

Sept. 19, 1939.

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2,173,283

ADJUSTABLE RECLINING CHAIR

Original Filed Nov. 22, 1935 2 Sheets-Sheet 1

Fig. 1

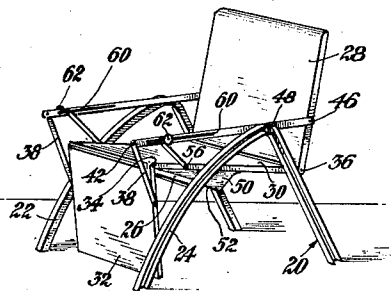


Fig. 2

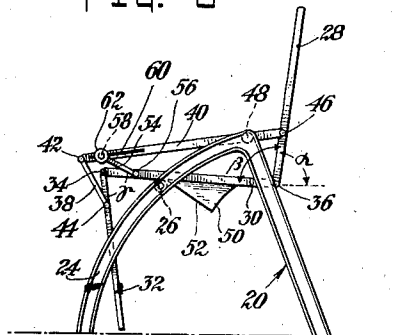


Fig. 3

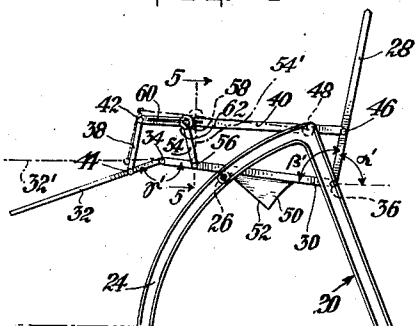


Fig. 4

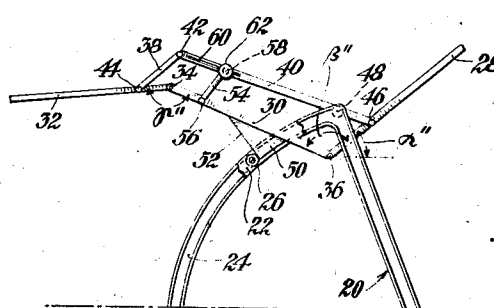


Fig. 5

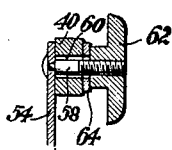


Fig. 7

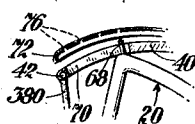


Fig. 8

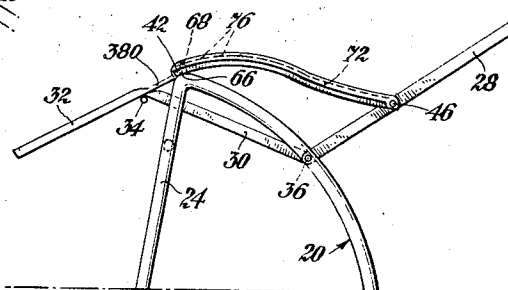
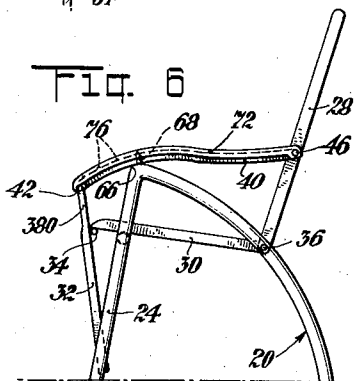


Fig. 6



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Fig. 9

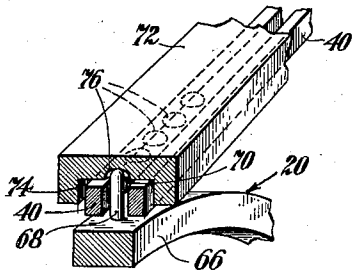


Fig. 10

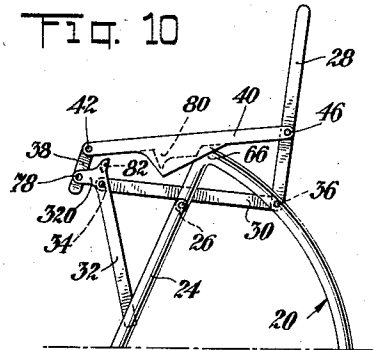


Fig. 11

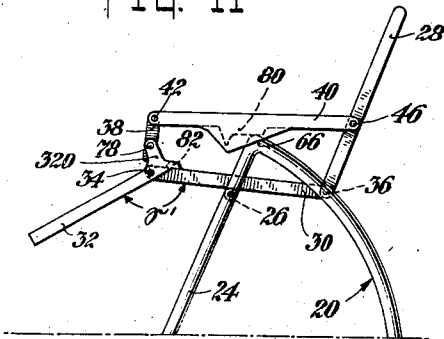


Fig. 12

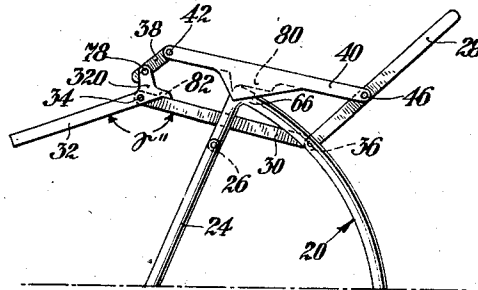


Fig. 13

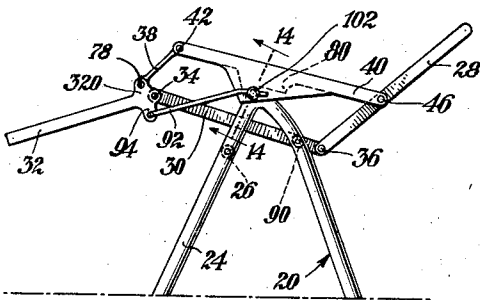


Fig. 15

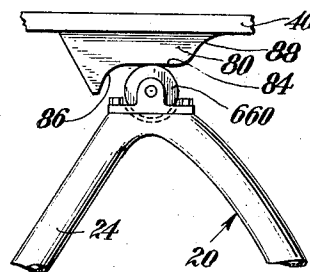
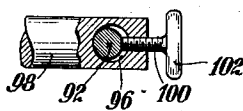


Fig. 14



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UNITED STATES PATENT OFFICE

2,173,283

ADJUSTABLE RECLINING CHAIR

Anton Lorenz, Berlin-Schöneberg, and Hans
Luckhardt, Berlin-Dahlem, GermanyContinuation of application Serial No. 51,119,
November 22, 1935. This application April 1,
1939, Serial No. 265,380. In Germany Novem-
ber 22, 1934

13 Claims. (Cl. 155—106)

This is a continuation of patent application Serial No. 51,119, filed November 22, 1935.

Our invention relates to an adjustable reclining chair, and more particularly to an adjustable reclining chair, in which a back-seat, a seat, a leg-rest and connecting link-means are pivotally interconnected with each other to form a polygonal structure with unequal sides, and wherein one point of the polygonal structure is pivoted to a support and cooperating sliding means are arranged on the support and on one member of the polygonal structure to control the movement of the members of the polygonal structure.

One object of our invention is to provide an adjustable reclining chair of the above described type, in which the space below the seat is free from any mechanism.

Another object of our invention is to provide an adjustable reclining chair of the above described type being of such a construction, that, when the back-rest is swung from an upright to a partially reclined position, the leg rest will be swung almost in line with the seat and further reclining of the back-rest will raise the front of the seat with respect to the rear thereof without appreciably changing the relative position of the leg-rest with respect to the seat.

In order to carry out our invention into practice, we provide an adjustable reclining chair comprising a support, a back-rest, a seat, a leg-rest, said seat extending between said back-rest and said leg-rest and being pivoted thereto, connecting link-means, one connecting link-means being arranged on each side of the chair, each of said connecting link-means including a short link and a long link hingedly connected with each other, the free end of said long link being pivoted to an intermediate point of the back-rest above the pivot point between the back-rest and the seat, said short link being connected to said leg-rest, said back-rest, said seat, said leg-rest and said connecting link-means forming a polygonal structure having unequal sides, one point of said polygonal structure being pivoted to said support, and cooperating sliding means arranged on the support and one member of said polygonal structure. In a preferred embodiment of our invention the long links of said connecting link-means located above the seat, form the arm rests of the chair. In order to obtain the specific construction mentioned in the preceding paragraph, according to another embodiment of our invention, the short link of the connecting link-means is pivoted to an intermediate point of the leg-rest and a guiding link is arranged between the seat

and the long link of the connecting link-means, one end of said guiding link being hinged to said seat, the other end of said guiding link being in slidable engagement with said long link.

The above mentioned objects and advantages as well as other objects and advantages will be more fully disclosed in the following specification reference being had to the accompanying drawings forming part of this specification in which

Fig. 1 is a perspective view of an adjustable reclining chair, in which a sliding cam is arranged on the seat and the short link of the connecting link-means is pivoted to an intermediate point of the leg-rest,

Fig. 2 is a side elevational view of the adjustable reclining chair, the movable parts of the reclining chair being in sitting position,

Fig. 3 is a side elevational view of the reclining chair similar to that shown in Fig. 2, the movable parts of the chair, however, being in an intermediate position,

Fig. 4 is a side elevational view of the reclining chair similar to that shown in Fig. 2, the movable parts of the chair, however, being in the extreme reclining position, and a part of one side frame being broken away,

Fig. 5 is a fragmentary section taken on line 5—5 of Fig. 3,

Fig. 6 is a side end view of another embodiment of a reclining chair, in which the sliding means is arranged on the long link of the connecting link-means and the short link of the connecting link-means forms an integral part of the leg rest.

Fig. 7 is a fractional side end view, partly in section, of the front end of the chair shown in Fig. 6, the covering member, however, being disengaged from the long link forming the arm-rest,

Fig. 8 is a side end view of the reclining chair similar to that shown in Fig. 6, in which, however, the movable parts of the chair are in reclining position,

Fig. 9 is a fragmentary perspective view of the arm-rest and locking means of the reclining chair shown in Figs. 6—8, partly in section,

Fig. 10 is a side end view of a further embodiment of an adjustable reclining chair, in which the sliding cam is arranged on the long link of the connecting link-means and the short link of the connecting link-means is hinged to an extension of the leg-rest,

Fig. 11 is a side end view of the reclining chair similar to that shown in Fig. 10, in which, however, the movable parts of the chair are in an intermediate position,

Fig. 12 is a side end view of the reclining chair

similar to that shown in Fig. 10, in which, however, the movable parts of the chair are in the extreme reclining position,

Fig. 13 is a side end view of still another embodiment of an adjustable reclining chair; said reclining chair being similar to that shown in Figs. 10-12 with the exception that only the seat is pivoted to the frame and means are provided for locking the movable parts of the chair in any adjusted position,

Fig. 14 is a fragmentary section taken on line 14-14 of Fig. 13; and

Fig. 15 is a fragmentary side view of a different construction of the bearing member arranged on the supporting frame to engage with the cam of the arm rest of the reclining chairs shown in Figs. 10-13.

Referring now to Figs. 1-4, 20 generally indicates the support comprising the two side frames 22 and 24 connected with each other by the transverse rod 26. One side frame is arranged on each side of the chair.

28 indicates a back-rest, 30 indicates a seat, and 32 indicates a leg-rest. The seat extends between the back-rest and the leg-rest. The front end of the seat 30 is pivoted to the upper end of the leg-rest 32 at 34, the rear end of the seat is pivoted to the lower end of the back-rest 28 at 36. Connecting link-means, comprising a short link 38 and a long link 40 hingedly connected with each other at 42, are arranged on either side of the chair. The short link 38 is pivotally connected to an intermediate point of the leg-rest 32 at 44. The long link 40 is pivotally connected to an intermediate point of the back-rest 28 at 46. The back-rest 28, the seat 30, the leg-rest 32 and the connecting link-means 38, 40 form a polygonal structure having five unequal sides.

One point of the polygonal structure 28, 30, 32, 38, 40 is pivoted to the support 20. In the embodiment shown in Figs. 1-4, this point is an intermediate point 48 of the long link 40.

In order to obtain the various positions of the members of the polygonal structure swingably mounted at 48, the movement of the members of said polygonal structure must be controlled. For this purpose we arrange a sliding cam 50 on the seat 30. Said sliding cam has an upwardly inclined face 52 at its underside adapted to cooperate with the bearing transverse rod 26 of the support. Furthermore, we arrange a guiding link 54 between the seat 30 and the long link 40. The lower end of said guiding link 54 is hinged to the seat 30 and 56, the upper end of said guiding link is in slidable engagement with the long link 40. As best shown in Fig. 5, a pin 58 secured to said upper end of the guiding link 54 may slide in a slot 60 of the long link 40. A locking or clamping screw 62 is screwed on the threaded end of said pin 58 for pressing a washer 64 against the long link 40 and locking the relative position between the guiding link 54 and the long link 40, if desired. Fig. 2 shows the movable parts of the chair in sitting position, in which the seat 30 rests on the transverse rod 26. α indicates the angle between the back-rest 28 and a horizontal line, β is the angle between the back-rest 28 and the seat 30, and γ is the angle between the seat 30 and the leg-rest 32. When the user of the chair wishes to change the position of the movable parts of the reclining chair, he may shift the weight of his body on the seat to the rear of the pivot 48, so that the long link 40 is rotated about the

pivot 48 and the seat 30 slides for a short distance on the transverse rod 26 from the sitting position shown in Fig. 2 into the intermediate position shown in full lines in Fig. 3. The angle α' between the horizontal line and the back-rest 28 in the intermediate position is somewhat smaller than the angle α of the sitting position, while the angle β' between the seat and the back-rest in the intermediate position is substantially the same as the angle β of the sitting position. During the above described rotation of the long link 40 about the pivot 48 from the sitting position into the intermediate position the short link 38 hinged to the long link 40 and to the leg-rest 32 swings the latter about the pivot 34 almost in line with the seat 30 and at the same time the pin 58 secured to the upper end of the guiding link 54 slides in the slot 60 of the long link from the position shown in Fig. 2 into the position shown in Fig. 3. The angle γ' between the leg-rest 32 and the seat 30 in the intermediate position is considerably larger than the angle γ of the sitting position. Now, during further pressure of the body of the user against the back-rest 28, the entire polygonal structure 28, 30, 32, 38, 40 will be swung about the pivot 48 and the inclined face 52 of the cam 50 will slide on the bearing member 26, so that the movable parts of the chair are brought into the reclining position shown in Fig. 4. The angle α'' between the horizontal line and the back-rest in the reclining position is smaller than the angles α and α' of the positions shown in Figs. 2 and 3 respectively, the angle β'' is larger than the angles β and β' respectively, and the angle γ'' is substantially equal to the angle γ' of the intermediate position shown in Fig. 3. The change of the angles mentioned above shows that in the intermediate position (Fig. 3), which is obtained during the very first part of the movement of the members of the polygonal structure, the leg-rest 32 has almost reached its final position relatively to the seat 30, while the back-rest is still in an upright or only partially reclined position, and that in the final or reclining position (Fig. 4) the back-rest is inclined with respect to the horizontal plane and the rear of the seat is lowered with respect to the front of the seat, while the relationship between the leg-rest and the seat remains substantially the same as in the intermediate position (Fig. 3). Thus, the user of the chair may take a partially sitting and partially relaxed position (the back of the body upright, the legs in an almost horizontal plane), if he uses the chair in the intermediate position according to Fig. 3. The final or reclining position (Fig. 4) of the chair permits the user to be in a very comfortable relaxed position.

The dash lines in Fig. 3 illustrate a further position of the polygonal structure, which may be obtained, if, starting from the intermediate position shown in full lines in said Fig. 3, the user of the chair swings the guiding link 54 by hand about the pivot 56 into the position 54', whereby the front end of the long link 40 is lifted and the leg-rest 32 is brought into the elevated position 32' by means of the short link 38.

As mentioned above, the adjusted positions of the polygonal structure may be locked by means of the clamping screw 62, which may be tightened against the washer 64.

In the embodiment of the reclining chair shown in Figs. 6-9 the controlling sliding member is arranged on the long link 40 of the connecting link means instead of on the seat 30. For this

purpose, the long link 40 has a cam-like shaped underside cooperating with the bearing portion 66 of the support 20. The upper portion of the leg-rest 32 has an extension 320 extending upwardly beyond the pivot 34 between the seat and the long link. Said extension 320 forms the short link of the connecting link-means, or in other words, the short link is rigidly connected with the leg-rest and forms an integral part thereof. The polygonal structure has only four unequal sides and comprises the back-rest 28, the seat 30, the extension 320 of the leg-rest representing the short link of the connecting link-means, and the long link 40 of the connecting link-means. One point of the polygonal structure is pivoted to the support 20, this point being the pivot point 36 between the seat 30 and the back-rest 28. When the back-rest 28 is moved to the right from the sitting position shown in Fig. 6, the movable parts of the chair are brought into the reclining position shown in Fig. 8. The cam-like underside of the long link 40 controls the movements of the parts when the polygonal structure is swung about the pivot 36. During the lowering of the back-rest 28 into a reclined position, the front of the seat will be raised with respect to the back of the seat, and the leg-rest will be lifted at a higher rate of speed than the back-rest is lowered owing to the short side 380 of the polygonal structure in the front part of the chair. The leg-rest, however, will not be swung almost in line with the seat, when the back-rest is swung only to a partially reclined position, as is true of the embodiment of the chair shown in Figs. 1-4, because the short link 380 is not hinged to an intermediate point of the leg-rest but forms an integral part of the leg-rest.

In order to lock the movable parts of the chair in adjusted positions, the chair is provided with the following mechanism: As best shown in Fig. 9, a pin 68 is mounted on the bearing portion 66 of the support 20. Said pin 68 is in slidable engagement with a longitudinal slot 70 of the long link 40. A member 72 provided with a groove 74 adapted to cover the long link 40 is hinged to the latter at the pivot point 46. The member 72 has a plurality of indentations 76, and the pin 68 may be engaged with either one of them for locking the relative position between the long link 40 and the support 20, i. e. for locking the polygonal structure in the adjusted position. If it is desired to change the position of the polygonal structure, the covering member 72 is lifted (see Fig. 7) by a rotation about the pivot 46 (see Fig. 6) whereupon the long link 40 may be shifted along the bearing portion 66 of the support for an adjustment of the polygonal structure in a different position. Then, the covering member 72 is lowered and the pin 68 is engaged with a different indentation 76, so that the polygonal structure is locked in the adjusted position.

The reclining chair shown in Figs. 10-12 has a separate short link 38, one end of which being hinged to the long link 40 at 42, the other end of which being pivoted to an upper extension 320 of the leg-rest 32 at 78. The leg-rest 32 is pivoted to the seat 30 at 34, and said extension 320 extends beyond the pivot point 34. The pivot point 36 between the seat 30 and the back-rest 28 is pivoted to the support 20. The long link 40 is provided with a cam 80 engaging with the bearing portion 66 of the support 20. In the sitting position, the seat 30 rests on the transverse bar 26, as shown in Fig. 10. The polygonal structure 28, 30, 320, 38, 40 may be rotated about the pivot

36, whereby the cam 80 slides on the bearing portion of the support and first causes the leg-rest 32 to be swung about the pivot 34. A stop 82 arranged on the extension 320 of the leg-rest and projecting in a direction inwardly of the latter abuts against the seat 30 and limits the angle γ' between the leg-rest and the seat as shown in Fig. 11 illustrating an intermediate position of the movable parts of the chair. During a further shifting backwards of the back-rest 28, the middle part 84 and end part 86 (see Fig. 15) of the cam 80 slide on the bearing part of the support 20, which may be either a portion of the support as shown in Figs. 10-12 or a roller 660 for reduction of friction as shown in Fig. 15, and raise the seat 30 from the transverse bar 26, as a further rotation of the leg-rest 32 about the pivot 34 is prevented by the stop 82. The final reclining position of the movable parts of the chair is illustrated in Fig. 12. As shown in Fig. 15, the operative surface of the cam 80 substantially consists of three parts 88, 84, 86 merging into each other, wherein the beginning part 88 and the end part 86 are considerably inclined with respect to the middle part 84. The beginning part serves to secure the sitting position, while the steep end part 86 prevents an overturn of the chair in its reclined position.

The reclining chair shown in Fig. 13 is similar to that shown in Figs. 10-12 with the exception, that instead of the pivot point 36 an intermediate point 90 of the seat 30 is pivoted to the support 20, said point 90 being a short distance from the rear end of the seat. This construction permits the use of the chair in such a manner, that the user may obtain the various positions of the movable parts of the chair by a simple shifting of the weight of his body. In order to lock the polygonal structure in intermediate positions, an adjusting rod 92 is connected to the end of an extension 94 of the leg-rest 32. As best shown in Fig. 14, said adjusting rod 92 passes through the bore 96 of a stud 98 secured to the support 20 of the chair and may slide in said bore, when the set screw 100 provided with a knob 102 and threaded in said stud is disengaged from said adjusting bar. If the parts of the chair are brought into the desired position, the set screw 100 is turned and brought in contact with said adjusting rod 92 to clamp the latter in its position. Thus, the set screw 100 and the adjusting rod 92 serve to lock the polygonal structure in different positions. The long link 40 carries the cam 80 sliding on the support 20.

The long links 40 of the connecting link means form the arm-rests of the chair in all embodiments shown in the drawings.

We have shown preferred embodiments of our invention, but it is clear that numerous changes, combinations and omissions may be made without departing from the spirit of our invention.

What we claim is:

1. An adjustable reclining chair comprising: a support, a back-rest, a seat, a leg-rest, said seat extending between said back-rest and said leg-rest and being pivoted thereto, connecting link-means, one connecting link-means being arranged on each side of the chair, each of said connecting link-means including a short link and a long link hingedly connected with each other, the free end of said long link being pivoted to an intermediate point of the back-rest above the pivot point between the back-rest and

the seat, said short link being connected to said leg-rest, said back-rest, said seat, said leg-rest and said connecting link-means forming a polygonal structure having unequal sides, one point of said polygonal structure being pivoted to said support, and cooperating sliding means arranged on the support and one member of said polygonal structure.

2. An adjustable reclining chair as claimed in claim 1, in which the long links of said connecting link-means form the arm-rests of the chair.

3. An adjustable reclining chair as claimed in claim 1, said cooperating sliding means comprising a cam arranged on a member of the polygonal structure and a bearing member disposed on the support, and the operative surface of said cam substantially consisting of three parts merging into each other, wherein the beginning and the end part of the surface are considerably inclined with respect to the middle part thereof.

4. An adjustable reclining chair as claimed in claim 1, in which said short link is rigidly connected to said leg-rest.

5. An adjustable reclining chair as claimed in claim 1, in which said short link is an integral part of the leg-rest and forms an extension thereof extending upwardly beyond the pivot point between the seat and the leg-rest.

6. An adjustable reclining chair comprising: a support, a back-rest, a seat, a leg-rest, said seat extending between said back-rest and said leg-rest and being pivoted thereto, connecting link-means, one connecting link-means being arranged on each side of the chair, each of said connecting link-means including a short link and a long link hingedly connected with each other, the free end of said long link being pivoted to an intermediate point of the back-rest above the pivot point between the back-rest and the seat, said short link being connected to said leg-rest, said back-rest, said seat, said leg-rest and said connecting link-means forming a polygonal structure having unequal sides, one point of said polygonal structure being pivoted to said support, and cooperating sliding means arranged on the support and said long link.

7. An adjustable reclining chair comprising: a support, a back-rest, a seat, a leg-rest, said seat extending between said back-rest and said leg-rest and being pivoted thereto, said leg-rest having an extension at its upper end, connecting link-means, one connecting link-means being arranged on each side of the chair, each of said connecting link-means including a short link and a long link hingedly connected with each other, the free end of said long link being pivoted to an intermediate point of the back-rest above the pivot point between the back-rest and the seat, said short link being hingedly connected to said extension of said leg-rest, said back-rest, said seat, said leg-rest and said connecting link-means forming a polygonal structure having unequal sides, one point of said polygonal structure being

pivoted to said support, and cooperating sliding means arranged on the support and said long link.

8. An adjustable reclining chair as claimed in claim 7, in which the polygonal structure is pivoted to the support at the pivot point between the seat and the back-rest.

9. An adjustable reclining chair as claimed in claim 7, in which an intermediate point of the seat is pivoted to the support.

10. An adjustable reclining chair comprising: a support, a back-rest, a seat, a leg-rest, said seat extending between said back-rest and said leg-rest and being pivoted thereto, connecting link-means, one connecting link-means being arranged on each side of the chair, each of said connecting link-means including a short link and a long link hingedly connected with each other, the free end of said long link being pivoted to an intermediate point of the back-rest above the pivot point between the back-rest and the seat, said short link being connected to said leg-rest, said back-rest, said seat, said leg-rest and said connecting link-means forming a polygonal structure having unequal sides, one point of said polygonal structure being pivoted to said support, and cooperating sliding means arranged on the support and said seat.

11. An adjustable reclining chair comprising: a support, a back-rest, a seat, a leg-rest, said seat extending between said back-rest and said leg-rest and being pivoted thereto, connecting link means, one connecting link-means being arranged on each side of the chair, each of said connecting link-means including a short link and a long link hingedly connected with each other, the free end of said long link being pivoted to an intermediate point of the back-rest above the pivot point between the back-rest and the seat, said short link being pivoted to an intermediate point of said leg-rest, said back-rest, said seat, said leg-rest, and said connecting link-means forming a polygonal structure having unequal sides, a guiding link extending between said seat and said long link and being connected thereto, said long link being pivoted to said support, and cooperating sliding means arranged on the support and the seat.

12. An adjustable reclining chair as claimed in claim 11, one end of said guiding link being pivotally connected to said seat, and the other end of said guiding link being in slidable engagement with said long link.

13. An adjustable reclining chair as claimed in claim 11, one end of said guiding link being pivotally connected to said seat, the other end of said guiding link being in slidable engagement with said long link, and locking means arranged on said guiding link for locking an adjusted position of the polygonal structure.

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