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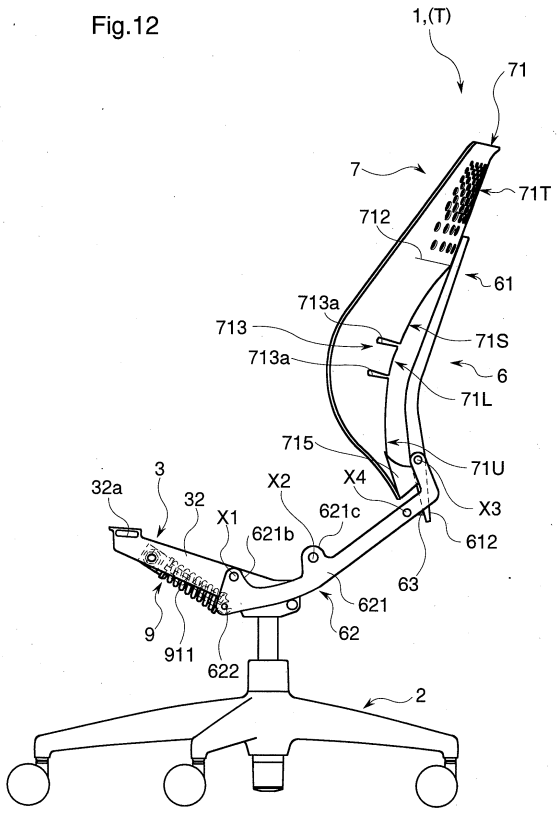
(54) **CHAIR**

(57) A chair includes a seat 5 for sinking backward as a backrest 7 mainly made up of an elastically deformable back shell 71 tilts back, wherein a back support post 6 which is pivoted at its lower end portion on a support base portion 3 disposed below the seat 5 and which supports the back shell 71 includes an upper back frame 61 for supporting a portion of the back shell 71 above a lumbar support portion 71L of the back shell 71 capable of supporting a lumbar part of a seated person and a lower back frame 62 for supporting a portion near a lower end portion of the back shell 71, the back frames (the upper back frame 61 and the lower back frame 62) are pivoted on each other and the pivot point (third support shaft X3) is set behind the lower end portion of the back shell 71, and the whole back shell 71 is curved and deformed to protrude the lumbar support portion 71L relatively forward as the upper back frame 61 tilts back about the pivot point (third support shaft X3) with respect to the lower back frame 62.

Fig.12



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Description

TECHNICAL FIELD

[0001] The present invention relates to a chair suitable for use in an office or the like.

BACKGROUND TECHNIQUE

[0002] Conventionally, as a chair suitable for use in an office or the like, there is a known chair having a synchronous rocking function for enabling a seat to slide in a direction of sinking backward as a backrest tilts back.

[0003] As an example of such a chair, there is one in which a back shell is supported by a back support post, a lower end portion of the back support post extends forward, and the extending end is pivoted on a support base portion provided to an upper portion of a leg body for turning about a horizontal axis, and the back shell is curved and deformed so that a lumbar support portion of the back shell capable of supporting a lumbar part of a seated person protrudes forward as the back support post tilts back according to a load applied on the back shell (see Patent Document 1 described below, for example).

[0004] The Patent Document 1 discloses a structure in which an upper portion of the backrest (back shell) is supported for turning on a shaft provided to an upper portion of the back support post, guide chips having cam grooves in shapes of L in side views are secured to lower portions of back faces of left and right opposite side portions of the backrest, and an operation lever is operated to move tilting chips integrally provided to the operation lever in the cam grooves to thereby adjust an amount of forward protrusion of the lumbar support portion.

Patent Document 1: Japanese Patent Application Laid-Open No. 2004-49719

DISCLOSURE OF THE INVENTION

PROBLEMS TO BE SOLVED BY THE INVENTION

[0005] However, the above-described prior-art chair requires a special mechanism for protruding the lumbar support portion forward, which complicates the structure, requires special operation of the seated person (user), takes the user time to get used to how to use, and makes the chair less practical.

[0006] Moreover, the chair described above has the synchronous rocking function for moving the seat in synchronization with the backward tilting operation of the backrest but does not have a back tilting function for curving and deforming the back shell to thereby tilt back only the backrest. Even if the above-described structure is combined with a chair having the back tilting function, the chair is still not practical because it requires the special mechanism for protruding the lumbar support portion forward and requires the special operation of the seated person (user).

[0007] The present invention has been made while focusing on such problems and it is a main object to provide a chair that has not only a synchronous rocking function but also a back tilting function and is practical because it does not require a special mechanism for protruding a lumbar support portion forward when the chair shifts from a normal state in which no load is applied on a backrest to a back tilt state in which only the backrest is tilted back, has a simplified structure, and does not require a special operation for protruding the lumbar support portion forward of a seated person.

APPROACH FOR SOLVING THE PROBLEMS

[0008] In other words, a chair according to the invention includes a seat for moving in synchronization with backward tilting operation of a backrest mainly made up of an elastically deformable back shell, wherein a back support post which is pivoted at its lower end portion or its portion near the lower end portion on a support base portion disposed below the seat and which supports the back shell includes an upper back frame for supporting a portion of the back shell above a lumbar support portion of the back shell capable of supporting a lumbar part of a seated person and a lower back frame for supporting a lower end portion or a portion near the lower end portion of the back shell, the back frames are pivoted on each other, the pivot point is set behind the lower end portion of the back shell, and the whole back shell is curved and deformed to protrude the lumbar support portion relatively forward as the upper back frame tilts back about the pivot point with respect to the lower back frame.

[0009] With this structure, the chair has both the synchronous rocking function for moving the seat in synchronization with the backward tilting operation of the backrest and the back tilting function for tilting back only the backrest by curving and deforming the back shell. A pivot point between the upper back frame for supporting the portion of the back shell above the lumbar support portion of the back shell, i.e., the upper portion of the back shell and the lower back frame for supporting the lower end portion or the portion near the lower end portion of the back shell is set behind the lower end portion of the back shell. Therefore, when the seated person purposely puts his/her weight on the upper portion of the back shell, the upper back frame tilts back about the pivot point to cause the upper portion of the back shell to lean back. As a result, an area between the upper portion and the lower portion of the back shell and specifically the lumbar support portion is naturally curved and deformed in such a direction as to protrude forward to provide the seated person with a comfortable feeling of support of his/her lumbar part. Moreover, an amount of forward protrusion of the lumbar support portion changes according to a degree to which the seated person puts his/her weight on the upper portion of the back shell. Therefore, the

seated person can set the amount of protrusion of the lumbar support portion to such an amount as to obtain a desired feeling of support of the lumbar part by changing the manner in which he/she puts his/her weight without separately operating a special operation portion, which simplifies the structure without impairing practicality of the chair at all.

[0010] As described above, because a special mechanism for protruding the lumbar support portion forward is unnecessary, it is possible to effectively simplify the structure. Moreover, because special operation for protruding the lumbar support portion forward or special operation for adjusting the amount of protrusion of the lumbar support portion are not required, the chair is usable for the seated person.

[0011] Especially, if either one of the upper back frame and the lower back frame has an overhanging portion extending in a predetermined direction from the pivot point and a resilient body for generating a reaction force as the upper back frame tilts back is disposed between the overhanging portion and the other back frame, it is possible to make the reaction force mechanism compact, the mechanism being especially for the back tilting operation which is the tilting back of only the upper back frame with respect to the lower back frame.

[0012] To prevent suppression of the forward protruding deformation of the lumbar support portion due to interference of the lumbar support portion with the upper back frame, a space for allowing curving and deformation of the shell in the backward tilting operation of the backrest may be formed between the upper back frame and the lumbar support portion of the back shell.

[0013] Moreover, at least one of the upper back frame and the lower back frame may support the back shell while engaged with the back shell for sliding movements in the height direction. In this way, when the seated person puts his/her weight on the upper portion of the back shell and the upper back frame tilts back about the pivot point, the back shell slides in the height direction with respect to at least one of the upper back frame and the lower back frame to thereby allow smooth curving and deformation of the whole back shell with respect to the back support post.

[0014] Because the one back support post including the upper back frame and the lower back frame is disposed at a substantially central portion in the lateral width direction of the back shell, opposite side end portions of the back shell become free and can be warped flexibly and greatly according to a load when the load is applied on the left and right opposite end portions of the back shell even if the back shell which is a resin plate-shaped member has enough strength to support a load of a back of the seated person. As described above, torsional deformation of the back shell is allowed and three-dimensional deformation of the back shell according to the manner in which the seated person puts his/her weight and movements of the back of the seated person is possible.

[0015] To allow the back shell to reliably protrude the lumbar support portion forward while the whole back shell is curved and deformed when the seated person puts his/her weight on the upper portion of the back shell and the upper back frame tilts back about the pivot point, a deformation trigger means which is a portion of the lumbar support portion and more likely to be deformed than portions around it is preferably provided to the lumbar support portion of the back shell in order to direct a deformation characteristic of the back shell.

[0016] A preferable example of the deformation trigger means is a deformation trigger means made up of one or a plurality of slits extending in the lateral width direction of the back shell.

EFFECTS OF THE INVENTION

[0017] As described above, according to the invention, it is possible to provide the chair having not only the synchronous rocking function but also the back tilting function. The chair does not require the special mechanism for protruding the lumbar support portion forward when the chair is shifted from the normal state in which no load is applied on the backrest to the back tilt state in which only the backrest is tilted back, the structure of the chair can be simplified, and the chair is excellent in practicality, because it does not require special operation for protruding the lumbar support portion forward of the seated person.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018]

[FIG. 1] A general view from a diagonally front side of a chair according to an embodiment of the present invention.

[FIG. 2] A general view from a diagonally back side of the chair according to the embodiment.

[FIG. 3] A side view of the chair in a normal state in the embodiment.

[FIG. 4] A back view of the chair in the normal state in the embodiment.

[FIG. 5] An operation explanatory view showing FIG. 3 while omitting part of it.

[FIG. 6] A view from a direction of an arrow X in FIG. 5.

[FIG. 7] A vertical sectional view schematically showing part of FIG. 5, i.e., only a back shell and taken at a center in a lateral width direction.

[FIG. 8] A drawing schematically showing a manner in which the back shell and a back support post are mounted to each other in an area Y in FIG. 5.

[FIG. 9] A drawing showing the chair in a synchronous rocking state in the embodiment and corresponding to FIG. 3.

[FIG. 10] A drawing showing the chair in the synchronous rocking state in the embodiment and corresponding to FIG. 5.

[FIG. 11] A drawing showing the chair in a back tilt

state in the embodiment and corresponding to FIG. 3.

[FIG. 12] A drawing showing the chair in the back tilt state in the embodiment and corresponding to FIG. 5.

[FIG. 13] Drawings schematically showing a variation of a slide engagement mechanism in the embodiment and corresponding to FIGS. 5 and 12.

EXPLANATION OF REFERENCE NUMERALS

[0019]

1	chair
3	support base portion
5	seat
6	back support post
61	upper back frame
612	overhanging portion
62	lower back frame
63	resilient body (second coil spring)
7	backrest
1	back shell
713	deformation trigger means
713a	·slit
71L	lumbar support portion
X3	pivot point (third support shaft)

BEST MODE FOR CARRYING OUT THE INVENTION

[0020] An embodiment of the present invention will be described below with reference to the drawings.

[0021] As shown in FIGS. 1 to 5, a chair 1 according to the present embodiment is what is called a rotary chair including a leg 2, a support base portion 3 mounted on an upper end side of the leg 2 to be able to turn horizontally, a seat receiver 4 supported at its front portion on the support base portion 3, a seat 5 mounted on the seat receiver 4, a back support post 6 pivoted at its lower end portion on the support base portion 3 and supporting a back portion of the seat receiver 4, and a backrest 7 mounted to the back support post 6.

[0022] The leg 2 is made up of a plurality of (five in the example in the drawings) leg blades 21 each having a caster at a tip end thereof and a leg stay 22 rising from a portion where base end portions of the respective leg blades 21 gather.

[0023] As shown in FIG. 6, which shows a state viewed from a direction of an arrow X in FIG. 5, the support base portion 3 is a member made of metal, for example, and including an upper wall portion 31, a pair of hanging side wall portions 32 respectively hanging integrally from opposite side edges of the upper wall portion 31 by bending, and a pair of partition walls 33 and 34 provided between front end portions of the pair of hanging side wall portions 32 and serving as reinforcing ribs and the support base portion 3 is supported on the leg stay 22 by mounting an upper end portion of the leg stay 22 to a rear end portion of the upper wall portion 31. The partition wall 33 on a relatively back side out of the pair of partition walls 33 and 34 is provided with a retainer guide portion 33a formed in a wall thickness direction to guide a retainer 912b inserted through the retainer guide portion 33a for moving forward and backward in a compressive forward/backward moving direction of a coil spring 911 described later. A first support shaft X1 for axially supporting the back support post 6 for turning is laterally supported like a bridge between portions of the support base portion 3 slightly displaced backward from substantially central portions of the left and right hanging side wall portions 32. Furthermore, elongated holes 32a for supporting a front frame (not shown) of the seat receiver 4 (described later) are respectively formed in a wall thickness direction at front end portions of the left and right hanging side wall portions 32. The support base portion 3 is covered with a support base portion cover body 3c from below so that it cannot be seen directly from outside (see FIG. 3).

[0024] The seat receiver 4 is located above the support base portion 3 and supported on the support base portion 3 with the rod-shaped front frame (not shown) provide at a front end portion of the seat receiver 4 inserted through the elongated holes 32a of the support base portion 3. The chair 1 in the embodiment has armrests 8 respectively extending upward from portions near left and right opposite side edge portions of the seat receiver 4. Although the armrests 8 shown in FIG. 1 and the like are not height-adjustable, it is possible to employ height-adjustable armrests in place of the armrests 8. Alternatively, the chair may not have armrests.

[0025] The seat 5 includes a seat shell 51 performing a function as a structural member for uniformly supporting a load applied on the seat 5, a seat cushion (not shown) provided above the seat shell 51, and a seat cushion cover 52 covering the seat cushion.

[0026] The backrest 7 includes a back shell 71 serving as a structural member for uniformly supporting a load applied on the backrest 7 and supported on the back support post 6, a back cushion (not shown) provided in front of the back shell 71, and a back cushion cover 72 covering the back cushion.

[0027] The back shell 71 is mainly made up of an elastic plate-shaped body made of resin and has a three-dimensional shape with an upper portion and a lower

portion protruding further backward than its central portion in a height direction and left and right opposite side edge portions protruding further forward than its central portion in the lateral width direction. An area of the back shell 71 above a lumbar support portion 71L capable of supporting a lumbar part of a seated person and more specifically an area of the back shell 71 above its central portion in the height direction is provided with a large number of apertures 711 so that an aperture ratio which is a ratio of the apertures 711 to a predetermined area of the back shell 71 gradually increases toward an upper edge portion and the opposite side edge portions of the back shell 71. In the following description, the whole area provided with the apertures 711 out of the back shell 71 will be referred to as "a back shell upper portion 71T". In other words, as shown in FIG. 4 and the like, the back shell 71 integrally includes the back shell upper portion 71T, a back shell central portion 71S which is the central portion of the back shell 71 in the height direction, the lumbar support portion 71L positioned slightly below the back shell central portion 71S, and a back shell lower portion 71U which is an area below the lumbar support portion 71L. The back shell central portion 71S, the lumbar support portion 71L, and the back shell lower portion 71U have the same curvature of curved faces in a plan view and the curvature is set to a magnitude greater than a curvature of a curved face of the back shell upper portion 71T in the plan view. As shown in FIG. 7 (which is a vertical sectional view corresponding to FIG. 5, schematically showing only the back shell 71, and taken at the center in the lateral width direction), the back shell central portion 71S, the lumbar support portion 71L, and the back shell lower portion 71U having the relatively greater curvature are curved and arched to be continuous with each other while the back shell upper portion 71T having the relatively smaller curvature is in a substantially straight shape along the height direction. The back shell central portion 71S and the back shell upper portion 71T are continuous with each other at a discontinuous line 712 as a border therebetween.

[0028] The lumbar support portion 71L of the back shell 71 is provided with a deformation trigger means 713 which is more likely to be deformed than portions of the lumbar support portion 71L around it. In the embodiment, slits 713a extending in the lateral width direction are employed as the deformation trigger means 713. A single slit 713a or a plurality of slits 713a may be provided and the pair of upper and lower slits 713a with a predetermined interval therebetween in the height direction is provided in the embodiment.

[0029] As shown in FIG. 8 (which is a drawing schematically showing a state before mounting of the back shell upper portion 71T to the back support post 6 in order to show a manner of mounting of the back shell 71 and the back support post 6 to each other in an area Y in FIG. 5), the back shell upper portion 71T is integrally or substantially integrally provided with an engagement portion 714 protruding backward and capable of being engaged in a slide engagement hole 611 formed in an upper end portion of an upper back frame 61 (described later). In FIG. 8, the apertures 711 in the back shell upper portion 71T are not shown. The engagement portion 714 is substantially in a block shape and integrally has a flange portion 714a at a tip end portion (an end portion on a side away from a back face of the back shell 71).

[0030] As shown in FIG. 5 and the like, the back shell lower portion 71U is integrally or substantially integrally provided with supported portions 715 protruding backward and supported on an upper end portion of a lower frame (described later). In the embodiment, the pair of left and right thin plate-shaped supported portions 715 is provided at a lower end portion of the back shell lower portion 71U, i. e. , a lower end portion of the back shell 71.

[0031] As shown in FIG. 5 and the like, the back support post 6 for supporting the back shell 71 includes the upper back frame 61 for supporting a portion of the back shell 71 above the lumbar support portion 71L supporting the lumbar part of the seated person and specifically the back shell upper portion 71T and a lower back frame 62 for supporting the back shell lower portion 71U. A pivot point (a third support shaft X3 that will be described later) between the upper back frame 61 and the lower back frame 62 is set behind a lower end portion of the back shell 71 so that the upper back frame 61 can tilt about the pivot point with respect to the lower back frame 62 (tilting operation). As shown in FIG. 2, the upper back frame 61 and the lower back frame 62 are covered with an upper back frame cover body 61c and a lower back frame cover body 62c from behind and below, respectively, and cannot be directly seen from outside.

[0032] As shown in FIGS. 5, 6, and the like, the lower back frame 62 includes a pair of left and right lower back frame main bodies 621 disposed on outer sides of opposite side faces of the support base portion 3 and a rigid connection shaft 622 for rigidly connecting lower end portions of the pair of lower back frame main bodies 621 and disposed below a lower face of the support base portion 3.

[0033] The respective lower back frame main bodies 621 are substantially in plate shapes and are in shapes, in a side view, gradually extending diagonally backward from their lower end portions toward their portions near their upper end portions and bent diagonally forward at their portions near their upper end portions.

[0034] The rigid connection shaft 622 is in a rod shape and is laid and fixed like a bridge between the lower end portions of the lower back frame main bodies 621 by appropriate means such as welding.

[0035] To mount the lower back frame 62 to the support base portion 3, the pair of left and right lower back frame main bodies 621 is put from behind on the support base portion 3 in such a manner as to sandwich the support base portion 3 between the portions near the lower end portions of the respective lower back frame main bodies 621 after rigidly connecting the lower back frame main bodies 621 by the rigid connection shaft 622 and the first

support shaft X1 is inserted through insertion holes 621a formed at the portions near the lower end portions of the respective lower back frame main bodies 621 and through holes (not shown) formed at the opposite hanging side wall portions 32 of the support base portion 3 after making the insertion holes communicating with each other. In this way, the lower back frame 62 and eventually the back support post 6 becomes able to turn about the first support shaft X1 with respect to the support base portion 3. In the embodiment, extending portions 621b extending further forward than other portions are integrally provided to the portions near the lower end portions of the respective lower back frame main bodies 621 and the insertion holes 621a are formed in the respective extending portions 621b. The first support shaft X1 is disposed on an upper back side with respect to the rigid connection shaft 622.

[0036] In a state in which the lower back frame 62 is mounted to the support base portion 3 in the chair 1 according to the embodiment, the rigid connection shaft 622 of the lower back frame 62 is located below the lower face of the support base portion 3 (specifically, lower faces of the hanging side wall portions 32) and the coil spring 911 for generating a reaction force as the back support post 6 tilts back is disposed between the rigid connection shaft 622 and the support base portion 3. When the lower back frame 62 tilts back about the first support shaft X1, the rigid connection shaft 622 biases the coil spring 911 in such a direction as to accumulate resilience.

[0037] To put it concretely, as shown in FIG. 6, the rigid connection shaft 622 supports a coil spring receiving portion 911x provided on one end side of the coil spring 911 (described later) at its central portion in a longitudinal direction. The coil spring 911 and the coil spring receiving portion 911x form a tilting reaction force adjusting device 9 for adjusting the reaction force in tilting back the back support post 6.

[0038] As shown in FIGS. 5 and 6, at least part of the tilting reaction force adjusting device 9 is housed in the support base portion 3 and the tilting reaction force adjusting device 9 includes a reaction force generating portion 91 for generating the reaction force in tilting back the back support post 6 independently of the seat receiver 4 and a reaction force adjusting operation portion 92 provided on a front end side of a side edge of the seat 5 for adjusting operation of strength of the reaction force of the reaction force generating portion 91.

[0039] To put it more concretely, the reaction force generating portion 91 includes the coil spring 911 and a compressing and expanding portion 912 provided on one end side of the coil spring 911 to compress or expand the coil spring 911 in synchronization with the adjusting operation applied to the reaction force adjusting operation portion 92. The compressing and expanding portion 912 is made up of a slider 912a in a trapezoidal shape in a plan view and for moving forward and backward in a direction orthogonal to a direction of compression and expansion of the coil spring 911 in synchronization with the adjusting operation applied to the reaction force adjusting operation portion 92, a retainer 912b in a trapezoidal shape in a plan view and for moving forward and backward in the direction of the compression and expansion while sliding against the slider 912a and supporting the coil spring 911, and the retainer guide portion 33a for guiding the forward and backward movements of the retainer 912b in the direction of the compression and expansion. As described above, the retainer guide portion 33a is formed on the partition wall 33 of the support base portion 3 for supporting the seat receiver 4.

[0040] The reaction force adjusting operation portion 92 includes a rod 921 extending in the lateral width direction while passing through one of the hanging side wall portions 32 of the support base portion 3 and an operation grip 922 provided to a tip end portion of the rod 921 to rotate the rod 921 about an axis.

[0041] Getting back to description of the lower back frame 62, the respective lower back frame main bodies 621 of the lower back frame 62 are integrally provided with second extending portions 621c extending further forward than portions around them at portions slightly below central portions in the height direction and a second support shaft X2 laid and fixed like a bridge between the second extending portions 621c supports a rear end side of the seat receiver 4. Furthermore, the supported portions 715 of the back shell 71 are fixed to portions near the upper end portions of the respective lower back frame main bodies 621 by appropriate means such as screws so that relative angles cannot be changed.

[0042] As shown in FIG. 5, the upper back frame 61 pivoted on the upper end portion of the lower back frame 62 having the above-described structure has such width as to be sandwiched between the pair of left and right lower back frame main bodies 621 and is substantially in a shape of < in a side view with its upper end portion and lower end portion protruding further backward than its central portion in the height direction. As shown in FIG. 8, the slide engagement hole 611 in which the engagement portion 714 provided to the back shell upper portion 71T can be engaged by sliding is formed in the upper end portion of the upper back frame 61. The slide engagement hole 611 is made up of a large hole portion 611a in and from which the flange portion 714a of the engagement portion 714 can be inserted and withdrawn and a small hole portion 611b formed continuously with an upper side of the large hole portion 611a and allowing a relative sliding movement of the engagement portion 714 while prohibiting withdrawal of the flange portion 714a that has been inserted from the large hole portion 611a. The small hole portion 611b is greater than the large hole portion 611a in height so as to secure a margin for relative sliding movements of the slide engagement hole 611 and the engagement portion 714.

[0043] An insertion hole (not shown) is formed to pass through a lower end portion of the upper back frame 61 in the lateral width direction and the third support shaft X3 is inserted through the insertion hole and insertion

holes 621d formed in the upper end portions of the respective lower back frame main bodies 621 after making the insertion holes communicating with each other to thereby enable the upper back frame 61 to tilt back about the third support shaft X3 (corresponding to "the pivot point" in the invention). In the embodiment, the third support shaft X3 is located behind the lower end portion of the back shell 71. The upper back frame 61 includes an overhanging portion 612 extending downward from the pivot point (third support shaft X3) and a second coil spring 63 which is a resilient body in the invention and which generates a reaction force as the upper back frame 61 tilts back is disposed between the overhanging portion 612 and the lower back frame 62. In the embodiment, a fourth support shaft X4 is laid and fixed like a bridge between portions of the pair of left and right lower back frame main bodies 621 of the lower back frame 62 slightly below the bent portions near the upper end portions, one end portion of the second coil spring 63 is supported on the fourth support shaft X4, and the other end portion of the second coil spring 63 is supported on the overhanging portion 612 of the upper back frame 61.

[0044] In a state in which the back shell upper portion 71T and the back shell lower portion 71U are supported on the upper end portion of the upper back frame 61 and the upper end portion of the lower back frame 62,respectively, a space is formed between the back shell 71 and the back support post 6 (specifically, the upper back frame 61).

[0045] Next, usage and operation of the chair 1 according to the embodiment and made up of the above-described respective members will be described.

[0046] The chair 1 according to the embodiment can be brought into at least a normal state (S) in which the backrest 7 is in a standing attitude as shown in FIGS. 1 to 5, a synchronous rocking (synchronous tilt) state (R) in which the seat 5 slides in such a direction as to sink backward in synchronization with the backward tilting operation of the backrest 7 as shown in FIGS. 9 and 10, and a back tilt state (T) in which the upper back frame 61 tilts back about the third support shaft X3 (the pivot point in the invention) when the seated person purposely puts his/her weight on an upper portion of the backrest 7 in the normal state (S) and, as a result, the whole back shell 71 is curved and arched in the side view as shown in FIGS. 11 and 12.

[0047] In the normal state (S), the back shell 71 that is mainly made up of the elastic plate-shaped body is in an arched and curved shape in the side view against its elasticity.

[0048] If the seated person leans at his/her entire back against the backrest 7 of the chair 1 in this normal state (S), the back support post 6 tilts back about the first support shaft X1 while keeping the relative angle between the upper back frame 61 and the lower back frame 62 and the back shell 71 tilts back as well as shown in FIG. 10. At this time, because the weight of the seated person is applied substantially uniformly on the whole backrest 7 and therefore the back shell 71 tilts back while maintained in substantially the same shape as in the normal state (S) without tilting back of the upper back frame 61 with respect to the lower back frame 62, i.e., without changing the relative angle between the upper back frame 61 and the lower back frame 62. Then, the seat receiver 4 with its rear end side supported by the second support shaft X2 of the lower back frame 62 slides in such a direction as to sink backward while moving the front frame (not shown) provided on its front end portion in the elongated holes 32a as a result of the backward tilting operation of the back support post 6. As a result, the whole seat 5 supported on the seat receiver 4 slides in the same direction as the seat receiver 4, i.e., in such a direction as to sink backward (see FIG. 9) to thereby bring the chair 1 into the synchronous rocking state (R).

[0049] In the synchronous rocking state (R), the rigid connection shaft 622 of the lower back frame 62 presses the coil spring 911 in such a direction as to accumulate the resilience. Therefore, if the seated person moves his/her back away from the backrest 7, i.e., sits up, the whole back support post 6 naturally returns into a normal attitude before titling back due to the resilience of the coil spring 911. In the embodiment, it is possible to adjust the reaction force in tilting back the backrest 7 by using the tilting reaction force adjusting device 9. To put it concretely, if the operation grip 922 is rotated in one of clockwise and counterclockwise directions (e.g., in the clockwise direction), the slider 912a moves in such a direction as to approach the operation grip 922 in synchronization with the rotation and the slider 912a presses the retainer 912b. Then, the retainer 912b pressed by the slider 912a moves in such a direction as to compress the coil spring 911 to thereby increase the reaction force in tilting back the backrest 7. On the other hand, if the operation grip 922 is rotated in the reverse direction (e.g., in the counterclockwise direction), it is possible to reduce the reaction force in tilting back the backrest 7.

[0050] On the other hand, if the seated person purposely puts his/her weight on the back shell upper portion 71T in the normal state (S), the upper back frame 61 of the back support post 6 tilts back about the third support shaft X3 with respect to the lower back frame 62 as shown in FIG. 12. As the upper back frame 61 tilts back, a force for leaning back is applied to the back shell upper portion 71T of the back shell 71 supported on the upper back frame 61 while the lower end portion of the back shell 71 supported on the lower back frame 62 tries to stay in its position in the normal state (S) due to the lower back frame 62 which does not tilt back. Therefore, the back shell 71 is arched and curved to protrude its portion between the back shell upper portion 71T and the back shell lower portion 71U further forward. In the embodiment, because the lumbar support portion 71L of the back shell 71 is provided with the deformation trigger means 713 which is specifically the slits 713a, the lumbar support portion 71L is deformed in such a direction as to reduce height of the openings of the slits 713a when the whole

back shell 71 is arched and curved and, as a result, the lumbar support portion 71L protrudes further forward than in the normal state (S). In the embodiment, the back shell upper portion 71T is engaged and supported in the upper back frame 61 so that it can relatively slide in the height direction. By relatively sliding the engagement portion 714 provided to the back shell upper portion 71T in the height direction in the slide engagement hole 611 formed in the upper end portion of the upper back frame 61 in such a range as not to be disengaged from the slide engagement hole 611 in the tilting back of the upper back frame 61, the whole back shell 71 can be curved to follow the backward tilting operation of the upper back frame 61. In the chair 1 in the embodiment, because the curvature of the curved face of the back shell 71 in the plan view is smaller than that of the other portion and the upper end portion of the upper back frame 61 relatively slides against the back shell upper portion 71T in a substantially straight line shape along the height direction, it is possible to achieve the smooth sliding movement in the stable state.

[0051] As the chair 1 shifts from the normal state (S) into the back tilt state (T), the overhanging portion 612 of the upper back frame 61 presses the second coil spring 63 disposed between the overhanging portion 612 and the lower back frame 62 in such a direction as to accumulate the resilience. Therefore, if the seated person moves his/her back away from the backrest 7, i.e., sits up, the upper back frame 61 naturally returns into its normal attitude before the tilting back of the upper back frame 61 due to the resilience of the second coil spring 63 and the chair 1 returns from the back tilt state (T) to the normal state (S). Moreover, when the chair 1 shifts from the normal state (S) to the back tilt state (T), an elastic recovering force of the back shell 71 which has been further arched and curved than in the normal state (S) acts as a force for biasing the upper back frame 61 in such a direction as to pull the upper back frame 61 back forward. Therefore, if the seated person purposely puts his/her weight on the lumbar support portion 71L when the chair 1 is in the back tilt state (T), the biasing force further increases, the biasing force and the resilience of the second coil spring 63 combine with each other, and, when the seated person moves his/her back away from the backrest 7, i.e., sits up, the upper back frame 61 follows the operation and quickly and automatically returns to its normal attitude before the tilting back.

[0052] If the seated person puts his/her weight on the whole backrest 7 after the chair 1 is shifted from the normal state (S) into the back tilt state (T), the lower back frame 62 tilts back about the first support shaft X1 while maintaining the upper back frame 61 in the backward tilted attitude with respect to the lower back frame 62. As a result, the chair 1 is brought into a most reclined state (not shown) which is a combination of the back tilt state (T) and the synchronous rocking state (R). Substantially similarly, if the seated person purposely puts his/her weight on the upper back frame 61 after the chair 1 is shifted from the normal state (S) into the synchronous rocking state (R), the upper back frame 61 tilts back about the third support shaft X3 with respect to the lower back frame 62 and the chair 1 is brought into the most reclined state (not shown) which is the combination of the synchronous rocking state (R) and the back tilt state (T).

[0053] In other words, the chair 1 according to the embodiment is brought into the normal state (S), the synchronous rocking state (R), the back tilt state (T), the most reclined state, or an intermediate state between two of them (e.g., an intermediate state between the normal state (S) and the synchronous rocking state (R) and an intermediate state between the normal state (S) and the back tilt state (T)(not shown)) depending on how the seated person sits and more specifically how the seated person puts his/her weight on the chair 1.

[0054] The chair 1 in the embodiment includes a tilting braking device A provided between the back support post 6 and the support base portion 3 to selectively enable the tilting operation of the backrest 7. A lower end portion of the tilting braking device A is supported for swinging on a rear end side of the support base portion 3 and an upper end portion of the tilting braking device A is supported for swinging on the fourth support shaft X4 of the lower back frame 62. As shown in FIG. 6, employed as the tilting braking device A in the embodiment is a known gas spring which has a substantially cylindrical gas spring main body A1 and a piston rod portion (not shown) for moving forward and backward so that substantially the whole piston rod portion is housed in the gas spring main body A1 and which functions as a tilting braking portion and the tilting braking device A will not be described in detail.

[0055] As described above, the chair 1 according to the embodiment is the chair 1 that can be brought into the synchronous rocking state (R) in which the seat 5 moves in synchronization with the backward tilting operation of the backrest 7 and the back tilt state (T) in which the back shell 71 is curved and deformed and only the backrest 7 is tilted back. The pivot point (third support shaft X3) between the upper back frame 61 for supporting the portion of the back shell 71 above the lumbar support portion 71L and specifically the back shell upper portion 71T and the lower back frame 62 for supporting the lower end portion of the back shell 71 is set behind the lower end portion of the back shell 71. Therefore, when the seated person purposely puts his/her weight on the upper portion of the back shell 71, the upper back frame 61 tilts back about the pivot point (third support shaft X3) to cause the upper portion of the back shell 71 to lean back. As a result, an area between the upper portion and the lower portion of the back shell 71 and specifically the lumbar support portion 71L is naturally curved and deformed in such a direction as to protrude forward to provide the seated person with a comfortable feeling of support of his/her lumbar part. Moreover, an amount of forward protrusion of the lumbar support portion 71L changes according to a degree to which the seated person puts

his/her weight on the upper portion of the back shell 71. Therefore, the seated person can set the amount of protrusion of the lumbar support portion 71L to such an amount as to obtain a desired feeling of support of the lumbar part by changing the manner in which he/she puts his/her weight without separately operating a special operation portion, which simplifies the structure without impairing practicality of the chair at all.

[0056] Especially because the upper back frame 61 has the overhanging portion 612 extending below the pivot point (third support shaft X3) and the resilient body (second coil spring 63) for generating the reaction force as the upper back frame 61 tilts back is disposed between the overhanging portion 612 and the lower back frame 62, it is possible to make the reaction force mechanism for the back tilting compact to effectively prevent the structure from increasing in size and becoming complex.

[0057] Moreover, because the space is formed between the upper back frame 61 and the lumbar support portion 71L of the back shell 71, it is possible to reliably prevent suppression of the forward protruding deformation of the lumbar support portion 71L due to interference of the lumbar support portion 71L with the upper back frame 61.

[0058] The upper back frame 61 supports the back shell 71 while engaged with the back shell 71 for sliding movements in the height direction. Therefore, when the seated person purposely puts his/her weight on the upper portion of the back shell 71 and the upper back frame 61 tilts back about the pivot point (third support shaft X3), the back shell 71 slides in the height direction with respect to the upper back frame 61 to thereby allow the leaning back of the back shell upper portion 71T and smooth deformation of the whole back shell 71 in the arched shape.

[0059] Because the one back support post 6 including the upper back frame 61 and the lower back frame 62 is disposed at a substantially central portion in the lateral width direction of the back shell 71, opposite side end portions of the back shell 71 are open to allow torsional deformation of the back shell 71 and three-dimensional bending deformation of the back shell 71 according to the manner in which the seated person applies his/her weight. In the embodiment, the plurality of apertures 711 are formed in the back shell upper portion 71T and greatly contribute to achievement of the smooth torsional deformation of the back shell upper portion 71T for supporting parts around shoulders of the seated person. Additionally, the fact that the aperture ratio which is the ratio of the apertures 711 to the predetermined area gradually increases toward the upper edge portion and the opposite side edge portions of the back shell 71 contributes to achievement of the smooth torsional deformation of the back shell upper portion 71T as well.

[0060] Because the deformation trigger means 713 which is the portion of the lumbar support portion 71L and more likely to be deformed than portions around it is provided to the lumbar support portion 71L of the back shell 71 in order to direct a deformation characteristic of the back shell 71, the back shell 71 can reliably protrude the lumbar support portion 71L forward while the whole back shell 71 is curved and deformed when the upper back frame 61 tilts back about the pivot point (third support shaft X3). Especially because the deformation trigger means 713 is made up of the plurality of slits 713a extending in the lateral width direction of the back shell 71 in the embodiment, it is possible to achieve the deformation trigger means 713 by an extremely easy method.

[0061] The invention is not limited to the embodiment described above in detail.

[0062] For example, although the upper back frame 61 has the overhanging portion 612 extending in the predetermined direction from the pivot point (third support shaft X3) and the resilient body (second coil spring 63) for generating the reaction force as the upper back frame 61 tilts back is provided between the overhanging portion 612 and the lower back frame 62 in the embodiment, the lower back frame may have an overhanging portion further extending in a predetermined direction (e. g. , upward) from the pivot point between the upper back frame and itself and a resilient body for generating a reaction force as the upper back frame tilts back may be disposed between the overhanging portion and the upper back frame.

[0063] As the resilient body for generating the reaction force as the upper back frame tilts back, it is possible to use what is called a coil spring with its axial direction substantially aligned with the lateral width direction of the chair and its opposite end portions extending away from each other from an axial center or rubber. Furthermore, the overhanging portion provided to either one of the upper back frame and the lower back frame may pull the resilient body disposed between the overhanging portion and the other frame in such a direction as to accumulate the resilience as the upper back frame tilts back.

[0064] The upper back frame 61 supports the back shell upper portion 71T while engaged with the back shell upper portion 71T for sliding movements in the height direction in the example shown in the embodiment. Instead, the lower back frame may support the lower portion of the back shell while engaged with the lower portion for sliding movements in the height direction or the both the upper back frame and the lower back frame support the back shell while engaged with the back shell for sliding movements in the height direction. In other words, the slide engagement mechanism for allowing relative sliding movements of the back shell and the back support post may be provided only between the upper back frame and the back shell, only between the lower back frame and the back shell, or between each of the back frames and the back shell. Furthermore, a distance of sliding may be changed appropriately according to specifications and the like. Although the engagement portion is engaged in the engagement hole in the example shown in the embodiment, an engagement groove may be employed in place of the engagement hole. Moreover, as the slide engagement mechanism, an engagement re-

cessed portion such as an engagement hole and an engagement groove may be integrally provided to the back shell and an engagement protruding portion that can be engaged in the engagement recessed portion by sliding may be provided to the back frame. For example, as shown in FIG. 13, a pocket-shaped engagement recessed portion 714' open downward is integrally provided to a back face of the back shell 71 (back shell upper portion) and an upward engagement protruding portion 611' which is in an L shape in the side view and which can be inserted into the engagement recessed portion 714' from below is provided to the back support post (upper back frame 61). As the upper back frame 61 tilts back, an amount of covering of the engagement protruding portion 611' with the engagement recessed portion 714' is reduced in such a range as not to disengage the engagement protruding portion 611' and the engagement recessed portion 714' from each other. In this way, the back shell 71 can slide in the height direction with respect to the back support post (upper back frame 61). In this case, it is possible to engage the engagement recessed portion and the engagement protruding portion with each other by slipping the back shell over the back support post from above, which facilitates an assembly operation.

[0065] The back support post made up of the upper back frame and the lower back frame may be provided to each of the opposite side edge portions of the back shell or portions near the opposite side edge portions of the back shell. In other words, the chair may include a plurality of (including three or more) back support posts each made up of the upper back frame and the lower back frame.

[0066] In place of the slits extending in the lateral width direction of the back shell as the deformation trigger means, thin-walled portions (thin-walled hinges), notch portions formed by notching the opposite side edges of the back shell in the lateral width direction toward the center, or a plurality of holes formed at equal intervals or intermittently along the lateral width direction of the back shell may be employed.

[0067] Moreover, the lower back frame may support a portion of the back shell near the lower end portion instead of the lower end portion.

[0068] The specific structures of the respective portions are not limited to those in the above-descried embodiment but can be changed in various ways without departing from the gist of the invention.

INDUSTRIAL APPLICABILITY

[0069] As described above, according to the invention, it is possible to provide the chair having not only the synchronous rocking function but also the back tilting function. The chair does not require a special mechanism for protruding the lumbar support portion forward when the chair is shifted from the normal state in which no load is applied on the backrest to the back tilt state in which only the backrest is tilted back, the structure of the chair can be simplified, and the chair is excellent in practicality, because it does not require special operation for protruding the lumbar support portion forward of the seated person.

Claims

1. A chair including a seat for moving in synchronization with backward tilting operation of a backrest mainly made up of an elastically deformable back shell,
wherein a back support post which is pivoted at its lower end portion or its portion near the lower end portion on a support base portion disposed below the seat and which supports the back shell includes an upper back frame for supporting a portion of the back shell above a lumbar support portion of the back shell capable of supporting a lumbar part of a seated person and a lower back frame for supporting a lower end portion or a portion near the lower end portion of the back shell, the back frames are pivoted on each other, the pivot point is set behind the lower end portion of the back shell, and the whole back shell is curved and deformed to protrude the lumbar support portion relatively forward as the upper back frame tilts back about the pivot point with respect to the lower back frame.

2. The chair according to claim 1, wherein either one of the upper back frame and the lower back frame has an overhanging portion extending in a predetermined direction from the pivot point and a resilient body for generating a reaction force as the upper back frame tilts back is disposed between the overhanging portion and the other back frame.

3. The chair according to claim 1 or 2, wherein a space is formed between the upper back frame and the lumbar support portion of the back shell.

4. The chair according to any one of claims 1 to 3, wherein at least one of the upper back frame and the lower back frame supports the back shell while engaged with the back shell for sliding movements in a height direction.

5. The chair according to any one of claims 1 to 4, wherein the one back support post including the upper back frame and the lower back frame is disposed at a substantially central portion in a lateral width direction of the back shell.

6. The chair according to any one of claims 1 to 5, wherein a deformation trigger means which is more likely to be deformed than portions adjacent to the lumbar support portion is provided to the lumbar support portion of the back shell in order to direct a deformation characteristic of the back shell.

7. The chair according to claim 6, wherein the deformation trigger means is one or a plurality of slit (s) extending in the lateral width direction of the back shell.

Fig.1

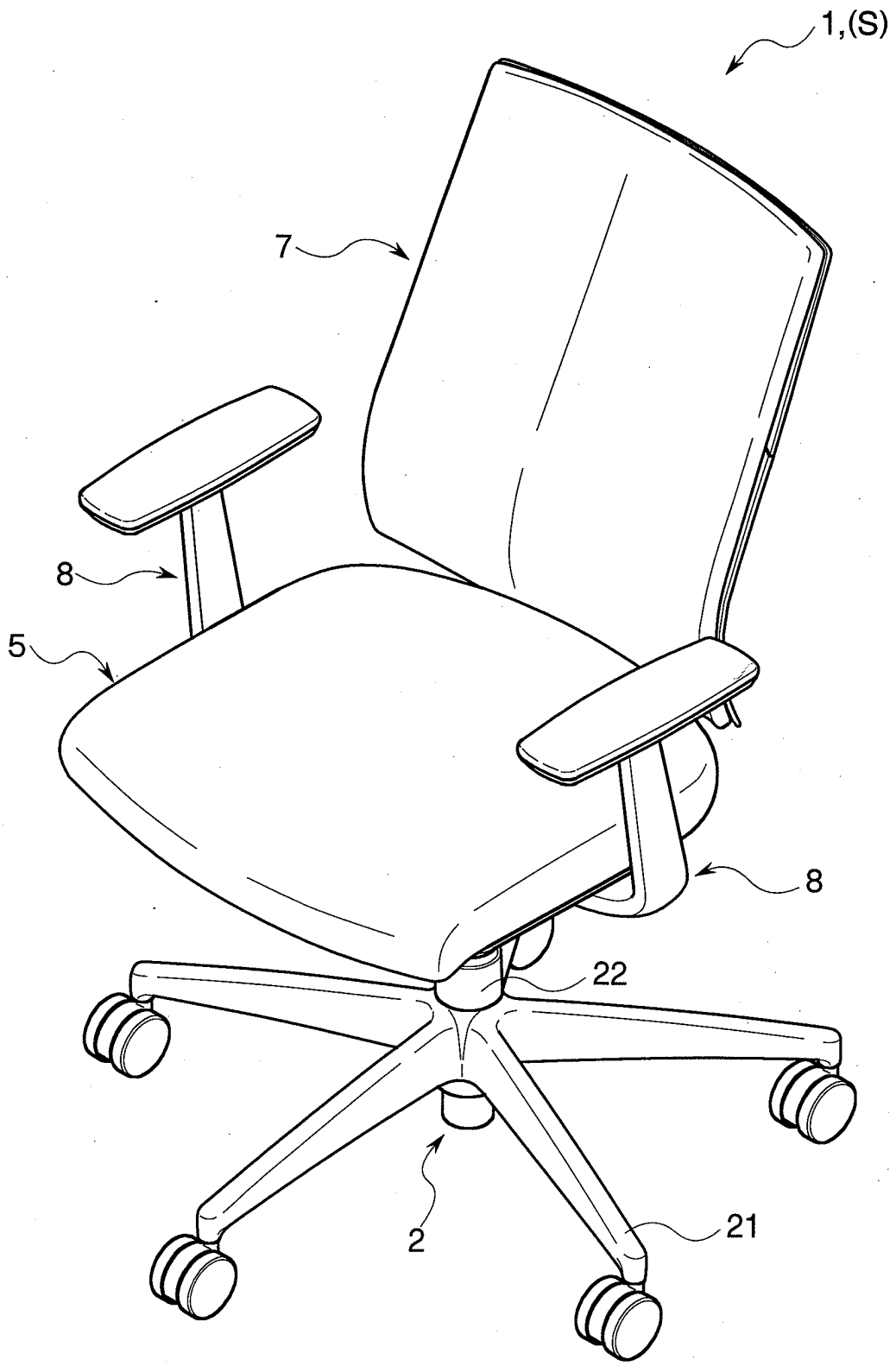

Fig.2

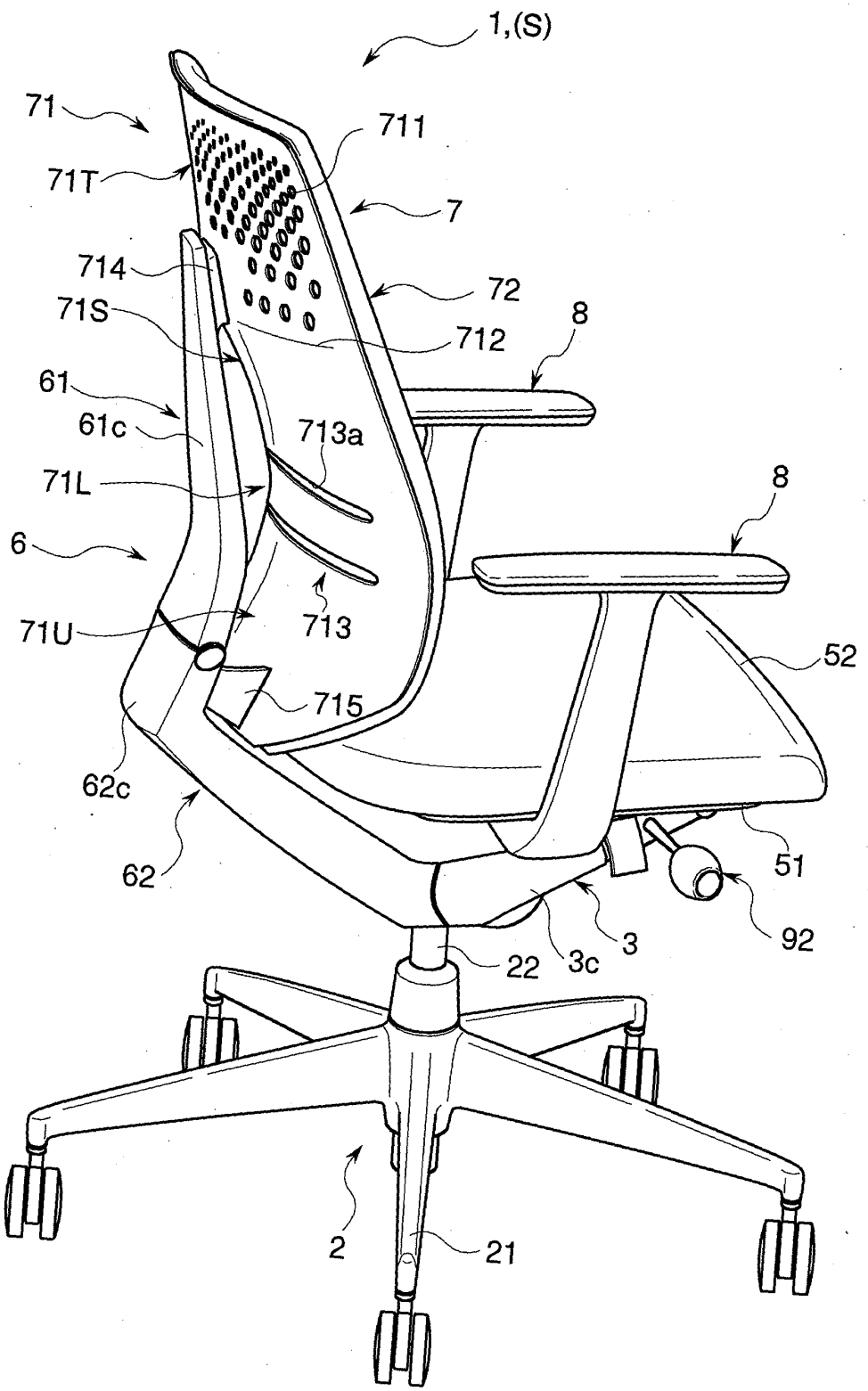
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Fig.3

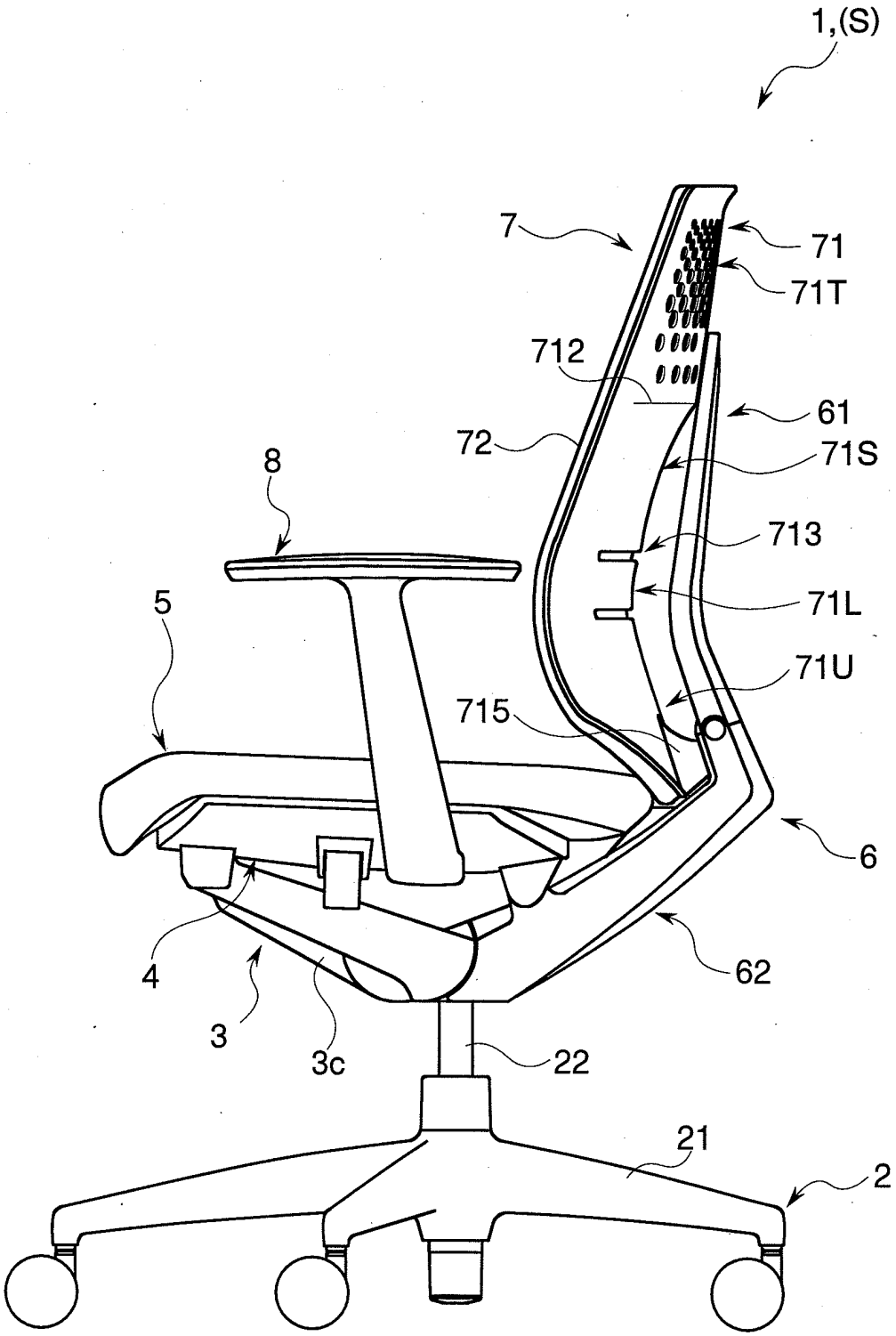


Fig.4

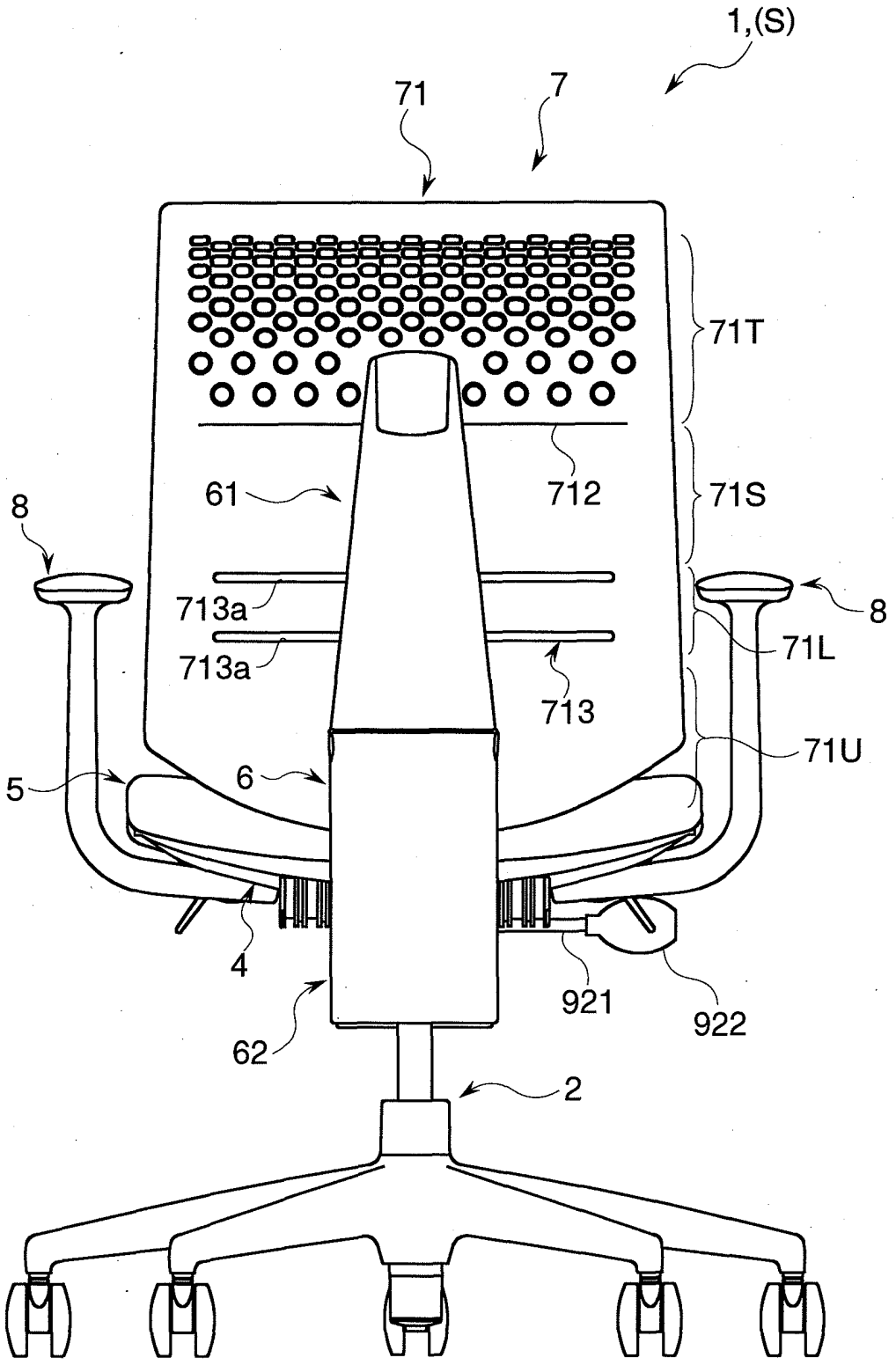
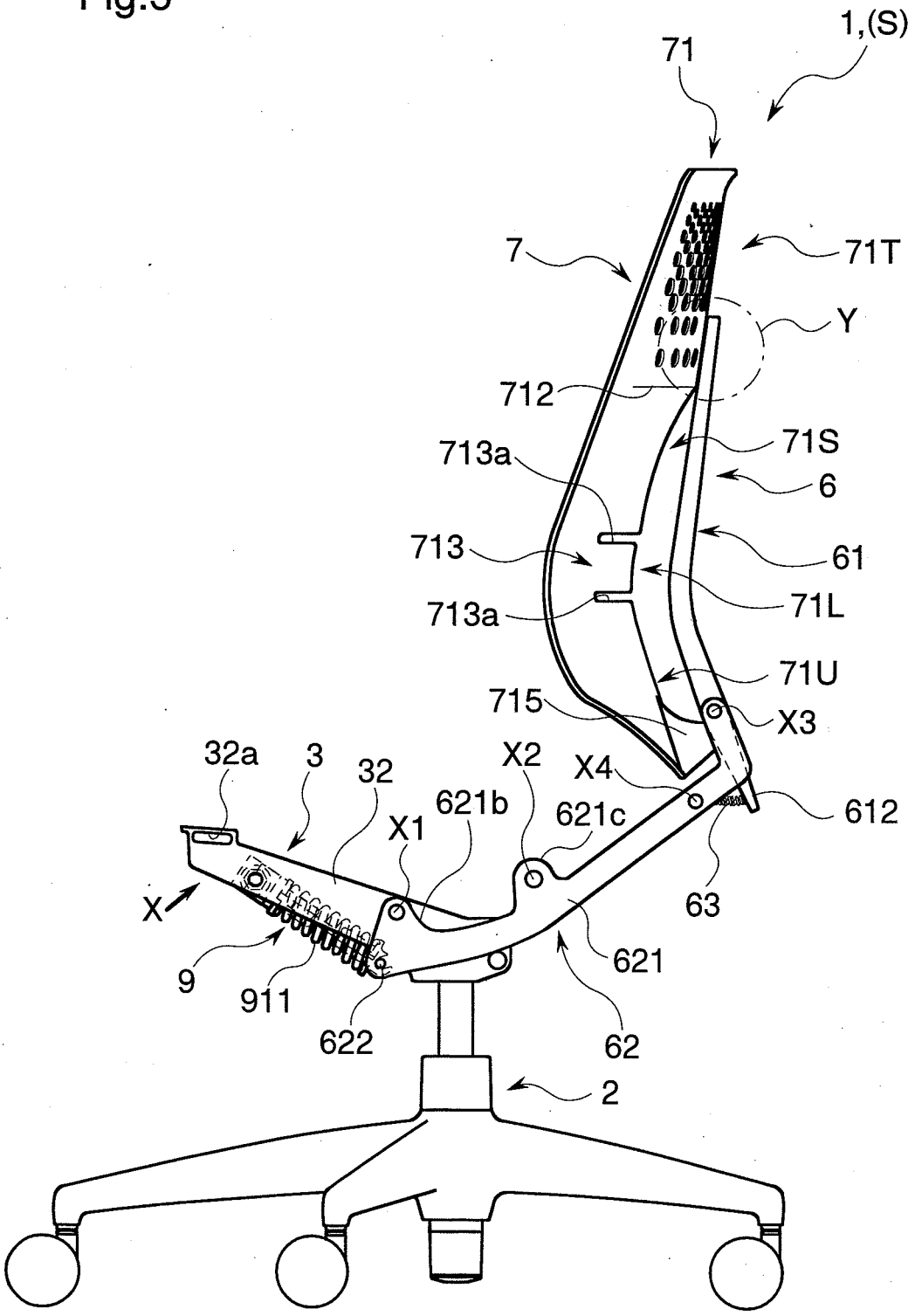


Fig.5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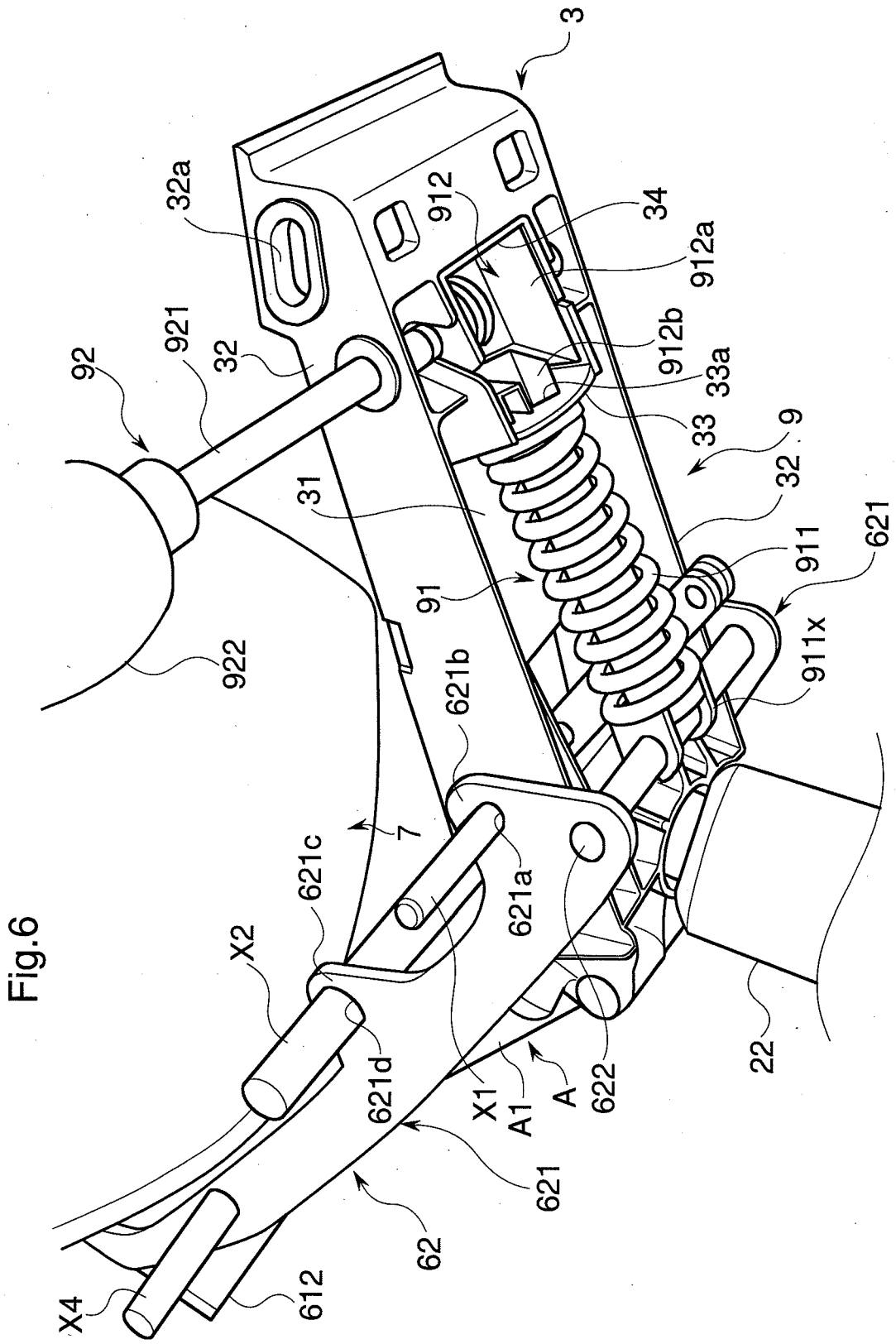
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Fig.6

Fig.7

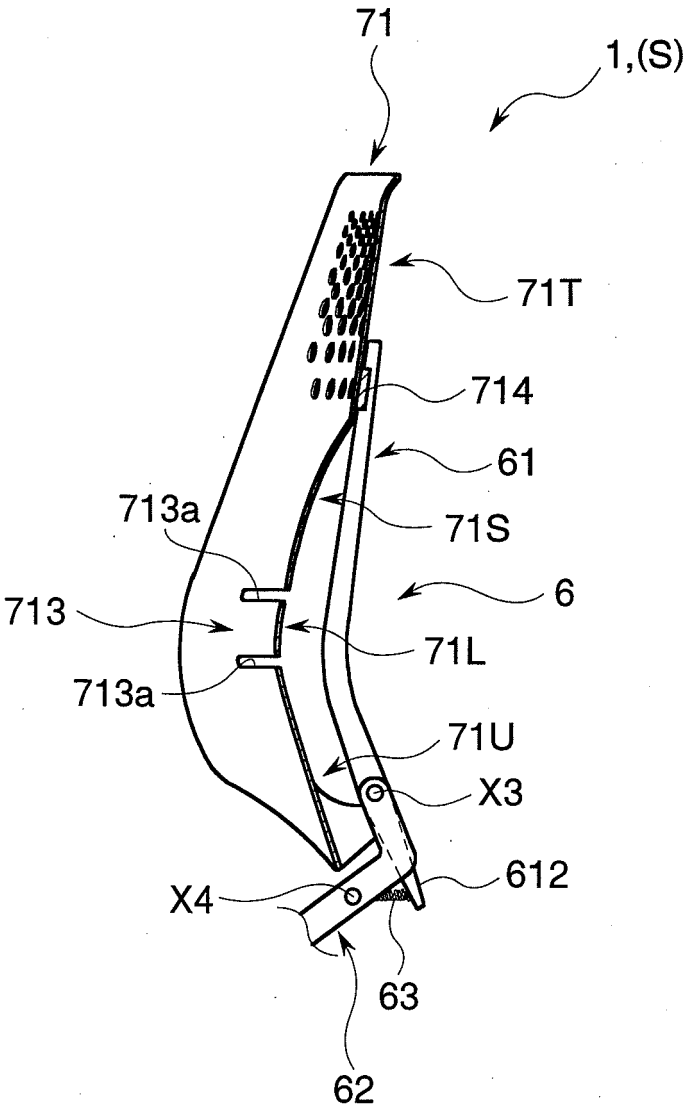

Fig.8

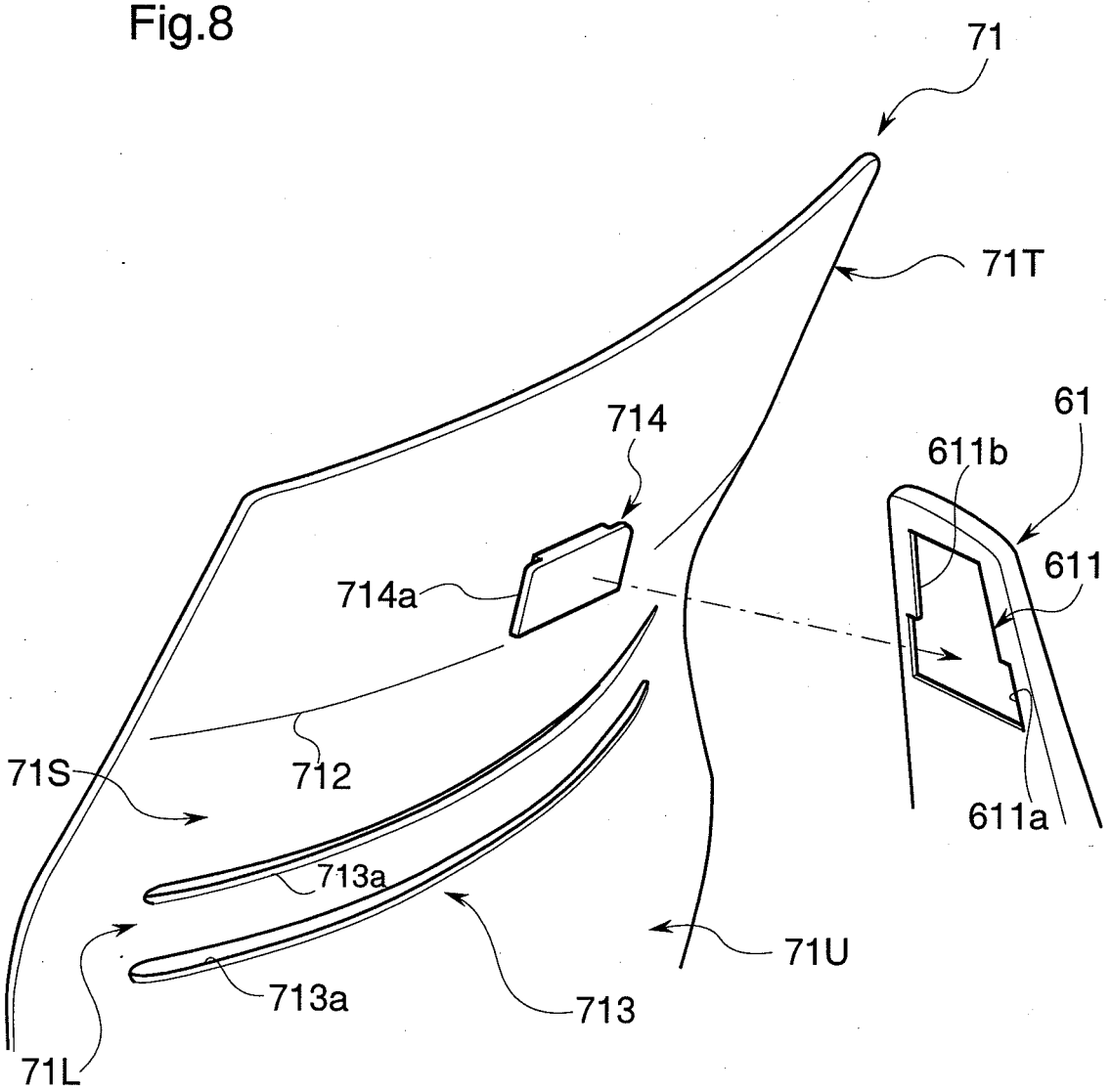

Fig.9

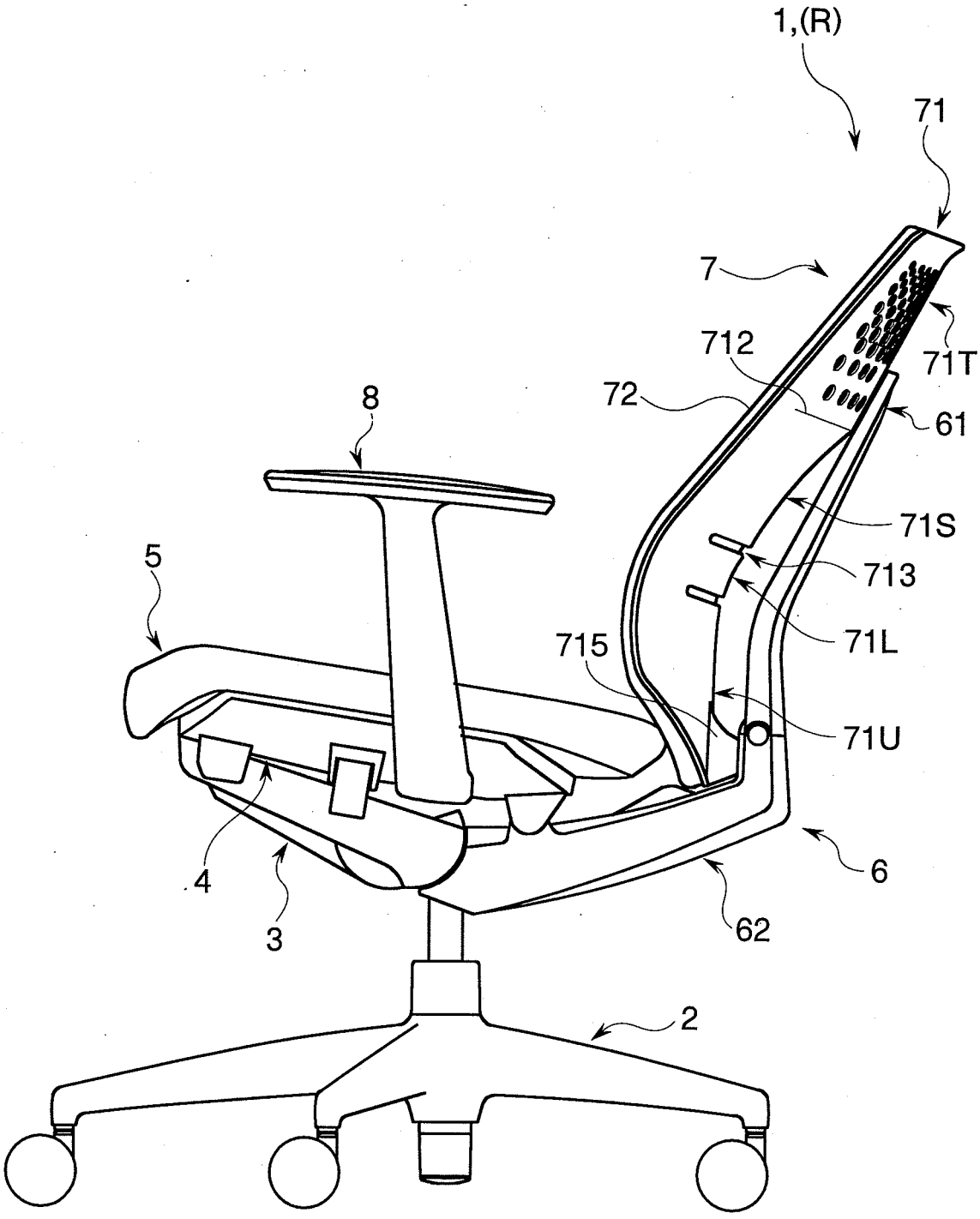

Fig.10

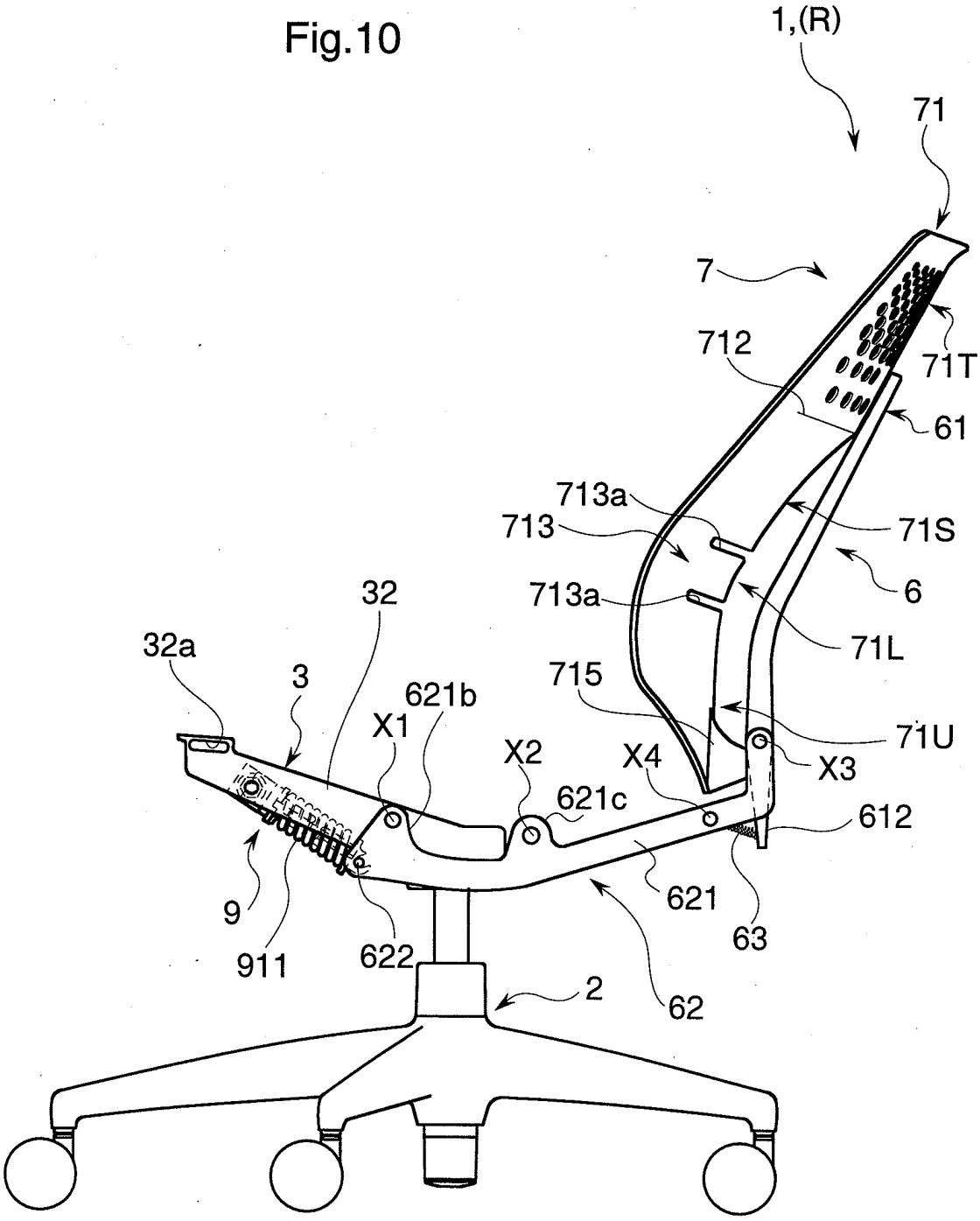
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Fig.11

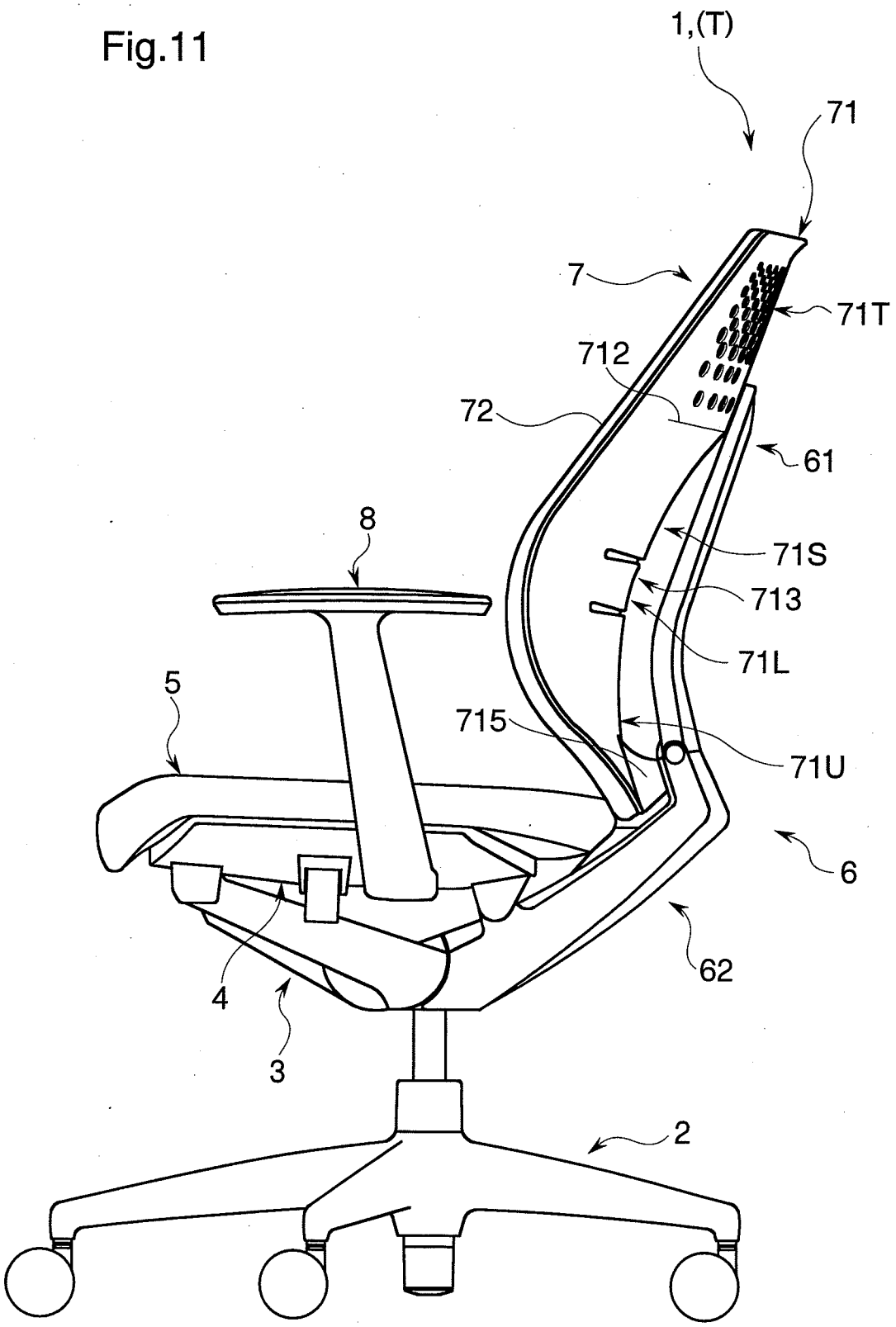

Fig.12

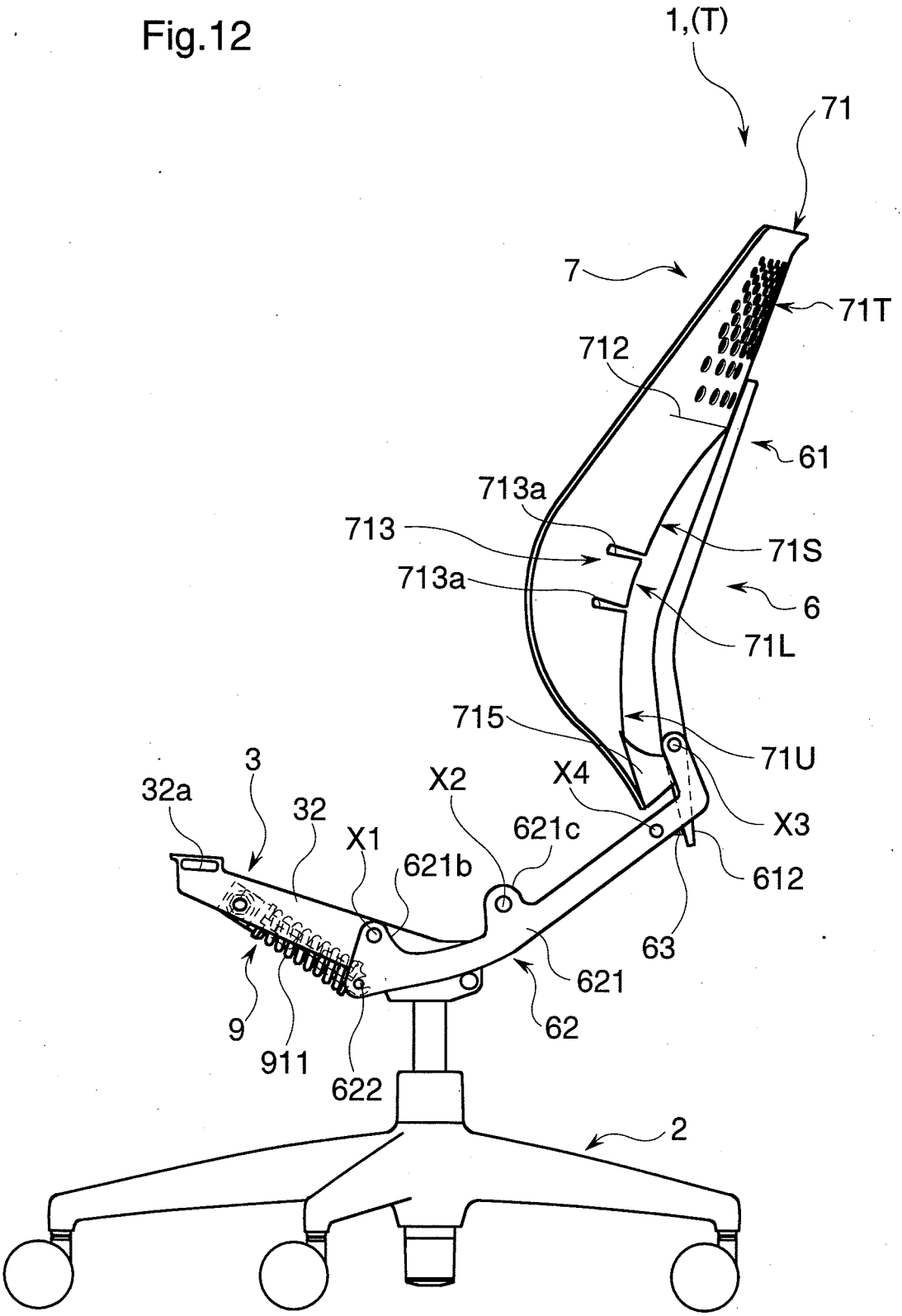
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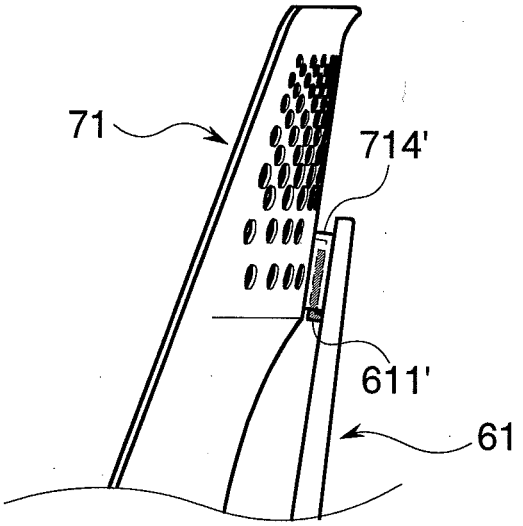
Fig.13

(a)



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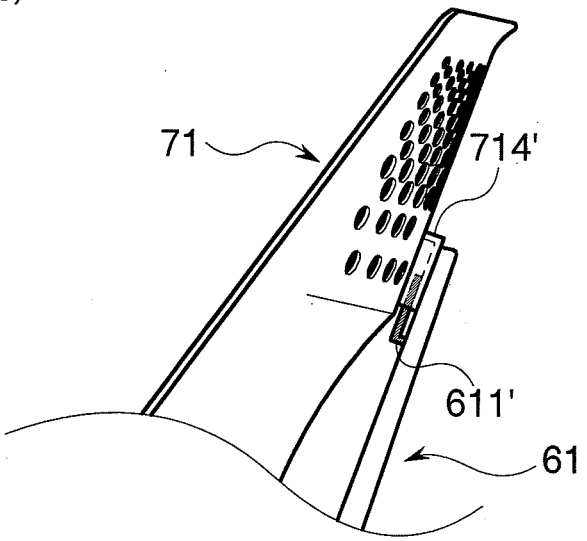

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2008/064032

A. CLASSIFICATION OF SUBJECT MATTER
A47C3/026(2006.01)i, *A47C7/46*(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A47C3/026, A47C7/46

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2008
Kokai Jitsuyo Shinan Koho 1971-2008 Toroku Jitsuyo Shinan Koho 1994-2008

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	JP 2507575 Y2 (Itoki Crebio Corp.), 14 August, 1996 (14.08.96), Full text; all drawings (Family: none)	1,3,4,6,7 2,5
Y	JP 2007-307425 A (Kokuyo Co., Ltd.), 29 November, 2007 (29.11.07), Column 15; all drawings (Family: none)	2
Y	JP 2002-282081 A (Kokuyo Co., Ltd., Tamagawa K-12 & University), 02 October, 2002 (02.10.02), Column 19; Fig. 1 (Family: none)	5

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:
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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
29 August, 2008 (29.08.08)	09 September, 2008 (09.09.08)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (April 2007)

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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