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(54) **SELF-BALANCING SLIDING WHEEL**

(57) The present invention discloses a self-balancing pulley device, comprising a mounting block (1). A balancing sheet (2) is hinged by a hinge shaft (10) through the side face of the mounting block (1);
the balancing sheet (2) is provided with pulleys (3) arranged on two sides of the hinge shaft (10). Such a self-balancing pulley device is simple in structure and convenient to install. The pulleys (3) on both sides can realize automatic balancing.

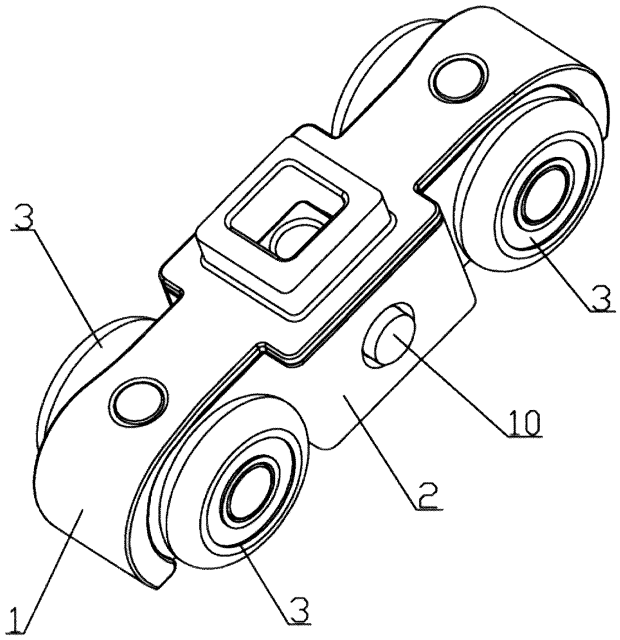

FIG. 1

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Description

FIELD OF THE INVENTION

[0001] The present invention relates to the field of a pulley device with self-balancing function.

BACKGROUND OF THE INVENTION

[0002] A pulley device is widely used on sliding door leaf such as in shower rooms or in closet doors of the state of art to assist the door leaf to be opened by sliding. In some cases, the weight of door leaf is large. In order to prevent door leaf shaking, more than two pulleys are employed to assist a door leaf to slide smoothly. While in practice, all the pulleys are required to slide on the same plane. Once uneven places appear on the rail the door leaf slides, the door leaf will move unsteadily or derail, and noise is generated, and the like, so that certain hidden danger is caused.

[0003] In addition, in order to prevent the door leaf shaking, two parallel guide rails are generally adapted to carry the weight of the door leaf, and then the pulleys are set on two sides of the pulley device respectively, wherein each side of the pulley side is placed to the corresponding side of the guide rail. In order to move the door leaf smoothly, both sides of the guide rail must be parallel and always maintained in the same height. However, after a long time of use, the guide rail doesn't bear the same gravity or caused deformation, resulting in the door leaf swinging or swaying when sliding. Some of the existing self-balancing pulley devices' structures are complex, and the adjustment is not convenient.

SUMMARY OF THE INVENTION

[0004] In order to overcome the deficiencies in the prior art, the present invention intends to provide a self-balancing pulley device which is simple in structure and convenient to adjust and is automatically adjusted by a self-balancing pulley.

[0005] In order to solve the above problems, the present invention adopts the following technical solutions:

A self-balancing pulley device comprises a mounting block, wherein a balancing sheet is hinged by a hinge shaft through the side face of the mounting block; the balancing sheet is provided with pulleys arranged on two sides of the hinge shaft.

[0006] According to the present invention, the balancing sheet is attached on two opposite side faces of the mounting block.

[0007] According to the present invention, the self-balancing pulley device is provided with two pieces of the balancing sheets.

[0008] According to the present invention, the mounting block further comprises a left arm and a right arm at both extending ends of the mounting block, and four pieces of the balancing sheet are provided and arranged on opposite sides of the left arm and the right arm respectively.

[0009] Another aim of the present invention is to overcome the deficiencies of the prior art and to provide a self-balancing pulley device of swing type which is simple in structure and can automatically adjust side pulleys to slide the door leaf smoothly.

[0010] In order to solve the above problems, the present invention adopts the following technical solutions:

Another better scheme is that a mounting cavity is provided in the middle of the mounting block , and the mounting cavity is provided with a rotating column, the rotating shaft of the rotating column is parallel to the sliding direction of the mounting block, and the mounting block is provided with mounting hole communicating with the mounting cavity, and the mounting block is further provided with a steering column inserted from the mounting hole into the rotating column.

[0011] According to the present invention, the rotating column is provided with a nut groove, and the nut groove is provided with a nut for the insertion of the steering column and threaded connection with the steering column.

[0012] According to the present invention, two opposite side faces of the left arm is provided with a left gasket groove respectively, and two opposite side faces of the right arm is provided with has a right gasket groove respectively; and two side faces of the mounting block are provided with a mounting gasket respectively, and two ends of the mounting gasket extend into the chamber of the left gasket groove and the right gasket groove respectively, and the balancing sheet is attached on the outer wall of the mounting gasket.

[0013] According to the present invention, the balancing sheet has a "⊓" shape.

[0014] According to the present invention, the mounting block is provided with a blocking portion capable of blocking the rotation of the balancing sheet.

[0015] The present invention has the beneficial effects that when the guide rail is not flat, the heights of the pulleys on the two sides of the balancing sheet are different, and under the gravity of the door leaf, pulleys rotate around the hinge shaft. The pulleys of two sides are always kept in the guide sliding groove and sliding on a plane by automatic adjustment, ensures smooth sliding of the door leaf. The self-balancing pulley device is provided with advantages of simple structure, convenient for adjustment, and long service life benefit from pulleys' adjustment. The blocking portion limits the swing amplitude of the balancing sheet to prevent the balancing sheet from swinging excessively.

[0016] The rotating shaft of the rotating column is parallel to the sliding direction of the mounting block, so that the steering column swings in the width direction of the sliding groove, adjusting the height of the pulleys on two

sliding grooves. Hence, the door leaf will not swing or shake due to the deformation of the two sliding grooves during sliding, guarantees the smooth sliding of the door leaf. The self-balancing pulley device is provided with benefits of simple structure, convenient for adjustment.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017]

FIG. 1 is a perspective view of the self-balancing pulley device according to Example 1 of the present invention;

FIG. 2 is a cross-sectional view of the self-balancing pulley device according to Example 1 of the present invention;

FIG. 3 is an exploded view of the self-balancing pulley device according to Example 1 of the present invention;

FIG. 4 is a partially exploded view of the self-balancing pulley device according to Example 1 of the present invention;

FIG. 5 is a schematic diagram of the self-balancing pulley device in using state according to Example 1 of the present invention;

FIG. 6 is a perspective view of the self-balancing pulley device according to Example 2 of the present invention;

FIG. 7 is an exploded view of the self-balancing pulley device according to Example 2 of the present invention;

FIG. 8 is a partially exploded view of the self-balancing pulley device according to Example 2 of the present invention;

DETAILED DESCRIPTION OF ILLUSTRATED EMBODIMENTS

[0018] The present invention will be further described in detail below with reference to the accompanying drawings and specific embodiments.

Example 1

[0019] In example 1, as shown in FIG. 1 to FIG. 5, a self-balancing pulley device comprises a mounting block 1. A balancing sheet 2 is hinged on the side face of the mounting block 1 via a hinge shaft 10, and the balancing sheet 2 is attached on the side faces of the mounting block 1 along the elongation direction of the mounting block 1. The balancing sheet 2 is provided with pulleys 3 on two sides of the hinge shaft 10 respectively. The pulleys 3 at both ends of the balancing sheet 2 can be rotated around the hinge shaft 10, and the mechanism is similar to the seesaw. The mounting block 1 is provided with a blocking portion 18 which can block the rotation of the balancing sheet 2. When the balancing sheet 2 swings, it is blocked by the blocking portion 18 to prevent excessive swinging. The balancing sheet 2 is provided with two pieces, the connection line of two pieces of the balancing sheet 2 is perpendicular to the sliding direction of the mounting block 1. The mounting block 1 is sandwiched by the two pieces of the balancing sheet 2, and the balancing sheet 2 is attached on two opposite side faces of the mounting block 1, and each balancing sheet 2 is provided with pulleys 3. In the embodiment, two pulleys 3 are arranged on the balancing sheet 2, the balancing sheet 2 has a "⊓" shape, and the pulleys 3 on the balancing sheet 2 slide in a guide groove. When sliding inside, when the unevenness occurs in one guide rail, the two pulleys 3 on the balancing sheet 2 swing around the hinge shaft 10 under the gravity of the door leaf to realize automatic balance, so that the door leaf slides smoothly.

[0020] The mounting block 1 is provided with a mounting cavity 13 in the middle of the mounting block 1. A rotating column 4 is disposed in the mounting cavity 13 in a relatively rotatable manner. The rotating column 4 is placed in the mounting cavity 13. The rotating shaft of the rotating column 4 is parallel to the sliding direction of the mounting block 1, and the mounting block 1 is provided with a mounting hole 14 communicating with the mounting cavity 13. The mounting block 1 is further provided with a steering column 15 inserted from the mounting hole 14 into the rotating column 4, and the steering column 15 is extended from the mounting hole 14 and connected to the door leaf. The size of the opening of the mounting hole 14 limits the swinging amplitude of the steering column 15, and prevents the steering column 15 from excessively swinging, so that the steering column 15 will rotate the rotating column 4 to swing in the direction of the balancing sheet 2 on both sides.

[0021] When the heights of guide rail are different, and under the gravity of the door leaf, the rotating column 4 will rotate and swing, thereby adjusting the height of the pulleys 3 of the two balancing sheets 2, that is, adjusting the height of the pulleys 3 in the guide rail, ensuring a smooth sliding of the door leaf. A nut groove 41 is disposed in the rotating column 4, and the nut groove 41 is provided with a nut 42 for inserting and screwing the steering column 15, and the rotating column 4 is threaded connected with the steering column 15 by the nut 42, which is simple and convenient to install.

Example 2

[0022] In example 2, as shown in FIG. 6 to FIG. 8, the difference from example 1 is that the balancing sheet 2 is provided with four pieces. The mounting block 1 is provided with a left arm 11 and a right arm 12 at both extending ends of the mounting block 1, and four pieces of the balancing sheet 2 are provided and arranged on opposite sides of the left arm 11 and the right arm 12 respectively. Each balancing sheet 2 is provided with two pulleys 3, so that there are eight pulleys 3, and the pulleys

3 on the same side are placed in the same guide rail. Since there are many pulleys 3, if four pulleys 3 are placed on one balancing sheet 2, the balancing sheet 2 will be too long and the swing amplitude will be too large. Therefore, each side of the mounting block is provided with two pieces of balancing sheet 2. Two opposite side faces of the left arm 11 is provided with a left gasket groove 16 respectively, and two opposite side faces of the right arm 12 is provided with has a right gasket groove 17 respectively; and two side faces of the mounting block 1 are provided with a mounting gasket 5 respectively, and two ends of the mounting gasket 5 extend into the chamber of the left gasket groove 16 and the right gasket groove 17 respectively, and the balancing sheet 2 is attached on the outer wall of the mounting gasket 5.

[0023] Since the balancing sheet 2 on the same side are provided separately, the mounting gasket 5 is attached to the side face of the mounting block 1 for the purpose of securing the strength of the mounting block 1.

Claims

1. A self-balancing pulley device, comprising:

   a mounting block (1);
   a balancing sheet (2) is hinged by a hinge shaft (10) through the side face of the mounting block (1); and
   the balancing sheet (2) is provided with pulleys (3) arranged on two sides of the hinge shaft (10).

2. A self-balancing pulley device as claimed in claim 1, wherein the balancing sheet (2) is attached on two opposite side faces of the mounting block (1).

3. A self-balancing pulley device as claimed in claim 2, wherein the self-balancing pulley device is provided with two pieces of the balancing sheets (2).

4. A self-balancing pulley device as claimed in claim 2, wherein the mounting block (1) further comprising:
   a left arm (11) and a right arm (12) at both extending ends of the mounting block (1), and four pieces of the balancing sheet (2) are provided and arranged on opposite sides of the left arm (11) and the right arm (12) respectively.

5. A self-balancing pulley device as claimed in any one of claims 2-4,
   wherein a mounting cavity (13) is provided in the middle of the mounting block (1), and the mounting cavity (13) is provided with a rotating column (4), the rotating shaft of the rotating column (4) is parallel to the sliding direction of the mounting block (1), and the mounting block (1) is provided with a mounting hole (14) communicating with the mounting cavity (13), and the mounting block (1) is further provided with a steering column (15) inserted from the mounting hole (14) into the rotating column (4).

6. A self-balancing pulley device as claimed in claims 5, wherein the rotating column (4) is provided with a nut groove (41), and the nut groove (41) is provided with a nut (42) for the insertion of the steering column (15) and threaded connection with the steering column (15).

7. A self-balancing pulley device as claimed in claims 4, wherein two opposite side faces of the left arm (11) is provided with a left gasket groove (16) respectively, and two opposite side faces of the right arm (12) is provided with has a right gasket groove (17) respectively; and two side faces of the mounting block (1) are provided with a mounting gasket (5) respectively, and two ends of the mounting gasket (5) extend into the chamber of the left gasket groove (16) and the right gasket groove (17) respectively, and the balancing sheet (2) is attached on the outer wall of the mounting gasket (5).

8. A self-balancing pulley device as claimed in claims 3, wherein the balancing sheet (2) has a "⊓" shape.

9. A self-balancing pulley device as claimed in claims 1, the mounting block (1) is provided with a blocking portion (18) capable of blocking the rotation of the balancing sheet (2).

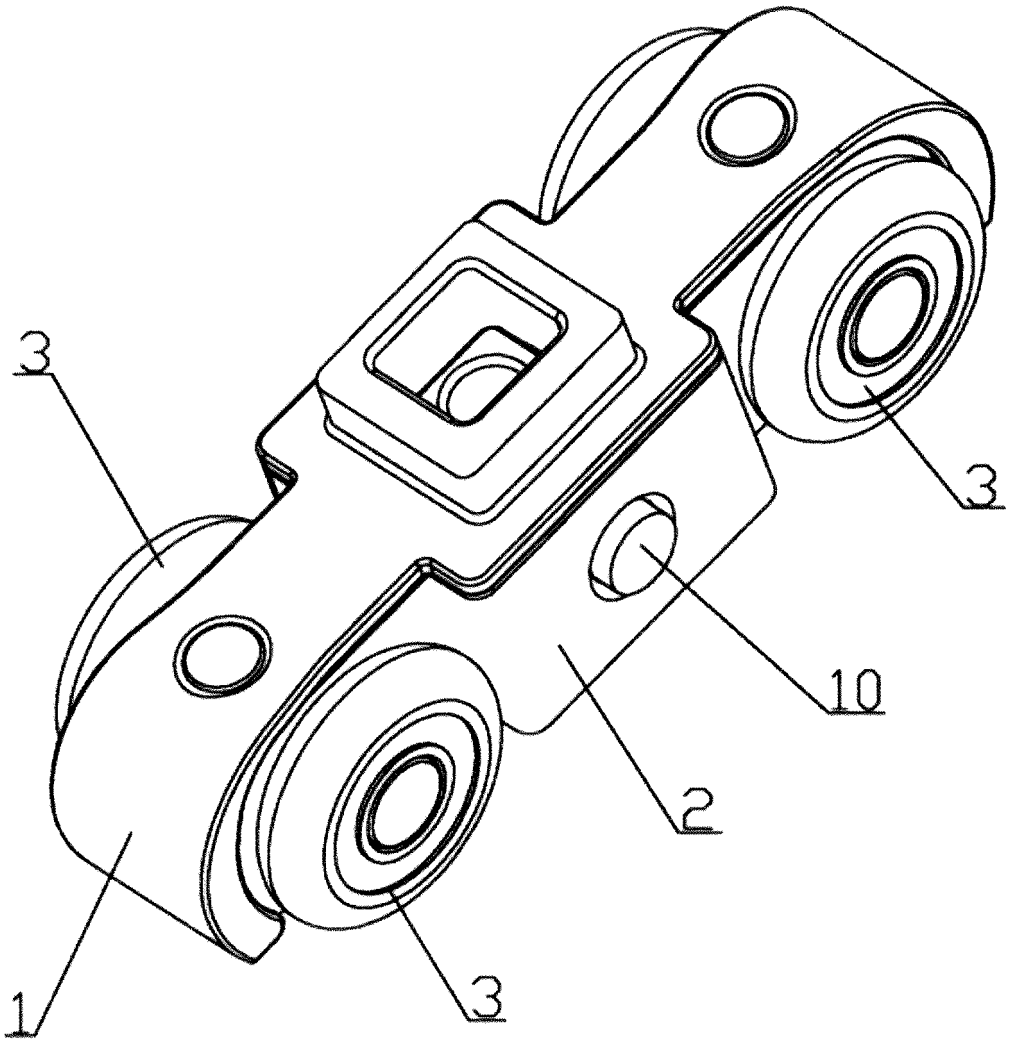

FIG. 1

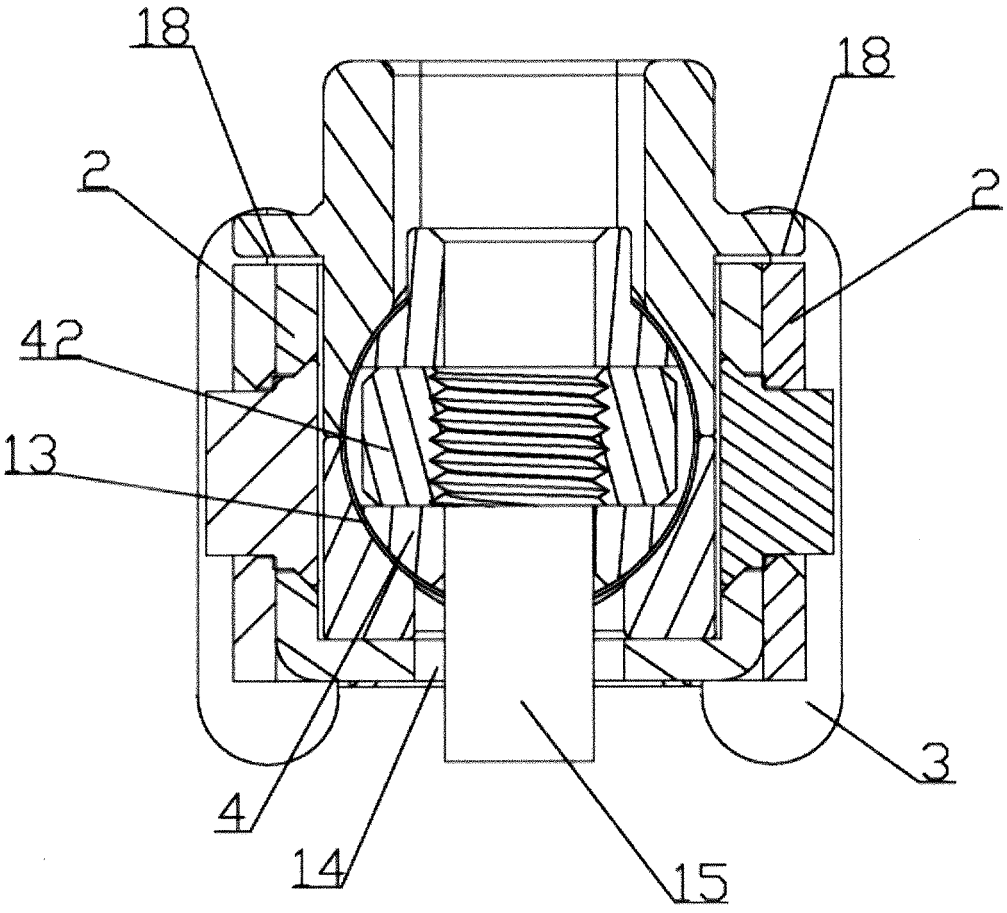

FIG. 2

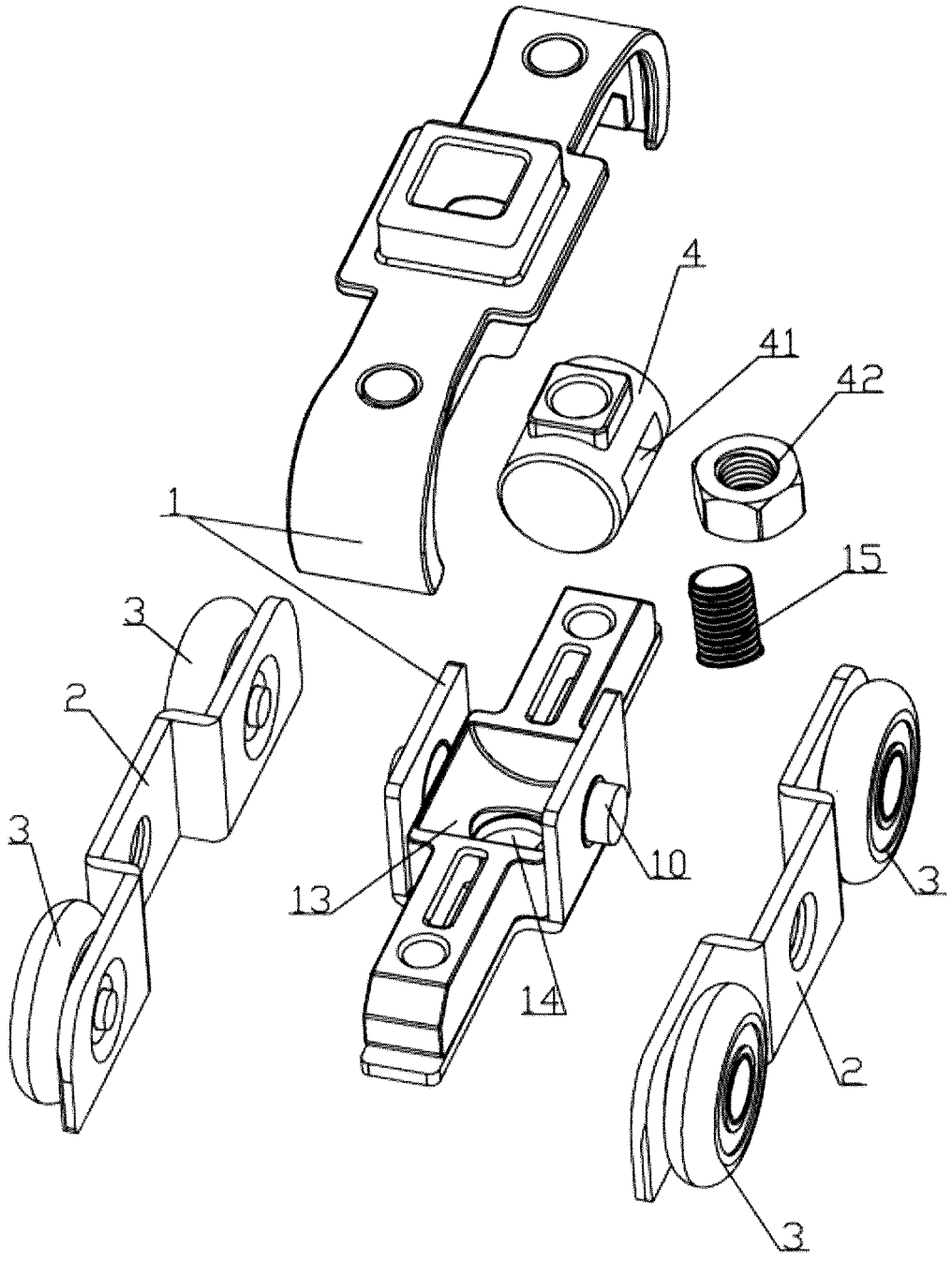

FIG. 3

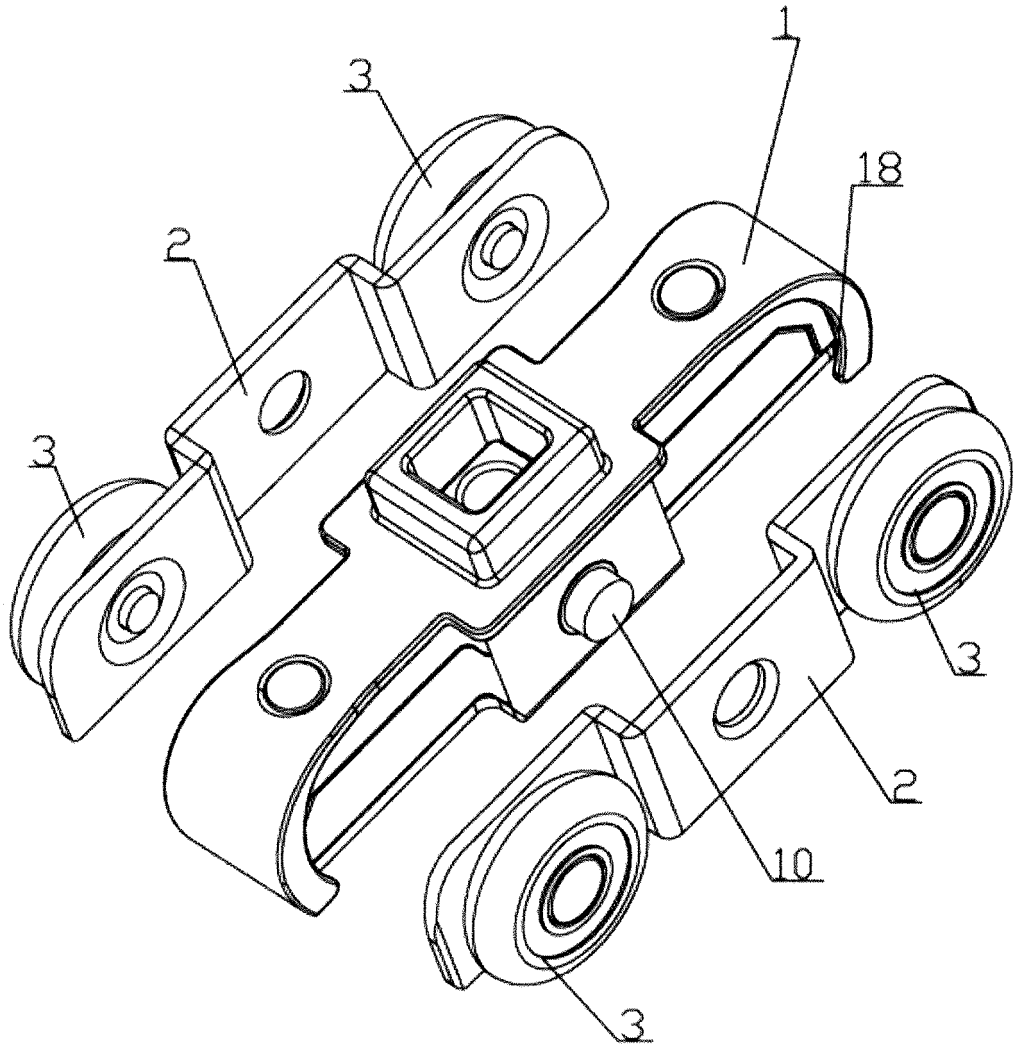

FIG. 4

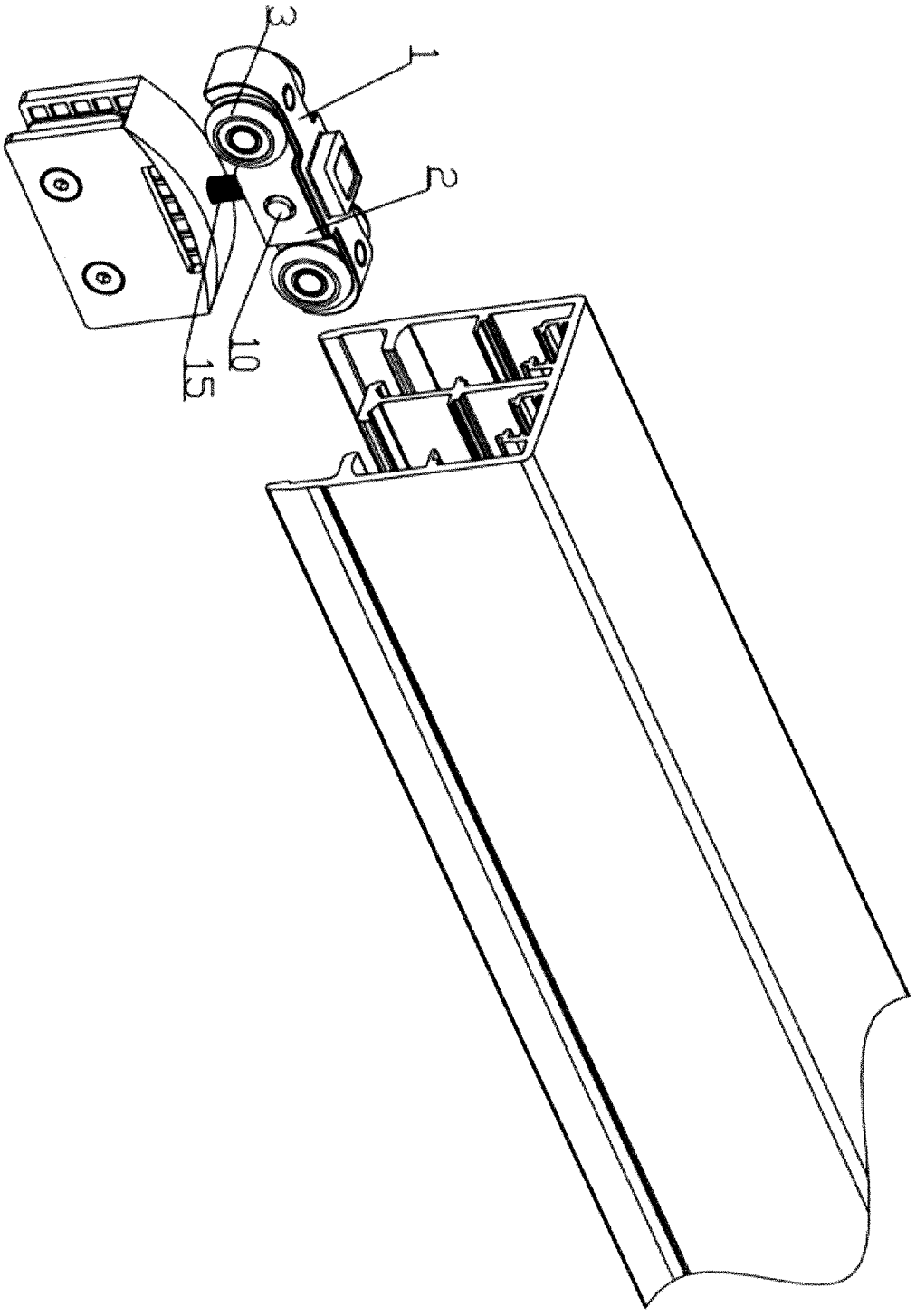

FIG. 5

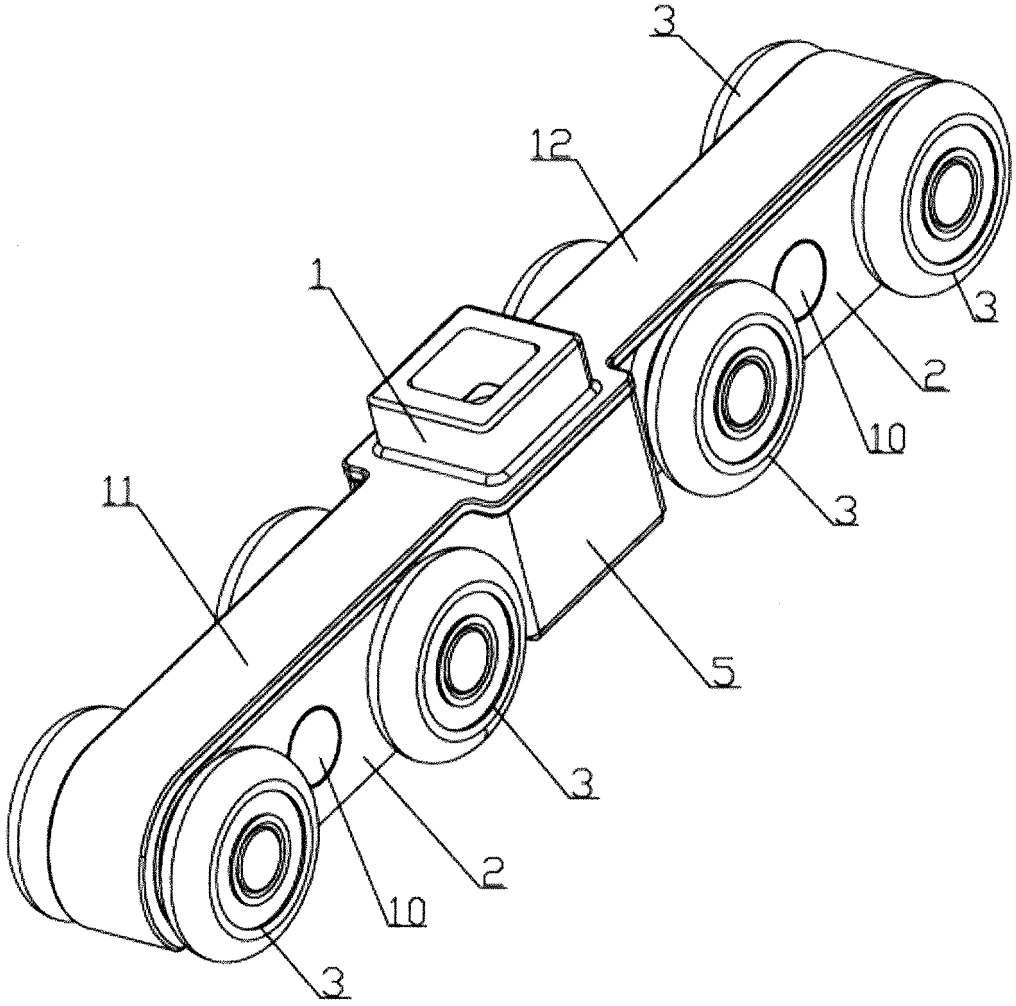

FIG. 6

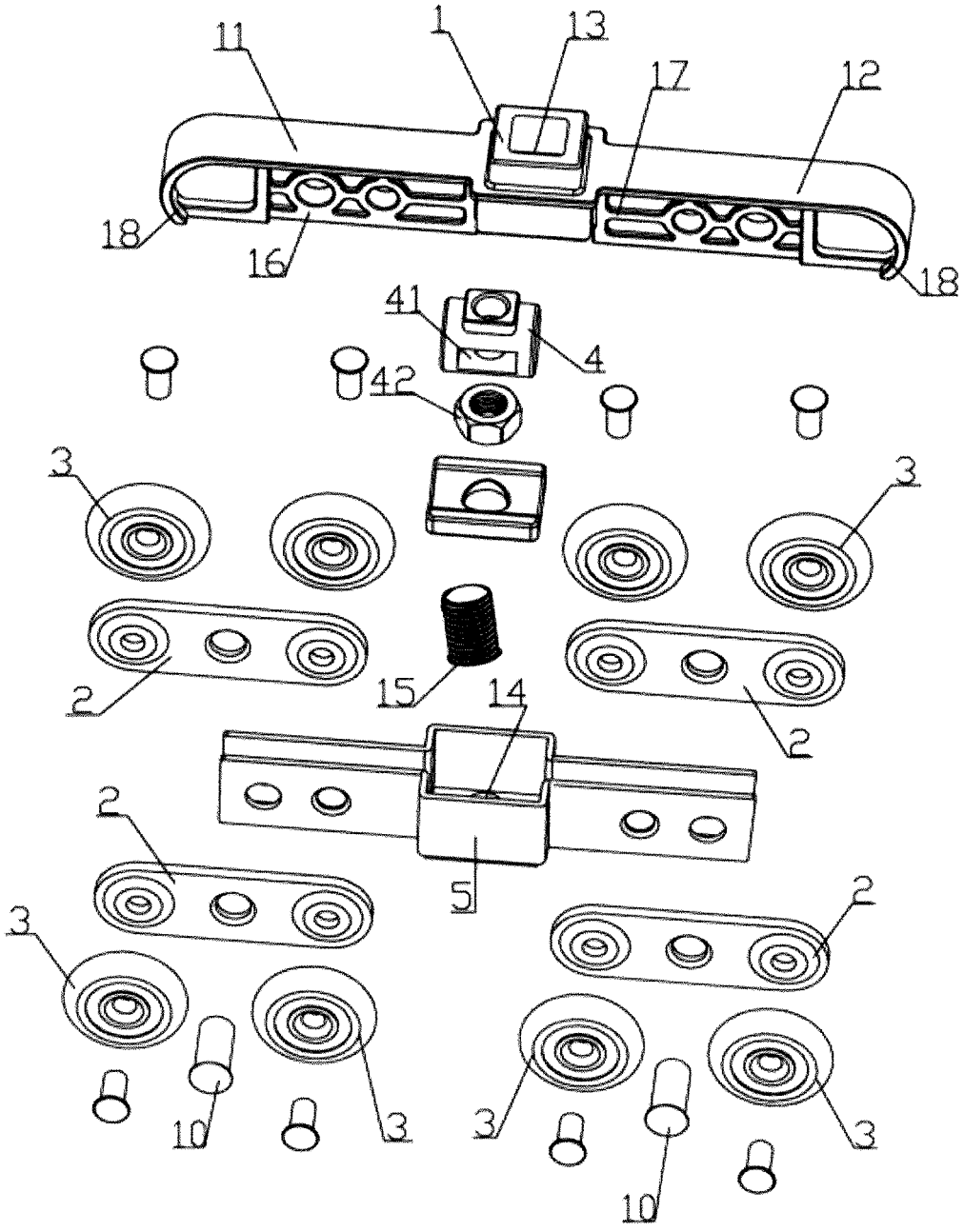

FIG. 7

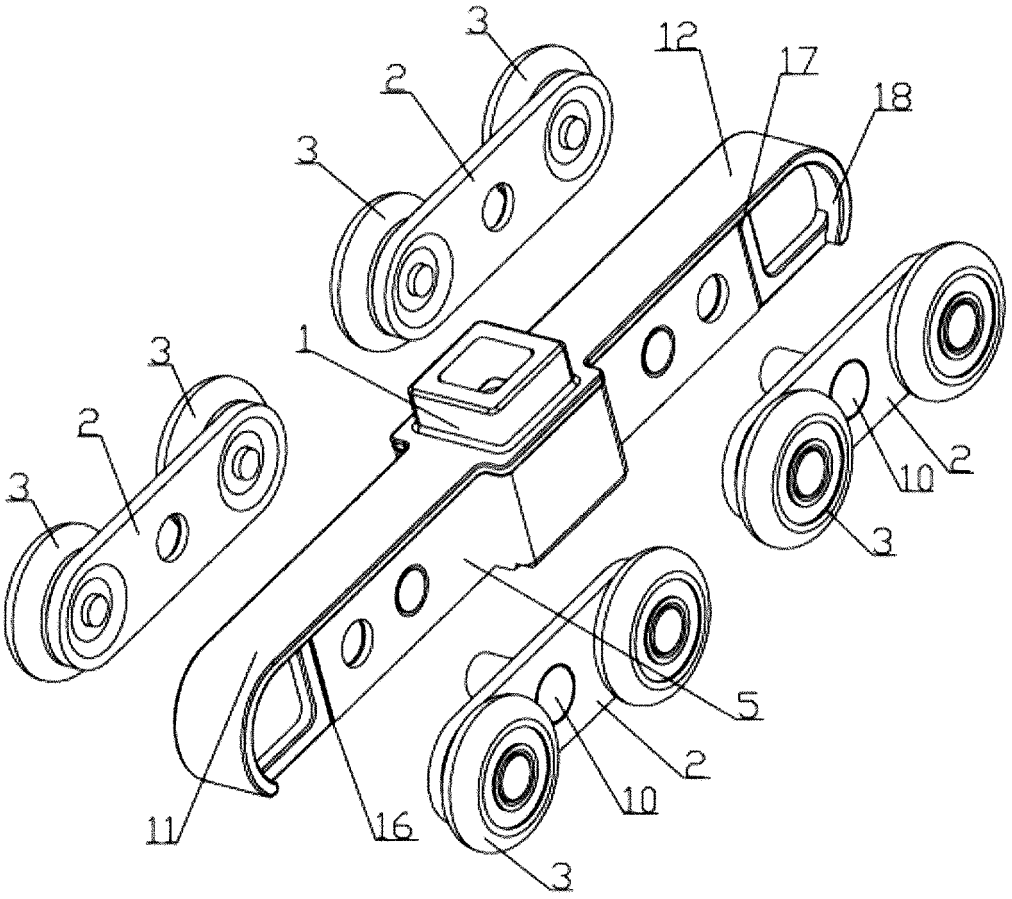

FIG. 8

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2017/098635

A. CLASSIFICATION OF SUBJECT MATTER

E05D 13/00 (2006.01) i

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

E05D

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)

CNABS, CNTXT, VEN, SIPOABS, CNKI: 轮, 自平衡, 轴, 两侧, 相对侧, 平衡, 找平, 跷跷板, 转动, 摆动, 摆柱, 摆杆, 转柱, 转珠, 活动块, 螺母, balance, pulley, wheel, shaft, four, two, twin, double, nut, pole, post

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 206035179 U (JIANG) 22 March 2017 (22.03.2017), claims 1-9	1-9
PX	CN 106193870 A (XU, Jiangde) 07 December 2016 (07.12.2016), claims 1-9	1-9
PX	CN 206053646 U (XU, Jiangde) 29 March 2017 (29.03.2017), claims 1-8	1-9
Y	CN 204060281 U (XU, Jiangde) 31 December 2014 (31.12.2014), description, paragraph [0037], and figures 1-6	1-4, 7-9
Y	CN 202850709 U (LAN, Zongbao) 03 April 2013 (03.04.2013), description, paragraph [0015], and figures 1-4	1-4, 7-9
A	US 2010101150 A1 (HUANG SHIH-CHANG) 29 April 2010 (29.04.2010), entire document	1-9

☐ 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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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
07 November 2017	29 November 2017
Name and mailing address of the ISA State Intellectual Property Office of the P. R. China No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088, China Facsimile No. (86-10) 62019451	Authorized officer LI, Xiaoxiao Telephone No. (86-10) 4653

Form PCT/ISA /210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2017/098635

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
CN 206035179 U	22 March 2017	None	
CN 106193870 A	07 December 2016	None	
CN 206053646 U	29 March 2017	None	
CN 204060281 U	31 December 2014	None	
CN 202850709 U	03 April 2013	None	
US 2010101150 A1	29 April 2010	None	

Form PCT/ISA /210 (patent family annex) (July 2009)