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(54) ROPE ACCESS CHAIR

(57) This invention relates to a rope access chair which, thanks to its geometry, provides unique comfort and safety conditions to people working in heights, due to its two arms wherein two ropes can be attached, thus increasing the chair's stability. The angle formed between the arms of the chair causes the equilibrium of forces to be achieved, providing the worker with stability in parallel to the work's vertical plane. This invention allows two ropes to be installed, thereby increasing stability, since the opening angle of the arms allows the worker to be balanced in the two ropes in parallel to the work's vertical plane, also ensuring that the space ahead is unobstructed so that he is able to work with his hands. The fact that the arms of the chair are ended with eyelets, allows descenders to be fixed thereto in order to perform lowering and raising operations. This invention is designed to be transported by a single man, thus providing greater work autonomy in what concerns the assembly operations of the ropes' systems intended for securing the workers, and its rigidity (which is similar to a common chair) exponentially enhances the workers' comfort.

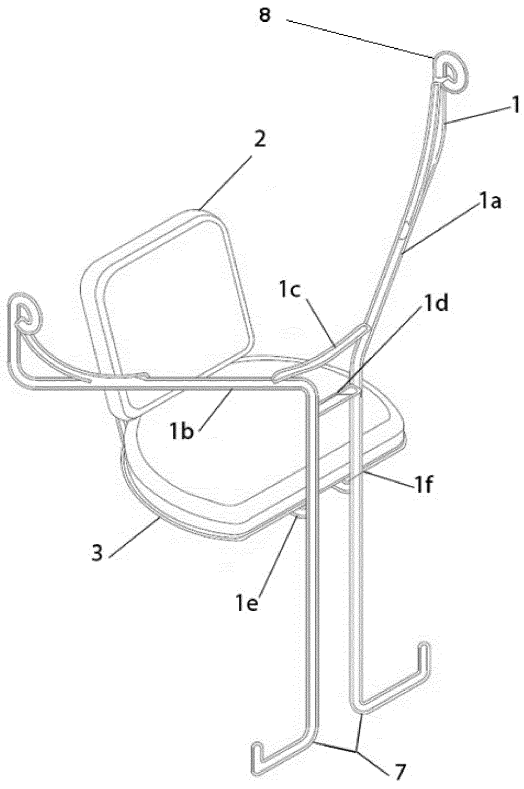

Figure 1

EP 3 150 778 A1

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.

[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.

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 of the ties (8) (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] In an embodiment of 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).

[0017] 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 540n/mm2 to 690n/mm2, and elasticity in the range of from 205 to 410n/mm2.

[0018] Moreover, the descenders could alternatively be a common tie, or even a motorized system.

Indication of the reference numbers:

[0019]

(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

Industrial applicability

[0020] 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 **characterized in that** it comprises:

a) a seat (3) and a backrest (2) which are attached to the equipment by means of descenders;
b) 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;
c) each one of the arms (1a) (1b) has in its lower end a footrest (7) and in its upper end the fixing means of the ties (8);
d) 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;
e) the distance between the two ends of the arms (8) is of 982mm; and
f) 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 540n/mm2 to 690n/mm2, and its elasticity is in the range of from 205 to 410n/mm2.

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.

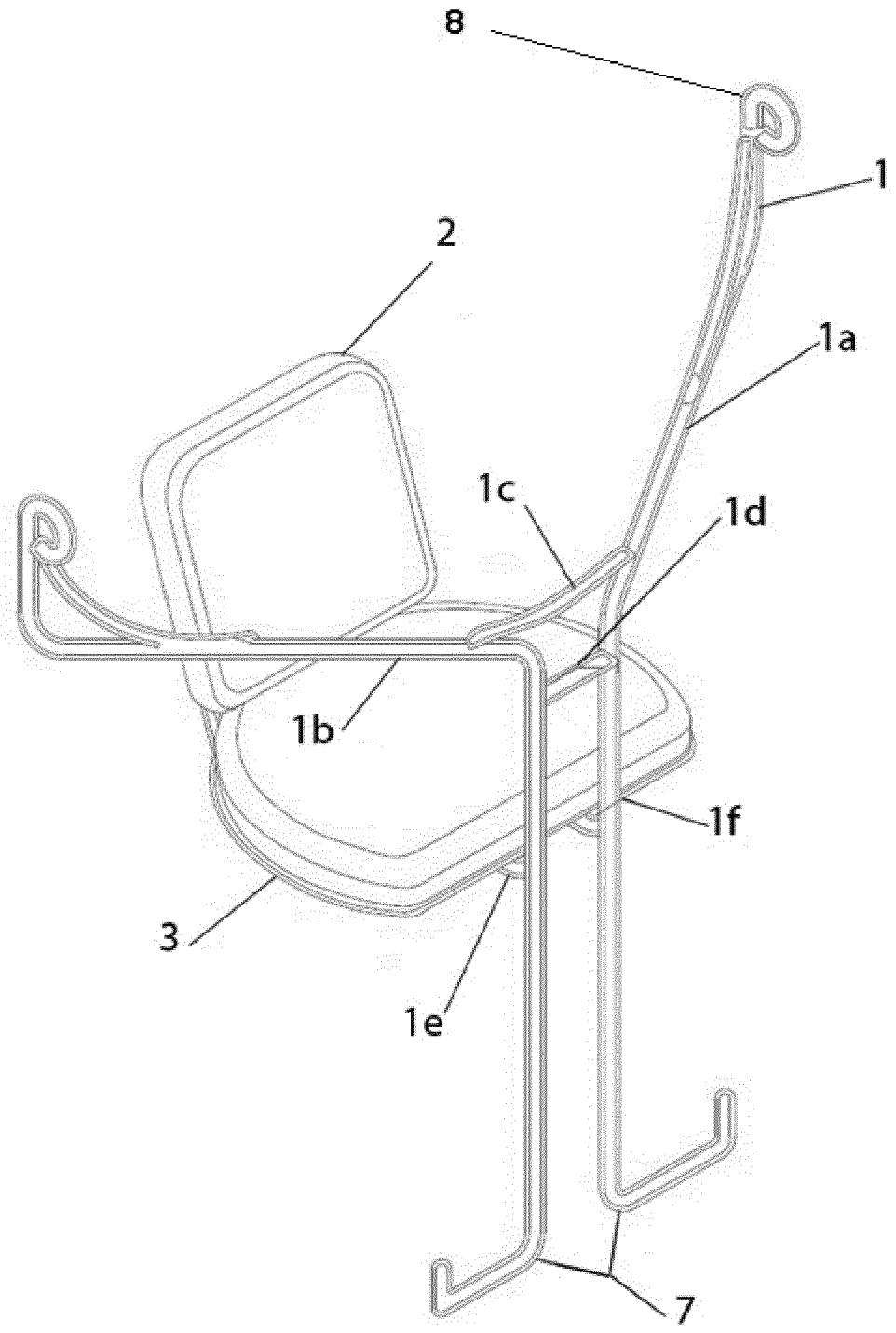

Figure 1

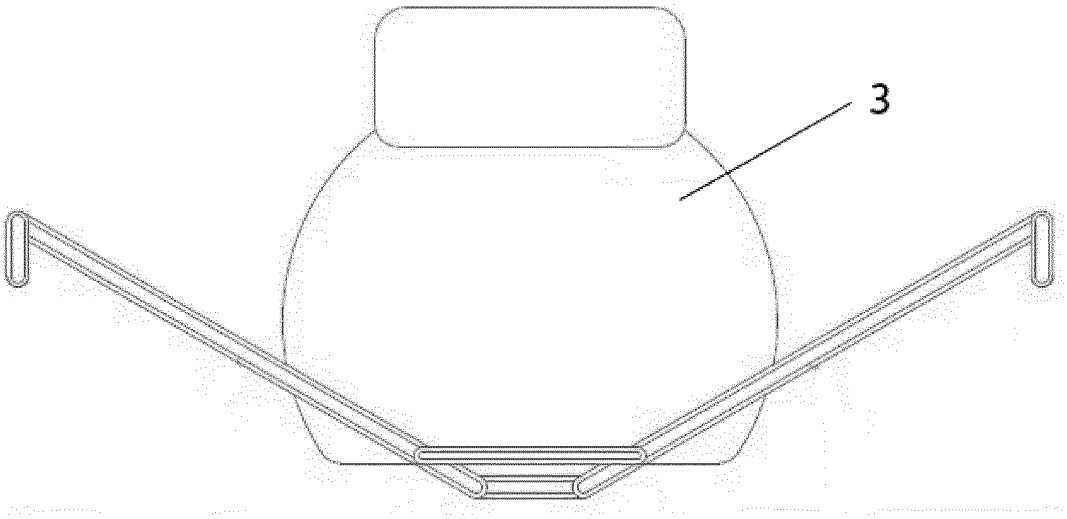

Figure 2

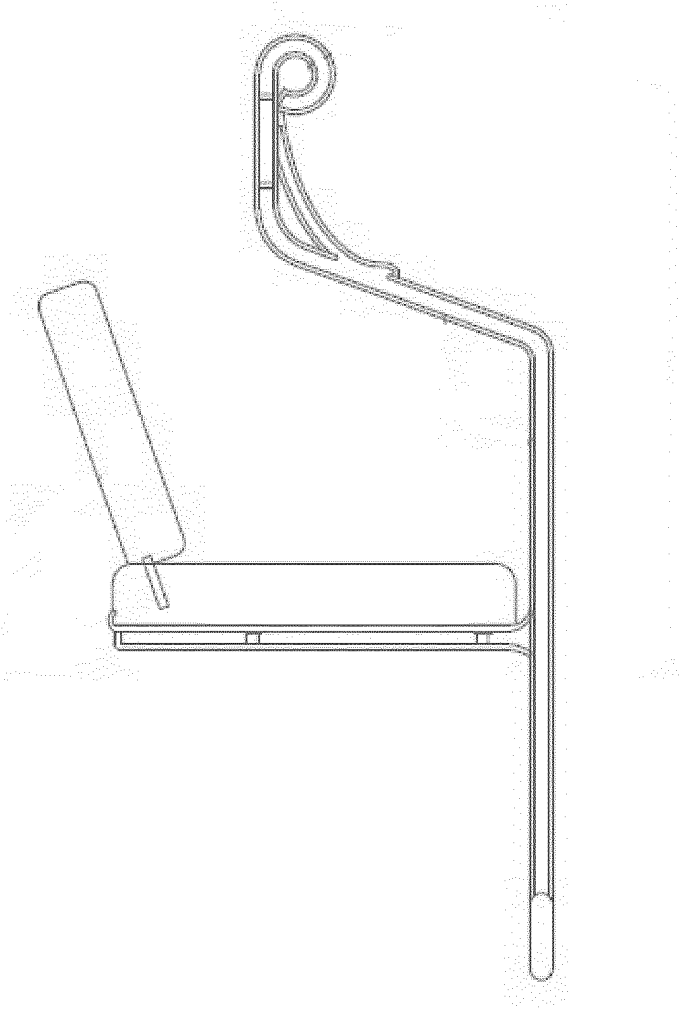

Figure 3

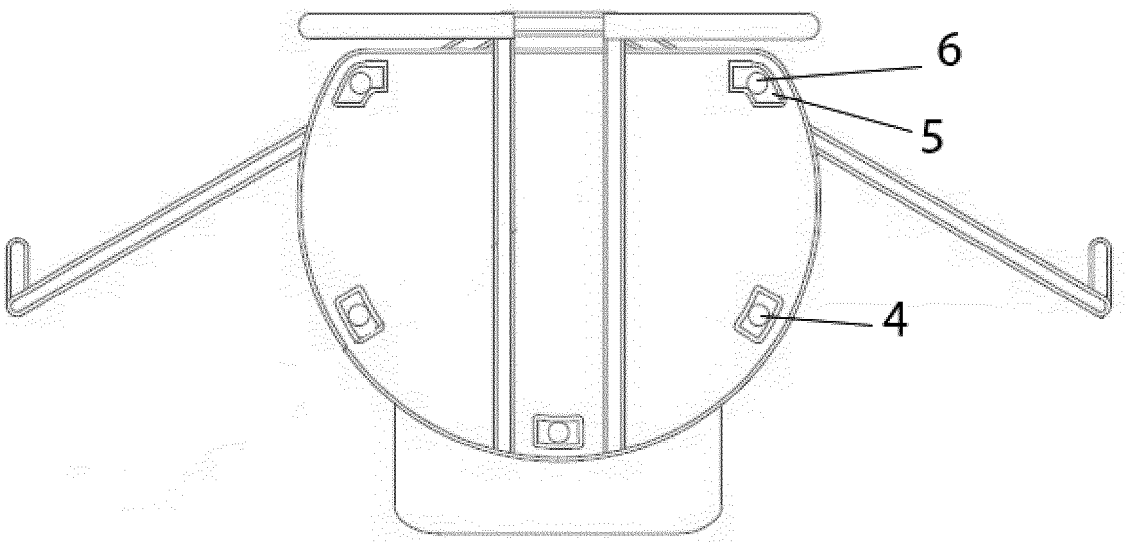

Figure 4

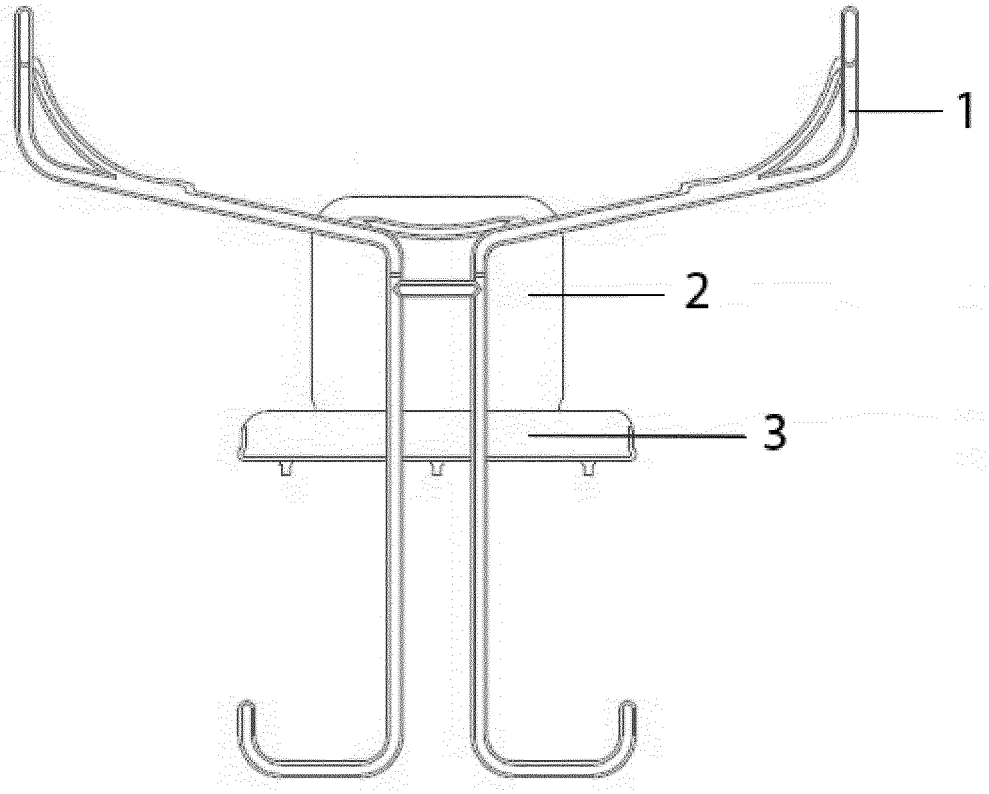

Figure 5

INTERNATIONAL SEARCH REPORT

International application No
PCT/PT2015/000026

A. CLASSIFICATION OF SUBJECT MATTER
INV. E04G3/30 A47L1/02 A62B1/00 E04G3/22 A47L3/00
ADD.

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)
E04G A47L A62B A47C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data, PAJ

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 H05 179797 A (DE A GAISO KK) 20 July 1993 (1993-07-20) abstract; figures 5,21	1-3,6-10 4,5
Y A	US 3 731 762 A (SIRLS J) 8 May 1973 (1973-05-08) column 2, line 41 - column 3, line 13; figures 1,2 column 3, line 18 - line 21	4,5 1-3,6-10
A	CN 202 942 021 U (ZHOU XIAOZHU) 22 May 2013 (2013-05-22) abstract; figures 1,2	1-10
A	JP S61 277763 A (HIRAYAMA HIROYOSHI) 8 December 1986 (1986-12-08) abstract; figures 1,2	1-10

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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Date of the actual completion of the international search	Date of mailing of the international search report
31 August 2015	07/09/2015

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Manera, Marco

Form PCT/ISA/210 (second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/PT2015/000026

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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Form PCT/ISA/210 (patent family annex) (April 2005)

REFERENCES CITED IN THE DESCRIPTION

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- US 4195708 D2 **[0007]**
- EP 1191165 A **[0008]**
- FR 2929972 **[0008]**
- WO 9203190 A **[0008]**
- EP 2353657 A **[0008]**
- US 2006169534 A **[0008]**
- US 2006055545 A **[0008]**
- US 5921345 A **[0008]**
- US 3484833 A **[0008]**
- US 8365864 B **[0008]**
- CN 201447863 U **[0008]**