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(54) **Ergonomic Chair**

Ergonomischer Stuhl

Chaise ergonomique

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## Description

**[0001]** The present invention relates to a chair and in particular an ergonomic chair (or armchair).

**[0002]** Ergonomic chairs are already known in the furnishings sector, in particular in the office furnishings and furniture sector. These chairs typically comprise a backrest and a seat supported by a support element generally resting rotatably on a floor via wheels (typically castor wheels). The known ergonomic chairs typically comprise a synchronised pivoting mechanism which allows the backrest and the seat to be inclined in a predetermined manner. Generally, when the backrest is inclined at an angle  $\alpha$  (alpha), the seat is inclined at an angle ( $\beta$ ) beta equal to about half the angle of the backrest. In other words, the backrest and the seat of the known ergonomic chairs move in unison, albeit with different degrees of pivoting.

**[0003]** In the known ergonomic chairs the seat and the backrest are formed as two separate parts. Such a chair is known from WO 02/32260.

**[0004]** Although these ergonomic chairs are fairly comfortable, especially when compared with chairs which have a fixed backrest, the Applicant has defined the aim of improving the comfort and therefore providing an ergonomic chair which is even more comfortable than the known ergonomic chairs.

**[0005]** According to a first aspect, an ergonomic chair with a seat and a backrest is provided, the chair comprising:

- a pivoting mechanism;
- a substantially undeformable rear element connected to the pivoting mechanism and situated at the backrest;
- a substantially undeformable front element connected to the pivoting mechanism and situated at the seat;
- a deformable support frame connected to the substantially undeformable rear element and to the substantially undeformable front element; and
- a supporting cover tensioned on said support frame, said deformable support frame comprising a pair of substantially L-shaped bars which define the profile of the backrest and the seat of the chair.

**[0006]** In one embodiment, each of said L-shaped bars is rigidly connected to said substantially undeformable rear element at a section of the side which defines the backrest and is also rigidly connected to said substantially undeformable front element at a section of the side which defines the seat, the two connecting sections having, between them, a curved section which is not constrained to either one of the substantially undeformable rear and front elements.

**[0007]** In one embodiment, the support frame also comprises an upper cross-piece for connecting the top ends of said L-shaped bars.

**[0008]** Preferably, each of said L-shaped bars has a double-strip profile which defines slots for fixing, in a tensioned condition, the supporting cover.

5 **[0009]** At least one part of said deformable support frame may be made of a plastic material, for example nylon.

**[0010]** The substantially undeformable rear element may be profitably connected rotatably to said substantially undeformable front element.

10 **[0011]** Said substantially undeformable rear element may be profitably hinged to the pivoting mechanism.

**[0012]** Said substantially undeformable front element may be hinged to the pivoting mechanism.

15 **[0013]** In one preferred embodiment, the substantially undeformable rear element and said substantially undeformable front element are made of aluminium or an alloy of aluminium.

**[0014]** The present invention will become fully clear from a reading of the following detailed description, provided purely by way of a non-limiting example, to be read with reference to the accompanying sets of illustrative drawings in which:

25 Figure 1 is a schematic axonometric view of an ergonomic chair according to an embodiment of the invention, together with the supporting fabric;

- Figure 2 is an axonometric view of the chair according to Figure 1, without the supporting fabric;

- Figure 3 is a side view of the chair according to Figure 1, without the supporting fabric;

30 - Figure 3a is an enlarged view which shows the rotational points of the undeformable structure with respect to the pivoting mechanism;

- Figure 4 is a rear view of the chair according to Figure 1, with the supporting fabric;

35 - Figure 5 is a rear view of the chair according to Figure 1, without the supporting fabric;

- Figure 6 is an axonometric view of parts of the chair according to Figure 1, showing the pivoting mechanism, the substantially undeformable rear element and the substantially undeformable front element;

40 - Figure 7 is an axonometric rear side view showing the pivoting mechanism, the substantially undeformable rear element, the substantially undeformable front element and the deformable support frame;

- Figure 8 shows the same components as in Figure 7, but from a different angle;

- Figures 9 and 10 show the shoulders of the deformable structure;

45 - Figure 11 is a cross-section which shows schematically the cover tensioned between two shoulders of the deformable support frame.

50 **[0015]** The ergonomic chair according to one embodiment of the invention and which is shown in the various figures is denoted overall by the reference number 1. It comprises a conventional pivoting mechanism 2. In the embodiment shown, the pivoting mechanism 2 is sup-

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ported by a central tubular structure 3 (typically with a pneumatic piston for varying the height of the seat from the ground) connected to a plurality of arms 31. Each arm or radial element 31 terminates with a wheel 32 (typically a castor wheel). Alternatively, the chair 1 could be supported by legs with feet without wheels or by any other support structure.

**[0016]** The pivoting mechanism 2 may be of any known type, typically a parallelogram pivoting mechanism, and will not be described in further detail.

**[0017]** According to the invention (Figure 2), a substantially undeformable rear element 4 is connected to the pivoting mechanism 2. In a preferred embodiment, the substantially undeformable rear element 4 is connected to the pivoting mechanism 2 by means of a turned down saddle-shaped element 43.

**[0018]** In one embodiment, the substantially undeformable rear element 4 comprises a curved substantially flat top bar 41 and two flat side profiles 42 suitably shaped so as to define substantially the shape of the backrest. Top bar 41 and side profiles 42 form a sort of "C" shaped element. The two flat side profiles 42 are shaped as can be seen more clearly in the various figures, for example as shown in Figure 2 and in Figures 6 to 8. In the embodiment which is shown in the Figures, the two side profiles 42 are rigidly connected to the turned down saddle-shaped element 43 at rotation points 46 and by screws 43'. In this manner, the "C" shaped element and the turned down saddle-shaped element 43 are rigidly connected to form a rigid component. The thus created closed profile is certainly more rigid than an open profile would be.

**[0019]** Connection blocks 44 (see Figure 7) are suitable for connecting the backrest (not shown in the Figures).

**[0020]** The two side profiles 42 are preferably reinforced with ribs 45 which are visible, for example, in Figure 8. In Figure 8, as well as in Figures 6 and 7, it is also possible to see the points 46 of rotation of the substantially undeformable rear element 4 and of substantially undeformable front element 5, which will be described more fully in the remainder of this description. Points 46 could be parts of connection blocks 44 or could be provided substantially at the end of the two side profiles 42.

**[0021]** For the purposes of the present description, a "substantially undeformable element" is understood as meaning:

- a support element which is sufficiently rigid so as not to suffer visible deformation under load and which is able to support at least statically (but preferably also dynamically) the weight and the thrust exerted on the seat and on the backrest of a chair by a person of about 130 Kg;
- a rigid (undeformable and unextendable) rigid structure which, however, adapts to a parallelogram hinging movement via hinging points.

**[0022]** The substantially undeformable rear element 4 may be made of plastic, metallic or composite material, or a combination thereof. The term "plastic material", for the purposes of the present description, is intended to mean primarily a material different from metal and in particular a substantially thermoplastic material with elongation at break values  $\geq 50\%$  (during tensile tests performed on test pieces at 5 mm/min.) such as polycarbonate, polyester, polybutylene terephthalate, polypropylene, polyamide and their derivatives, EPDM-reinforced polypropylene and any combination thereof.

**[0023]** In one preferred embodiment, the substantially undeformable rear element 4 is made of steel or an alloy thereof. In a still preferred embodiment, the substantially undeformable rear element 4 is made of aluminium or an alloy of aluminium. Preferably, the substantially undeformable rear element 4 is cast made.

**[0024]** The chair 1 according to the invention also comprises a substantially undeformable front element 5 rotatably connected to the pivoting mechanism and to the undeformable rear element at two rotational points 46 visible (as said above), for example, in Figures 3a and 7.

**[0025]** In one embodiment, the substantially undeformable front element 5 is C-shaped with a front transverse bar 51 and two side flanges 52 which terminate at the two rotational points 46. The two side flanges 52 are preferably L-shaped or in any case are reinforced by ribs 52' (Figure 6).

**[0026]** The chair 1 according to the invention also comprises a perimetral frame 6. The perimetral frame 6 comprises two shoulders 61 (righthand shoulder and lefthand shoulder) and an upper reinforcing cross-piece 62. Each shoulder 61 is suitably substantially L-shaped, as shown in the various figures and in particular in Figures 9 and 10. Preferably, each shoulder 61 has a double profile, i.e. is formed by two parallel, flat, strips 61 a, 61 b which define between them a slit partially interrupted by partitions 61c which connect the two strips 61a, 61b. Slots 63 for fixing a supporting fabric 8 are thus formed. Bushes or cylinder pieces 64 are also provided at each shoulder 61 (Fig. 9). Preferably, a central length 66 is provided without any partition 61 c.

**[0027]** The shoulders 61 of the perimetral frame 6 are fixed to the flat side profiles 42 of the substantially undeformable rear element 4. In particular, the abovementioned side profiles 42 comprise listels 47 (Figure 6) with holes. In order to fix a shoulder 61 to the substantially undeformable rear element 4 typically screws (or similar threaded parts) are used, being inserted inside the bushes 64 of the shoulders 61 and inside the holes of the listels 47. Similarly, still with reference to Figure 10, the two side flanges 52 of the substantially undeformable front element 5 have two listels 57 with holes. In order to fix a shoulder 61 to the substantially undeformable front element 5 typically screws (or similar threaded parts) are used, being inserted inside the bushes 64 of the shoulders 61 and inside the holes of the listels 57.

**[0028]** The listels of the substantially undeformable

front element 5 and the substantially undeformable rear element 4 may be formed integrally with the said elements or may be separate parts joined afterwards by means of welding or using further threaded parts.

**[0029]** The shoulders 61 of the perimetral frame 6 may be made of any material, but a material which is considered particularly suitable is nylon or a similar material owing to its elastic properties.

**[0030]** The two shoulders 61 may be connected at the top by the abovementioned upper cross-piece 62.

**[0031]** For the purposes of the present description, the term "deformable element" is therefore understood as meaning an element which performs the function of a seat and a backrest of a chair, being constrained to the hinging system of a parallelogram, and adapts to the movement of the said parallelogram according to its constructional characteristics and also to the characteristics of the seat or backrest (fabric, mesh or leather cover).

**[0032]** As already mentioned, the chair according to the invention is completed by a supporting fabric 8 tensioned between the two shoulders 61. The supporting fabric may be visible (for example a mesh fabric) or may be incorporated inside an upholstery article, i.e. could be covered by another fabric, or a leather or imitation leather lining without a supporting function.

**[0033]** As shown in Fig. 7 or in Fig. 8 three separate zones are therefore formed: a first fixing zone (A) considered undeformable (situated in the vicinity of the seat, where the lower parts of shoulders 61 are connected to the substantially undeformable front element 5), a second zone (B) which is not connected to shoulders 61 and therefore is deformable, and a third zone (C) which is considered undeformable (situated in the vicinity of the backrest, where the shoulders 61 are connected to the substantially undeformable rear element 4).

**[0034]** In this way it is possible to obtain an ergonomic chair provided with a pivoting mechanism which causes a synchronised movement of the backrest and the seat in absolute terms (movement of the backrest and the seat with respect to the ground) and in relative terms (movement of the backrest and the seat relative to each other).

**[0035]** As described above, unlike the known solutions in which the backrest and the seat are two single components separate from each other, the chair according to the invention provides a single structure with:

1. A structural, perimetral and deformable frame 6 (deformable so as to allow the abovementioned "relative deformation");
2. A supporting fabric (where the weight of the person is supported elastically by the fabric itself which is tensioned between the two shoulders of the structural frame).

**[0036]** A kind of deformable monostructure with a backrest zone and a seat zone formally differentiated by a connecting radius is thus formed. Deformation of the structure so as to allow the typical movement according

to the type of pivoting mechanism used occurs in the zone of the connecting radius.

**[0037]** The supporting fabric follows the movement of the structure and at the same time undergoes elastic deformation due to the weight of the person seated. The combination of these two deformation possibilities ensures a unique level of comfort.

**[0038]** In the chair according to the present invention, the seat and backrest support elements are joined together by a double articulation and form a rigid and unextendable structure when constrained to the hinging system of the parallelogram mechanism. Since the rotational points of the parallelogram allow rotation of the seat and the backrest at different angles, the definition "undeformable" refers to a rigid structure which adapts via the hinging points to the hinging of that parallelogram. Figure 3a shows the rotational points 46, 48 and 53 of the undeformable structure.

**[0039]** Reference number 53 designates the rotational point between front transverse bar 51 and the pivoting mechanism 2. Reference number 46 designates, as said above, the rotational point between substantially undeformable rear element 4 and substantially undeformable front element 5. Reference number 48 designates the rotational point between the pivoting mechanism 2 and the substantially undeformable rear element 4.

**[0040]** In the turned down saddle-shaped element 43 further holes 49 are provided. Such holes 49 guide an oscillating movement as indicated by the double head harrow. In this respect, properly shaped slots (not shown) are provided in the pivoting mechanism 2 in correspondence of holes 49. A pivot (also not shown) is inserted in each of hole 49 and corresponding slot.

**[0041]** Figure 11 shows a schematic cross-sectional view of a supporting cover 8 pre-tensioned between two shoulders 61. A hooking member 81 for engaging with a tooth 65 of the shoulder 61 with a double profile (61 and 62) is preferably fixed to the edges of the cover 8.

## Claims

1. A chair (1) with a seat and a backrest, the chair comprising:
  - a pivoting mechanism (2);
  - a substantially undeformable rear element (4) connected to the pivoting mechanism (2) and situated at the backrest;
  - a substantially undeformable front element (5) connected to the pivoting mechanism (2) and situated at the seat;
  - a deformable support frame (6) connected to the substantially undeformable rear element (6) and to the substantially undeformable front element (5); and
  - a supporting cover (8) tensioned on said support frame, wherein said deformable support

frame (6) comprises a pair of substantially L-shaped bars (61) which define the profile of the backrest and the seat of the chair (1).

2. The chair (1) according to Claim 1, wherein each of said L-shaped bars (61) is rigidly connected to said substantially undeformable rear element (4) at a section of the side which defines the backrest and is also rigidly connected to said substantially undeformable front element (5) at a section of the side which defines the seat, the two connecting sections having, between them, a curved section which is not constrained to either one of the substantially undeformable rear and front elements (4, 5).
3. The chair (1) according to Claim 1 or 2, wherein said support frame (6) also comprises an upper cross-piece (62) for connecting the top ends of said L-shaped bars.
4. The chair (1) according to any one of Claims 1 to 3, wherein each of said L-shaped bars has a double-strip profile which defines slots for fixing, in a tensioned condition, the supporting cover.
5. The chair (1) according to any one of the preceding claims, wherein at least one part of said deformable support frame (6) is made of a plastic material, for example nylon.
6. The chair (1) according to any one of the preceding claims, wherein said substantially undeformable rear element (4) is connected rotatably (46) to said substantially undeformable front element (5).
7. The chair (1) according to any one of the preceding claims, wherein said substantially undeformable rear element (4) is hinged to the pivoting mechanism (2).
8. The chair (1) according to any one of the preceding claims, wherein said substantially undeformable front element (5) is hinged to the pivoting mechanism (2).
9. The chair (1) according to any one of the preceding claims, wherein said substantially undeformable rear element (4) and said substantially undeformable front element (5) are made of aluminium or an alloy of aluminium.

#### Patentansprüche

1. Stuhl (1) mit einer Sitzfläche und einer Rückenlehne, wobei der Stuhl umfasst:
  - einen Schwenkmechanismus (2);
  - ein im Wesentlichen nicht verformbares Rück-

kelement (4), das mit dem Schwenkmechanismus (2) verbunden ist und an der Rückenlehne angeordnet ist;

- ein im Wesentlichen nicht verformbares Frontelement (5), das mit dem Schwenkmechanismus (2) verbunden ist und an der Sitzfläche angeordnet ist;
  - einen verformbaren Trägerrahmen (6), der mit dem im Wesentlichen nicht verformbaren Rückelement (4) und dem im Wesentlichen nicht verformbaren Frontelement (5) verbunden ist; und
  - eine Trägerabdeckung (8), die auf den Trägerrahmen gespannt ist,
- wobei der verformbare Trägerrahmen (6) ein Paar von im Wesentlichen L-förmigen Stäben (61) umfasst, welche das Profil der Rückenlehne und der Sitzfläche des Stuhls (1) definieren.

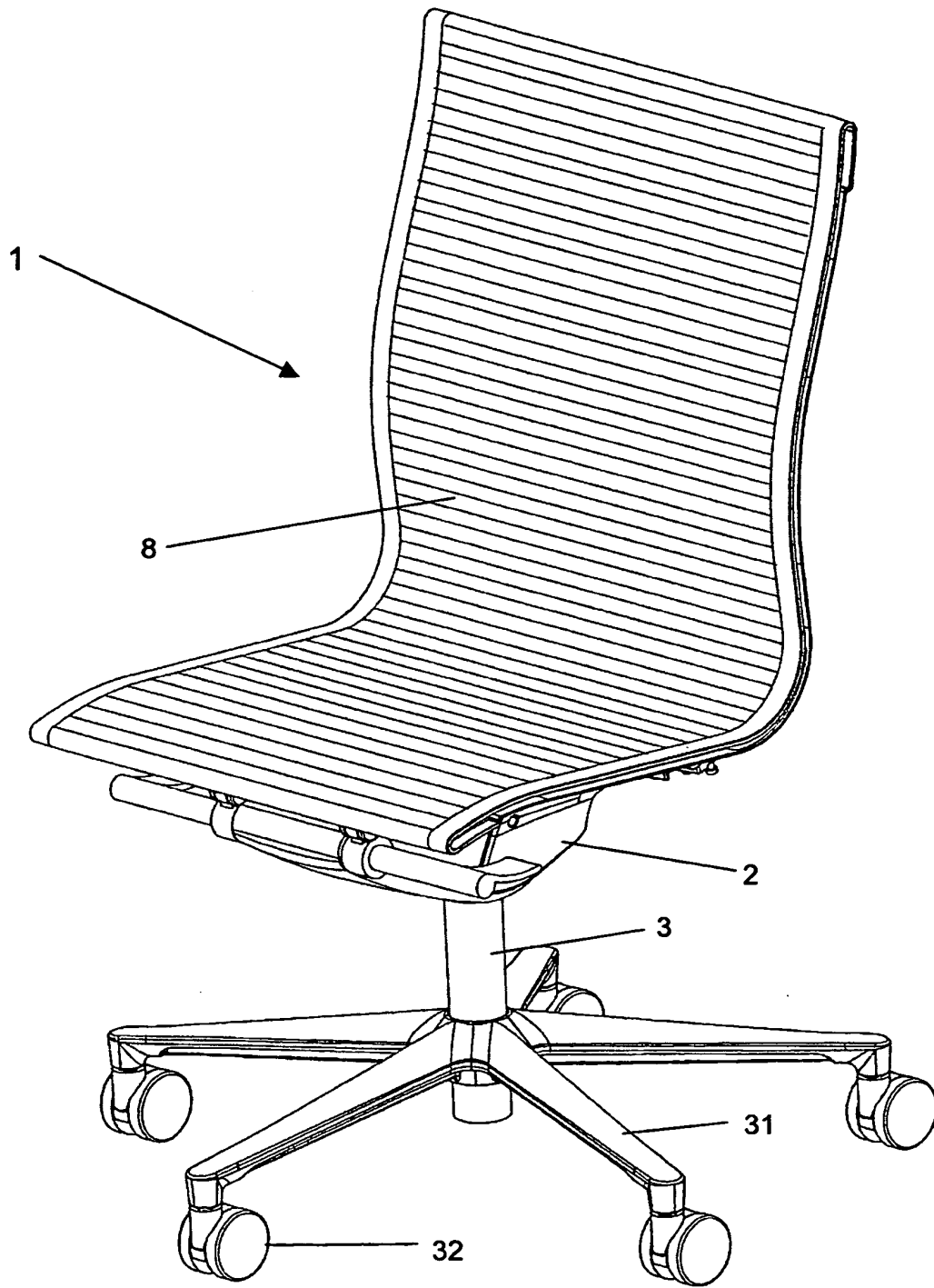
2. Stuhl (1) gemäß Anspruch 1, wobei jeder der L-förmigen Stäbe (61) mit dem im Wesentlichen nicht verformbaren Rückelement (4) an einem Bereich der Seite, welche die Rückenlehne definiert, starr verbunden ist und ebenso mit dem im Wesentlichen nicht verformbaren Frontelement (5) in einem Bereich der Seite, welche die Sitzfläche definiert, starr verbunden ist, wobei die zwei Verbindungsbereiche einen dazwischen liegenden gebogenen Bereich aufweisen, welcher nicht an eines der beiden im Wesentlichen nicht verformbaren Rück- und Frontelemente (4, 5) gebunden ist.
3. Stuhl (1) gemäß Anspruch 1 oder 2, wobei der Trägerrahmen (6) auch ein oberes Querteil (62) zum Verbinden der oberen Enden der L-förmigen Stäbe umfasst.
4. Stuhl (1) gemäß einem der Ansprüche 1 bis 3, wobei jeder der L-förmigen Stäbe ein Doppelstreifenprofil aufweist, welches Schlitze zum Befestigen der Trägerabdeckung in einem gespannten Zustand definiert.
5. Stuhl (1) gemäß einem der vorangegangenen Ansprüche, wobei wenigstens ein Teil des verformbaren Trägerrahmens (6) aus einem Kunststoffmaterial, beispielsweise Nylon, besteht.
6. Stuhl (1) gemäß einem der vorangegangenen Ansprüche, wobei das im Wesentlichen nicht verformbare Rückelement (4) drehbar (46) mit dem im Wesentlichen nicht verformbaren Frontelement (5) verbunden ist.
7. Stuhl (1) gemäß einem der vorangegangenen Ansprüche, wobei das im Wesentlichen nicht verformbare Rückelement (4) an den Schwenkmechanismus (2) angelenkt ist.

8. Stuhl (1) gemäß einem der vorangegangenen Ansprüche, wobei das im Wesentlichen nicht verformbare Frontelement (5) an den Schwenkmechanismus (2) angelenkt ist.
9. Stuhl (1) gemäß einem der vorangegangenen Ansprüche, wobei das im Wesentlichen nicht verformbare Rückelement (4) und das im Wesentlichen nicht verformbare Frontelement (5) aus Aluminium oder einer Aluminiumlegierung bestehen sind.

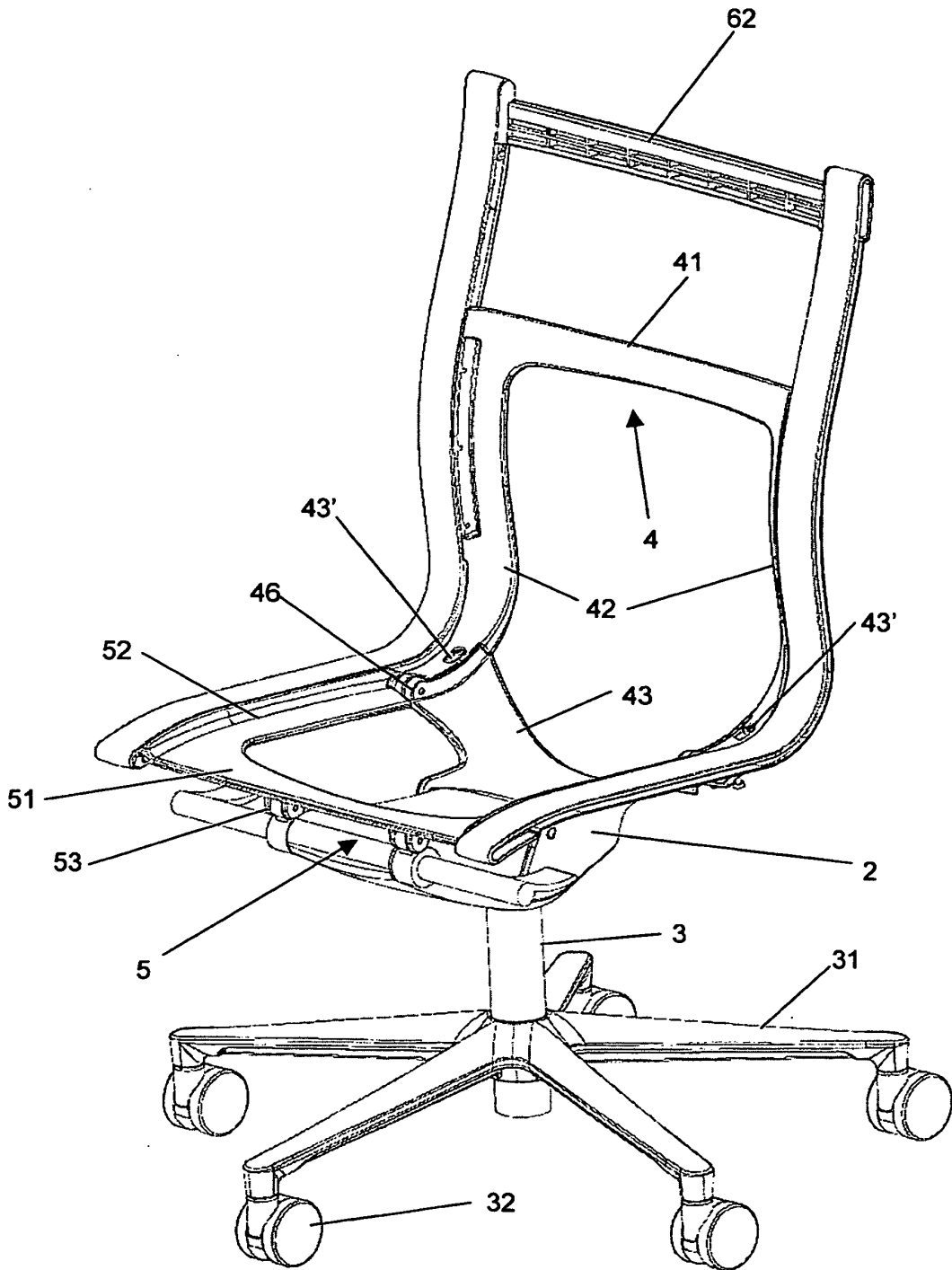
### Revendications

1. Chaise (1) avec une assise et un dossier, la chaise comprenant :
- un mécanisme de pivotement (2) ;
  - un élément arrière sensiblement indéformable (4) raccordé au mécanisme de pivotement (2) et situé au niveau du dossier ;
  - un élément avant sensiblement indéformable (5) raccordé au mécanisme de pivotement (2) et situé au niveau de l'assise ;
  - un châssis de support déformable (6) raccordé à l'élément arrière sensiblement indéformable (4) et à l'élément avant sensiblement indéformable (5) ; et
  - un couvercle de support (8) tendu sur ledit châssis de support, dans laquelle ledit châssis de support déformable (6) comprend une paire de barres sensiblement en forme de L (61) qui définissent le profil du dossier et de l'assise de la chaise (1).
2. Chaise (1) selon la revendication 1, dans laquelle chacune desdites barres en forme de L (61) est rigidement raccordée audit élément arrière sensiblement indéformable (4) au niveau d'une section du côté qui définit le dossier et est également rigidement raccordée audit élément avant sensiblement indéformable (5) au niveau d'une section du côté qui définit l'assise, les deux sections de raccordement ayant, entre elles, une section incurvée qui n'est pas contrainte ni par l'élément arrière ni par l'élément avant sensiblement indéformables (4, 5).
3. Chaise (1) selon la revendication 1 ou 2, dans laquelle ledit châssis de support (6) comprend également une traverse supérieure (62) pour raccorder les extrémités supérieures desdites barres en forme de L.
4. Chaise (1) selon l'une quelconque des revendications 1 à 3, dans laquelle chacune desdites barres en forme de L a un profil à double bande qui définit des fentes pour fixer, dans une condition tendue, le couvercle de support.

5. Chaise (1) selon l'une quelconque des revendications précédentes, dans laquelle au moins une partie dudit châssis de support déformable (6) est réalisée avec une matière plastique, par exemple du nylon.
6. Chaise (1) selon l'une quelconque des revendications précédentes, dans laquelle ledit élément arrière sensiblement indéformable (4) est raccordé de manière rotative (46) audit élément avant sensiblement indéformable (5).
7. Chaise (1) selon l'une quelconque des revendications précédentes, dans laquelle ledit élément arrière sensiblement indéformable (4) est articulé par rapport au mécanisme de pivotement (2).
8. Chaise (1) selon l'une quelconque des revendications précédentes, dans laquelle ledit élément avant sensiblement indéformable (5) est articulé par rapport au mécanisme de pivotement (2).
9. Chaise (1) selon l'une quelconque des revendications précédentes, dans laquelle ledit élément arrière sensiblement indéformable (4) et ledit élément avant sensiblement indéformable (5) sont réalisés à partir d'aluminium ou à partir d'un alliage d'aluminium.

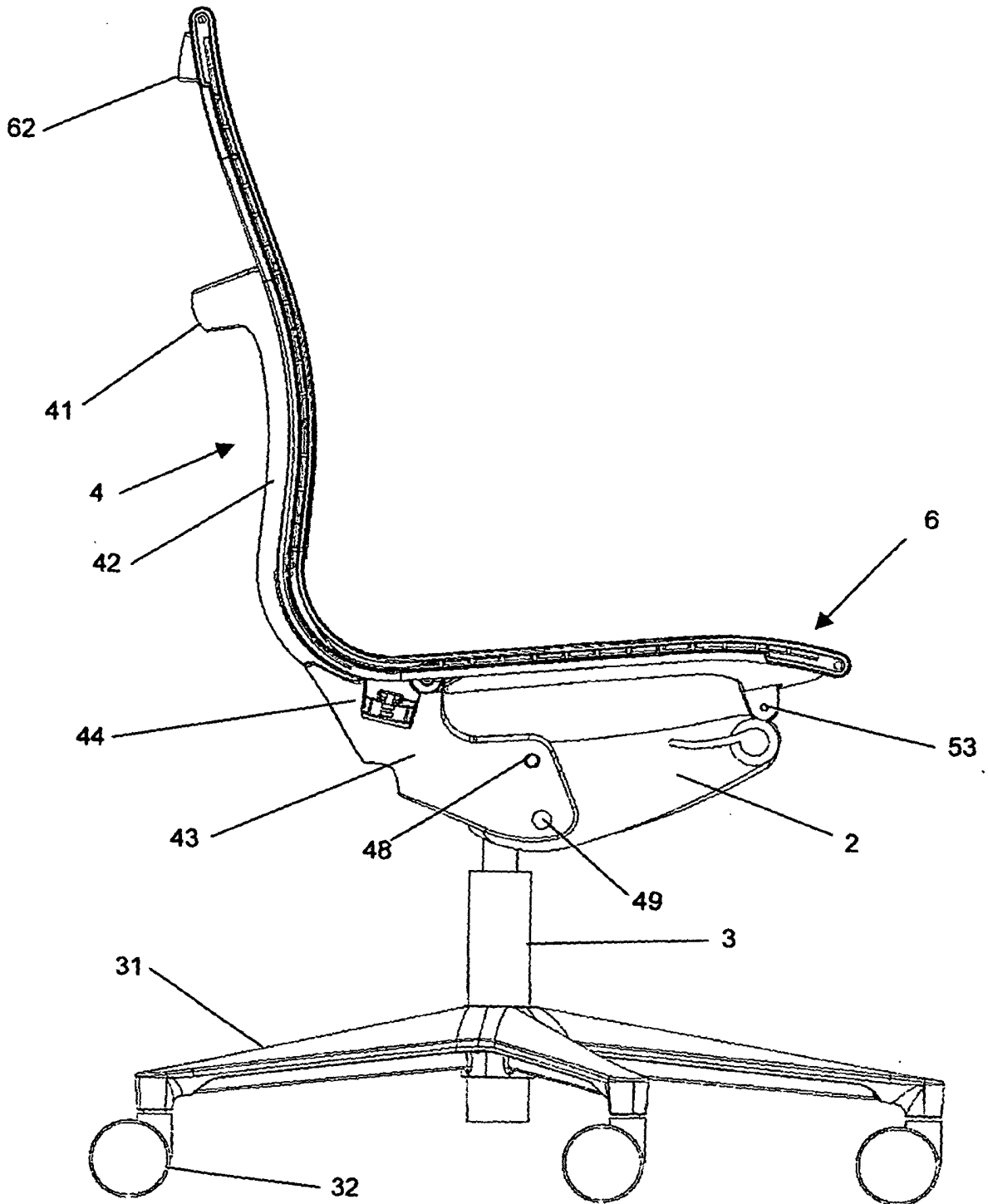


**Fig. 1**



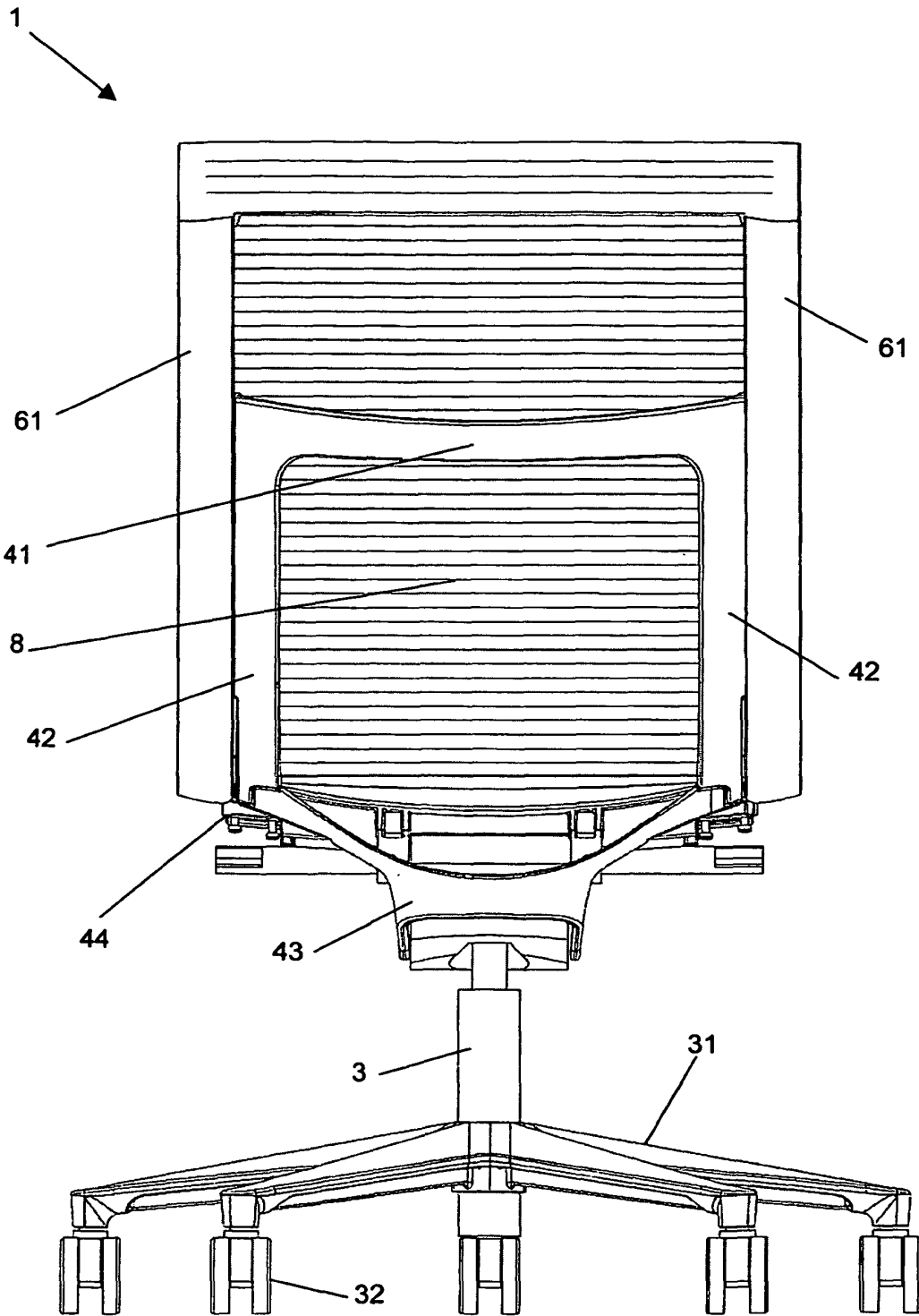
**Fig. 2**



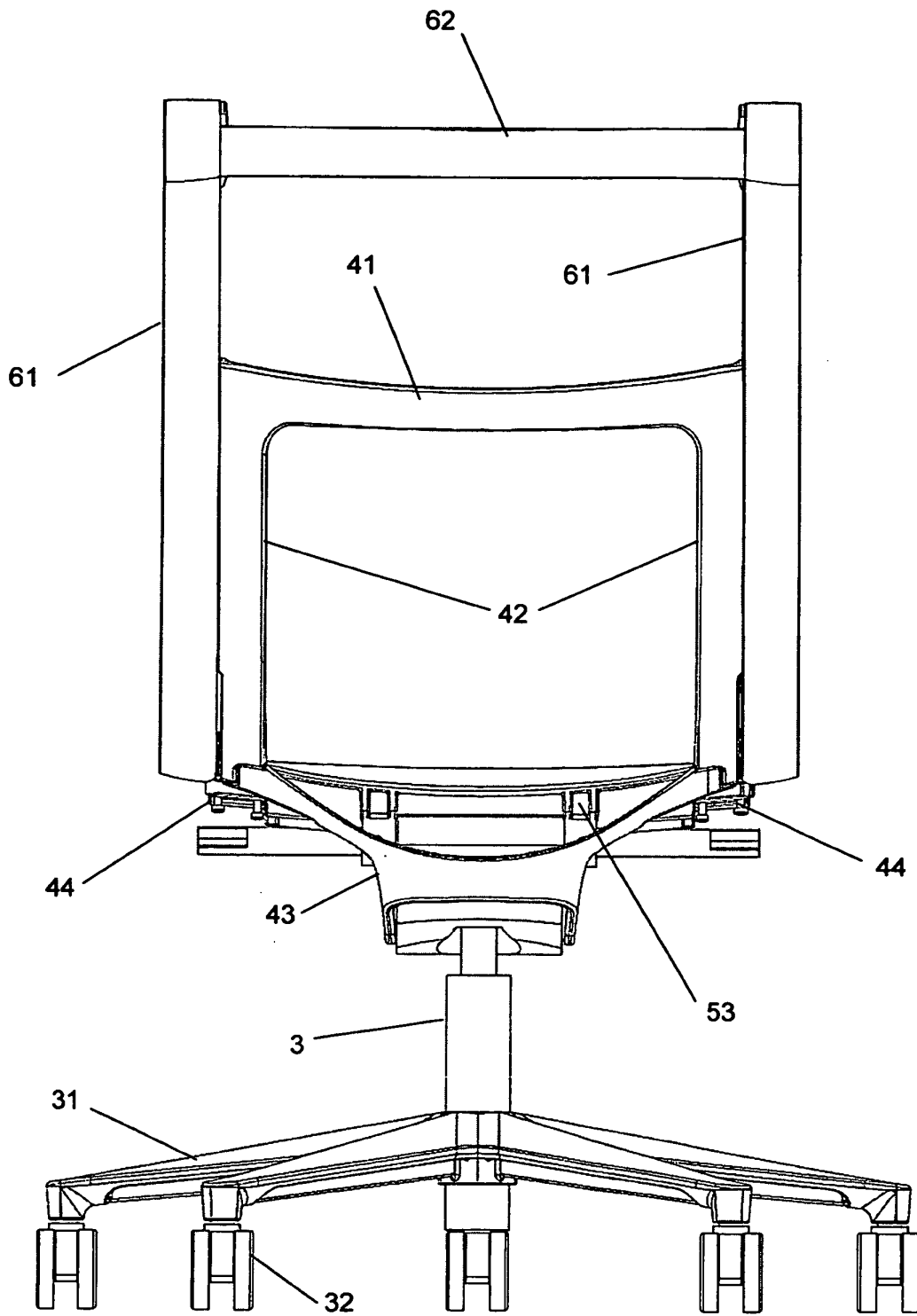


**Fig. 3**

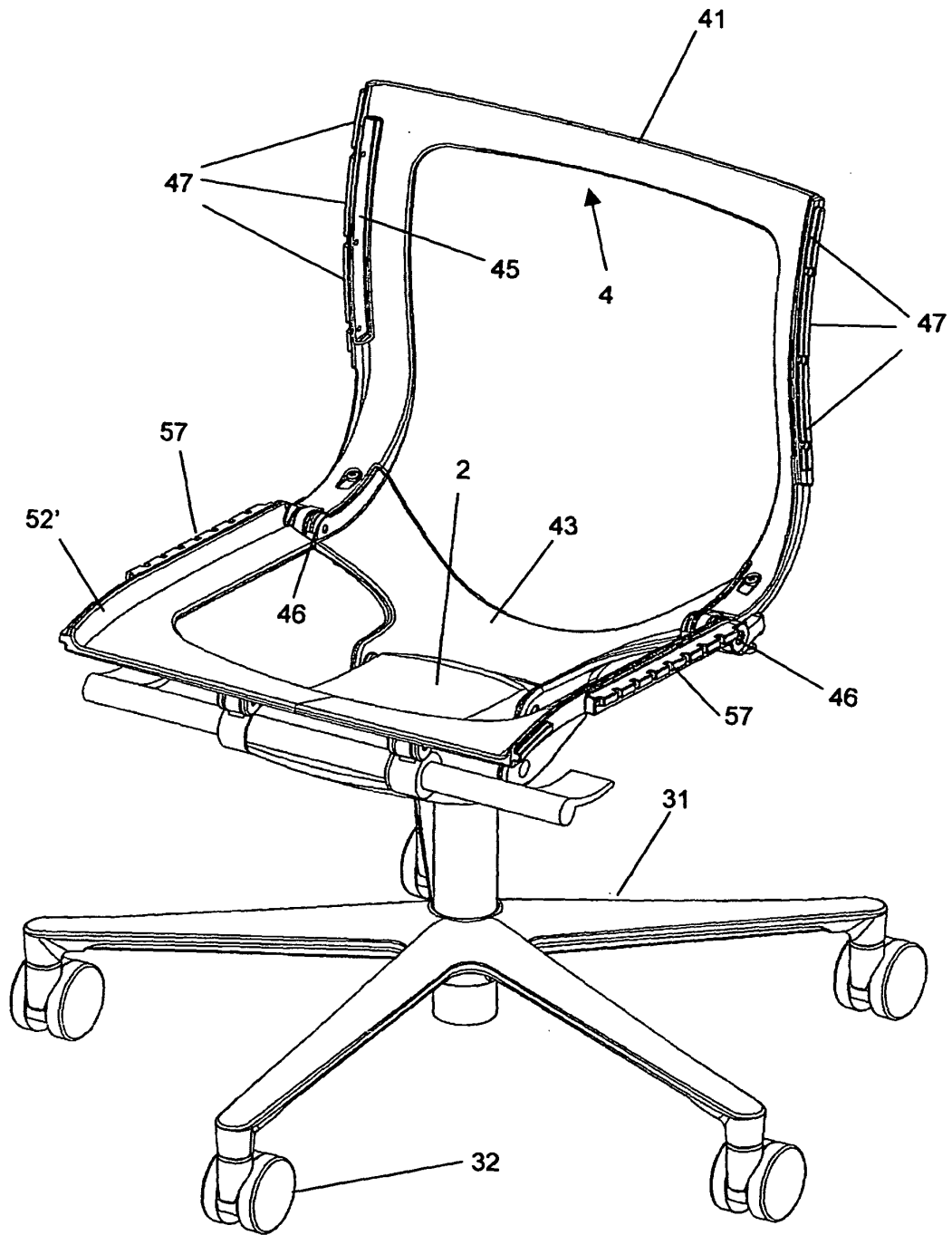




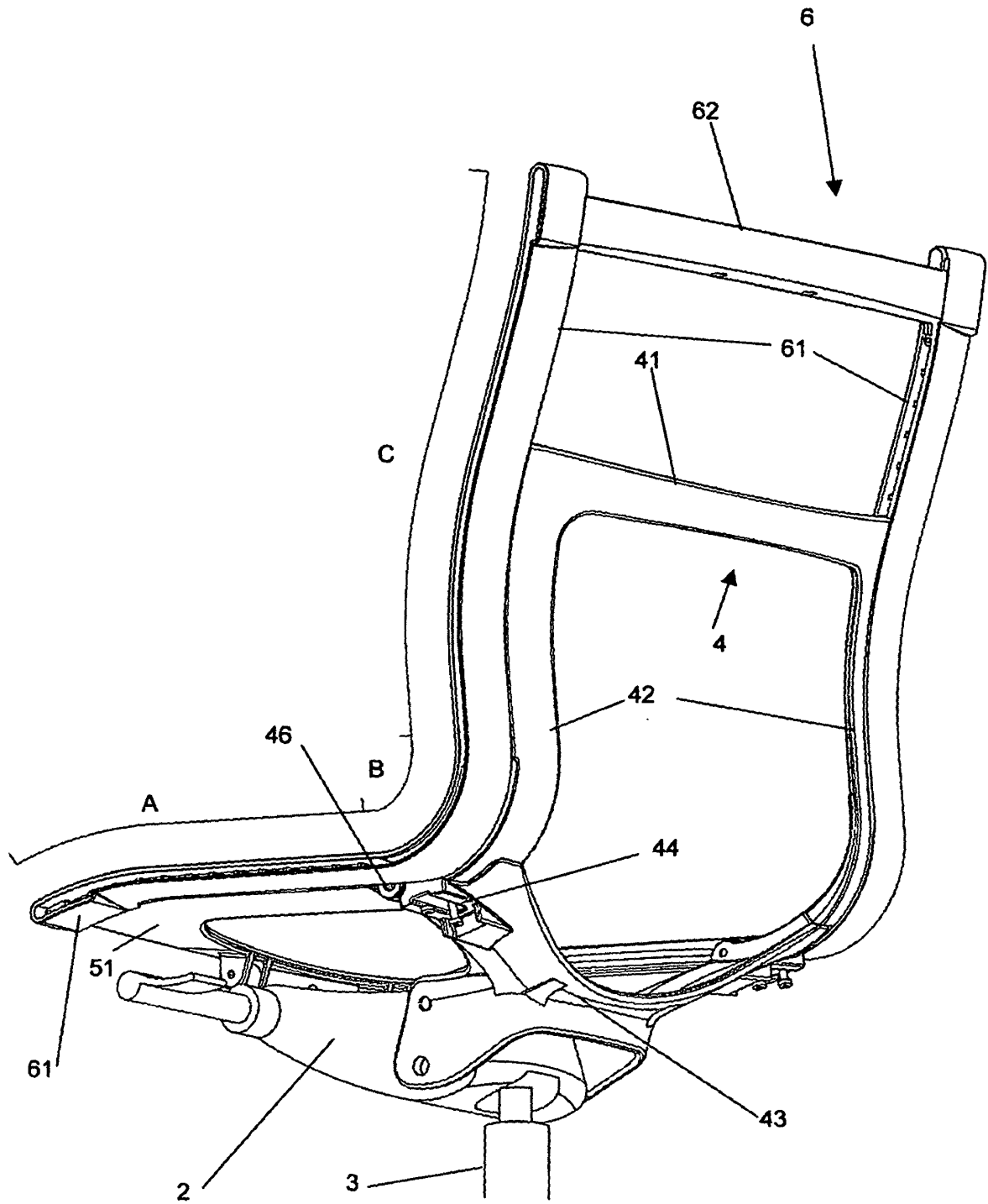
**Fig. 4**



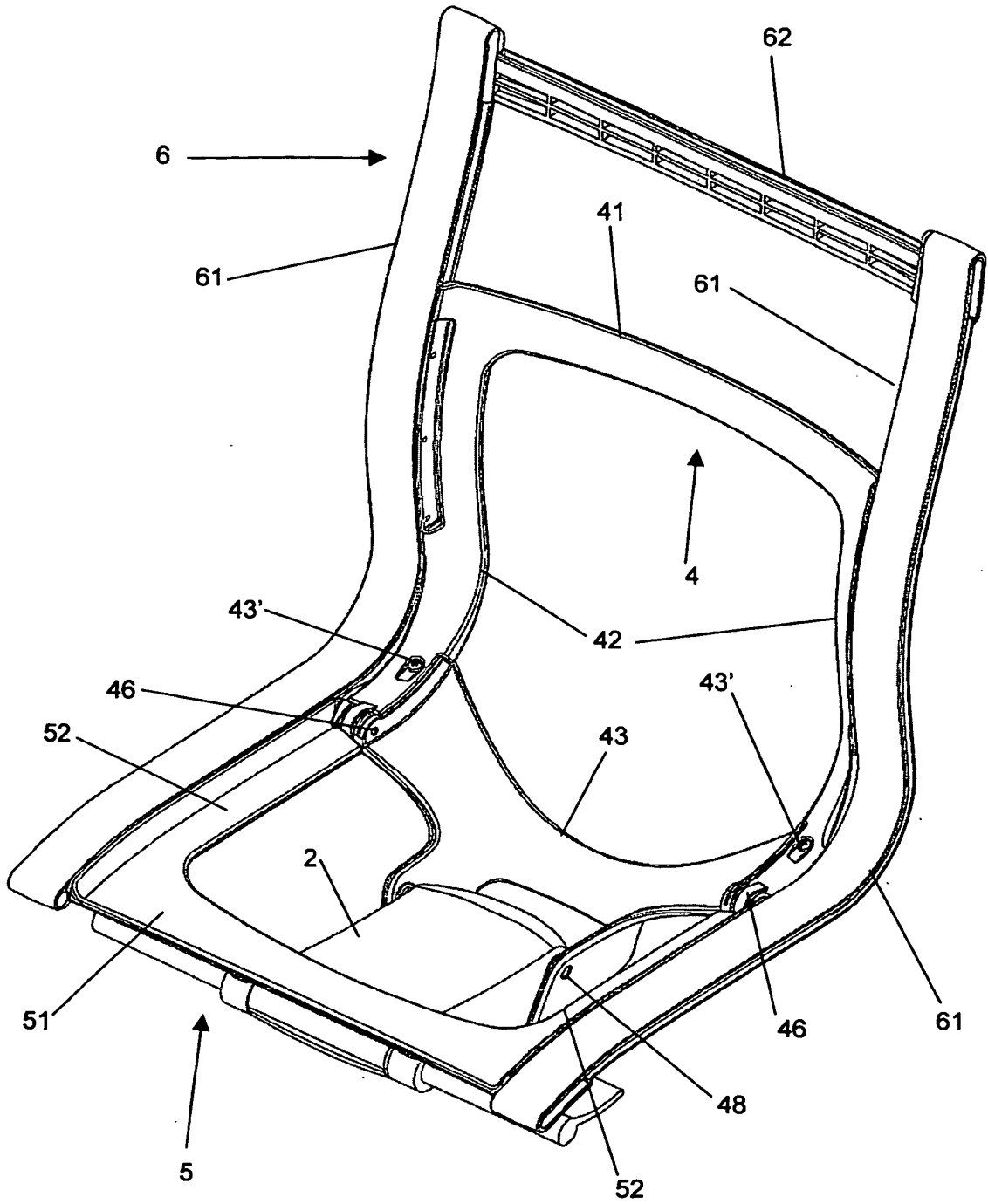
**Fig. 5**



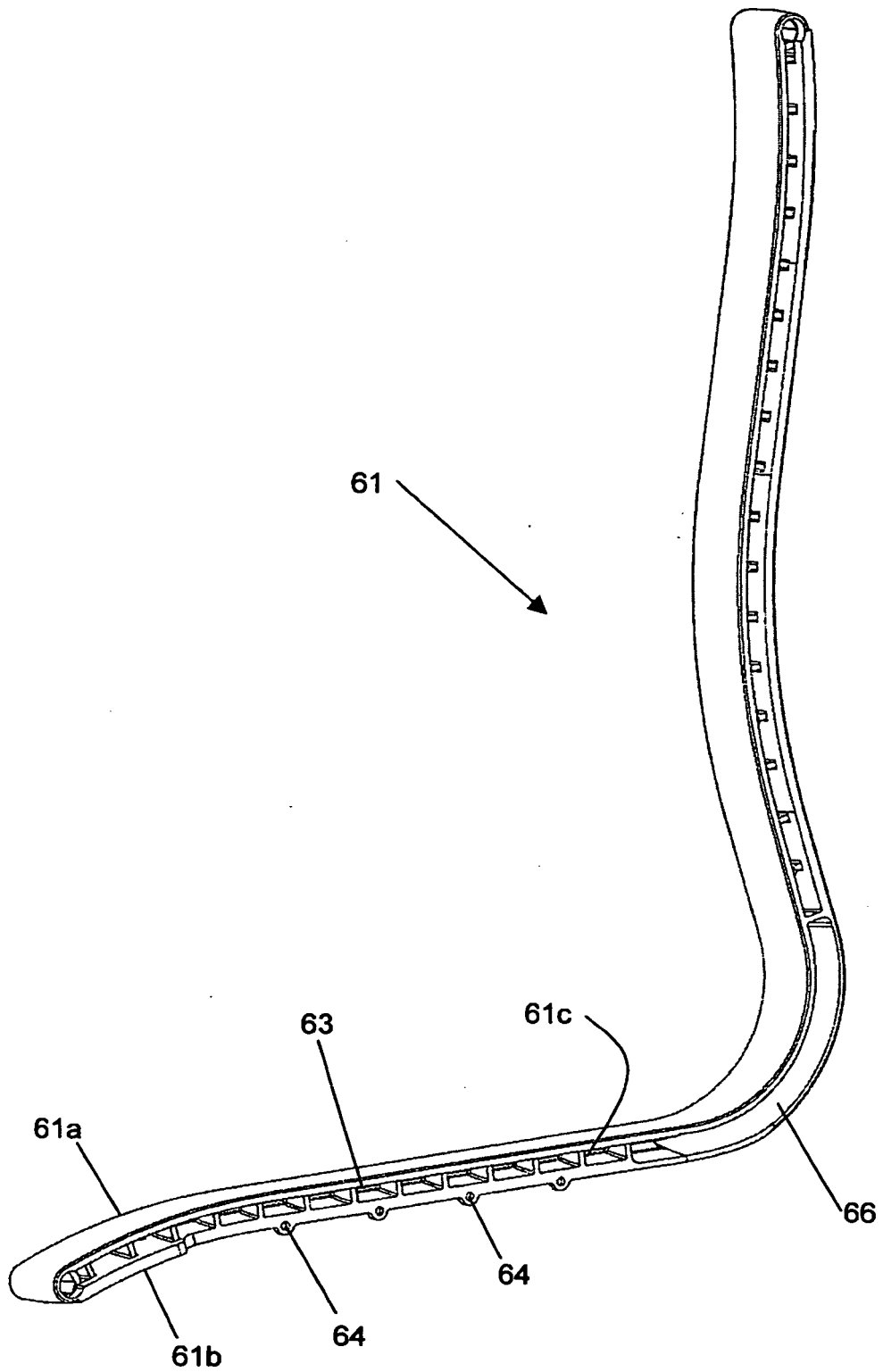
**Fig. 6**



**Fig. 7**

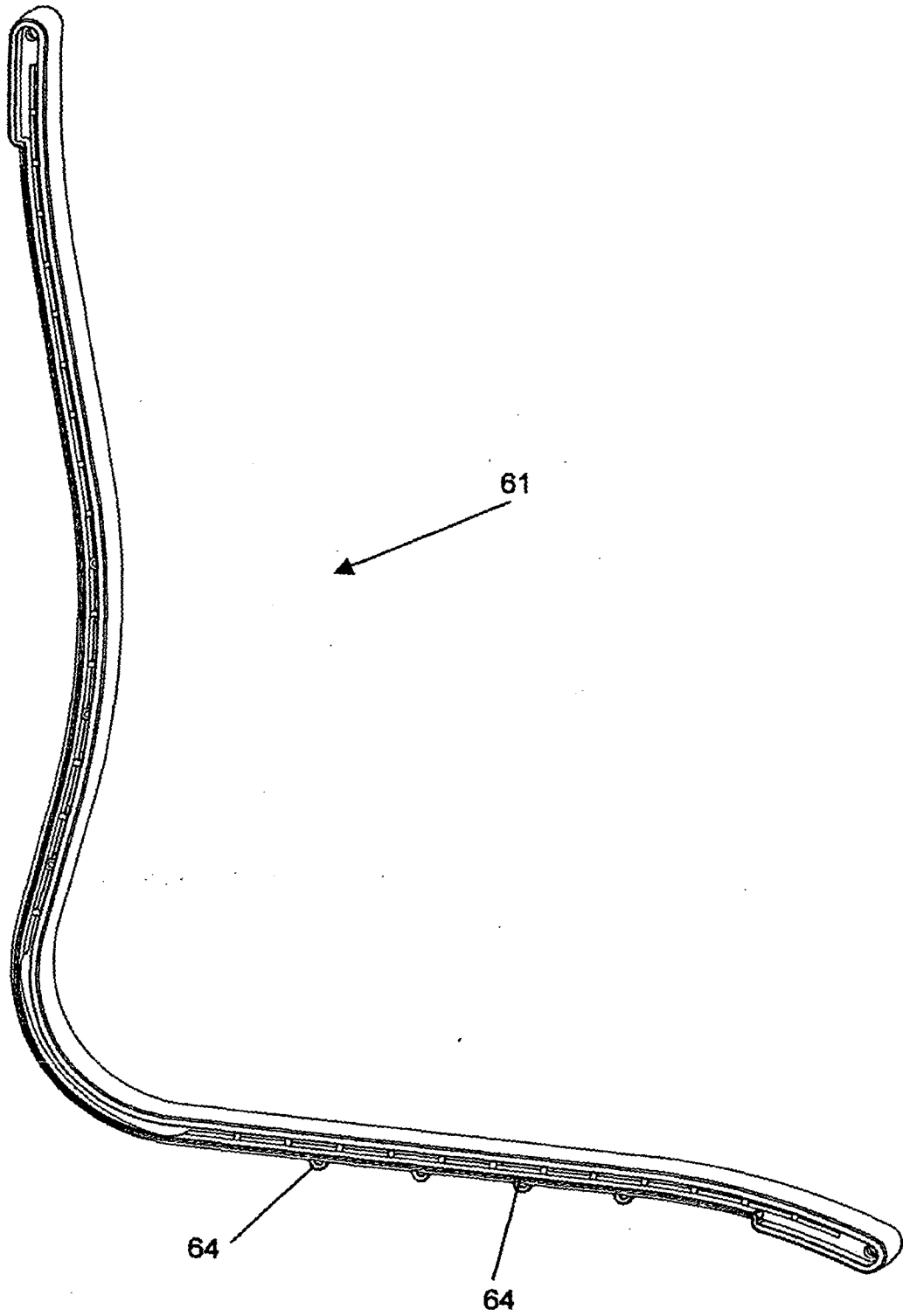


**Fig. 8**

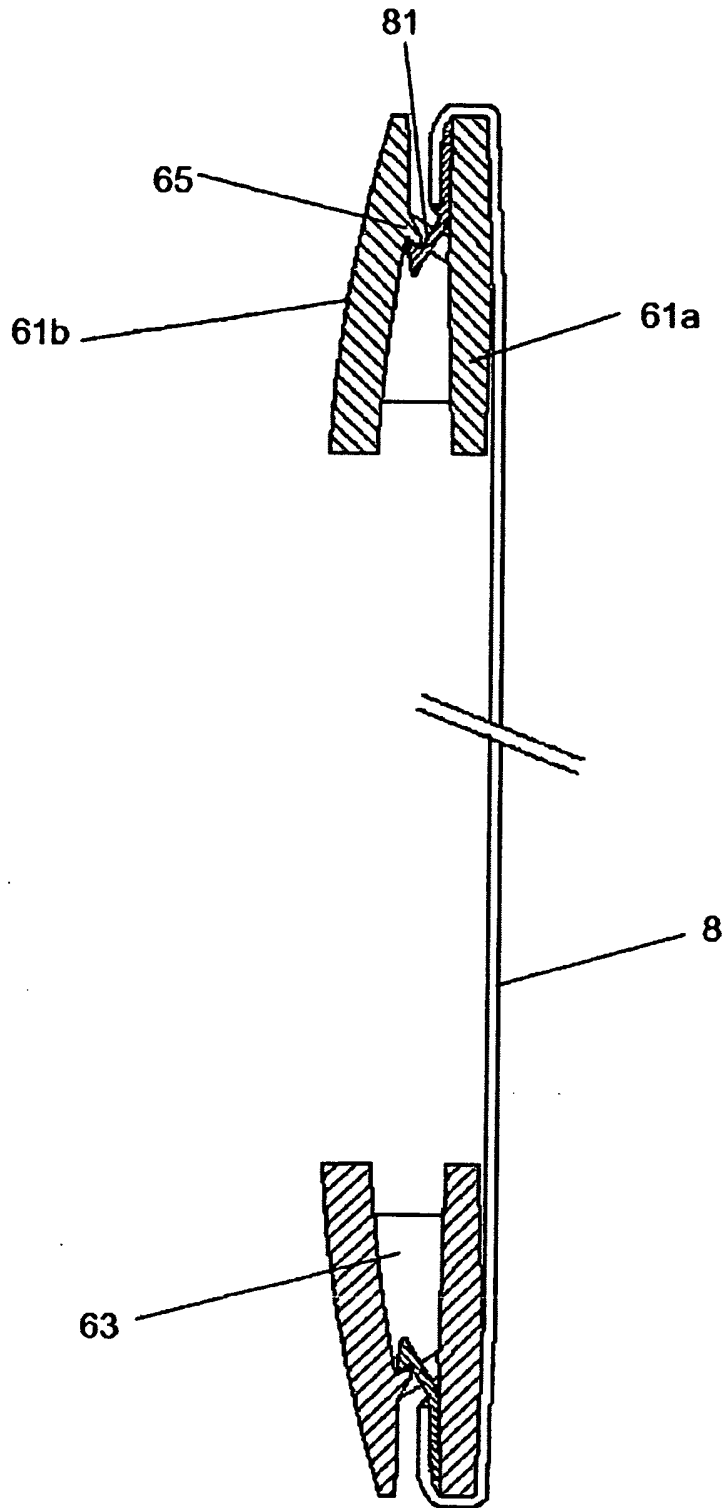


**Fig. 9**





**Fig. 10**



**Fig. 11**

**REFERENCES CITED IN THE DESCRIPTION**

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