(12) UK Patent Application (19) GB (11) 2495488 (13) A

(43) Date of A Publication 17.04.2013

(21) Application No: 1117357.2

(22) Date of Filing: 07.10.2011

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(51) INT CL:
A47C 1/032 (2006.01) ***A47C 3/20*** (2006.01)
A47C 7/40 (2006.01) ***A47D 1/00*** (2006.01)

(56) Documents Cited:
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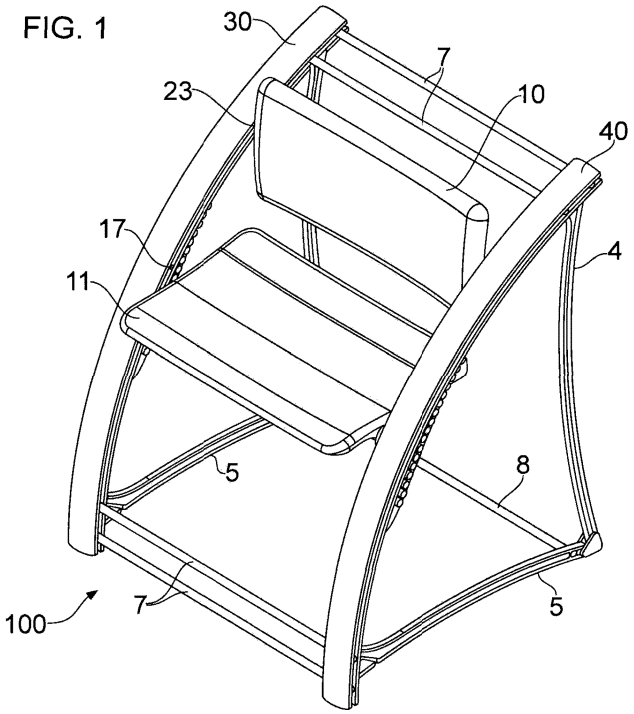
JP 2001046171 A1 **US 2479175 A**

(58) Field of Search:
UK CL (Edition X) **A4L**
INT CL **A47C, A47D**
Other: **Online: EPODOC, WPI; TXTE, TXTT**

(54) Title of the Invention: **Chair**
Abstract Title: **Chair with seat depth and seat height adjustment**

(57) A chair 100 comprises a seat 11, a back rest 10 and a frame with a curved rail 30,40, wherein the seat and back rest are carried by a runner 17 which is movable along the rail such that the position of the back rest 10 relative to the seat 11 changes in a horizontal direction as the seat and back rest move along the rail 30,40 together. The chair provides a seat with simultaneous adjustment of seat height and seat depth, suitable for use by pupils in school. The chair may be foldable and preferably includes a pair of side rails to support the backrest. Also disclosed is a chair with a seat, a frame which comprises a series of fixing elements on each side of the frame for defining a range of heights of the seat, and a locking device mounted on the seat and arranged to engage with the fixing elements to lock the seat in any one of a number of heights corresponding the position of the fixing elements on each side of the frames [see Figs. 3-5]. Also disclosed is a foldable chair with a seat supported by a frame that has a side rail and a leg carried by the side rail, and wherein the chair can change between an open position with the leg extended, and a folded position in which the leg is retracted and which causes the seat to move substantially flat with the rest of the chair.

FIG. 1



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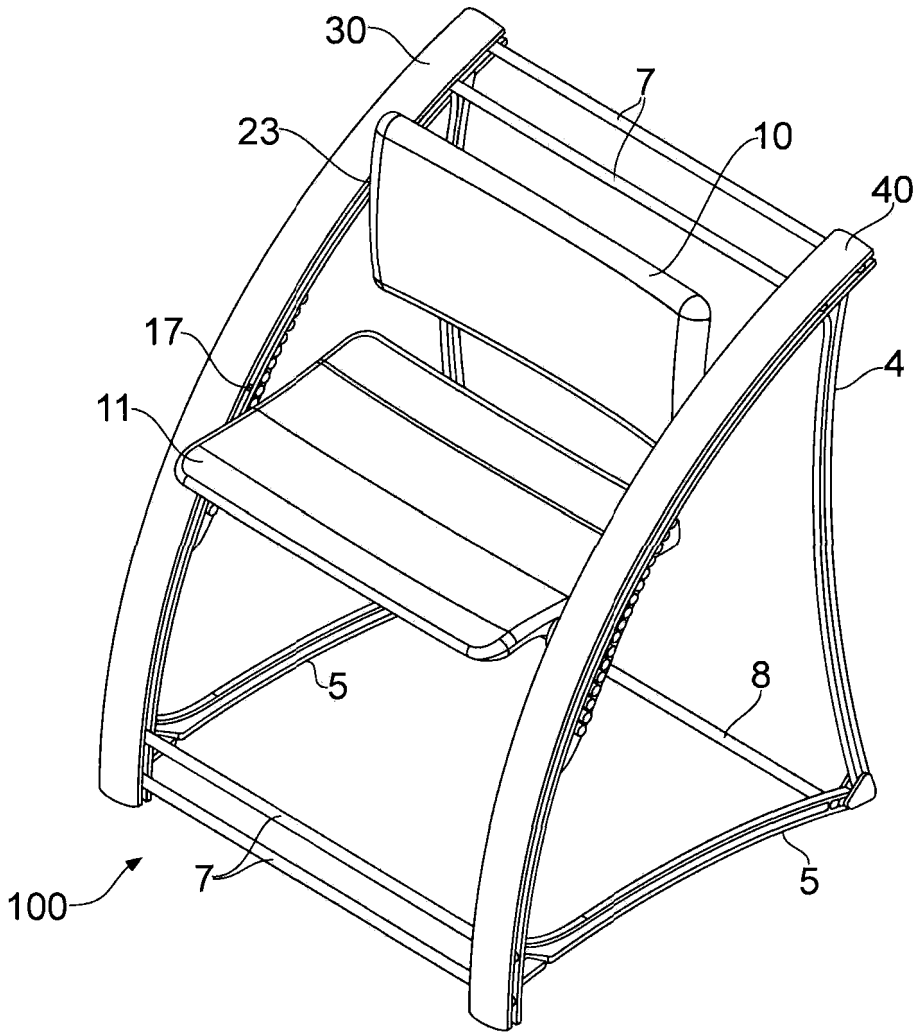


FIG. 1

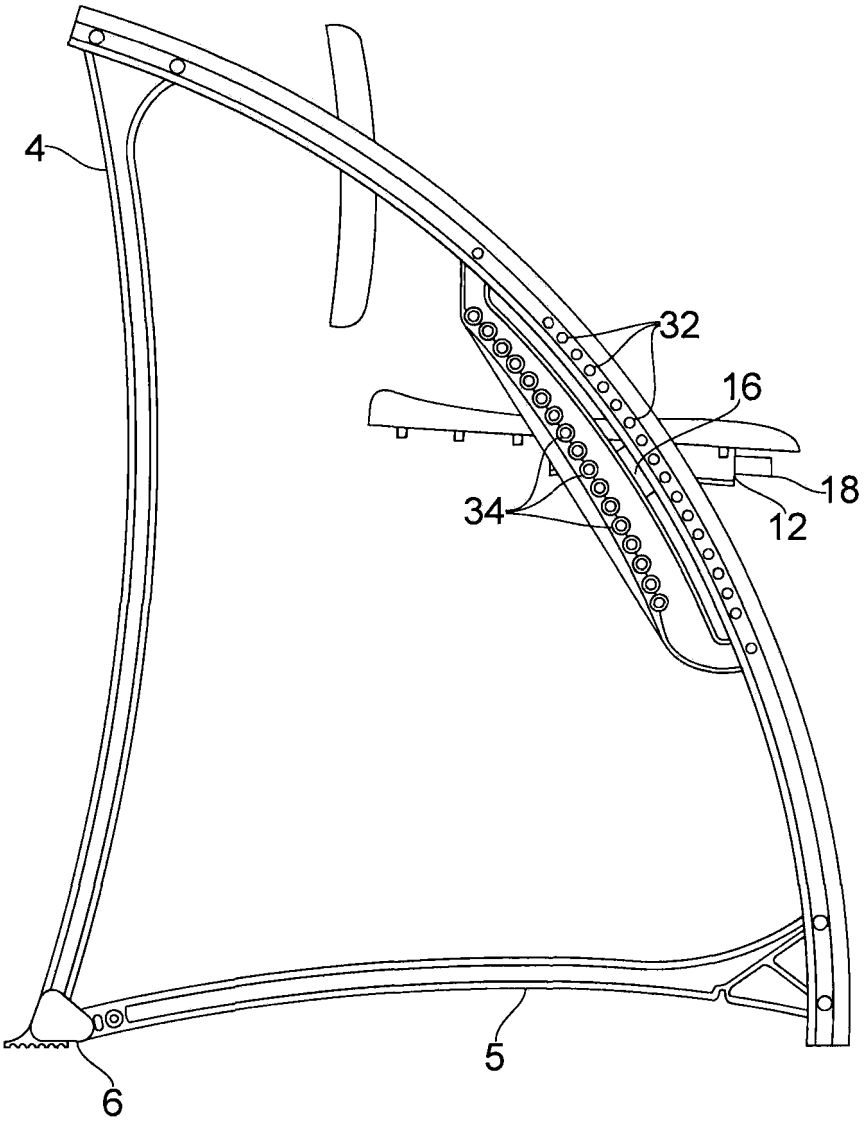


FIG. 2

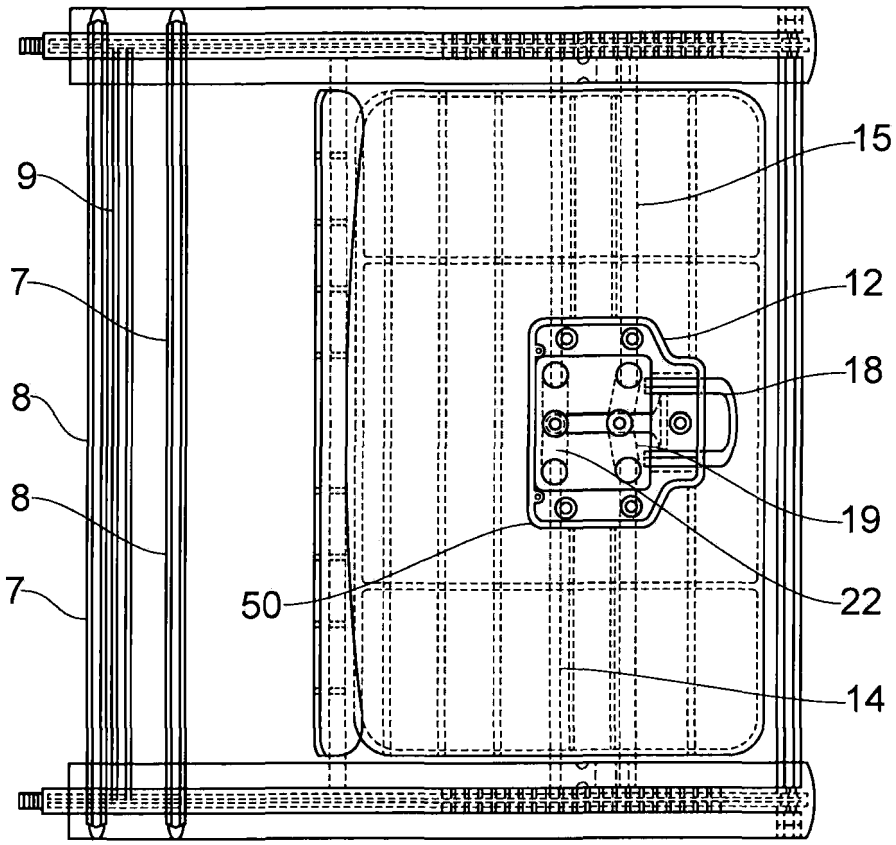


FIG. 3

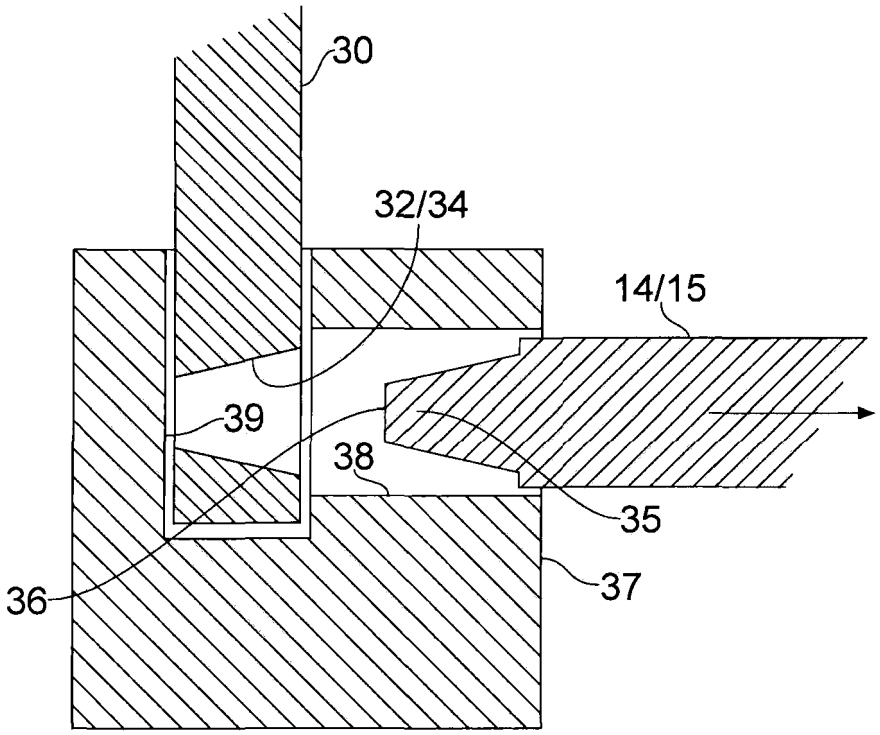


FIG. 4

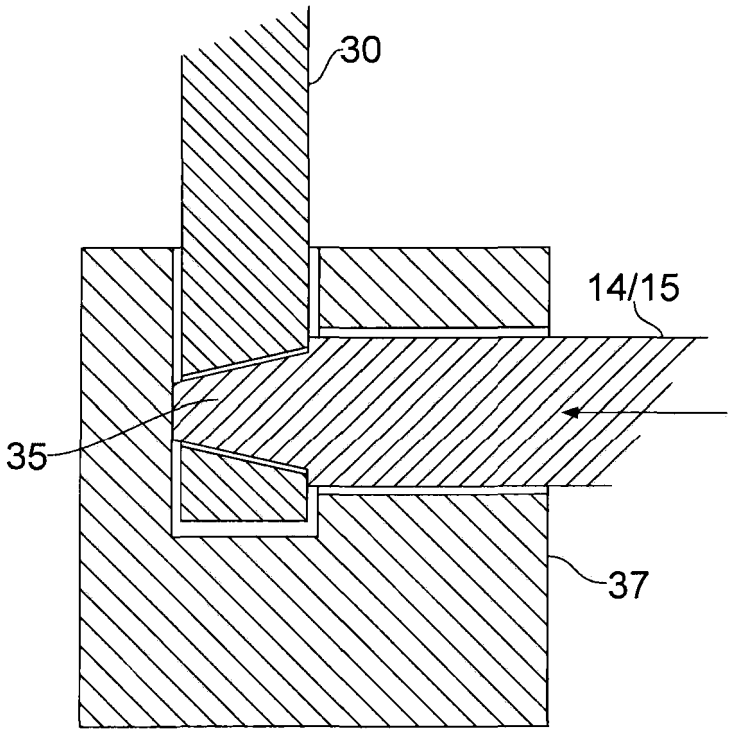


FIG. 5

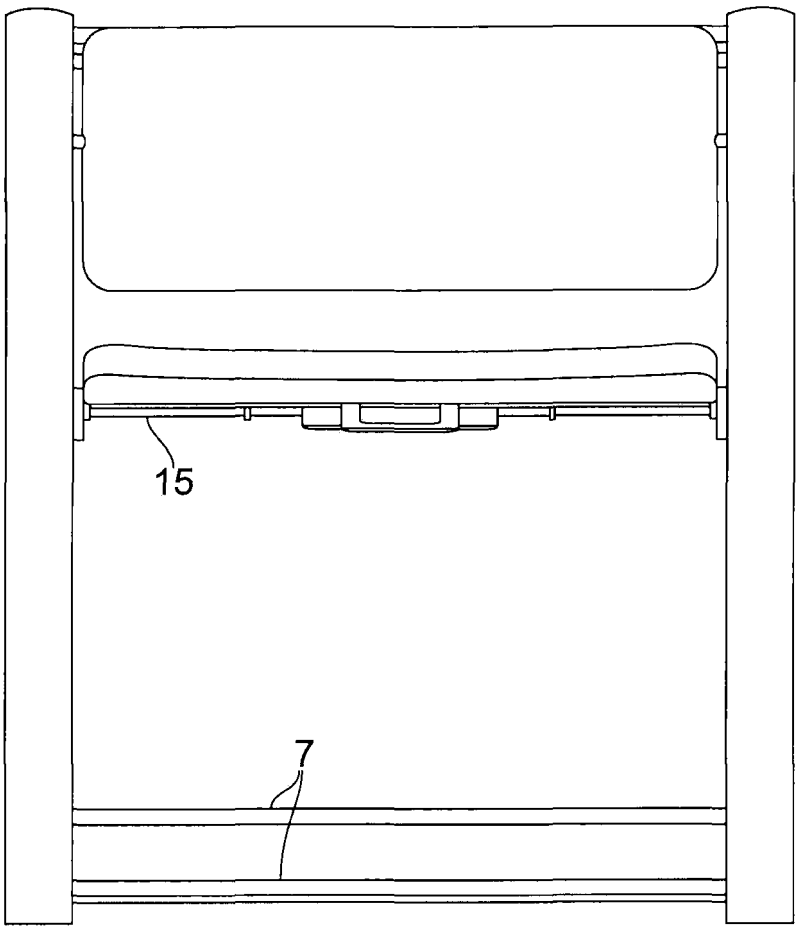


FIG. 6

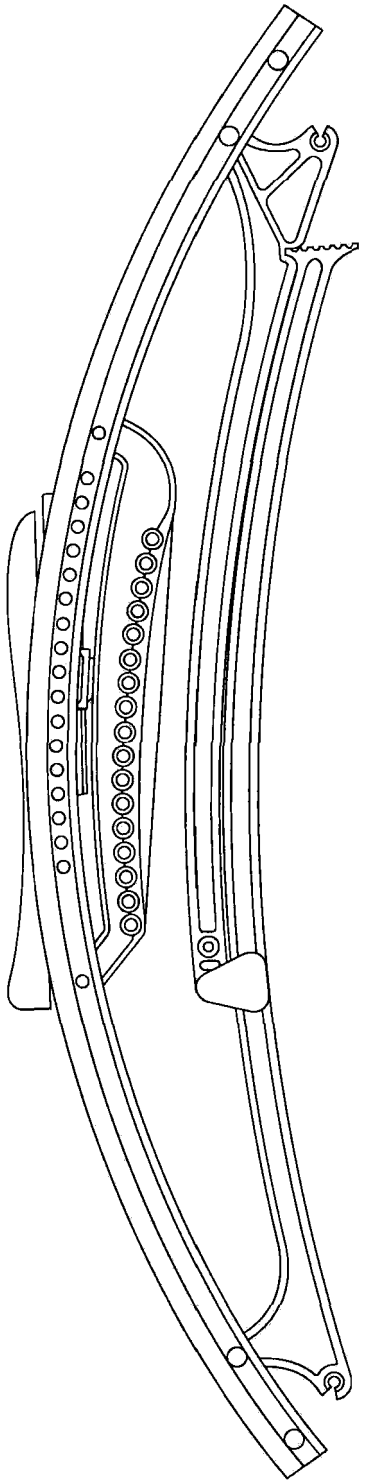
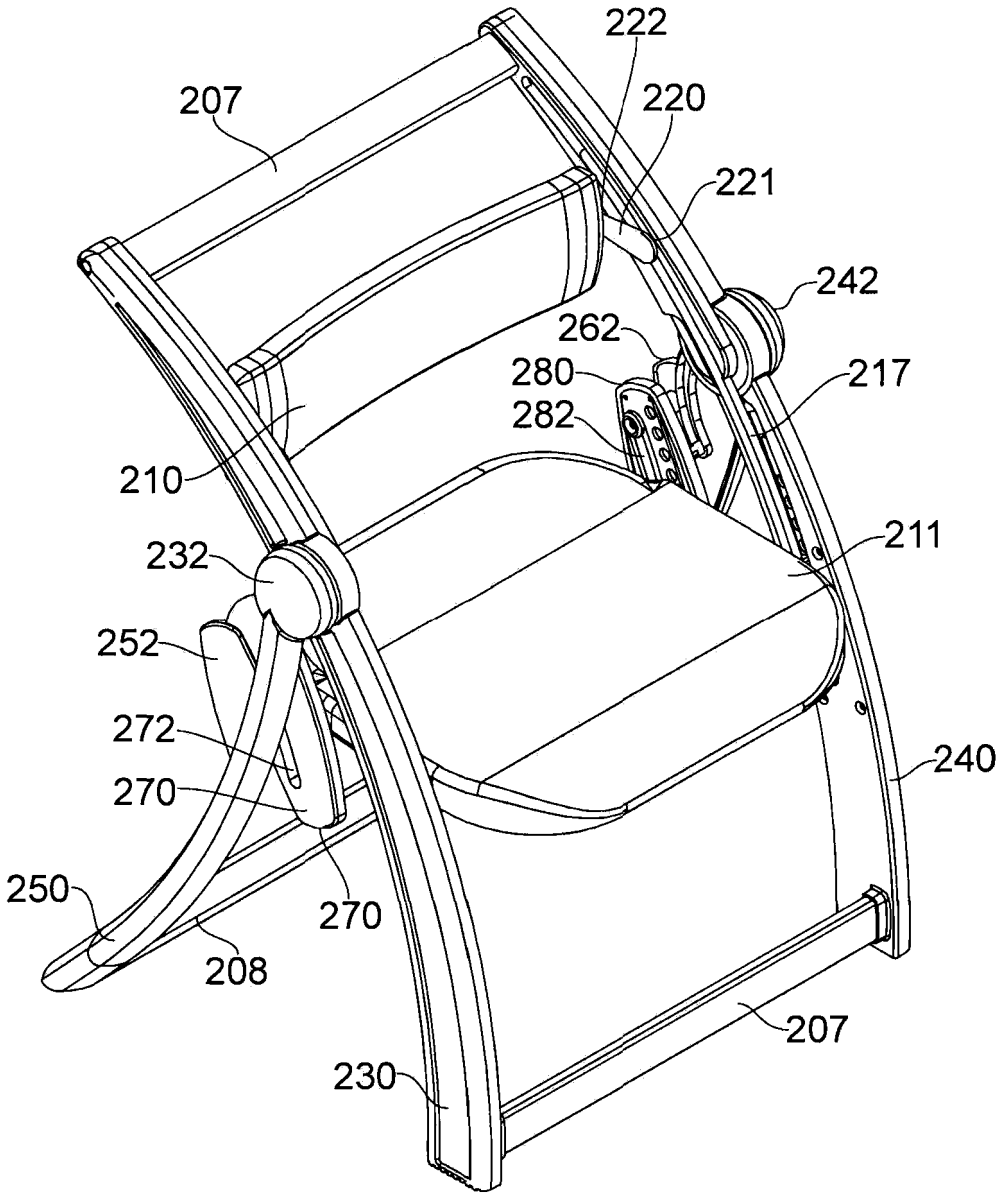


FIG. 7


222
207
220
221
242
262
280
217
282
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211
232
252
272
240
270
250
270
208
207
230

FIG. 8

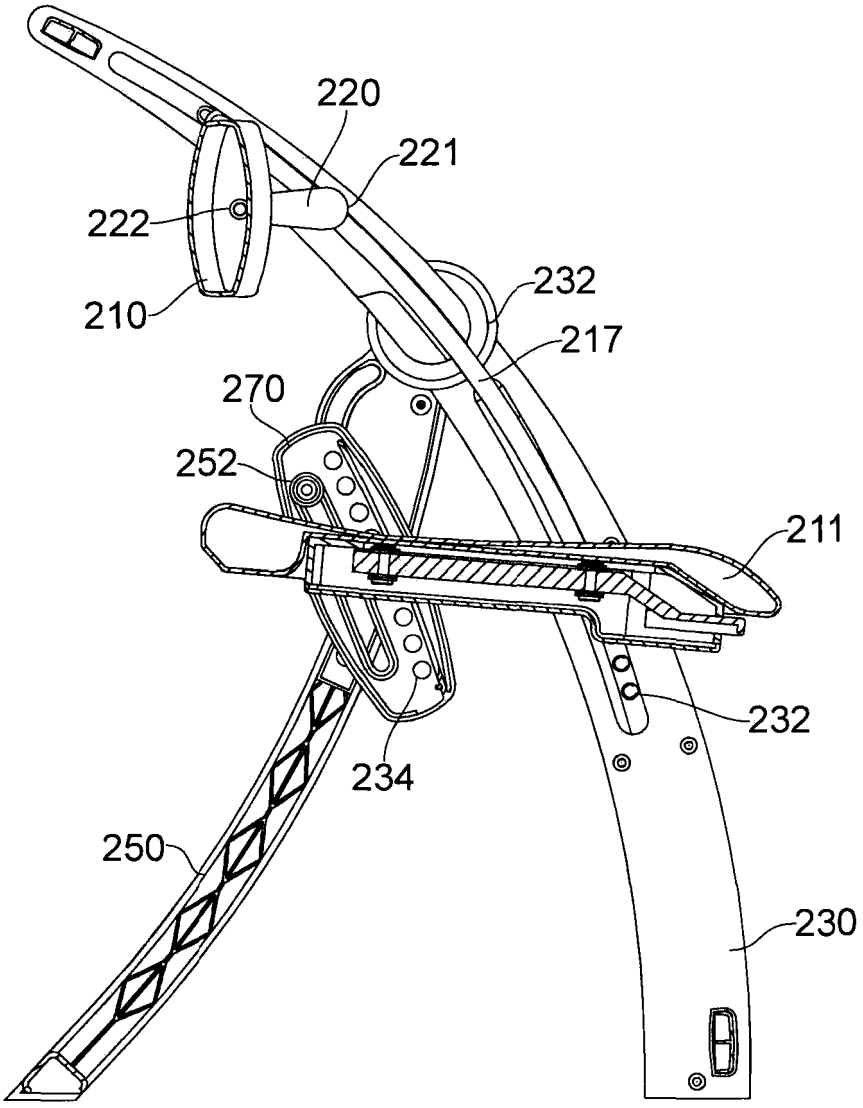

FIG. 9

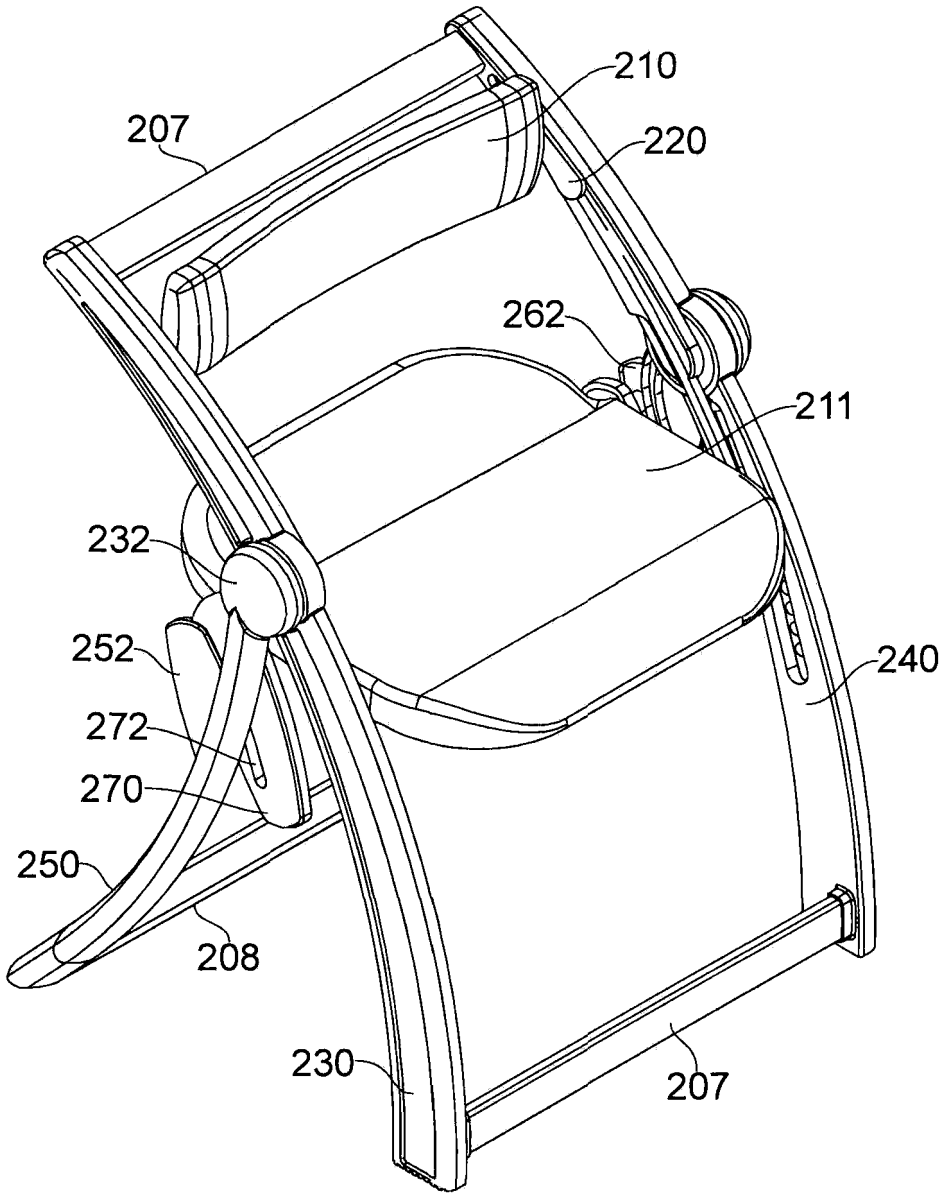

FIG. 10

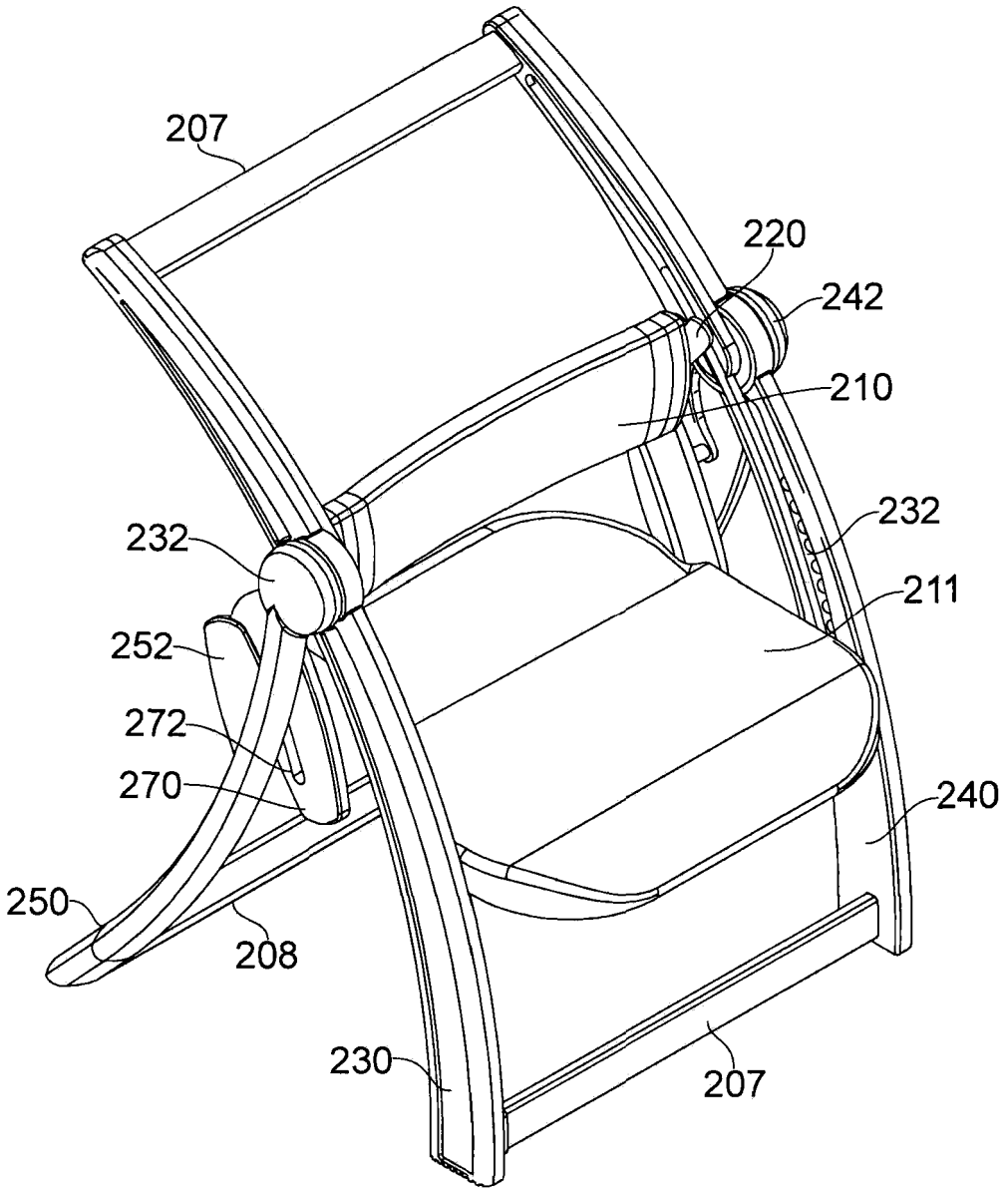

FIG. 11

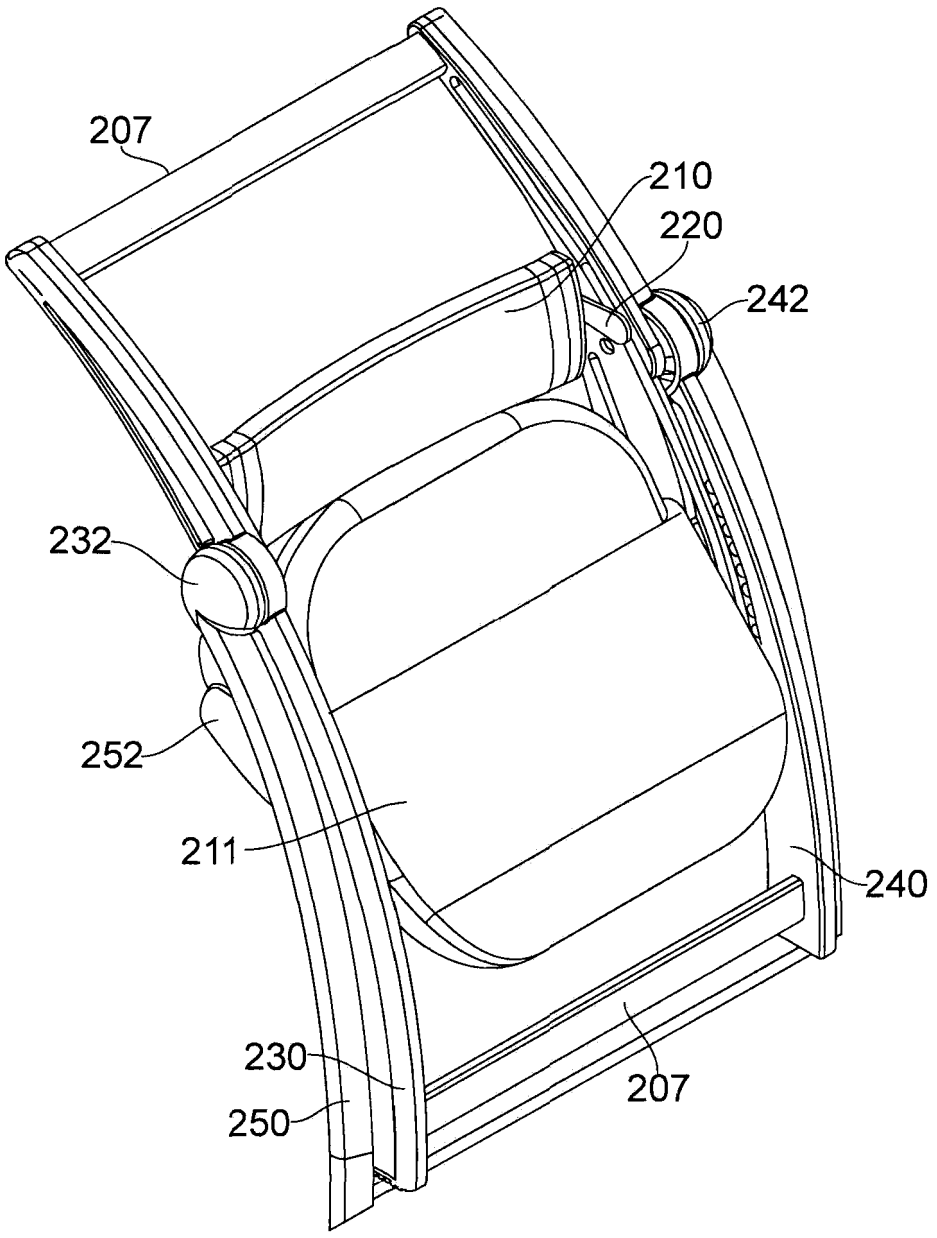

FIG. 12

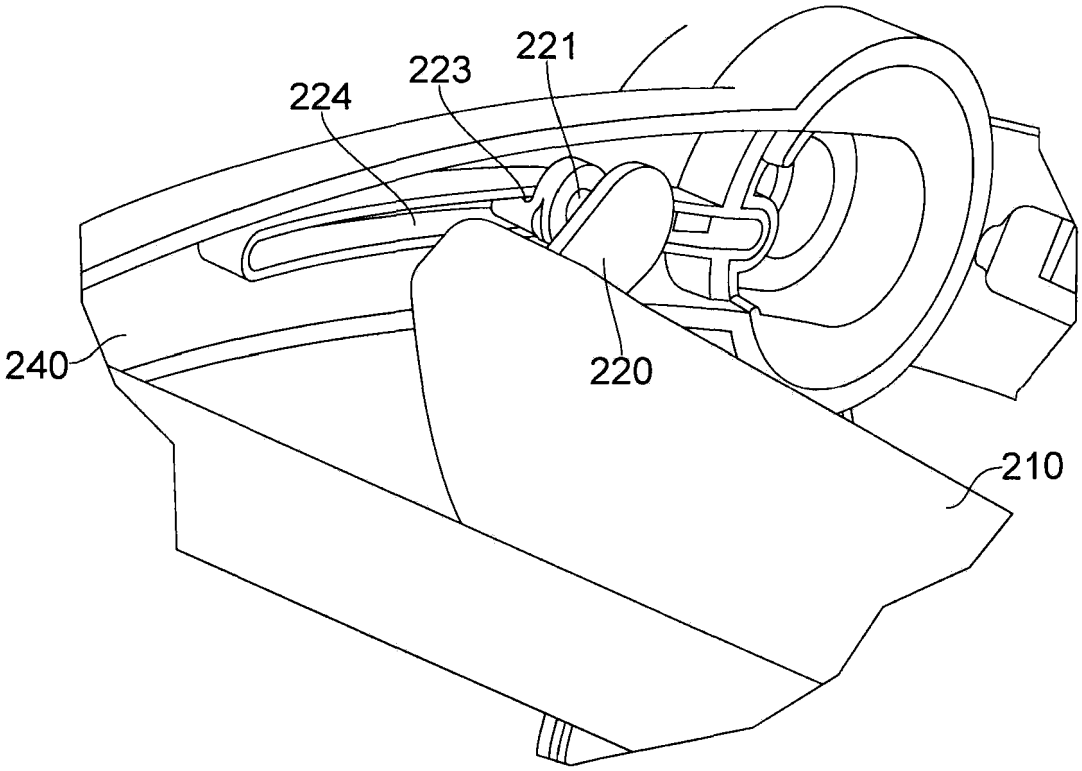

FIG. 13

Chair

The present invention relates to a chair in which the height of the seat is adjustable.

Chairs used by pupils and students in schools usually consist of a metal frame having a fixed size with no adjustability. Since such chairs are used by pupils/students of various statures and sometimes very different bodily characteristics, such chairs will support the optimal posture of only a few individual users. Such chairs will be incorrectly sized for many, if not most, of them. This problem is more prominent in primary schools since a substantial amount of growth occurs between ages of 5 and 11. At primary schools, the pupils will be at different stages of growth and have very different physiques to one another. During the physical development of a child, incorrect postures can have serious consequences on bone structure and body development.

The present invention seeks to overcome such problems by providing a chair which can easily be adapted to the physique of the users, whilst improving the posture of each user.

According to a first aspect of the present invention, a chair comprises a seat, a back rest and a frame having a curved rail; and a runner moveable along the rail; wherein the seat and back rest are carried by the runner such that the seat and the back rest can be moved together along the rail, and the position of the back rest relative to the seat changes in a horizontal direction as the seat and the back rest move along the rail. Raising and lowering the seat in this case has the effect of automatically adjusting the position of the back rest to take account of the body size of the person using the chair.

Preferably, the rail is constituted by a pair of convex side rails. This permits the seat and the back rest to be supported on two sides.

Preferably, the back rest is moveable along a track defined in the rail, and it is further advantageous for the track to be shaped such that the bottom of the track is positioned towards the front of the chair, and the top of the track is positioned towards the back

of the chair, thus making the automatic adjustment of the relative positions of the seat and the back rest, depending on the size of the person using the chair.

Preferably the back rest is pivotally attached to a connecting means, and the connecting means is moveable along the track in the rail. This gives a convenient and efficient structure to the chair. The connecting means may be angularly moveable to change the position of the back rest relative to the seat in a horizontal direction as the seat and back rest move along the rail. This might be achieved by shaping the tracks so as to cause the connecting means to move angularly as it travels along the rails to give additional adjustment of the position of the seat back relative to the seat.

The chair may include a set of fixing elements defining a range of heights at which the seat may be fixed, and a locking device may be included which engages with the set of fixing elements to lock the seat in any one of a plurality of positions along the rail. The locking device preferably includes a tapered bolt, and the fixing elements include tapered holes into which the bolt fits. This permits a very rigid and secure locking of the seat which not only reduces the possibility of the seat twisting, but also rigidifies the entire chair. The locking device may include a locking body which houses the locking device and the fixing element at the point at which they engage.

It is also advantageous for the chair to be able to fold for storage, and so it is preferred that the frame further comprises a pair of legs, each leg being pivotally connected to one side rail such that the chair can move between an open position and a folded position through pivotal movement between the legs and the side rails. Advantageously it is arranged such that, moving the chair into the folded position brings the seat into a position where it is generally flat with respect to the back rest and/or with respect to the rest of the chair.

The chair may further comprise upright supports and base supports arranged such that each side rail is connected to both an upright support and a base support. Each side rail and its associated upright support and base support may form a substantially triangular shape when the chair is in an open position, the upright supports may include a track, and the base supports may include a guide moveable along the track such that the chair can move between the open position and the folded position through the movement of the guides along the tracks.

According to a second aspect of the invention, a chair comprises a seat a frame having a pair of side rails between which the seat is supported, and a series of fixing elements on each side of the frame defining a range of heights of the seat; and a locking device mounted on the seat and arranged to engage with the fixing elements to lock the seat at any one of a number of heights corresponding to the position of the fixing elements on each side of the frames. The adjustability of the height of the chair is important since it must be easy for a person to adjust the height of the seat that he is sitting on to optimise the person's posture.

Preferably, each fixing element includes a fixing point. The locking device preferably includes a tapered bolt, and the fixing elements include tapered holes into which the bolt fits. This permits a very rigid and secure locking of the seat which not only reduces the possibility of the seat twisting, but also rigidifies the entire chair. The locking device may include a locking body which houses the locking device and the fixing element at the point at which they engage.

The locking device may include a handle and a set of bolts extending between a fixing point on the first side rail and a corresponding fixing point on the second side rail, wherein the handle allows the bolts to be extended into or retracted from the fixing points. In this way, secure locking is achieved. The bolts may be connected to the handle via linking plates.

Preferably, the frame includes a pair of legs, each leg being pivotally connected to a side rail such that the chair can move between an open position and a folded position through the pivotal movement between the legs and the side rails. In the folding position, the seat is folded flat with the rest of the chair and/or the seat back.

The fixing element and the locking device may be arranged to fix the angle of the seat relative to the ground, either horizontally or at a predetermined angle with respect to the ground. Advantageously, the fixing elements are provided on the side rail, although in another embodiment, one is positioned on the side rail, and the other on a support attached to the legs.

Preferably, the chair includes a back rest, and in one embodiment, runners are included which connect the seat to the back rest and are moveable along the side rails.

In such a case, the horizontal position of the back rest relative to the seat may change as the height of the seat is adjusted. This is achieved in the embodiments of this invention by having first and second side rails which are curved.

According to a third aspect of the present invention, a foldable chair comprises a seat; and a frame for supporting the seat, having a side rail and a leg carried by the side rail, wherein the chair can change between an open position in which the leg is extended and a folded position in which the leg is moved into a retracted position which causes the seat to be moved so as to be substantially flat with the rest of the chair.

The side rail and the leg may constitute a side frame, and the frame may include two side frames between which the seat and the back rest are supported. Advantageously, the height of the seat is adjustable, and the seat will fold flat regardless of the height at which the seat is locked.

As with earlier embodiments, the frame may include a series of fixing elements on each side of the frame defining a range of heights of the seat.

According to a fourth aspect of the invention, a chair comprises a back rest; a seat; and a frame having a pair of side rails between which the seat and the back rest is supported, wherein the back rest is pivotally attached to the frame by a back rest support member, which is moveable along the side rails, such that the back rest support member is arranged to change the position of the back rest relative to the seat in a horizontal direction. This permits adjustment of the back rest with respect to the seat as the seat is raised and lowered. This feature may be included in addition to the adjustment of the back rest set out in the first, second and third aspects of the present invention.

The back rest support member may be angularly moveable so that, as the position of the seat is changed, the back rest support member angularly moves to change the position of the back rest relative to the seat in a horizontal direction. The side rails may further include tracks along which the back rest support member is moveable, the tracks being shaped so as to cause the back rest support member to move angularly as it travels along the rails.

The invention will now be described by way of example only, and with reference to the following Figures.

Figure 1 is a perspective view of a chair according to a first embodiment of the present invention.

Figure 2 is a side view of the chair of Figure 1.

Figure 3 is a top plan view of the chair of Figure 1 showing a seat locking device underneath the seat;

Figure 4 is a sectional view of part of the locking device in an unlocked position;

Figure 5 is a sectional view of the part of the locking device shown in Figure 4, but in a locked position;

Figure 6 is a front view of the chair of Figure 1.

Figure 7 is a side view of the chair of Figure 1 in a folded position.

Figure 8 is a perspective view of a chair according to a second embodiment of the present invention.

Figure 9 is a sectional side view of the chair of Figure 8.

Figure 10 is a perspective view of the chair of Figure 8 with the seat and the back rest at the highest position.

Figure 11 is a perspective view of the chair of Figure 8 with the seat and the back rest at the lowest position.

Figure 12 is a perspective view of the chair of Figure 8 in a folded position.

Figure 13 is a perspective view of part of the chair of Figure 8.

A first illustrative embodiment of a chair 100 is shown in Figures 1 to 7 and comprises a back rest 10, a seat 11 and a frame which carries the seat 11 and the back rest 10.

The frame includes a first side rail 30, a second side rail 40, a pair of upright supports 4 and a pair of base supports 5. The side rails 30, 40 are convexly curved and include a channel along a substantial part of its length. Each of the side rails 30, 40 is connected to one of the upright supports 4 and to one of the base supports 5 to form harp-shaped side frames that are substantially triangular. The connection between the side rails 30, 40 and the corresponding upright support 4, and between the side rails 30,40 and the corresponding base support 5 are pivotable connections, and the connection between the upright and base supports 4, 5 is releasable so that the side frames can be folded as is shown in Figure 7.

The upright support 4 has a track along a substantial part of its length, in this case formed by the upright support 4 having an I- or C-shaped cross-section, and the end of the base support 5 is connected to the upright support 4 via a guide 6, which engages with and is movable along the track of the upright support 4. The movement of the guide 6 along the rail 4 towards the side rail 30, 40 allows the chair to change from an open position to a folded position. Therefore, when in the fully folded position, the chair 100 adopts a substantially flat configuration (Figure 7) which allows stacking of the chairs for easy storage. As will be appreciated, the substantially flat configuration may be curved owing to the curved nature of the first and second side rails 30 and 40. Nevertheless, the different components of the chair are substantially aligned in the fully folded position so that the chairs can be stacked one on top of one another.

In this embodiment, when the chair is in the open position, the guide 6 is not locked into position because the weight of a person sitting in the chair and the concave curve to the upright support will not permit it to fold. However, a lock can be included to ensure that the chair does not fold unexpectedly.

The side rails 30, 40 of opposite side frames are connected by a plurality of support rods 7, and the base supports 5 are connected by a base rod 8 so as to form the frame which supports the seat 11 and back rest 10. Once assembled and in the open position, the frame is a rigid structure.

The seat 11 is linked to the back rest 10 by two runners 17, one on each side of the chair to form a seat assembly. The runners 17 are arranged to be moveable along the first and second side rails 30, 40 within the channel referred to above. As the runners 17 move along the first and second side rails, the back rest 10 and the seat 11 move accordingly. Since the side rails are inclined with respect to the ground on which the chair stands, the height of the seat 11 changes as the runners move. Owing to the curved shape of the side rails, the horizontal position of the back rest 10 relative to the seat 11 varies as the height of the seat 11 is adjusted. In particular, as the height of the seat 11 increases by moving the runners 17 towards the top of the side rails 30 and 40, the back rest 10 becomes positioned towards the back of the seat 11. As the runners 17 are moved towards the bottom of the side rails to lower the height of the seat 11, the back rest 10 becomes positioned towards the front of the seat 11. This feature accommodates users of different sizes, adapting the relative positions of the seat 11 and back rest according to the user's size. Thus, if a small child uses the chair, the seat 11 is placed in a low position and the back rest 10 is automatically positioned forward to shorten the effective depth of the seat 11 to take account of the user's relatively short upper leg length. When a large child subsequently uses the chair, the seat 11 is raised into a higher position, and the back rest 10 moves back to lengthen the effective seat depth and to allow for the user's longer upper leg length.

The back rest 10 is connected to the runners 17 via a pivotable connection 23. The seat 11 is arranged so as to be generally level, although it does not have to be parallel with the ground. It does need to be held in its generally level position, and the chair must be arranged to allow for height adjustment. The features which permit this will now be described, primarily with reference to Figures 2 and 3. The side rail 30 includes a series of fixing elements defining a range of heights of the seat 11. Each fixing element 31 consists of a pair of front and rear fixing points 32, 34, as can be seen in Figure 2. In this embodiment, the fixing points are holes having generally

horizontal axes oriented transversely of the chair. Each pair of fixing points 32, 34 defines a particular height and angle of the seat 11. The two fixing points in each pair are generally horizontally aligned.

The underside of the seat 11 carries a locking device 50 comprising a lock housing 12 and a handle 18. The locking device 50 is shown more clearly in Figure 3. The lock housing 12 contains two sets of link plates, front link plates 19 and rear link plates 22, fixed on two sets of pivots, respectively. Two sets of bolts are connected to the link plates. The front bolts 15 are connected to the front link plates 19 and extend between the front fixing points 32 on the first and second side rails 30 and 40. The rear bolts 14 are connected to the back link plates 22 and extend between the corresponding rear fixing points 34 on the first and second side rails 30 and 40. The two sets of link plates 19 and 22 are linked together by a location bolt 13 which is in turn connected to the handle 18. When the handle 18 is pulled outwardly from the lock housing 12, the location bolt 13 is pulled towards the front of the seat 11, which in turn pulls the two sets of link plates 19, 22 forwards. The movement of the link plates 19, 22 retracts the front and rear bolts 15,14 from the fixing points 32, 34. In this adjustment position, the seat 11 (together with the back rest 10) can freely move along the side rails. When the desired seat height is reached, the handle 18 is pushed back, which moves the location bolt 13 and thus the link plates 19, 22 back to the original position. The movement of the link plates 19, and 22 pushes the front and rear bolts 15 and 14 outwards to engage with the front and rear fixing points 32, 34 to lock the seat 11 in position.

Figures 4 and 5 show the way in which the bolts 14, 15 engage with the fixing points 32, 34. The bolts 14, 15 are tapered at their ends to form a tapered section 35 with a flat end 36. Where the tapered section meets the full diameter thickness of the bolt, there is a lip. The fixing points 32, 34 are formed by tapered holes with the taper of the same angle as the angle of the tapered section 35 of the bolt.

Engagement of the bolt 14, 15 and the side rail 30 where the fixing points are located occurs within a seat guide clamp 37. The seat guide clamp 37 includes a hole 38 within which the bolt 14, 15 is moveable, and a slot 39 allowing movement of the seat

guide clamp 37 along the side rail 30. The seat guide clamp 37 may form part of the runner 17.

Once the seat 11 has been moved into the right position the bolt 14, 15 is moved in the hole 38 from the position shown in Figure 4 to the position shown in Figure 5 in which the tapered section 35 of the bolt 14, 15 engages with the tapered hole 32, 34 such that, there is not only a snug fit between the two tapered surfaces, but the flat end 36 of the bolt presses against the opposing face of the slot 39. This effectively causes the entire structure to become locked up, not only preventing the seat from being moved up and down, but also preventing the seat from twisting. A significant amount of rigidity in the structure of the chair is achieved through this arrangement.

As will be appreciated by those skilled in the art, instead of using the handle, link plates and location bolt arrangement, the locking device may use a different mechanism to move the bolts into and out of the fixing points.

In this particular embodiment, the fixing elements are in the form of holes and the locking device comprises cylindrical bolts that extend into the holes. However, the fixing elements can take any form as long as the seat can be maintained at an appropriate angle with the ground. Suitable fixing elements are known to those skilled in the art. For example, the fixing elements could be in the form of slots and the bolts of the locking device may have a rectangular instead of a cylindrical shape. In addition, each fixing element of the present invention may consist of any number of fixing points. For example, each fixing element may consist of only one fixing point, e.g. in the form of a wide slot that is inclined horizontally such that the seat forms an angle with the ground. Alternatively, each fixing element may consist of 3, 4 or more fixing points.

As shown in this particular embodiment, the front of the seat 11 is lower than the back to form a slight angle with the ground. This is achieved by arranging the rear fixing points 34 at a slightly higher position than the corresponding front fixing points 32. As will be appreciated by those skilled in the art, the arrangement of the front and rear fixing points may vary depending on the size of the desirable angle of the seat 11 with

the ground. Alternatively, it may be possible to arrange the seat 11 such that the rear of the seat 11 is lower than the front. This might be achieved by arranging the rear fixing points 34 at a slightly lower position than the corresponding front fixing points 32.

When in the folded position, the seat 11 may be disengaged from the fixing elements 31 by pulling the handle 18 and orienting the seat to a position such that it is substantially flat with the back rest 10.

A second illustrative embodiment of a chair 200 is shown in Figures 8 to 12 and comprises a back rest 210, a seat 211 and a frame which carries the seat 211 and the back rest 210. Many of the features of the second embodiment are the same as in the first embodiment, and it is to be understood that those features may be described in more detail with respect to the first embodiment than the second, but apply equally to the second embodiment.

The frame includes a first side rail 230, a second side rail 240 and a pair of legs 250 and 260 pivotally connected to the first and second side rails 230 and 240, respectively. The pivotal connections 232 and 242 between the legs and the side rails allow the chair 200 to be folded as is shown in Figure 12, and are spaced away from the ends of the side rails (230, 240) about one third of the way from the top of them. The side rails 230, 240 are convexly curved and include channels along a substantial part of their lengths.

Each of the legs 250 and 260 has a linking plate 252 and 262 attached thereto. A rear support plate 270 and 280 is provided on either side of the seat 211. Each of the rear support plates 270 and 280 has a track 272 and 282, respectively, along a substantial part of its length. The linking plates 252 and 262 are slidable along the tracks 272 and 282, respectively.

When the legs of the chair (250, 260) are in the fully open position, the linking plates 252 and 262 are at the upper most position in the tracks 272 and 282. As the legs 250 and 260 are moved towards a closed position against the side rails 230 and 240, the

linking plates 252 and 262 slide downwardly along the tracks 272 and 282 to incline the seat 211 such that it adopts a substantially flat configuration (Figure 12).

When the chair is opened, the length of the tracks 272 and 282 define the maximum angle between the legs 250 and 260 and the side rails 230 and 240. Further movement of the legs 250 and 260 away from the side rails 230 and 240 is prevented by the linking plates 270, 280 reaching the uppermost end of the tracks 272 and 282. On the other hand, when the chair 200 is in the open position, inward collapsing of the legs 250 and 260 towards the side rails 230 and 240 (i.e. folding of the chair) is prevented by the weight of a person sitting in the chair and the spacing between the legs and the side rails. In other embodiments, a lock may be included to ensure that the chair does not fold unexpectedly.

The side rails 230, 240 of opposite side frames are connected by two support rods 207, and the legs 250 and 260 are connected by a base rod 208 so as to form the frame which supports the seat 211 and back rest 210. Once assembled and in the open position, the frame is a rigid structure.

The seat 211 is linked to the back rest 210 by two runners 217, one on each side of the chair to form a seat assembly. The runners 217 are arranged to be moveable along the first and second side rails 230, 240 within the channel referred to above. As the runners 217 move along the first and second side rails, the back rest 210 and the seat 211 move accordingly. Owing to the curved shape of the side rails 230 and 240, as the height of the seat 211 changes, the horizontal position of the back rest 210 relative to the seat 211 varies in a similar way as explained in the previous embodiment. Additional movement of the horizontal position of the back rest 210 relative to the seat 211 is provided in this embodiment. The back rest 210 is connected to the runners 217 via a pair of cam arms 220, one on each side of the back rest 210. The cam arms 220 are pivotally attached to both the runners 217 (at 221) and the back rest 210 (at 222). The cam arms 220, where they connect to the runners 217, include a connection point 221. They also include a cam follower 223 such that, as the cam follower is twisted, the cam arm 220 is angularly moved so as to reposition the back rest 210. Each of the side rails 230 and 240 has a cam guide slot 224.. The cam follower 223 is

moveable along the cam guide slot 224. The bottom ends of the cam guide slot 224 is shaped such that the cam arm points rearwards and downwards, as is shown in Figure 11. The top of the cam guide slot is shaped so that the cam arm 220 points generally upwards and rearwards, as shown in Figure 10. The movement of the cam follower 223 along the cam guide slot 224 causes the cam arm 220 to pivot about the pivot point 221. The pivotal movement between the cam arm 220 and the runner 217 changes the orientation of the cam arm 220. This in turn moves the back rest 210 towards the back or the front of the seat 211, and changes its height. Although the back rest 210 can freely pivot about the pivot points 222, it typically adopts a substantially vertical position since its axis of pivot is above its centre of mass

The seat 211 is arranged so as to be generally level, although it does not have to be parallel with the ground. The features that permit the seat 211 to be held in its generally level position, whilst allowing height adjustment, are similar to those described in the first embodiment. However, instead of having both the front and rear fixing points on the side rails, only the front fixing points 232 are positioned on the side rails 230 and 240, and the rear fixing points 234 are positioned on the rear support plates 270, as can be seen in Figure 9. Nevertheless, just as in the previous embodiment, the front and rear fixing points 232 and 234 together define a range of heights of the seat 211 and each pair of fixing points 232, 234 defines a particular height of the seat 211. The two fixing points in each pair are either horizontally aligned or are of similar heights so that the seat is positioned horizontally, or slightly inclined or reclined. Similar to the previous embodiments, the front of the seat 211 is lower than the back thereof to form a slight angle with the ground.

The locking device 250 on the underside of the chair 200 is substantially the same as the locking device 50 in the previous embodiment, and is not described again here.

In this particular embodiment, owing to the presence of the linking plates 252 and 262 which are slidable along the tracks 272 and 282 in the rear support plates 270 and 280, there is no need to disengage the seat 211 from the fixing points 232 and 234 to fold the chair 200.

The chairs 100 and 200 can be made of any suitable material, such as wood, plastic and aluminium. In addition, the various components of the chairs may be made of the same material, which enables ease of manufacture. Alternatively, the various components may be made of different materials. For example, the frame components (e.g. the side rails, upright support, base support, legs and rear support plates) may be made of one material, such as steel, and the seat and the back rest may be made of plastics material, or upholstered with fabrics for comfort. In a preferred embodiment, the chairs are entirely made of plastics such that they are light in weight and cheap and easy to manufacture to allow mass production.

Claims

1. A chair comprising:

a seat;

a back rest;

a frame having a curved rail; and

a runner moveable along the rail;

wherein the seat and back rest are carried by the runner such that the seat and the back rest can be moved together along the rail, and the position of the back rest relative to the seat changes in a horizontal direction as the seat and the back rest move along the rail.

2. A chair according to claim 1, wherein the rail is a pair of convex side rails.

3. A chair according to claim 1 or 2, wherein the back rest is moveable along a track defined in the rail.

4. A chair according to claim 3, wherein the track is shaped such that the bottom of the track is positioned towards the front of the chair and the top of the track is positioned towards the back of the chair.

5. A chair according to claim 3 or 4, wherein the back rest is pivotally attached to a connecting means, and wherein the connecting means is moveable along the track in the rail.

6. A chair according to claim 5, wherein the connecting means is angularly moveable to change the position of the back rest relative to the seat in a horizontal direction as the seat and the back rest move along the rail.

7. A chair according to claim 6, wherein the tracks are shaped so as to cause the connecting means to move angularly as it travels along the rails.

8. A chair according to any of the preceding claims, wherein the frame includes a set of fixing elements defining a range of heights at which the seat may be fixed.

9. A chair according to claim 8, further comprising a locking device, wherein the locking device engages with the set of fixing elements to lock the seat in any one of a plurality of positions along the rail.

10. A chair according to claim 9, wherein the locking device includes a tapered bolt, and the fixing elements include tapered holes into which the bolt fits.

11. A chair according to claim 9 or claim 10, wherein the locking device includes a locking body which houses the locking device and the fixing element where they engage.

12. A chair according to any one of claims 2 to 9, wherein the frame further comprises a pair of legs, each leg being pivotally connected to one side rail, such that the chair can move between an open position and a folded position through the pivotal movement between the legs and the side rails.

13. A chair according to claim 9, wherein moving the chair into the folded position brings the seat into a position where it is generally flat with respect to the back rest.

14. A chair according to any one of claims 2 to 9, further comprising upright supports and base supports arranged such that each side rail is connected to both an upright support and a base support.

15. A chair according to claim 14, wherein each side rail and its associated upright support and base support form a substantially triangular shape when the chair is in an open position.

16. A chair according to claim 14 or 15, wherein the upright supports include a track and the base supports include a guide moveable along the track, such that the chair can move between the open position and a folded position through the movement of the guides along the tracks.

17. A chair comprising:

a seat;

a frame having a pair of side rails between which the seat is supported, and a series of fixing elements on each side of the frame defining a range of heights of the seat; and

a locking device mounted on the seat and arranged to engage with the fixing elements to lock the seat at any one of a number of heights corresponding to the position of the fixing elements on each side of the frames.

18. A chair according to claim 17, wherein each fixing element includes a fixing point.

19. A chair according to claim 18, wherein the bolt is tapered, and the fixing elements include tapered holes into which the bolt fits.

20. A chair according to any one of claims 17 to 19, wherein the locking device includes a locking body which houses the locking device and the fixing element where they engage.

21. A chair according to claim 18, wherein the locking device includes a handle and a set of bolts extending between a fixing point on the first side rail and a corresponding fixing point on the second side rail, wherein the handle allows the bolts to be extended into or retracted from the fixing points.

22. A chair according to claim 21, wherein the bolts are connected to the handle via linking plates.

23. A chair according to any one of claims 17 to 22, wherein the frame includes a pair of legs, each leg being pivotally connected to a side rail such that the chair can move between an open position and a folded position through the pivotal movement between the legs and the side rails .

24. A chair according to any one of claims 17 to 23, wherein the fixing elements and the locking device are arranged to fix the angle of the seat relative to the ground.

25. A chair according to claim 24, wherein each fixing element includes a pair of fixing points horizontally aligned to fix the seat at a predetermined angle with the ground.

26. A chair according to any one of claims 17 to 25, wherein the fixing elements are provided on the side rails.

27. A chair according to claim 26, wherein one of the pair of fixing points is positioned on the side rail and the other is positioned on a support attached to the legs.

28. A chair according to any of claims 17 to 27, further comprising a back rest.

29. A chair according to claim 28, further comprising runners connecting the seat to the back rest and movable along the side rails

30. A chair according to claim 29, wherein the horizontal position of the back rest relative to the seat changes as the height of the seat is adjusted.

31. A chair according to any one of claims 17 to 30, wherein the first and second side rails are curved.

32. A foldable chair comprising:

a seat; and

a frame for supporting the seat, having a side rail and a leg carried by the side rail,

wherein the chair can change between an open position in which the leg is extended and a folded position in which the leg is moved into a retracted position

which causes the seat to be moved so as to be substantially flat with the rest of the chair.

33. A foldable chair according to claim 32, further comprising a back rest, and wherein, when the chair is moved to its folded position, the seat is moved to be substantially flat with respect to the back rest.

34. A chair according to claim 32 or 33, wherein the side rail and the leg constitute a side frame, and the frame includes two side frames between which the seat and the back rest are supported.

35. A chair according to any one of claims 32 to 34, wherein the height of the seat is adjustable.

36. A chair according to claim 35, wherein the frame includes a series of fixing elements on each side of the frame defining a range of heights of the seat.

37. A chair according to claim 33, further comprising a locking device mounted on the seat and arranged to engage with the fixing elements to lock the seat at any one of a number of heights corresponding to the position of the fixing elements on each side of the frame.

38. A chair according to any of claims 33 to 37, wherein the frame further comprises a seat support member connected to the seat and the leg.

39. A chair according to claim 38, wherein the leg is moveable along a track defined in the seat support member.

40. A chair according to any of claims 36 to 37, wherein each fixing element includes a fixing point.

41. A chair according to any of claims 36 to 40, wherein the fixing elements are on located on the support means.

42. A chair according to any of claims 36 to 41, wherein each fixing element includes a pair of fixing points horizontally aligned to fix the seat at a predetermined angle with the ground.

43. A chair according to claim 42, wherein one of the pair of fixing points is located on the seat support member.

44. A chair comprising:

a back rest;

a seat; and

a frame having a pair of side rails between which the seat and the back rest is supported,

wherein the back rest is pivotally attached to the frame by a back rest support member, which is moveable along the side rails, such that the back rest support member is arranged to change the position of the back rest relative to the seat in a horizontal direction.

45. A chair according to claim 44, wherein the back rest support member is angularly moveable so that, as the position of the seat is changed, the back rest support member angularly moves to change the position of the back rest relative to the seat in a horizontal direction.

46. A chair according to claim 44 or 45, wherein the side rails include tracks along which the back rest support member is moveable, the tracks being shaped so as to cause the back rest support member to move angularly as it travels along the rails.

Application No:	GB1117357.2	**Examiner:**	Barnaby Wright
Claims searched:	1-16	**Date of search:**	31 January 2012

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
X	1-3, 5-7 at least	DE 19502485 A1 (FUSS) See esp. WPI Abs. Accession No. 1996-355132 [36], and Figs. 1 & 2, noting seat and backrest coupled for simultaneous movement along a curved rail.
X	1 at least	US 2479175 A (MCARTHUR) See whole doc., esp. Figs. 2 & 3, and col. 5, lines 47 to 56, noting seat and backrest coupled by pin 87 which runs along curved slot 35.
A	-	CN 2437213 Y (HOU) See esp. Fig. 1.
A	-	EP 0726045 A2 (MOLL) See esp. Figs. 1-8.
A	-	JP 2001046171 A1 (KOKUYO) See esp. WPI Abs. Accession No. 2001-251682 [26], and Fig. 1, noting backrest slidably mounted to rail of chair frame.
A	-	DE 7324322 U1 (FRANZ SCHLAPP) See Figs.

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
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Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^{X} :

A4L

Worldwide search of patent documents classified in the following areas of the IPC

A47C; A47D

The following online and other databases have been used in the preparation of this search report

EPODOC, WPI; TXTE, TXTT

International Classification:

Subclass	Subgroup	Valid From
A47C	0001/032	01/01/2006
A47C	0003/20	01/01/2006
A47C	0007/40	01/01/2006
A47D	0001/00	01/01/2006