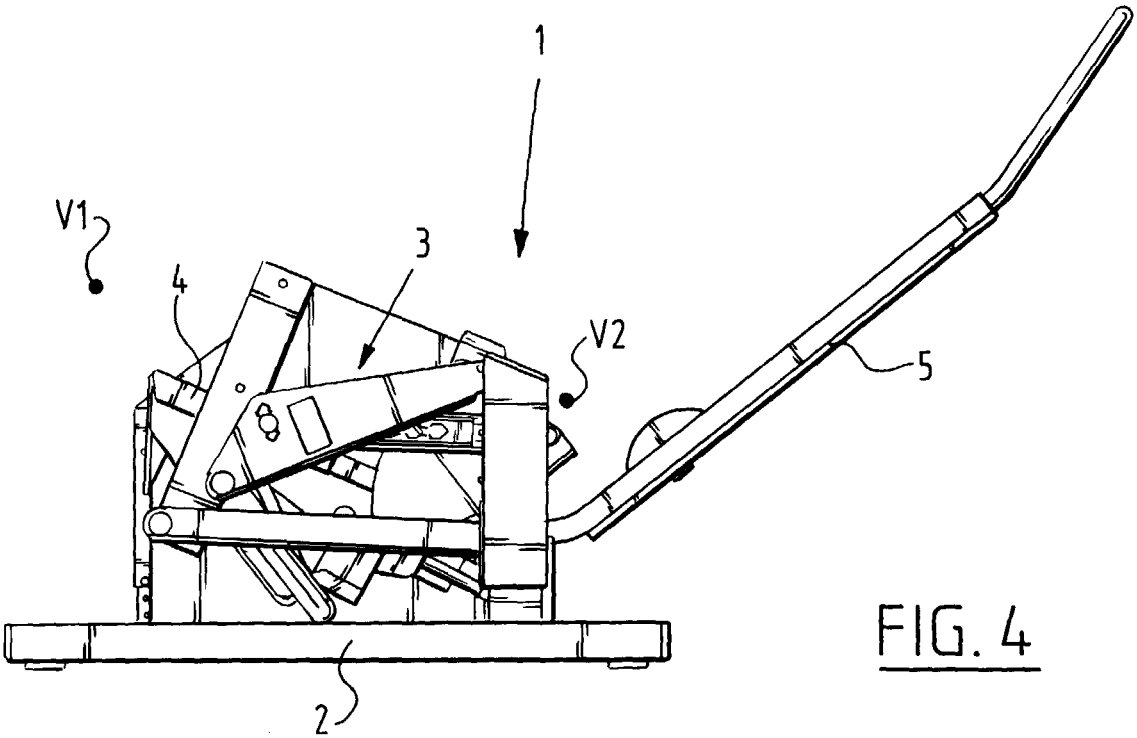


FIG. 4

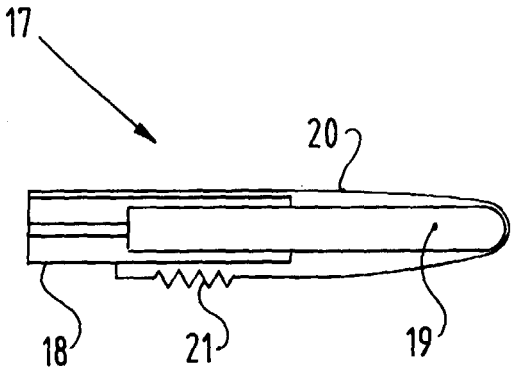


FIG. 5

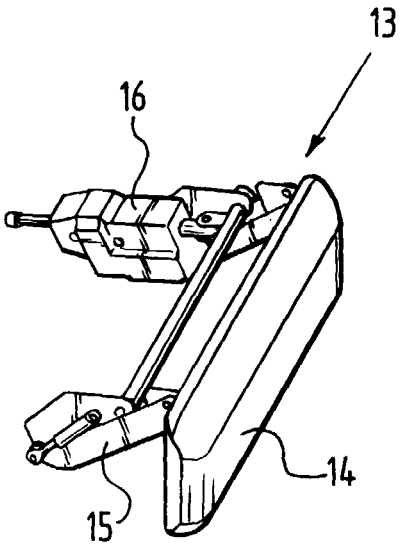


FIG. 6

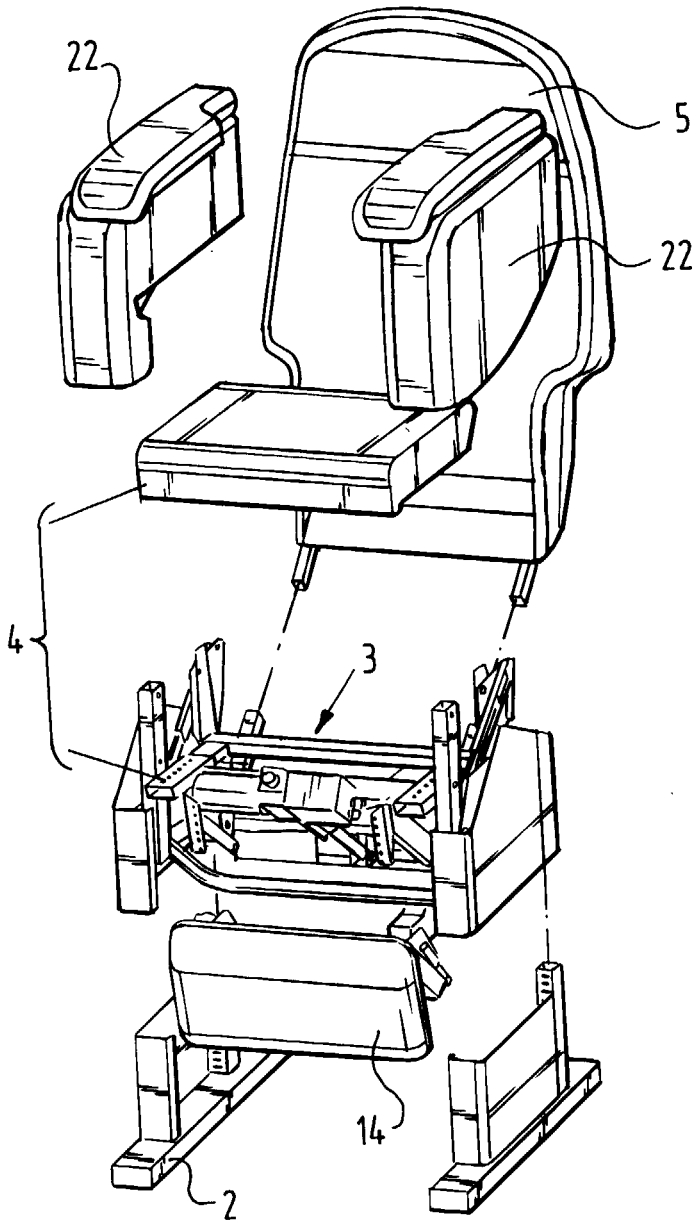


FIG. 7

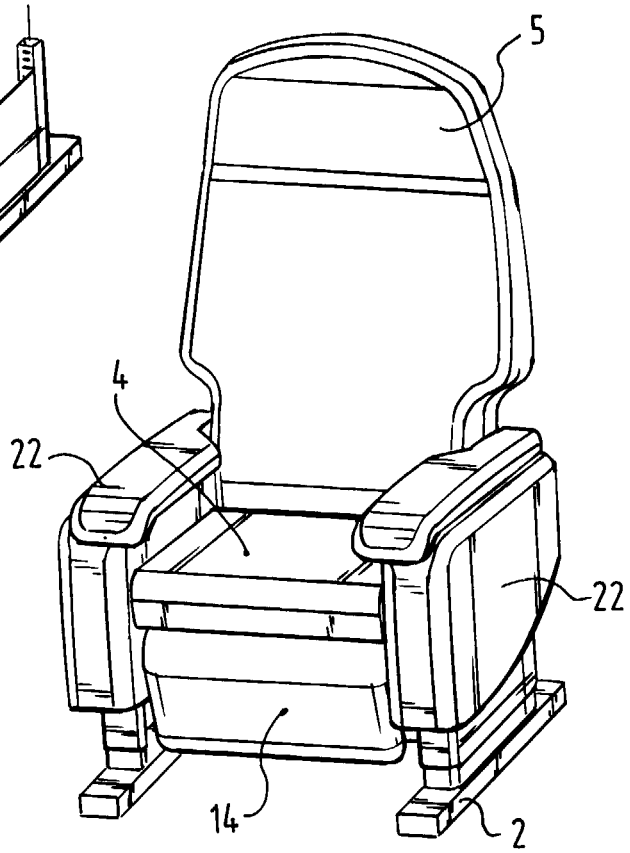


FIG. 8

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 00 20 0413

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)
X Y	WO 82 01314 A (CHURCHWARD ROGER) 29 April 1982 (1982-04-29) * page 4, line 10 - page 9, line 17; figures 1-6 *	1,4,5,8, 9,15,16 11-13	A61G5/14
A Y	US 5 024 486 A (AUEL CARL C) 18 June 1991 (1991-06-18) * column 3, line 29 - line 41; figures *	1-3 11-13	

TECHNICAL FIELDS SEARCHED (Int.Cl.7)

A61G

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	19 May 2000	Godot, T

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 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 00 20 0413

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.

19-05-2000

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 8201314 A	29-04-1982	EP 0062656 A	20-10-1982
US 5024486 A	18-06-1991	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82