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(54) EXTENDABLE STRUCTURE OF SEATING FOOTREST, EXTENDABLE SUPPORTING FRAME AND SEATING UNIT

(57) Provided in the present invention is an extendable structure of seating footrest, characterized by including a driving link and a supporting link both hinged to a mounting frame, a first extending link, a second extending link, and a footrest part, wherein: an end of the first extending link is hinged to the footrest part, and an opposite end of the first extending link is hinged to a free end of the supporting link at a fourth hinge point; an end of the second extending link is hinged to the footrest part at a first hinge point, and an opposite end of the second extending link is hinged to a free end of the driving link; the second extending link is hinged to the supporting link at a second hinge point; and during a rotation of the driv-

ing link around a hinge point with the mounting frame, an upper edge of a segment of the first extending link between the first hinge point and the fourth hinge point may be obscured by the second extending link when viewed from an exterior of the second extending link along an axial direction of a rotation axis of the driving link towards the first extending link. In the present invention, the second extending link obscures the first extending link, which prevents narrow gaps between the first extending link and the second extending link due to posture adjustment from causing pinching injury to the user, so as to provide a high level of safety.

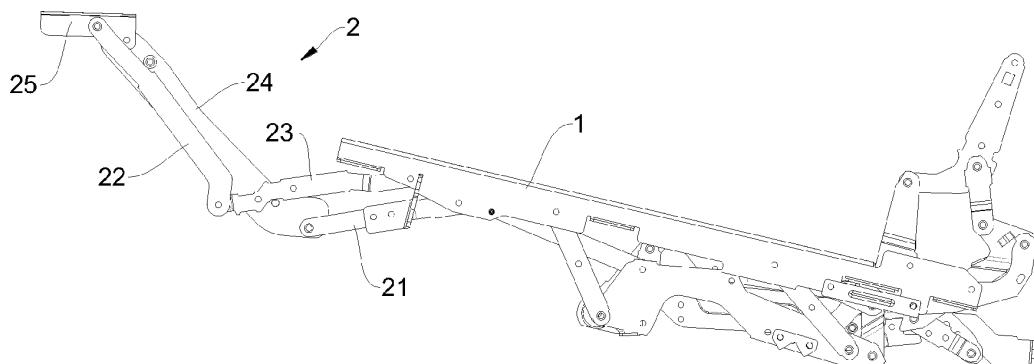


Fig.1

Description**Field of the invention**

[0001] The present invention relates to the field of sofa supporting frame, in particular to an extendable structure of seating footrest, an extendable supporting frame and a seating unit.

Background of the invention

[0002] A functional sofa is a sofa with multiple functions, which may realize the transformation of the sofa through a specially designed structure, so as to meet the user demand for sitting, lying, or massaging.

[0003] Disclosed in the Chinese Patent No. CN113796687A is a seating footrest reclining retracting apparatus, a seating supporting frame and a seating unit, comprising a footrest assembly hinged to a front end of a mounting frame of a seating frame, wherein the inner side of the mounting frame of the seating frame is provided with a mounting platform, a height of the mounting platform is lower than an upper edge of the mounting frame of the seating frame, and the plane on which the mounting platform is located is the mounting surface of the seating frame; a footrest driving link and a footrest following link constituting the footrest assembly are hinged to a front end of the mounting frame of the seating frame, respectively; an end of a first footrest link is hinged to the footrest driving link, and an opposite end of the first footrest link is hinged to an end of a footrest part; an end of a second footrest link is hinged to the footrest following link, and an opposite end of the second footrest link is hinged to a central part of the footrest part; the footrest part comprises a mounting plane of a footrest plate for mounting the footrest plate, and the mounting plane of the footrest plate is retracted below the mounting plane of the seating frame and is oblique relative to the horizontal when the footrest assembly is retracted to the ultimate position. After upholstering the seat of the application mentioned above, the thickness of the seat viewed in front is thinner, which leads to an increase in the bottom space; and the solution of the application mentioned above may also be used for seating styles with high legs.

[0004] However, in the application mentioned above, the first footrest link and the second footrest link are both hinged to the footrest part and provided oppositely, wherein the opposite end of the second footrest link is hinged to an end of the footrest following link, the opposite end of the first footrest link is hinged to an end of the footrest driving link, and the first footrest link is hinged to the footrest following link; that is, the footrest part, the first footrest link, the second footrest link and the footrest following link constitute a four-bar mechanism; whereas a narrow gap will be formed between the first footrest link and the second footrest link during the structural transformation of the four-bar mechanism, which may lead to

injury to user in practice. Safety protection is generally provided using an external protecting piece. However, the additional protecting piece is inconvenient to use and affects the sofa's aesthetic appearance to a certain extent, which is useless in practice.

Summary of invention

[0005] In order to address the shortcomings of the prior art, provided in the first purpose of the present invention is an extendable structure of seating footrest, which may prevent narrow gaps between the first extending link and the second extending link due to posture adjustment by obscuring the first extending link through the second extending link from causing pinching injury to the user.

[0006] Provided in the second purpose of the present invention is an extendable supporting frame, which enjoys a high level of safety and convenience of storage.

[0007] Provided in the third purpose of the present invention is a seating unit, which may provide support for the user's feet and may enjoy the convenience of use.

[0008] Embodiments of the present invention are implemented by the technical solution as follows:

[0009] An extendable structure of seating footrest comprises a driving link and a supporting link both hinged to a mounting frame, a first extending link, a second extending link, and a footrest part, wherein: an end of the first extending link is hinged to the footrest part, and an opposite end of the first extending link is hinged to a free end of the supporting link at a fourth hinge point; an end of the second extending link is hinged to the footrest part at a first hinge point, and an opposite end of the second extending link is hinged to a free end of the driving link; the second extending link is hinged to the supporting link at a second hinge point; and during a rotation of the driving link around a hinge point with the mounting frame, an upper edge of a segment of the first extending link between the first hinge point and the fourth hinge point may be obscured by the second extending link when viewed from an exterior of the second extending link along an axial direction of a rotation axis of the driving link towards the first extending link.

[0010] In such a setup, a four-bar mechanism constituted by the footrest part, the first extending link, the second extending link, and the supporting link may provide support for the user's legs by adjusting the postures, so as to realize the structural transformation of the functional sofa; while adjusting the postures, the second extending link obscures the first extending link, which prevents narrow gaps between the first extending link and the second extending link due to posture adjustment from causing pinching injury to the user, so as to provide a high level of safety.

[0011] According to a preferred embodiment, the second extending link comprises a main body, wherein an arc-shaped plate is provided on the main body, and the arc-shaped plate is arranged close to the free end of the supporting link. The arc-shaped plate is convex down-

wards here; on the one side, the width of the main body may be increased to get a better obscuring effect of the second extending link on the first extending link; on the flip side, the sharpness of the extendable structure of seating footrest may be reduced to prevent the user from injury, which provides a high level of safety.

[0012] According to a preferred embodiment, the arc-shaped plate and the main body are formed integrally. The integrally formed structure contributes to the increased strength of the second extending link.

[0013] According to a preferred embodiment, the supporting link comprises a staggered segment and an isolated segment connected with each other, wherein: the staggered segment is connected to the first extending link, and the isolated segment is connected to the mounting frame; and the staggered segment and the isolated segment are parallel and do not share a same plane. The setup that the staggered segment and the isolated segment are parallel and do not share a same plane provides space for the storage of the second extending link after retracting; the parallel setup of the staggered segment and the isolated segment enables a more compact layout of the extendable structure of seating footrest, which facilitates use and enhances aesthetics.

[0014] According to a preferred embodiment, the staggered segment is connected to the isolated segment through a bridging segment; the staggered segment, the isolated segment and the bridging segment are formed integrally. The integral design of the structure ensures the strength of the supporting link and facilitates the machining of the supporting link.

[0015] According to a preferred embodiment, an angle between the bridging segment and the staggered segment is between 85 and 95 degrees.

[0016] According to a preferred embodiment, the isolated segment is arranged close to the second extending link along the axial direction of the rotating axis of the driving link.

[0017] According to a preferred embodiment, a first restricting protrusion is provided on the main body and arranged close to the second hinge point.

[0018] According to a preferred embodiment, the first restricting protrusion is arranged between the second hinge point and the free end of the driving link.

[0019] According to a preferred embodiment, a restricting slot snapped with the first restricting protrusion is provided on the supporting link.

[0020] According to a preferred embodiment, the first extending link is hinged to the footrest part at a third hinge point, wherein the first hinge point does not coincide with the third hinge point.

[0021] According to a preferred embodiment, a second restricting protrusion is provided on the second extending link and arranged close to the first hinge point.

[0022] According to a preferred embodiment, the footrest part is arranged between the first extending link and the second extending link, wherein the second extending link is arranged on an external side of the footrest part.

[0023] An extendable supporting frame comprises a mounting frame and the extendable structure of seating footrest mentioned above, wherein the extendable structure of seating footrest is provided in front of the mounting frame, which enjoys a high level of safety and convenience of storage.

[0024] A seating unit comprises at least the extendable supporting frame mentioned above, which may provide support for the user's feet and may enjoy the convenience of using.

Brief description of the drawings

[0025] In order to illustrate more clearly the technical solutions of the embodiments of the present invention, hereinafter provided is a brief description of the attached drawings required in the embodiments. It is to be understood that the following attached drawings only illustrate specific embodiments of the invention and thus should not be construed as a limitation of scope; other relevant drawings may be obtained based on these attached drawings without any inventive effort by those of ordinary skill in the art.

25 Fig. 1 is a front view of the structure of the present invention after being mounted to the mounting frame; Fig. 2 is a front view of the structure of the present invention;

30 Fig. 3 is a perspective view of the structure of the present invention;

Fig. 4 is a perspective view of the structure of the supporting link in the present invention;

Fig. 5 is a front view of the structure of the second extending link in the present invention;

Fig. 6 is a perspective view of the structure of the present invention in an extended state after being mounted to the mounting frame;

Fig. 7 is a perspective view of the structure of the present invention in a halfextended state after being mounted to the mounting frame;

Fig. 8 is a perspective view of the structure of the present invention in a retracted state after being mounted to the mounting frame.

45 **[0026]** 1: mounting frame; 2: extendable structure of seating footrest; 21: driving link; 22: first extending link; 23: supporting link; 231: staggered segment; 2311: restricting slot; 232: bridging segment; 233: isolated segment; 24: second extending link; 241: main body; 242: second restricting protrusion; 243: first restricting protrusion; 244: arc-shaped plate; 25: footrest part; 26: first hinge point; 27: second hinge point; 28: third hinge point; 29: fourth hinge point.

Detailed description of the preferred embodiments

[0027] For better understanding and implementation, the technical solutions in embodiments of the present

invention will be clearly and completely described below in conjunction with the attached drawings in embodiments of the present invention.

[0028] In the description of the present invention, it is to be noted that the terms "up", "down", "front", "back", "left", "right", "vertical", "horizontal", "top", "bottom", "inside", "outside" and other orientation or lateral position relationships are based on the orientation or lateral position relationships shown in the attached drawings. It is only intended to facilitate description and simplify operation, but not to indicate or imply that the referred device or element has a specific orientation, or is constructed and operated in a specific orientation. Therefore, they should not be construed as a limitation of the present invention.

[0029] Unless otherwise defined, all terms (including technical and scientific terms) used herein have the same meaning as commonly understood by those skilled in the art to which the present invention belongs. The terms used herein in the specification of the present invention are used only to describe specific embodiments and are not intended as a limitation of the invention.

[0030] Please refer to Fig. 1 to Fig. 8, an extendable structure of seating footrest 2 comprises a driving link 21 and a supporting link 23 both hinged to a mounting frame 1, a first extending link 22, a second extending link 24, and a footrest part 25, wherein: an end of the first extending link 22 is hinged to the footrest part 25, and an opposite end of the first extending link 22 is hinged to a free end of the supporting link 23 at a fourth hinge point 29; an end of the second extending link 24 is hinged to the footrest part 25 at a first hinge point 26, and an opposite end of the second extending link 24 is hinged to a free end of the driving link 21; the second extending link 24 is hinged to the supporting link 23 at a second hinge point 27; and during a rotation of the driving link 21 around a hinge point with the mounting frame 1, an upper edge of a segment of the first extending link 22 between the first hinge point 26 and the fourth hinge point 29 may be obscured by the second extending link 24 when viewed from an exterior of the second extending link 24 along an axial direction of a rotation axis of the driving link 21 towards the first extending link 22.

[0031] Further, as shown in Fig. 1 and Fig. 2, the first extending link 22 is hinged to the footrest part 25 at a third hinge point 28, wherein the first hinge point 26 does not coincide with the third hinge point 28. The footrest part 25, the first extending link 22, the second extending link 24 and the supporting link 23 may constitute to a four-bar mechanism, due to the non-coincidence of the first hinge point 26 and the third hinge point 28, which may enable the footrest part 25 in the stored state to be presented in an inclined position relative to the ground as shown in Fig. 8, so as to increase the distance between the functional sofa in stored state and the ground, thereby allowing a sufficient gap between the functional sofa and the ground, which facilitates cleaning up. The extendable structure of seating footrest 2 is mounted in front of the

mounting frame 1, which is used for realizing the switch between the different functions of the functional sofa. The extendable structure of seating footrest 2 is used for supporting the user's lower legs or feet, which allows the user to enjoy a comfortable reclined posture and to relieve lower limb fatigue effectively. Specifically, as shown in Fig. 6, Fig. 7 and Fig. 8, the extendable structure of seating footrest 2 retracts sequentially from the extended posture to the stored posture. During the process mentioned above, as shown in Fig. 2 and Fig. 3, in a four-bar mechanism constituted by the footrest part 25, the first extending link 22, the second extending link 24 and the supporting link 23, the first extending link 22 is spatially arranged on the diagonal lower side of the second extending link 24. However, in the normal four-bar mechanism, a gap between an upper edge of the first extending link 22 and a lower edge of the second extending link 24 may lead to injury to the user. In the present embodiment, the second extending link 24 obscures the first extending link 22, which prevents narrow gaps between the first extending link 22 and the second extending link 24 due to posture adjustment from causing pinching injury to the user, so as to provide a high level of safety.

[0032] Further, as shown in Fig. 2 and Fig. 3, the second extending link 24 comprises a main body 241, wherein an arc-shaped plate 244 is provided on the main body 241, and the arc-shaped plate 244 is arranged close to the free end of the supporting link 23. The arc-shaped plate 244 and the main body 241 are formed integrally. The arc-shaped plate 244 is convex downwards here; on the one side, the width of the main body 241 may be increased to get a better obscuring effect of the second extending link 24 on the first extending link 22; on the flip side, the sharpness of the extendable structure of seating footrest 2 may be reduced to prevent the user from injury, which provides a high level of safety.

[0033] In the present embodiment, a first restricting protrusion 243 is provided on the main body 241 and arranged close to the second hinge point 27. The first restricting protrusion 243 is arranged between the second hinge point 27 and the free end of the driving link 21. A restricting slot 2311 snapped with the first restricting protrusion 243 is provided on the supporting link 23. The first restricting protrusion 243 is snapped with the restricting slot 2311 to restrict the supporting link 23. Specifically, when the extendable structure of seating footrest 2 is in the extended state or in the retracted state, that is, when the supporting link 23 is in two ultimate positions, the first restricting protrusion 243 may abut the inner wall of the restricting slot 2311 and restrict the position of the supporting link 23, so as to enable the extendable structure of seating footrest 2 to maintain a stationary ultimate state and facilitate the usage for the user. The outer edge of the opening of the restricting slot 2311 mentioned above is provided with a rounded chamfer to facilitate the first restricting protrusion 243 to snap into the restricting slot 2311 during the movement of the supporting link 23. The first restricting protrusion 243 mentioned above is in co-

lumbar form. Preferably, the first restricting protrusion 243 is in cylindrical form.

[0034] As shown in Fig. 1 and Fig. 2, in the present embodiment, a second restricting protrusion 242 is provided on the main body 241 and arranged close to the first hinge point 26. The second restricting protrusion 242 mentioned above is in cylindrical form and arranged on the same side as the first restricting protrusion 243. When the extendable structure of seating footrest 2 is in the extended state, the second restricting protrusion 242 is abutted to the first extending link 22 to restrict its position; when the extendable structure of seating footrest 2 is in the retracted state, the second restricting protrusion 242 may abut the footrest part 25 to restrict its position. In such a setup, the first restricting protrusion 243 cooperated with the second restricting protrusion 242 restricts the position of the extendable structure of seating footrest 2 supported and driven by the supporting link 23 and the driving link 21, so as to enable the extendable structure of seating footrest 2 in both ultimate states to maintain stationary and facilitate the usage for the user, which lead to a high level of safety.

[0035] In the present embodiment, the footrest part 25 is arranged between the first extending link 22 and the second extending link 24, wherein the second extending link 24 is arranged on an external side of the footrest part 25.

[0036] As shown in Fig. 2, Fig. 3 and Fig. 4, the supporting link 23 comprises a staggered segment 231 and an isolated segment 233 connected with each other, wherein: the staggered segment 231 is connected to the first extending link 22, and the isolated segment 233 is connected to the mounting frame 1; and the staggered segment 231 and the isolated segment 233 are parallel and do not share a same plane. The setup that the staggered segment 231 and the isolated segment 233 are parallel and do not share a same plane, provides space for the storage of the second extending link 24 after retracting; the parallel setup of the staggered segment 231 and the isolated segment 233 enables a more compact layout of the extendable structure of seating footrest 2, which facilitates use and enhances aesthetics. Further, the staggered segment 231 is connected to the isolated segment 233 through a bridging segment 232; the staggered segment 231, the isolated segment 233 and the bridging segment 232 are formed integrally.

[0037] In the present embodiment, an angle between the bridging segment 232 and the staggered segment 231 is between 85 and 95 degrees. the isolated segment 233 is arranged close to the second extending link 24 along the axial direction of the rotating axis of the driving link 21. Preferably, the angle between the bridging segment 232 and the staggered segment 231 is 90 degrees. The spatial setup of the staggered segment 231, the isolated segment 233, and the bridging segment 232 may enable a more compact layout of the supporting link 23 and the second extending link 24 when the extendable structure of seating footrest 2 is in the stored state, which

may effectively prevent the supporting link 23 from interfering the second extending link 24 during the storing process.

[0038] Provided in the present embodiment is an extendable supporting frame, comprising a mounting frame 1 and the extendable structure of seating footrest 2 mentioned above, wherein the extendable structure of seating footrest 2 is provided in front of the mounting frame 1, which enjoys a high level of safety and convenience of storage.

[0039] Additionally, provided further in the present embodiment is a seating unit, comprising at least the extendable supporting frame mentioned above. The sofa is a functional sofa, which may provide support for user's feet and may enjoy convenience of using.

[0040] The technical means disclosed in the present inventive solution are not limited to those disclosed in the embodiments mentioned above, but also include technical solutions consisting of any combination of the above technical features. It should be noted that for those of ordinary skill in the art, a plurality of improvements and embellishments may be made without departing from the principles of the present invention, and these improvements and embellishments are also considered to be within the scope of protection of the present invention.

Claims

1. An extendable structure of seating footrest (2), characterized by comprising a driving link (21) and a supporting link (23) both hinged to a mounting frame (1), a first extending link (22), a second extending link (24), and a footrest part (25), wherein:

an end of the first extending link (22) is hinged to the footrest part (25), and an opposite end of the first extending link (22) is hinged to a free end of the supporting link (23) at a fourth hinge point (29);

an end of the second extending link (24) is hinged to the footrest part (25) at a first hinge point (26), and an opposite end of the second extending link (24) is hinged to a free end of the driving link (21);

the second extending link (24) is hinged to the supporting link (23) at a second hinge point (27); and

during a rotation of the driving link (21) around a hinge point with the mounting frame (1), an upper edge of a segment of the first extending link (22) between the first hinge point (26) and the fourth hinge point (29) may be obscured by the second extending link (24) when viewed from an exterior of the second extending link (24) along an axial direction of a rotation axis of the driving link (21) towards the first extending link (22).

2. The extendable structure of seating footrest (2), according to claim 1, **characterized in that** the second extending link (24) comprises a main body (241), wherein an arc-shaped plate (244) is provided on the main body (241), and the arc-shaped plate (244) is arranged close to the free end of the supporting link (23). 5

3. The extendable structure of seating footrest (2), according to claim 2, **characterized in that** the arc-shaped plate (244) and the main body (241) are formed integrally. 10

4. The extendable structure of seating footrest (2), according to claim 1, **characterized in that** the supporting link (23) comprises a staggered segment (231) and an isolated segment (233) connected with each other, wherein: 15

the staggered segment (231) is connected to the first extending link (22), and the isolated segment (233) is connected to the mounting frame (1); and 20

the staggered segment (231) and the isolated segment (233) are parallel and do not share a same plane. 25

5. The extendable structure of seating footrest (2), according to claim 4, **characterized in that** the staggered segment (231) is connected to the isolated segment (233) through a bridging segment (232); the staggered segment (231), the isolated segment (233) and the bridging segment (232) are formed integrally. 30

6. The extendable structure of seating footrest (2), according to claim 5, **characterized in that** an angle between the bridging segment (232) and the staggered segment (231) is between 85 and 95 degrees. 35

7. The extendable structure of seating footrest (2), according to any one of claims 4 to 6, **characterized in that** the isolated segment (233) is arranged close to the second extending link (24) along the axial direction of the rotating axis of the driving link (21). 40

8. The extendable structure of seating footrest (2), according to claim 2 or 3, **characterized in that** a first restricting protrusion (243) is provided on the main body (241) and arranged close to the second hinge point (27). 45

9. The extendable structure of seating footrest (2), according to claim 8, **characterized in that** the first restricting protrusion (243) is arranged between the second hinge point (27) and the free end of the driving link (21). 50

10. The extendable structure of seating footrest (2), according to claim 9, **characterized in that** a restricting slot (2311) snapped with the first restricting protrusion (243) is provided on the supporting link (23). 55

11. The extendable structure of seating footrest (2), according to claim 1, **characterized in that** the first extending link (22) is hinged to the footrest part (25) at a third hinge point, wherein the first hinge point (26) does not coincide with the third hinge point (28). 12. The extendable structure of seating footrest (2), according to claim 1, **characterized in that** a second restricting protrusion (242) is provided on the second extending link (24) and arranged close to the first hinge point (26). 13. The extendable structure of seating footrest (2), according to claim 1, **characterized in that** the footrest part (25) is arranged between the first extending link (22) and the second extending link (24), wherein the second extending link (24) is arranged on an external side of the footrest part (25). 14. An extendable supporting frame, **characterized by** comprising a mounting frame (1) and the extendable structure of seating footrest (2) as claimed in any one of claims 1 to 13, wherein the extendable structure of seating footrest (2) is provided in front of the mounting frame (1). 15. A seating unit, **characterized by** comprising at least an extendable supporting frame as claimed in claim 14. 30

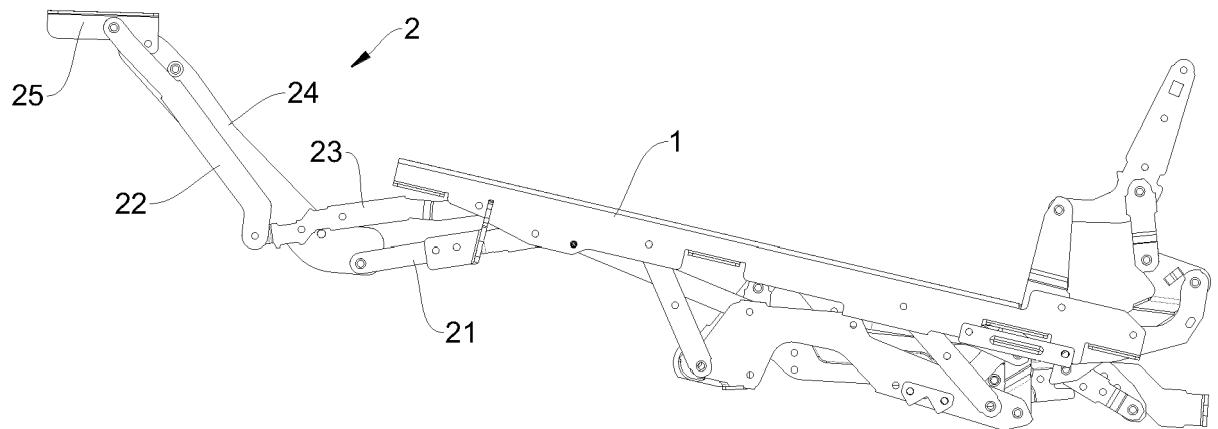


Fig.1

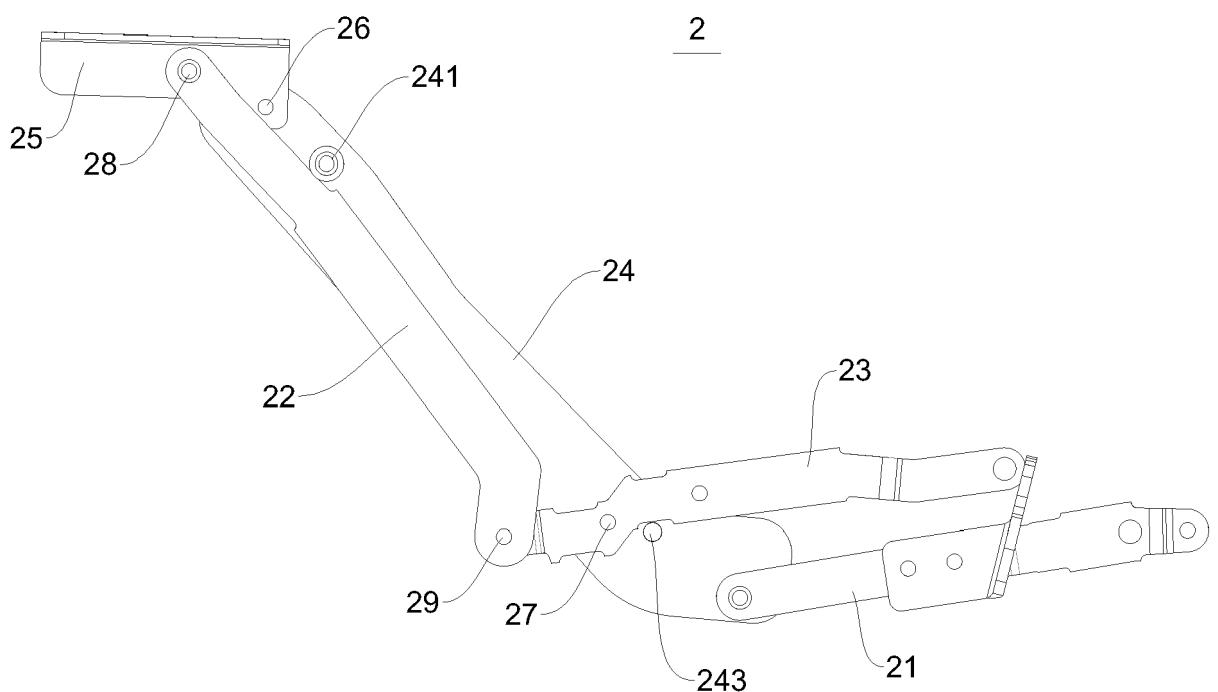


Fig.2

2

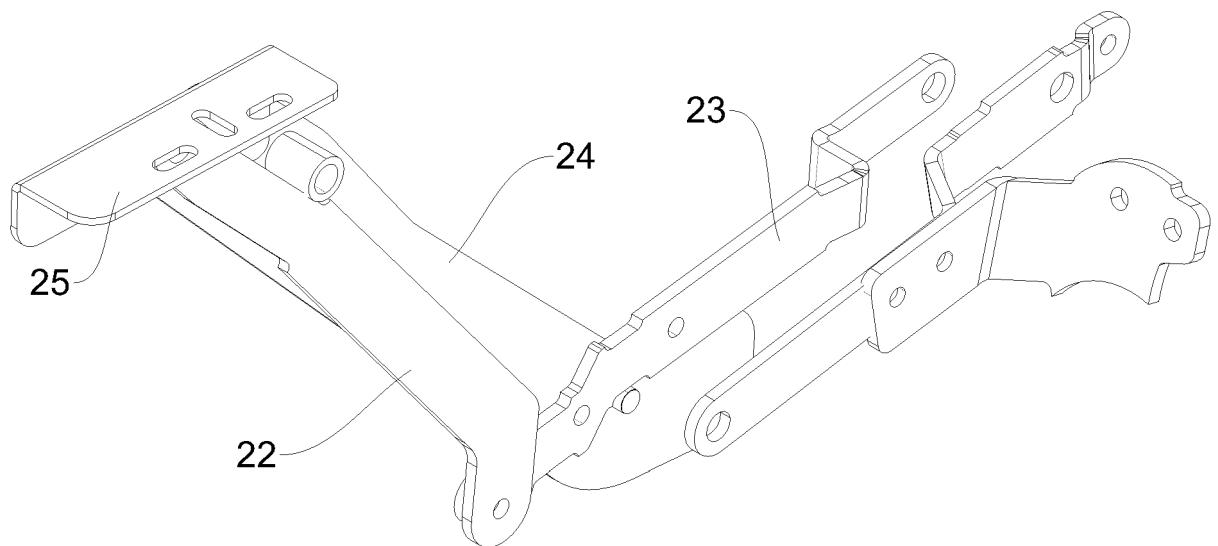


Fig.3

23

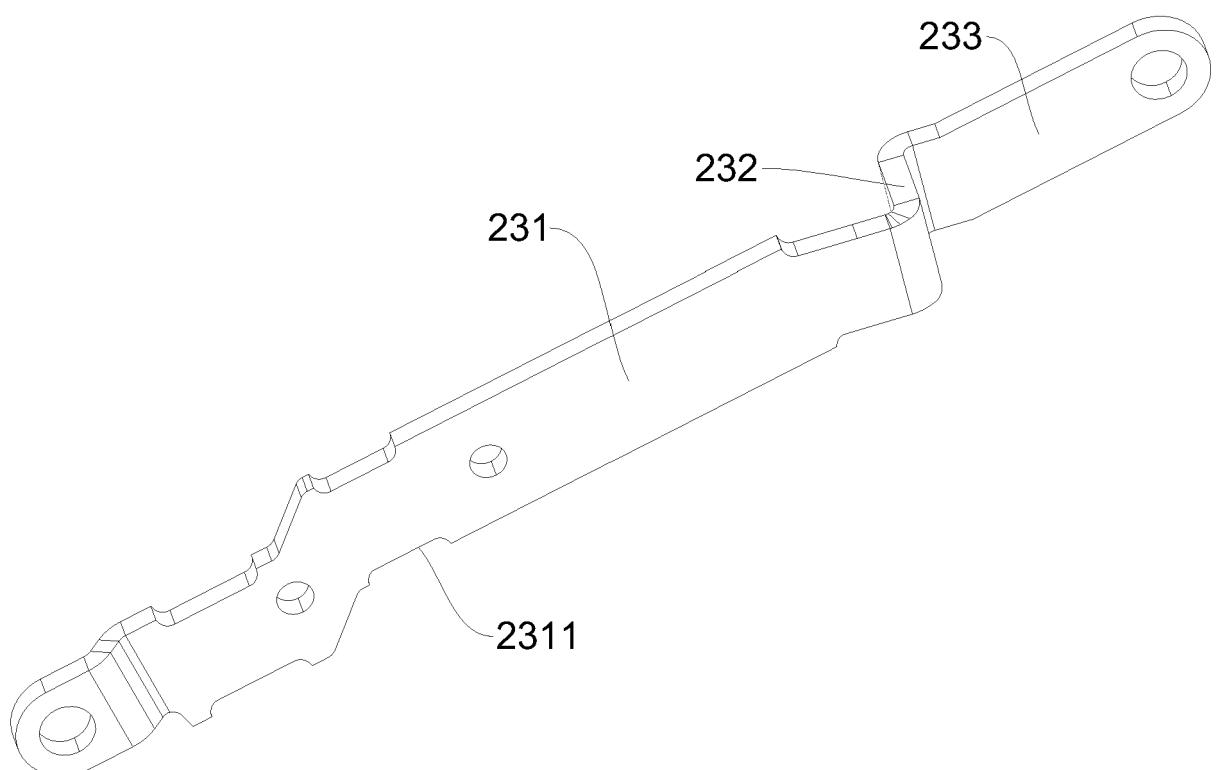


Fig.4

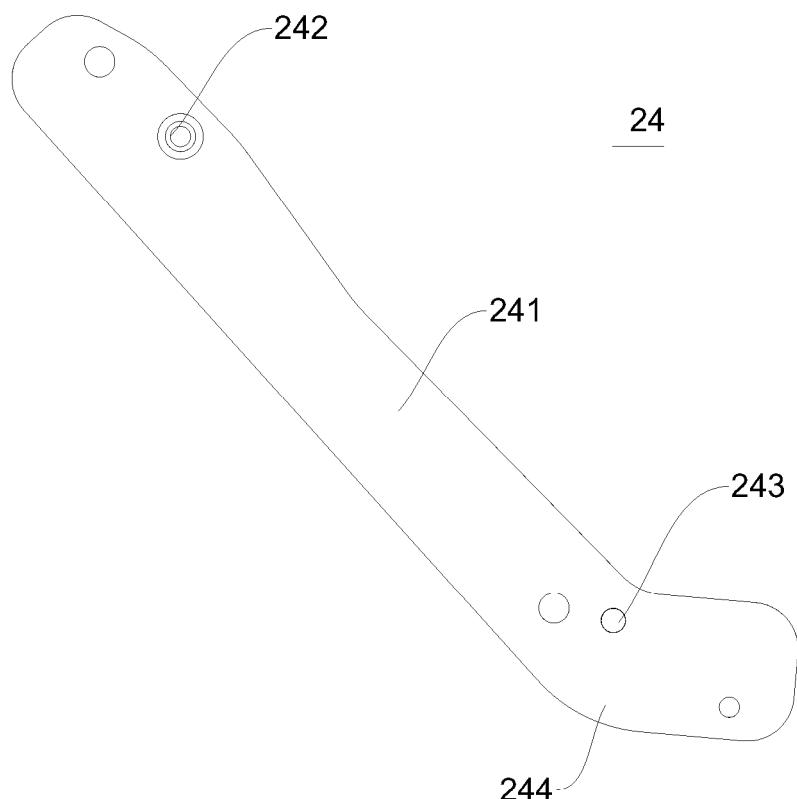


Fig.5

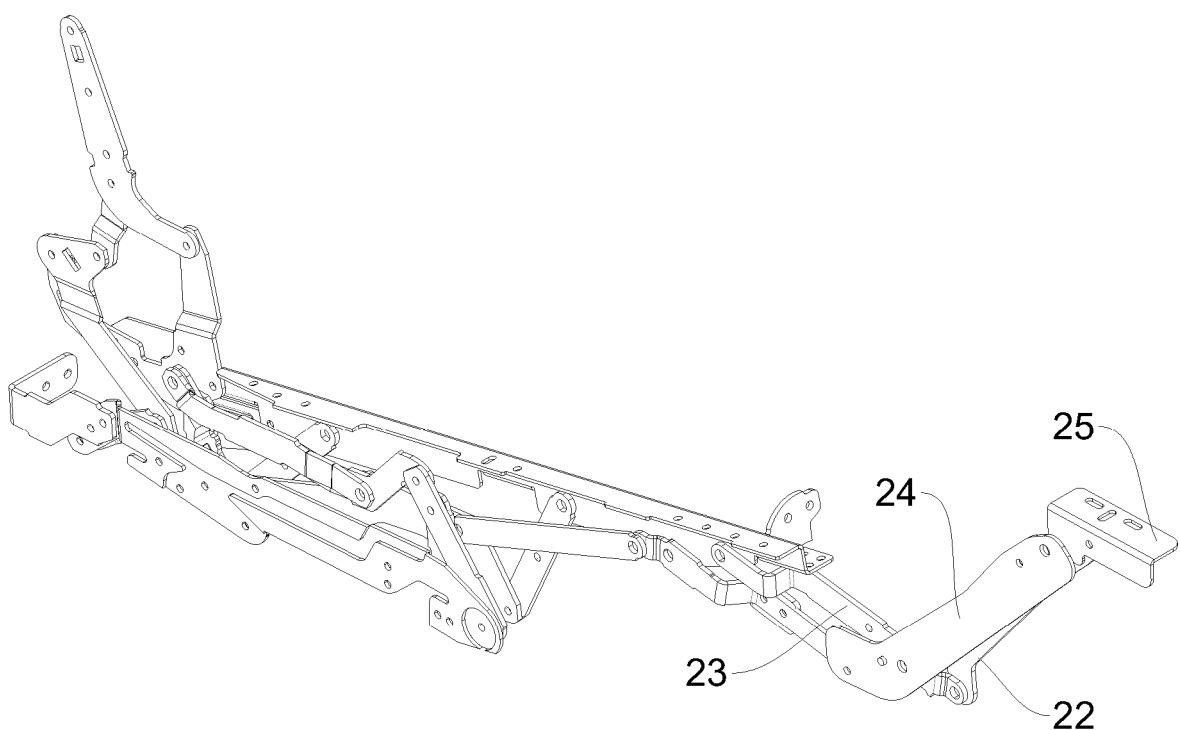


Fig.6

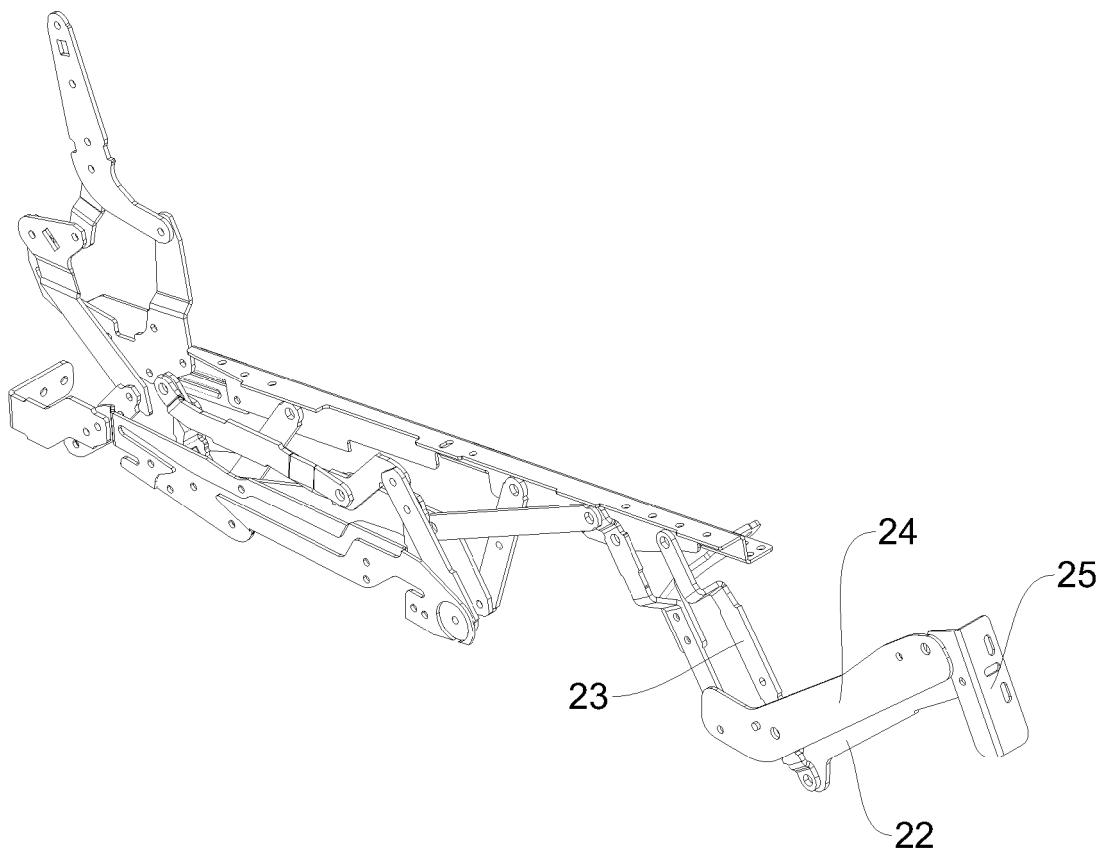


Fig.7

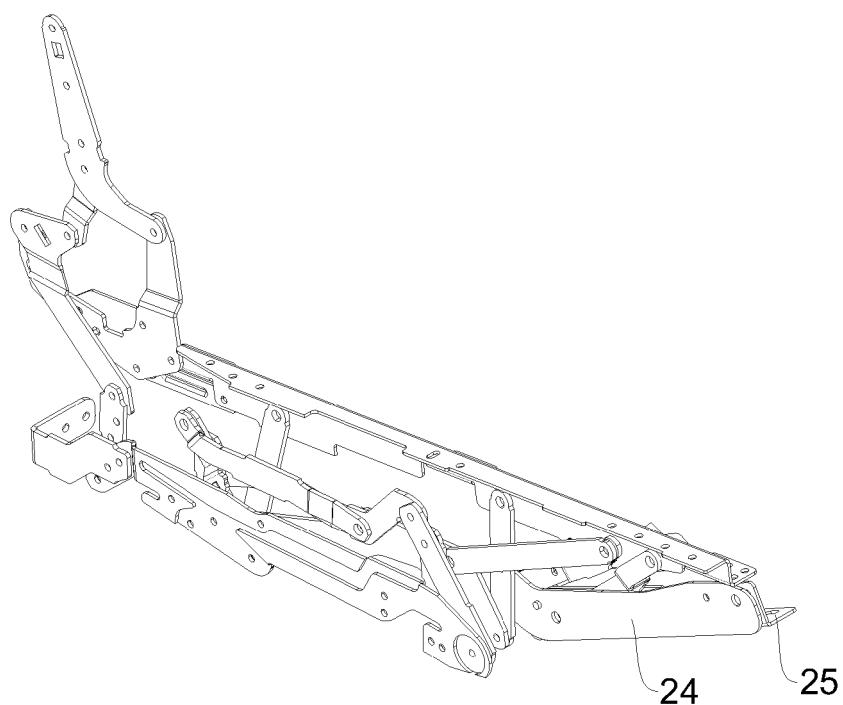


Fig.8



EUROPEAN SEARCH REPORT

Application Number

EP 23 16 4765

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	DE 203 07 916 U1 (SICHELSCHMIDT STANZWERK [DE]) 24 July 2003 (2003-07-24) * page 6, paragraph 1 - page 9, line 2; figures 1-2 *	1-9, 11-15	INV. A47C1/0355
X	CN 104 856 478 A (ZHEJIANG UE FURNITURE CO LTD) 26 August 2015 (2015-08-26) * paragraph [0035] - paragraph [0046]; figures 1-6 *	1-9, 11-15	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
			A47C
Place of search	Date of completion of the search	Examiner	
The Hague	10 August 2023	Kus, Slawomir	
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10	Patent document cited in search report	Publication date	Patent family member(s)	Publication date
	DE 20307916 U1 24-07-2003		NONE	
15	CN 104856478 A	26-08-2015	NONE	
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Patent documents cited in the description

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