



(11)

EP 4 740 795 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
13.05.2026 Bulletin 2026/20

(51) International Patent Classification (IPC):
A47C 7/38 (2006.01)

(21) Application number: **25156983.6**

(52) Cooperative Patent Classification (CPC):
A47C 7/38

(22) Date of filing: **10.02.2025**

(84) Designated Contracting States:
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC ME MK MT NL
NO PL PT RO RS SE SI SK SM TR**
Designated Extension States:
BA
Designated Validation States:
GE KH MA MD TN

(71) Applicant: **ATEC International Team Co., Ltd.**
Taoyuan City 33857 (TW)

(72) Inventor: **Chen, Te-Chun**
33857 Taoyuan City (TW)

(74) Representative: **Straus, Alexander**
2K Patentanwälte - München
Bajuwarenring 14
82041 Oberhaching (DE)

(30) Priority: **07.11.2024 TW 113142726**

(54) **CHAIR HEADREST ASSEMBLY**

(57) A chair headrest assembly (100) comprising a headrest body (120) that can be vertically adjusted as a single unit relative to a support frame (100, 110) attached to the chair back. The headrest body (120) is pivotally connected to the top of the support frame (100, 110) via a pivot (1122) that passes through slightly curved openings (1226) extending vertically on both sides of the rear portion (122) of the headrest body (120). A track (140) with teeth (142, 1322) is mounted on the inner surface (1221) of the rear portion (122), and a damping gear mechanism (130) is pivotally connected to the pivot (1122) and meshed with the track (140). This meshing allows controlled vertical and angular adjustment of the headrest body (120), providing smooth movement and maintaining the headrest position without the need for additional locking mechanisms. The simplified structure enhances user comfort by eliminating interference with the user's neck and reduces manufacturing complexity.

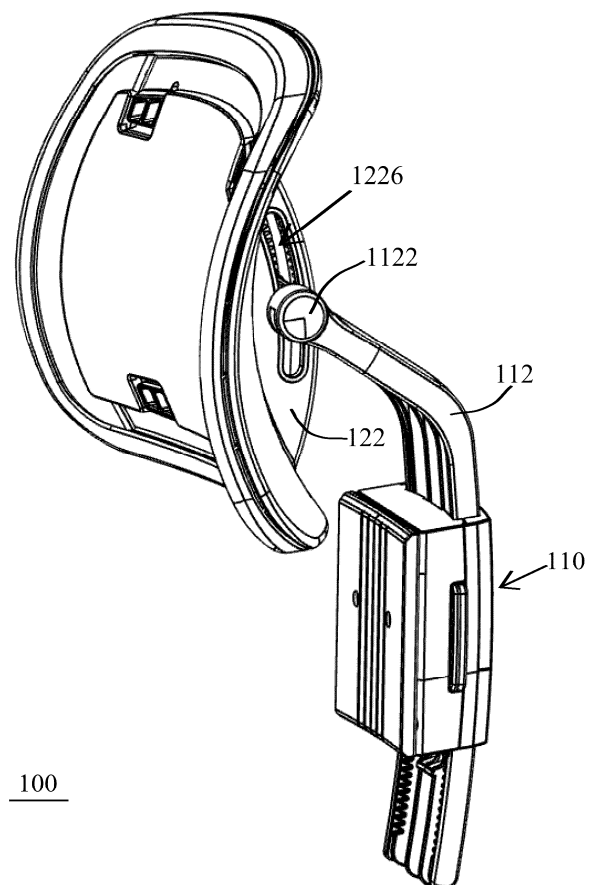


FIG. 1

Description

FIELD OF THE DISCLOSURE

[0001] The present invention relates to ergonomic furniture, particularly to an adjustable chair headrest. More specifically, the invention pertains to a chair headrest with vertical and angular adjustability to enhance user comfort and provide improved support for the head and neck.

BACKGROUND OF THE INVENTION

[0002] Adjustable chair headrests are commonly integrated into office chairs, gaming chairs, and other seating solutions to provide support and comfort to users during prolonged periods of sitting. Traditional headrest designs typically feature fixed or limited adjustment structures, allowing the headrest to tilt to a certain angle or adjust vertically within a predefined range.

[0003] A notable example of prior art is U.S. Patent No. 9,380,878, which discloses a chair headrest assembly comprising front components, intermediate components, and rear components. This design achieves vertical and angular adjustments through a combination of pivot mechanisms and fastening components, allowing users to customize the position of the headrest according to their preferences.

[0004] Despite advancements in existing designs, several limitations remain that affect user comfort and the overall functionality of chair headrests. For instance, the design disclosed in U.S. Patent No. 9,380,878 includes multiple interconnected front, intermediate, and rear components. This complexity increases manufacturing costs, assembly time, and the potential risk of mechanical failures. Additionally, the increased number of components necessitates more complicated maintenance procedures, which may shorten product lifespan and increase the likelihood of wear and tear. Moreover, the integration of multiple components may result in a headrest design that is overly bulky, failing to meet modern ergonomic aesthetics or space-saving requirements. Furthermore, the complex assembly restricts easy customization or adjustment of the headrest design to accommodate different chair models or user preferences, limiting its applicability across various seating solutions. The precision alignment and complex assembly of numerous components require higher production costs, potentially translating to higher retail prices and reduced market competitiveness. Additionally, the precise alignment and complex assembly processes of numerous components may lead to higher defect rates and lower overall product reliability.

[0005] Moreover, in the adjustment process, the design in U.S. Patent No. 9,380,878 keeps the rear components stationary, which may cause interference between the user's neck and the rear portion of the headrest, particularly during extended use. The static rear portion could press against the user's neck, causing

discomfort.

[0006] Furthermore, in existing office chair designs, although some headrests offer vertical and angular adjustments, the range and smoothness of these adjustments are often limited. Users of varying heights and seating postures may find it difficult to achieve an optimal headrest position that provides adequate support without causing pressure.

[0007] Given the above limitations, there is a clear need for a more simplified and ergonomically compliant chair headrest design. For example, reducing the number of components to enhance manufacturing efficiency, lower costs, and minimize maintenance requirements; additionally, providing interference-free vertical and angular adjustments to improve overall user comfort during use.

SUMMARY OF THE INVENTION

[0008] The present invention provides an improved chair headrest assembly that addresses the ergonomic and structural limitations of traditional headrest designs. Specifically, the invention introduces a simplified and streamlined headrest structure, enhancing user comfort, adjustment convenience, and manufacturing efficiency.

[0009] Unlike existing technologies that include multiple interconnected front, intermediate, and rear components, the proposed headrest design omits the intermediate component. This reduction in component complexity achieves a more streamlined assembly, lowers manufacturing costs, and simplifies the assembly and maintenance processes. In this embodiment, the headrest body comprises an integrated rear portion and front portion. The rear portion serves as the support framework for the front portion, ensuring structural stability while allowing smooth adjustments. This integrated design eliminates static components that could cause ergonomic issues, such as interference with the user's neck, thereby enhancing overall user comfort.

[0010] Additionally, the track mechanism installed on the inner surface of the rear portion features a series of teeth. These tracks provide precise and controlled pathways for vertical adjustment of the headrest. In the present invention, the number of tracks in the track mechanism can be adjusted as needed, accommodating one, two, or even three or more tracks.

[0011] The chair headrest assembly of the present invention also includes a damping gear mechanism, which is pivotally connected to a pivot at the top of the support frame. The damping gear mechanism is enclosed within the headrest body and meshes with the teeth of the track, providing resistance during vertical adjustments. This setup ensures that the headrest can move vertically with controlled force, maintaining its position securely without the need for additional locking mechanisms.

[0012] Furthermore, in one embodiment, the pivot located at the top end of the support frame passes through

slightly curved openings extending vertically on both sides of the rear portion of the headrest. The slight curvature of these openings allows the headrest to simultaneously perform vertical and angular adjustments during movement. This dual adjustment capability ensures that the headrest appropriately tilts during vertical movement, providing optimal ergonomic support tailored to the user's height and seating posture.

[0013] The coordinated movement of the rear and front portions of the headrest minimizes the risk of neck interference, promoting a comfortable and natural resting posture for the user's head and neck. The damping gear mechanism ensures that the adjustment process is smooth and gradual by preventing sudden movements and maintaining stability during and after adjustments, thereby enhancing the user experience. Additionally, the integration and enclosure design of the damping gear mechanism and tracks, protected by a protective cover, improves the durability of the headrest by preventing internal components from being affected by dust and debris. Furthermore, the streamlined appearance adds sophistication and a modern feel, making the headrest suitable for various chair designs and environments.

[0014] In summary, the present invention offers the following advantages:

1. Simplified Structure: Reduced number of components lowers manufacturing costs, simplifies assembly, and enhances reliability.
2. Improved Ergonomics: By ensuring all moving parts of the headrest operate in unison, interference with the neck is eliminated, providing consistent and comfortable support.
3. Controlled Adjustability: Combining toothed tracks with a pivotally connected damping gear mechanism enables precise and stable height and angle adjustments without the need for additional locking mechanisms.
4. Durability and Protection: Enclosing critical moving components within the headrest body protects them from environmental factors, extending product lifespan.

[0015] Overall, the present invention introduces a novel chair headrest assembly that significantly improves upon existing designs through a simplified structure, enhanced ergonomic support, and a reliable and user-friendly adjustment mechanism. The combination of tracks and pivotally connected damping gear mechanisms, along with the use of curved vertical openings for synchronized adjustment, provides an outstanding solution that meets diverse user needs while maintaining manufacturing efficiency and aesthetic appeal.

[0016] To make the above features and advantages of the present invention more apparent and understandable, a preferred embodiment is exemplified below, in conjunction with the accompanying drawings, for detailed description.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017]

FIG. 1 is an external view of the chair headrest assembly according to the present invention.

FIG. 2A is a view of the inner surface of the rear portion of the headrest body in the embodiment when the protective cover is not installed in the recess.

FIG. 2B is a view of the inner surface of the rear portion of the headrest body in the embodiment when the protective cover is installed in the recess. FIG. 2C illustrates the internal structure of the protective cover.

FIG. 3 is an external view of the headrest body in the embodiment.

FIG. 4 is an external view of the damping gear mechanism in the embodiment.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0018] The present invention relates to an improved chair headrest assembly, aimed at enhancing ergonomic support, facilitating adjustment, and simplifying the manufacturing process. The following detailed description elucidates the structure, components, and operational mechanisms of the headrest assembly, with reference to the accompanying drawings illustrating specific embodiments of the invention.

[0019] Referring to FIG. 1, FIG. 1 illustrates an external view of one embodiment of the chair headrest assembly according to the present invention. The chair headrest assembly 100 comprises a support frame 110, designed to be securely attached to the chair back. The chair headrest assembly 100 also includes a headrest body 120, which comprises a rear portion 122 and a front portion 124. Next, refer concurrently to FIG. 2A, which depicts the inner surface 1221 of the rear portion 122 in this embodiment. On the inner surface 1221 of the rear portion 122 of the headrest body 120, at least one track 140 with multiple teeth 142 is provided.

[0020] As shown in FIG. 1, the support frame 110 constitutes the fundamental structure of the chair headrest assembly 100. It includes a central support column 112 extending vertically from the chair back (not shown), providing the necessary structural strength to support the headrest body 120 and the user's head. At the upper end of the central support column 112, a pivot 1122 is provided in a hinged manner, serving as the pivot point with the headrest body 120. In this embodiment, the support frame 110 is made of high-strength materials such as steel or reinforced aluminum to ensure durability and stability under the load exerted by the user's head. Additionally, the chair headrest assembly 100 includes a damping gear mechanism 130, which is pivotally connected to the top of the support frame 110 via the pivot

1122. The headrest body 120 can be vertically adjusted as a whole relative to the support frame 100.

[0021] Refer to FIG. 3, which illustrates an external view of the headrest body 120 in this embodiment. In this embodiment, the headrest body 120 is ergonomically contoured to provide optimal support for the user's head. It comprises a rear portion 122 and a front portion 124, which are integrally connected via multiple fasteners 1222, allowing the headrest body 120 to move as a unified whole. The rear portion 122 forms the structural support of the headrest body 120 and houses internal components such as the track 140 and damping gear mechanism 130. The front portion 124 includes a cushioning layer made of foam or other elastic materials, providing a soft contact surface for the head and neck, thereby enhancing user comfort during extended periods of use. This integrated design ensures that the rear portion 122 and front portion 124 move synchronously during adjustment, eliminating any static components that might interfere with the user's neck.

[0022] Mounted on the inner surface 1221 of the rear portion 122 is a track 140, which serves as a component for vertical adjustment. As shown in FIG. 2A, the track 140 features a series of uniformly spaced teeth 142 along its length, forming a rack-like structure. These teeth 142 are designed with complementary profiles to ensure meshing with the teeth 1322 of the damping gear mechanism 130 (as shown in FIG. 4). In this embodiment, the track 140 is integrally formed on the inner surface 1221 of the rear portion 122. However, in other embodiments, the track 140 can be securely mounted using fasteners such as screws or adhesives and made from durable materials, such as hardened steel or engineering plastics like polyoxymethylene, to withstand repeated adjustments and minimize wear. In this embodiment, there are two tracks 140, but a person skilled in the art could set the number of tracks 140 to three or more. Multiple tracks 140 are typically arranged in parallel to uniformly distribute the load and enhance the stability of the headrest body 120 during adjustment.

[0023] Refer to FIG. 4, which illustrates an external view of the damping gear mechanism 130 in this embodiment. The damping gear mechanism 130 plays a critical role in achieving controlled vertical adjustment. The damping gear mechanism 130 comprises at least one (two in this embodiment) damping gears 132 with teeth 1322 that are complementary and tightly meshing with the teeth 142 of the track 140. The damping gear mechanism 130 is mounted on the pivot 1122 of the support frame 110, designed to rotate relative to the support frame 110 while remaining within the headrest body 120. The damping gears 132 are equipped with damping elements (not shown), such as friction pads or viscous fluid chambers, which provide resistance during rotation. This resistance ensures that adjustments require intentional manual force, allowing the headrest body 120 to move smoothly and maintain its position securely after adjustment without the need for additional locking me-

chanisms. Refer also to FIG. 2A and FIG. 2B, wherein the damping gear mechanism 130 is enclosed within a recess 1223, and a protective cover 1224 is secured over the recess 1223 to protect the damping gears 132 and damping elements from dust, debris, and other environmental factors that could affect functionality, thereby reducing the risk of mechanical wear. Additionally, refer to FIG. 2C, which shows the interior side of the protective cover 1224, where it can be seen that biasing elements 1225 are provided on both sides of the protective cover 1224. These biasing elements 1225 are used to apply force to the damping gear mechanism 130 to maintain the meshing between the damping gears and the track.

[0024] Continuing with reference to FIG. 1, FIG. 2A, and FIG. 2B, a notable feature of the chair headrest assembly 100 in this embodiment is the presence of vertically extending, slightly curved openings 1226 on both the left and right sides of the rear portion 122. These openings 1226 are designed to accommodate the pivot 1122, and in this embodiment, the openings 1226 are slightly curved to allow simultaneous adjustment of both height and angle of the headrest body 120. When the headrest body 120 moves vertically along the track 140, the curvature of the openings 1226 causes the headrest to tilt forward and backward, aligning the angle of the headrest body 120 with the user's posture and seating position. This dual adjustment capability ensures that the headrest body 120 can accommodate users of different heights and adjust to various seating postures, thereby enhancing ergonomic support and user comfort.

[0025] In this embodiment, the headrest body 120, comprising the rear portion 122 and front portion 124, is typically manufactured using injection-molded plastics such as ABS or polypropylene, which balance strength, flexibility, and ease of molding complex shapes. The track 140 and damping gear 132 are made from materials that are wear-resistant and capable of maintaining smooth meshing during repeated use. These components preferably utilize high-strength metals such as steel or brass, or high-performance plastics with self-lubricating properties.

[0026] Compared to the prior art, the chair headrest assembly 100 in this embodiment features a simple and efficient assembly process. The modular structure of the components within the chair headrest assembly 100—including the support frame 110, headrest body 120, and damping gear mechanism 130—allows for easy integration without the need for special tools. The support frame 110 is connected to the chair back via standardized mounting points, which can be customized to accommodate different chair models. Once the support frame 110 is secured, the rear portion 122 of the headrest body 120 is connected to the pivot 1122, and the damping gear mechanism 130 is installed onto the pivot, meshing with the track 140. Subsequently, the protective cover 1224 is installed to enclose the damping gear mechanism 130 and to join the front portion 124 of the headrest body 120 to the rear portion 122. This essentially completes the

entire assembly process.

[0027] The operation of the chair headrest assembly 100 is intuitive and user-friendly. To adjust the height of the headrest body 120, the user simply applies manual force to the front portion 124, moving the headrest body 120 vertically along the track 140. As the headrest moves, the damping gear 132 rotates along the teeth 142 of the track 140, with the damping elements providing resistance to ensure controlled movement. The slightly curved openings 1226 guide the pivot 1122, causing the headrest body 120 to tilt appropriately during the lifting and lowering process. This synchronized vertical and angular adjustment ensures that the headrest aligns with the user's natural posture, providing optimal support without causing discomfort or interfering with the user's neck.

[0028] In summary, the design of the chair headrest assembly 100 offers significant ergonomic benefits. By eliminating intermediate components found in the prior art, the headrest body 120 moves as a unified unit, reducing the risk of interference with the user's neck and thereby enhancing overall comfort. The damping gear mechanism 130 ensures that adjustments are smooth and stable, preventing sudden movements and securely maintaining the position of the headrest body 120 after adjustment.

[0029] Alternative embodiments of the present invention may include variations in the number and configuration of tracks and damping gears to accommodate different chair designs or user preferences. For example, additional tracks and gears can be added to more evenly distribute the load and enhance stability, particularly for larger or more robust chair headrest assemblies. The curvature of the openings 1226 can also be adjusted to provide different ranges of angular adjustment, meeting specific ergonomic requirements or user needs.

[0030] Maintenance and durability are key considerations in the design of the chair headrest assembly. The use of wear-resistant materials for the track 140 and damping gear 132 ensures a long lifespan and long-term stable performance. The protective cover 1224 and recess 1223 shield the mechanical components from dust and debris, reducing the likelihood of contamination and mechanical failures. The modular assembly allows for easy disassembly and replacement of individual components when necessary, facilitating straightforward maintenance and repair procedures.

[0031] Additionally, user safety has been considered in the design of the chair headrest assembly 100. For example, the protective cover 1224 and recess 1223 eliminate the exposure of moving parts such as the damping gear mechanism 130, reducing the risk of injury from accidental contact. The damping gear mechanism 130 prevents unintended movement of the headrest body 120, ensuring that it remains securely in place when bearing the user's head load. Furthermore, the smooth edges and contoured surfaces of the headrest body 120 minimize the risk of discomfort or injury during use.

[0032] In conclusion, the detailed description of the present invention has revealed a chair headrest assembly that, through its simplified structure, integrated tracks and damping gear mechanisms, and enhanced ergonomic support, provides significant improvements over existing designs. The combination of vertical and angular adjustability, controlled damping resistance, and protective covers results in a headrest that is both user-friendly and durable, meeting the diverse needs of users across various seating applications.

Claims

1. A chair headrest assembly, comprising:

a support frame configured to be connected to a chair back, the support frame comprising a pivot located at an upper end thereof;
a headrest body, comprising:

a rear portion; and

a front portion connected to the rear portion;

at least one track installed on an inner surface of the rear portion of the headrest body, the track having a series of teeth along its length;
at least one damping gear mechanism pivotally connected to the pivot of the support frame and enclosed within the headrest body, the damping gear mechanism meshing with the teeth of the track;

wherein the rear portion of the headrest body has vertically extending openings on both sides, each opening configured to receive a corresponding end of the pivot;

wherein the meshing of the damping gear mechanism with the track allows the headrest body to be vertically adjusted relative to the support frame in a controlled manner.

2. The chair headrest assembly of claim 1, wherein the track comprises two parallel toothed tracks installed on an inner bottom surface of the rear portion, and the damping gear mechanism comprises two gears, each meshing with a respective toothed track.

3. The chair headrest assembly of claim 1, wherein the track is integrally formed on the inner surface of the rear portion of the headrest body.

4. The chair headrest assembly of claim 1, wherein the openings on the rear portion of the headrest body are vertically extending slots with a predetermined curvature, configured to guide ends of the pivot during vertical adjustment and correspondingly tilt the headrest body forward or backward.

5. The chair headrest assembly of claim 1, wherein the damping gear mechanism provides resistance during vertical movement, requiring manual force to adjust the headrest body, and maintains the position of the headrest body upon release. 5
6. The chair headrest assembly of claim 1, wherein the rear portion and the front portion of the headrest body are ergonomically contoured to support the user's head and neck, and do not interfere with the user's neck during use. 10
7. The chair headrest assembly of claim 1, further comprising a protective cover that encloses the damping gear mechanism and the pivot within the headrest body. 15
8. The chair headrest assembly of claim 7, wherein the damping gear mechanism includes a biasing element that applies force to maintain meshing between the damping gear and the track, and the biasing element is disposed on the protective cover. 20
9. The chair headrest assembly of claim 1, wherein the damping gear mechanism includes a biasing element that applies force to maintain meshing between the damping gear and the track. 25
10. The chair headrest assembly of claim 1, wherein the support frame comprises a central support column connected to the chair back, and the pivot is located at a top end of the central support column. 30

35

40

45

50

55

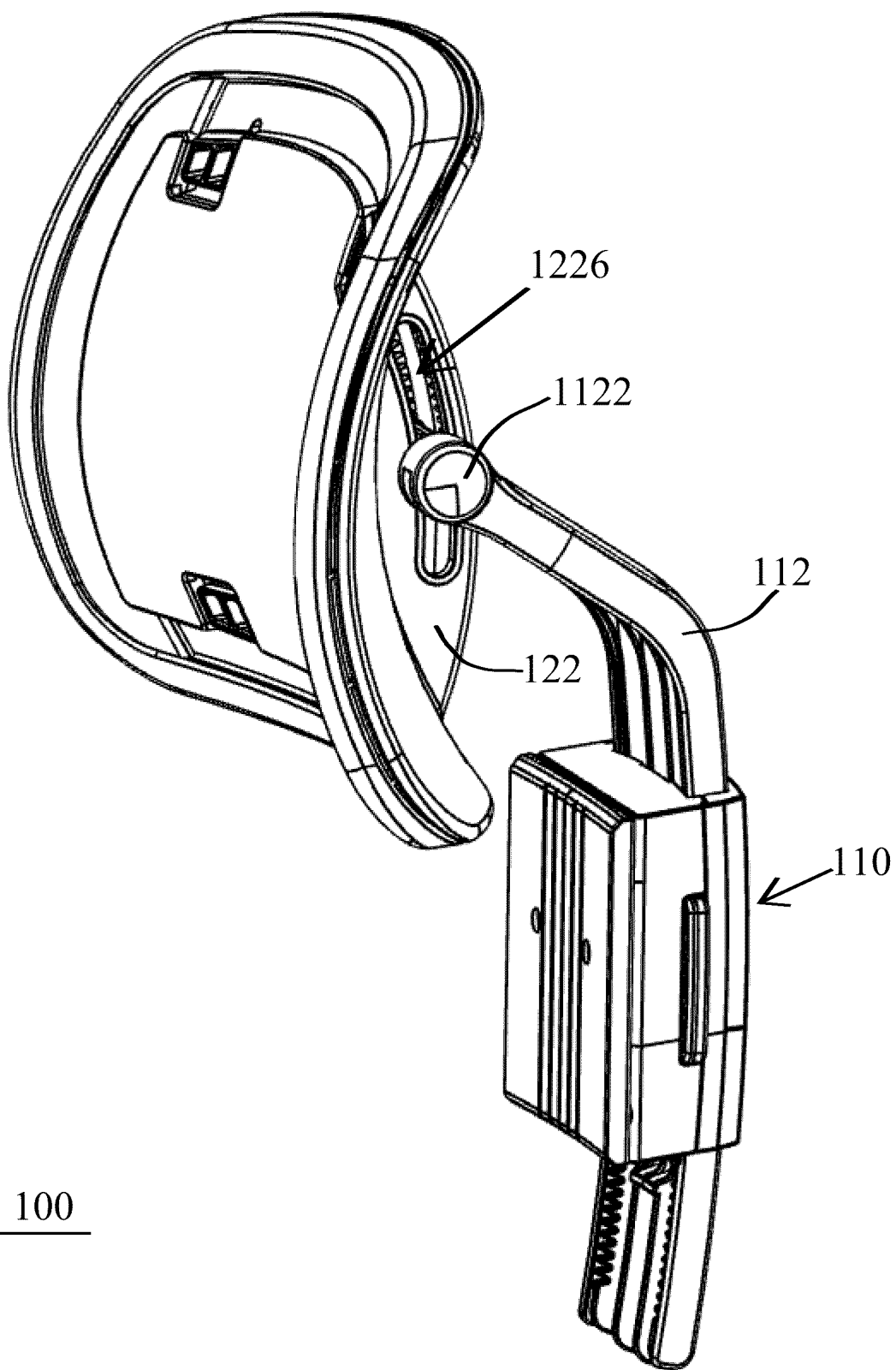
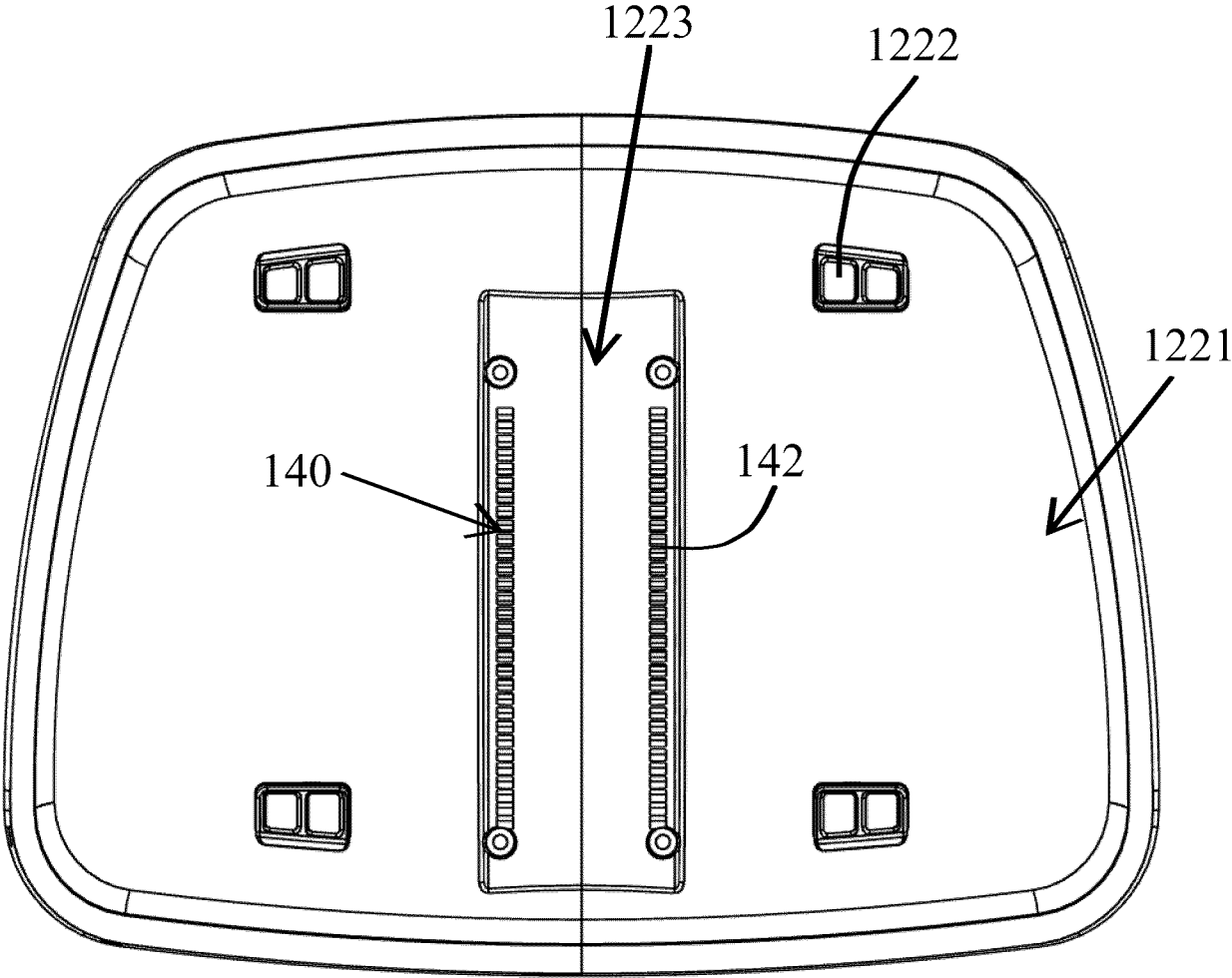
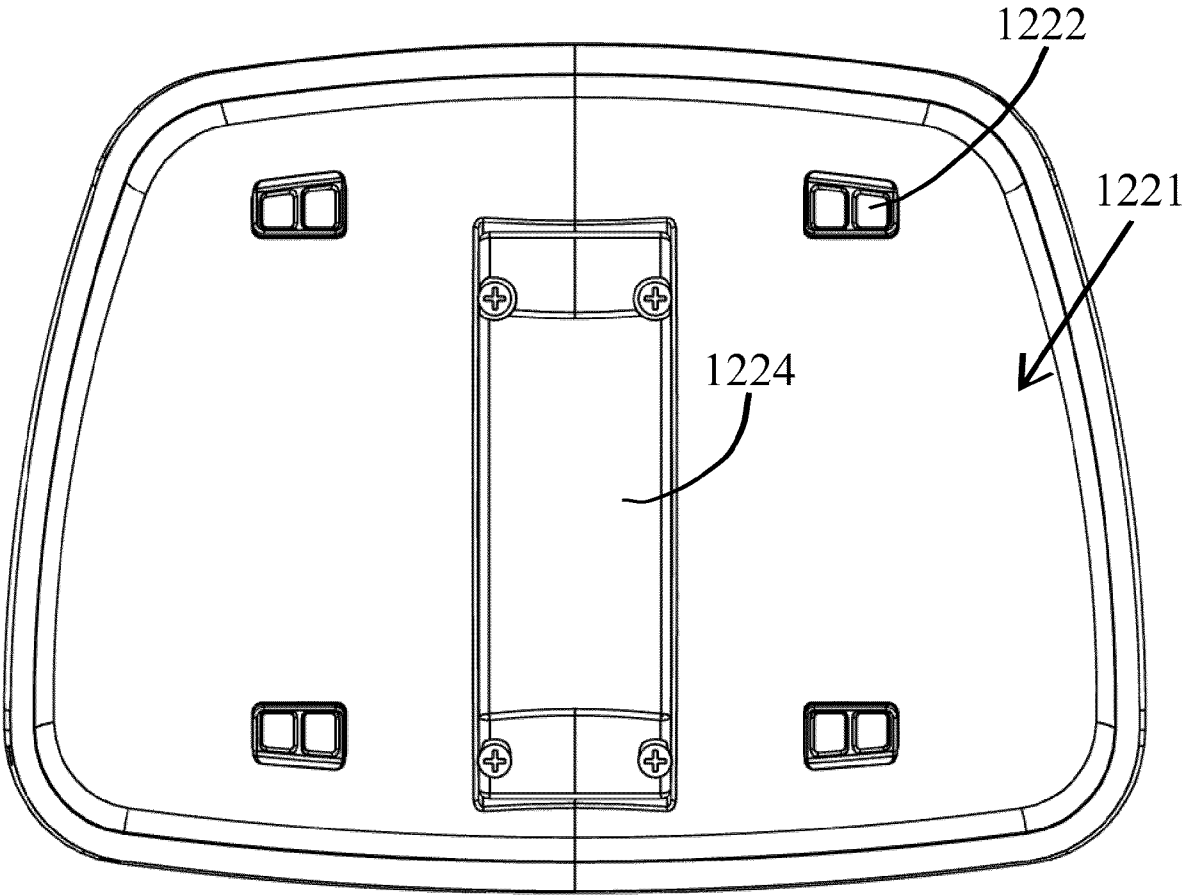


FIG. 1



122

FIG. 2A



122

FIG. 2B

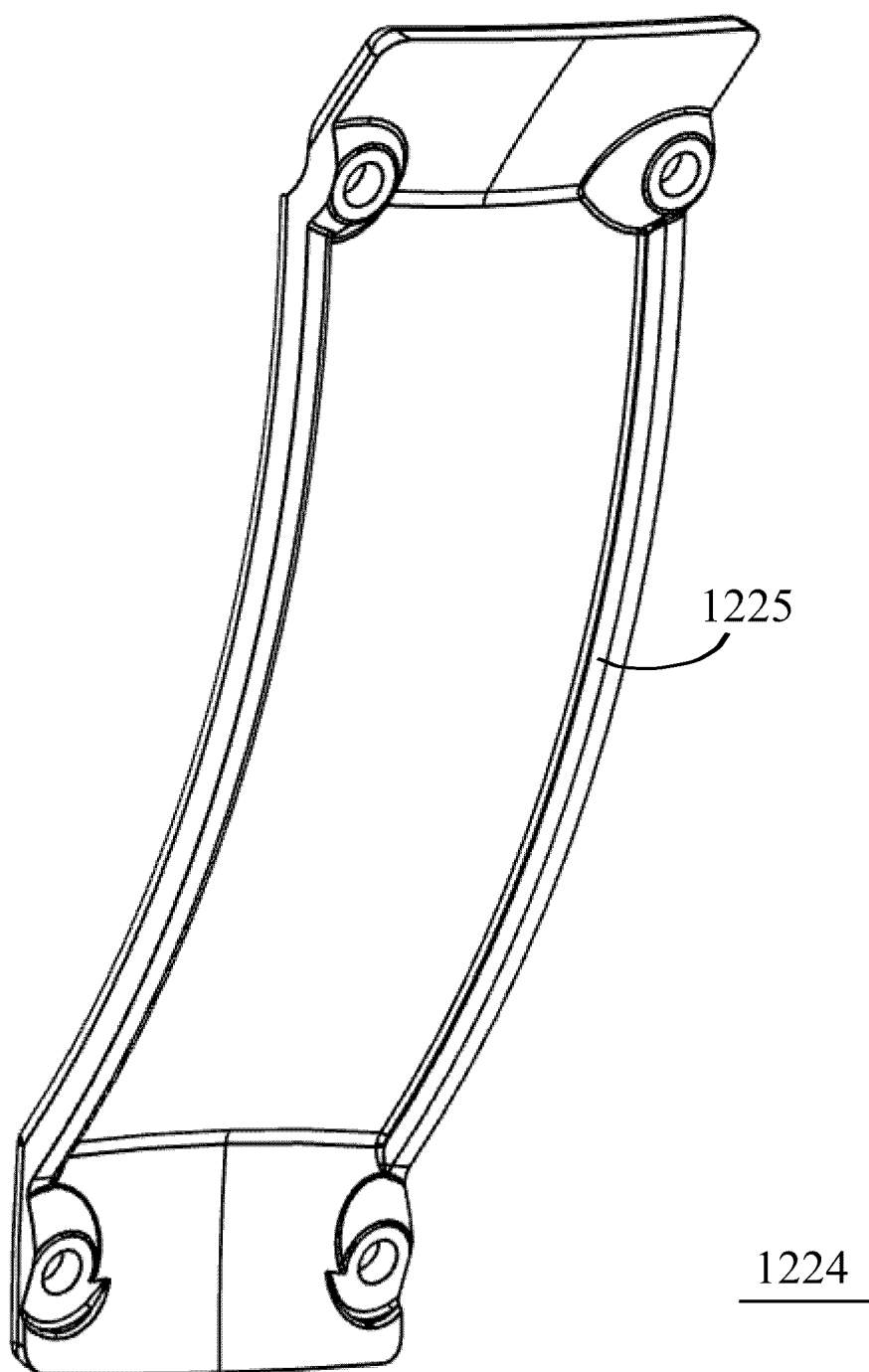


FIG. 2C

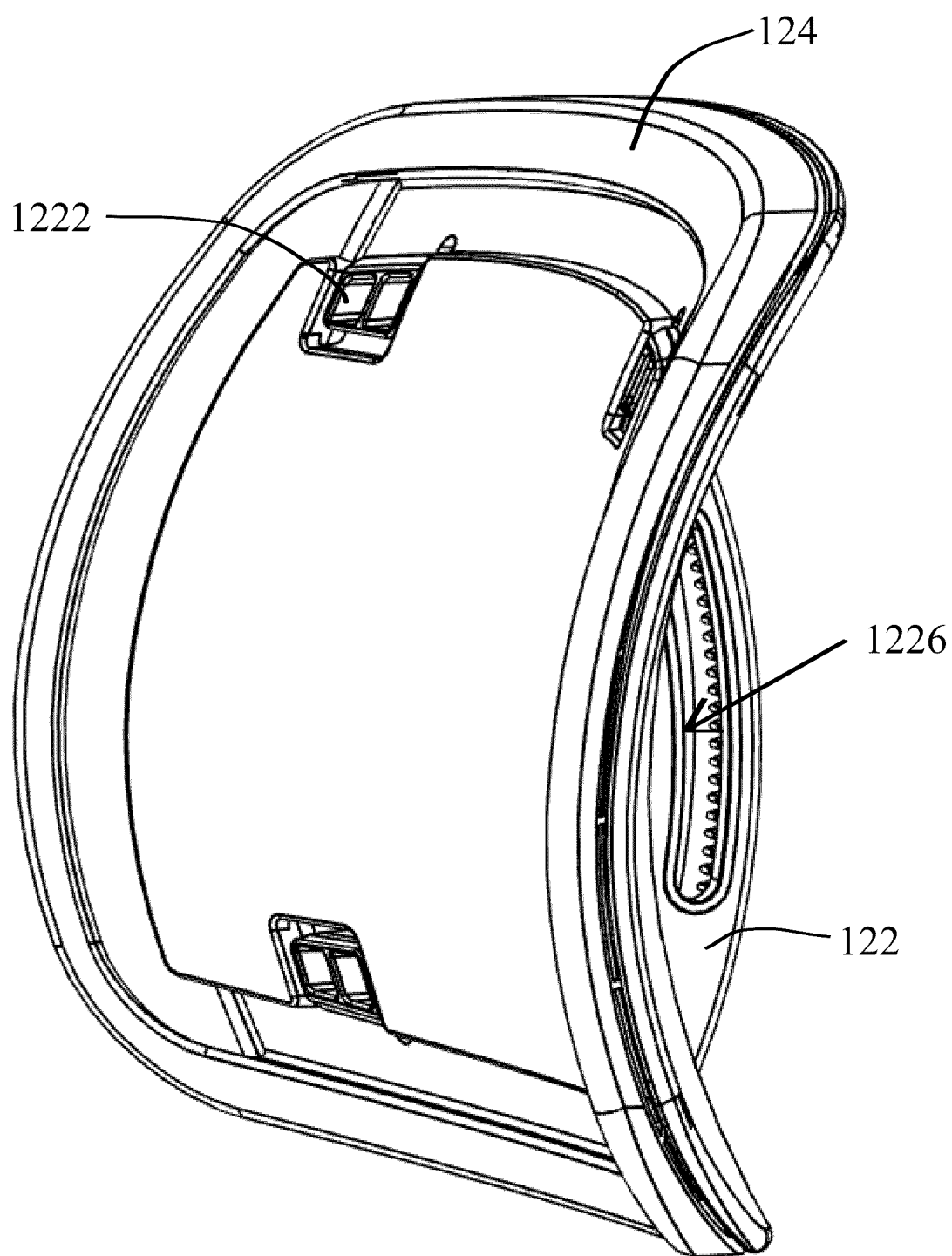


FIG. 3

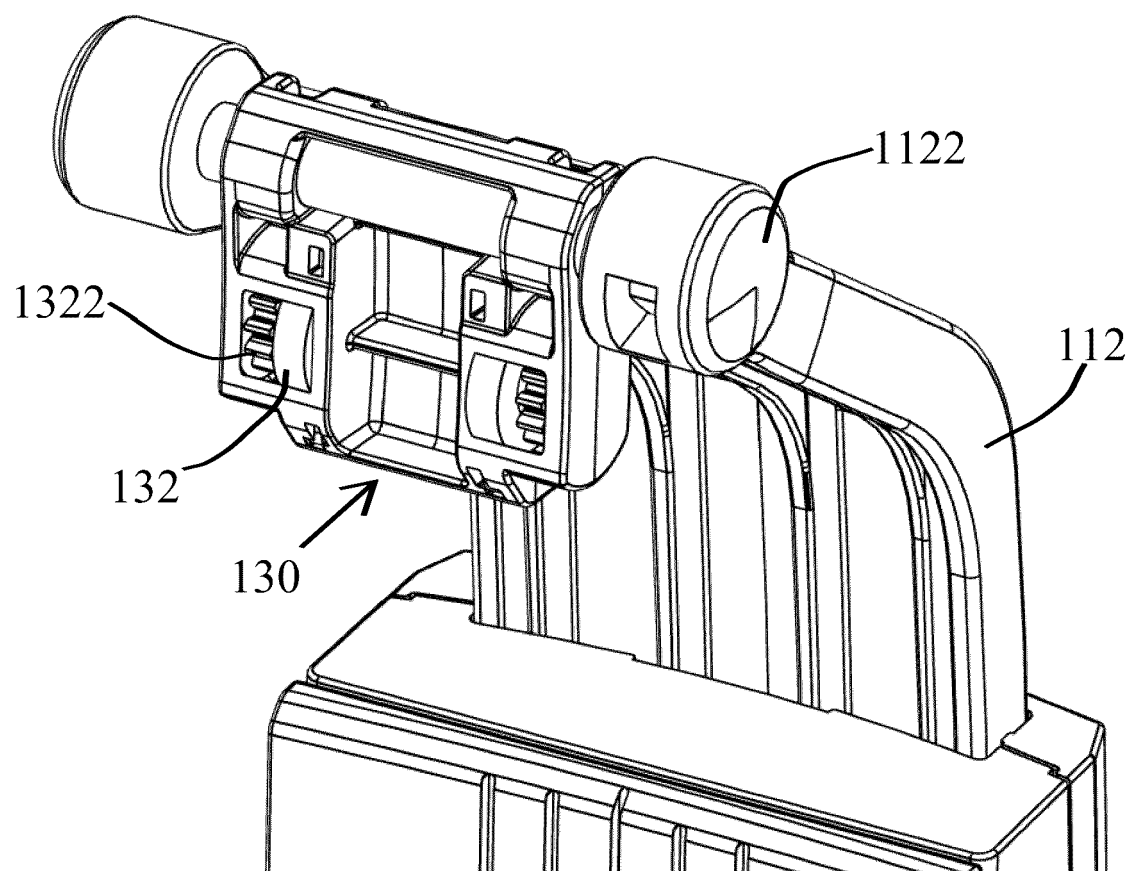


FIG. 4



EUROPEAN SEARCH REPORT

Application Number

EP 25 15 6983

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	CN 216 797 066 U (PERMANENT ART FURNITURE CO LTD) 24 June 2022 (2022-06-24) * paragraph [0014]; figures * -----	1-10	INV. A47C7/38
A	WO 2023/207090 A1 (ANJI RUIBAO FURNITURE CO LTD [CN]) 2 November 2023 (2023-11-02) * paragraph [0036]; figures * -----	1-10	
A	US 2016/150885 A1 (PETERSON GORDON JAY [US] ET AL) 2 June 2016 (2016-06-02) * paragraph [0190]; figures * -----	1-10	
			TECHNICAL FIELDS SEARCHED (IPC)
			A47C
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
The Hague		21 July 2025	Kis, Pál
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			
T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03.82 (P34C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO.

EP 25 15 6983

5

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

21-07-2025

10

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
CN 216797066	U	24-06-2022	NONE

WO 2023207090	A1	02-11-2023	CN 217337932 U 02-09-2022
			WO 2023207090 A1 02-11-2023

US 2016150885	A1	02-06-2016	NONE

15

20

25

30

35

40

45

50

55

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- US 9380878 B [0003] [0004] [0005]