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(54) **Moving means of an inclinable or articulated backrest joined to a chair**

(57) This is a new way of moving an inclinable or articulated backrest joined to a seat that has, in addition to the normal variation of the angle of inclination with respect to the seat, a further unrestricted inclination within a defined range. (Fig.16)

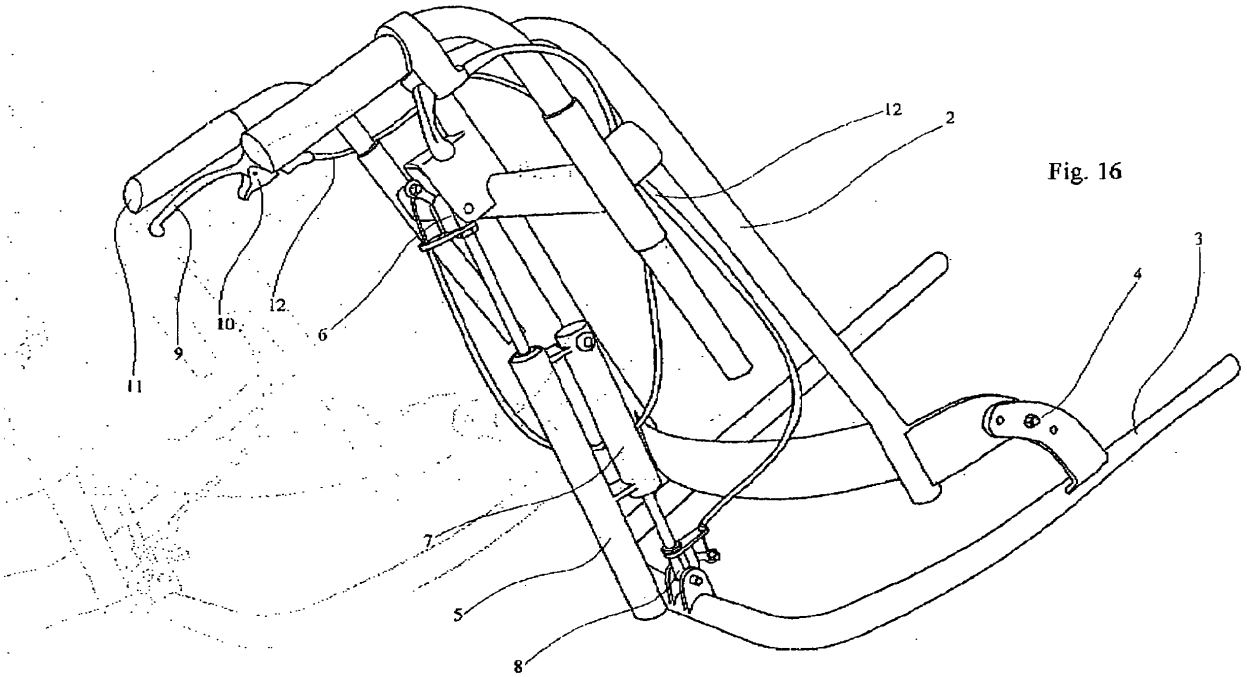

Fig. 16

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Description

BACKREST JOINED TO A SEAT

[0001] The object of this invention is a new way of moving a backrest, called dynamic because it remains in contact with the back of the person sitting on the seat.

[0002] In particular this new backrest is particularly suitable for use in wheelchairs for disabled people.

[0003] As is well known, on the market there are various types of wheelchairs for the disabled that have an inclinable or articulated backrest.

[0004] The inclinable backrest allows the user to vary the angle of inclination with respect to the seat.

[0005] After setting the above-mentioned angle of inclination this configuration is then fixed.

[0006] Naturally it is possible to modify, continuously or discretely, this configuration, according to the requirements of the user, in varying degrees of simplicity with varyingly complex devices.

[0007] Recently you can find wheelchairs with an inclinable or articulated backrest fitted with a spring or gas pump to assist the above-mentioned operations for varying the angle of inclination of the backrest.

[0008] This gas pump helps and makes things easier for the operator when the backrest has to come back to its original erect configuration and prevents any dangerous falls and/or overturning of the backrest itself.

[0009] Evidently the above-mentioned gas pump that helps the operator is practically useless when the inclination of said backrest is carried out using servo actuators.

[0010] In fact, in this case the operator, or the user directly, using a control intervenes directly to fix the inclination of the backrest at the required angle.

[0011] Similarly, what has been explained above occurs for elevating wheelchairs fitted with servo actuators, where the various movements are managed and set by an operator or by the user himself.

[0012] In order that there might be no danger that the position is maintained also when there is no electricity (or when the battery has drained) the actuators are always of the irreversible type, and therefore the position set for the inclination of the backrest is fixed also in this eventuality.

[0013] As. also with office chairs where there is a spring that provides a limited range of angles with respect to the erect position, also on wheelchairs it would be good to have this type of freedom of movement of the backrest; nevertheless such an arrangement is too restrictive for the needs of the disabled.

[0014] In fact, the disabled person very often requires having the backrest at an angle and not erect at 90° with respect to the seat.

[0015] Moreover, there is a category of users affected by dystonia due to neurological spasms that would benefit greatly from a backrest that could be freely inclined, without worsening the jerking due to the impact with a rigid backrest.

[0016] Nevertheless, these users very often require wheelchairs with an electric inclinable backrest, electric elevating wheelchairs or much more simply a wheelchair that has an inclined backrest.

[0017] To resolve these above-mentioned and other drawbacks that will become evident from the following description, the invention of this patent application was developed.

[0018] The invention consists of having an inclinable or articulated backrest at any type of pre-fixed angulation, while keeping the possibility of a further inclination within a preestablished range.

[0019] This innovation can be configured differently for manual wheelchairs and electrical ones, while still maintaining an equivalent effect.

[0020] This is a new type of movement for an inclinable or articulated backrest joined to a seat, where said backrest has, inverted between the two restraints that fix the desired inclination, a pliable elastic element that provides further free inclination within a set range.

[0021] Preferably, but not essential, this movement is effective as set out below when applied to wheelchairs for the disabled.

[0022] Advantageously a gas pump can be used as a pliable elastic element that deadens unexpected and sudden inclinations of the backrest with an appropriate preload, and which resists with proportionally increasing force the speed of sudden changes of angulation of said backrest.

[0023] Moreover, a gas pump, which can be chosen for its appropriate strength, with respect to the need to counter various stresses on the basis of the physical build of the user, renders the movement slow and smooth, dissipating the energy and bringing the backrest slowly back to the pre-set inclination.

[0024] This pliable elastic element can be placed either below the chair or at the top rear part of the backrest, and very usefully it can be activated or deactivated using levers on the rear handle or else using a control available to the user.

[0025] In the case where the installation of this pliable elastic element is behind the backrest, it can usefully be connected to the components for adjusting the inclination of the backrest and inserted between the two restraints, one on the backrest and the other on the frame that supports the seat; where preferably said restraints are hinges.

[0026] In the case, on the other hand, where the installation of said pliable elastic elements are placed lower than the seat it would be good that it is configured as a continuation of the components for adjusting and fixing the desired inclination of the backrest.

[0027] Eventually this is configured as a kinematic chain where the adjustment and fixing components and said pliable elastic element are hinged on a plate on which are hinged at least one end of the backrest and/or at least one end of the frame that supports the seat.

[0028] In the event that it should be used on a wheelchair with a vertical elevating function it is essential that the unrestricted inclination be progressively reduced in order to avoid possible traumas in the spine region.

[0029] In fact, in a vertically rising wheelchair generally the chair inclines at the same time as the backrest, so it is convenient that also in the case where the elastic element of the backrest is deactivated (with a consequent locking for example of the gas pump) an automatic release operates to permit the vertical elevation.

[0030] Since with vertically elevating wheelchairs an excessive additional inclination could be dangerous for the spine, it would be good to provide some regulation that limits the above-mentioned inclination.

[0031] This regulation is equally useful for the eventual extension of the chair to adapt to the physical build of the user.

[0032] Beneficially, this adjustment consists of a housing for the pliable elastic element fitted with a system for adjustable fixing, and, in the case of a circular gas pump, it is a perforated tubular element inside whose holes is to be fixed the end fixing plug of the gas pump inside said tubular element.

[0033] It is clear that even if this refers to just a single fixing element, it should be understood and referred to as both applied singularly, and preferably in the central area, as well as divided and preferably situated near the side parts of said backrest or the frame that supports the seat.

[0034] What has been said above is valid not only for the pliable elastic element but also for the components for regulating the inclination, and relative parts connected to them.

[0035] The above-mentioned advantages, and further ones that will become clear further on in the description, are described below with reference to a preferred realisation and in no way limited to that.

Fig. 1 shows a wheelchair with an inclinable backrest with manual movement fitted with a new way of moving the backrest.

Fig. 2 shows the wheelchair of fig. 1 with the backrest inclined.

Fig. 3 shows a part of the drawing 1 and 2 partially overlapping that highlights the possible inclination of the backrest on which the user is resting.

Fig. 4 shows the wheelchair of fig. 1 in more detail.

Fig. 5 shows the wheelchair of fig. 4 with the backrest inclined with a compression of the pliable elastic component.

Fig. 6 shows a wheelchair with an inclinable backrest where the device that provides the new movement is situated behind the chair.

Fig. 7 shows the wheelchair of fig. 6 with a vertical elevation configuration, both of the backrest as well as the chair.

Fig. 8 shows a part of the wheelchair of fig. 6 a dotted line highlighting the maximum possible range for unrestricted inclination allowed by the pliable elastic element located under the chair.

Fig. 9 shows a part of the wheelchair of fig. 6, shown also in fig. 8, in an erect position.

Fig. 10 shows the wheelchair of fig. 9 in an inclined position.

Fig. 11 shows an elevating electric wheelchair fitted, in the rear of the backrest, with an actuator for elevating the backrest and underneath the chair the movement device that is the object of this patent application.

Fig. 12 shows the wheelchair of fig. 11 in a vertical position, both of the backrest as well as the chair.

Fig. 13 shows a part of the wheelchair of fig. 11 with a dotted line highlighting the maximum possible range for unrestricted inclination allowed by the pliable elastic element located under the chair.

Fig. 14 shows a part of the wheelchair of fig. 11, shown also in fig. 13, in an erect position.

Fig. 15 shows the wheelchair of fig. 14 where just the backrest is inclined.

Fig. 16 shows a prospective view of the rear part of a wheelchair fitted with the movement device visible in figs. 1 to 5.

Fig. 17 is a prospective view of the hinging of the dynamic gas pump, located below the seat, on the plate configured as a lever whose cam profile operates on the release device of the dynamic gas pump.

[0036] With reference to figs. 1 to 5, which refer to an inclinable wheelchair 1 with manual movement, we see that the backrest 2, hinged in 4 with respect to the seat 3, can be inclined only after the gas pump 5 has been released.

[0037] This gas pump 5 for making adjustments (which can anyway be replaced by an adjustment strut with continual or discrete fixing) has one end 6 hinged onto the frame of the backrest 2. In figs. 1 and 2 we can see the extreme upper and lower positions that the end 6 can take on.

[0038] To these above-mentioned positions correspond the solid line drawing and the dotted line drawing shown in fig. 3, which correspond to the maximum range possible for the fixed adjustment of the backrest 2.

[0039] The body of the adjustment gas pump 5 is solidly joined to the body of the dynamic pump 7, whose end 8 is hinged to the frame, generally but not essentially, of the chair 3.

[0040] Still in figs. 1 and 2 we can see the upper and lower extreme positions that the end 8 can assume, corresponding to unrestricted inclination, with reference to an upright erect fixing of the backrest shown in figs. 4 and 5.

[0041] From the above-mentioned description of the drawings it can easily be understood how the invention works.

[0042] After having fixed the position of the backrest at the desired angle with respect to the chair, in the ex-

ample shown by rendering the adjustment gas pump 5 free, inclining the backrest 2 and again locking the adjustment gas pump 5 (but in a generic way releasing the fixing device, inclining the backrest and restoring the fixing device to the new angled position of the backrest 2), the user or the companion, in order to activate the new movement, release, using a special control 9, in the diagrams shown as a lever 9 near a handle 11, that can be made permanent with a lock 10, the dynamic pump 7 acting on the end 8 placing cable 12 under traction.

[0043] Once the dynamic pump 7 has been released, the backrest 2 is free to oscillate following the stresses of the user, in permanent contact with his back.

[0044] With a small preload of the gas pump the user will have no unpleasant oscillations of the backrest 2, but will have the feeling of a solid support.

[0045] Nevertheless, especially for a person who suffers from dystonias due to neurological spasms, this dynamic muffled flexion, absorbing the impact and therefore calming the user, prevents the spasms from becoming accentuated, as happens with a rigidly fixed backrest.

[0046] Figs. 6 to 10 show the new movement applied to an elevating wheelchair with the inclination of the backrest 14 articulated with respect to the chair 15, or applied to its support frame.

[0047] Advantageously a dynamic gas pump 16 was adopted, positioned under the seat.

[0048] Also in this case, the dynamic gas pump can be released using a cable 27 that is put under traction by a lever 18 positioned near the handle 19. This lever 18 can be blocked by a lock 20.

[0049] The maximum angulation range that the backrest can assume with the unrestricted dynamic gas pump is shown in fig. 8.

[0050] From this figure 8 we can see that one end of this dynamic gas pump 16 is hinged 17 near the front part of the seat 15, i.e. the part near the knee of the user, and a second end, near the rear part of the wheelchair, is hinged 18 to a plate 22 configured as a lever 19 at the base of which the backrest 14 and the seat 15 are hinged.

[0051] This lever 19 is shaped as a cam 20 in order to act directly on the release device 21 of the dynamic gas pump 16.

[0052] During the rising of the elevating wheelchair 13 the cam 20 operates by releasing the dynamic gas pump 16, preventing dangerous traumas in the spine area that could occur when the user of the companion do not release the dynamic gas pump 16 when it is elevating.

[0053] In figs. 11 to 15 we see the application of the new movement of the backrest on an electric wheelchair 29 with an inclinable backrest.

[0054] It basically has the structure shown in the wheelchair of figs. 6 to 10, where the dynamic gas pump 16 is similarly positioned below the seat 15 (or the frame supporting the seat) and hinged 17 at the front part of the seat 15 (near to the knee of the user) and the opposite end of this dynamic gas pump is hinged 18 to a plate 23 configured as a lever 24 at the base of which the backrest and the seat are hinged.

[0055] One end of a hinged 25 servo actuator 26 acts on said plate 23, the opposite end of said actuator being hinged to the frame of the seat 14.

[0056] The function of this servo actuator 26 is to recline the backrest 14 independently or in a manner correlated to the correlation of the seat 15 (or the frame that supports it).

[0057] Also in this case it is possible to see in the drawings that the housing of the dynamic gas pump 16 has a series of holes in which a plug can be applied for fixing one end of the dynamic gas pump 16; these holes 28 allow the above-mentioned dynamic gas pump 16 to be installed, because they can regulate the extension of the dynamic inclination of the backrest, setting an eventual preload, adapting to any extensions to the depth of the seat in order to adapt to the build of the user and finally to reduce to a limited dynamic inclination of the backrest 14 when it is upright vertical position together with the seat 15.

[0058] Also in this plate 23 there is a lever 24 configured as a cam, whose operation is similar to that shown of the cam on the lever 19.

[0059] In figs. 14 and 15 we see the two positions that the user can assume by operating the above-mentioned dynamic gas pump 16, the regulation of the inclination of the backrest 14 being set and fixed by the irreversible actuator 26.

[0060] Also in this case we can understand the enormous benefit there is from this new movement also for a normal user who would like to grant himself the physiological desire to arch his back, or simply change the posture of his seat, with respect to an inclination of the backrest that has already been set.

[0061] It is clear that the greatest benefit is for those users affected by dystonias due to neurological spasms, who very often require an angled position of the backrest, and not finding a rigid and fixed impact to counter their twitches, they freely flex the dynamically inclinable backrest with a set and proportional resistance, which calms and relaxes them, allowing them to quickly return to a tranquil condition, without having endured any impact.

Claims

1. Movement of an inclinable or articulated backrest joined to a chair, **characterised by** the fact that said backrest has, inserted between the two restraints that fix said desired inclination, a pliable elastic element that provides a further unrestricted inclination within to an established range.

2. Movement of an inclinable or articulated backrest joined to a chair according to claim 1 where said pliable elastic element is a dynamic gas pump.

3. Movement of an inclinable or articulated backrest

joined to a chair according to claims 1 or 2, **characterised by** the fact that said pliable elastic element is joined to the component for adjusting the inclination.

4. Movement of an inclinable or articulated backrest joined to a chair according to the previous claim, **characterised by** the fact that said pliable element joined to the component for adjusting the inclination is inserted between two restraints, one on the backrest and the other on the frame that supports the chair.

5. Movement of an inclinable or articulated backrest joined to a chair according to the previous claim, **characterised by** the fact that said pliable element is inserted as a continuation of the component for adjusting and fixing said desired inclination.

6. Movement of an inclinable or articulated backrest joined to a chair according to the previous claim, **characterised by** the fact that said pliable element is placed below the chair.

7. Movement of an inclinable or articulated backrest joined to a chair according to the previous claim, **characterised by** the fact that said continuation is realised by means of a plate on which are hinged said pliable element and at least one of the ends of the chair frame and/or at least one end of the frame that supports the chair.

8. Movement of an inclinable or articulated backrest joined to a chair according to the previous claim, **characterised by** the fact that said plate has a lever that can operate on said pliable element at least during the elevation phase between the backrest and the chair whenever said backrest and said chair are part of an elevating wheelchair for disabled people.

9. Movement of an inclinable or articulated backrest joined to a chair according one or more of the previous claims, **characterised by** the fact said pliable element can be activated or deactivated, and when activated it can be limited and/or set to provide an elastic recovery and/or an inclination of the backrest with a differentiated time constant; while when it is deactivated it can take on a permanent fixed configuration.

10. Movement of an inclinable or articulated backrest joined to a chair according one or more of the previous claims, **characterised by** the fact said elastic element can have its position adjusted to follow the personal requirements of the backrest and/or the chair.

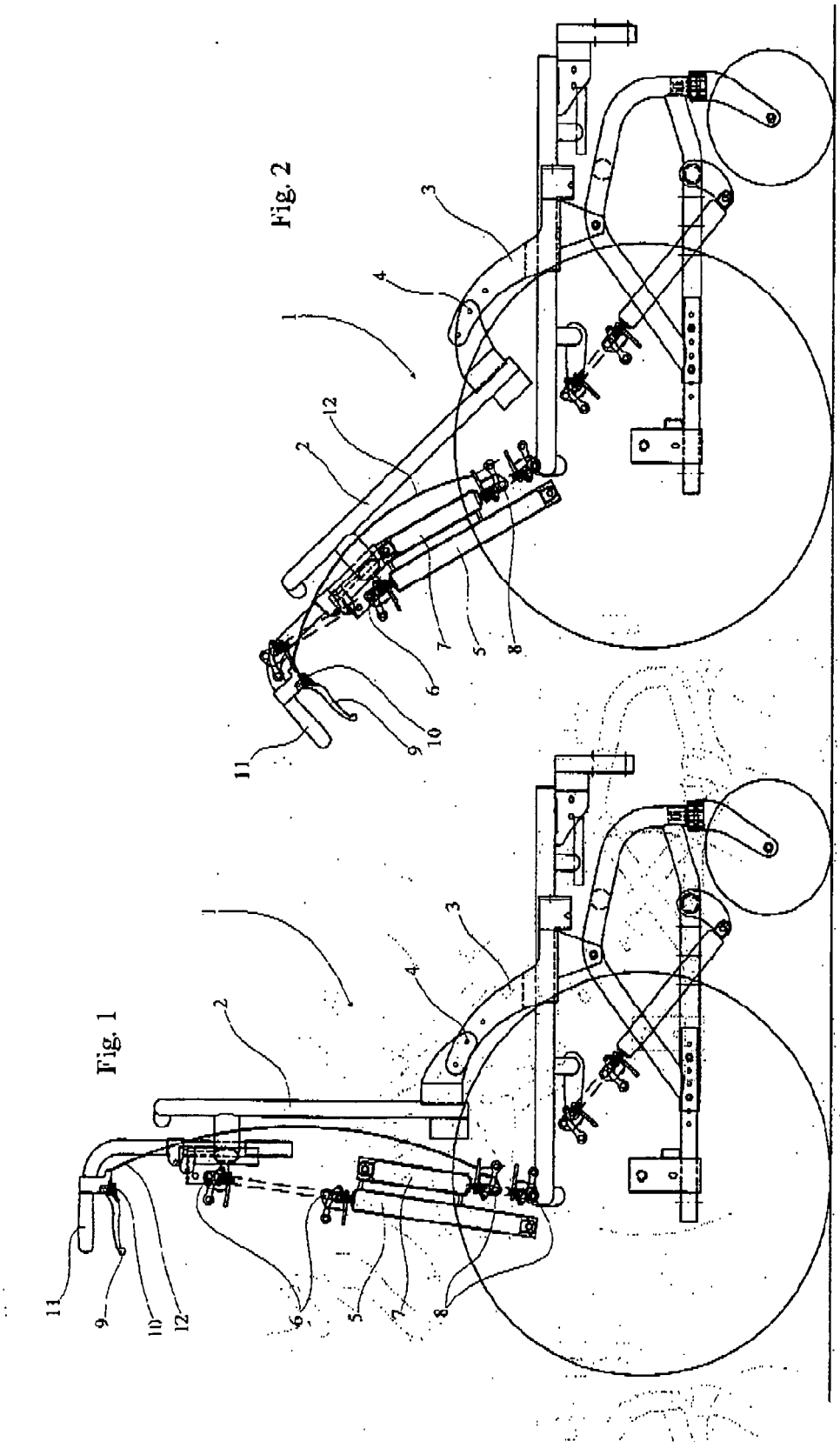
Fig. 2
Fig. 1
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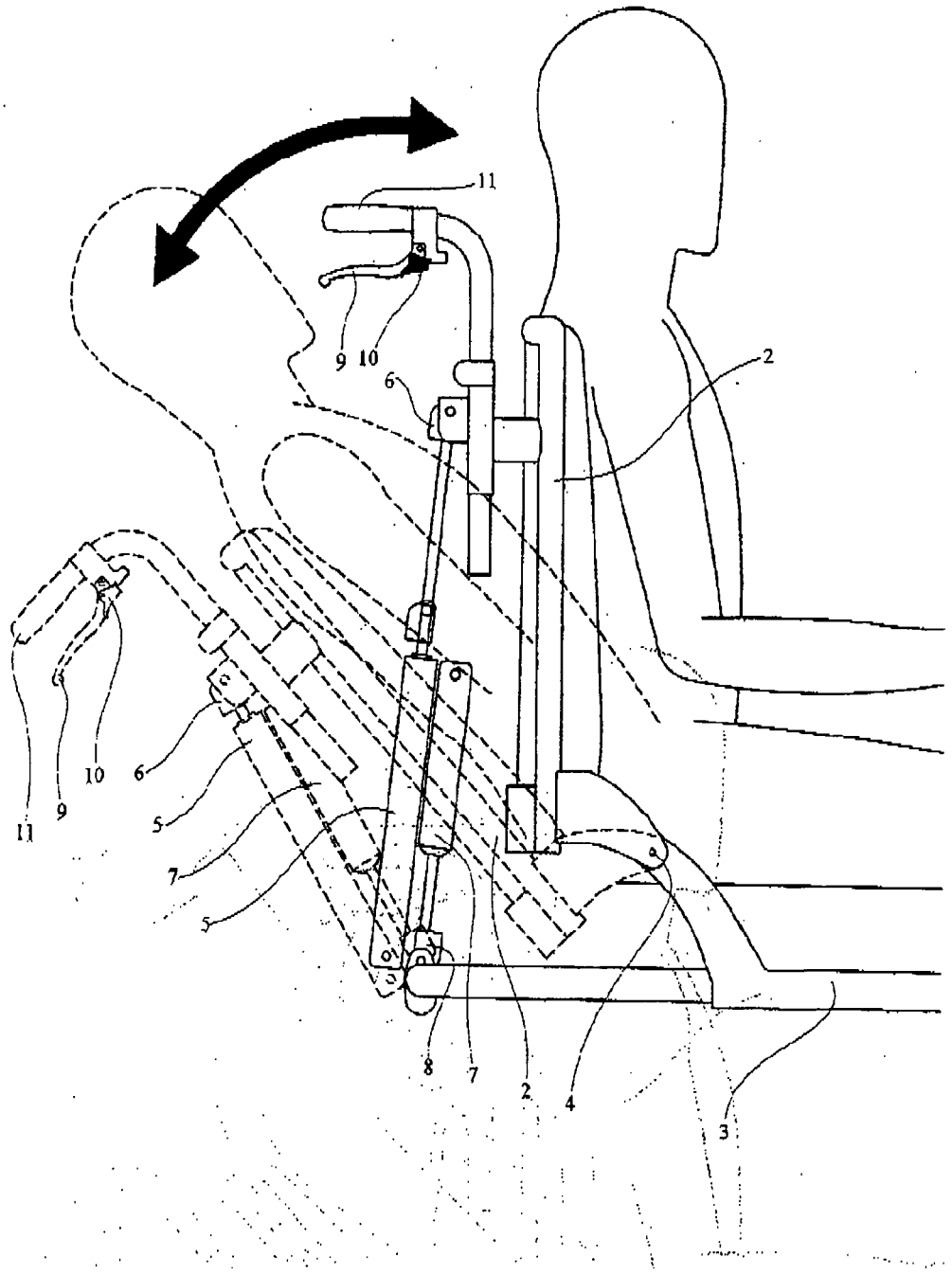
Fig. 3



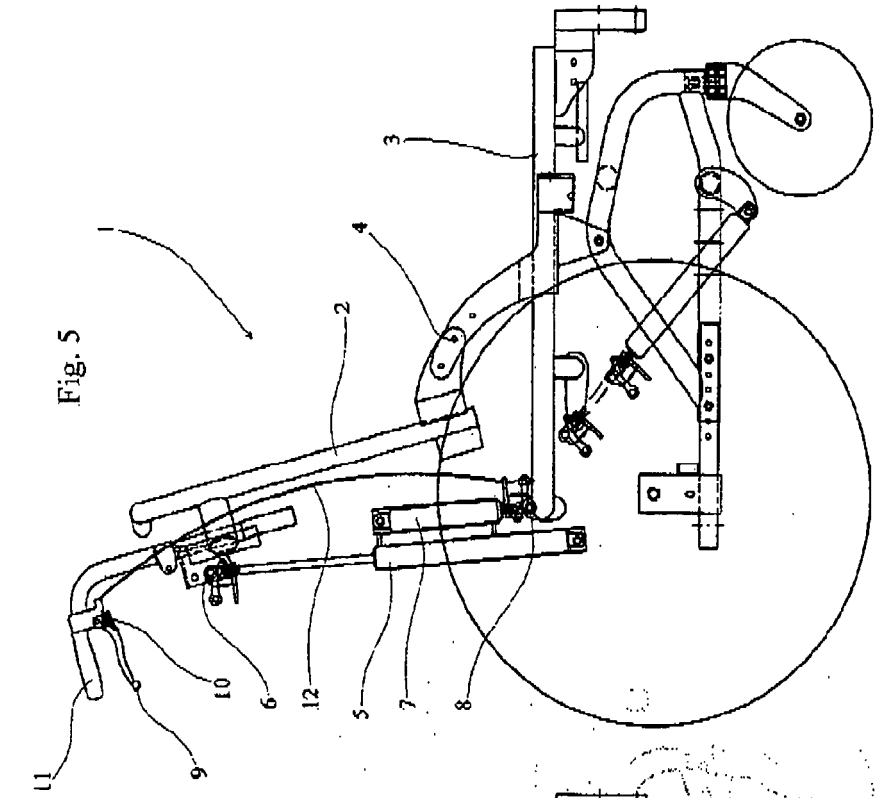


Fig. 5

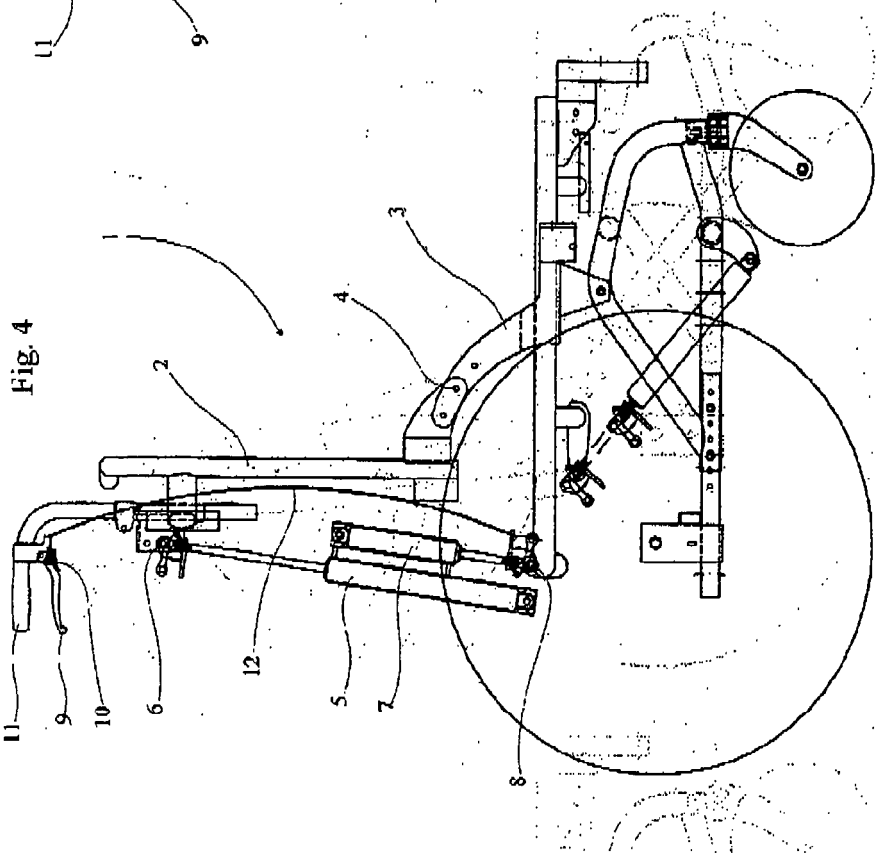


Fig. 4

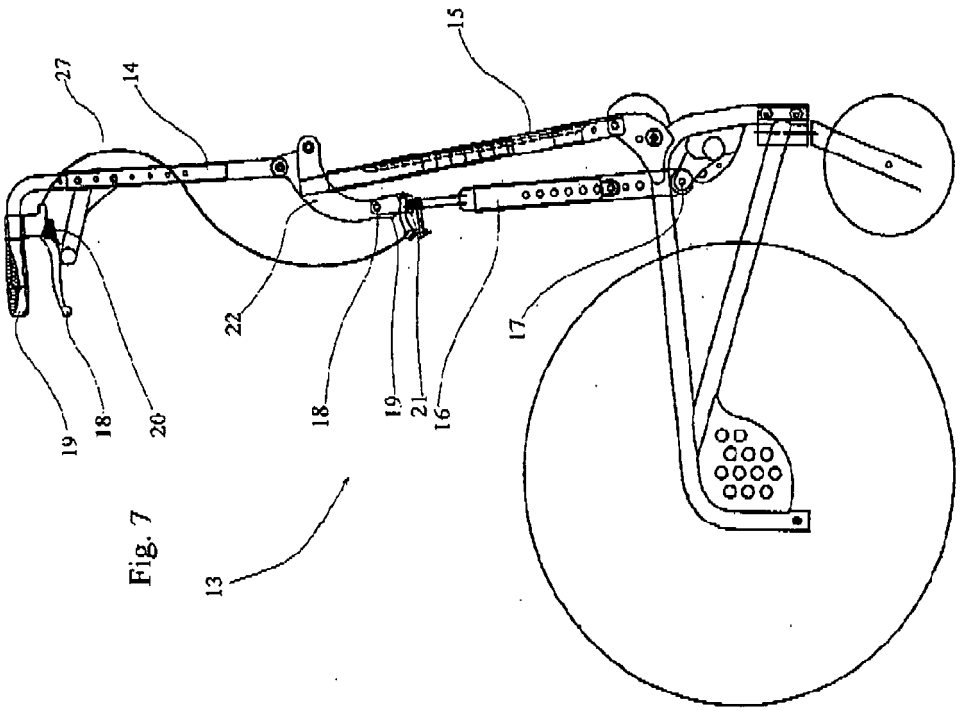

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Fig. 7

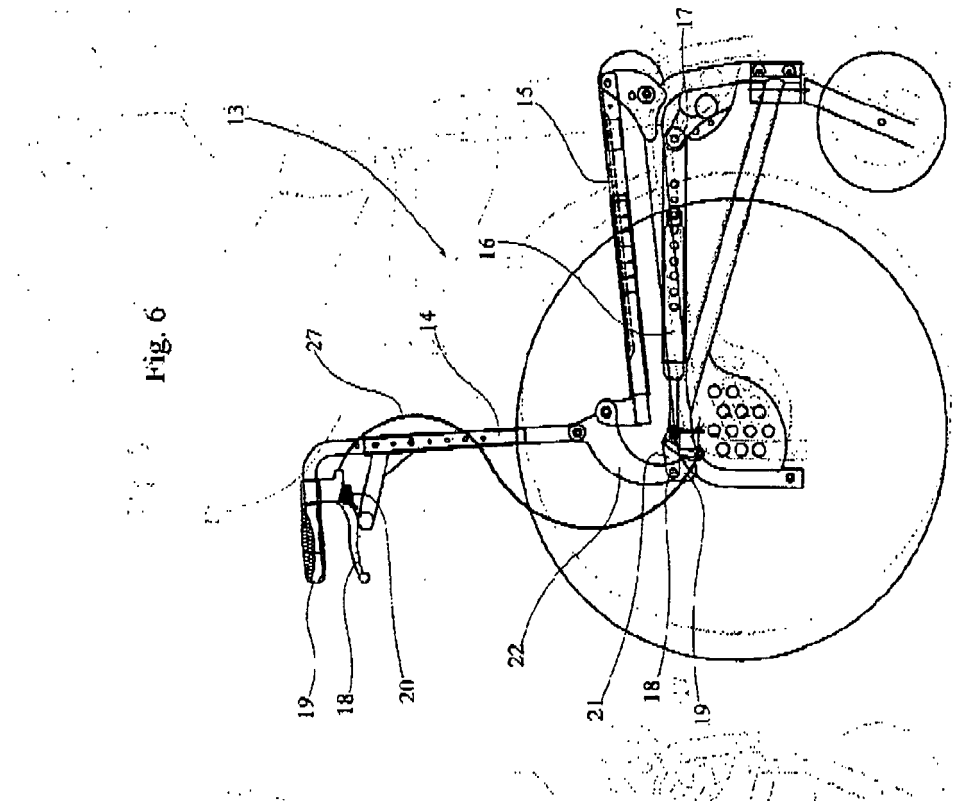
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Fig. 6

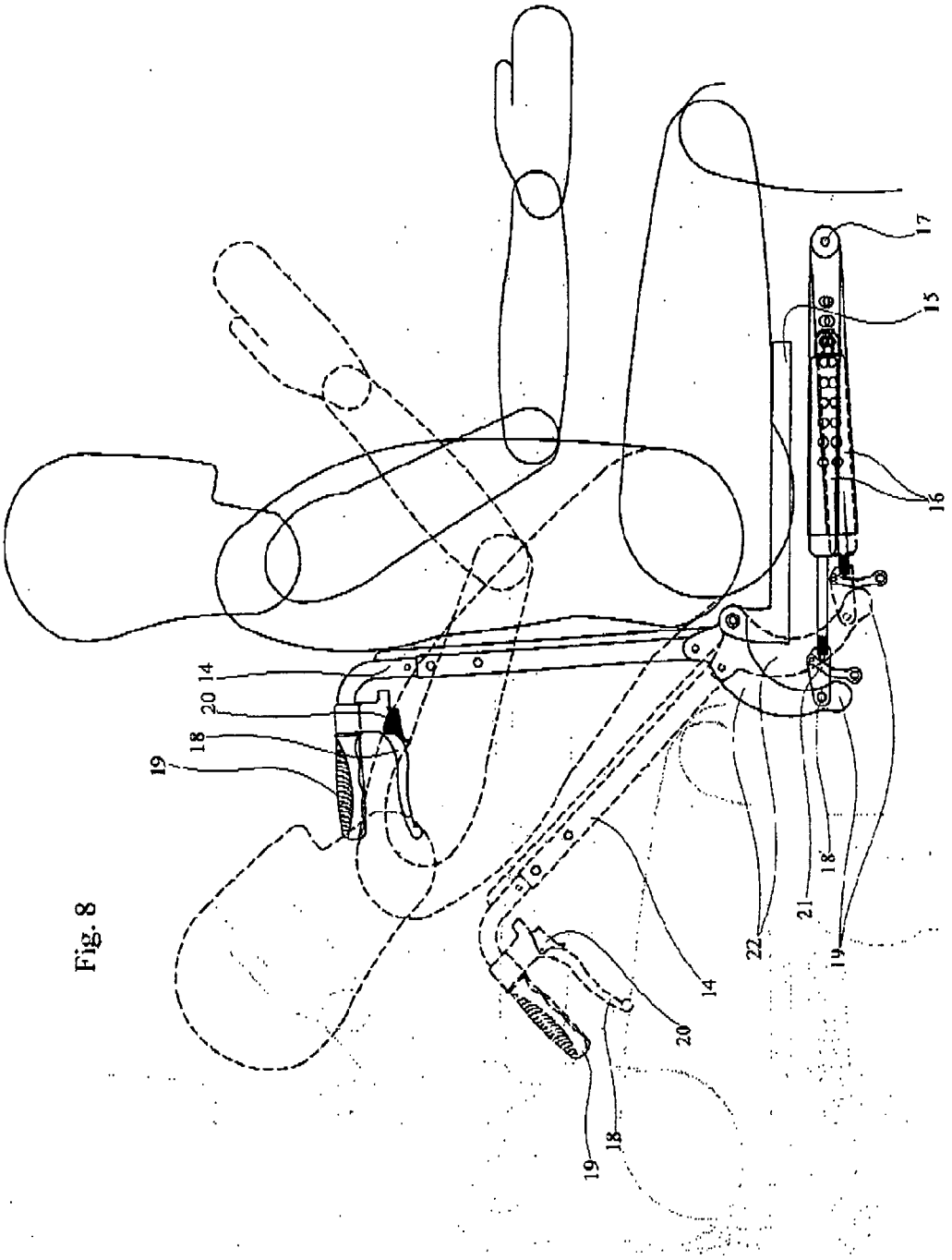

Fig. 8

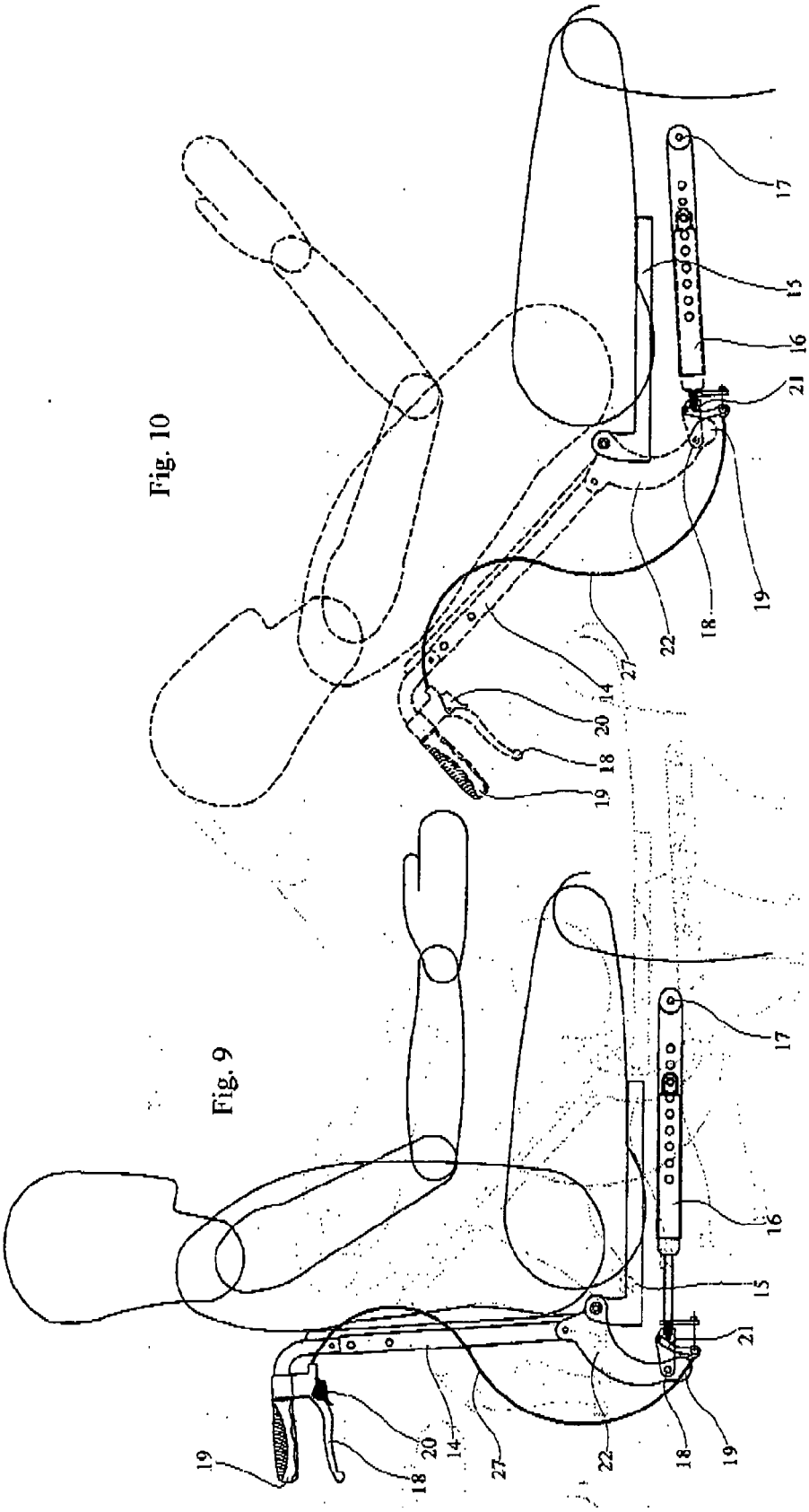

Fig. 10

Fig. 9

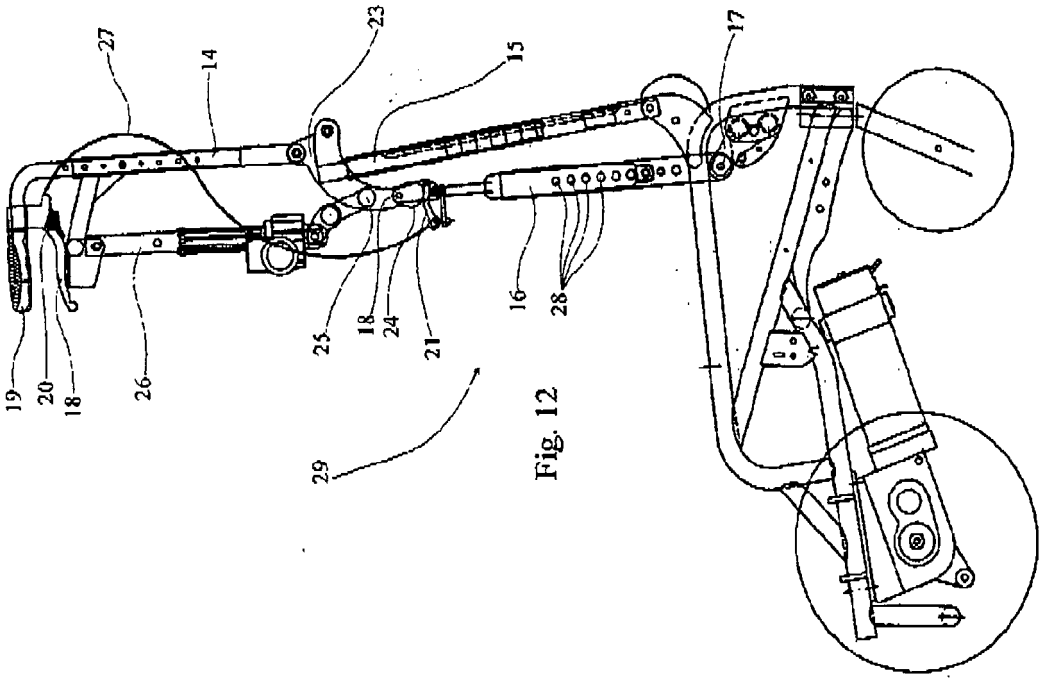
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Fig. 12

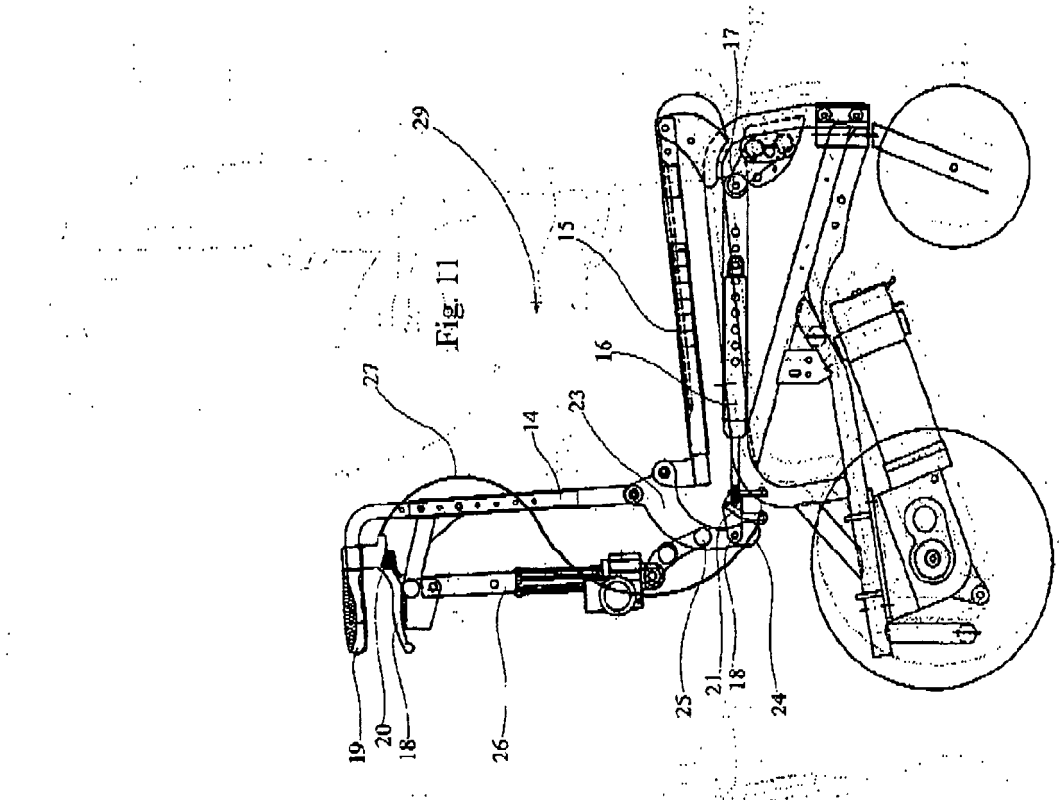
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Fig. 11

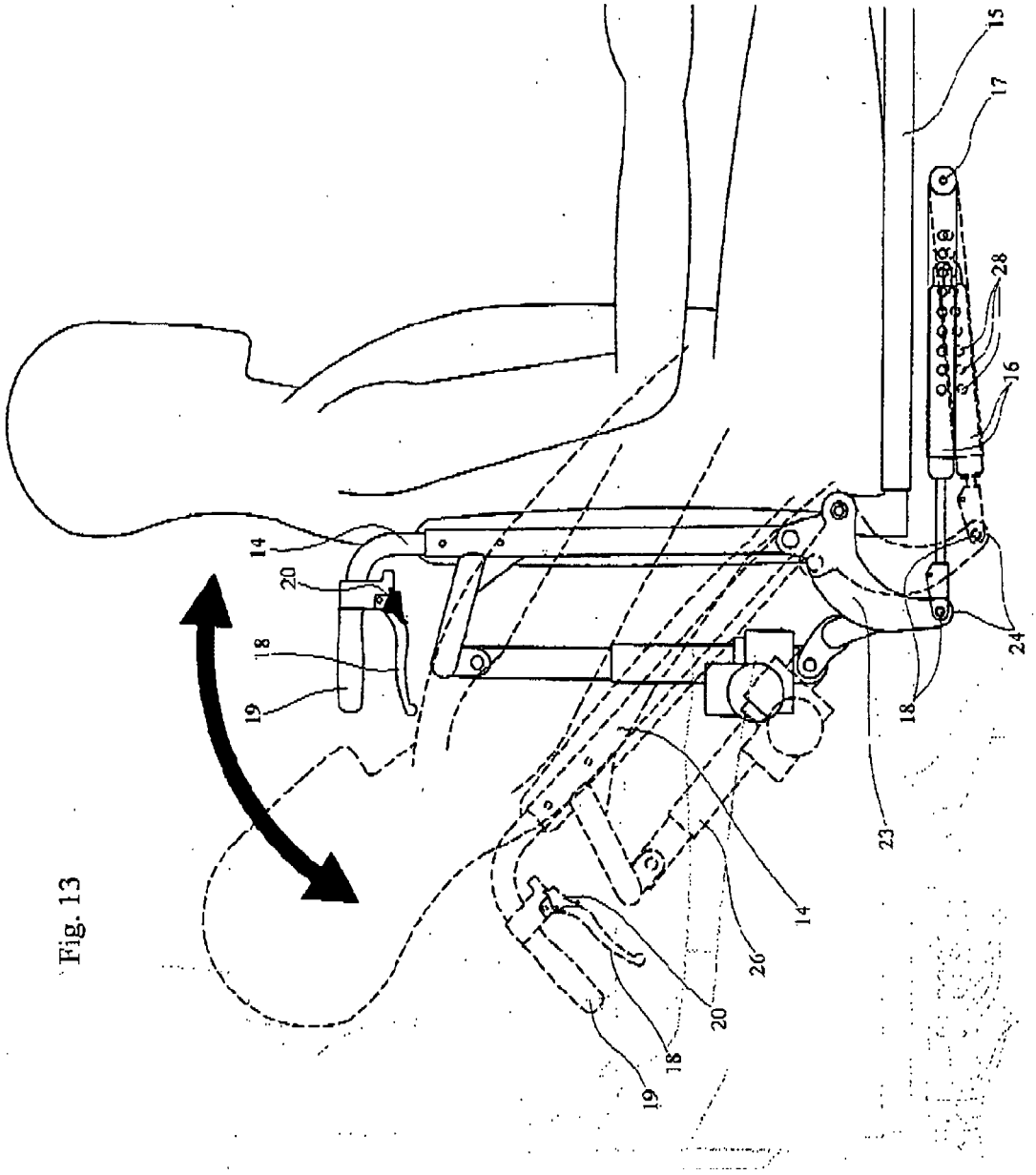


Fig. 13

Fig. 14

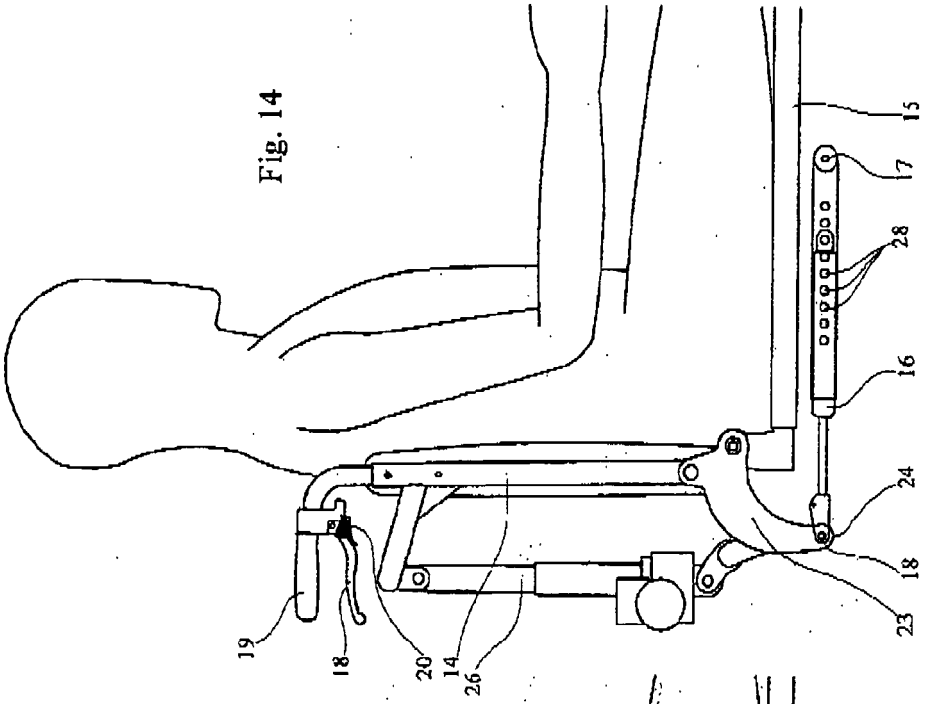


Fig. 15

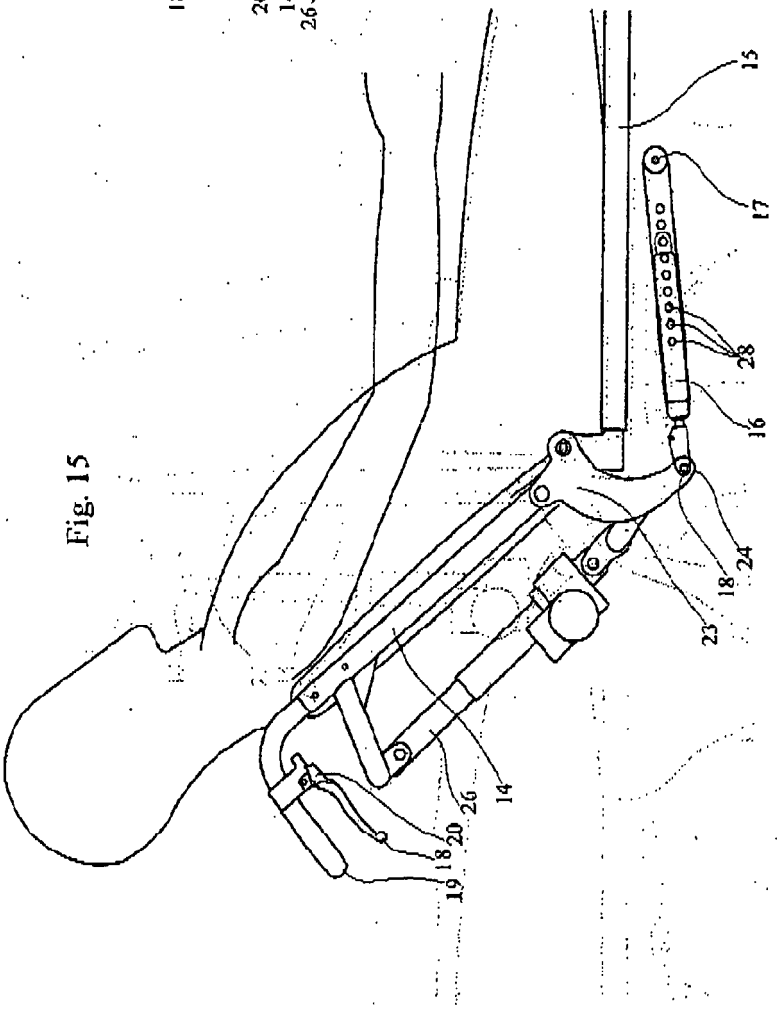
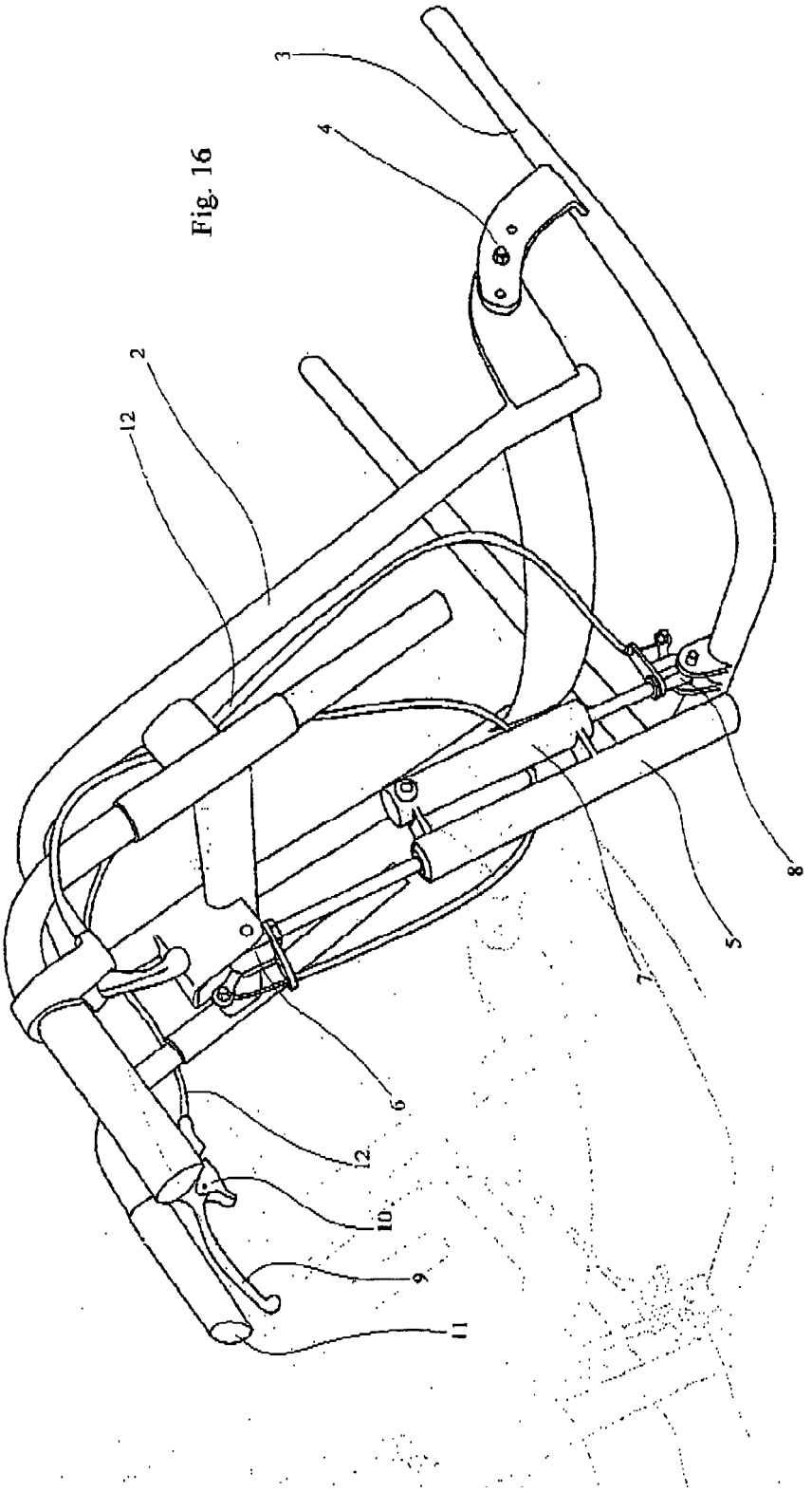


Fig. 16



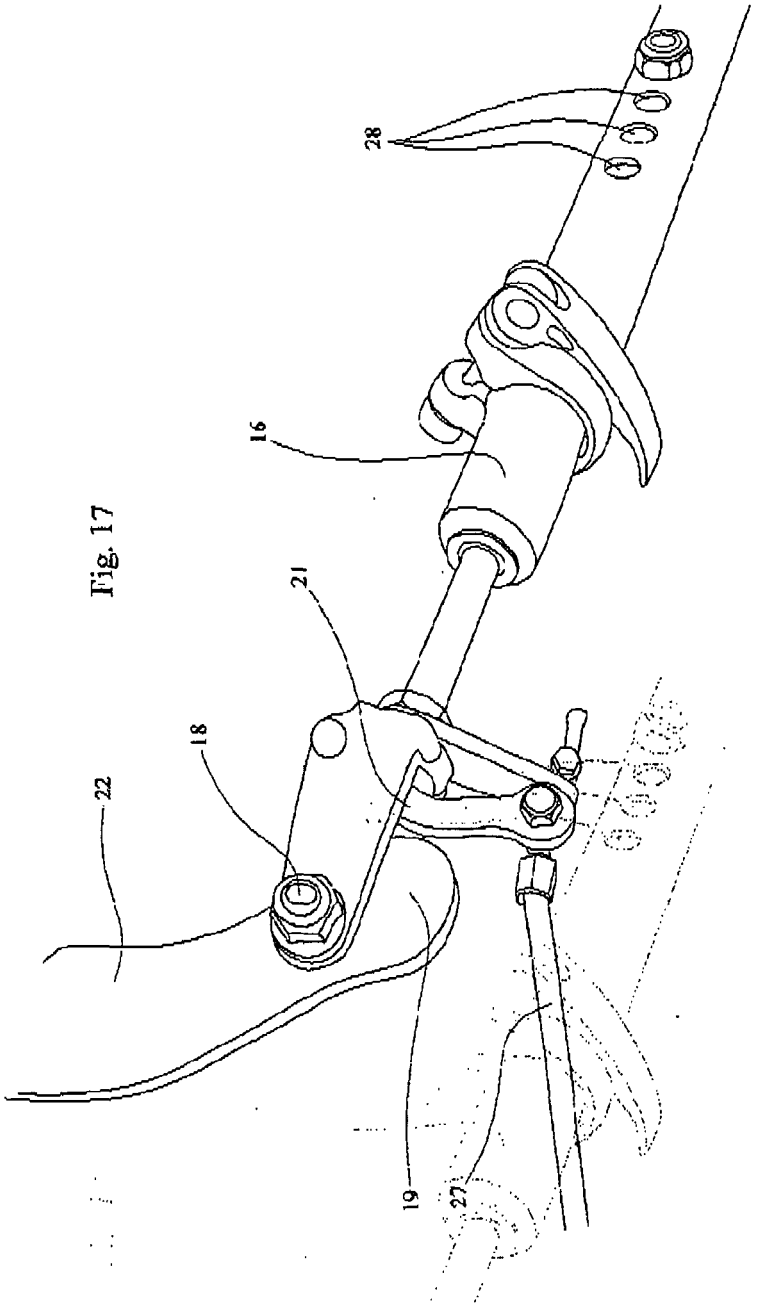


Fig. 17

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EUROPEAN SEARCH REPORT

Application Number
EP 11 00 4248

DOCUMENTS CONSIDERED TO BE RELEVANT

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A	US 2006/208552 A1 (NISHIWAKI TAKURO [CA]) 21 September 2006 (2006-09-21) * paragraph [0139]; figure 25 *	1-10	

TECHNICAL FIELDS SEARCHED (IPC)

A61G

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	9 August 2011	Kroeders, Marleen

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 11 00 4248

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09-08-2011

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