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(54) **INSERT OF CHAIR BACK HANDLING ASSEMBLY OF A CHAIR AND HANDLING ASSEMBLY INCLUDING SAID INSERT**

(57) An insert of a movement assembly of a seat-back, wherein said insert is plate-shaped and comprises a first face and a second face opposite the first face, is described.

The insert further comprises combining means configured to combine the insert with a blade and a frame of the seatback and which define at least one axis of the insert on which the insert is rotatable in response to a stress imparted thereon. The insert further comprises resilient means provided at the first face and/or at the second face, which are susceptible to reversible compression in a direction parallel to or coincident with the first face and/or in a direction incident to the second face. A movement assembly of a seatback, comprising a blade, a frame and the insert mentioned above, is further described.

The frame is rotatable, by compression of the resilient means, with respect to said blade on the at least one axis of the insert in response to a respective stress exerted by a user.

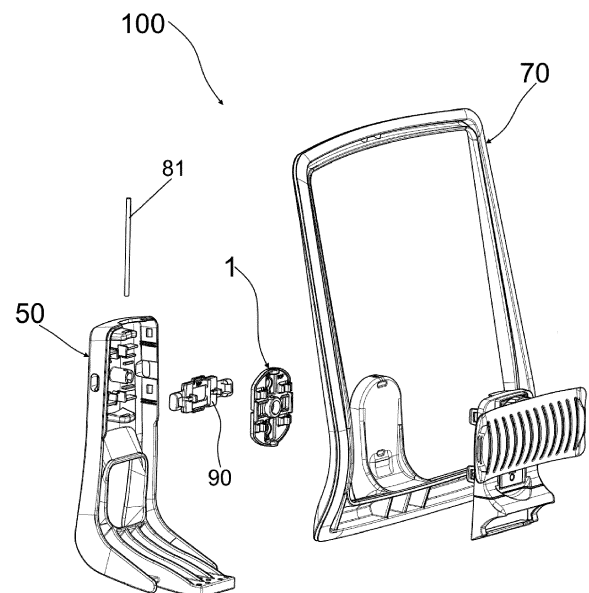


Fig. 1

Description

Field of the invention

[0001] The present invention concerns the technical sector of chairs designed to support the movements of a person seated on the chair.

Known art

[0002] Currently, many activities provide to have to stay seated for many hours in contact with the public or in front of a PC screen, with few or rare occasions to be able to stand and walk.

[0003] Staying continuously seated for many hours can lead to drawbacks from a physical and psychological point of view.

[0004] In fact, it is known that keeping a static posture for a prolonged amount of time can cause circulation problems, pain in the joints and muscles of the feet, legs, hips and dorsal region. These discomforts can further have an impact on the mood and spirit, and can favor the onset of a certain sensation of fatigue and dissatisfaction which can also affect efficiency at work.

[0005] When analyzing the posture of a person forced to stay seated for many hours, it can be noted that the person makes various movements on the chair: folding and extending the legs, displacing the chest forward and backward with respect to the back, adjusting one's position on the seat.

[0006] These movements can be seen as the body's attempt to address a situation in which it is forced to remain in the same position for several hours, such as, for example, to activate the circulation of the lower limbs.

[0007] However, it is known that traditional chairs do not allow to support these movements.

[0008] In other words, traditional chairs do not provide the possibility to change the position within the space of the different components of the chair in response to the movements of the person; at most, traditional chairs allow the user to be able to raise or lower the seat with respect to the ground or to recline and raise the back to adjust the posture from time to time and through appropriate systems voluntarily operated by the user.

[0009] For this reason, models of chairs, especially used in the work setting, were designed and marketed in recent years which aim to achieve a so-called "*dynamic seat*," i.e. which allow for some mobility of the body also when staying seated.

[0010] In practice, in these types of chairs, the back and/or seat are susceptible to movements in space, such as swinging or rotations, to support the movements that the person makes on the chair.

[0011] For example, in the chair model designed by the company Wilkhahn Wilkening & Hahne under the trade name "*AT. 187 range*," the seat and the back can be tilted with respect to an ideal horizontal plane parallel to the ground because they are rotatable together on a

respective pivot. In practice, whenever the person seated on the chair displaces his/her own weight to one side of the seat, the chair assists this movement by tilting the seat and back towards that side.

[0012] The company ACTIU Berbegal y Formas S.A. has also designed a chair model, under the trade name "*TNK Flex*," which provides the possibility to tilt the seat or back since provided with a tilting system that uses central springs which combine the swinging and flexing of the back in all directions.

[0013] Instead, the chair marketed by the company Sedus Stoll AG., under the trade name "*Swing up*," is provided with a system which allows the swinging of the seat with respect to the back. The system comprises a circular hub which has a back portion and a front portion: the hub is constrained to the seat of a chair at its back part and to the seatback at its front part.

[0014] The back part and the front part are rotatable one with respect to the other on a central axis passing through the center of the hub, thanks to the presence of a rubber sleeve fixed on the front part of the hub.

[0015] Systems that allow to achieve these movements are however difficult and costly to make; in fact, the chairs with the so-named "*dynamic seat*" are generally costly and not economically accessible for most people.

[0016] Moreover, these systems generally allow to carry out rotations of the seat with respect to the back, or vice-versa, on a single rotation axis, such as not to have to make too complex systems and that could lead to malfunctions over time.

[0017] This circumstance limits the degrees of freedom on which the components of the chair can rotate and, consequently, limits the movements of the body that the chair can support and the well-being it can generate.

Summary of the invention

[0018] Object of the present invention is to provide a movement assembly insert of a seatback and a movement assembly of a seatback comprising such insert, which allow to support the posture and movements of a user seated on a respective chair and which are simultaneously easy and economical to make.

[0019] Object of the present invention is also to provide a movement assembly insert of a seatback and a movement assembly of a seatback comprising such insert which allow to rotate the back on multiple axes, such as to ensure greater well-being for the seated person, and which are simultaneously easy and economical to make and durable over time.

[0020] Finally, object of the present invention is to provide a movement assembly insert of a back and a movement assembly of a seatback comprising such insert, which allow to limit the rotation range of the back within a predetermined interval and which ensure a reversible rotation of the back, with a smooth and not jerky performance, such as to ensure that the back returns in the not-

rotated position once the stress imparted by the user ceases.

[0021] One or more of the aforesaid objects are achieved by means of an insert according to claim 1.

[0022] In particular, claim 1 concerns a movement assembly insert of a seatback. The insert is plate-shaped and comprises a first face and a second face opposite the first face. Essentially, the insert has a substantially flat body with a first face that can be identified as back face and with a second face that can be identified as front face.

[0023] As will become clearer hereunder, the insert is intended to be inserted into a movement assembly of a seatback and to thus be combined with a blade adapted to be combined with the seat of a chair at the first face, and with a frame of a back or with an element combinable with the frame of a back, at the second face. The frame is arranged to be in turn combined with the blade.

[0024] The insert further comprises combining means configured to combine the insert with a blade and with a frame of the back of the movement assembly, such as to allow the respective assembly of the insert inside a movement assembly of a seatback. In practice, the combining means allow the insert to be combined with the blade and with the frame of the back.

[0025] The combining means define at least one axis of the insert, i.e. they define one or more axes of the insert. In practice, the combining means extend on the first face and/or the second face, such as to define a single axis, two axes or more axes of the insert.

[0026] For the purpose of the present invention, whenever referring to the fact that the combining means define at least one axis, it means that the combining means define the at least one axis at one or more elements adapted to allow them to be combined with one or more pivots or plugs of the movement assembly and/or adapted to allow them to be combined with one or more holes of the movement assembly.

[0027] The insert is rotatable in space on at least one axis of the insert in response to a stress exerted thereon. In practice, if the combining means define a single axis, the insert is rotatable on a single axis; if the combining means define two axes, the insert is rotatable on two axes; if the combining means define three or more axes, the insert is rotatable on three or more axes.

[0028] Since the combining means allow the insert to be combined with the blade and the frame of a movement assembly, the insert, whenever inserted into a movement assembly, allows the frame to rotate, or tilt, with respect to the blade on the at least one axis defined by the combining means.

[0029] Moreover, the insert comprises resilient means provided at the first and/or second face and which are susceptible to compression in a direction opposite or equal to a rotation direction of the insert on the at least one axis defined by the combining means.

[0030] Essentially, the insert comprises resilient means provided on the first face and/or the second face,

or at the first and/or second face at the level of windows or openings provided in the insert.

[0031] Such resilient means can be compressed in a direction parallel to or coincident with the first face and/or in a direction incident with the second face.

[0032] In practice, the resilient means can be compressed on a plane parallel to or coincident with a plane containing the first face and/or on a plane incident to a plane containing the second face.

[0033] For the purpose of the present invention, incident direction or incident plane means a direction or a plane defining, together with the second face or with a plane containing the second face, an angle between 1° and 179°, for example 30°, 60°, 90°, 120°, 150°. For example, the incident direction, or incident plane, can be orthogonal to the second face or tilted with respect to the second face.

[0034] Essentially, the resilient means can switch from an at rest, or not compressed, configuration to a compressed configuration, and vice-versa. After compressing, the resilient means can extend thus returning to the at rest, not compressed, configuration.

[0035] The resilient means of the insert allow to limit the rotation of the frame of the back on the at least one axis, i.e. they allow to contain the rotation of the frame of the back within a certain rotation range given by the degree of compression of the resilient means themselves. Moreover, the resilient means ensure that the rotation of the frame of the back is pleasant, i.e. is smooth and not jerky, and that the frame of the back rotates in the opposite direction to a not rotated position, once the stress of the user that caused the compression of the resilient means and the rotation of the back has ceased. Essentially, the resilient means make the movements of the frame of the seatback reversible and not too pronounced in response to the movements and stresses of the user.

[0036] Preferably, the insert comprises first resilient means jutting out from the first face and which are susceptible to compression in a direction parallel to the first face itself in response to a stress exerted thereon or on the insert. Additionally, or as an alternative to the first resilient means, the insert comprises second resilient means jutting out from the second face and which are susceptible to compression in a direction incident to the second face itself in response to a stress exerted thereon or on the insert. In practice, the insert comprises first resilient means and/or second resilient means that are obtained, respectively, on the first face and/or on the second face, such as to protrude from the respective face.

[0037] In a preferred embodiment, the insert comprises first resilient means and second resilient elements.

[0038] Essentially, the first resilient means can be reversibly compressed in a direction parallel to the first face and, more precisely, in a direction perpendicular, or substantially perpendicular, to the direction along which the first resilient means themselves extend on the first face.

[0039] The second resilient means can instead be

compressed towards the second face, or towards a plane containing the second face, and extend away from the second face, or from a plane containing the second face.

[0040] Preferably, the combining means allow a rotation of the insert with respect to a first axis perpendicular to the first face and/or a rotation with respect to a second axis parallel to the second face and, whenever the insert comprises combining means that define two rotation axes, preferably perpendicular to said first axis. In practice, the combining means define a first axis and/or a second axis on which the insert is rotatable.

[0041] Preferably, the combining means define a first axis and a second axis, such as the insert is preferably rotatable on the first axis and the second axis. This ensures that the user can be able to move with the back on two degrees of freedom with respect to the seat.

[0042] Preferably, the combining means comprise a hole obtained on the first face and having an axis parallel or coincident with the first axis.

[0043] This hole is arranged to be combined with a pivot-shaped combining element of the blade described hereunder.

[0044] Preferably, the hole is a through hole which crosses the first face and the second face of the insert such as to define the first axis of the insert on which it can rotate.

[0045] Preferably the combining means of the insert comprise a series of through holes, wherein the through holes are aligned with each other and are arranged along an axis parallel to or coincident with the second axis and are obtained on respective jutting portions provided on the second face. In practice, the through holes of the series of through holes are obtained at corresponding portions jutting out from the second face, such as to define a second axis of the insert on which it can rotate.

[0046] Preferably, the combining means of the insert comprise the hole, preferably a through hole, obtained on the first face and the series of through holes obtained at the second face and which define, respectively, the first axis of the insert and the second axis of the insert.

[0047] Preferably, the first resilient means described above comprise a first resilient element extended substantially parallel to the second axis. The first resilient element preferably has a first arched side and a second arched side symmetric to each other, i.e. symmetric with respect to a plane containing the second axis.

[0048] Preferably, the first resilient means comprise a second resilient element equal to and arranged symmetrically to the first resilient element with respect to a plane containing the first axis and perpendicular to the second axis. The first resilient element and, whenever present, also the second resilient element is/are susceptible to compression at the first arched side or second arched side, depending on the stress imparted, in a direction parallel to or coincident with the first face, or to a plane containing the first face and perpendicular, or almost perpendicular, to the plane of symmetry containing the second axis.

[0049] In practice, the compression of the second side corresponds to the rotation of the insert in a direction, for example counterclockwise, on the first axis, whereas the compression of the first side corresponds to the rotation of the insert in another direction, for example the clockwise direction, on the first axis.

[0050] Preferably, the second resilient means comprise two resilient elements extended cantileverly from the second face, from opposite parts with respect to the second axis. In substance, the second resilient means comprise a first resilient element provided on a first half of the insert and a second resilient element provided on a second half of the insert, with respect to the second axis. Preferably, the second resilient means comprise two couples of resilient elements arranged symmetrically to each other with respect to a plane perpendicular to the second axis and preferably containing the first axis. These resilient elements can be compressed towards the second face or towards a plane defined by the second face, such as to allow the frame to rotate on the second axis. In particular, the compression of the first resilient element of the second resilient means causes the counterclockwise rotation of the frame of the back on the second axis, whereas the compression of the second resilient element of the second resilient means causes the clockwise rotation of the frame of the back on the second axis.

[0051] Preferably, each resilient element of the second resilient means comprises two side portions and one central portion comprised between the side portions: the central portion is more protruding from the second face with respect to the side portions. In practice, the top of the central portion is at a greater distance from the second face, or from a plane defined by the second face, with respect to that of the side portions. Preferably, the resilient elements are compressible towards the second face at the central portion.

[0052] Preferably, the insert comprises a first window and a second window which are arranged on opposite sides with respect to the at least one axis, i.e. arranged on opposite sides with respect to the first axis and/or second axis.

[0053] Preferably, the insert comprises two windows arranged on opposite sides with respect to the second axis and which are passing in the first face and the second face. Such windows are arranged to cooperate with a slider, described hereunder, which allows to control the rotations of the frame on the second axis.

[0054] The present invention further concerns a movement assembly of a seatback according to claim 10.

[0055] In particular, the assembly comprises:

- an insert with one or more of the characteristics described above;
- a blade arranged to be combined with the seat of a chair and
- a frame of a back, or a portion thereof, combined with the blade.

[0056] The insert is interposed between the blade and the frame, i.e. the blade and the frame define a housing in which the insert is positioned. In practice, the insert is interposed between a bottom wall of the blade and a bottom wall of the frame.

[0057] The frame and the blade comprise respective combining means which cooperate with the combining means of the insert that are described above.

[0058] According to the invention, the frame is rotatable with respect to the blade on at least one axis defined by the combining means of the insert in response to a respective stress exerted by a user, with a corresponding compression of the resilient means.

[0059] In practice, the frame can rotate with respect to the blade on the first axis, by reversible compression of the first resilient means, and/or can rotate with respect to the blade on the second axis, by reversible compression of the second resilient means. Preferably, the frame is provided rotatable with respect to the blade on the first axis and/or the second axis, by compression of the first resilient means and/or the second resilient means, depending on the case.

[0060] The assembly described herein allows to achieve the advantages described above with reference to the insert 1.

[0061] First of all, the assembly according to the present invention is a simple and economical means for supporting the movements of the user on the chair. In practice, the assembly described herein is economical and simple to make and ensures a certain freedom of movement to the user which is particularly advantageous in the event of prolonged permanence of the user on the chair.

[0062] Moreover, the assembly allows the frame to move on one or more axes and preferably on two axes, such as to ensure a greater degree of possible movements on the chair.

[0063] The presence of the resilient means ensures that the frame of the back doesn't move out of control with respect to the seat and allows to lend certain smoothness to the movement of the back. The resilient means are further arranged to make the frame return to the not-rotated position when the user stops exerting a corresponding force thereon, such as to contribute to making the movement of the frame as natural as possible and corresponding to the movements of the user himself/herself.

[0064] Preferably, the insert is combined with the blade and the frame such as the first face of the insert is facing the blade and the second face of the insert is facing the frame.

[0065] As stated above, the frame is preferably rotatable with respect to the blade on the first axis of the insert, by compression of the first resilient means, and/or is rotatable with respect to said blade on the second axis of the insert, by compression of the second resilient means.

[0066] Preferably, the blade comprises at least one element countering the first resilient means, which is provided

on the bottom wall of the blade. Preferably, the blade comprises two countering elements for each resilient element of the first resilient means, in particular a countering element for each arched side of the resilient elements.

[0067] In practice, the rotation of the frame on the first axis with respect to the blade corresponds to the compression of the first resilient means on the at least one countering element.

[0068] Preferably, the combining means of the blade cooperating with the combining means of the insert comprise a pivot jutting out from the bottom wall of the blade that engages the hole of the insert described above. In addition to being used to combine the insert with the blade, the pivot and the hole allow the frame to rotate with the insert on the pivot of the blade, i.e. on the first axis of the insert. In fact, the frame and the insert are integral to each other in the rotations on the first axis with respect to the blade.

[0069] In fact, whenever the assembly is assembled, the axis along which the pivot extends coincides with the first axis of the insert.

[0070] Preferably, the combining elements of the blade and frame that cooperate with the combining means of the insert and which allow a rotation of the frame on the first axis, comprise a plurality of passages provided, respectively, on the blade and frame. In particular, such passages are preferably obtained in portions jutting out from the bottom wall of the blade and frame or at the perimeter of the same.

[0071] The plurality of passages of the blade and frame are aligned with the series of holes described above and provided in the insert.

[0072] The assembly further comprises a plug which engages the plurality of passages of the blade and frame and the series of holes of the insert.

[0073] The plug is thus combined with the blade, the insert and the frame.

[0074] The plug can swing with the frame and the insert with respect to the blade on the first axis, such as to allow a respective rotation of the frame in clockwise or counterclockwise direction with respect to the blade on the first axis.

[0075] To allow this, the passages provided on the blade have a width greater than the width of the plug (for example they are slots), such as the plug can swing with the frame and the insert preferably by $\pm 7^\circ$ with respect to the second axis, more preferably by $\pm 6^\circ$ with respect to the second axis.

[0076] The compression of the first resilient means of the insert occurs on corresponding countering elements provided on the blade in a direction opposite the swinging direction of the frame, in response to this rotation.

[0077] Similarly to that which is described above, the combining elements of the blade and frame that cooperate with the combining means of the insert and which allow a rotation of the frame on the second axis, preferably comprise a plurality of passages provided on the

blade and frame, which plurality is aligned to the series of holes provided in the insert. Also in this case, the plug that engages the plurality of passages of the blade and frame and the plurality of holes of the insert extends along the second axis such as the frame is rotatable on the second axis with respect to the insert and the blade by at least $\pm 5^\circ$, more preferably by $\pm 4^\circ$. The rotation of the frame on the second axis occurs by compression of the second resilient means in the rotation direction of the frame on the second axis.

[0078] Preferably, the assembly comprises a slider combined with the blade and susceptible to transverse movements with respect to the second axis, i.e. susceptible to displacements in a direction perpendicular to the second axis.

[0079] The slider is provided with at least one element jutting out towards the frame, i.e. in the direction opposite the bottom wall of the blade. The at least one jutting element is provided on the slider such as it is next to at least one window obtained in the insert, such as the at least one jutting element emerges from the respective window. In fact, the insert is combined with the blade by positioning itself above the slider.

[0080] In turn, the frame comprises at least one abutment element jutting out towards the blade at the window of the insert mentioned above. The abutment element and the at least one jutting element are provided, respectively on the frame and on the slider, such as to extend on the same plane perpendicular to the second axis.

[0081] The slider is mutually movable between:

- an unlocking position in which the at least one jutting element of the slider is staggered, and not aligned, with the at least one abutment element of the frame on a straight line parallel to the first axis. Whenever the slider is in this position, the frame can be rotated on the second axis, with respect to the blade, in response to a stress exerted by a user because the at least one abutment element does not go into abutment on the jutting element whenever the frame is pushed by the user towards the blade;
- a locking position in which the at least one jutting element of the slider is aligned with the at least one abutment element of the frame along an axis parallel to the first axis. Whenever the slider is in this position, the frame is prevented from rotating on the second axis with respect to the blade because the at least one abutment element is in abutment or can go into abutment on the at least one jutting element of the slider in response to a stress imparted by a user. In this circumstance, the rotation of the frame on the second axis does not occur because the frame does not compress the second resilient means: in fact, it stays separated therefrom or cannot compress them, due to the bulk given by the at least one abutment element.

[0082] Preferably, the blade comprises at least one

half-cylinder element in abutment on a side of the slider. A first recess and a second recess of a shape complementary to the half-cylinder element are obtained at the respective side.

[0083] In practice, whenever the slider is in the unlocking position, the at least one half-cylinder element is coupled to the first recess and whenever the slider is in the locking position, the at least one half-cylinder element is coupled to the second recess.

[0084] This ensures that the switch from the locking position to the unlocking position, and vice-versa, occurs only if controlled by a user.

[0085] The present invention further concerns a chair according to claim 19, comprising an insert with the characteristics described above or a movement assembly with the characteristics described above.

[0086] The chair thus made allows to obtain a so-named dynamic seat in a simple and economical way.

20 Brief list of the figures

[0087] Further characteristics and advantages of the invention will become clearer in the review of the following detailed description of a preferred, although not exclusive, embodiment illustrated by way of example and without limitations with the aid of the accompanying drawings, in which:

- figure 1 is an exploded view of a preferred embodiment of a movement assembly of a seatback, comprising an insert, a blade, a frame of a seatback, a slider and a fastening plug, according to the present invention;
- figure 2 is a rear elevation view of the insert shown in figure 1 and in which first resilient elements are visible in the front;
- figure 3 is a front elevation view of the insert shown in figure 1 and in which second resilient elements are visible in the front;
- figure 4 is a rear isometric view of the insert shown in figure 1;
- figure 5 is a front isometric view of the insert shown in figure 1;
- figure 6 is a side view of the insert shown in figure 1 with respect to the right side of the insert as shown in figure 2;
- figure 7 is a top view of the insert shown in figure 1;
- figure 8 is a top sectional view, considered according to the sectional plane A-A, shown in figure 3 of the insert shown in figure 1;
- figure 9 is a right-side sectional view of the insert shown in figure 3, considered with respect to the sectional plane B-B shown in figure 3;
- figure 10 is a side view of the blade shown in figure 1;
- figure 11 is a front elevation view of the blade shown in figure 1;
- figure 12 is a front elevation view of the blade, insert and slider shown in figure 1, combined with each

- other by means of the plug, in a not-rotated configuration;
- figure 13 is a front elevation view of the blade, insert and slider shown in figure 1, combined with each other by means of the plug, in a configuration rotated on a first axis X;
 - figure 14 is a front elevation view of the blade and insert shown in figure 1, coupled to each other, in a not-rotated configuration;
 - figure 15 is a top view of the blade and insert shown in figure 12;
 - figure 16 is a top view of the insert shown in figure 1 with the second resilient means in a first compressed configuration;
 - figure 17 is a top view of the insert shown in figure 1 with the second resilient means in a second compressed configuration;
 - figure 18 is a front view of the blade and slider shown in figure 1, combined with each other;
 - figure 19 is an isometric view of the slider shown in figure 1;
 - figure 20 is an isometric elevation view of the insert, slider and plug shown in figure 1, combined with each other with slider in an unlocking position;
 - figure 21 is an isometric elevation view of the insert, slider and plug shown in figure 1, combined with each other with slider in a locking position;
 - figure 22 is a top sectional view of the insert, blade and slider, coupled to each other with the slider in unlocking position;
 - figure 23 is a top sectional view of the insert, blade and slider, combined with each other with the slider in locking position;
 - figure 24 is a front elevation view of the frame of the back shown in figure 1;
 - figure 25 is an isometric elevation view of a particular of the frame of the back shown in figure 1, in particular of the frame portion adapted to be combined with the aforesaid insert and the aforesaid blade;
 - figure 26 is a rear elevation view of the frame shown in figure 1, in which the first X and second Y axes with respect to which it can rotate are shown;
 - figure 27 is a top view of the assembly shown in figure 1 rotated clockwise on the axis Y of figure 26;
 - figure 28 is a top view of the assembly shown in figure 1 rotated counterclockwise on the axis Y of figure 26;
 - figure 29 is a rear elevation view of the assembly shown in figure 1 rotated counterclockwise on the axis X of figure 26;
 - figure 30 is a rear elevation view of the assembly shown in figure 1 rotated clockwise on the axis X of figure 26.

Detailed description of the invention

[0088] Figure 1 shows a movement assembly of a seat-back generally denoted by the number of reference **100**.

[0089] The movement assembly **100** comprises an insert **1**, a blade **50** arranged for being combined with a seat of a chair, not shown, a frame **70** of the seatback and a slider **90** for locking and unlocking the seatback.

[0090] The movement assembly **100** will be discussed more in detail below; the insert **1**, also with reference to figures 2-9, is instead described hereunder.

[0091] As shown in these figures, the insert **1** is plate-shaped, i.e. has a plate-shaped body **2**, with a first face **3** visible in figures 2 and 4, and with a second face **4** visible in figures 3 and 5.

[0092] The first face **3** and the second face **4** are opposite each other, as shown in figure 6.

[0093] As shown in figures 2 and 3, the perimeter of the insert **1** preferably comprises two rounded sides **5a**, **5b** opposite each other and two rectilinear sides **5c**, **5d** opposite each other.

[0094] A first end **6a** and a second end **6b** of the insert **1** can respectively be identified at the sides **5a**, **5b**.

[0095] The insert **1** comprises combining means generally denoted by the reference **7**, for example in figures 4 and 5, and configured to combine the insert **1** with the blade **50** and the frame **70** of the back.

[0096] In the embodiment shown in the example of the accompanying figures, the combining means **7** comprise a hole **8** made at the first face **3**, as shown in figures 2 and 4, a series of holes, preferably through holes, generally denoted by the number of reference **9** in figure 5 and obtained at the second face **4**.

[0097] As shown in the example of the figures, the hole **8** is a through hole passing in the insert **1** through the first face **3** and the second face **4**, the possibility of providing a blind hole instead of the through hole **8** not however being excluded.

[0098] In practice, the hole **8** is obtained orthogonally to the first face **3** and the second face **4**.

[0099] The series **9** of holes is instead obtained parallel to the second face **4**, i.e. extends in a rectilinear way parallel thereto.

[0100] Essentially, the combining means **7** define two distinct axes of the insert **1**, i.e. they develop or extend along two axes orthogonal to each other.

[0101] In fact, the hole **8** defines a first axis X which is perpendicular to the first face **3** and the second face **4**, as shown in figures 2, 3, 6, whereas the series **9** of holes defines, or extends along, a second axis Y which lies on a plane parallel to the second face **4** and which is perpendicular to the first axis X, i.e. not orthogonal or incident with respect to the plane of the second face **4**.

[0102] The insert **1** is rotatable with respect to these two axes, i.e. is rotatable on the first axis X and/or rotatable on the second axis Y.

[0103] The fact of arranging the insert **1** rotatable on these axes allows, whenever the insert is part of the aforesaid movement assembly **100**, to be able to rotate the frame **70** of the back with respect to the blade **50**, such as to support the movements of a user seated on the chair.

[0104] This aspect will become clearer hereunder.

[0105] When analyzing the description of the combining means 7 more in detail, it is possible to see that a ring 10 shown in figures 3-6 is present at the hole 8, which ring extends along the direction of the axis X and juts out from the second face 4. In practice, the ring 10 delimits the hole 8 at the second face 4 and develops in a circular way, having the first axis X as its center.

[0106] As better visible in figures 5 and 6, jutting portions 11a, 11b are obtained on the second face 4, respectively at the ends 6a, 6b.

[0107] Through holes 9a-9d, extending parallel to the second face 4, are obtained in each of these jutting portions 11a, 11b and in the ring 10. In particular, a first through hole 9a in the first jutting portion 11a, a second through hole 9b in the portion of the ring 10 proximal to the first jutting portion 11a, a third through hole 9c in the portion of the ring 10 proximal to the second jutting portion 11b and a fourth through hole 9d in the second jutting portion 11b are obtained.

[0108] The through holes 9a-9d are shown in figures 4 and 5.

[0109] The through holes 9a-9d are aligned with each other, i.e. are arranged on a same straight line, such as to define the second axis Y.

[0110] The hole 8 and the through holes 9a-9d are further shown in figures 8 and 9, which are respectively a sectional view of the insert 1 considered with respect to the sectional plane A-A shown in figure 3 and a sectional view of the insert 1 considered with respect to the sectional plane B-B shown in figure 3.

[0111] The sectional plane A-A is a plane containing the first axis X and is orthogonal to the second axis Y, whereas the sectional plane B-B is a plane containing the first axis X and the second axis Y and is perpendicular to the sectional plane A-A.

[0112] The insert 1 further preferably has a series of windows 12, i.e. of through openings, obtained in the body 2 and thus open on the first face 3 and on the second face 4.

[0113] As shown in figures 2-5, the insert 1 is provided with a first window 12a and a second window 12b obtained on opposite sides with respect to the hole 8 along the sectional plane A-A shown in figure 3, i.e. a first window 12a obtained between the side 5c and the hole 8 and a second window 12b obtained between the hole 8 and the side 5d; in practice, the first window 12a and the second window 12b are obtained along the sectional plane A-A, on opposite sides with respect to the second axis Y.

[0114] These windows 12a, 12b are further shown in the sectional view of figure 8.

[0115] The function of these windows is to allow, or not, the control of the rotation of the insert 1 on the second axis Y combined with the slider 90, as described hereunder.

[0116] The insert 1 preferably further comprises a third window 12c and a fourth window 12d, shown in figures

2-5, which are obtained on opposite sides with respect to the hole 8 along an axis parallel to the second axis Y. In practice, the third window 12c is obtained between the first end 6a and the hole 8, and the fourth window 12d is obtained between the hole 8 and the second end 6b.

[0117] The function of these windows will be described more in detail hereunder.

[0118] The insert 1 preferably further comprises four further windows, identified as windows 12e, 12f, 12g, 12h, visible in figures 2-5.

[0119] Such windows are obtained in the portion of the insert 1 delimited by the windows 12a-12d described above and by the sides 5a-5d of the insert 1. In practice, the windows 12e-12h are obtained in couples on opposite sides with respect to each window 12a, 12b, or on opposite sides with respect to each window 12c-12d.

[0120] Resilient means jutting out from the first face 3 or from the second face 4 are preferably present at the windows 12c-12h.

[0121] In fact, the insert 1 is provided with resilient means, i.e. with elastic means which are arranged to be reversibly compressed, and preferably comprises first resilient means 13 and second resilient means 14, visible in figures 2-9.

[0122] The first resilient means 13 are preferably jutting out from the first face 3, i.e. are not flush with respect to it but protrude from the plane of the first face 3. This is clear in figures 4, 6 and 7.

[0123] Instead, as shown in figures 2-9, the second resilient means 14 are jutting out from the second face 4, on the opposite side with respect to the first face 3.

[0124] As can be seen in figures 2 and 4, the first resilient means 13 extend bridge-like at the space delimited by the third window 12c and the fourth window 12d, i.e. when looking at the insert 1 in elevation view as shown in figures 2 and 3, the first resilient means 13 partially close the windows 12c and 12d.

[0125] The first resilient means 13 preferably comprise two resilient elements 13a, 13b: a resilient element 13a arranged at the third window 12c and a resilient element 13b arranged at the fourth window 12d.

[0126] Each resilient element 13a, 13b extends substantially parallel to the second axis Y, i.e. except for portions of the resilient elements not parallel to the second axis Y, the resilient elements 13a and 13b develop lengthwise along a direction parallel to the second axis Y.

[0127] As emerges from figure 3, the resilient elements 13a and 13b are arranged symmetrically to each other with respect to the sectional plane A-A.

[0128] Such resilient elements are susceptible to compression in a direction parallel to the first face 3, preferably in a transverse direction, i.e. incident (for example orthogonal) with respect to the sectional plane B-B or to an axis parallel to the second axis Y.

[0129] With reference to figure 4, it is possible to see that each resilient element 13a, 13b extends from a first end 15a or 15b, which develops cantileverly at the first end 6a or at the second end 6b of the insert 1, to a second

end **16a** or **16b**, which extends cantileverly at the hole **8**, on the opposite side of the body **2** with respect to the second through hole **9b** or the third through hole **9c**.

[0130] Each resilient element **13a**, **13b** has two sides **17a**, **17b** arranged symmetrically with respect to an axis parallel to the second axis Y

[0131] Preferably, the sides **17a**, **17b** delimit a hollow space, continuously with the hollow space delimited by the corresponding third window **12c** and fourth window **12d**.

[0132] Each side **17a**, **17b** is arched, i.e. has an arched portion **18** away from the symmetry axis of the corresponding resilient element **13a**, **13b**.

[0133] Each resilient element **13a**, **13b** can be reversibly compressed and, consequently, extends following the compression, transversally to the sectional plane B-B or to an axis parallel to the second axis Y, in the sense that the respective sides **17a**, **17b** can reversibly move closer to each other in response to a stress exerted thereon or on the insert itself.

[0134] Preferably, the arched portion **18** of each side **17a**, **17b** is susceptible to compression.

[0135] The compression of the resilient elements **13a**, **13b** is favored by the fact that, at the arched portions **18**, they are constrained to the body **2** but extend bridge-like at the third window **12c** and the fourth window **12d**.

[0136] Remembering that the insert **1** is rotatable on the first axis X, it is clear that each resilient element **13a**, **13b** is compressible in a direction parallel to the first face or is compressible on a plane parallel to a plane containing the first face. In practice, each resilient element **13a**, **13b** is compressible in a direction opposite the rotation direction of the insert **1** on the first axis X. As will become clearer hereunder with reference to the description of the assembly **100**.

[0137] As mentioned above and shown in figures 2-9, the insert **1** further comprises second resilient means **14** jutting out from the second face **4**, on the opposite side with respect to the first face **3**.

[0138] This can be particularly noted in figures 5-9.

[0139] Preferably, the second resilient means **14** comprise four resilient elements **14a**, **14b**, **14c**, **14d** which extend in couples in a direction transverse to the second axis Y.

[0140] In particular, the second resilient means **14** comprise a couple of resilient elements **14a** and **14b** that extend on opposite sides with respect to the second axis Y and to the resilient element **13a** of the first resilient means **13**, and a couple of resilient elements **14c**, **14d** that extend on opposite sides with respect to the second axis Y and to the resilient element **13b**, symmetrically to the resilient elements **14a**, **14b** with respect to the sectional plane A-A.

[0141] In particular, a resilient element **14a-14d** is present at each window **12e-12h**, in other words, each resilient element **14a-14d** extends cantileverly, bridge-like, from the second face **4** above the space delimited by each corresponding fifth window **12e-12h**, somewhat

partially closing said windows.

[0142] As can be noted by examining the figures 5, 7 and 8, each resilient element **14a-14d** comprises two side portions **19** extending cantileverly directly from the second face **4** and a central portion **20** comprised between the side portions **19** and which is cantilevered and suspended above the respective fifth window **12e-12h**.

[0143] As visible in these figures, the central portion **20** is more protruding from the second face **4** with respect to the side portions **19**. In other words, the top of the central portion **20** is at a greater distance from the plane of the second face **4** with respect to the top of the side portions **19**.

[0144] The resilient elements **14a-14d** are compressible towards the second face **4** in an incident, for example orthogonal, direction with respect to it, preferably at the central portion **20**.

[0145] Remembering that the insert **1** is rotatable on the second axis Y, the second resilient means **14** can be compressed in the same rotation direction of the insert **1** on the second axis Y, as will become clearer hereunder.

[0146] In practice, the first resilient means **13** and the second resilient means **14** can be reversibly compressed in response to a certain force applied thereon or on the insert **1**.

[0147] Preferably, the first resilient means **13** and the second resilient means **14** are made integral with the body **2**. In fact, the insert **1** is preferably made in one piece, the possibility of making the present insert in more pieces assembled to each other not however being excluded.

[0148] Preferably, the insert **1** is made in an acetal resin POM (Polyoxymethylene), by injection molding.

[0149] This material has particular mechanical characteristics which ensure that the deformation of its parts is always elastic: this ensures that the compression of the first resilient means **13** and the second resilient means **14** is reversible. As an alternative, the first resilient means **13** and/or the second resilient means **14** can be made in acetal resin POM separately from the body **2** and removably fixed to the body **2** after it has been made.

[0150] In this second case, the first resilient means **13** and the second resilient means **14** can be removably combined with the body **2** of the insert **1**, for example they can be fixed to the body **2** and, whenever necessary, separated therefrom to be able to be replaced in the event of breakage or when desiring to associate the first resilient means **13** and the second resilient means **14** with a particular elastic constant.

[0151] The insert **1** described above allows to solve the drawbacks of the solutions of the known art because, unlike traditional solutions, the insert **1** is a simple, economical and effective solution that allows, once inserted into the movement assembly **100** of the seatback, to support the movements of the user on the chair, i.e. it allows the back to move with respect to the seat, substantially such as to follow the movements carried out by the user.

[0152] Moreover, the insert **1** allows the frame to move

on two axes, i.e. on the first axis X and on the second axis Y. This way, the degrees of freedom of the movement of the back with respect to the seat increase, thus decreasing the sensation of discomfort and constriction a user can suffer when seated for a long time, on the other hand increasing the well-being for the user of the chair.

[0153] Finally, the presence of resilient means, and in particular of first resilient means **13** and second resilient means **14**, allows the insert **1** to limit the movements of the frame **70** of the back with respect to the seat within a certain rotation range, determined by the impossibility of the resilient means to be compressed beyond a certain degree. Although allowing a certain degree of movement, this characteristic confers a sensation of safety to the seated user, who doesn't feel that the back is moving in a not controlled way in response to his/her movements.

[0154] The advantages of the insert can be better understood by considering it within the movement assembly **100** mentioned above and which will be described in more detail hereunder.

[0155] With reference to the figures 10 and 11, the aforesaid blade **50**, which is intended to be combined with the seat of a chair, not shown, and with the aforesaid frame **70** of a back, shown in figure 24, is described in detail.

[0156] The blade **50** has an L-shaped profile, as visible in figure 10, with a first portion **51** and a second portion **52** which extend one orthogonal, or almost, to the other. The first portion **51** is intended to be combined with the seat of a chair, whereas the second portion **52** is intended to be combined with the insert **1** and the frame **70**.

[0157] More specifically, as shown in figure 11, at the second portion **52**, the blade **50** has a housing **53** delimited in the back by a bottom wall **54** and, on the perimeter, by sides **55**; in the front, the housing **53** is open and is intended to be closed by the frame **70**.

[0158] As shown in figures 12-14, the insert **1** is intended to be inserted into the housing **53** at the combining means **56** provided on the blade **50** and arranged to be coupled to the combining means **7** of the insert **1**.

[0159] Such combining means **56**, shown in figure 11, preferably comprise a pivot **57** jutting out from the bottom wall **54** and extending along an axis X', substantially perpendicular to the plane of the bottom wall **54**.

[0160] Preferably, the pivot **57** is cylinder-shaped and has a diameter preferably equal to, or slightly less than, the hole **8** of the insert **1**. In fact, the pivot **57** is arranged to be inserted into the hole **8** of the insert **1**, such as to allow to combine the insert **1** with the blade **50**, as shown in figures 12-14.

[0161] Returning to figure 11, it is possible to see that, at the top, the pivot **57** has at least one recess **58a** or **58b** whose surface is rounded. In particular, in the embodiment depicted in the examples of the figures, the pivot **57** consists of an axially hollow body jutting out from the bottom wall **54** along the axis X'; it further comprises two recesses **58a** and **58b** obtained along the thickness

59 of the pivot **57** on opposite sides, such as, whenever the insert **1** is combined with the blade **50**, the second through hole **9b** and the third through hole **9c** are aligned with the recesses **58a** and **58b** of the pivot **57**, as shown in figure 12.

[0162] The recesses **58a**, **58b** obtained in the pivot **57** define an axis Y' that is perpendicular to the axis X'.

[0163] Whenever the pivot **57** is not hollow, the recess consists of a channel obtained on top of the pivot **57** and which runs through it from side to side.

[0164] The combining elements **56** of the blade **50** preferably further comprise two elements **60a** and **60b** jutting out from the bottom wall **54** of the blade **50** and positioned one symmetrically to the other with respect to the pivot **57**, such as to be transverse with respect to the axis Y' perpendicular to the axis X'.

[0165] Preferably, the elements **60a**, **60b** extend on an arc of a circle centered on the axis X', such as the its central portion lies on the axis Y'.

[0166] The elements **60a**, **60b** are positioned from each other at distance equal to or greater than the length of the insert **1** considered with respect to the axis Y, such as, as shown in figure 12, the insert **1** is inserted into the blade **50** between the two elements **60a**, **60b**.

[0167] Each element **60a**, **60b** has a respective slot-shaped through opening **61a** and **61b**, both visible in figure 12, which also extends along an arc of a circle centered on the axis X', such as the central portion of the through openings **61a**, **61b** lies on the axis Y' and is aligned with the recesses **58a**, **58b** of the pivot **57**.

[0168] In practice, as shown in figure 12, whenever the insert **1** is combined with the blade **50**, the first jutting portion **11a** and the second jutting portion **11b** place themselves, respectively, at the element **60a** and at the element **60b**, such as the first through hole **9a** faces the through opening **61a** and the fourth through hole **9d** faces the through opening **61b**.

[0169] Essentially, the insert **1** is combined with the blade **50** with the first face **3** facing the bottom wall **54** of the blade **50** and with the face **4** facing the opposite side, such as the first axis X and the second axis Y of the insert **1** are coincident with, respectively, the axis X' and the axis Y' of the blade **50**.

[0170] This way, the through opening **61a**, the first through hole **9a**, the second through hole **9b**, the recess **58a**, the recess **58b**, the third through hole **9c**, the fourth through hole **9d** and the through opening **61b** are aligned on the second axis Y and on the axis Y' whenever the insert **1** is not subjected to rotation.

[0171] When returning to figure 11, it is possible to see that further elements which emerge cantileverly from the bottom wall **54** are provided on the bottom wall **54** itself.

[0172] In particular, four countering elements, denoted by the numbers of reference **62a**, **62b**, **62c**, **62d** and arranged in couples, can be identified. The components of each couple of countering elements **62a**, **62b** e **62c**, **62d** are arranged symmetrically to each other and symmetrically with respect to the axis Y'; in turn, the two couples

of countering elements are arranged symmetrically with respect to a plane containing the axis X' and perpendicular to the axis Y'. Each of these countering elements **62a-62d** comprises a rectilinear portion **63a** developing in a direction orthogonal to the axis Y' and a tilted portion **63b** extending for a certain length towards the pivot **57**.

[0173] Whenever the insert **1** is combined with the blade **50**, it abuts with its first face **3** on the countering elements **62a-62d** and with the first resilient means **13**, cantileverly from the first face **3**, between the space delimited by the tilted portions **63b** of the countering elements **62a-62d**. In particular, the resilient element **13a** is inserted between the countering elements **62a** and **62b**, whereas the resilient element **13b** is inserted between the countering elements **62c** and **62d**.

[0174] Moreover, the blade **50** has two half-cylinder elements **64a** and **64b** denoted by the respective number of reference in figure 18, arranged on opposite sides with respect to the pivot **57** on the axis Y', preferably at the corresponding tilted portions **63b** of the countering elements **62a-62b**, such as the convex part of these elements faces the pivot **57**.

[0175] In figure 11, it is possible to observe that the blade **50** further comprises a series of transverse sections denoted by the numbers of reference **65** and **66**.

[0176] In particular, four transverse sections **65** and four transverse sections **66** are present, which sections extend in an orthogonal direction with respect to the axis Y'; the transverse sections **65** are further away from the pivot **57** with respect to the transverse sections **66**, and both the transverse sections **65** and the transverse sections **66** are arranged in couples on opposite sides with respect to the axis Y'.

[0177] The function of these transverse sections will become clearer hereunder, the reader is now invited to turn his/her attention to figures 24 and 25, which show the frame **70** of a seatback.

[0178] The frame **70** comprises a framework **71** arranged for mounting the seatback, and a portion **72** at which the frame **70** is combined with the blade **50** and the insert **1**.

[0179] In the detail of the frame **70** depicting the portion **72** and shown in figure 25, it is possible to see that it has a bottom wall **73** which delimits, together with a perimeter edge **74**, a housing **75**.

[0180] The frame **70** comprises combining means **76** for combining the frame **70** with the blade **50** and with the insert **1** and which are intended to be coupled with the combining means **7** of the insert and with the combining means **56** of the blade.

[0181] In particular, the combining means **76** comprise a first hole **77a** and a second hole **77b** made on opposite sides of the perimeter edge **74**: the first hole **77a** is a through hole, whereas the second hole **77b** is a blind hole.

[0182] As shown in figure 25, protuberances **78a**, **78b**, which have a substantially cylindrical structure that extends on an axis parallel to the bottom wall **73**, also

emerge from the bottom wall **73**.

[0183] A channel **79a** and a channel **79b**, which cross the respective protuberance **78a**, **78b** from side to side along an axis parallel to the bottom wall **73**, are obtained respectively in the protuberances **78a** and **78b**.

[0184] In practice, the first hole **77a** and the second hole **77b** are aligned with the channels **79a** and **79b**, i.e. they define an axis Y" shown in figure 24.

[0185] Two abutment elements **80a**, **80b** are further obtained cantileverly on the bottom wall **73**, on opposite sides with respect to the axis Y".

[0186] Returning to figure 12, it is clear that the combining elements **76** of the frame **70** are arranged to be aligned with the combining means **56** of the blade and with the combining means **7** of the insert which are arranged on the second axis Y, such as, whenever the assembly **100** is assembled, the second axis Y of the insert **1** coincides with the axis Y' of the blade **50** and with the axis Y" of the frame **70**.

[0187] In practice, the portion **72** of the frame is combined with the blade **50** such as the second face **4** of the insert **1** is facing the frame **70**. This way, the first hole **77a** of the frame **70** is positioned at the through opening **61a** of the blade **50**, the protuberance **78a** of the frame **70** between the first through hole **9a** and the second through hole **9b** of the insert **1**, the protuberance **78b** of the frame **70** between the third through hole **9c** and the fourth through hole **9b** of the insert **1** and the first hole **77b** of the frame **70** at the through opening **61b** of the blade **50**.

[0188] In practice, the protuberances **78a** and **78b** are positioned at the second window **12c** and the fourth window **12d** of the insert **1**, on the side opposite the first resilient means **13**. This way, it is possible to insert a plug **81**, i.e. a shaft, shown in figure 12, through the combining means **76** and **56** and the combining means **7** mentioned above.

[0189] It must be underlined that, in figure 12, the plug **81** is shown coupled to the combining means **7** of the insert **1** that are arranged on the second axis Y and to the combining means **56** of the blade **50**: it is clear that, in the movement assembly **100** completely assembled, the plug **81** is also inserted into the combining means **76** of the frame **70**.

[0190] In light of what has been described above, the operation of the movement assembly **100** with the respective insert **1** is explained hereunder.

[0191] The comparison between figures 12 and 13 shows the insert **1**, respectively, in a not rotated position, in which the second axis Y of the insert **1** coincides with the axis Y' of the blade **50**, and in a rotated position, in which the second axis Y of the insert **1** forms an angle α with the axis Y' of the blade **50**. In particular, the insert **1** rotates on the first axis X with respect to the blade **50**, i.e. rotates on the pivot **57** at the hole **8** of the ring **10**.

[0192] In figure 13, the insert **1** and the plug **81** are rotated counterclockwise; they can also rotate clockwise such as the second axis Y forms an angle $-\alpha$ with the

axis Y'.

[0193] This rotation is allowed thanks to the fact that the through openings **61a**, **61b** are slot-shaped and that the recesses **58a**, **58b** have a width greater than the plug **81**, such as to be able to rotate the plug **81** and to simultaneously ensure that the frame **70** stays combined with the blade **50**.

[0194] This aspect can be appreciated in figure 15, which shows the blade **50** combined with the insert **1** by means of the plug **81** and in which the plug **81** is shown in the central position in the through opening **61a**.

[0195] The rotation of the insert **1** and of the frame **70** with respect to the blade **50** on the axis X is however limited within a given rotation range determined by the extent of the through openings **61a**, **61b** and, advantageously, also by the ability of the first resilient means **13** to be compressed on the countering elements **62a-62d**.

[0196] In fact, whenever the insert **1** rotates on the first axis X, the compression of the resilient elements **13a**, **13b** occurs on the countering elements **62a-62d** and, in particular, on the tilted portions **63b**.

[0197] In fact, in figure 14, it is possible to see that, whenever the insert **1** is combined with the blade **50**, the resilient elements **13a**, **13b** of the insert are interposed between the tilted portions **63b** of the countering elements **62a-62d**.

[0198] Therefore, the compression of the side **17b** of the resilient elements **13a** and **13b** on the corresponding tilted portion **63b** of the countering elements **62a** and **62d** corresponds to the counterclockwise rotation of the insert **1** on the first axis X, whereas the compression of the side **17a** of the resilient elements **13a** and **13b** on the corresponding tilted portion **63b** of the countering elements **62b** and **62c** corresponds to the clockwise rotation of the insert **1** on the first axis X.

[0199] This way, the insert **1** rotates with respect to the blade **50** within a range of preferably 12° . In practice, the angle α identified between the axis Y' and the axis Y preferably has a maximum range of 6° with respect to the axis Y', whereas the angle $-\alpha$ preferably has a maximum range of -6° with respect to the axis Y'.

[0200] Once the force that allows to rotate the insert **1** and to compress the resilient elements **13a** or **13b** has ceased, the insert **1** returns to the not-rotated position shown in figure 12, thanks to the elasticity of the resilient elements **13a**, **13b** themselves.

[0201] That which has been described above allows to understand how the rotation of the frame **70**, with respect to the blade **50**, on the first axis X is obtained from the movement assembly **100** described herein, i.e. the possibility that the seatback comprising the movement assembly **100** can support the movements carried out by the user seated on the chair itself.

[0202] In practice, the frame **70** is rotated integrally with the insert **1** on the first axis X by means of the plug **81** and, thus, the frame **70** itself is also susceptible, with the insert **1**, of rotations on the first axis X with respect to the blade **50**.

[0203] This is shown for example in figures 26, 29 and 30. In particular, the fact that the frame **70** is rotatable on the axis X with respect to the blade **50** is shown in figure 26.

[0204] Figure 29 shows the frame **70** rotated counterclockwise with respect to the blade **50** by an angle α which, in the embodiment shown herein, is an angle of 6° , whereas figure 30 shows the frame **70** rotated by an angle of $-\alpha$ degrees, which, in the embodiment shown herein, is an angle of -6° with respect to the blade **50**, i.e. with respect to the axis Y' of the blade **50**.

[0205] The inclination of the frame **70** with respect to the blade **50** and the respective axis Y' can occur in response to the movements of the user on the chair and this possibility, provided by the assembly **100** with the respective insert **1** described herein, allows to support the movements carried out by the user in this direction.

[0206] Moreover, the inclination of the frame **70** being limited within a range of 12° ensures that the user does not feel a lack of control on the movements of the chair itself.

[0207] As mentioned above, the frame **70** is rotatable with respect to the blade **50** also on the second axis Y of the insert **1**, as shown in figure 26.

[0208] Figures 27 and 28 show the rotation that the frame **70** can carry out on the second axis Y with respect, for example, to a plane parallel to, or coincident with, the first face **3** or the second face **4** of the insert **1**.

[0209] In particular, figure 27 shows that the frame **70** can rotate clockwise with respect to the blade **50** and the insert **1** by an angle β , preferably equal to 4° , whereas figure 28 shows that the frame **70** can rotate counterclockwise with respect to the blade **50** and the insert **1** by an angle $-\beta$, preferably equal to -4° .

[0210] Essentially, the frame can rotate on the second axis Y of the insert **1** or on the axis Y' of the blade **50** within a range of 8° from $+\beta$ to $-\beta$, i.e. from $+4^\circ$ to -4° .

[0211] The rotation of the frame **70** on the axis Y occurs with respect to the blade **50** and the insert **1**, which blade and insert stay stationary during the rotations of the frame **70** on the second axis Y.

[0212] This can be understood when remembering that the second face **4** of the insert **1** is facing, along with the respective resilient elements **14a-14d**, the frame **70**.

[0213] In practice, whenever the user changes position on the back and exerts a force in a direction substantially orthogonal to the back itself, he/she pushes the frame **70** in abutment on the resilient elements **14a-14d** of the insert, thus causing its compression.

[0214] Figures 16 and 17 show just a couple of resilient elements **14a**, **14b** arranged on opposite sides with respect to the second axis Y.

[0215] The bottom wall **73** and the resilient elements **14a** and **14b** are schematically shown with a line **82**, in figure 16. The position of the line **82** shown in figure 16 corresponds to the frame rotated **70** clockwise, as shown in figure 27, by an angle β .

[0216] In this case, the resilient element **14b**, and in

particular its central portion **20**, is compressed towards the second face **4** of the insert **1**. In figure 16, the difference between the height reached by the central portion **20** extended and the height of the central portion **20** whenever the resilient element **14b** is compressed is denoted by D.

[0217] Instead, in figure 17, the insert **1** is shown when the frame **70** is rotated counterclockwise, as shown in figure 28. In this case, the resilient element **14a** is the one to be compressed of a distance D, such as to allow the frame **70** to rotate by an angle of $-\beta$.

[0218] Obviously, that which has been shown for the resilient elements **14a** and **14b** can also be extended correspondingly to the resilient elements **14c** and **14d**.

[0219] As far as the second resilient means **14** are concerned, the rotation range on the second axis Y is determined by the height of the resilient elements **14a-14d** with respect to the plane of the second face **4** and to their elastic constant. Obviously, also in this case, whenever the stress that determines the rotation of the frame **70** on the axis Y ceases, the resilient elements **14a-14d** extend to bring the frame **70** to the not-rotated position.

[0220] The presence of second resilient means **14** ensures that the rotations of the frame **70** on the second axis Y are also limited within a range of predetermined values, such as the movements of the frame **70** are not perceived as being out of control by the user.

[0221] In order to give the user the possibility to decide whether or not to allow the frame **70** to rotate on the axis Y, the movement assembly **100** preferably comprises the aforesaid slider **90** combined with the blade **50** and shown in detail in figure 19.

[0222] The slider **90** has a body **91** with a first face **91a** and a second face **91b**: the first face **91a**, not visible in figure 19, is intended to go into abutment on the bottom wall **54** of the blade, whereas the second face **91b** is intended to keep facing the bottom wall **73** of the frame **70** and to act as a support for the insert **1**.

[0223] The body **91** further has jutting portions **93a** and **93b** at an upper side **91c** and at a lower side **91d**: a jutting portion **93a** on the upper side **91c** and a jutting portion **93b** on the lower side **91d**. Each of the jutting portions **93a** and **93b** have rounded recesses **95a**, **95b** and, respectively, rounded recesses **95c**, **95d**. The recesses **95a-95d** are intended to be coupled to the half-cylinder elements **64a**, **64b**, as described hereunder.

[0224] The slider **90** is provided with two side wings **92a**, **92b** which are inserted into windows **67a**, **67b** provided in the sides **55** of the blade **50**, as shown in figure 18.

[0225] The body **91** of the slider **90** further has a window **96** in a central position.

[0226] Whenever combined with the blade **50**, the slider **90** is inserted with the window **96** on the pivot **57**, such as the pivot **57** can emerge therefrom, as depicted in figure 18.

[0227] The slider **90** is susceptible to movements transverse, i.e. orthogonal or almost orthogonal, to the

axis Y' of the blade **50**. For this reason, the window **96** has a width such as to allow the slider **90** to move relatively to the pivot **57**, which remains stationary on the blade **50**.

[0228] In these movements, the slider **90** is guided by transverse sections **66** provided on the blade **50** and is limited within the limits determined by the transverse sections **65** of the blade **50**.

[0229] The slider **90** is provided with at least one jutting element **94a** or **94b** and preferably with two jutting elements **94a** and **94b** jutting out from the second face **91b**.

[0230] The jutting elements **94a**, **94b** are arranged on the slider **90** such as to cooperate with the abutment elements **80** provided on the frame **70**.

[0231] For this reason, the jutting elements **94a**, **94b** and the abutment elements **80** are obtained on the slider **90** and the frame **70**, such as to be, when combined with the assembly **100**, aligned on the same straight line orthogonal to the second axis Y'.

[0232] Moreover, as shown in figures 20 and 21, whenever the insert **1** is mounted on the blade **50** with the slider **90** combined, the jutting elements **94a**, **94b** cross respectively the window **12b** and the window **12a** of the insert **1**: in practice, the jutting elements **94a**, **94b** protrude, or emerge, from the respective window **12a**, **12b**.

[0233] From the comparison between figures 20 and 21, it is possible to observe that the slider **90** can move in a direction transverse to the second axis Y, so that the jutting elements **94a** and **94b** can be positioned at a first side, for example of the right side, of the windows **12a** and **12b** as shown in figure 20, or at a second side opposite the first, for example the one on the left as shown in figure 21.

[0234] The operation of the slider **90** is described hereunder with reference to figures 22 and 23, which show the assembly **100** along a sectional plane passing through the jutting elements **94a**, **94b**.

[0235] In practice, the slider **90** is movable transversely to the axis Y, Y' between:

- a first position, defined as unlocking, shown in figures 22 and 20, in which the jutting elements **94a**, **94b** of the slider **90** are staggered and not aligned with the respective abutment elements **80** of the frame **70**, and
- a second position, defined as locking, shown in figures 23 and 21, in which the jutting elements **94a**, **94b** of the slider **90** are aligned with the abutment elements **80** of the frame **70**.

[0236] In practice, in the first position, the frame **70** can rotate with respect to the insert **1** and the blade **50**, because the frame **70** can compress the second resilient means **14**, the abutment elements **80** being staggered with respect to the jutting elements **94a**, **94b** and not able to go into abutment thereon whenever the user imparts a rotation to the frame **70** on the second axis Y

[0237] Instead, in the second position, the frame **70**

cannot compress the second resilient means **14** and rotate on the second axis Y, because the abutment elements **80** are in abutment on the jutting elements **94a**, **94b** or go into abutment thereon whenever the frame **70** is pushed to rotate on the second axis Y

[0238] The fact that the slider **90** is displaced from the first position to the second position, and vice-versa, only following a force imparted by a user and not by an accidental displacement, is ensured by the fact that, in the unlocking position, the slider **90** is coupled to the half-cylindrical elements **64a**, **64b** of the blade **50** at the recesses **95a** and **95c**, whereas whenever it is in the locking position, the slider **90** is coupled to the half-cylindrical elements **64a**, **64b** at the recesses **95b**, **95d**. Therefore, in order to switch from the first position to the second position and vice-versa, a force must be exerted on the wings **92a**, **92b** of the slider **90** such as to allow the slider to be displaced transversely by overcoming the resistance to displacement exerted by the half-cylindrical elements **64a**, **64b** on the walls of the recesses **95a-95d**.

[0239] Those described above are the preferred embodiments of the insert **1** and of the assembly **100**, it is clear that it is possible to make an insert **1** and an assembly **100** according to the present invention by further providing alternative embodiments.

[0240] For example, it is possible to provide combining means of the magnetic type for combining the insert with the blade and the frame and which allow both the mutual assembly of the components and the relative rotation between them on the first axis X and on the second axis Y.

[0241] As an alternative, it is possible to provide interlocked combining means between the insert, the blade and the frame and which allow to pivot thereon, for example on the second axis Y.

[0242] Generally, it is possible to make the insert **1** and the assembly **100** such as to allow the rotation of the frame **70** on a single axis, i.e. only on the first axis X or only on the second axis Y.

[0243] For example, it is possible to make an insert **1** able to rotate only on the first axis X but not on the second axis Y, because devoid of second resilient elements or because provided with elements similar to the second resilient means but unable to be compressed.

[0244] Or else, it is possible to make an insert **1** able to rotate on the second axis Y but not on the first axis X, because devoid of first resilient means and/or because devoid of slots or recesses on the pivot of a width greater than that of the plug.

[0245] In order to meet contingent and specific needs, a technician of the field can make numerous changes and modifications to the present invention in the embodiments shown and described, all however included in the scope of protection of the invention as defined in the following claims.

Claims

1. An insert (1) of a movement assembly (100) of a seatback, wherein said insert is plate-shaped and comprises:
 - a first face (3) and a second face (4) opposite the first face (3);
 - combining means (7) configured to combine the insert (1) with a blade (50) and a frame (70) of the seatback, said combining means (7) defining at least one axis (X, Y) of the insert (1) on which the insert (1) is rotatable in response to a stress imparted thereon;
 - resilient means (13, 14) provided at the first face (3) and/or at the second face (4), which are susceptible to reversible compression in a direction parallel to or coincident with the first face (3) and/or in a direction incident to the second face (4).
2. Insert (1) according to claim 1, comprising first resilient means (13) jutting out from said first face (3), said first means (13) being susceptible to compression in a direction parallel to the first face (3) in response to a stress exerted thereon or on the insert (1), and/or comprising second resilient means (14) jutting out from said second face (4), said second means (14) being susceptible to compression in a direction incident to said second face (4) in response to a stress exerted thereon or on the insert (1).
3. Insert (1) according to claim 1 or 2, wherein the combining means (7) allow a rotation of the insert (1) with respect to a first axis (X) perpendicular to the first face (3) and/or a rotation with respect to a second axis (Y) parallel to the second face (4) and preferably perpendicular to said first axis (X).
4. Insert (1) according to claim 3, wherein the combining means (7) comprise a hole (8) obtained on said first face (3) and having an axis parallel to or coincident with the first axis (X), wherein said hole (8) preferably is a through hole (8) which crosses the first face (3) and the second face (4).
5. Insert (1) according to claim 3 or 4, wherein the combining means (7) comprise a series (9) of through holes (9a, 9b, 9c, 9d), wherein the through holes (9a, 9b, 9c, 9d) are aligned with each other and are arranged along an axis parallel to or coincident with the second axis (Y) and are obtained on respective jutting portions (10, 11a, 11b) provided on the second face (4).
6. Insert (1) according to any one of claims 3-5, wherein the first resilient means (13) comprise a first resilient element (13a) extending substantially parallel to the

second axis (Y) and having a first arched side (17a) and a second arched side (17b) symmetric to each other, wherein the resilient means (13) preferably comprise a second resilient element (13b) identical and arranged symmetrically to said first resilient element (13a) with respect to a plane (A-A) containing the first axis (X).

7. Insert (1) according to any one of claims 3-6, wherein the second resilient means (14) comprise two resilient elements (14a, 14b) extending on opposite sides with respect to the second axis (Y), wherein the second resilient means (14) preferably comprise two couples of resilient elements (14a, 14b, 14c, 14d) arranged symmetrically to each other with respect to a plane (A-A) perpendicular to the second axis (Y).

8. Insert (1) according to claim 7, wherein each resilient element (14a, 14b, 14c, 14d) of said second resilient means (14) comprise two side portions (19) and one central portion (20) which is comprised between said side portions (19), wherein said central portion (29) is more protruding from the second face (4) than said side portions (19).

9. Insert (1) according to any one of the preceding claims, comprising a first window (12a) and a second window (12b) arranged on opposite sides with respect to the at least one axis (X, Y) of the insert (1).

10. Movement assembly (100) of a seatback, comprising:

- a blade (50) comprising a bottom wall (54), said blade (50) being adapted to be combined with the seat of a chair;
- a frame (70) of a back, combined with said blade (50);
- an insert (1) according to any one of the preceding claims,

wherein said insert (1) is interposed between said blade (50) and said frame (70), wherein said blade (50) and said frame (70) comprise respective combining elements (56, 76) cooperating with said combining means (7) of said insert (1), and wherein the frame (70) is rotatable, by reversible compression of the resilient means (13, 14), with respect to said blade (50) on at least one axis (X, Y) of the insert (1) in response to a respective stress exerted by a user.

11. Assembly (100) according to claim 10, wherein the first face (3) of the insert (1) is facing said blade (50) and the second face (4) of the insert (1) is facing said frame (70).

12. Assembly (100) according to claim 10 or 11, wherein the insert (1) comprises first resilient means (13) jut-

ting out from said first face (3), said first resilient means (13) being susceptible to compression in a direction parallel to the first face (3) in response to a stress exerted thereon or on the insert (1), and/or it comprises second resilient means (14) jutting out from said second face (4), said second resilient means (14) being susceptible to compression in a direction incident to said second face (4) in response to a stress exerted thereon or on the insert (1), wherein the combining means (7) of the insert (1) allow a rotation of the insert (1) on a first axis (X) perpendicular to the first face (3) and/or allow a rotation on a second axis (Y) parallel to the second face (4), and preferably perpendicular to said first axis (X), wherein the frame (70) is rotatable with respect to said blade (50) on said first axis (X) of the insert (1) by compression of the first resilient means (13) and/or is rotatable with respect to said blade (50) on said second axis (Y) of the insert (1) by compression of the second resilient means (14).

13. Assembly (100) according to claim 12, wherein the blade (50) comprises at least one countering element (62a-62d) of said first resilient means (13), said at least one countering element (62a-62d) being provided on said bottom wall (54) of the blade (50), and wherein the compression of said first resilient means (13) on said at least one countering element (62a-62d) corresponds to rotation of the frame (70) on the first axis (X) with respect to the blade (50).

14. Assembly (100) according to claim 12 or 13, wherein the combining means (7) of the insert (1) comprise a hole (8) obtained on the first face (3) and having an axis parallel to or coincident with the first axis (X), wherein the combining elements (56) of the blade (50) that cooperate with the combining means (7) of the insert (1) comprise a pivot (57) jutting out from the bottom wall (54) of said blade (50) and which engages said hole (8) of the insert (1) and wherein the frame (70), with the insert (1), is rotatable on said pivot (57) of the blade (50) on the first axis (X).

15. Assembly (100) according to any one of claims 12-14, wherein the combining elements (56, 76) of the blade (50) and of the frame (70) that cooperate with the combining means (7) of the insert (1) and which allow a rotation of said frame (70) on said first axis (X) comprise a plurality of passages (58a, 58b, 61a, 61b, 77a, 77b, 79a, 79b) provided on said blade (50) and on said frame (70), said plurality of passages (58a, 58b, 61a, 61b, 77a, 77b, 79a, 79b) being aligned with a series (9) of through holes (9a, 9b, 9c, 9d) provided in said insert (1), said assembly (100) comprising a plug (81) which engages said plurality of passages (58a, 58b, 61a, 61b, 77a, 77b, 79a, 79b) of the blade (50) and of the frame (70) and said series (9) of through holes (9a, 9b, 9c, 9d) of said insert (1),

wherein the passages (58a, 58b, 61a, 61b) provide on said blade (50) have a width greater than the width of the plug (81) and wherein said plug (81) can swing with the frame (70) and the insert (1) with respect to the blade (50) on the first axis (X), preferably by $\pm 7^\circ$ with respect to the second axis (Y), more preferably by $\pm 6^\circ$ with respect to the second axis (Y), by compression of the first resilient means (13) of the insert (1) onto countering elements (62a-62d) provided on the blade (50), in a direction parallel to or coincident with the first face (3).

16. Assembly (100) according to any one of claims 12-15, wherein the combining elements (56, 76) of the blade (50) and of the frame (70) that cooperate with the combining means (7) of the insert (1) which allow a rotation of said frame (70) on said second axis (Y) comprise a plurality of passages (58a, 58b, 61a, 61b, 77a, 77b, 79a, 79b) provided on said blade (50) and on said frame (70), said plurality of passages (58a, 58b, 61a, 61b, 77a, 77b, 79a, 79b) being aligned with a series (9) of through holes (9a, 9b, 9c, 9d) provided in said insert (1), said assembly (100) comprising a plug (81) which engages said plurality of passages (58a, 58b, 61a, 61b, 77a, 77b, 79a, 79b) of the blade (50) and of the frame (70) and said series (9) of through holes (9a, 9b, 9c, 9d) of said insert (1), wherein the plug (81) extends along the second axis (Y) and the frame (70) is rotatable on said second axis (Y) with respect to the insert (1) and the blade (50), preferably by $\pm 5^\circ$, more preferably by $\pm 4^\circ$, by compression of the second resilient means (14) in a direction incident to the second face (4).
17. Assembly (100) according to any one of claims 12-16, comprising a slider (90) combined with the blade (50) and susceptible to transverse movements with respect to the second axis (Y), wherein the slider (90) is provided with at least one jutting element (94a, 94b) jutting out towards the frame (70) at a corresponding at least one window (12a, 12b) obtained in the insert (1), wherein the frame (70) comprises at least one abutment element (80a, 80b) jutting out towards the blade (50) at said at least one window (12, 12b), and wherein the slider (90) is movable between:
- an unlocking position in which the at least one jutting out element (94a, 94b) of the slider (90) is staggered, and not aligned, with the at least one abutment element (80a, 80b) of the frame (70) such as the frame (70) is rotatable on the second axis (Y) with respect to the blade (50) in response to a stress exerted by a user, and
 - a locking position in which the at least one jutting element (94a, 94b) of the slider (90) is aligned with the at least one abutment element (80a, 80b) of the frame (70) and the frame (70)

is prevented from rotating on the second axis (Y) with respect to the blade (50), the at least one abutment element (80a, 80b) being adapted to go into abutment on the at least one jutting out element (94a, 94b) of the slider (90) in response to a stress by a user, without compression of the second resilient means (14).

18. Assembly (100) according to claim 17, wherein the blade (50) comprises at least one half-cylinder element (64a, 64b) in abutment on a side (91c, 91d) of the slider (90) and wherein, at the respective side (91c, 91d), a first recess (95a, 95c) and a second recess (95b, 95d) of a shape complementary to the at least one half-cylinder element (64a, 64b) are obtained, and wherein the at least one half-cylinder element (64a, 64b) coupled to the first recess (95a, 95c) corresponds to the slider (90) in an unlocking position and wherein the at least one half-cylinder element (64a, 64b) coupled to the second recess corresponds to the slider (90) in a locking position, the slider (90) being susceptible to movements from the unlocking position to the locking position, and vice-versa, depending on the decoupling of the half-cylinder element from the first recess and on its coupling to the second recess, and vice-versa, in response to a force applied to the slider by a user.
19. Seat comprising an insert (1) according to any one of claims 1-9, or a movement assembly (100) according to any one of claims 10-18.

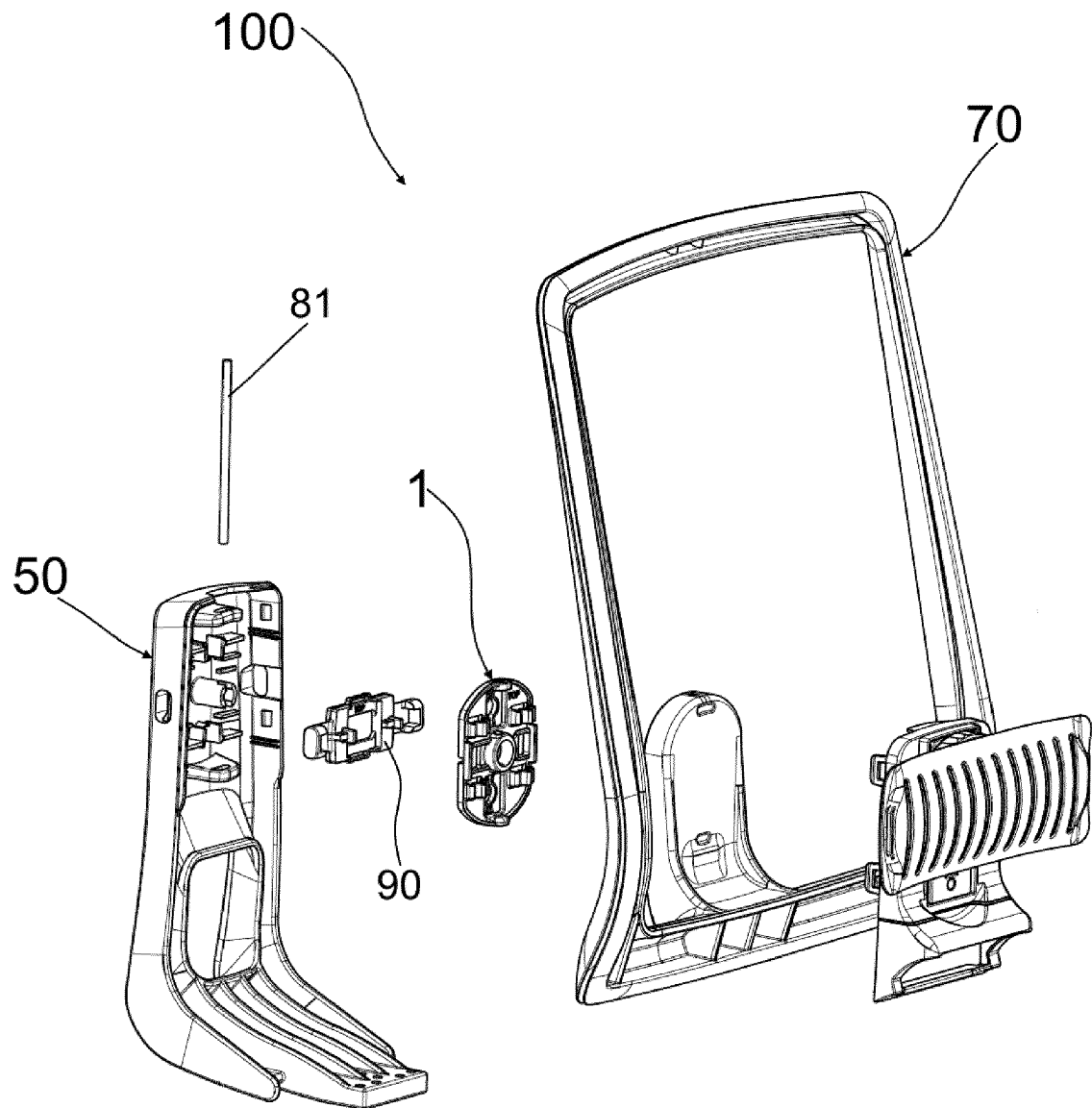
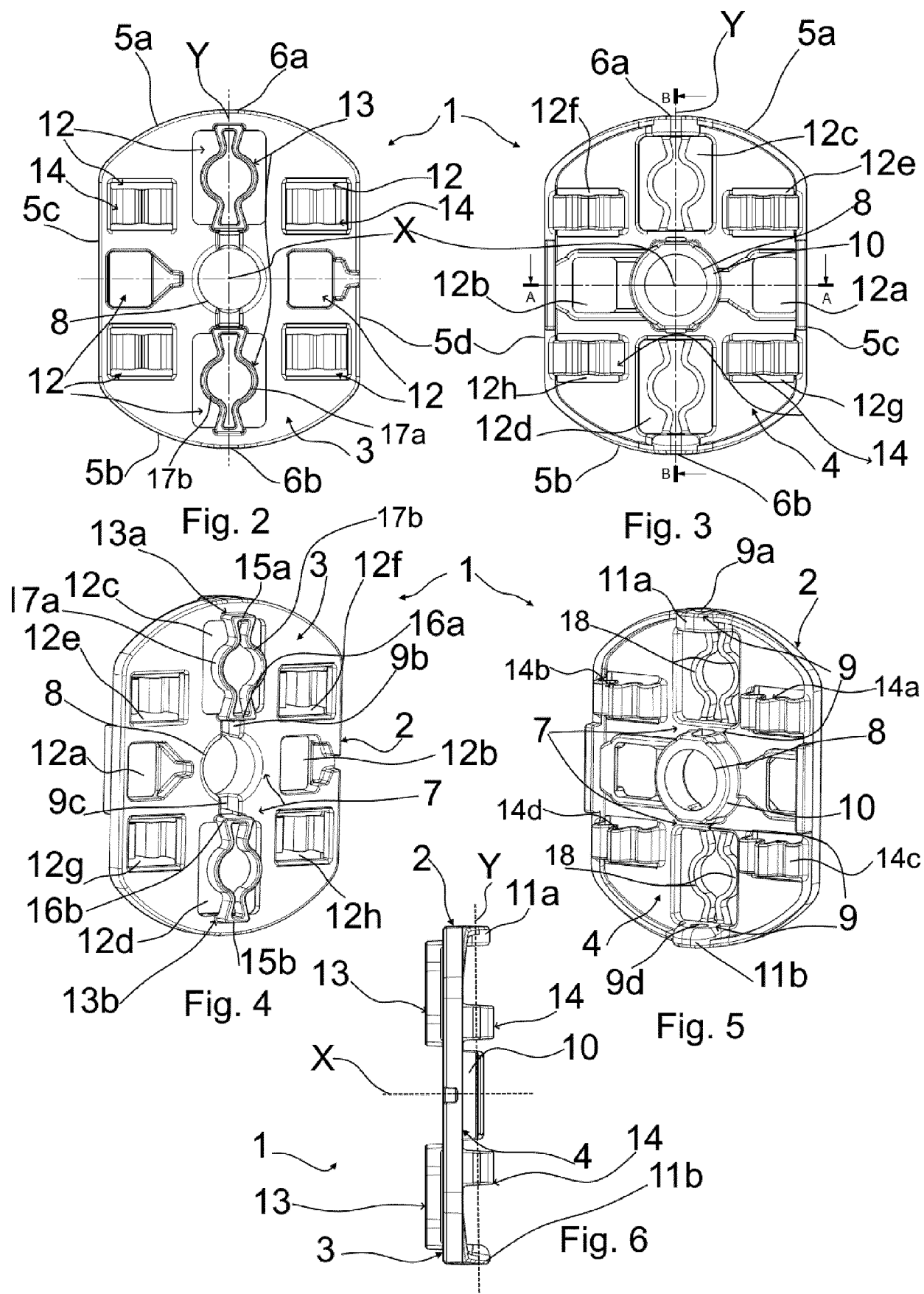


Fig. 1



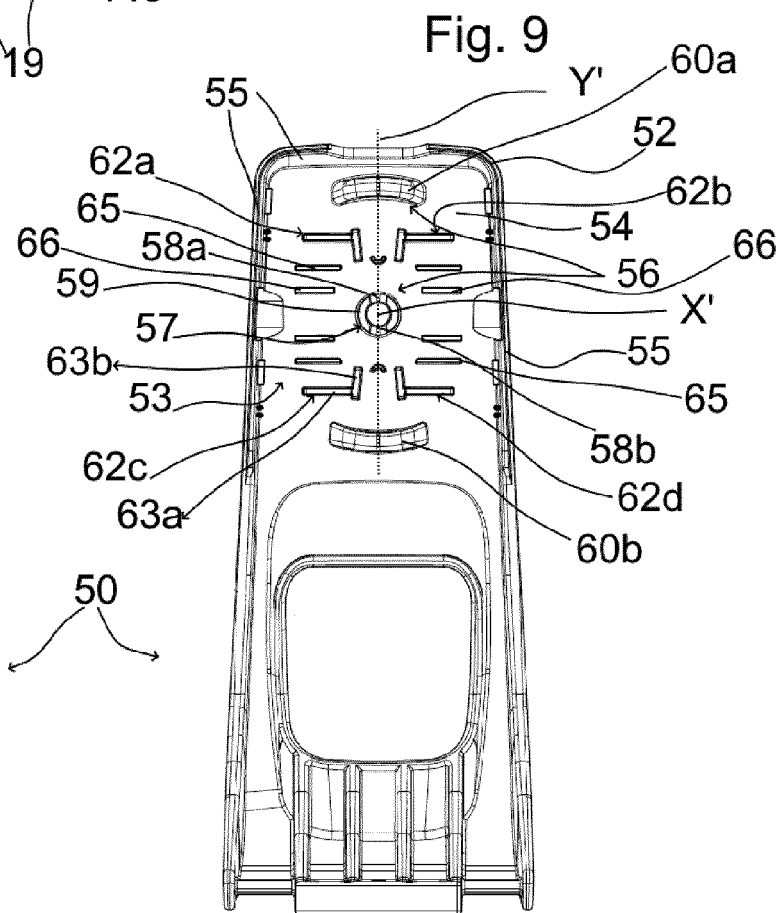
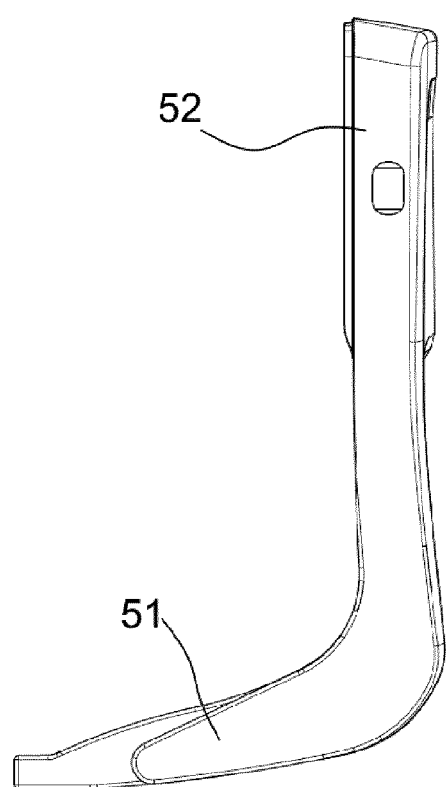
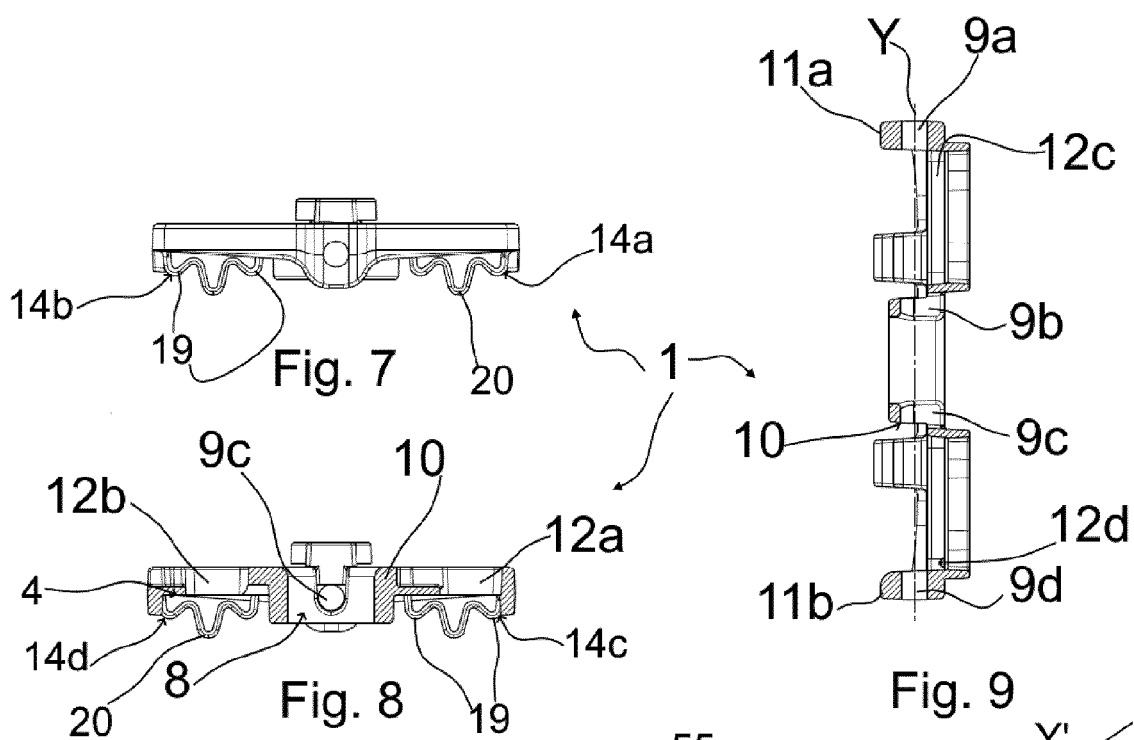


Fig. 10

Fig. 11

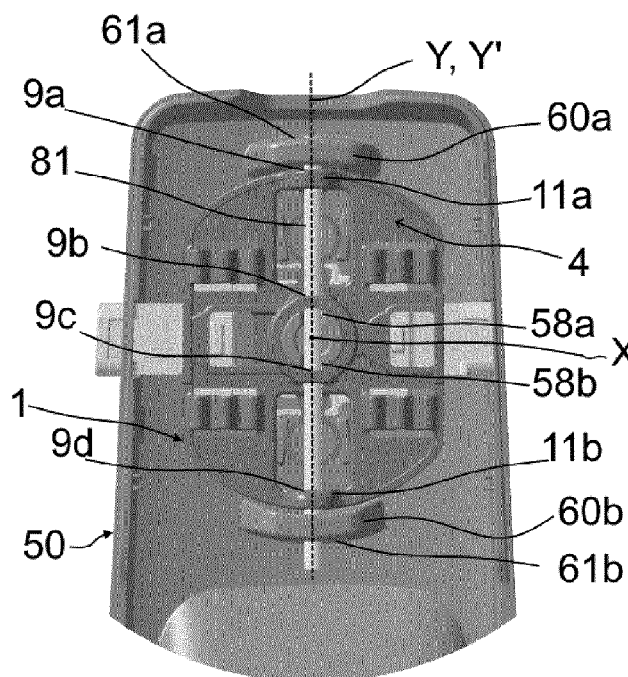


Fig. 12

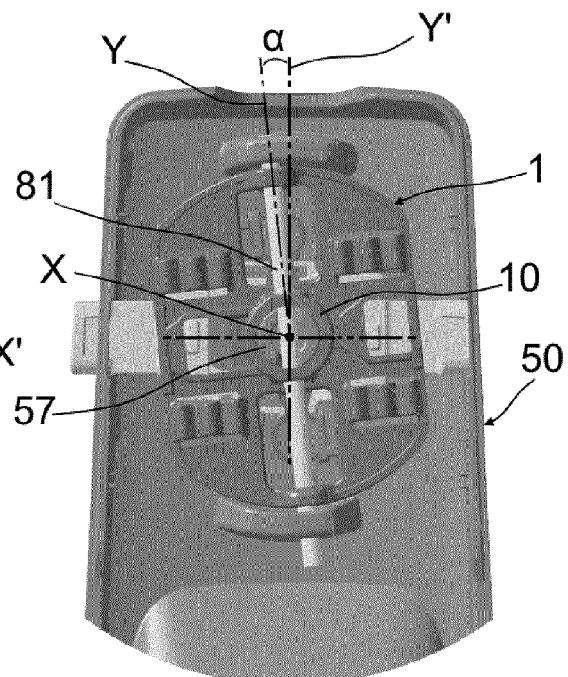


Fig. 13

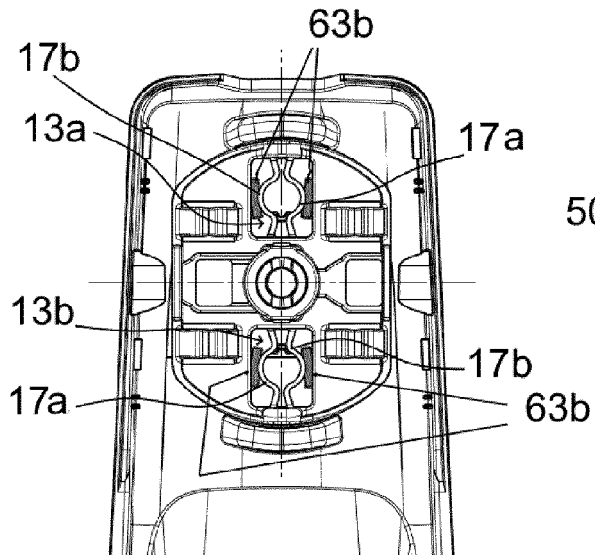


Fig. 14

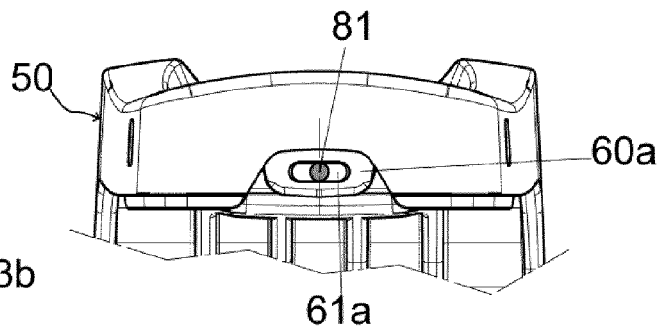
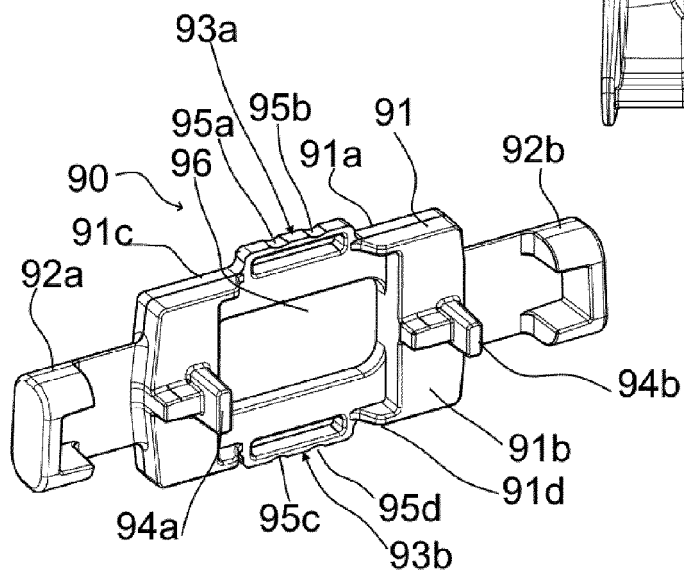
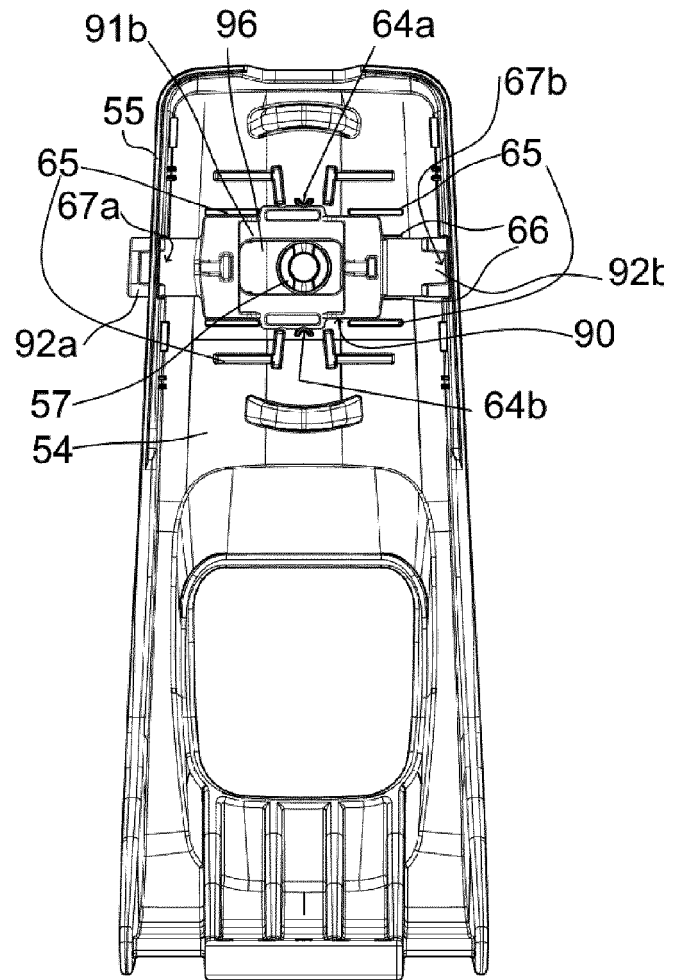
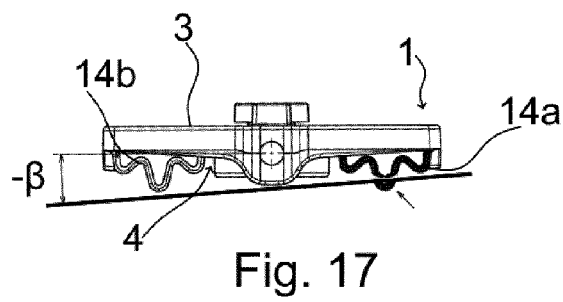
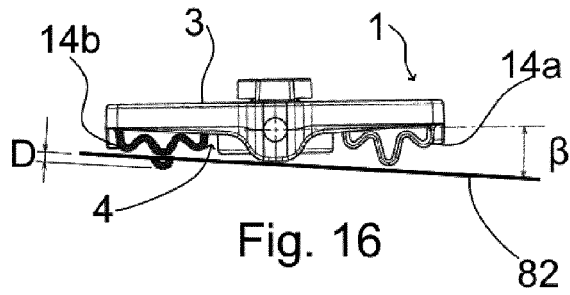


Fig. 15



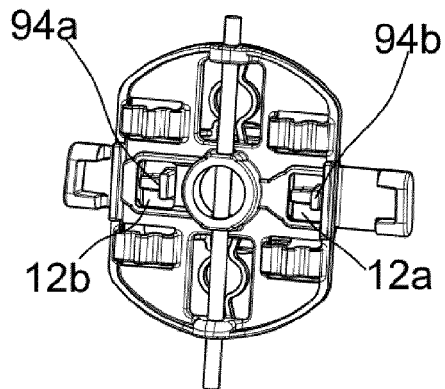


Fig. 20

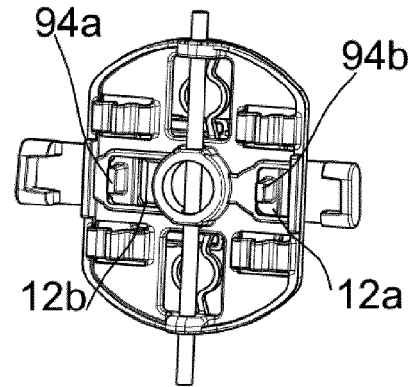


Fig. 21

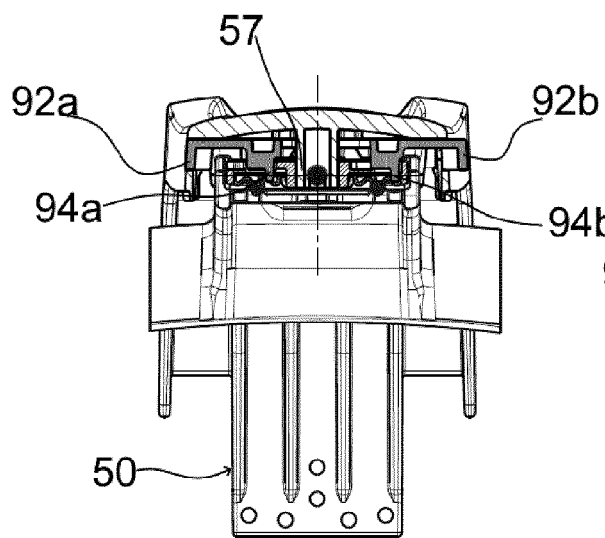


Fig. 22

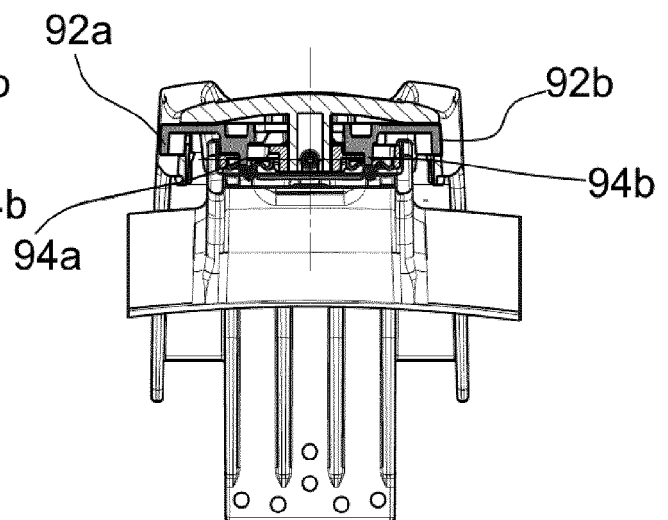


Fig. 23

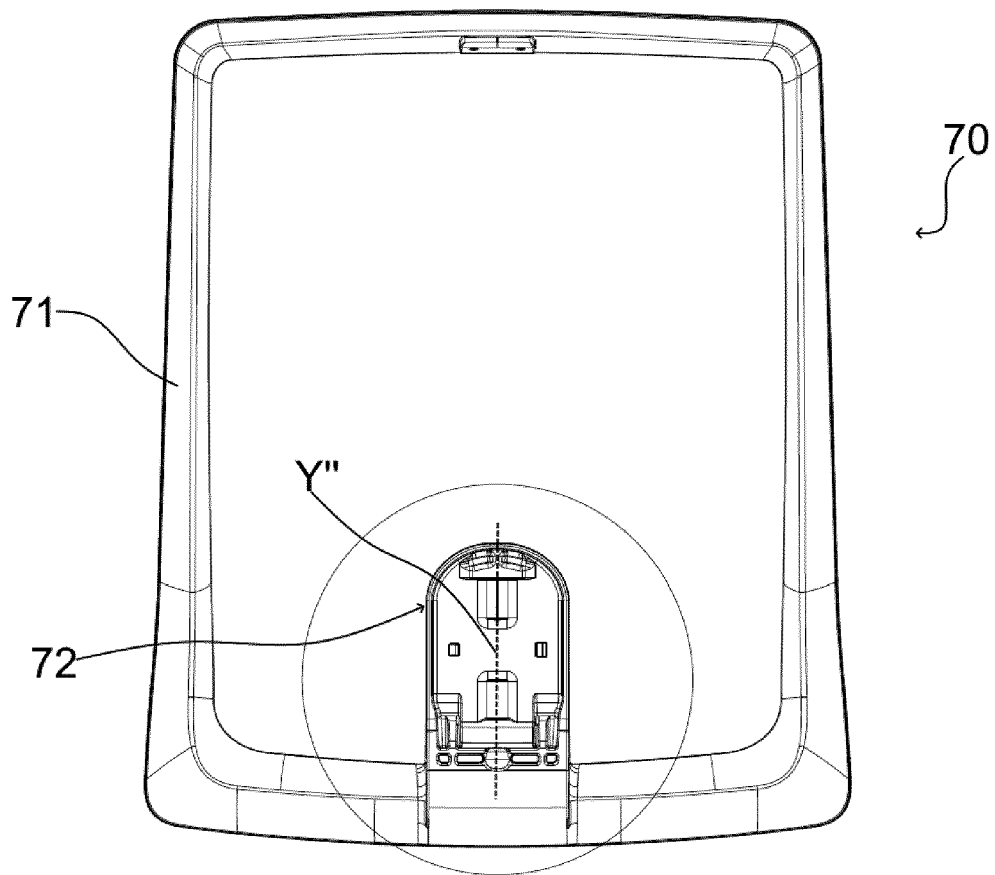


Fig. 24

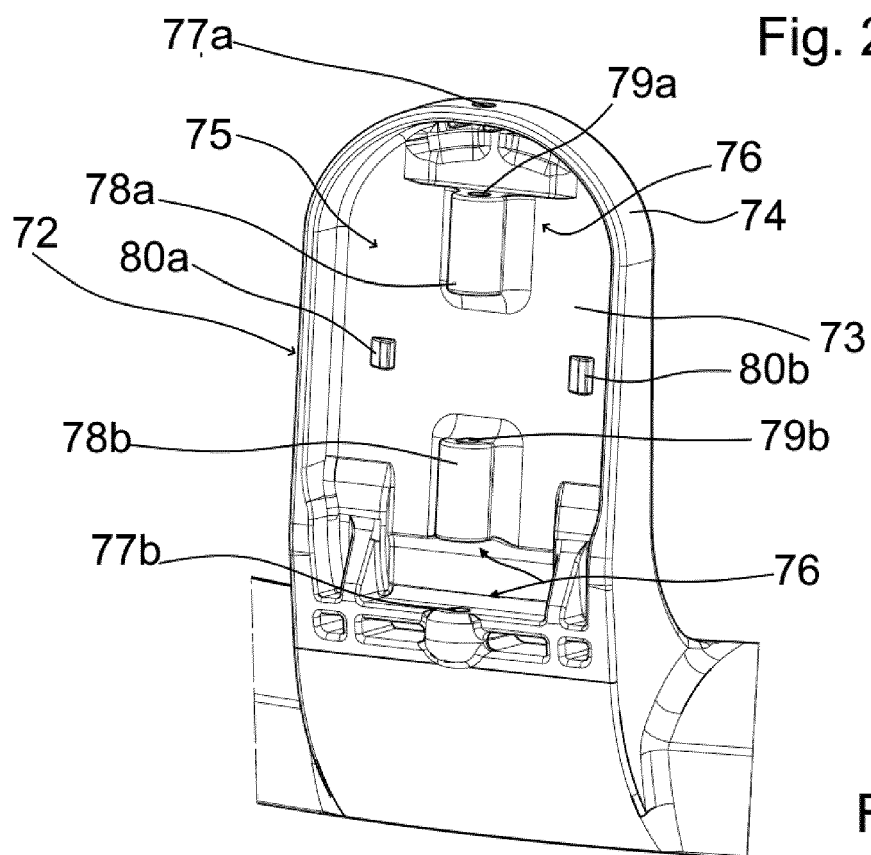


Fig. 25

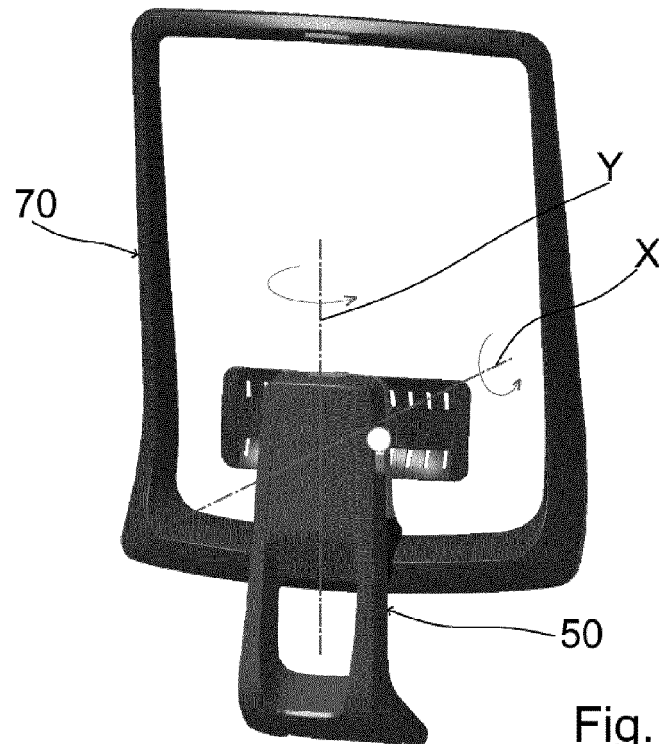


Fig. 26

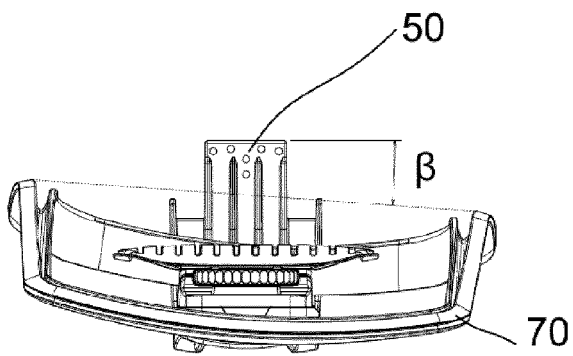


Fig. 27

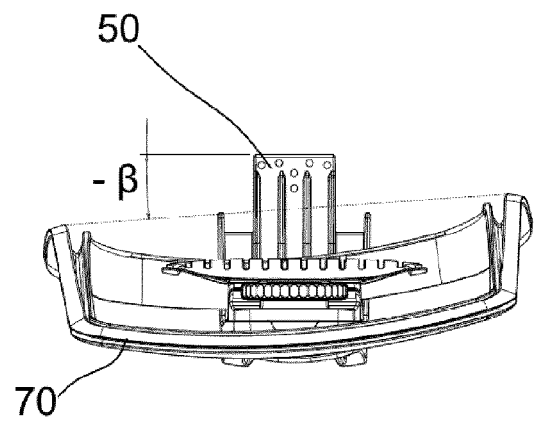


Fig. 28

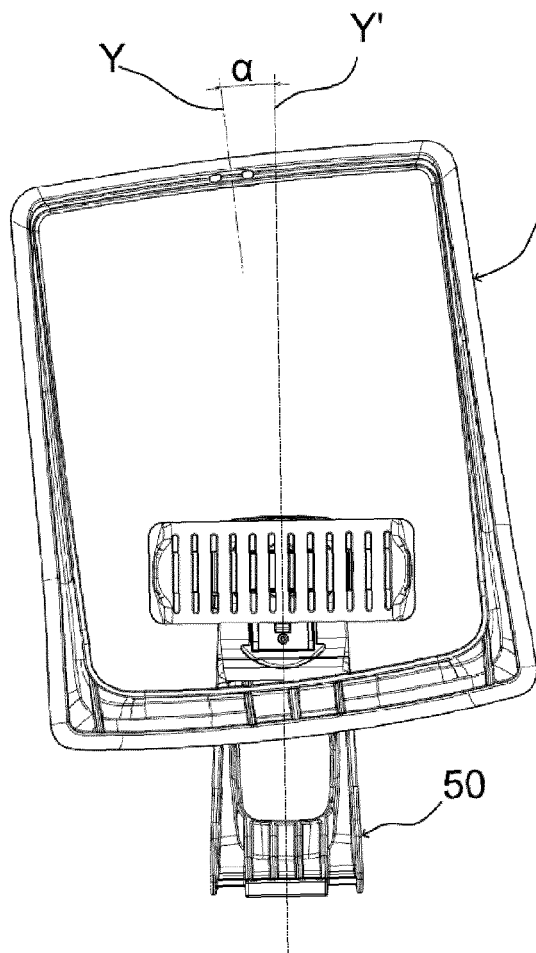


Fig. 29

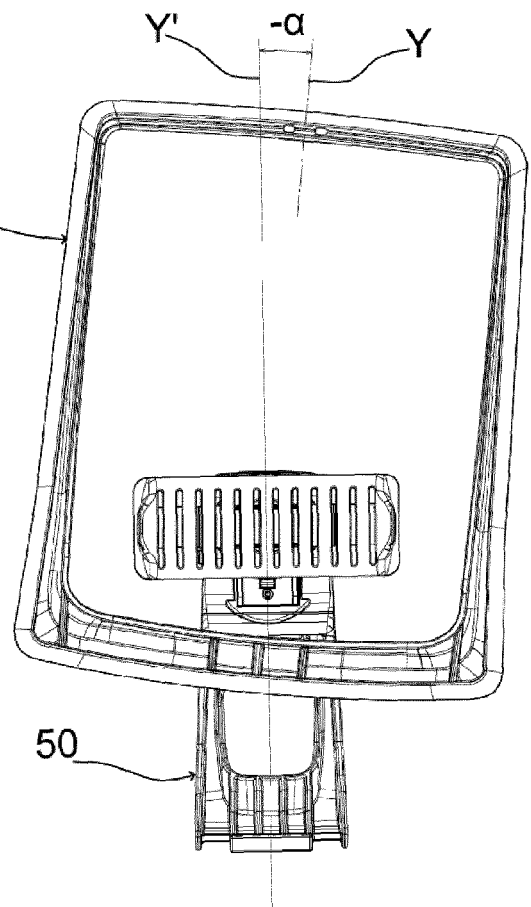


Fig. 30



EUROPEAN SEARCH REPORT

Application Number

EP 22 19 5881

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2018/078812 A1 (HARLOW BRYCE [US]) 22 March 2018 (2018-03-22) * figures 1-8 *	1-4, 6-14, 19 5, 15-18	INV. A47C1/032 A47C3/026 A47C7/38
A	-----		
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Date of completion of the search			
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