

(19)



(11)

**EP 3 150 778 B1**

(12)

**EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention  
of the grant of the patent:

**31.03.2021 Bulletin 2021/13**

(51) Int Cl.:

**E04G 3/30** (2006.01) **A47L 1/02** (2006.01)  
**A62B 1/00** (2006.01) **E04G 3/22** (2006.01)  
**A47L 3/00** (2006.01)

(21) Application number: **15734742.8**

(86) International application number:

**PCT/PT2015/000026**

(22) Date of filing: **26.05.2015**

(87) International publication number:

**WO 2015/183113 (03.12.2015 Gazette 2015/48)**

(54) **ROPE ACCESS CHAIR**

AN SEILEN HÄNGENDER STUHL

CHAISE DE SUSPENSION EN HAUTEUR

(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 MK MT NL NO  
PL PT RO RS SE SI SK SM TR**

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(30) Priority: **27.05.2014 PT 10766714**

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(43) Date of publication of application:

**05.04.2017 Bulletin 2017/14**

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## Description

### Technical domain and scope of the invention

**[0001]** This invention falls within the scope of civil engineering support equipment and is directed to the rehabilitation domain, specifically to works in height with access by ropes, in which rappel technique is used. As regards the international classification of patents, this invention belongs to the subclasses A47C, A62B and E04G3.

### State of the art

**[0002]** The rope access technique for works in height reduces operational costs as well as the environmental impact, since it eliminates the need for the use of conventional equipments, such as scaffolds and lifting platforms, thus reducing the number of working hours, namely in the assembly, disassembly and transport of the said systems and, consequently, reducing the energy consumption of that same operation.

**[0003]** Professionals in the field of "works in height" are subject to extreme conditions of physical effort, discomfort and, also, potentially dangerous situations which put human life at risk. In this kind of tasks, the equipments developed shall ensure high safety levels, as well as high comfort levels, along with psychological stability, during the performance of those operations.

**[0004]** The suspension equipments existing in the state of the art consist of chairs attached to a single point of support (used by the operators in this kind of tasks and wherein the operator is seated). The chair is fixed to only one upper end by means of a "rope" or "cable", which can be made from different materials, in order to prevent the suspended person from falling down during the execution of that kind of operation.

**[0005]** The systems existing in the state of the art cause high oscillation to occur and offer weak ergonomic conditions to the worker. As an illustration of this problem, reference is herein made to the fact that with the existing equipments the worker is not able to endure a continuous work day, so he must stop and come down several times a day in order to rest and make some muscle extension exercises.

**[0006]** The rope access chair, which is the object of this invention, ensures higher safety, greater stability, as well as increased comfort and autonomy to the worker, when compared to others currently available for that purpose.

**[0007]** As a result of the search on the state of the art of the invention, which was made in order to determine if the same had been already thought of or executed by other inventors, the following patent documents were identified:

(D1) WO2013108141 - D1 discloses a suspended chair (D1 - Abstract, Figure 1) which is comprised of

a rod having two identical arms symmetrically positioned in relation to the vertical axis of the chair (D1 - Figure 1) with arms with a footrest at the lower end (D1 - Figure 1) and fixing means of the ties (D1 - Figure 1) provided with double fixing of the support cables (D1 - Figure 1);

(D2) US4195708 - D2 discloses a suspended chair (D2 - Abstract, Figure 1) which is comprised of a rod having two identical arms symmetrically positioned in relation to the vertical axis of the chair (D2 - Figure 1 and 2) with arms with a footrest at the lower end (D2 - Figure 1 and 2).

**[0008]** Additionally, patent documents EP1191165, FR2929972, WO9203190, EP2353657, US2006169534, US2006055545, US5921345, WO9203190, US3484833, US8365864 and CN201447863U can also help to ascertain the state of the art JPH05179797 discloses a suspended access chair for cleaning building facades.

**[0009]** This invention differs from the state of the art, since in addition to the worker's common ties it also includes the two ties of the chair, which are fastened to the equipment through descenders and footrests, thus increasing safety and comfort which are essential so that the worker can effectively perform his tasks.

**[0010]** The distinguishing technical characteristics of this invention make a contribution to the state of art, in as much as they add the following technical effects:

- Increased safety for the worker, since in addition to the worker's common ties, it also includes the two ties of the chair, which is comprised of a rigid seat and backrest, both of them padded and leather-coated;
- Stability provided for works in height, since two supports were developed which can be attached to the equipment by means of descenders, which ensure the fastening of the chair and the downwards movement when the tightened bolt gradually releases (unlocks) the ropes. Using both hands, the operator presses the descenders simultaneously and the chair is progressively lowered. The stability increases because the two ropes being at a distance of almost 1 meter from each other, it is unlikely that the chair rotates (spins) around its axis. This is very useful in the scope of works performed on wind towers located at significant heights (the towers can reach heights above 100 meters), in situations wherein the workers do not have any vertical surface near them to grasp with their hands;
- Increased comfort, which is essential so that the worker can effectively perform his tasks, in as much as those works in height put a huge physical and psychological strain on the worker, and this equipment allows a person wishing to work in this field and after having received a standard training, to work in

height. This will solve another problem existing in the sector that is the one of labour force recruitment. The above objects are achieved with a rope access chair according to claim 1.

### Description of the invention

**[0011]** This invention relates to a rope access chair which, in addition to the common ties, also includes the two ties of the chair, the latter being comprised of the rigid seat (3) and backrest (2), both of them padded and leather-coated, which can be attached to the equipment by means of descenders and footrests (7).

**[0012]** The framework of the chair is a rod (1) preferably made of massive stainless steel of 16 mm diameter, but it can also be of carbon fibre and PVC in order to make the equipment lighter. Furthermore, this invention can be built in a reinforced composite material of continuous glass- and/or carbon fibre and epoxy resin matrix.

**[0013]** The rod (1) is comprised of two arms (1a) (1b), which are identical and symmetrically positioned in relation to the vertical axis of the chair. The said arms (1a) (1b) are attached by means of two reinforcement parts (1e) (1f), to the seat (3), and have two connecting elements (1c) (1d) between them. Each one of the arms (1a) (1b) has in its lower end a footrest (7) and in its upper end the fixing means (8) for ties (figure 1).

**[0014]** The rod (1) is attached to the framework of the seat through welding or, alternatively, screwed mechanical fixings.

**[0015]** The backrest (2) forms an angle of 70° with the horizontal plane (figure 3). The backrest (2) and the seat (3) are preferably of sponge with a black leather lining. The ties can be ropes or steel cables, among other appropriate materials.

**[0016]** According to the invention, each one of the arms forms an angle of about 109° at a distance of, or approximately, 552 mm from the footrest (7), opening towards the sides externally to the vertical axis of the chair, so that the distance between the two ends of the arms (8) is of, or approximately, 982 mm and that the angle formed with the horizontal plane of the seat (3) is of, or approximately, 30° (figure 2). In a preferred embodiment, this invention also has the following characteristics: hardness in the range of from 70rc to 85rc, tensile strength in the range of from 540 N/mm<sup>2</sup> (540 MPa) to 690 N/mm<sup>2</sup> (690 MPa), and elasticity in the range of from 205 to 410 N/mm<sup>2</sup> (410 MPa).

**[0017]** Moreover, the descenders could alternatively be a common tie, or even a motorized system.

### Indication of the reference numbers:

#### [0018]

- (1) Stainless steel rod
- (1a) (1b) arms
- (1c) (1d) connecting elements

- (1e) (1f) reinforcement parts
- (2) Padded backrest
- (3) Padded plate seat
- (4) Screw stud
- (5) Plain washer
- (6) Stainless steel hexagon nut
- (7) Footrest
- (8) Fixing means of the ties

### 10 Industrial applicability

**[0019]** This invention can be used in a variety of works in height: technical inspection of façades and rooftops; painting and waterproofing of façades and rooftops; occasional repair of cracks in façades or places of difficult access; installation of lifelines; painting and maintenance works in bridges, dams and wind-energy parks; maintenance works in water tanks; anti-corrosion treatments in metal structures; cleaning of buildings façades and rooftops; cleaning of illuminated advertising signs; outer and inner cleaning of silos and reservoirs; pruning of trees and cliffs cleaning; assembly and disassembly of large format screens in façades (publicity); disassembly of illuminated advertising signs; inner and outer cleaning of wind towers; anti-corrosion treatments; painting inspection and flange sealing.

### Claims

1. A rope access chair comprising a seat (3), a rod (1) comprising two identical arms (1a) (1b) symmetrically positioned in relation to the vertical axis of the chair, wherein the said arms (1a) (1b) are attached by means of two reinforcement parts (1e) (1f) to the seat (3) and include two connecting elements (1c) (1d) between them; and each one of the arms (1a) (1b) has in its lower end a footrest (7) and in its upper end fixing means for ties (8) **characterized in that further comprises**
  - a) a backrest (2) which is attached to the chair by means of descenders and **in that**
  - b) each one of the arms (1a) (1b) forms an angle of about 109° at a distance of, or approximately, 552mm from the footrest (7), opening towards the sides externally to the vertical axis of the chair;
  - c) the distance between the two ends of the arms (8) is of 982 mm; and
  - d) the angle formed with the horizontal plane of the seat (3) is of 30°.
2. A chair according to claim 1, **characterized in that** the backrest (2) forms an angle of 70° with the horizontal plane.
3. A chair according to claim 1, **characterized in that**

it comprises two ties in addition to the common ties.

4. A chair according to claim 1, **characterized in that** the rod (1) is attached to the framework of the seat through welding or, alternatively, screwed mechanical fixings.
5. A chair according to claim 1, **characterized in that** the rigid backrest (2) and seat (3) are both sponge padded and leather-coated.
6. A chair according to claim 1, **characterized in that** the ties are ropes or steel cables.
7. A chair according to claim 1, **characterized in that** its hardness is in the range of from 70rc to 85rc, its tensile strength is in the range of from 540 N/mm<sup>2</sup> (540 MPa) to 690 N/mm<sup>2</sup> (690 MPa) and its elasticity is in the range of from 205 to 410 N/mm<sup>2</sup> (410 MPa)
8. A chair according to claim 1, **characterized in that** its descenders are common ties or a motorized system.
9. A chair according to claim 1, **characterized in that** it is made of a reinforced composite material of continuous glass- and/or carbon fibre and epoxy resin matrix.
10. A chair according to claim 1, **characterized in that** the rod (1) is made of massive stainless steel with 16 mm diameter, or of carbon fibre and PVC.

#### Patentansprüche

1. Ein Seilzugangsstuhl, welcher einen Sitz (3), eine Stange (1), welche zwei identische Arme (1a) (1b) umfasst, die zu der Vertikalachse des Stuhls symmetrisch platziert sind, umfasst, worin die besagten Arme (1a) (1b) mittels zwei Verstärkungsteile (1e) (1f) an den Sitz (3) befestigt sind und zwei Verbindungselemente (1c) (1d) zwischen ihnen enthalten; und jeder der Arme (1a) (1b) hat an seinem unteren Ende eine Fußstütze (7) und an seinem oberen Ende Befestigungsmittel für Befestigungen (8) **dadurch gekennzeichnet, dass er weiterhin folgendes umfasst**

- a) eine Rückenlehne (2), welche mittels Unterlängen an den Stuhl befestigt ist, und dass
- b) jeder der Arme (1a) (1b) einen Winkel von etwa 109° bildet, bei einem Abstand von, oder zirka, 552mm von der Fußstütze (7), sich zu den Seiten, äußerlich der Vertikalachse des Stuhls eröffnend;
- c) der Abstand zwischen den zwei Enden der Arme (8) beträgt 982mm; und

d) der Winkel, der sich mit der Horizontalebene des Sitzes (3) bildet, beträgt 30°.

2. Ein Stuhl nach Anspruch 1, **dadurch gekennzeichnet, dass** die Rückenlehne (2) mit der Horizontalebene einen Winkel von 70° bildet.
3. Ein Stuhl nach Anspruch 1, **dadurch gekennzeichnet, dass** er zusätzlich zu den üblichen Befestigungen, zwei Befestigungen umfasst.
4. Ein Stuhl nach Anspruch 1, **dadurch gekennzeichnet, dass** die Stange (1) zu dem Rahmen des Sitzes durch Schweißen, alternativ, durch mechanischer Schraubenfixierung, befestigt ist.
5. Ein Stuhl nach Anspruch 1, **dadurch gekennzeichnet, dass** die starre Rückenlehne (2) und der Sitz (3) mit Schaumstoff gepolstert und mit Leder beschichtet sind.
6. Ein Stuhl nach Anspruch 1, **dadurch gekennzeichnet, dass** die Befestigungen Seile oder Stahlkabel sind.
7. Ein Stuhl nach Anspruch 1, **dadurch gekennzeichnet, dass** seine Härte einen Wertebereich von 70 rc bis 85 rc hat, seine Zugfestigkeit einen Wertebereich von 540 N/mm<sup>2</sup> (540 MPa) bis 690 N/mm<sup>2</sup> (690 MPa) hat, seine Elastizität einen Wertebereich von 205 bis 410 N/mm<sup>2</sup> (410 MPa) hat.
8. Ein Stuhl nach Anspruch 1, **dadurch gekennzeichnet, dass** seine Unterlängen übliche Befestigungen oder ein motorisiertes System sind.
9. Ein Stuhl nach Anspruch 1, **dadurch gekennzeichnet, dass** er aus verstärktem Verbundmaterial aus endlosen Glas - und/oder Kohlefasern und Epoxidharzmatrix besteht.
10. Ein Stuhl nach Anspruch 1, **dadurch gekennzeichnet, dass** die Stange (1) aus massivem Edelstahl mit 16mm Durchmesser, oder Kohlefasern und PVC besteht.

#### Revendications

1. Une chaise de suspension en hauteur comprenant un siège (3), une tige (1) constituée de deux bras identiques (1a) (1b) positionnés symétriquement par rapport à l'axe vertical de la chaise, où lesdits bras (1a) (1b) sont fixés par deux renforts (1e) (1f) au siège (3) et comprennent deux éléments de liaison (1c) (1d) entre eux ; et chacun des bras (1a) (1b) possède à son extrémité inférieure un repose-pied (7) et à son extrémité supérieure des moyens de

fixation pour des éléments d'attache (8)

**caractérisée en ce qu'elle comprend en outre**

- a) un dossier (2) qui est attaché à la chaise au moyen de descendeurs, et **en ce que** 5
  - b) chacun des bras (1a) (1b) forme un angle d'environ 109° à une distance de, ou d'environ, 552 mm du repose-pied (7), s'ouvrant vers les côtés de manière externe à l'axe vertical de la chaise ; 10
  - c) la distance entre les deux extrémités des bras (8) est de 982 mm ; et
  - d) l'angle formé avec le plan horizontal du siège (3) est de 30°. 15
2. Une chaise selon la revendication 1, **caractérisée en ce que** le dossier (2) forme un angle de 70° avec le plan horizontal.
  3. Une chaise selon la revendication 1, **caractérisée en ce qu'elle** comprend deux éléments d'attache en plus des éléments d'attache ordinaires. 20
  4. Une chaise selon la revendication 1, **caractérisée en ce que** la tige (1) est fixée au cadre du siège par soudage ou, alternativement, par des raccords mécaniques vissés. 25
  5. Une chaise selon la revendication 1, **caractérisée en ce que** le dossier (2) et le siège rigides sont à la fois rembourrés en mousse et revêtus de cuir. 30
  6. Une chaise selon la revendication 1, **caractérisée en ce que** les éléments d'attache sont des cordes ou des câbles en acier. 35
  7. Une chaise selon la revendication 1, **caractérisée en ce qu'elle** présente une dureté dans la plage de 70rc à 85rc, une résistance à la traction dans la plage de 540 N/mm<sup>2</sup> (540 MPa) à 690 N/mm<sup>2</sup> (690 MPa) et une élasticité dans la plage de 205 à 410 N/mm<sup>2</sup> (410 MPa). 40
  8. Une chaise selon la revendication 1, **caractérisée en ce que** ses descendeurs sont des éléments d'attache ordinaires ou un système motorisé. 45
  9. Une chaise selon la revendication 1, **caractérisée en ce qu'elle** est constituée d'un matériau composite renforcé de fibre de verre et/ou de carbone continue et matrice de résine époxy. 50
  10. Une chaise selon la revendication 1, **caractérisée en ce que** la tige (1) est faite en acier inoxydable massif d'un diamètre de 16 mm, ou en fibre de carbone et PVC. 55

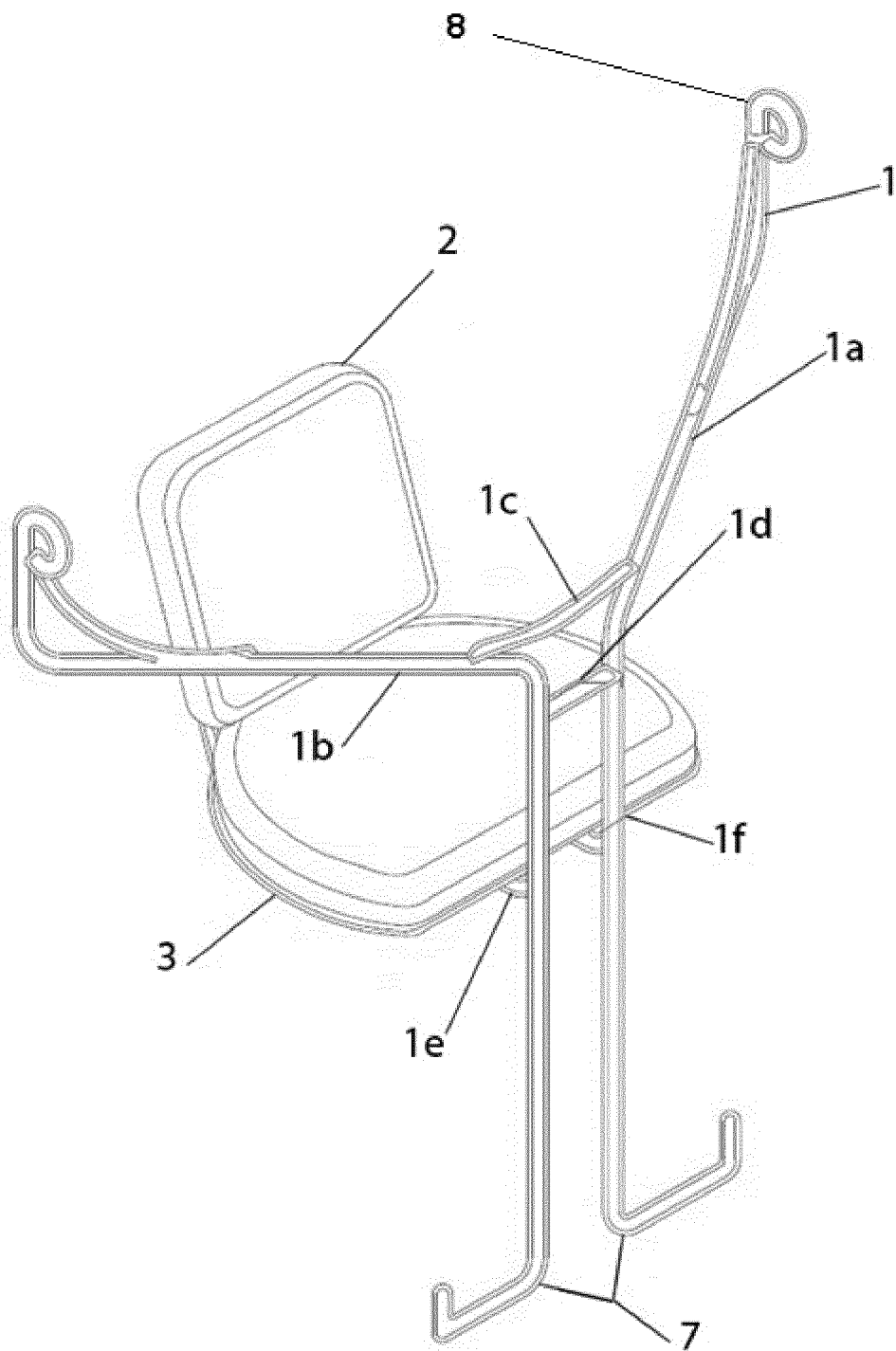


Figure 1

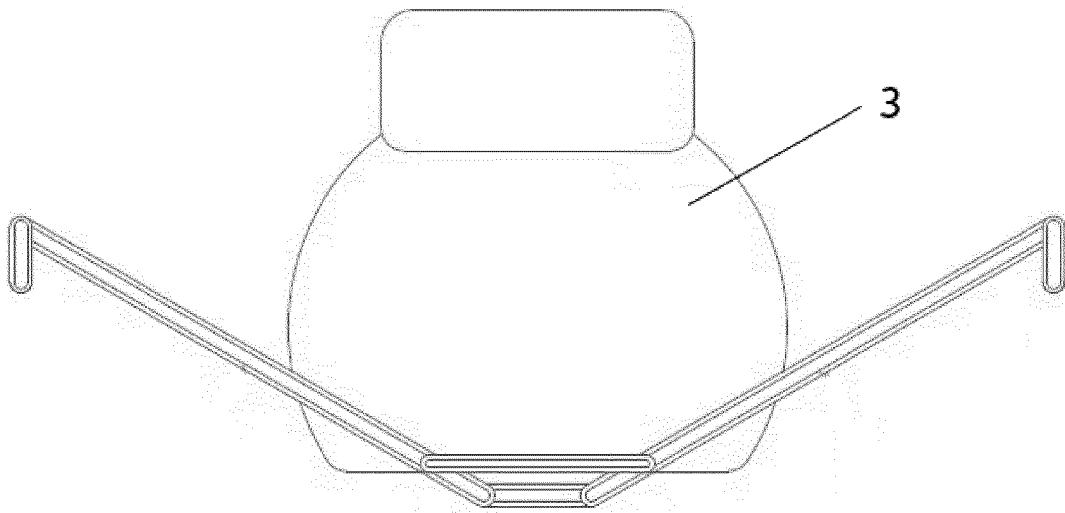


Figure 2

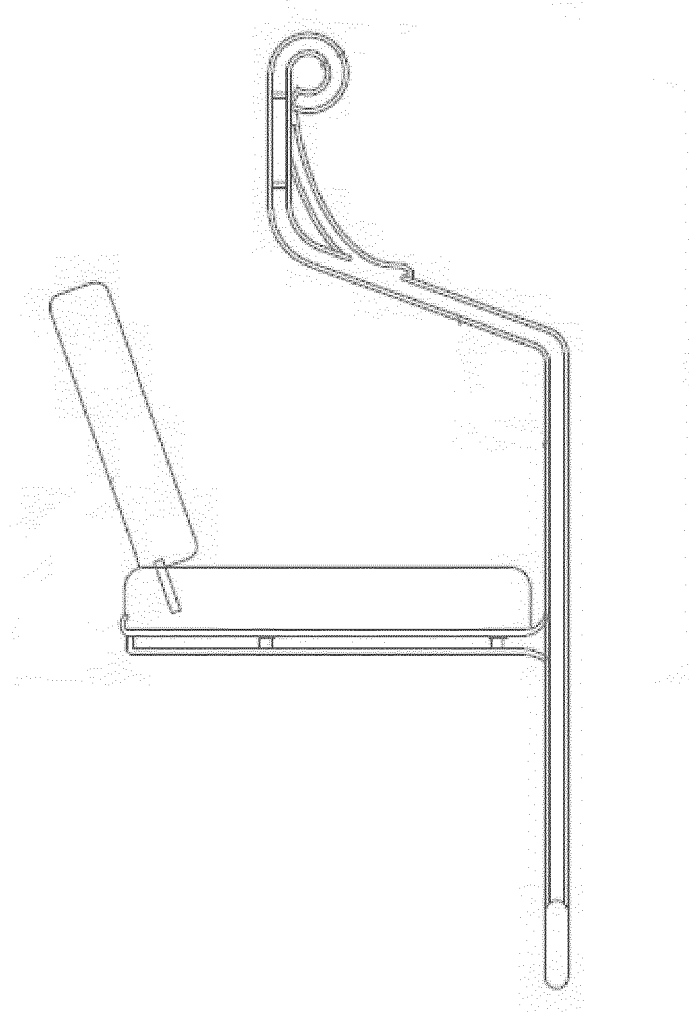


Figure 3

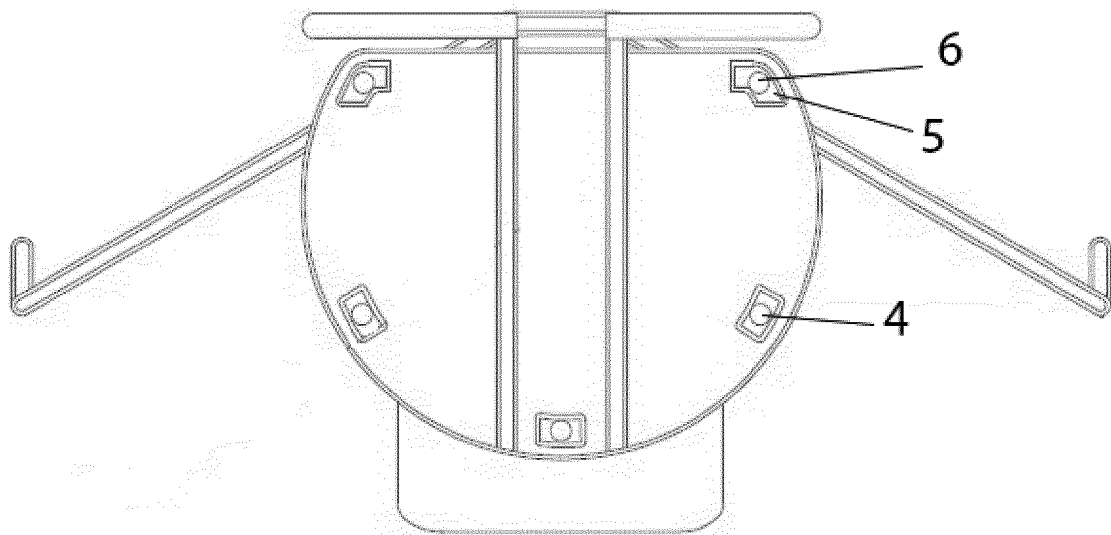


Figure 4



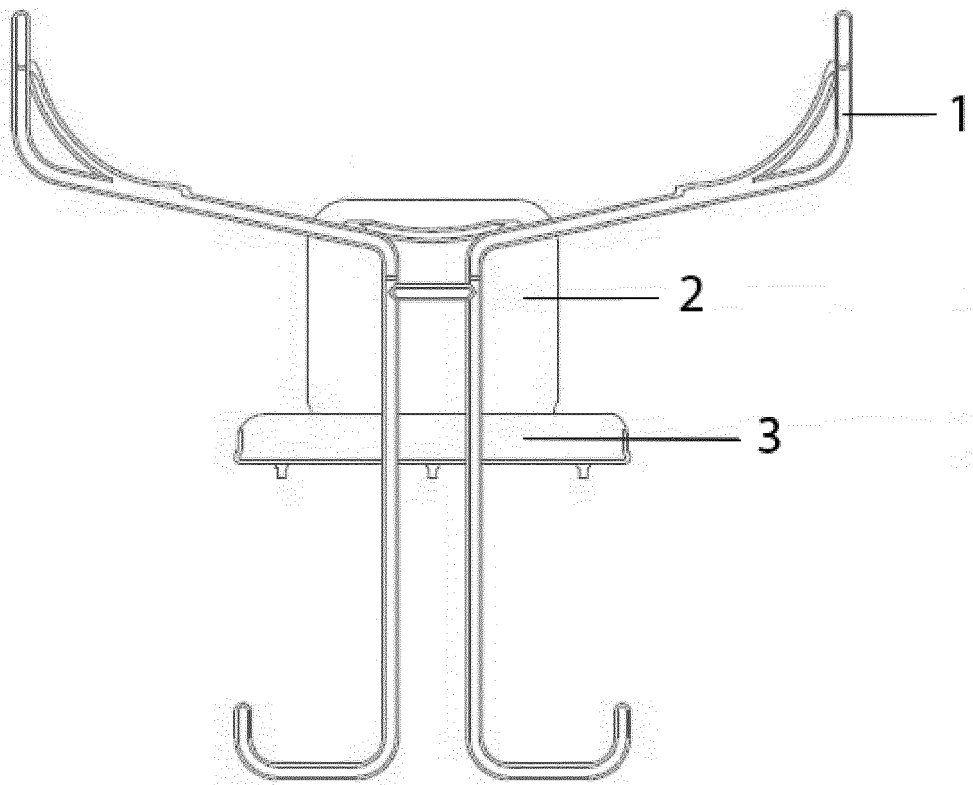


Figure 5

**REFERENCES CITED IN THE DESCRIPTION**

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