

(19)



Europäisches Patentamt  
European Patent Office  
Office européen des brevets



(11)

EP 1 658 789 A1

(12)

## EUROPEAN PATENT APPLICATION

(43) Date of publication:  
24.05.2006 Bulletin 2006/21

(51) Int Cl.:  
A47D 1/02 (2006.01)

A47D 13/10 (2006.01)

(21) Application number: 05256952.2

(22) Date of filing: 10.11.2005

(84) Designated Contracting States:  
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR  
HU IE IS IT LI LT LU LV MC NL PL PT RO SE SI  
SK TR  
Designated Extension States:  
AL BA HR MK YU

(30) Priority: 18.11.2004 GB 0425461

(71) Applicant: Kwan Kwai Wun, Tony  
Hong Kong (CN)

(72) Inventor: Kwan Kwai Wun, Tony  
Hong Kong (CN)

(74) Representative: Hedges, Martin Nicholas et al  
A.A. Thornton & Co.  
235 High Holborn  
London WC1V 7LE (GB)

### (54) Collapsible rocker chair

(57) A collapsible chair frame 1 comprises a base 10 having longitudinally extending side bars 10a, 10b, with front mounting brackets 11a, 11b attached to one end of each side bar 10a, 10b. An actuation handle 13 is rotatably connected to the mounting bracket 11a, 11b so as to be rotatable relative thereto about a second axis parallel to but offset from said first axis, and one of a second pair of brackets 20a, 20b is secured to a second end of each side bar 10a, 10b. A front support bar 16, 17 extends from each side of said actuation handle 13 at an inclined angle substantially towards said second end of its re-

spective side bar 10a, 10b. A pair of rear support bars 21, 22 are rotatably connected to the second side brackets and extend at an inclined angle substantially towards said first end of its respective side bar 10a, 10b. Geared plates 18, 24 on ends of the support bars on each side of the frame engage with each other so as to contain the bars 21, 22 on each side to rotate together. The actuation handle 13 further includes locking pins 14 which secure said handle against rotation release means 34 being operable to release the handle 13 for rotation relative to said first pair of brackets.

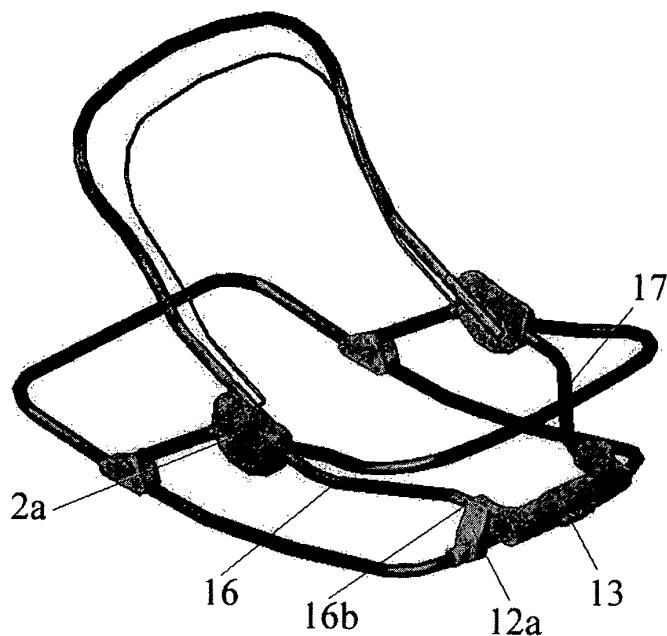


Figure 2b

## Description

**[0001]** The present invention relates to rocker chairs and in particular to rocker chairs for infants which are formed around a collapsible frame.

**[0002]** Infant rocker seats are well known in the art which are collapsible for compact storage. Strict safety legislation exists relating to the design of such collapsible rocker seats, in particular relating to the locking system utilised to prevent accidental collapse of the frame when an infant is seated therein. In order to meet these requirements, one existing design of collapsible rocker seat utilises two separate locking systems which are remotely located from each other, a user being required simultaneously to release a first lock with one hand and a second lock with the other hand. This system has the drawback, however, that it is very cumbersome to operate since both hands of the user are required to release the locks making it difficult then to press the frame towards its closed position.

**[0003]** According to the present invention there is provided a collapsible chair frame comprising a base having a pair of longitudinally extending side bars, a first pair of brackets attached proximate to a first end of each side bar so as to be freely rotatable about a first axis substantially perpendicular to said side bars, an actuation member extending between and rotatably connected to each bracket of said first pair so as to be rotatable relative to said first pair of brackets about a second axis parallel to but offset from said first axis, a second pair of brackets secured proximate to a second end of each side bar, a first pair of support bars each having a first end secured to a respective one of opposing ends of said actuation member and a second end having engagement means provided thereon, each of said first pair of support bars extending from said actuation member at an inclined angle substantially towards said second end of its respective side bar, and a second pair of support bars which extend at an inclined angle substantially towards said first end of its respective side bar, each second support bar having a first end rotatably connected to a respective one of said second pair of brackets and a second end having engagement means provided thereon, said engagement means of the second end of each of said second pair of support bars engaging with the engagement means of the second end of an associated one of the first pair of support bars, such that each of said second pair of support bars and its associated one of the first pair of support bars are constrained to rotate together, wherein said actuation member further includes locking means engageable with said first pair of brackets to secure said actuation member against rotation relative to said brackets, release means operable to move said locking means from a locked position to an unlock position in order to release said actuation member for rotation relative to said first pair of brackets, and safety catch means which, in a first position interacts with the release means to prevent operation thereof and in a second po-

sition is released from said release means so as to enable operation thereof to unlock said actuation member from said brackets.

**[0004]** A collapsible chair frame in accordance with the invention has the advantage that the provision of the release means and the safety catch means necessitates operation of the two separate catches in sequence in order to enable collapse of the frame, thereby reducing the possibility of accidental collapse, whilst the two catches can be configured to enable operation with a single hand of a user, thereby simplifying the collapse operation.

**[0005]** Preferably, a housing is provided on each side of the frame in which are received the second end of a respective one of each of the first pair of support bars and the second pair of support bars so as to maintain the engagement means provided thereon in engagement. More particularly, the second end of each of the first and second pairs of support bars are pivotally mounted in their respective housing, for example by means of through pins, which maintain said ends in positions in which their engagement means are engaged. The engagement means may particularly advantageously take the form of gear teeth which may be formed directly on the second end of the each of the first and second support bars, or may alternatively be formed on end plates which are separately attached to said second ends.

**[0006]** The base of the frame preferably includes a pair of end bars which extend from proximate ends of the side bars transversely of said side bars towards each other, each of said first pair of brackets being rotatably mounted on the end of a respective one of the end bars and the actuation member, which preferably takes the form of a handle, then extends between said brackets substantially parallel to said end bars.

**[0007]** Preferably, tubing defining the plane of the seat and the back of the chair extend between said side housings, in particular each of the back tubing and the seat tube being substantially U-shaped with one end engaged in each of the side housings. The back tubing may advantageously be pivotally connected to said side housings and include locking means operable to lock the back tube in a number of different pivotal positions relative to the side housing, thereby enabling adjustment of the angle of the back of the seat.

**[0008]** The locking means preferably takes the form of a pair of pins which extend from opposing ends of the actuation means and engage in complementary shaped recesses formed in said first brackets, when the actuation means is properly aligned therewith, in order to lock said actuation means against relative rotation, said release means operating to retract said pins from said recesses in order to enable relative rotation to take place. The pins are then attached either to common sides of separate pivot levers or opposing sides of a common pivot lever, operation of the release means causing rotation of the or each pivot lever in order to retract said pins.

**[0009]** In a particularly preferred embodiment, the re-

lease means is a button which projects from the side of the actuation member and is depressible thereinto in order to operate said locking means. More particularly, said button includes a pin which engages into cam openings formed in opposing pivot levers to which said locking pins are connected, movement of the button relative to said pivot levers causing rotation of said levers in opposing directions, which, in turn, pulls said locking pins in opposite directions into the actuation member. In this configuration, the safety catch takes the form of a button which is slidably mounted in the actuation member and has at least one projection which, in a first slide position of the safety catch, extends into the path of movement of the button so as to prevent operation movement thereof, and in a second position, is retracted from said path of movement so as to permit release of said locking pins. In a further development, the safety catch is slidably mounted for movement away from its first position in opposite directions such that in said first position the button is locked against movement, and upon movement away from the first position in either direction, the button is free to be operated to release the locking pins. In this way, operation by both left and right-handed users is possible. Alternatively, however, the release means may take the form of a rotatable lever with the safety catch having a projection which engages into an opening in the lever so as to prevent rotation thereof. Preferably, biasing means such as a spring is associated with the safety catch which biases it into a position in which operational movement of the release means is prevent, the safety catch being manually retractable against the loading of the biasing means.

**[0010]** Other developments and improvements will follow from the embodiment examples described below.

**[0011]** In order that the invention may be well understood, there will now be described some embodiments thereof, given by way of example, reference being made to the accompanying drawings, in which:

Figure 1 is a perspective view of a rocker seat frame according to the invention in an erect position;  
 Figures 2a to 2c are perspective views of the seat frame of Figure 1 at various stages of collapse;  
 Figure 3 is a perspective view of the seat frame of Figure 1 in a collapsed position;  
 Figures 4a to 6b are enlarged views, at various stages of collapsed, of a gearing mechanism coupling the movement of front and rear legs of the seat frame of Figure 1;  
 Figure 7a and 7b are an enlarged view of a locking mechanism of the seat frame according to a first embodiment of the invention;  
 Figure 8 is a side view of the rocker seat of the invention;  
 Figure 9 is a rear perspective view of the seat frame of Figure 1 illustrating operation of a seat back adjustment mechanism; and  
 Figure 10 is an enlarged view of a locking mechanism

of the seat frame according to a second embodiment of the invention.

**[0012]** Referring first to figures 1 to 3, there is shown 5 a collapsible frame structure 1 of an infant's rocker chair as an embodiment example of the present invention. The frame 1 comprises a base tube 10 having a first pair of longitudinally extending side bars 10a, 10b, a rear cross bar 10c extending transversely between said side bars 10a, 10b at the rear of the frame 1, and a pair of front cross bars 10d, 10e which extend transversely from the front end of each side 10a, 10b co-axially towards each other partially across the front of the frame. As can be clearly seen in Figure 4a, the side bars 10a, 10b are 10 curved such that the sides, front and rear bars together define a curved lower surface on which the base tube 10 can rock back and forth.

**[0013]** A mounting bracket 11a, 11b is rotatably mounted 20 on the end of each of the front cross bars 10d, 10e of the base tube 10, each bracket having an arm 12a, 12b extending radially from the respective front cross bar 10d, 10e upon which it is mounted, and a release bar 13 extends between the mounting brackets and is pivotally attached to each of the arms 12a, 12b of the brackets 11a, 11b at a point offset from the front cross bars 10d, 10e such that the release bar 13 is rotatable relative to said brackets 11a, 11b about an axis which is parallel to but radially offset from the axis longitudinal axis of the front cross bars 10d, 10e.

**[0014]** The release bar 13 further includes a pair of locking pins 14 which extend along an axis which is parallel to but offset from the axis of rotation of the release bar 13 relative to the brackets 11a, 11b, which project from opposing ends of the release bar 13 and which are 35 engageable in complementary shaped recesses formed in the brackets when the pins are substantially aligned with the front cross bars 10d, 10e so as to lock the release bar 13 against rotation relative to the brackets.

**[0015]** An aperture 15 which extends radially of the 40 longitudinal axis of the release bar 13 is formed in each end of the release bar 13 and are oriented such that they point upwards towards the rear of the frame at an inclined angle when the locking pins 14 are engaged in the recesses of the brackets 11a, 11b so as to lock the release bar to the brackets as shown in Figure 1. A pair of front support bars 16, 17 each have a first end 16a, 17a which engages in one of the apertures 15 in the release bar 13 and is secured therein by means of a cross bolt, and a second end 16b, 17b on which is fastened a geared plate 45 18 and which is pivotally housed within a respective side housing 2a, 2b. A pair of rear support brackets 20a, 20b are also fixed to the base tube 10, one being connected to each side bar 10a, 10b in longitudinal alignment proximate to the rear cross bar 10c, each support bracket 50 20a, 20b having an associated rear support bar 21, 22 pivotally attached thereto at one end 21a, 22a, the associated rear support bar extending forwardly from the support bracket 20a, 20b, being pivotally connected to a

respective one of the side housings 2a, 2b at a point which is offset from the point of pivotal attachment of the corresponding front support bar 16, 17, and having a geared plate 24 fastened to its upper end 21b, 22b, the teeth of which mesh with the teeth of the geared plate 18 of the correspond front support bar 16, 17. In this way, the front and rear support bars 16, 17, 21, 22 on each side of the frame are constrained to pivot within the side housings 2a, 2b together.

**[0016]** A substantially U-shaped seating tube 3 also has one end 3a, 3b securely fixed to each of the side housings 2a, 2b such that the orientation of the seating tube 3 is substantially fixed relative to the side housings 2a, 2b, and the seating tube 3 loops forward between the side housings 3 so as to form a front support for the chair. As shown in more detail in Figure 4b, each side housing 2a, 2b has a cylindrical recess 4a, 4b formed therein into which the corresponding end 3a, 3b of the seating tube 3 is close tolerance fit so that the seating tube is prevented from pivotal movement relative to the side housings 2a, 2b, the ends 3a, 3b being secured in the respective recesses 4a, 4b by means of a bolt 5 as shown in Figures 4a to 6b. It can also be seen that each end 3a, 3b has more than one through opening into which the bolts 5 are engageable, such that distance by which the seating tube 3 extends forward from the side housings 3 a, 3b can be adjusted.

**[0017]** Similarly, a substantially U-shaped rear tube 6 also has one end 6a, 6b pivotally attached to each side housing 2a, 2b with the sides of the rear tube 6 extend substantially rearwardly from the side housings 2a, 2b as shown in Figure 2c. Locking means 7 is associate with the rear tube 6, in the form of a U shaped locking lever which engages with opposing ends 7a, 7b with locking recesses 8 formed in the side housings 2a, 2b to lock the rear tube in one of a plurality of different pivotal positions in a manner which is well known in the art and which will not therefore be described further.

**[0018]** Referring now to Figure 7a and 7b, there is shown a detailed view of a release mechanism housed within the release bar 13 for disengaging the pins 14 from the brackets 11a, 11b so as to enable the frame to be collapsed as described hereinafter. Each pin 14 is attached to a respective pull cable 30, which, in turn, are attached to a lever arm 31 c, 31 d of one of a pair of actuation plates 31 a, 31 b, each of which is pivotally mounted on one of a pair of spaced apart, parallel extending pivot posts 32a, 32b such that each plate 31a, 31b can be pivoted about the longitudinal axis of its associated post 32a, 32b in order to rotate its lever arm away from the end of the release bar 13 with which its locking pin 14 is associated and to retract the locking pin 14 into the release bar. The plates 31 a, 31b furthermore overlap each other and each plate 31 a, 31b has, formed in its overlapping section, a slot 33a, 33b, the sides of which form camming surfaces. A press button 34 is mounted in the release bar behind the plates 31a, 31b so as to be slidably movable relative thereto in a plane

perpendicular to the axes of rotation of the plates 31a, 31b. The button 34 furthermore has an actuation pin 35 which engages in both slots 33a, 33b of the two plates 31a, 31b, such that upon sliding movement of the button

5 34 relative to the plates 31a, 31b in a first direction, a camming action is developed between the actuation pin 35 and the slots 33a, 33b which causes the lever arms 31c, 31d to rotate away from each other, thereby pulling the cables 30 away from the associated ends of the release bar 13 and hence retracting the pins thereinto, and upon sliding movement of the button 34 relative to the plates 31a, 31b in a second direction opposite said first direction, a camming action is developed between the actuation pin 35 and the slots 33a, 33b which causes the 10 lever arms 31c, 31d to rotate towards each other, thereby relieving the tension in the cables 30. Springs 37 which are associated with each pin 14 and bias each said pin into an extending position then operate to return the pins 15 14 to their locking positions.

**[0019]** In order to prevent accidental operation of the press button 34, a slide button 36 is provided in the release bar 13 opposite the press button 34 which has projections 37 formed thereon which extend towards the press button 34. The slide button is slidably moveable 20 laterally in a direction perpendicular to the direction of sliding movement of the press button 34 from a central position in which the projections 37 thereon engage with the press button 34 so as to prevent movement of the press button towards the slide button 36 and hence prevent release of the locking pins 14, in either a left or right direction to a side position in which the projections 37 are disengaged from the press button so that the press button is free to move towards the slide button in order to retract the pins 14 into the release bar as described 25 above and hence unlock the release bar from the brackets. Springs 38 cooperate with the slide button 36 so as to bias it into its central position, and the projections 37 have inclined surfaces which engage with the press button 34 as the slide moves back towards its first position, 30 developing a camming action therewith which urged the press button away from the slide button 36 and back into its locked position.

The fame operates as follows:

45 **[0020]** With the release bar 14 in its locked position shown in Figure 1, the front support bars 16, 17 are locked in position due to their inability to pivot relative to the release bar 14, which, in turn, locks the rear support bars 50 18, 19 again movement due to the meshing engagement of the gear teeth carried on the ends 16b, 17b, 18b, 19b thereof which are housed within the side housings. The seat and rear tubes 6, 7 are therefore securely supported in elevated positions above the base tube 10 by the support bars 16, 17, 18, 19.

**[0021]** In order to collapse the frame, the user moves the slide button 36 towards its second position using the thumb and then presses the projection portion of the

press button 34 using the fingers of the same hand, which causes the locking pins to be retracted into the release bar 13, thereby unlocking for rotation relative to the brackets 11a, 11b. The release bar can then be rotated about the brackets 11a, 11b, whilst, at the same time, the brackets 11a, 11b are pivoted about the front cross bars 10e, 10f. This double pivot allows the release bar to be translated forwards relative to the frame, moving the front ends 16a, 17a of the front support bars 16, 17 with it. This, in turn causes the front support bars 16, 17 to rotate anti-clockwise relative to the side housings 2a, 2b, the meshing engagement of the teeth on the rear support bars 18, 19 causing those rear support bars to pivot clockwise relative to the side housings 2a, 2b, and the frame thereby collapses onto the base tube 10 under its own weight as shown in Figures 2a to 3.

**[0022]** In order to re-erect the frame, the side housings 2a, 2b are simply lifted away from the base tube 10, which causes the release bar and brackets to move back into engagement and lock together.

**[0023]** It will, of course, be understood that the press button mechanism of Figure 7 may be substituted with mechanism without departing from the invention. For example, a rotating lever may be utilised, a suite slide or press button being provided which releases and/or engages a pin into the lever plate so as to prevent its rotational movement and hence provide the necessary double lock.

**[0024]** Alternatively, each locking pin 14 may be connected to a linkage 102 which, in turn, connects to a rotating rod 103, rotation of the rod 103 causing a pin 103a, 103b carried eccentrically on the end thereof to move away from or towards the locking pin 14 so as, respectively, to pull or push an actuation lever 104a, 104b in order to retract or extend the pin. A press button 105 is then provided having an opening 106 formed therein in which engages an arm 107 which extends radially from the centre of the rod 103. The button is mounted in the release bar 13 for sliding movement both parallel and perpendicular to the longitudinal axis of the rod 103, and the opening 106 is L-shaped such that, in a first longitudinal position of the press button 105 relative to the release bar 13, movement of the press button perpendicular to the rod by pressing it into the release bar 13 causes the opening 106 to move relative to the arm 107 in the manner of a lost motion coupling without the sides thereof engaging the arm 107 and hence without effecting any rotation of the rod 103. Upon sliding the press button 105 longitudinally relative to the release bar 13 towards a second longitudinal position, the arm 107 is moved towards the closed end of the base of the L-shaped opening 106, whereupon movement of the press button towards the rod causes the arm 107 to be engaged by the side of the opening 106, moving it transversely relative to the rod 103 and thereby rotating the rod 103, which in turn, retracts the pins. Springs 109, 110 are provided within the release bar 13 which bias the press button both away from the rod 103 and longitudinally into its

first longitudinal position as shown in Figure 10.

**[0025]** In an variation of Figure 10 which is not illustrated, instead having an L-shaped opening in the press button, locking ribs may be provided on the casing of the release rod 13, which, when the button is in its first longitudinal position, engage with the press button to prevent its movement towards the rod but which, upon movement of the press button into its second longitudinal position, are aligned with slots formed in the press button so as to enable the button to be depressed and the pins thereby to be unlocked. In all embodiments, it will be seen that the double operation of the lock required to collapse the frame ensures that accidental release cannot occur.

## 15 Claims

1. A collapsible chair frame (1) comprising a base (10) having a pair of longitudinally extending side bars (10a, 10b), a first pair of brackets (11a, 11b) attached proximate to a first end of each side bar (10a, 10b) so as to be freely rotatable about a first axis substantially perpendicular to said side bars (10a, 10b), an actuation member (13) extending between and rotatably connected to each bracket (11a, 11b) of said first pair so as to be rotatable relative to said first pair of brackets (11a, 11b) about a second axis parallel to but offset from said first axis, a second pair of brackets (20a, 20b) secured proximate to a second end of each side bar (10a, 10b), a first pair of support bars (16, 17) each having a first end (16a, 17a) secured to a respective one of opposing ends of said actuation member (13) and a second end (16b, 17b) having engagement means (18) provided thereon, each of said first pair of support bars (16, 17) extending from said actuation member (13) at an inclined angle substantially towards said second end of its respective side bar 10a, 10b, and a second pair of support bars (21, 22) which extend at an inclined angle substantially towards said first end of its respective side bar (10a, 10b), each second support bar (21, 22) having a first end (21a, 22a) rotatably connected to a respective one of said second pair of brackets (20a, 20b) and a second end (21b, 22b) having engagement means (24) provided thereon, said engagement means (24) of the second end (21b, 22b) of each of said second pair of support bars (21, 22) engaging with the engagement means (18) of the second end (16b, 17b) of an associated one of the first pair of support bars (16, 17), such that each of said second pair of support bars (21, 22) and its associated one of the first pair of support bars (16, 17) are constrained to rotate together, wherein said actuation member (13) further includes locking means (14) engageable with said first pair of brackets (11a, 11b) to secure said actuation member (13) against rotation relative to said brackets (11a, 11b), release means (34) operable to move

said locking means (14) from a locked position to an unlock position in order to release said actuation member (13) for rotation relative to said first pair of brackets (11a, 11b), and safety catch means (36) which, in a first position interacts with the release means (34) to prevent operation thereof and in a second position is released from said release means (34) so as to enable operation thereof to unlock said actuation member (13) from said brackets (11a, 11b).

2. A collapsible chair frame according to claim 1, wherein a housing (2a, 2b) is provided on each side of the frame (1) in which are received the second end (16b, 21b; 17b, 22b) of a respective one of each of the first pair of support bars (16, 17) and the second pair of support bars (21, 22) so as to maintain the engagement means (18, 24) provided thereon in engagement.

3. A collapsible chair frame according to claim 2, wherein the second ends (16b, 21b; 17b, 22b) of each of the first and second pairs of support bars (16, 21; 17, 22) are pivotally mounted in their respective housing (2a; 2b), preferably said second ends (16b, 21b, 17b, 22b) being retaining in said housings (2a, 2b) by means of pins.

4. A collapsible chair frame according to claim 2 or claim 3, wherein tubing defining the plane of a seat portion (3) and a back portion (6) of the chair extends between said side housings (2a, 2b).

5. A collapsible chair frame according to any of the preceding claims, wherein the engagement means take the form of geared plates (18, 24), which preferably are formed separately from said first pair of support bars (16, 17).

6. A collapsible chair frame according to any of the preceding claims, wherein the base of the frame includes a pair of end bars (10d, 10e) which extend from proximate first ends of the side bars (10a, 10b) transversely of said side bars (10a, 10b) towards each other, each of said first pair of brackets (11a, 11b) being rotatably mounted on the end of a respective one of the end bars (10d, 10e), and the actuation member (13) extending between said brackets (11a, 11b) substantially parallel to said end bars (10d, 10e).

7. A collapsible chair frame according to claim 6, wherein said locking means comprises a pair of pins (14) which extend from opposing ends of the actuation member (13) and engage in complementary shaped recesses formed in said first brackets (11a, 11b) in order to lock said actuation member (13) against relative rotational movement, said release means (34) operating to retract said pins (14) from said recesses.

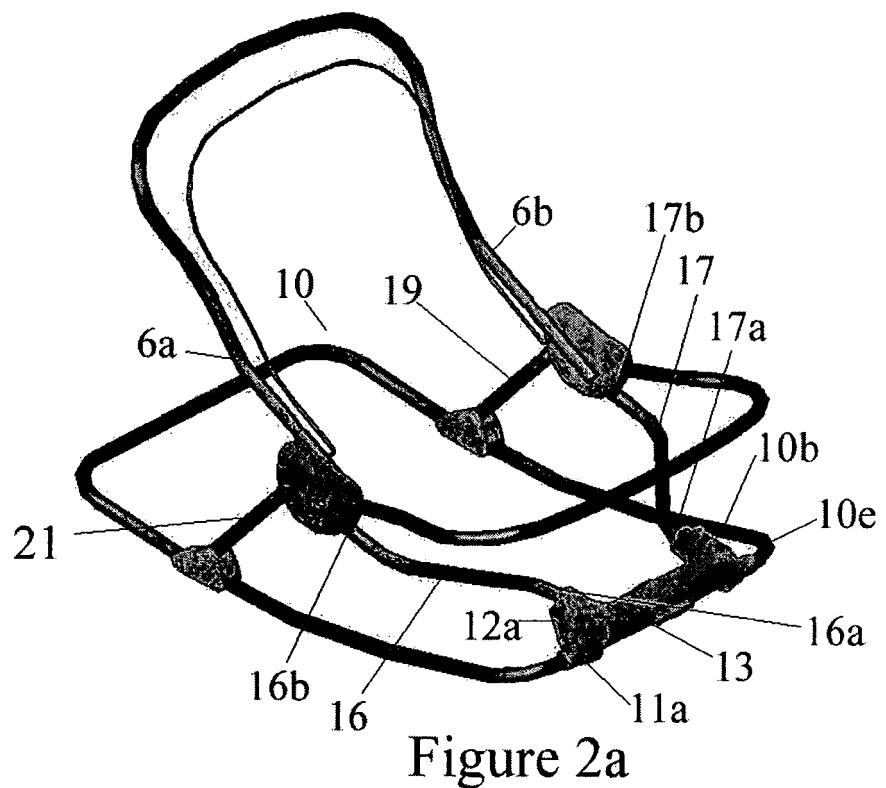
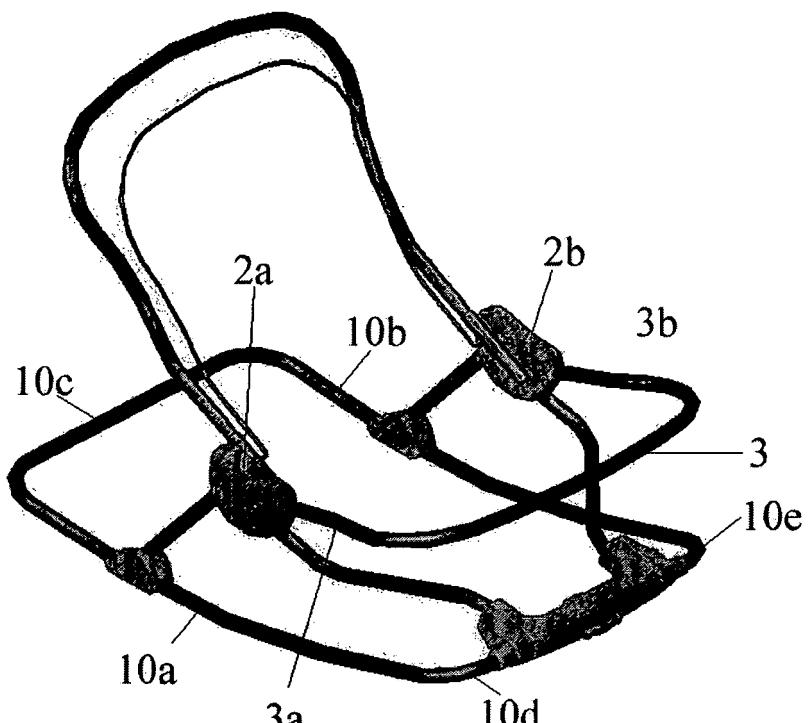
8. A collapsible chair frame according to claim 7, wherein each pin (14) is attached to an associated pivot lever (31a, 31b), operation of said release means (34) effecting rotation of said pivot levers (31a, 31b) in order to retract said pins (14).

9. A collapsible chair frame according to claim 7, wherein said pins (14) are attached to opposite sides of a common pivot lever, operation of said release means (34) effecting rotation of said pivot lever in order to retract said pins.

10. A collapsible chair frame according to claim 8 or claim 9, wherein the release means (34) is a button which projects from the side of the actuation member (13) and which includes an actuation pin (35) that engages into a cam opening (33a, 33b) formed in the or each pivot lever to which said pins (14) are attached, movement of the button (34) relative to the or each pivot lever causing operative rotation thereof which retracts said pins (14) into the actuation member (13).

11. A collapsible chair frame according to claim 10, wherein said safety catch (36) is slidably mounted in the actuation member (13) and has at least one projection (37) which, in a first slide position of the safety catch (36), extends into the path of movement of the release means (34) so as to prevent operative movement thereof, and in a second position, is retracted from said path of movement so as to permit release of said locking pins (14).

12. A collapsible chair frame according to claim 8 or claim 9, wherein the release means (34) is a rotatable lever, rotation of which effects rotation of the or each pivot lever, the safety catch having a projection which engages with said release means in order to prevent rotational movement thereof.



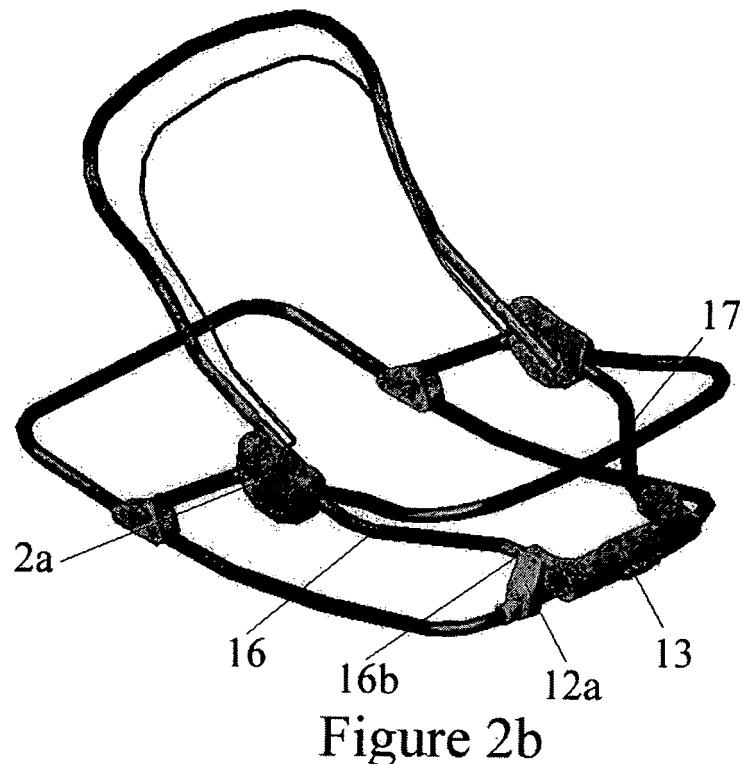


Figure 2b

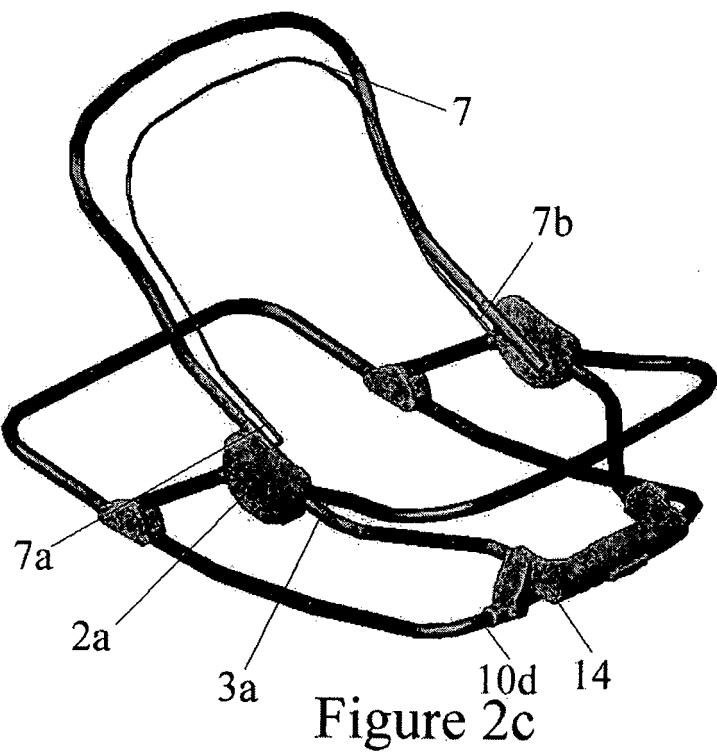


Figure 2c

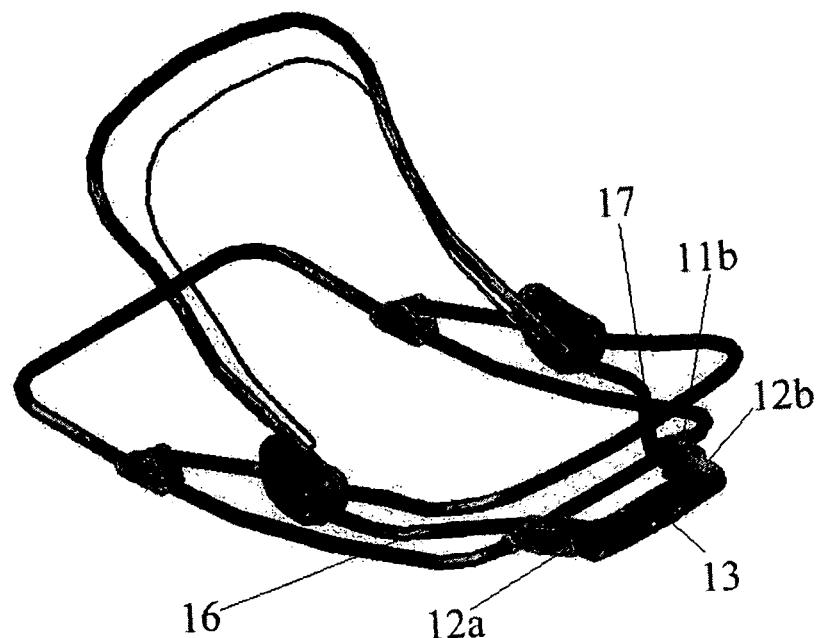


Figure 3

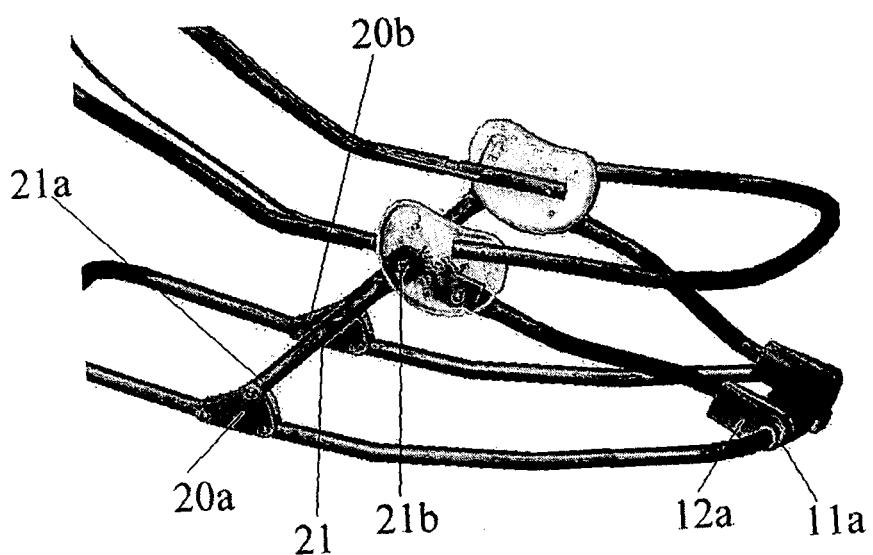
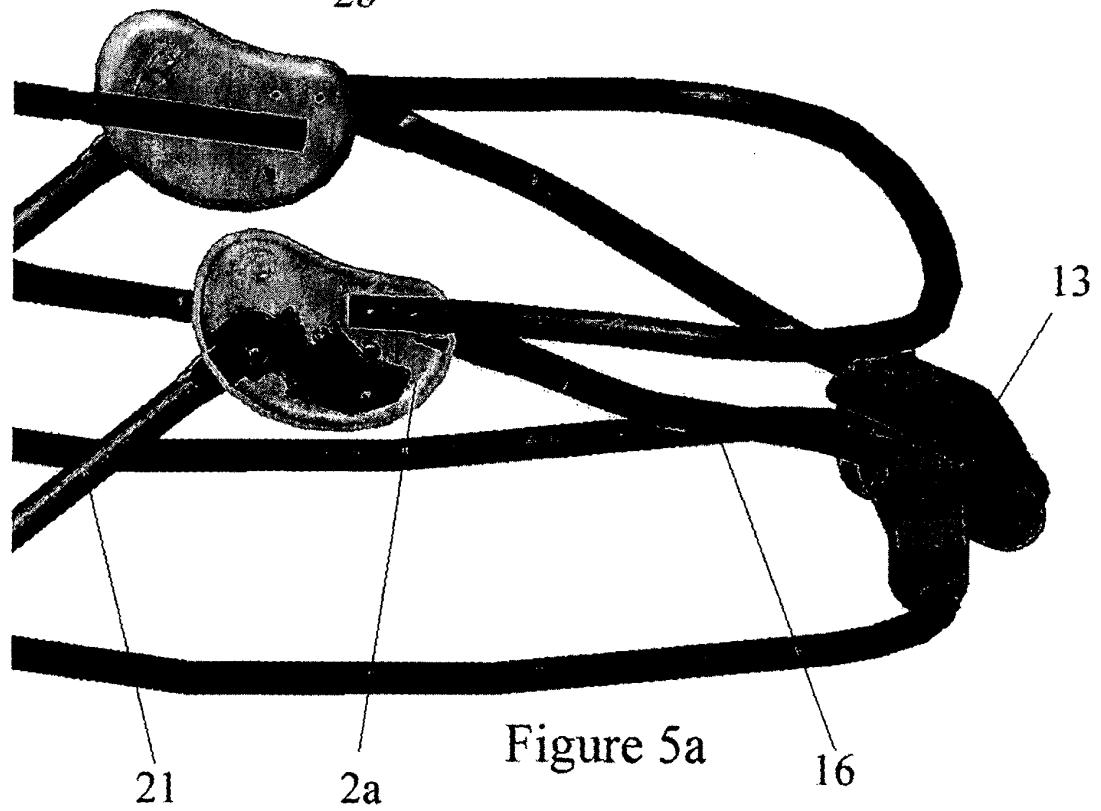
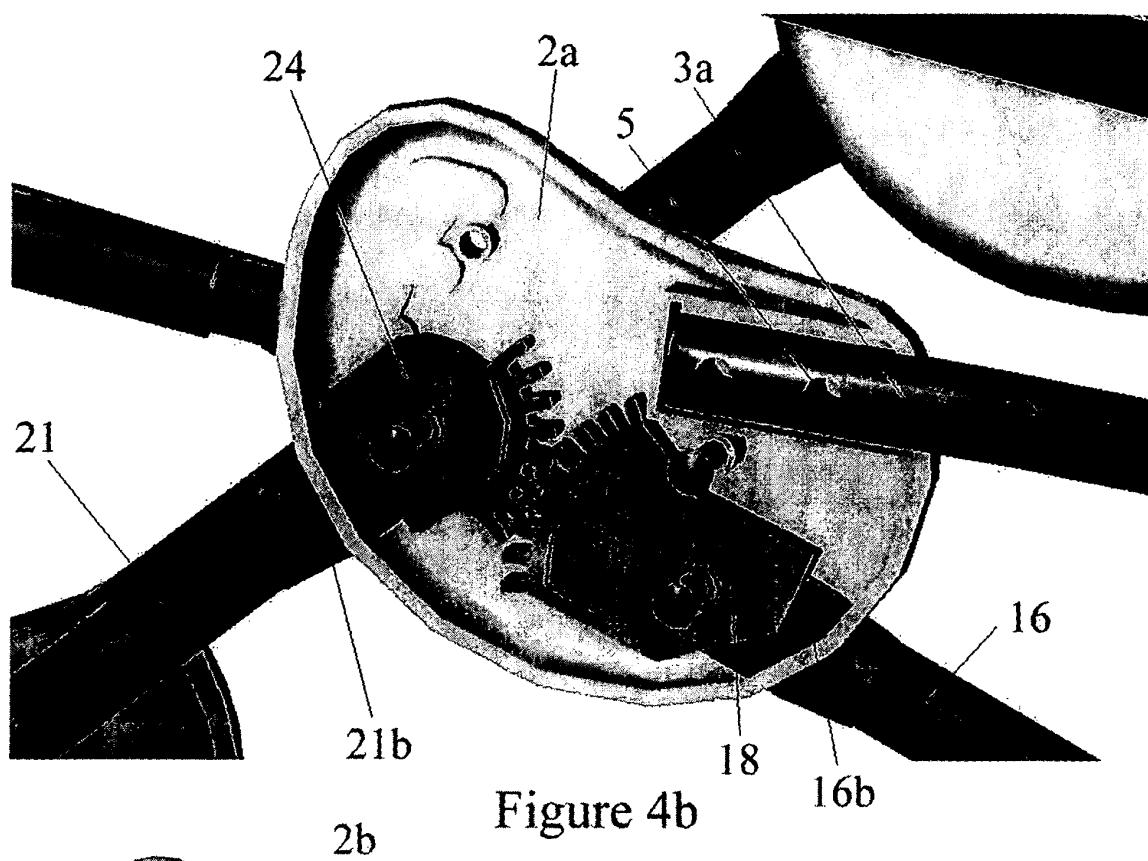


Figure 4a



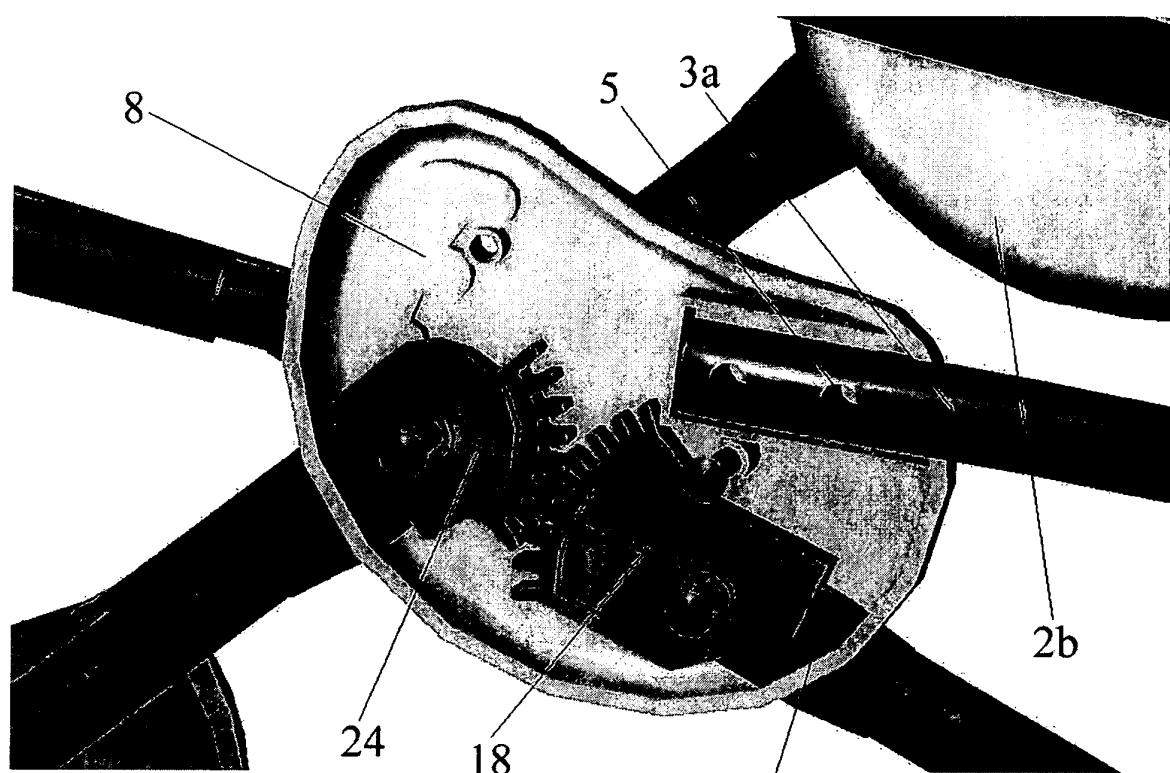


Figure 5b

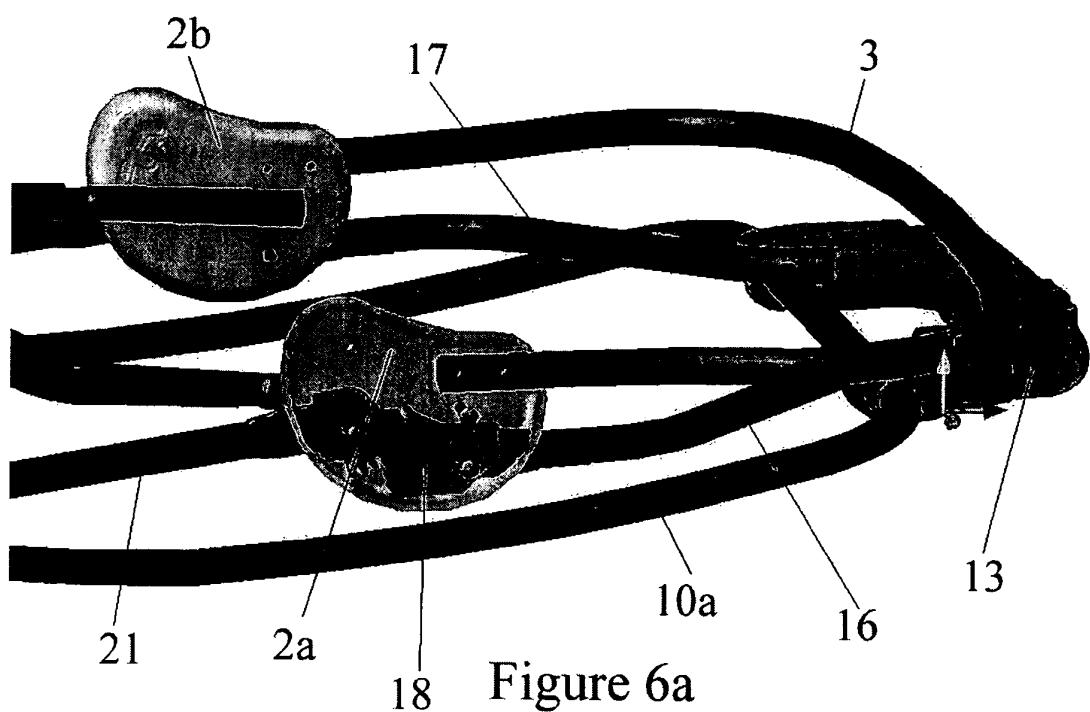


Figure 6a

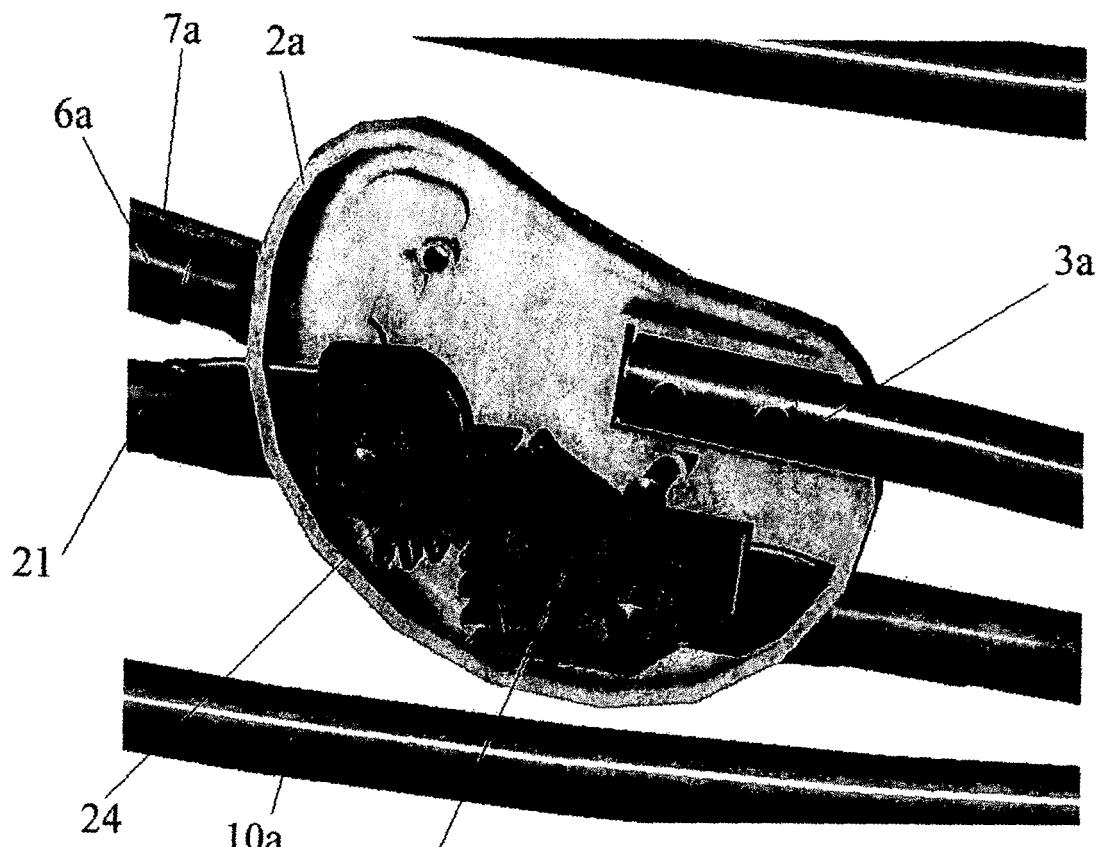


Figure 6b

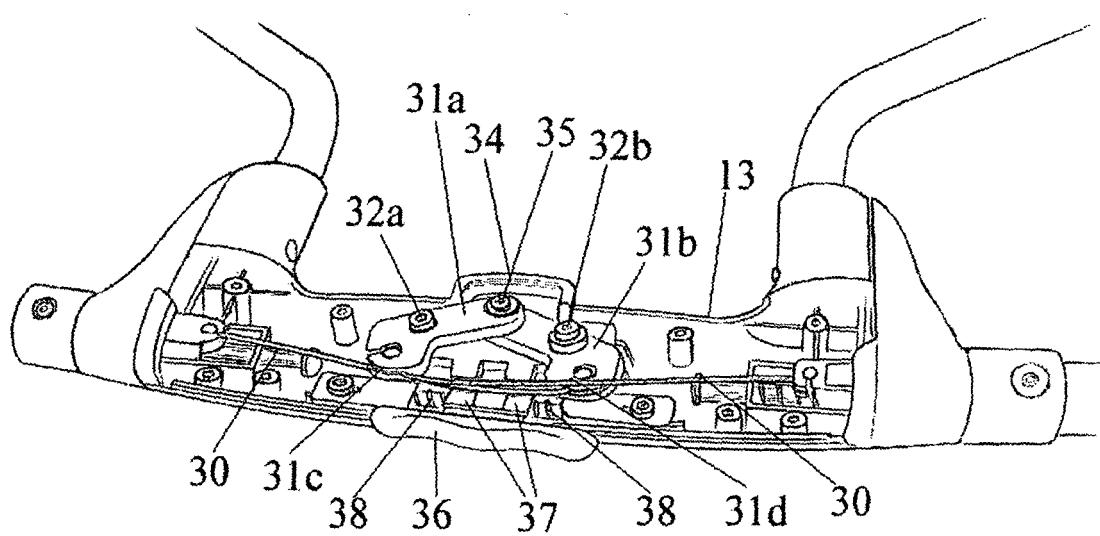


Figure 7a

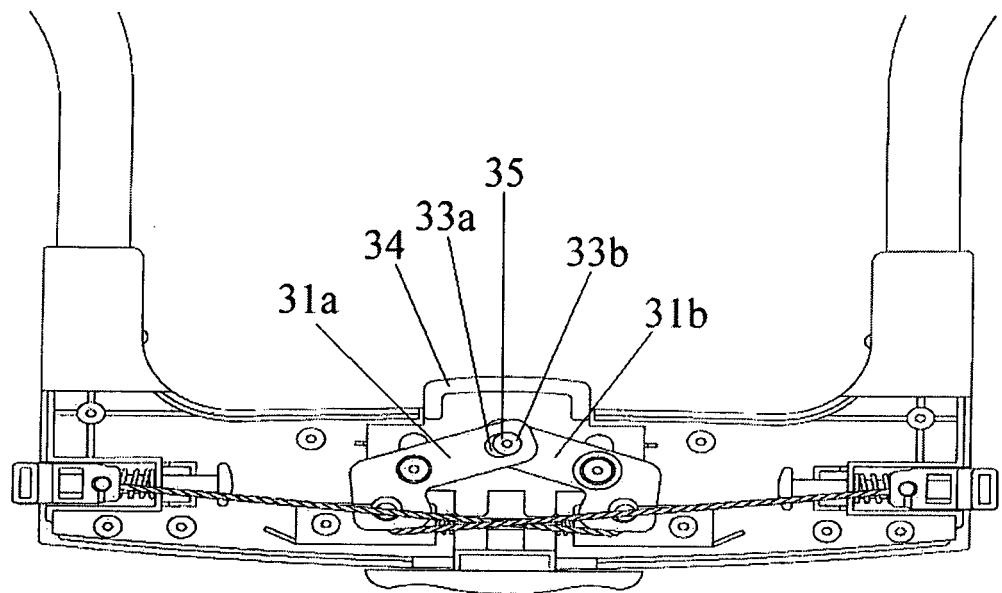


Figure 7b

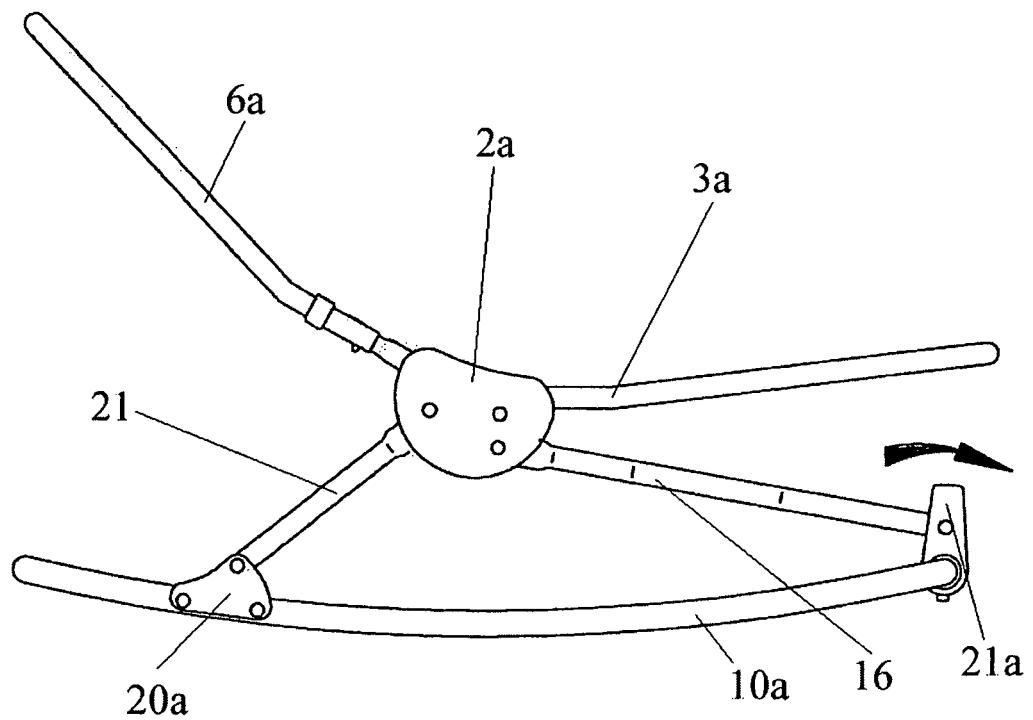


Figure 8

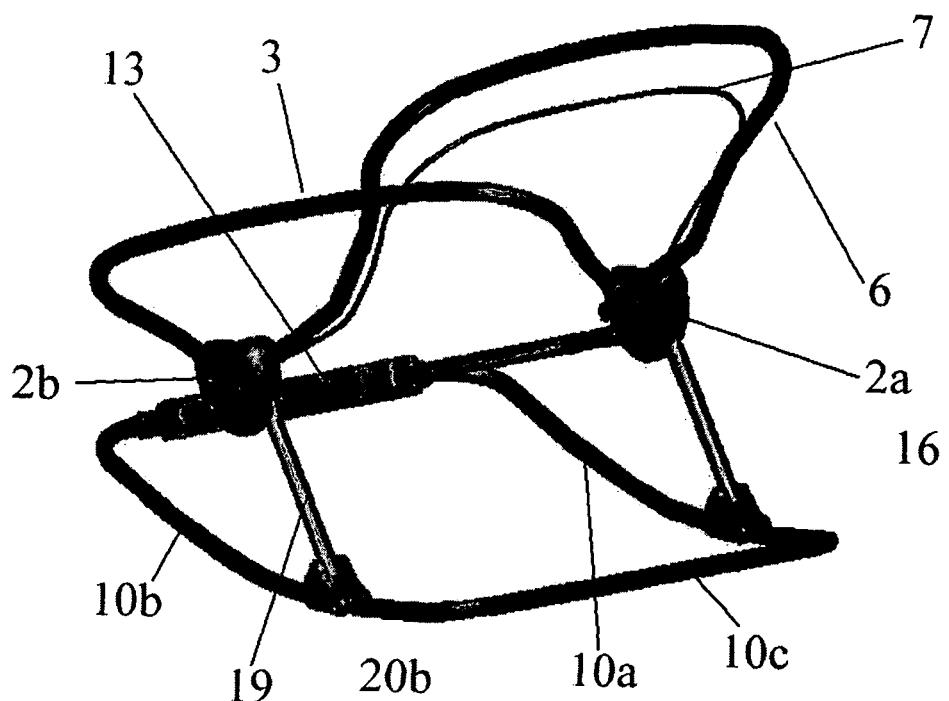


Figure 9

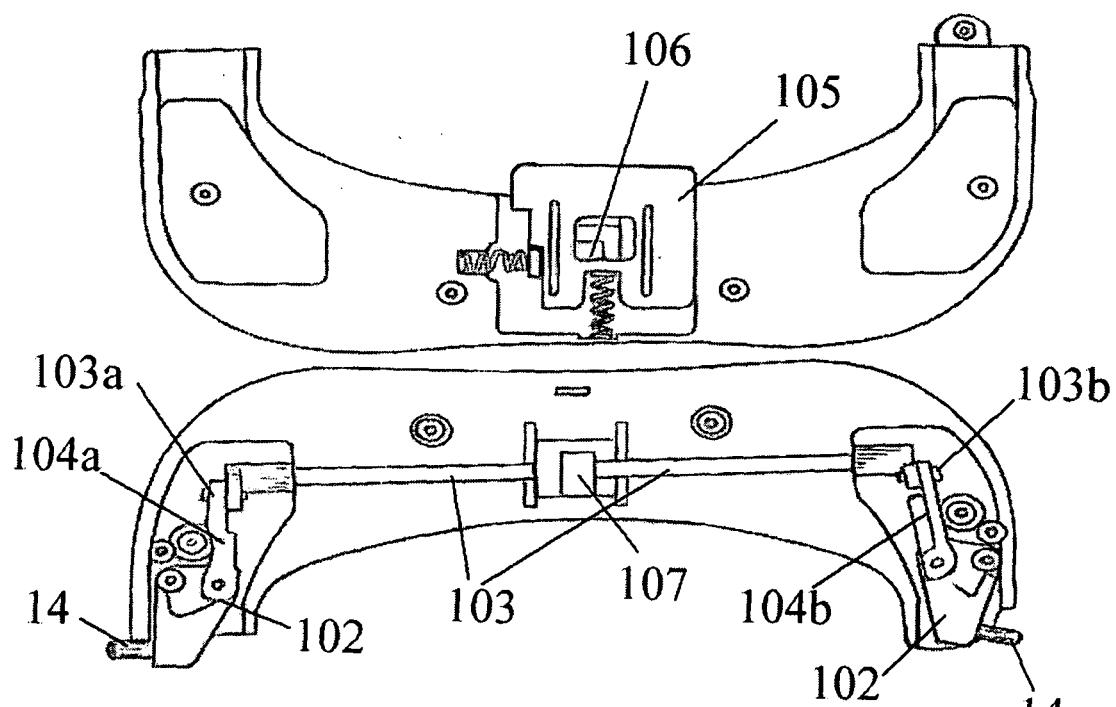


Figure 10



DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (IPC)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
A	US 2003/096654 A1 (TAI CHUAN-TSO ET AL) 22 May 2003 (2003-05-22) * the whole document *	1-12	A47D1/02 A47D13/10
A	US 6 682 148 B1 (CHEN OWEN) 27 January 2004 (2004-01-27) * the whole document *	1-12	
			TECHNICAL FIELDS SEARCHED (IPC)
			A47D
<p>1 The present search report has been drawn up for all claims</p>			
Place of search		Date of completion of the search	Examiner
Munich		3 February 2006	Lassen, S
<p>CATEGORY OF CITED DOCUMENTS</p> <p>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</p> <p>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 ..... &amp; : member of the same patent family, corresponding document</p>			

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

EP 05 25 6952

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.

03-02-2006

Patent document cited in search report		Publication date		Patent family member(s)		Publication date
US 2003096654	A1	22-05-2003	TW	502594 Y		11-09-2002
US 6682148	B1	27-01-2004	NONE			