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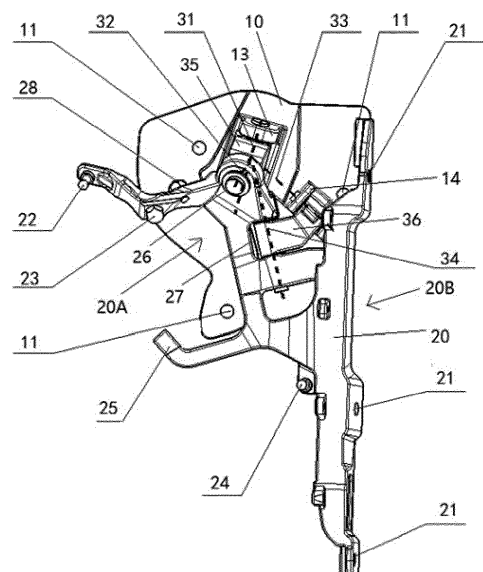
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(54) **VEHICLE DOOR HINGE, AND VEHICLE**

(57) The present invention discloses a vehicle door hinge and a vehicle. The vehicle door hinge comprises: a hinge mounting seat, the hinge mounting seat including a first axle housing and a second axle housing; a hinge arm, the hinge arm including a working portion and a connection portion, the working portion of the hinge arm including a mounting portion for a height adjustment axle block and a mounting portion for an opening state adjustment axle block; an axle-pin structure unit, the axle-pin structure unit including a hinge height adjustment axle block and a hinge opening state adjustment axle block. The vehicle door hinge according to the present invention simplifies opening and closing movement of the door as movement of the axle-pin structure unit, thereby allowing smooth opening of the door.



**FIG. 1**

## Description

### Field of Invention

[0001] The present invention relates to the technical field of vehicle manufacturing and, in particular, to a vehicle door hinge and a vehicle with the vehicle door hinge.

### Background

[0002] With rapid development of automotive technologies, all vehicle structures are gradually optimized and improved, and door mounting structures are becoming more and more diverse, and vehicle door hinges for scissor doors are becoming more and more high-end. The structures of conventional vehicle door hinges for scissor doors are complicated, with poor versatility and high failure rate, and there is room for improvement.

### Summary of Invention

[0003] The present invention aims to address at least one of the technical problems in the prior art. Therefore, an objective of the present invention is to provide a vehicle door hinge that is applicable to scissor doors, which simplifies the opening and closing operations of scissor doors and makes the opening operation of the doors smoother.

[0004] According to embodiments of the present invention, the vehicle door hinge includes: a hinge mounting seat hinge mounting seat including a first axle housing and a second axle housing; a hinge arm including a working portion and a connection portion, the working portion of the hinge arm including a height axle block mounting portion and an opening state adjustment axle block mounting portion; an axle-pin structure unit including a hinge height axle block and a hinge opening state adjustment axle block, wherein the hinge height axle block is connected to the first axle housing at an end to form a first rotation axis, and the hinge height axle block is connected to the height axle block mounting portion at the other end to form a second rotation axis, and wherein the hinge opening state adjustment axle block is connected to the second axle housing at an end to form a third rotation axis, and the hinge opening state adjustment axle block is connected to the opening state adjustment axle block mounting portion to form a fourth rotation axis.

[0005] The vehicle door hinge according to the embodiments of the present invention simplifies the movement of the door in three directions to a coordinated rotational movement rotating around the four rotation axes through the axle-pin structure unit during the opening and closing of the door. The movement is simple and has little impact on the structure of the door. The aesthetics and practicality of scissor doors are retained, and the smoothness and stability of the door movement are improved. The vehicle door hinge has a simple structure and is easy to

install.

[0006] The present invention further provides a vehicle.

[0007] According to an embodiment of the present invention, the vehicle is provided with the vehicle door hinge of any one of the aforementioned embodiments.

[0008] The vehicle has advantages similar to those of the aforementioned vehicle door hinge, which will not be repeated herein.

[0009] The additional aspects and advantages of the present invention will be partially given in the following description, and some will become more apparent in the following description, or be understood through practice of the present invention.

### Brief Description of Drawings

[0010] The aforementioned and/or additional aspects and advantages of the present invention will become apparent and easy to understand from the description of the embodiments with reference to the following drawings, in which:

FIG. 1 is a schematic diagram of a vehicle door hinge according to an embodiment of the present invention.

FIG. 2 is a schematic diagram of another vehicle door hinge according to an embodiment of the present invention.

FIG. 3 is a schematic diagram of a hinge height axle block according to an embodiment of the present invention.

FIG. 4 is a schematic diagram of a hinge opening state adjustment axle block according to an embodiment of the present invention.

FIG. 5 is a schematic diagram of an upper hinge slider block according to an embodiment of the present invention.

FIG. 6 is a schematic diagram of a lower hinge slider block according to an embodiment of the present invention.

FIG. 7 is a schematic diagram of the closed state when a vehicle door hinge is mounted on a door according to an embodiment of the present invention.

FIG. 8 is a schematic diagram of the opened state when a vehicle door hinge is mounted on a door according to an embodiment of the present invention.

FIG. 9 is a schematic diagram of another view of the opened state when a vehicle door hinge is mounted on a door according to an embodiment of the present invention.

FIG. 10 is a schematic diagram of another view of a vehicle door hinge according to an embodiment of the present invention.

FIG. 11 is a schematic diagram of a vehicle door hinge mounted on a vehicle body and a vehicle door according to an embodiment of the present invention.

FIG. 12 is a schematic diagram of another view of a vehicle door hinge mounted on a vehicle body and a vehicle door according to an embodiment of the present invention.

Reference signs:

**[0011]**

vehicle door hinge 100;  
hinge mounting seat 10;  
mounting hole 11 of the mounting seat;  
first axle housing 13 of the mounting seat;  
second axle housing 14 of the mounting seat;  
hinge arm 20;  
working portion 20A of the hinge arm;  
connection portion 20B of the hinge arm;  
door mounting hole 21 of the hinge arm;  
electric strut mounting ball 22;  
upper hinge slider 23;  
lower hinge slider ball 28;  
gas spring mounting ball 24;  
hinge arm limiter 25;  
hinge arm height adjustment axle block mounting portion 26;  
hinge arm opening level adjustment axle block mounting portion 27;  
axle-pin structure unit 30;  
first rotation axis 31;  
second rotation axis 32;  
third rotation axis 33;  
fourth rotation axis 34;  
hinge height adjustment axle block 35;  
hinge height adjustment axle block connection hole 351;  
hinge height adjustment axle block connection shaft 352;  
hinge opening state adjustment axle block 36;  
first connection hole 361 of the hinge opening state adjustment axle block;  
second connection hole 362 of the hinge opening state adjustment axle block;  
hinge opening state adjustment axle block stop protrusion 363;  
upper hinge slider 40;  
upper hinge slider block slideway 401;  
lower hinge slider 41;  
lower hinge slider block slideway 411;  
upper hinge limiting block 51;  
lower hinge limiting block 52;  
mid-hinge limiting block 53;  
gas spring 60;  
gas spring mounting bracket 61;  
electric strut 70;  
electric strut mounting bracket 71;  
door frame 200;  
door 300.

**Detailed Description**

**[0012]** The embodiments of the present invention are described in detail below. Examples of the embodiments are shown in the drawings, wherein the same or similar reference signs indicate the same or similar components or components with the same or similar functions throughout. The embodiments described below with reference to the drawings are exemplary, and are only used to explain the present invention, and are not construed as limitation to the present invention.

**[0013]** Unless otherwise specified, the front-rear direction in the present invention is the longitudinal direction of a vehicle, i.e., X direction; the left-right direction is the lateral direction of the vehicle, i.e., the Y direction; and the top-bottom direction is the vertical direction of the vehicle, i.e., the Z direction.

**[0014]** A vehicle door hinge 100 according to an embodiment of the present invention is described below with reference to FIG. 1 to FIG. 10. The vehicle door hinge 100 includes: a hinge mounting seat 10, a hinge arm 20, and an axle-pin structure unit 30.

**[0015]** The hinge mounting seat 10 hinge mounting seat includes a first axle housing 13 of the mounting seat and a second axle housing 14 of the mounting seat. The hinge mounting seat 10 further includes a mounting hole 11 of the mounting seat. The hinge mounting seat 10 may be mounted on the vehicle body frame of a vehicle.

**[0016]** The hinge arm 20 includes a working portion 20A of the hinge arm and a connection portion 20B of the hinge arm. The working portion 20A of the hinge arm includes a height adjustment axle block mounting portion 26 of the hinge arm and an opening state adjustment axle block mounting portion 27 of the hinge arm. The connection portion 20B of the hinge arm is provided with a door mounting hole 21 of the hinge arm, and the connection portion 20B of the hinge arm is used to connect with a door.

**[0017]** The axle-pin structure unit 30 includes a hinge height adjustment axle block 35 and a hinge opening state adjustment axle block 36. Further, with reference to FIG. 3, in the embodiment of the present invention, the hinge height adjustment axle block 35 is provided with a connection hole 351 of the hinge height adjustment axle block and a connection shaft 352 of the hinge height adjustment axle block. In some embodiments, the forms of the connection shaft and the connection hole are interchangeable, as long as an axial rotation is achieved. The connection hole 351 of the hinge height adjustment axle block is arranged on the first axle housing 13 of the mounting seat, and the hinge height adjustment axle block 35 cooperates with the first axle housing 13 of the mounting seat to form a first rotation axis 31. The connection shaft 352 of the hinge height adjustment axle block is connected to the height adjustment axle block mounting portion 26 of the hinge arm, which cooperate to form a second rotation axis 32. Further, with reference to FIG. 4, the hinge opening state adjustment axle block

36 includes a first connection hole 361 of the hinge opening state adjustment axle block and a second connection hole 362 of the hinge opening state adjustment axle block. In some embodiments, the connection holes of the hinge opening state adjustment axle block 36 may also be connection shafts. The first connection hole 361 of the hinge opening state adjustment axle block is connected to and cooperates with the second axle housing 14 of the mounting seat to form a third rotation axis 33. The second connection hole 362 of the hinge opening state adjustment axle block is connected to and cooperates with the opening state adjustment axle block mounting portion 27 of the hinge arm to form a fourth rotation axis 34. Furthermore, the hinge opening state adjustment axle block 36 is further provided with a stop protrusion 363 of the hinge opening state adjustment axle block. When the hinge arm 20 is opened to the maximum opening, the stop protrusion 363 of the hinge opening state adjustment axle block abuts against the hinge mounting seat 10. Furthermore, relative movement of the hinge arm 20 and the hinge mounting seat 10 can be achieved through the axle-pin structure unit 30. When the vehicle door hinge 100 is opened, the hinge height adjustment axle block 35 rotates around the first rotation axis 31, the hinge arm 20 rotates around the second rotation axis 32, and the first connection hole 361 and the second connection hole 362 of the hinge opening state adjustment axle block 36 respectively rotate around the third rotation axis 33 and the fourth rotation axis 34. The vehicle door hinge simplifies the movement of the door to a coordinated rotational movement rotating around the four rotation axes through the axle-pin structure unit 30.

**[0018]** In some embodiments, the first rotation axis 31, the second rotation axis 32, the third rotation axis 33, and the fourth rotation axis 34 intersect at a point, and the intersection point is on the hinge height adjustment axle block 35.

**[0019]** In some embodiments, the hinge arm 20 includes an upper hinge slider ball 23 and a lower hinge slider ball 28. The vehicle door hinge 100 further includes: an upper hinge slider block 40 and a lower hinge slider block 41. Referring to FIGS. 5-6, the upper hinge slider block 40 is provided with an upper hinge slider block slideway 401, and the lower hinge slider block 41 is provided with a lower hinge slider block slideway 411. The upper hinge slider block 40 and the lower hinge slider block 41 are fixed to the hinge mounting seat 100, and a space for the hinge arm 20 to pass is formed between the upper hinge slider block 40 and the lower hinge slider block 41. The hinge arm 20 abuts against the upper hinge slider block slideway 401 and the lower hinge slider block slideway 411 respectively through the upper hinge slider ball 23 and the lower hinge slider ball 28, and the hinge slider balls are slidable along the hinge slider slideways. The hinge sliders can provide stable support for the hinge arm, which further increases the stability of the vehicle door hinge 100 when it is opened.

**[0020]** In some embodiments, the vehicle door hinge

100 further includes a limiting unit, which includes an upper hinge limiting block 51, a lower hinge limiting block 52, and a mid-hinge limiting block 53. The upper hinge limiting block 51 is arranged on the hinge mounting seat 10, the lower hinge limiting block 52 is arranged on the vehicle body frame, and the mid-hinge limiting block 53 is arranged on the upper hinge slider block 40. The upper hinge limiting block 51 and the lower hinge limiting block 52 limit displacement of the connection portion 20B of the hinge arm, and the mid-hinge limiting block 53 limits displacement of the working portion 20A of the hinge arm. The limiting unit can ensure the stability of the door in a closed state.

**[0021]** In some embodiments, the vehicle door hinge 100 further includes a gas spring 60 and an electric strut 70. An end of the gas spring 60 is connected to a vehicle body frame, and the other end is connected to a gas spring mounting ball 24 of the hinge arm. An end of the electric strut 70 is connected to a vehicle body frame 200, and the other end is connected to an electric strut mounting ball 22. The gas spring mounting ball 24 and the electric strut mounting ball 22 are arranged on the hinge arm 20. The electric strut 70 is used to provide electric power for opening the door without manual operations, and the vehicle door hinge 100 can hover at any opening position. The gas spring 60 can provide pushing force for opening the hinge, and carry the door weight, and assist the electric strut 70 to open and close the door, thereby increasing the stability of the door during opening of the door.

**[0022]** Further, a mounting bracket 61 of the gas spring is provided between the gas spring 60 and the vehicle body frame 200; and a mounting bracket 71 of the electric strut is provided between the electric strut 70 and the vehicle body frame 200, to increase the mechanical performance of the vehicle body frame 200.

**[0023]** The present invention further provides a vehicle.

**[0024]** According to an embodiment of the present invention, the vehicle includes a vehicle body frame 200, a vehicle door 300, and a vehicle door hinge 100 of any one of the aforementioned embodiments. The vehicle door hinge 100 is fixed to the vehicle body frame 200 through the hinge mounting seat 10, and the vehicle door hinge 100 is fixed to the vehicle door 300 through the connection portion 20B of the hinge arm. The vehicle door 300 is rotatable relative to the vehicle body frame 200 through the vehicle door hinge 100, and the movement of the door 300 is simplified to a coordinated rotational movement rotating around the four rotation axes, making the opening of the door smoother.

1. In the description of the present invention, it should be understood that the terms "middle", "longitudinal", "lateral", "length", "width", "thickness", "upper", "lower", "front", "rear", "left", "right", "vertical", "horizontal", "top", "bottom", "inner", "outer", "clockwise", "counter-clockwise", "axial", "radial", "circumferential", etc. indicate the direction or positional relation-

ship based on the direction or positional relationship shown in the drawings. They are only for the convenience of describing the present invention and simplifying the description, and do not indicate or imply the apparatus or the components must have a specific direction, be constructed and operated in a specific direction, and therefore cannot be understood as a limitation to the present invention.

2. In the description of the present invention, "first characteristic" and "second characteristic" may include one or more of these characteristics. The "first" and "second" in the description of the present invention are only used for descriptive purposes, and cannot be understood as indicating or implying relative importance or implicitly indicating the number of indicated technical characteristics.

3. In the description of the present invention, "multiple" means two or more.

4. In the description of the present invention, the first characteristic "above" or "under" the second characteristic may include direct contact between the first and second characteristics, and it can also include that the first and second characteristics are not in direct contact but in contact through another characteristic between them.

5. In the description of the present invention, the first characteristic "on top of", "above" and "on" the second characteristic includes the first characteristic being directly above and diagonally above the second characteristic, or simply indicating that the first characteristic is horizontally higher than the second characteristic.

**[0025]** In the description of this specification, the description of the reference terms "one embodiment", "some embodiments", "exemplary embodiments", "examples", "specific examples", or "some examples" etc. mean that the specific characteristics, structures, materials, or features described by the embodiments or examples are included in at least one embodiment or example of the present invention. In this specification, the schematic description of the aforementioned terms does not necessarily refer to the same embodiment or example. Moreover, the described specific characteristics, structures, materials, or features can be combined in any one or more embodiments or examples in a suitable manner.

**[0026]** Although the embodiments of the present invention are shown and described, those of ordinary skill in the art can understand that various changes, modifications, substitutions, and transforms can be made to these embodiments without departing from the principle and purpose of the present invention. The scope of the present invention is defined by the claims and their equivalents.

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## Claims

1. A vehicle door hinge, comprising:

a hinge mounting seat comprising a first axle housing and a second axle housing;  
a hinge arm comprising a working portion and a connection portion, wherein the working portion comprises a height adjustment axle block mounting portion and an opening state adjustment axle block mounting portion; and  
an axle-pin structure unit comprising a hinge height adjustment axle block and a hinge opening state adjustment axle block, wherein one end of the hinge height adjustment axle block is connected to the first axle housing to form a first rotation axis, and the other end of the hinge height adjustment axle block is connected to the height adjustment axle block mounting portion to form a second rotation axis, and wherein one end of the hinge opening state adjustment axle block is connected to the second axle housing to form a third rotation axis, and the other end of the hinge opening state adjustment axle block is connected to the opening state adjustment axle block mounting portion to form a fourth rotation axis.

2. The vehicle door hinge of claim 1, wherein the first rotation axis, the second rotation axis, the third rotation axis, and the fourth rotation axis intersect at a point, and the point is on the hinge height adjustment axle block.

3. The vehicle door hinge of claim 1, wherein the hinge arm comprises an upper hinge slider ball and a lower hinge slider ball.

4. The vehicle door hinge of claim 1, wherein the hinge height adjustment axle block comprises a connection hole of the hinge height adjustment axle block and a connection shaft of the hinge height adjustment axle block.

5. The vehicle door hinge of claim 1, wherein the hinge opening state adjustment axle block comprises a first connection hole of the hinge opening state adjustment axle block and a second connection hole of the hinge opening state adjustment axle block.

6. The vehicle door hinge of claim 3, further comprising: an upper hinge slider block and a lower hinge slider block, wherein the upper hinge slider block is provided with an upper hinge slider block slideway, and the lower hinge slider block is provided with a lower

hinge slider block slideway, wherein the upper hinge slider ball is arranged to slide along the upper hinge slider block slideway, and the lower hinge slider ball is arranged to slide along the lower hinge slider block slideway.

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7. The vehicle door hinge of claim 3, further comprising:

a limiting unit, wherein the limiting unit comprises an upper hinge limiting block, a lower hinge limiting block, and a mid-hinge limiting block, wherein the upper hinge limiting block and the lower hinge limiting block are configured to restrict displacement of the connection portion of the hinge arm, and the mid-hinge limiting block is configured to restrict displacement of the working portion of the hinge arm.

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8. The vehicle door hinge of claim 1, further comprising a gas spring and an electric strut, wherein:

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one end of the gas spring is connected to a vehicle body frame, and the other end of the gas spring is connected to a gas spring mounting ball of the hinge arm; one end of the electric strut is connected to the vehicle body frame, and the other end of the electric strut is connected to an electric strut mounting ball; and the gas spring mounting ball and the electric strut mounting ball are arranged on the hinge arm.

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9. The vehicle door hinge of claim 5, wherein the hinge opening state adjustment axle block is provided with a limiting protrusion.

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10. A vehicle, comprising:

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a vehicle body frame, a vehicle door, and a vehicle door hinge of any one of claims 1-9, wherein the hinge mounting seat is mounted on the vehicle body frame, and the hinge arm is mounted on the vehicle door.

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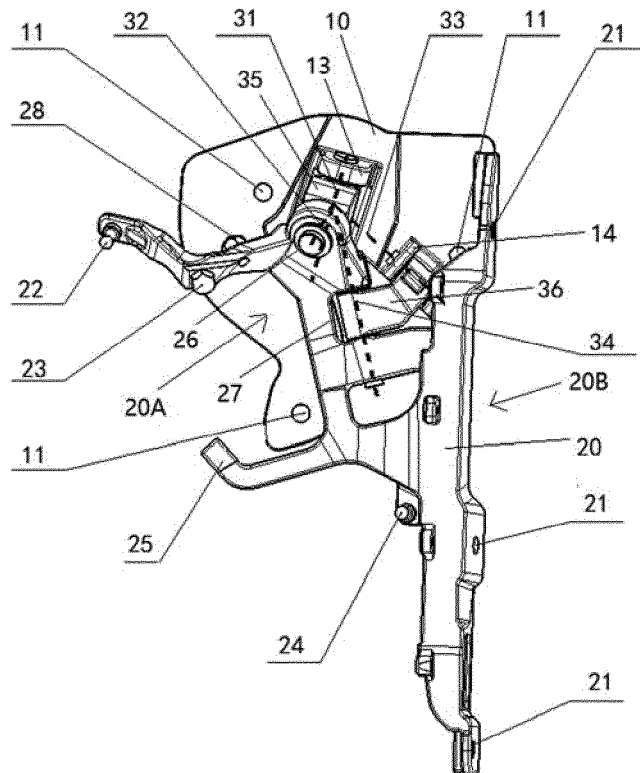


FIG. 1

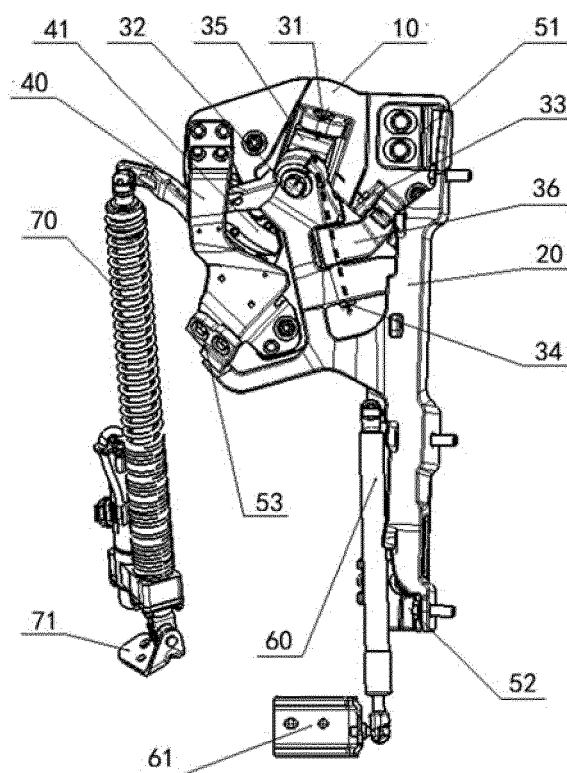


FIG. 2

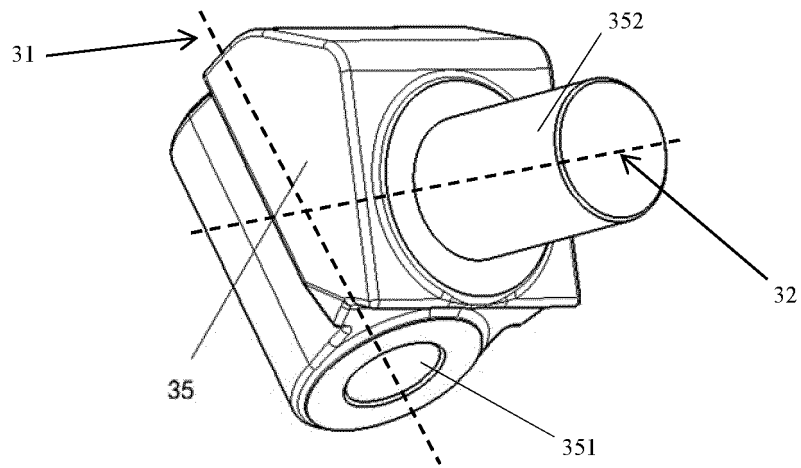


FIG. 3

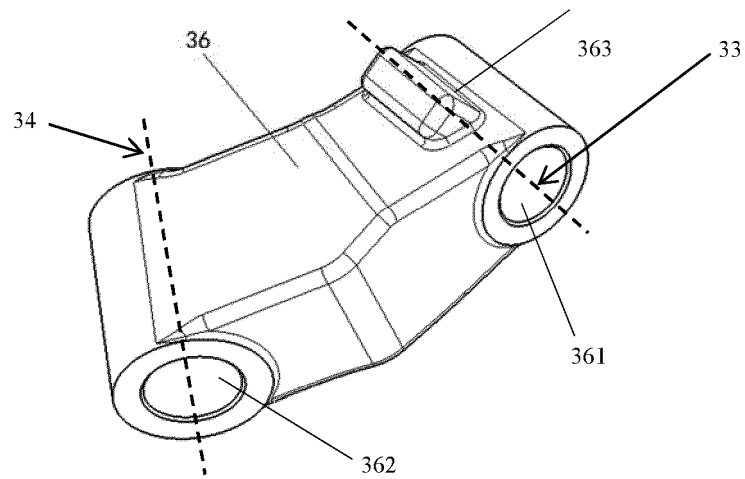


FIG. 4

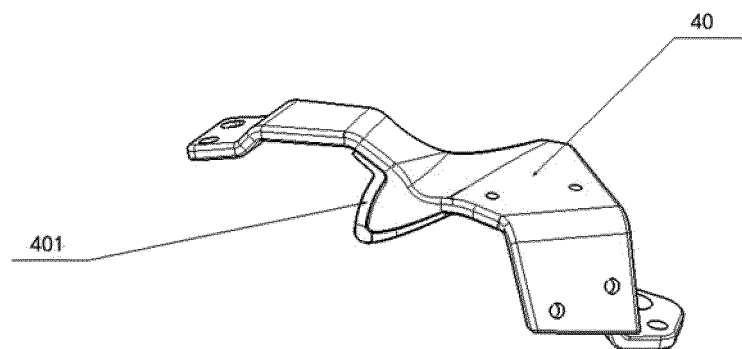


FIG. 5

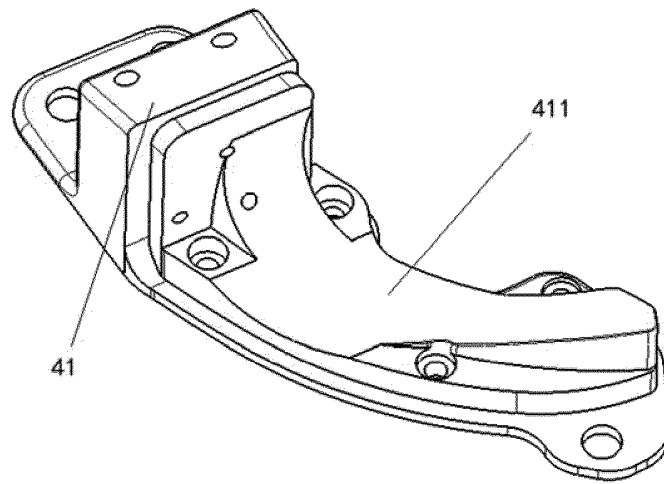


FIG. 6

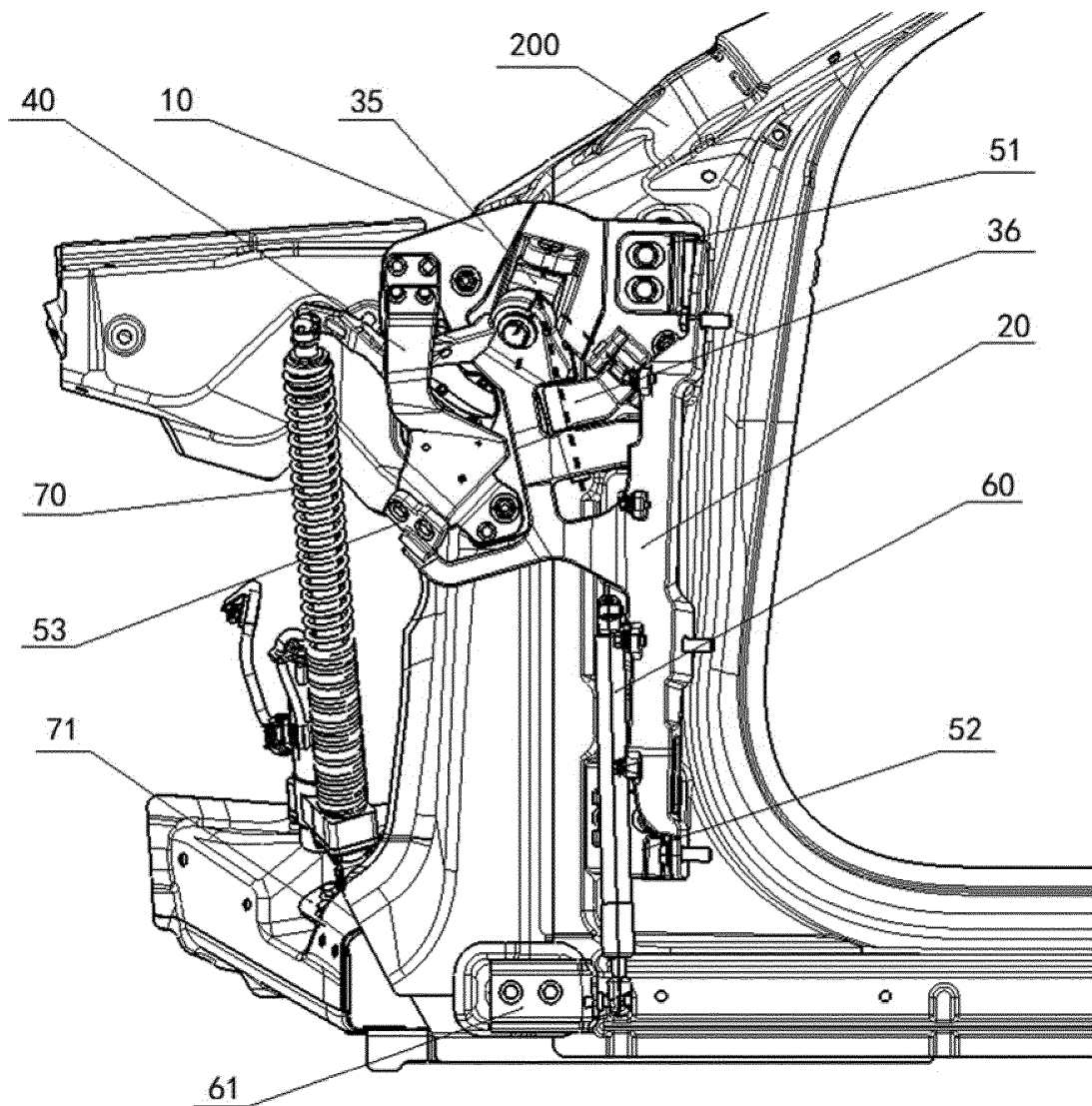


FIG. 7

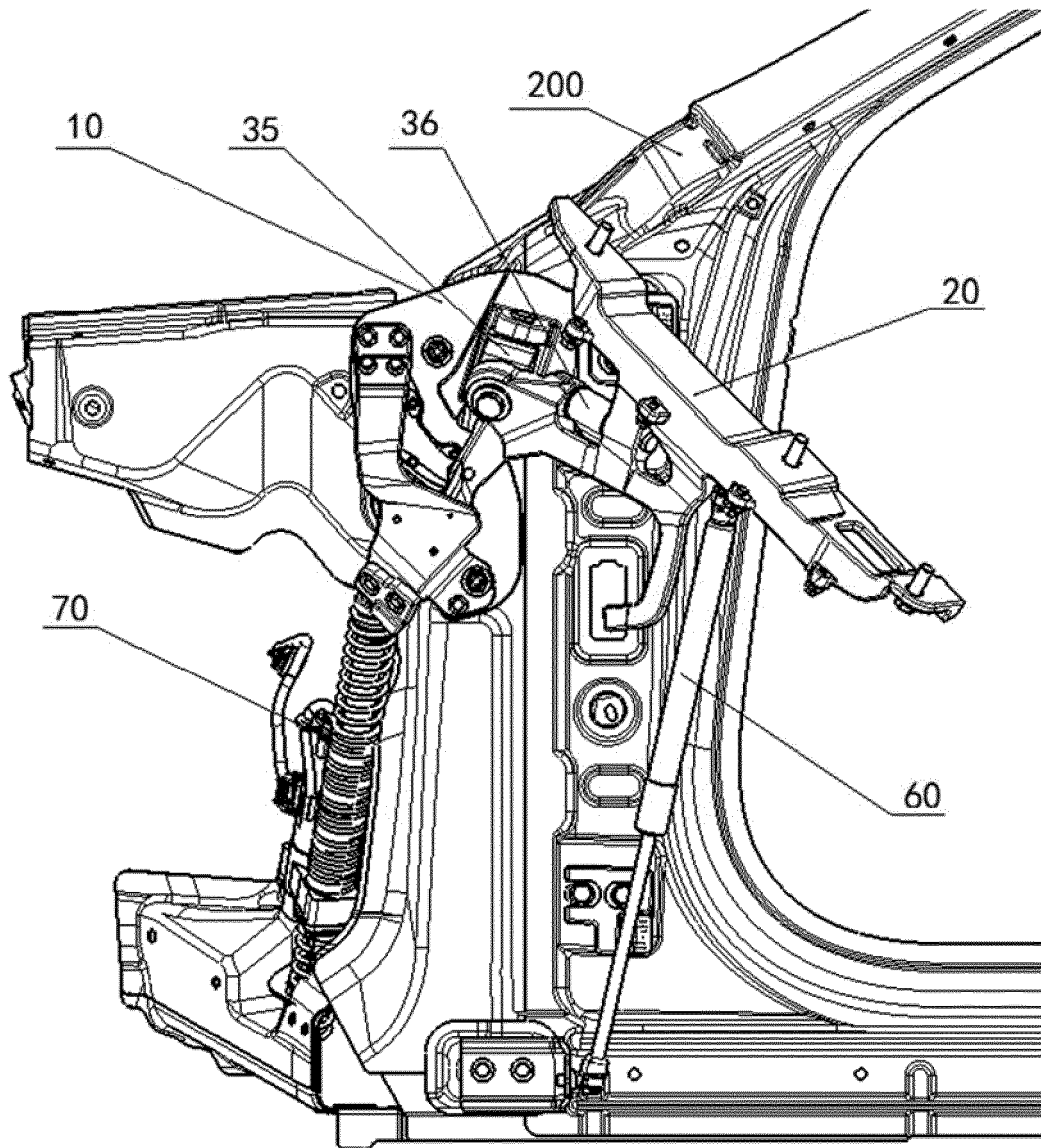


FIG. 8

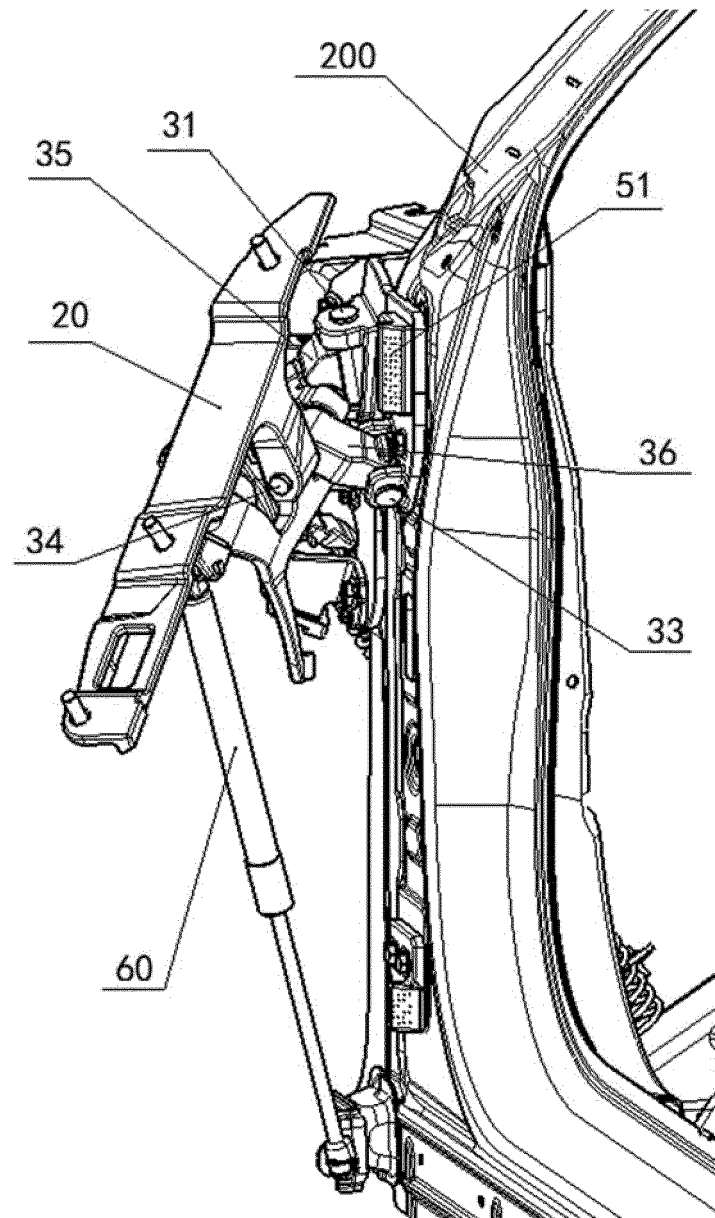


FIG. 9

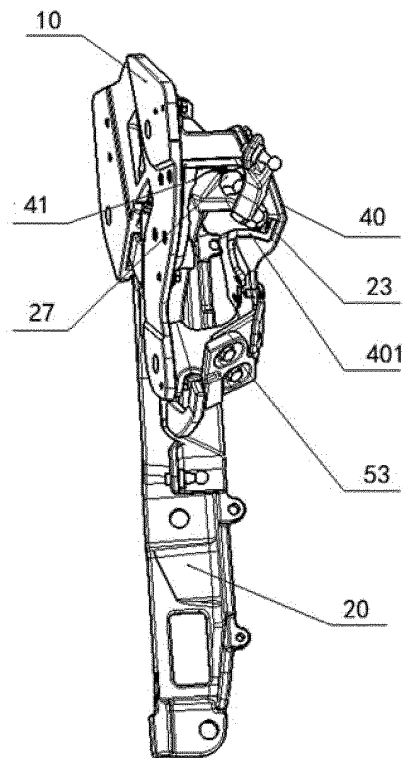


FIG. 10

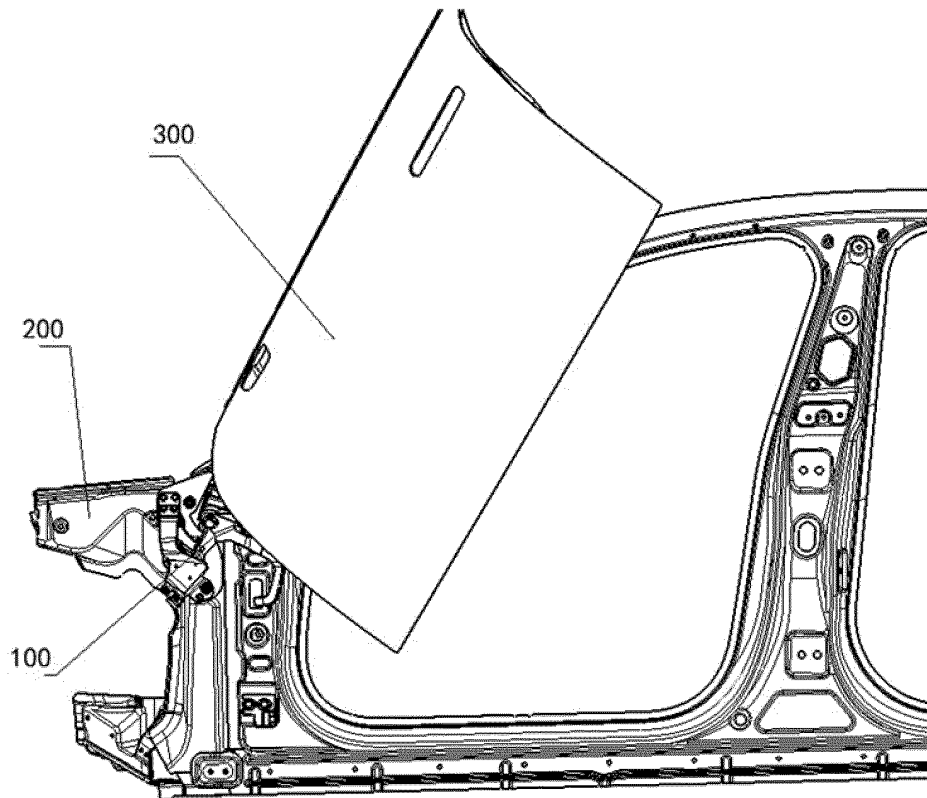


FIG. 11

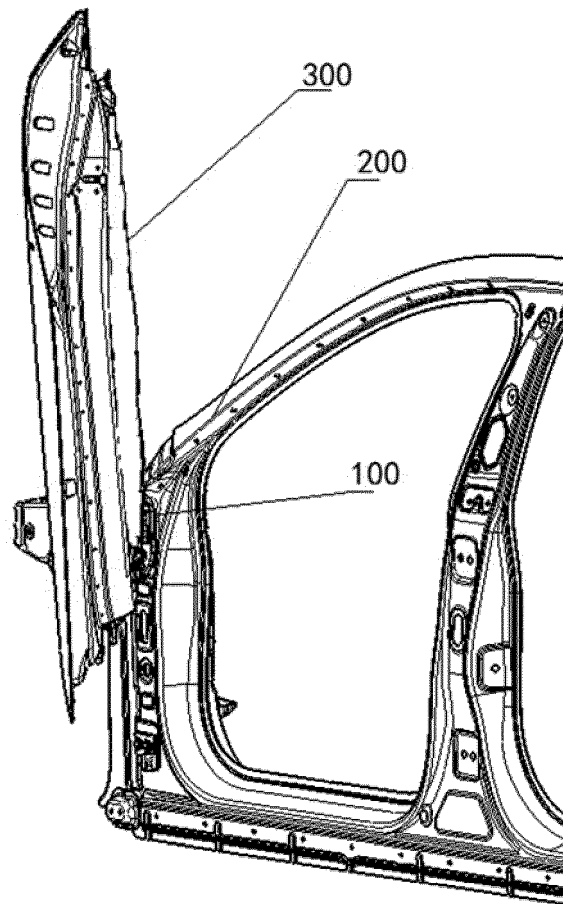


FIG. 12

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2020/121561

<b>A. CLASSIFICATION OF SUBJECT MATTER</b> E05D 11/10(2006.01)i; E05F 15/60(2015.01)i; E05D 5/02(2006.01)i; E05F 1/10(2006.01)i According to International Patent Classification (IPC) or to both national classification and IPC																					
<b>B. FIELDS SEARCHED</b>																					
Minimum documentation searched (classification system followed by classification symbols) E05D;E05F;B60J																					
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) SIPOABS; CNABS; DWPI; CNTXT; CNKI: 小鹏汽车, 橙行智动, 第四, 车门, 剪刀门, 轴块, 铰链, 轴, vehicle?, car?, hinge?, axial, axle?, spindle?, axis??. altitude, height, high??. open+, door, horizontal, vertical, wing, four																					
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>																					
<table border="1"> <thead> <tr> <th>Category*</th> <th>Citation of document, with indication, where appropriate, of the relevant passages</th> <th>Relevant to claim No.</th> </tr> </thead> <tbody> <tr> <td>PX</td> <td>CN 111749566 A (GUANGZHOU CHENGXING ZHIDONG AUTOMOTIVE TECHNOLOGY CO., LTD.) 09 October 2020 (2020-10-09) description, paragraphs [0004]-[0041]</td> <td>1-10</td> </tr> <tr> <td>A</td> <td>CN 209891912 U (SAIC MOTOR CORPORATION LIMITED) 03 January 2020 (2020-01-03) description, paragraphs [0003]-[0019], and figures 1-3</td> <td>1-10</td> </tr> <tr> <td>A</td> <td>CN 206368635 U (BEIJING LINGYUN INTELLIGENT TECHNOLOGY CO., LTD.) 01 August 2017 (2017-08-01) entire document</td> <td>1-10</td> </tr> <tr> <td>A</td> <td>CN 110949286 A (GUANGZHOU XIAOPENG MOTORS TECHNOLOGY COMPANY LTD.) 03 April 2020 (2020-04-03) entire document</td> <td>1-10</td> </tr> <tr> <td>A</td> <td>CN 110965893 A (GUANGZHOU XIAOPENG MOTORS TECHNOLOGY COMPANY LTD.) 07 April 2020 (2020-04-07) entire document</td> <td>1-10</td> </tr> <tr> <td>A</td> <td>EP 1745956 A1 (GM GLOBAL TECH. OPERATIONS INC.) 24 January 2007 (2007-01-24) entire document</td> <td>1-10</td> </tr> </tbody> </table>	Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	PX	CN 111749566 A (GUANGZHOU CHENGXING ZHIDONG AUTOMOTIVE TECHNOLOGY CO., LTD.) 09 October 2020 (2020-10-09) description, paragraphs [0004]-[0041]	1-10	A	CN 209891912 U (SAIC MOTOR CORPORATION LIMITED) 03 January 2020 (2020-01-03) description, paragraphs [0003]-[0019], and figures 1-3	1-10	A	CN 206368635 U (BEIJING LINGYUN INTELLIGENT TECHNOLOGY CO., LTD.) 01 August 2017 (2017-08-01) entire document	1-10	A	CN 110949286 A (GUANGZHOU XIAOPENG MOTORS TECHNOLOGY COMPANY LTD.) 03 April 2020 (2020-04-03) entire document	1-10	A	CN 110965893 A (GUANGZHOU XIAOPENG MOTORS TECHNOLOGY COMPANY LTD.) 07 April 2020 (2020-04-07) entire document	1-10	A	EP 1745956 A1 (GM GLOBAL TECH. OPERATIONS INC.) 24 January 2007 (2007-01-24) entire document	1-10
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Date of the actual completion of the international search <b>20 February 2021</b>	Date of mailing of the international search report <b>17 March 2021</b>																				
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**INTERNATIONAL SEARCH REPORT**  
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International application No.

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