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(54) Mechanism for lifting seating furniture to assist getting up

(57) Mechanism for lifting of seating furniture to assist getting up, with own driving mechanism with help of rotating motor drives, according to this invention presents solution with original kinematic mechanism and enables drive and appropriate kinematic achievement, and with help of rotating motor drives achieves optimum functioning of seating furniture during use of this function of lifting furniture to assist with getting up, and with that improves total possibilities of functions of a seat.

Mechanism according to this invention has possibil-

ity to transversely position rotating drive device which is with rotor part attached to shear mechanism, and with flange (9) on stator portion pulls lever (8) connected to shearing mechanism joint for lifting and support of frame of seat or mechanism, and lifts the whole mechanism, slants mechanism forward, thereby simplifying getting up from the seating furniture.

Mechanism is easily assembled by inserting of two pins (17) into cross tube of seating furniture frame and securing by two screws (24).

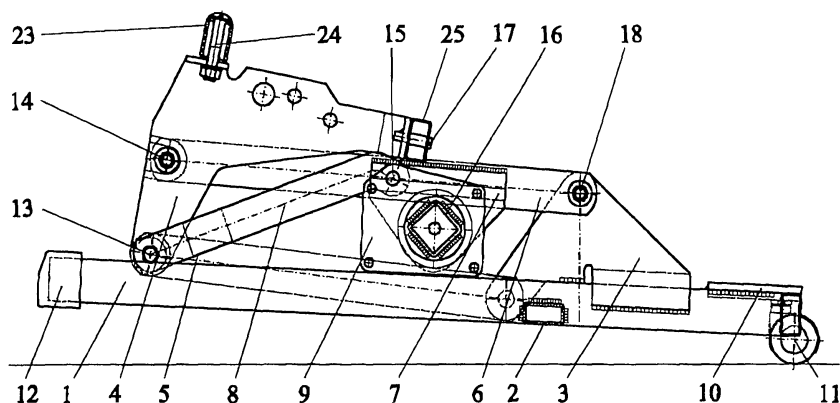


Fig. 1

## Description

### Field of technology

[0001] The subject of this invention is a mechanism which enables continuous, synchronized, and further independent of other functions of the furniture achieving position by an user appropriate for getting out of seating furniture by means of kinematically adapted lever mechanism. The invention is particularly suitable for rotating driving devices as opposed to linear driving devices as known in state of the art.

[0002] The subject of this invention belongs to classification comprising chairs; resting chairs; with adjustable seat and back support; with support for legs or feet, in combination with movable seat and back support.

### Technical problem

[0003] The lever mechanisms which are used in manufacturing of adjustable seats (also known as recliners) which can be used for resting or relaxation are kinematically speaking very complex mechanisms used in furniture manufacturing. The complexity is derived from requirements of designing mechanism which can be fitted in very close space, further need for achieving complex functions, high performances, synchronized operation of said driving device, and carrying of high specific loads and stresses in the material. In addition both precision of manufacturing, and low wear (high number of working cycles) is required.

[0004] This invention deals with mechanism which is adapted for use of rotating driving mechanism for driving of said lever mechanism, as well as with adaptation of said mechanism to rotating driving devices attachment. At the same time, conventional driving devices (such as linear driving mechanism) can be used with invention as presented.

### State of the art

[0005] There are several models of recliners available in the market, all of them with adjustable height. In addition, there can be found several lever mechanisms for operation of said seating furniture. There are also several models of motor driven mechanism to be found in the market, however, the main limiting factor in all these cases is existence of linear motor driving devices, be it in form of pistons, beams, telescopic beams etc. Those mechanisms are either connected to devices for operation of other function, or the latter have their own driving devices. The use of rotating driving devices is not found in mechanism for assistance in getting up.

[0006] So far, it has been customary to use linear driving devices for moving of movable parts of adjustable mechanisms to achieve function of assisting getting up. There is lack of efficient solutions to achieve compact mechanisms capable of rotating movements.

## DESCRIPTION OF NEW INVENTION

[0007] Mechanism for lifting of seating furniture to assist getting up, with own driving mechanism with help of rotating motor drives, according to this invention presents solution with original kinematic mechanism and enables drive and appropriate kinematic achievement, and with help of rotating motor drives achieves optimum functioning of seating furniture during use of this function of lifting furniture to assist with getting up, and with that improves total possibilities of functions of a seat.

[0008] The verb getting up or getting out as used in this application refers to both getting out of seating furniture, and getting on or getting in said seating furniture, i.e. assisted occupation, and vacation of said seating furniture. In this application the word chair is used liberally for any seating furniture which can be used in connection of invention described herein. It should be noted that said seating furniture can also refer to beds as this invention can be used for lifting of beds as well. The invention is used by users who need assistance as they may have problems with lowering their body into seating furniture, and so far required assistance of others to lower themselves into seating furniture. This invention provides for self sufficient use, or safer use, of seating furniture by lifting furniture rather than lowering the body of the user into usual seating furniture height (or beds for that matter).

[0009] In case of this invention the mechanism is designed in such a fashion to facilitate implementation of rotating (for purposes of this application known also as revolving) driving devices, with possibility to connect rotating and stationary part of the driving device in same axis of rotation, said axis also compatible with exit axle of rotating of mechanism for lifting. This axle of driving mechanism is moved together with kinematic movements of exit axis of rotating mechanism for lifting. This facilitates the limiting performances of mechanism which enables complete achievements of required functions of lifting while assisting getting up at seating furniture, comfort of work and use, durability, and other characteristics and improvements. At the same time it should be noted that the driving devices used should be as small as possible (minimum volume).

[0010] Further characteristic is a rotating driving lever device (shear mechanism) which is completed in pair, at the same time interconnected, and synchronized. In addition, the lever mechanism is designed to enable very simple and fast mounting onto the construction of seating furniture, or its mechanisms, by inserting additional axes, and interconnected by means of screws.

[0011] Rotation of the driving device lifts the frame of the chair, or frames of other mechanisms within the seat and consequently moves parts of the chair upward, or slants toward front in desired positions for easier getting up, in such a fashion that in every position seat of said chair is stable, and pivots make interconnected quadrangles which enable various positions of seat support, and

consequently seat itself.

**[0012]** The base of the mechanism is a frame on wheels, stable legs, or supports (lean-ons), on which two attachment elements are attached, these two attachment elements forming a base for kinematic mechanism, to which pivots and supports of other parts of mechanism are attached.

**[0013]** The rotating drive device requires special, different, and specific positioning and kinematic mechanism of levers and main attachment points of said drive device. In particular, this kinematic mechanism is an essence of this invention.

### Short description of figures

#### **[0014]**

Figure 1 shows side view on closed mechanism with kinematic mechanism of levers, positions of attachments of rotating driving devices, and means of connections and transfer of movements onto a frame of a chair or mechanism of a chair. This also shows a mechanism in normal seating position of said chair (i.e. lowered).

Figure 2 shows side view on open mechanism with kinematic mechanism of levers, positions of attachments of rotating driving devices, and means of connections and transfer of movements onto said frame of said chair or said mechanism of a chair. This also shows a mechanism in lifted position from which getting up is comfortable for user of this invention.

Figure 3 shows a top view of said mechanism relating to base and levers of said mechanism, top view of levers, supports, and driving devices of said mechanism, and parallel two side positioning of levers.

### Description of embodiment

**[0015]** Mechanism for lifting of seating furniture to assist getting up, with own mechanism drive with help of rotating motor drives, according to this invention, comprises of parts which are designed as kinematic mechanism two synchronized shear mechanisms which drive chair (recliner) or other form of furniture meant for seating or laying in positions, suitable for assisted getting up.

**[0016]** This new kinematic mechanism is different from those mechanisms known in the art as it combines rotating motor drives with synchronized shear mechanisms as opposed to linear motor drives as known in state of the art. It is this function, and combination, which delineates this mechanism from all others. The solution is not obvious as the strength of rotating motor drives is rather limited. In addition, the motor drives are operated within limited space. All of these limitations result in designing process in which the new solution must be well balanced as well thought-through to enable desired result which is

stable position of the seat in any and all positions, and obtaining of required height as well as angle of the seat to enable safe and comfortable getting up from the chair (or other form of furniture) which is subjected to the new lifting device.

**[0017]** Below, embodiment is described in detail by help of description of Figures, these Figures forming integral part of this description.

### 10 Description of Figures 1 and 2

**[0018]** Figures 1 and 2 show total mechanism with kinematic mechanism of levers, positions for attachment of rotating drives, and means of connecting and transfer of movements onto supports (23, 25) of a seat of said seating furniture. These supports are merely illustrative, and are simply input to describe any type of seating furniture which can be lifted with this invention, such seating furniture usually found in so called relax, or foldable mechanisms. Figure 1 is side view of this invention in lowered position which is position used by the user during resting, or seating in seating furniture. Figure 2 is side view of this invention in its lifted position, said position used for getting out of seating furniture.

**[0019]** The mechanism comprises of base (1), which can be equipped with wheels (11), or stable supports (12), or combination of these elements. This base (1) is comprised, preferably bent, from single beam or tube, which is then fixed (stabilized) with cross bar (2). On this base (1) at least two main attachment elements (3) are attached, in this embodiment welded. On these attachment elements (3) lifting levers (5, 6) are attached by means of pivot (18), said lifting levers (5, 6) used for lifting and rotating of main L-shaped supports (4) by means of pivots (13, 14). Said lifting levers (5, 6) are designed kinematically in such a fashion that the position of the seat of said seating furniture which is attached onto this invention via supports (23, 24) remains stable and controlled at all times during operation.

**[0020]** Namely, during lifting, the seat of said seating furniture is lifted, and slanted forward. It should be noted that while wheels (11) can be separate, they can also be at the same time wheels of said seating furniture as they are not lifted from the ground.

**[0021]** During lowering of said mechanism, and consequently said seat of said seating furniture by means of said main L-shaped supports (4), after the chair has been lowered to its customary seating position, said rotating drive device continues to operate, until said base (1) is lifted from ground until said levers (5) and (6) are folded onto each other thus reaching said mechanism's limiting position, and by doing so, said mechanism hides itself under chair, and is invisible to customarily attentive observer. Base (1) can be equipped with either four wheels or four fixed supports, or combination of these elements, all of which can serve as legs of said chair thus eliminating need for separate chair legs.

**[0022]** In preferred embodiment, main attachment el-

elements (3) are forked and welded to base (1), embracing tube of base (1) from inside and outside therefore forming stable base for lifting levers (5, 6) of lifting mechanism.

**[0023]** To the upper lifting lever (6) there is attached supporting element of driving device (7), preferably triangular with rectangular attachment for rotating driving device (16), onto which appropriate attachment of exit axle of rotating driving device is built (the rotating drive device is not shown in Figures, however, such rotating drive device is known in state of the art, preferably it is an electro motor). Supporting element (7), and rectangular attachment of rotating driving device (16) are lifted with lever (6), and consequently axis of driving device (22) is lifted therefore vacating room for movements of stator part of the driving device around axis (22). The rotating device is also lifted while remaining in same line (axis), and consequently vacates room below the chair which is both aesthetically pleasing and safety appropriate.

**[0024]** The rotating driving device by means of flange (9) which is attached to the stator part of the rotating driving device, and attachment (15) during rotating of stator and flange (9) pulls pulling lever (8) which in turn by means of pivot (13) lifts and rotates main L-support (4) onto which the seat is attached. In such a fashion, the lifting of seat and resulting assistance of getting up is achieved.

**[0025]** Various final positions of lifting of said seat can be achieved by combining different kinematic elements defining spaces between points of shear lever mechanism, or combinations of lengths and forms of levers in said shear mechanism.

**[0026]** On said stator part there is attached a transverse transferring mechanism of rotating drive device for transferring of rotation onto other side of mechanism in axis (22) on other flange (19), said flange (19) ensuring parallel movements on the other side of mechanism by means of pivot, symmetrical to pivot (15) and the other lever (8), this parallel movement ensuring level, safe, and stable lifting of whole seat and consequently helps in assisting user to get up.

**[0027]** This set-up, attachment, and movement of rotating drive device, as well as transfer of that movement onto other part of kinematic mechanism provides for original solution in the area of mechanisms for lifting of chairs in order to assist users with getting up.

**[0028]** Mechanism for lifting of seating furniture to assist getting up, with help of rotating drive devices, according to this invention is self propelled mechanism which is independent of other mechanisms within said furniture thereby enabling lifting independent of all other standard functions of a chair such as extending of feet support or adjustment of back support which remain unhindered. Further, as there is no pre-set height of either starting or ending of operation, proposed unit is very flexible, and at the same time enables lifting of chairs with no pre-set or pre-built mechanisms for movements.

**[0029]** The main L-shaped support (4) is designed to

enable fast and efficient assembly of support, and thereby the mechanism, onto the parts of the frame, or other mechanisms. This is possible by bending of rear portion of main support (4) in vertical axis, and attaching a pin (17) onto it, said pin (17) simply inserted into part of chair or other mechanism frame (25), and fixed with fixing means, such as screws (24). This provides for short assembly time, further provides for securing said joint in two directions while maintaining safety, said joint being safer than customary way of attaching.

**[0030]** Said chair is stable in every position as pivots of shear levers comprise connected quadrangle which enables various always stable positions of main L-support (4), and therefore whole chair, so the user feels safe operation of lifting, lowering, and slanting of said seat in order to assist his or her getting up. By means of sliding sleeves in joints and pivots one avoids uneven movements, staggering movements, hitting of parts of shear mechanism, free play of parts of the frame and similar difficulties so the system performs silently and continuously.

**[0031]** The final lower position is limited by lowering of said mechanism to base (1) itself, which by itself limits further unwanted or spurious moving. At the same time upper limiting position is mechanically limited by achieving final points of movements of shear mechanism, i.e. by contacting levers (5) and (6) (or folding lever (6) onto lever (5)), or folding of lever (8) onto the rectangular attachment of rotating driving device (16). In such a fashion, the movements of the mechanism is safe within pre-set limits, and extended motion is impossible, said extended motion posing potential harm to the user. At the same time, by means of limiting clutches of rotating drive device, as well as fuses built into to prevent electrical overload, or other safety solutions, three fold protection against moving outside pre-set boundaries is achieved in order to prevent possible hazards to the user.

**[0032]** Should there be only rotating drive device with single direction of movements built into the system, the return (lowering) of the mechanism is provided by weight of said chair, and the user, as well as by building into of return springs, without need to change already described kinematic mechanism and form of shear mechanism. Safety is increased when compared to other similar drives in this case as well.

**[0033]** Above described kinematic mechanism for lifting of seating furniture to assist with getting up, said mechanism self propelled by means of rotating driving devices, and its design provides for independent, separate, partial, or within full range operation of various functions, from any position, in various sequences, and synchronized. Actual way of operation depends on input by user as well as electronic regulation of rotation driving device.

**[0034]** In addition, above described mechanism provides for reliable, safe, and enduring product which enables comfortable control of chair to which subject of this invention is attached as well as providing for high effi-

ciency, and comfort of said chair.

### Emphasized inventive steps of invention

**[0035]** This invention is novel, and unobvious, these characteristics emanating from description and embodiment of this invention, i.e. novel efficient functional mechanism for lifting of seating furniture to assist with getting up, this mechanism self propelled by means of rotating driving device as well as from actual design of embodiment which provides for independent, separate, partial, or within full range operation of various functions, from any position, in various sequences, and synchronized. The inventive steps as emphasized in this section are not limiting the scope of this invention, they are presented in a way of example.

**[0036]** The mechanism as described in this application provides for application, attachment of at least one rotating drive device, and, according to Figures 1, 2, and 3 transfer of rotation of said rotating drive device by means of levers with special, and in this application described, kinematic mechanism. Further, the mechanism translates rotating movement of said rotating driving device via appropriate lever mechanism to movements of said seat of said seating furniture in upward (lifting) and downward (lowering) motion, and further of slanting said seat of said furniture forward, all to facilitate easier getting up from, and getting into seating furniture. Said mechanism is controlled with appropriate system for control.

**[0037]** Said mechanism is driven by rotating driving device which may work with other mechanism (e.g. with chair mechanism) either independently, or synchronized, and enables control of movements of said seat, as well as comfortable use of said seat, easy getting up while simultaneously enables functioning of all other mechanisms needed for operation of said chair, and not covered with this invention.

**[0038]** Inventive step is also seen in shear mechanism shown in Figures 1, 2, and 3, said shear mechanism enabling attachment of rotating drive mechanism as opposed to customary linear drive mechanism, said rotating drive mechanism attached to attachment of quadrangular shape (16) which by means of flange (9), pulling lever (8), pivots (13, 14), and main L-shaped support (4) transfers movements of said rotating driving device into upward or downward movements of said seat as well as slanting of said seat forward, all of these motions performed to assist said user to either get-up, or sit into said seating furniture. One should especially note transverse position of rotating driving device, and its positioning onto lifting levers thereby achieving lifting of axis of whole driving device with lifting of said chair consequently clearing the bottom of said chair and enabling access to lower part of said chair during lifted mechanism.

**[0039]** In addition the inventive step is form and securing of main attachment element (3), and levers (5) and (6). Said attachment element (3) in shape of the fork embraces the base's (1) frame from inner and outer side

and thereby increases stability of whole mechanism, and releases it from necessity of having additional cross connections of levers.

**[0040]** In addition, the inventive step of this invention is also in special position, movements, and trajectory of lever (8) which by means of attachment point (13) provides for motion of quadrangular shear mechanism in such a way that by means of lever (8) said main L-shaped support (4) and consequently said seat moves upward, slants forward, or moves downward into desired position.

**[0041]** In addition, the inventive step of this invention is also in form of said base (1) which is manufactured on single tube (which of course may be welded or in some other way attached together from many shorter pieces), said tube bent in particular fashion shown in Figure 3, onto which all parts of mechanism are attached, either directly, or indirectly, including base (1) supports such as wheels (11), or stable supports (12). Said base (1) can be mounted into said chair.

**[0042]** In addition, the inventive step of this invention is also in having rotating drive device attached to attachment plate (16), said attachment plate (16) with said rotating drive device being lifted during lifting of said mechanism, thereby vacating place under said seating furniture while said seating furniture is in lifted position. In state of the art, the drive device (linear in state of the art) is attached to a base and not to lifting mechanism as opposed to this invention.

**[0043]** Finally, the inventive step of this invention is extremely simplified assembly of said mechanism onto the frame of said chair or other mechanism already built into said chair, in such a way that the whole mechanism by means of a pin (17) or plurality thereof is simply inserted into appropriate holes, and then secured by means of securing means, preferably screws (24) thereby simplifying the assembly and reducing time needed for assembly.

### Claims

1. Mechanism for lifting of a seating furniture to assist getting up from said seating furniture, or sitting into said seating furniture, by lifting a seat of said seating furniture to such height that getting up or sitting into said seating furniture is made easy for an user, said mechanism self propelled by means of at least one driving device, preferably an electrical motor, **characterized in that** said driving device is rotating driving device, preferably rotating electrical motor, said rotating driving device attached to said mechanism, said mechanism comprised of at least one shearing mechanism, said shearing mechanism translating rotating motion of said rotating driving device by means of lever mechanism into vertical motion of a L-shaped support by means of quadrangular lever mechanism, said L-shaped support connected to said seat of said seating furniture.

2. Mechanism according to claim 1, **characterized in that** said mechanism is comprised of a base (1), said base (1) resting on supports, said base (1) comprised of a single bent tube, stabilized by means of a cross bar (2); said mechanism further **characterized in that** at least two main attachment elements (3) are attached, preferably welded to said base (1), said main attachment elements (3) attached to lifting levers (5) and (6) by means of a pivot (18), said lifting levers (5) and (6) used for lifting and rotating of said L-shaped supports (4) by means of pivots (13, 14), said L-shaped supports attached to said seat of said seating furniture. 5
3. Mechanism according to any of preceding claims, **characterized in that** said mechanism also enables slanting of said seat of said seating furniture forward by means of shearing mechanism when in lifted position, said slanting simplifying getting up or sitting into said seating furniture for said user; said mechanism further **characterized in that** there is at least one pair of shear mechanisms lifting and lowering said seat of said seating furniture, said pair of shear mechanisms interconnected, and synchronized. 10 15 20 25
4. Mechanism according to any of preceding claims, **characterized in that** said supports for said base (1) are either wheels (11) or stable supports (12), or combination thereof. 30
5. Mechanism according to any of preceding claims, **characterized in that** said main attachment elements (3) are forked and welded to base (1), embracing said tube of said base (1) from inside and outside therefore forming stable base for said lifting levers (5, 6) of said mechanism. 35
6. Mechanism according to any of preceding claims, **characterized in that** during lowering of said mechanism, and consequently said seat of said seating furniture by means of said main L-shaped supports (4), after the chair has been lowered to its customary seating position, said rotating drive device continues to operate, until said base (1) is lifted from ground, and further continues to operate until said levers (5) and (6) are folded onto each other thus reaching said mechanism's limiting position as shown in Figure 1, and by doing so, said mechanism hides itself under chair, and is invisible to customarily attentive observer. 40 45 50
7. Mechanism according to any of preceding claims, **characterized in that** said shear mechanism enables attachment of said rotating drive device attached to attachment of a quadrangular shape (16) which by means of a flange (9), a pulling lever (8), pivots (13, 14), and said main L-shaped support (4) translates movement of said rotating drive device into upward or downward movements of said seat as well as slanting of said seat forward, all of these motions performed to assist an user to either get-up, or sit into said seating furniture. 55
8. Mechanism according to any of preceding claims, **characterized in** simplified assembly of said mechanism onto a frame of said seating furniture or other mechanism already built into said chair, in such a way that the mechanism is connected to said seating furniture by means of a pin (17) or plurality thereof, said pin (17) simply inserted into appropriate hole in said frame of said seating furniture, and then secured by means of securing means, preferably screws (24).
9. Mechanism according to any of preceding claims, **characterized in that** said rotating drive device is attached to attachment plate (16), said attachment plate (16) with said rotating drive device being lifted during lifting of said mechanism, thereby vacating place under said seating furniture while said seating furniture is in lifted position; and further **characterized in that** said rotating drive device is positioned transversely.
10. Mechanism according to any of preceding claims, **characterized in that** said rotating driving device by means of a flange (9) which is attached to a stator part of the rotating driving device, and an attachment (15) during rotating of stator and flange (9) pulls a pulling lever (8) which in turn by means of a pivot (13) lifts and rotates said main L-shaped support (4) onto which the seat is attached thereby achieving lifting of said seat to assist getting up.

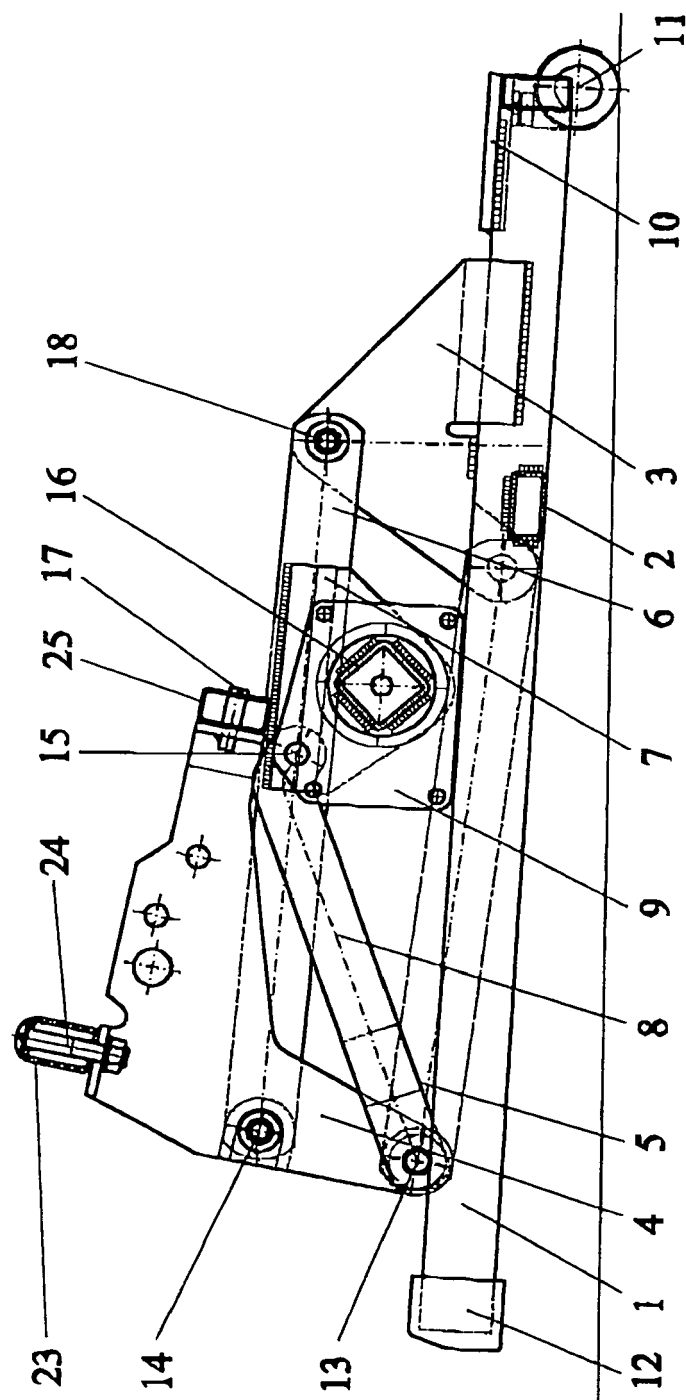
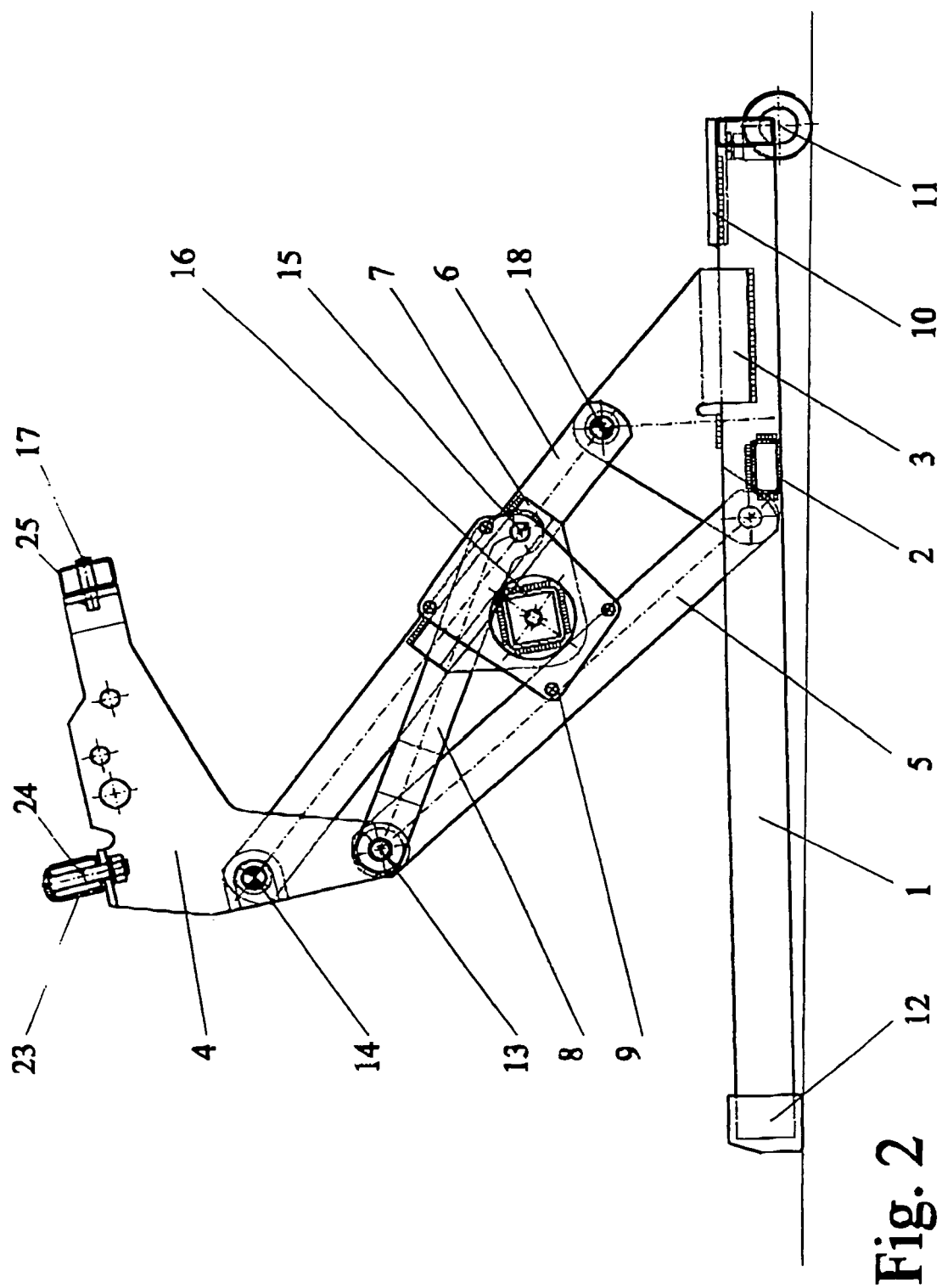


Fig. 1





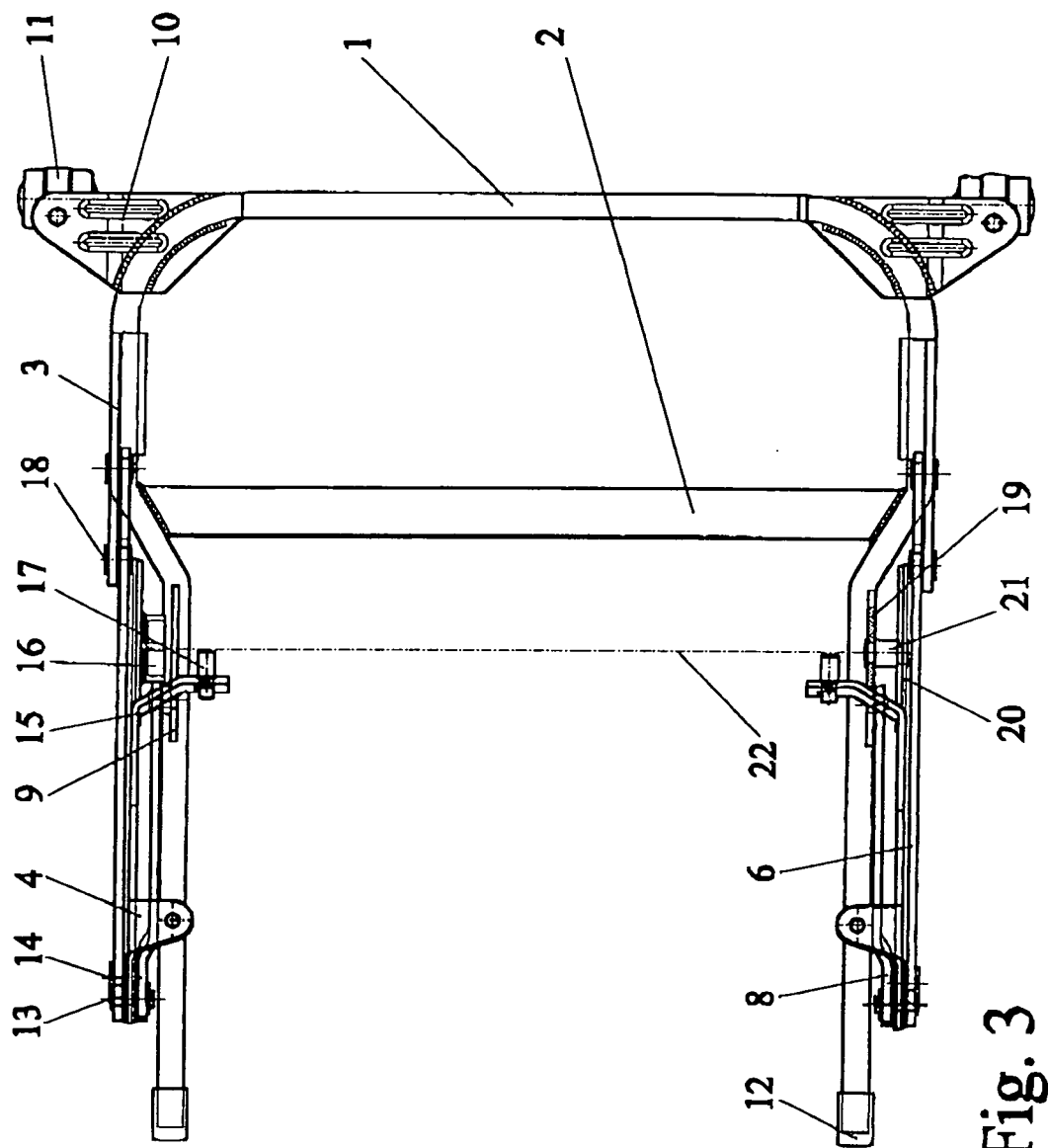


Fig. 3



European Patent  
Office

# EUROPEAN SEARCH REPORT

Application Number  
EP 05 00 8248

| 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)                        |
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| The present search report has been drawn up for all claims                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                      |                                                     |                                                                     |
| Place of search<br>The Hague                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                      | Date of completion of the search<br>18 October 2005 | Examiner<br>Kus, S                                                  |
| CATEGORY OF CITED DOCUMENTS<br>X : particularly relevant if taken alone<br>Y : particularly relevant if combined with another document of the same category<br>A : technological background<br>O : non-written disclosure<br>P : intermediate document<br>T : theory or principle underlying the invention<br>E : earlier patent document, but published on, or after the filing date<br>D : document cited in the application<br>L : document cited for other reasons<br>& : member of the same patent family, corresponding document |                                                                                                                                      |                                                     |                                                                     |

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EPO FORM 1503 (03.02 (P04C01))

**ANNEX TO THE EUROPEAN SEARCH REPORT  
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EP 05 00 8248

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