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(54) **VEHICLE HANDLE DEVICE, VEHICLE DOOR AND VEHICLE**

(57) A door handle apparatus for a vehicle, a door, and a vehicle are disclosed. The door handle apparatus for a vehicle includes: a support structure including a first side and a second side opposite to each other, wherein a housing recess is formed on the first side; a door handle arranged on the support structure, wherein in a first position, the door handle is received in the housing recess, and in a second position, a first end of the door handle is outside the housing recess; a switch element arranged on the support structure; and a transmission member movably arranged on the support structure and located on the second side, wherein the transmission member is connected to a second end of the door handle, when the door handle is rotated from the first position to the second position, the door handle drives the transmission member to move, when the door handle is in the second position, the transmission member abuts the switch element, and the switch element generates an electric signal for controlling the unlocking of the door. When the door handle is rotated to the second position outside the housing recess, the door handle can cause, through the transmission member, the switch element to generate an electric signal for controlling the unlocking of the door. Such

simple operations allow the door to be opened more conveniently by electric means.

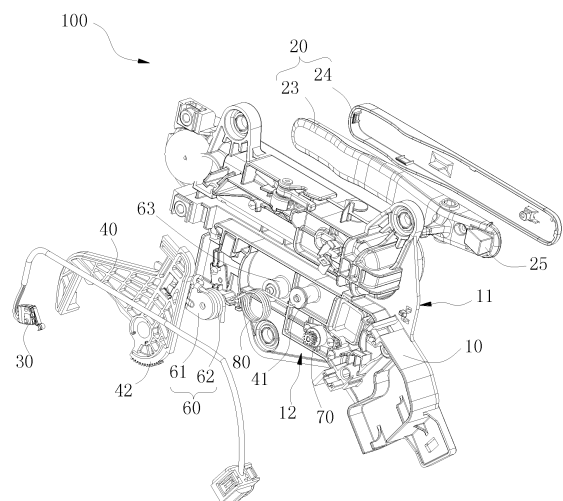


FIG. 4

Description

Cross Reference to Related Application

[0001] The present invention claims the priority of the Chinese patent application number CN 202020610791.0, entitled "Door handle apparatus for vehicle, door and vehicle", filed with the China Patent Office on 21 April 2020, the entire content of which is incorporated in the present invention by reference.

Field of Invention

[0002] The present invention relates to the technical field of automotive vehicle, in particular, to a door handle apparatus for a vehicle, a door, and a vehicle.

Background

[0003] Generally, a door for a vehicle is equipped with a door handle, and the door can be opened through the door handle. In order to improve the aesthetics of the vehicle and reduce the resistance during travelling of the vehicle, in the related art, the door handle is provided in the outer surface of the door. For the structure of such a concealed door handle, how to conveniently open the door through the door handle has become the focus of attention.

Summary of Invention

[0004] The present invention provides a door handle apparatus for a vehicle, a door, and a vehicle.

[0005] In an embodiment of the present invention, the door handle apparatus for a vehicle includes:

a support structure comprising a first side and a second side opposite to each other, wherein a housing recess is formed on the first side;

a door handle rotatably arranged on the support structure through a first rotation shaft, the door handle being rotatable between a first position and a second position, wherein in the first position, the door handle is received in the housing recess, and in the second position, a first end of the door handle is outside the housing recess;

a switch element arranged on the support structure; and

a transmission member movably arranged on the support structure and located on the second side, wherein the transmission member is connected to a second end of the door handle, when the door handle is rotated from the first position to the second position, the door handle drives the transmission member to move, and when the door handle is in the second position, the transmission member abuts the switch element, and the switch element generates an electric signal for controlling unlocking of a door.

[0006] In some embodiments, when the door handle is rotated from the first position to the second position, an angular distance that the door handle travels is within the range of 7°-13°.

[0007] In some embodiments, the door handle apparatus for a vehicle includes a pushing member connecting the second end of the door handle and the transmission member, wherein the pushing member passes through the support structure, and the door handle is operable to drive the transmission member to move via the pushing member.

[0008] In some embodiments, the transmission member is rotatably arranged on the support structure through a second rotation shaft, and the door handle is operable to drive the transmission member to rotate.

[0009] In some embodiments, the door handle apparatus for a vehicle includes an elastic member arranged on the support structure, wherein the elastic member is spaced apart from the switch element, the door handle is movable from the second position to a third position, and the second position is between the first position and the third position, and wherein during rotation of the door handle from the second position to the third position, the transmission member rotates and remains in contact with the switch element, and when the door handle is in the third position, the transmission member elastically abuts the elastic member.

[0010] In some embodiments, the elastic member comprises an abutting member and a first elastic member, the abutting member is rotatably arranged on the support structure through a third rotation shaft, the first elastic member is connected to the abutting member, when the door handle is in the third position, the transmission member abuts the abutting member, and the first elastic member applies a first restoring force to the abutting member.

[0011] In some embodiments, when the door handle is rotated from the first position to the third position, an angular distance that the door handle travels is within the range of 14°-16°.

[0012] In some embodiments, a limiting structure is provided in the housing recess, the door handle is movable from the third position to a fourth position, the third position is between the second position and the fourth position, and wherein during the rotation of the door handle from the third position to the fourth position, the transmission member rotates and remains in contact with the elastic member, and when the door handle is in the fourth position, the second end of door handle abuts the limiting structure.

[0013] In some embodiments, when the door handle is rotated from the first position to the fourth position, an angular distance that the door handle travels is within the range of 20°-24°.

[0014] In some embodiments, the transmission member forms an arc rack concentrically arranged with the second rotation shaft, the door handle apparatus comprises a gear rotatably arranged on the support structure,

and the gear meshes with the arc rack.

[0015] In some embodiments, the door handle apparatus for a vehicle further includes a second elastic member connecting the support structure and the transmission member, and the second elastic member is operable to apply a second restoring force to the transmission member. The second restoring force enables the transmission member to move to restore the door handle to the first position.

[0016] In some embodiments, the bottom surface of the housing recess is provided with a keyhole, and the keyhole is aligned with the first end of the door handle.

[0017] According to an embodiment of the present invention, the door includes a door body and the door handle apparatus for a vehicle described in any one of the aforementioned embodiments, the door handle apparatus for a vehicle is provided on the door body, and the outer surface of the door handle is flush with the outer surface of the door body, or the outer surface of the door handle is recessed on the outer surface of the door body.

[0018] According to an embodiment of the present invention, the vehicle includes a vehicle frame and the aforementioned door, and the door is arranged on the vehicle frame.

[0019] In the aforementioned door handle apparatus for a vehicle, the door, and the vehicle, when the door handle is rotated to the second position outside the housing recess, the door handle can cause, through the transmission member, the switch element to generate an electric signal for controlling the unlocking of the door. With such simple operations, the door can be opened conveniently by electric means.

[0020] The additional aspects and advantages of the present invention will be described below.

Brief Description of Drawings

[0021] The aforementioned and/or additional aspects and advantages of the present invention will become more apparent and easier to understand from the description of the embodiments with reference to the drawings, in which:

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

FIG. 2 is a schematic perspective view of a door handle apparatus for a vehicle according to an embodiment of the present invention;

FIG. 3 is a schematic exploded view of a door handle apparatus for a vehicle according to an embodiment of the present invention;

FIG. 4 is another schematic exploded view of a door handle apparatus for a vehicle according to an embodiment of the present invention;

FIG. 5 is a schematic structural diagram of a door handle apparatus for a vehicle when the door handle is at the first position according to an embodiment of the present invention;

FIG. 6 is a schematic structural diagram of the door handle apparatus for a vehicle when the door handle is at the second position according to an embodiment of the present invention;

FIG. 7 is a schematic diagram from another perspective of the door handle apparatus for a vehicle when the door handle is at the second position according to an embodiment of the present invention;

FIG. 8 is a schematic diagram showing part of the door handle apparatus for a vehicle when the door handle is at the third position according to an embodiment of the present invention;

FIG. 9 is a schematic structural diagram of the door handle apparatus for a vehicle when the door handle is at the fourth position according to an embodiment of the present invention; and

FIG. 10 is a schematic cross-sectional diagram of a door handle apparatus for a vehicle of FIG. 9 along A-A.

Reference signs:

[0022]

door handle apparatus 100 for a vehicle,
support structure 10,
first side 11,
second side 12,
housing recess 13,
first rotation shaft 14,
limiting structure 15,
first protrusion 151,
keyhole 16
door handle 20,
first end 21,
second end 22,
main body 23,
handle cover 24,
second protrusion 25,
switch element 30,
transmission member 40,
second rotation shaft 41,
arc rack 42,
pushing part 50,
elastic member 60,
abutting member 61,
first elastic member 62,
third rotation shaft 63,
gear 70,
second elastic member 80,
vehicle 200,
body frame 210,
door 300,
door body 310.

Detailed Description

[0023] Embodiments of the present invention are de-

scribed in detail below. Examples of the embodiments are shown in the drawings, wherein same or similar reference signs indicate same or similar components or components with same or similar functions throughout. The embodiments described below with reference to the drawings are exemplary, and are intended to explain the present invention, and cannot be construed as limiting the present invention.

[0024] The following disclosure provides different embodiments or examples for implementing different structures of the present invention. In order to simplify the disclosure of the present invention, the components and arrangements of specific examples are described below. Of course, they are only illustrative and are not intended to limit the present invention. In addition, same reference signs and/or reference letters may be used herein in different examples. Such usage is for the purpose of simplification and clarity, and does not indicate the relationship between the various embodiments and/or arrangements discussed. In addition, the present invention provides examples of various specific processes and materials, but those of ordinary skills in the art may be aware of the application of other processes and/or the use of other materials.

[0025] Referring to FIG. 1, which illustrates a door handle apparatus 100 for a vehicle according to an embodiment of the present invention. Door handle apparatus 100 for a vehicle may be applicable to door 300 of vehicle 200. In other words, door 300 includes door handle apparatus 100 for a vehicle. Door handle apparatus 100 for a vehicle is used to lock or unlock door 300. When door 300 is locked, door 300 cannot be opened; when door 300 is unlocked, door 300 can be opened.

[0026] In an embodiment of the present invention, door handle apparatus 100 for a vehicle includes support structure 10, door handle 20, a switch element 30 and transmission member 40. Support structure 10 includes first side 11 and second side 12 opposite to each other, and housing recess 13 is formed on first side 11. Door handle 20 is rotatably arranged on support structure 10 through first rotation shaft 14. Door handle 20 can be rotated between a first position and a second position. In the first position, door handle 20 is received in housing recess 13, and in the second position, first end 21 of door handle 20 is outside housing recess 13.

[0027] Switch element 30 is arranged on support structure 10. Transmission member 40 is movably arranged on support structure 10 and located on second side 12. Transmission member 40 is connected to second end 22 of door handle 20. When door handle 20 is rotated from the first position to the second position, door handle 20 drives transmission member 40 to move. When door handle 20 is in the second position, transmission member 40 abuts the switch element 30, and switch element 30 generates an electric signal for controlling the unlocking of door 300.

[0028] In the aforementioned door handle apparatus 100 for a vehicle, door 300, and vehicle 200, when door

handle 20 is rotated to the second position outside housing recess 13, door handle 20 can cause, through transmission member 40, switch element 30 to generate an electric signal for controlling the unlocking of door 300. Such simple operations enables door 300 to be opened in an electric manner more conveniently.

[0029] Specifically, support structure 10 is a carrier of door handle apparatus 100 for a vehicle, and support structure 10 may be used to carry other components of door handle apparatus 100 for a vehicle. Support structure 10 may have a plate shape, an irregular shape, or the like, and the specific shape of support structure 10 is not limited herein. In an embodiment of the present invention, in order to make support structure 10 easy to carry other components, support structure 10 has an irregular shape. Support structure 10 can be made of plastic, metal or other materials. For example, when support structure 10 is made of plastic, support structure 10 can be formed by an injection molding process.

[0030] In an embodiment of the present invention, first side 11 and second side 12 of support structure 10 respectively extend along the thickness direction of support structure 10. In other words, first side 11 and second side 12 of support structure 10 are respectively located on opposite sides of support structure 10 in the thickness direction. Housing recess 13 is a recessed part on support structure 10, and the volume of housing recess 13 is adapted to the volume of door handle 20 so that door handle 20 can be received in housing recess 13. In addition, the shape of housing recess 13 is adapted to the shape of door handle 20, allowing a more compact matching of housing recess 13 and door handle 20. For example, door handle 20 may have an oval shape as a whole, and housing recess 13 may also have an oval shape.

[0031] Door handle 20 is an operating component of door handle apparatus 100 for a vehicle, and users can open door 300 of vehicle 200 by operating door handle 20. Along the length of door handle 20, door handle 20 includes first end 21 and second end 22, and first rotation shaft 14 is provided between and passes through first end 21 and second end 22. In an embodiment of the present invention, first rotation shaft 14 is arranged closer to second end 22 than first end 21.

[0032] First rotation shaft 14 is located in housing recess 13, and first rotation shaft 14 and support structure 10 may be separately formed structures. First rotation shaft 14 can be detachably mounted on support structure 10. In an example, when assembling door handle apparatus 100 for a vehicle, door handle 20 can be placed in housing recess 13 first, and then first rotation shaft 14 is inserted into support structure 10 and door handle 20 in sequence, to complete the installation of door handle 20.

[0033] It can be understood that during the rotation of door handle 20 from the first position to the second position, first end 21 of door handle 20 turns out of housing recess 13, and second end 22 of door handle 20 turns into housing recess 13.

[0034] In an embodiment of the present invention, door handle 20 includes main body 23 and handle cover 24 covering and arranged on the main body 23, as shown in FIG. 2 and FIG. 3. Main body 23 is rotatably arranged on first rotation shaft 14. Handle cover 24 is an exterior part of door handle 20. Handle cover 24 can be formed with a smooth outer surface by paint spraying or other processes, so that door handle 20 is more artistic.

[0035] Switch element 30 is an electrical component, and switch element 30 can generate an electric signal when it is touched or approached. Switch element 30 may be a micro switch, a proximity sensor, or other components. Switch element 30 can be installed on support structure 10 by means of screws, buckles, or the like. Switch element 30 is located on second side 12 of support structure 10, so that the spaces on support structure 10 can be fully utilized to prevent switch element 30 from interfering with door handle 20, making door handle apparatus 100 for a vehicle more compact.

[0036] Transmission member 40 is a force transmitting component of door handle apparatus 100 for a vehicle, and transmission member 40 can transmit the force from door handle 20 to switch element 30. Transmission member 40 is located on second side 12 of support structure 10 so as to prevent transmission member 40 from interfering with door handle 20. Transmission member 40 can be made of plastic or other materials. The structure and shape of transmission member 40 are not specifically limited. In an embodiment of the present invention, transmission member 40 has an irregular shape.

[0037] Referring to FIG. 5, FIG. 5 shows the position of transmission member 40 when door handle 20 is in the first position. As shown in FIG. 5, when door handle 20 is in the first position, transmission member 40 is spaced apart from switch element 30, and at this point, switch element 30 is not triggered. Referring to FIG. 6 and FIG. 7, when door handle 20 is in the second position, transmission member 40 abuts switch element 30, and at this point, switch element 30 is triggered to generate an electric signal. The electric signal generated by switch element 30 can be transmitted to a controller of vehicle 200, and the controller can control corresponding electric component to unlock door 300 in an electric manner, so that door 300 can be opened when unlocked.

[0038] In some embodiments, when door handle 20 is rotated from the first position to the second position, the angular distance that door handle 20 travels is within the range of 7°-13°. In other words, door handle 20 reaches the second position after rotating 7°-13° from the first position. For example, when door handle 20 is rotated from the first position to the second position, the angle that door handle 20 has rotated may be 7°, 8.5°, 9°, 10°, 12.5°, or 13°.

[0039] It can be understood that, in the second position, since transmission member 40 abuts switch element 30, switch element 30 can form a reaction force on transmission member 40, and the force can be transmitted to door handle 20. Therefore, when users operate door han-

dle 20, they can perceive that switch element 30 is triggered.

[0040] Referring to FIG. 3 and FIG. 5, in some embodiments, door handle apparatus 100 for a vehicle includes pushing member 50, and pushing member 50 connects second end 22 of door handle 20 to transmission member 40. Pushing member 50 passes through support structure 10. Door handle 20 drives transmission member 40 to move through pushing member 50.

[0041] In this way, pushing member 50 facilitates door handle 20 to drive transmission member 40 to move. Specifically, pushing member 50 has a long strip shape. Pushing member 50 and main body 23 of door handle 20 may be in an integral structure, in other words, pushing member 50 and main body 23 of door handle 20 cannot be detached. Pushing member 50 abuts transmission member 40, so that transmission member 40 can be pushed to move.

[0042] Referring to FIG. 4, in some embodiments, transmission member 40 is rotatably arranged on support structure 10 through second rotation shaft 41, and door handle 20 is operable to drive transmission member 40 to rotate. In this way, transmission member 40 can be arranged on support structure 10 in a rotating manner, so that the movement mode of transmission member 40 is easier to control.

[0043] Specifically, second rotation shaft 41 and support structure 10 may be in an integral structure. The axial direction of second rotation shaft 41 is the same as the thickness direction of support structure 10. Second rotation shaft 41 and pushing member 50 are arranged at a predefined distance from each other, so that transmission member 40 can form a rotational torque, and thus pushing member 50 can push transmission member 40 to rotate during the movement.

[0044] Referring to FIG. 4, in some embodiments, door handle apparatus 100 for a vehicle includes elastic member 60 arranged on support structure 10, and elastic member 60 is spaced apart from switch element 30. Door handle 20 can move from the second position to a third position, and the second position is between the first position and the third position. During the rotation of door handle 20 from the second position to the third position, transmission member 40 rotates and remains in contact with switch element 30. When door handle 20 is in the third position, transmission member 40 elastically abuts elastic member 60.

[0045] In other words, during the rotation of door handle 20, it can rotate from the first position to the second position and the third position in sequence. The rotation angle of door handle 20 from the first position to the second position is smaller than the rotation angle of the door handle from the first position to the third position.

[0046] As shown in FIG. 8, when door handle 20 is in the third position, transmission member 40 elastically abuts elastic member 60, so that elastic member 60 can act as a soft limiting structure to transmission member 40, and elastic member 60 can form feedback to door

handle 20 through transmission member 40, reminding users that switch element 30 has been triggered and door 300 is unlocked during the rotation of door handle 20, so as to facilitate users to unlock door 300 with door handle 20.

[0047] As shown in FIG. 4, in some embodiments, elastic member 60 includes abutting member 61 and first elastic member 62. Abutting member 61 is rotatably arranged on support structure 10 through third rotation shaft 63. First elastic member 62 is connected to abutting member 61. When door handle 20 is in the third position, transmission member 40 abuts abutting member 61, and first elastic member 62 applies a first restoring force to abutting member 61.

[0048] In this way, first elastic member 62 can transmit feedback to door handle 20 through abutting member 61 and transmission member 40, and can make abutting member 61 restore to the initial position after being rotated. Specifically, abutting member 61 may have an irregular shape. Abutting member 61 is sheathed on third rotation shaft 63 so that abutting member 61 can rotate relative to support structure 10. Abutting member 61 and switch element 30 contact transmission member 40 respectively at different parts.

[0049] First elastic member 62 can be a spring, an elastic block, or other elastic member. In an embodiment of the present invention, first elastic member 62 is a torsion spring, and the torsion spring is sheathed on the third rotation shaft 63. The torsion spring can provide abutting member 61 with the first restoring force, so that abutting member 61 can restore to the initial position.

[0050] In some embodiments, when door handle 20 is rotated from the first position to the third position, the angular distance that the door handle 20 travels is within the range of 14° - 16° . In other words, after door handle 20 is rotated for an angle range of 14° - 16° , transmission member 40 abuts elastic member 60. The rotation angle of door handle 20 is appropriate and is convenient for users to operate. In an example, when door handle 20 is rotated from the first position to the third position, the angle that door handle 20 has rotated may be 14° , 15° , or 16° .

[0051] Referring to FIG. 9 and FIG. 10, in some embodiments, limiting structure 15 is provided in housing recess 13. Door handle 20 can move from the third position to a fourth position, and the third position is between the second position and the fourth position. During the rotation of door handle 20 from the third position to the fourth position, transmission member 40 rotates and remains in contact with elastic member 60. When door handle 20 is in the fourth position, second end 22 of door handle 20 abuts limiting structure 15.

[0052] In this way, when door handle 20 is located at the fourth position, limiting structure 15 can limit door handle 20 from continuing to rotate, so as to limit door handle 20 from overly rotating, which is convenient for users to use. Specifically, limiting structure 15 is first protrusion 151 formed in housing recess 13, and second

end 22 of door handle 20 may form second protrusion 25. First protrusion 151 abuts second protrusion 25, so that door handle 20 can be limited from continuing to rotate. The surface on which second protrusion 25 abuts first protrusion 151 may be an inclined surface.

[0053] In some embodiments, when the door handle is rotated from the first position to the fourth position, an angular distance that the door handle travels is within the range of 20° - 24° . In other words, after door handle 20 is rotated for an angle in the range of 20° - 24° , limiting structure 15 abuts second end 22 of door handle 20. The rotation angle of door handle 20 is appropriate and is convenient for users to operate. In an example, when door handle 20 is rotated from the first position to the fourth position, the angle door handle 20 has rotated may be 20° , 21° , 22° , or 24° .

[0054] Referring to FIG. 4 and FIG. 9, in some embodiments, transmission member 40 forms arc rack 42 concentrically arranged with second rotation shaft 41. Door handle apparatus 100 for a vehicle includes gear 70 rotatably arranged on support structure 10, and gear 70 meshes with arc rack 42.

[0055] In this way, transmission member 40 meshes with gear 70 through arc rack 42 so that the rotation of transmission member 40 can be more stable. Specifically, gear 70 is spaced apart from switch element 30 and abutting member 61. Abutting member 61 is located between switch element 30 and abutting member 61, so that the components of door handle apparatus 100 for a vehicle are reasonably arranged in place, such that door handle apparatus 100 for a vehicle is more compact.

[0056] Referring to FIG. 4, in some embodiments, door handle apparatus 100 for a vehicle further includes second elastic member 80 connecting support structure 10 and transmission member 40, and first elastic member 62 is used to apply a second restoring force to transmission member 40. The second restoring force enables transmission member 40 to move to restore door handle 20 to the first position.

[0057] In this way, door handle 20 can be restored into housing recess 13 after being rotated, which is convenient for users to use. Specifically, second elastic member 80 can be a spring, an elastic block, or other elastic members. In an embodiment of the present invention, second elastic member 80 is a torsion spring, and the torsion spring is sheathed on second rotation shaft 41. The torsion spring can provide transmission member 40 with a second restoring force, so that transmission member 40 can restore to the initial position, driving door handle 20 to restore to the first position and be received in housing recess 13.

[0058] Referring to FIG. 10, in some embodiments, the bottom surface of housing recess 13 is provided with keyhole 16, and keyhole 16 is arranged associated with first end 21 of door handle 20. In this way, keyhole 16 can allow key 102 to insert into door 300 to unlock door 300 in a mechanical manner. As discussed above, when door handle 20 is in the fourth position, the angle of door han-

dle 20 has rotated is the largest, and meanwhile the distance between first end 21 and housing recess 13 is relatively longer, so that key 102 can be inserted into key-hole 16.

[0059] Referring to FIG. 1 again, according to an embodiment of the present invention, door 300 further includes door body 310. Door handle apparatus 100 for a vehicle is provided on door body 310. The outer surface of door handle 20 is flush with the outer surface of door body 310, or the outer surface of door handle 20 is recessed on the outer surface of door body 310. In this way, door handle 20 can be concealed in door 300, which not only improves the aesthetics of door 300, but also reduces the resistance of vehicle 200 during travel.

[0060] According to an embodiment of the present invention, vehicle 200 includes body frame 210 and door 300, and door 300 is provided on body frame 210. In this way, door handle apparatus 100 for a vehicle can make the unlocking of door 300 of vehicle 200 more convenient, which helps to improve the user experience.

[0061] In the description herein, the terms "some embodiments", "one embodiment", "some implementations", "exemplary embodiments", "examples", "specific examples", or "some examples" etc. mean that the specific characteristics, structures, materials, or features described for the embodiments or examples are included in at least one embodiment or example of the present invention. In this disclosure, the illustrative 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.

[0062] In addition, terms "first," "second", etc. are only used for illustration purposes, and cannot be construed as indicating or implying relative importance or implicitly indicating the number of indicated technical characteristics. Therefore, the features defined with "first" and "second" may explicitly or implicitly include at least one of such features. In the description of the present invention, "multiple" means at least two, such as two, three, etc., unless otherwise specifically defined.

[0063] Although the embodiments of the present invention are shown and described, it can be understood that the aforementioned embodiments are exemplary and cannot be understood to limit the present invention. Those of ordinary skills in the art can make changes, modifications, substitutions and variations to the aforementioned embodiments within the scope of the present invention, and the scope of the present invention is defined by the claims and their equivalents.

Claims

1. A door handle apparatus for a vehicle, **characterized by:**

a support structure comprising a first side and a second side opposite to each other, wherein a housing recess is formed on the first side;
a door handle rotatably arranged on the support structure through a first rotation shaft, the door handle being rotatable between a first position and a second position, wherein in the first position, the door handle is received in the housing recess, and in the second position, a first end of the door handle is outside the housing recess;
a switch element arranged on the support structure; and
a transmission member movably arranged on the support structure and located on the second side, wherein the transmission member is connected to a second end of the door handle, when the door handle is rotated from the first position to the second position, the door handle drives the transmission member to move, and when the door handle is in the second position, the transmission member abuts the switch element, and the switch element generates an electric signal for controlling unlocking of a door.

2. The door handle apparatus for a vehicle of claim 1, wherein when the door handle is rotated from the first position to the second position, an angular distance that the door handle travels is within the range of 7°-13°.

3. The door handle apparatus for a vehicle of claim 1, comprising a pushing member connecting the second end of the door handle and the transmission member, wherein the pushing member passes through the support structure, and the door handle is operable to drive the transmission member to move via the pushing member.

4. The door handle apparatus for a vehicle of claim 1, wherein the transmission member is rotatably arranged on the support structure through a second rotation shaft, and the door handle is operable to drive the transmission member to rotate.

5. The door handle apparatus for a vehicle of claim 4, comprising an elastic member arranged on the support structure, wherein the elastic member is spaced apart from the switch element, the door handle is movable from the second position to a third position, and the second position is between the first position and the third position, and wherein during rotation of the door handle from the second position to the third position, the transmission member rotates and remains in contact with the switch element, and when the door handle is in the third position, the transmission member elastically abuts the elastic member.

6. The door handle apparatus for a vehicle of claim 5,

wherein the elastic member comprises an abutting member and a first elastic member, the abutting member is rotatably arranged on the support structure through a third rotation shaft, the first elastic member is connected to the abutting member, when the door handle is in the third position, the transmission member abuts the abutting member, and the first elastic member applies a first restoring force to the abutting member.

7. The door handle apparatus for a vehicle of claim 5, wherein when the door handle is rotated from the first position to the third position, an angular distance that the door handle travels is within the range of 14°-16°.

8. The door handle apparatus for a vehicle of claim 6, wherein a limiting structure is provided in the housing recess, the door handle is movable from the third position to a fourth position, the third position is between the second position and the fourth position, and wherein during the rotation of the door handle from the third position to the fourth position, the transmission member rotates and remains in contact with the elastic member, and when the door handle is in the fourth position, the second end of door handle abuts the limiting structure.

9. The door handle apparatus for a vehicle of claim 8, wherein when the door handle is rotated from the first position to the fourth position, an angular distance that the door handle travels is within the range of 20°-24°.

10. The door handle apparatus for a vehicle of claim 4, wherein the transmission member forms an arc rack concentrically arranged with the second rotation shaft, the door handle apparatus comprises a gear rotatably arranged on the support structure, and the gear meshes with the arc rack.

11. The door handle apparatus for a vehicle of claim 1, further comprising a second elastic member connecting the support structure and the transmission member, wherein the first elastic member is operable to apply a second restoring force to the transmission member, and the second restoring force enables the transmission member to move to restore the door handle to the first position.

12. The door handle apparatus for a vehicle of claim 1, wherein a bottom surface of the housing recess is provided with a keyhole, and the keyhole is aligned with the first end of the door handle.

13. A door of a vehicle, comprising:

a door body; and

a door handle apparatus for a vehicle of any one of claims 1-12, wherein the door handle apparatus is provided on the door body, and an outer surface of the door handle is flush with an outer surface of the door body, or the outer surface of the door handle is recessed on the outer surface of the door body.

14. A vehicle, comprising:

a vehicle frame, and
a door of claim 13, the door arranged on the vehicle frame.

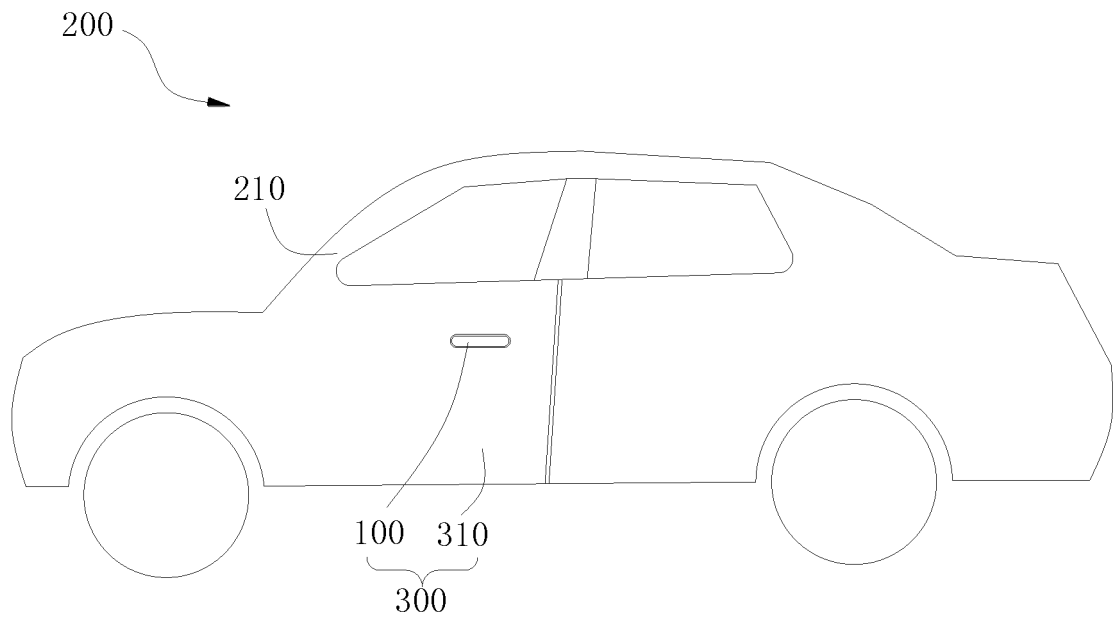


FIG. 1

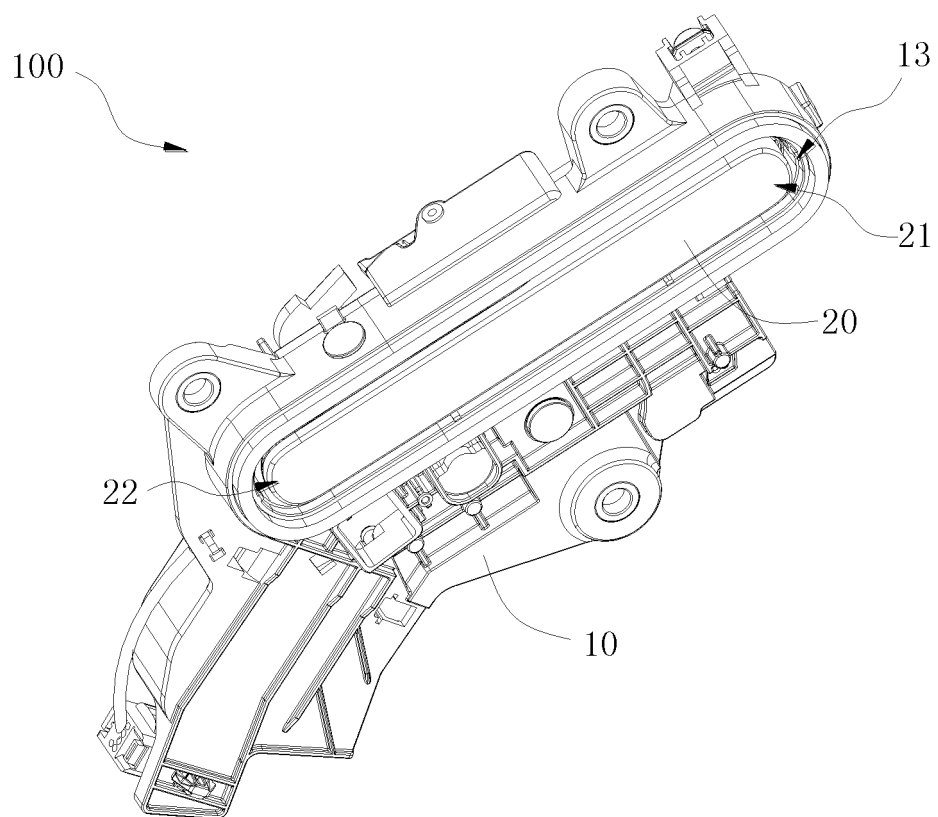


FIG. 2

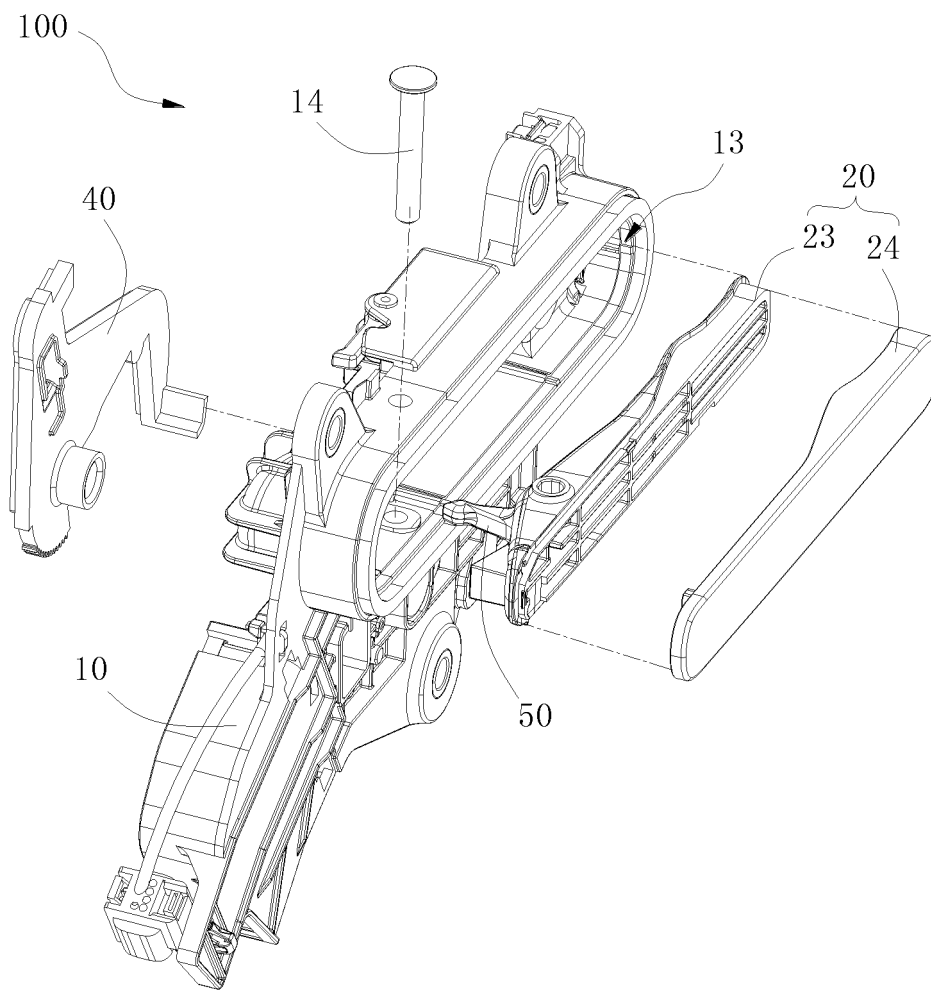


FIG. 3

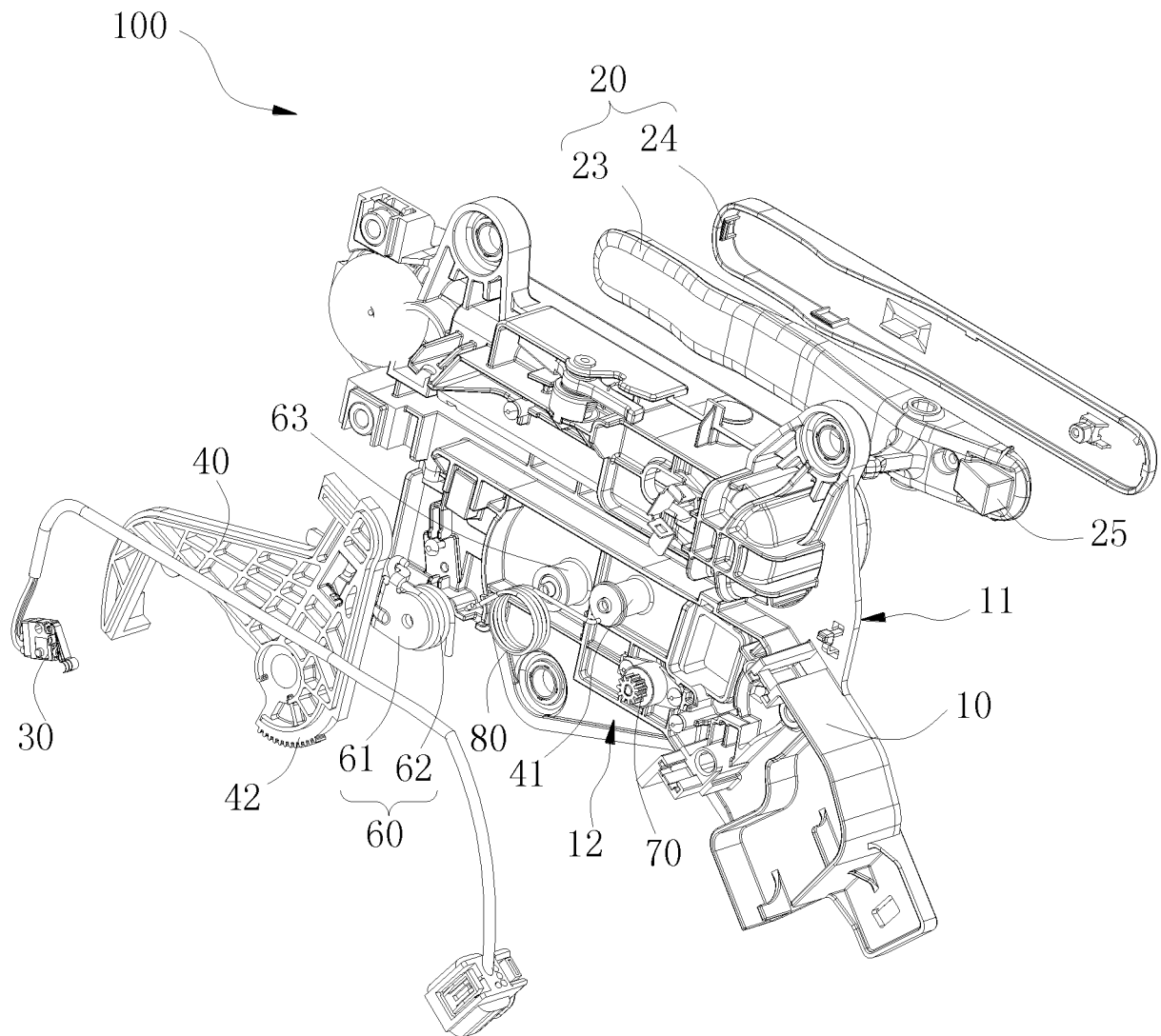


FIG. 4

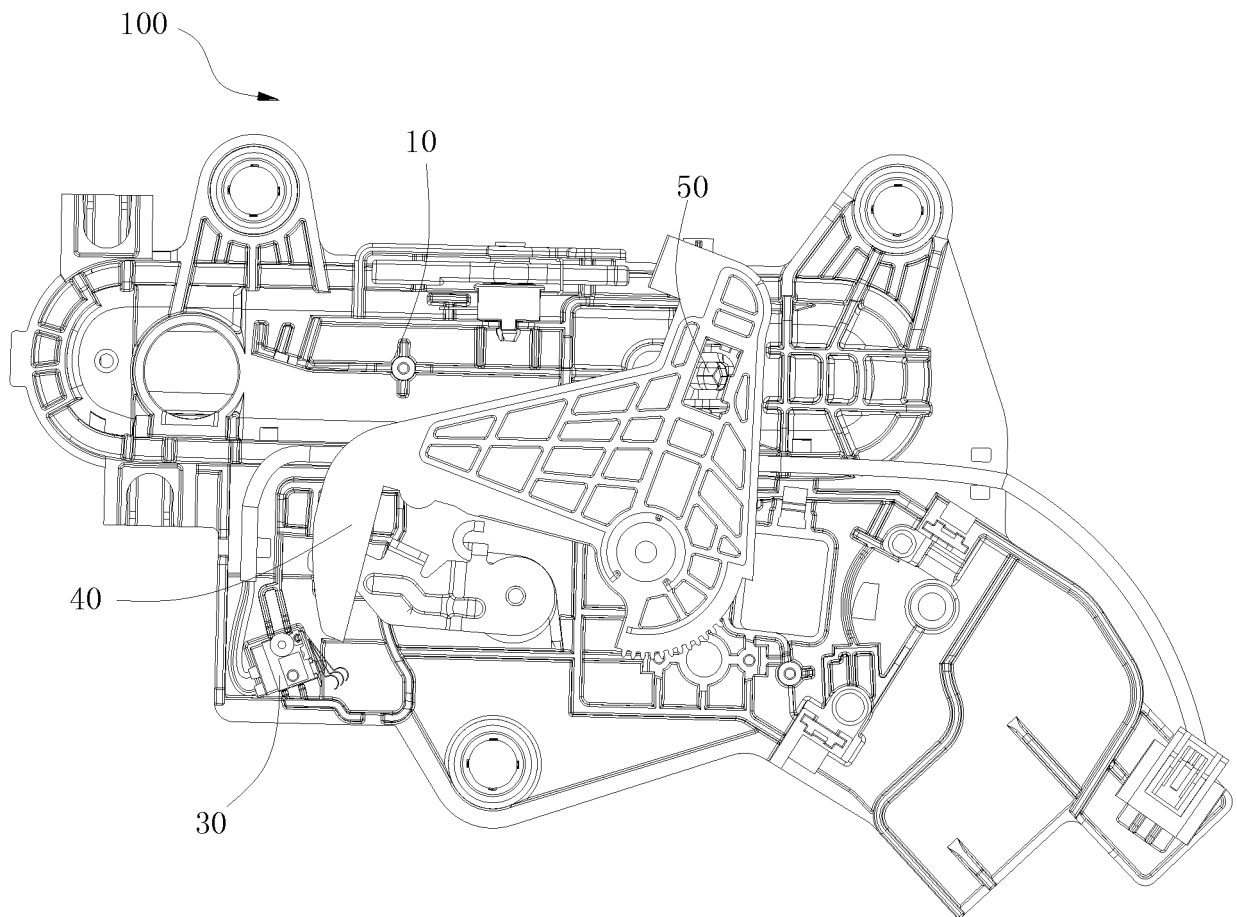


FIG. 5

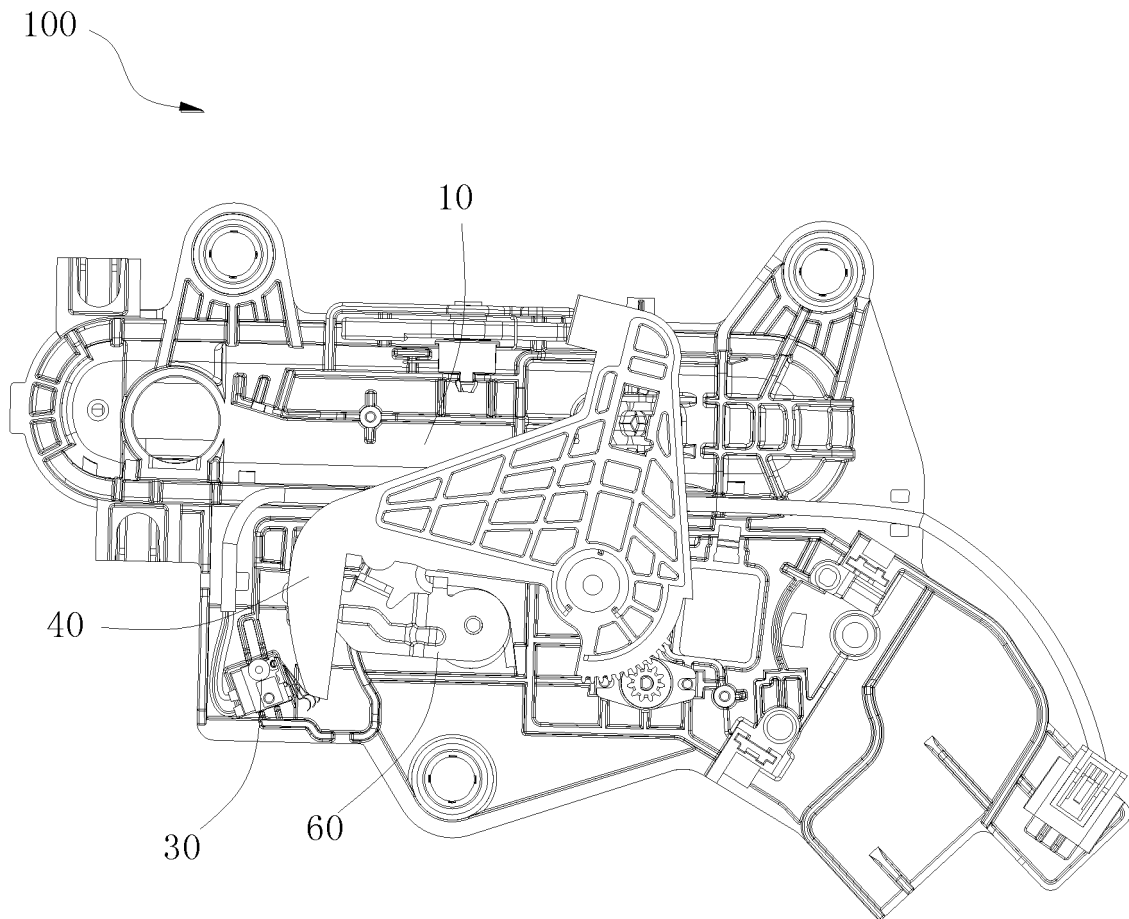


FIG. 6

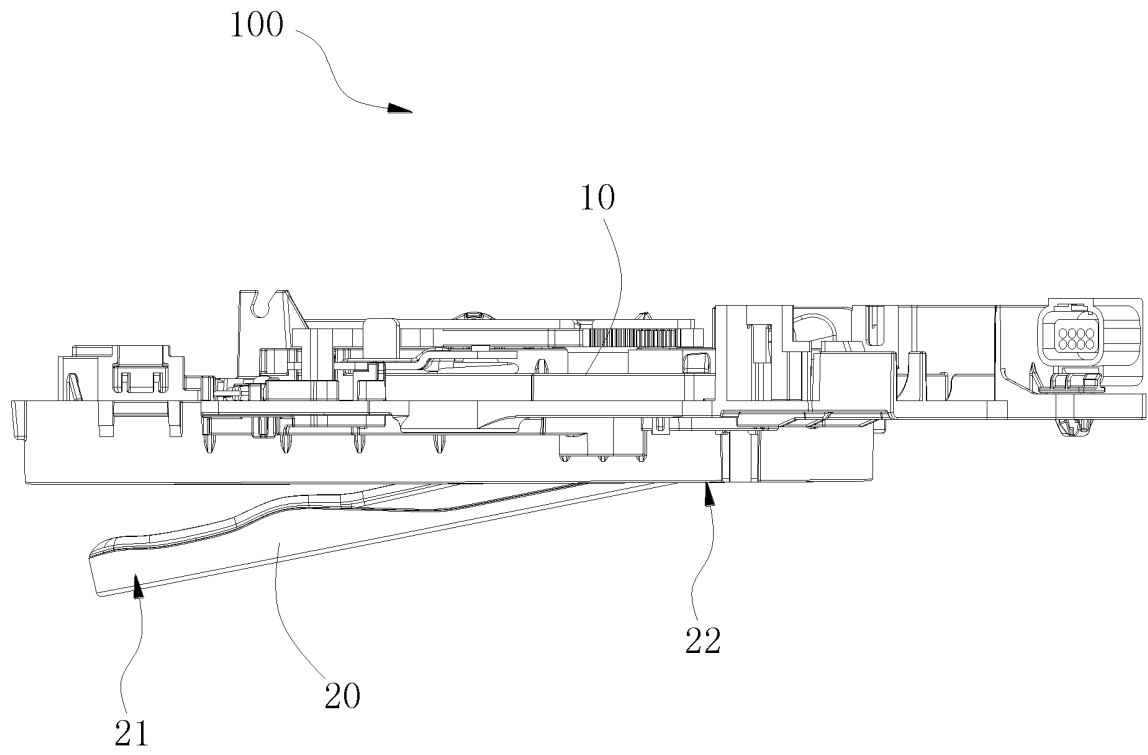


FIG. 7

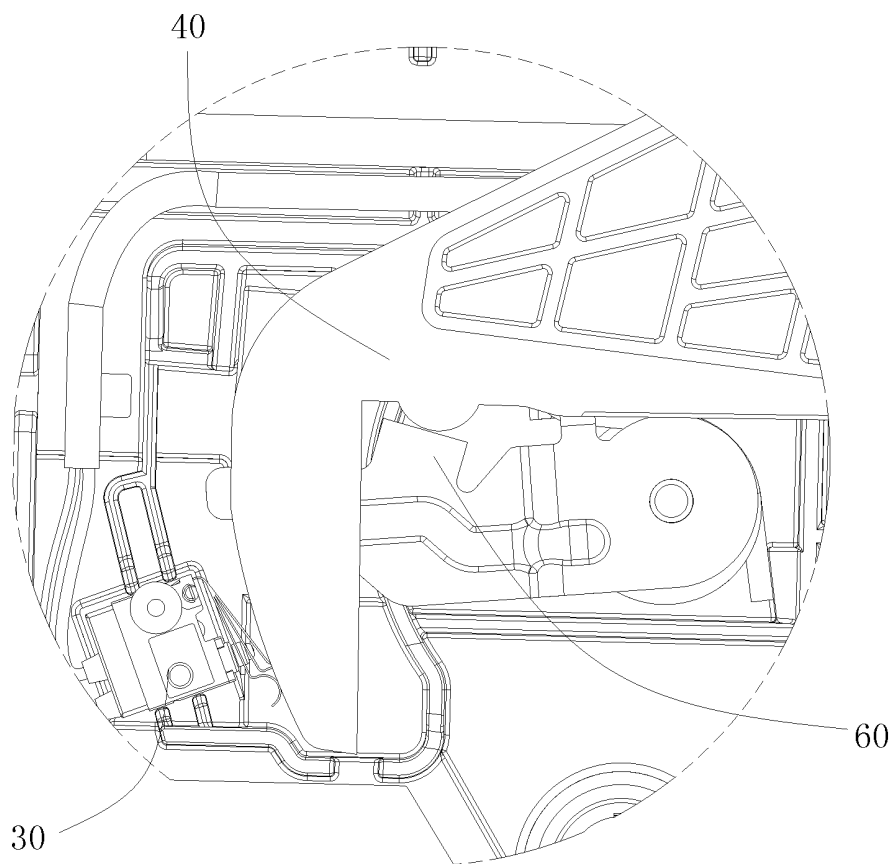


FIG. 8

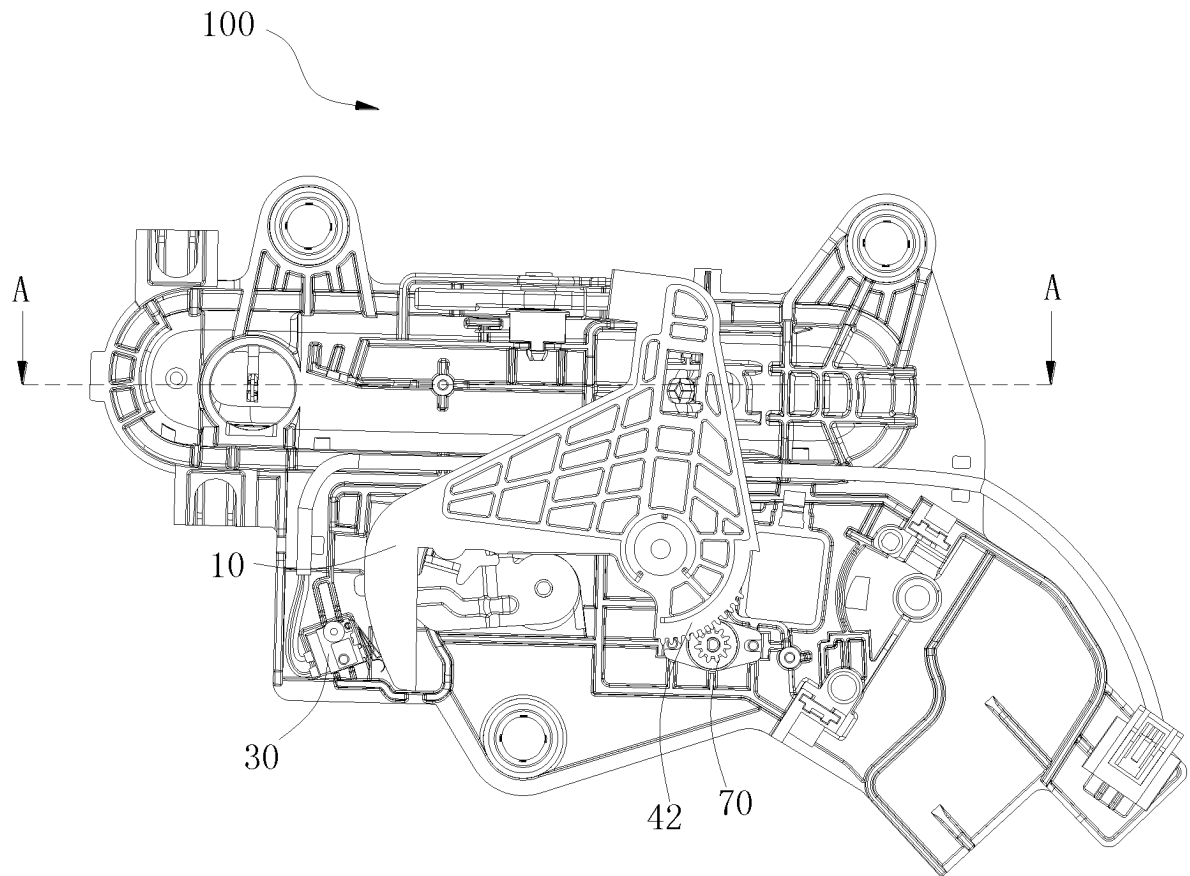


FIG. 9

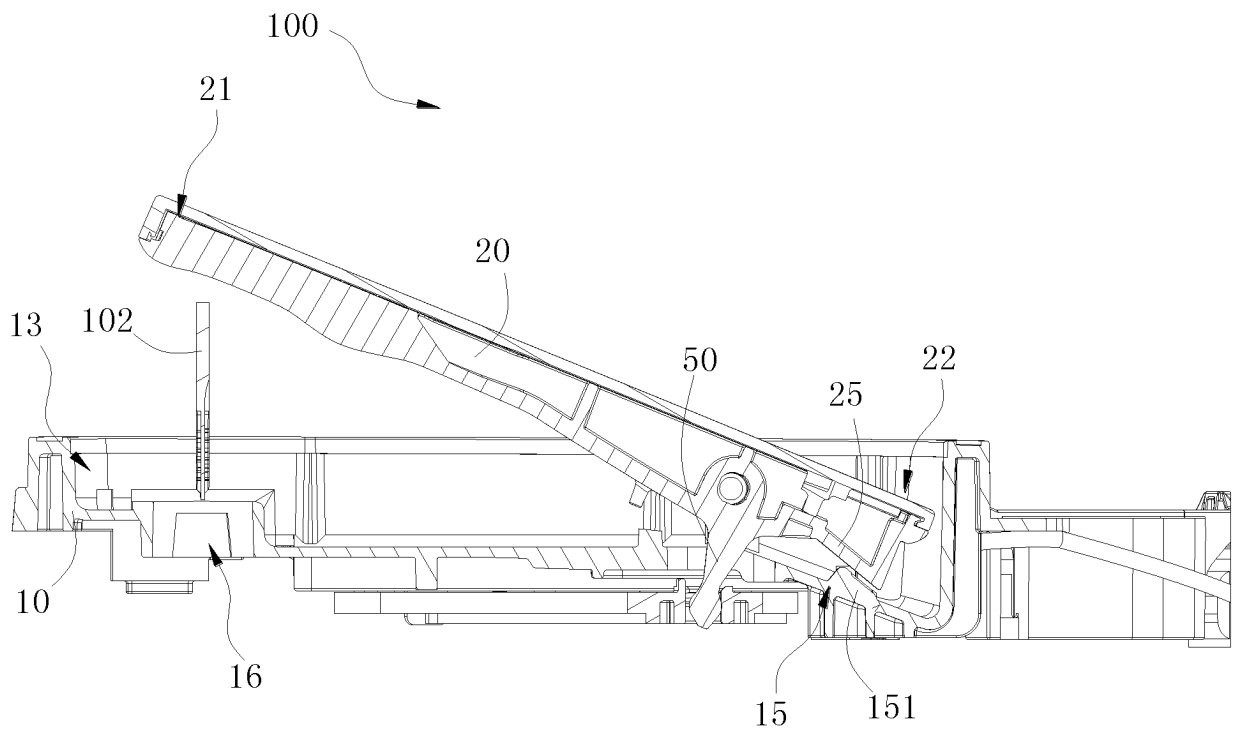


FIG. 10

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2020/135171

A. CLASSIFICATION OF SUBJECT MATTER

E05B 85/16(2014.01)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)

E05B 85/-

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)

USTXT; CNABS; EPTXT; CNTXT; 中国期刊网全文数据库; CJFD (Chinese Journal Full-text Database); DWPI; SIPOABS; 黄奔, 何小鹏, 刘传波, 李建春, 周鹏, 广州暨行智动汽车科技有限公司, 车辆, 汽车, 门锁, 车锁, 把手, 手柄, 拉手, 推杆, 扳手, 门把, 抓手, 把柄, 扣手, 收容腔, 容纳腔, 放置, 安放, 容置, 内置, 存储, 存放, 安装, 承载, 贮存, 固定, 安置, 容放, 腔, 槽, 空间, 仓, 舱, 室, 转轴, 转动轴, 枢轴, 销轴, 传动轴, 连接轴, 驱动轴, 转杆, 触发元件, 驱动, 开闭, 控制, 操作, 执行, 触动, 接触, 按压, 起闭, 元件, 器件, 部件, 组件, 单元, 设备, 装置, 零件, 工件, 结构, 传动件, 动力传递元件, 微型开关, 继电器开关, 行程开关, 位移开关, 信号开关, 限位开关, 触动开关, 灵敏开关, 辅助开关, 按压开关, 触发开关, 干簧开关, 接近传感器, 接近度传感器, 红外传感器, 邻近传感器, 距离传感器, 红外线传感器, 靠近传感器, 磁阻传感器, 加速度传感器, 方向传感器, 光电传感器, 位置传感器, 距离感应器, car, vehicle, automobile, door lock, latch, gate lock, door key, cycle lock, handle, haft, grip, doorknob, containing cavity, acceptance, receive, fitting, mount, groove, chamber, shaft, rotor axis, revolution axis, pivoted axle, driving axle, spring, strike, component, element, assembly, cell, equipment, device, driving member, sensitive switch, microswitch, relay switch, proximity transducer

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN 206503456 U (VAST CHINA CO., LTD.) 19 September 2017 (2017-09-19) description, paragraphs [0020]-[0023], and figures 1-6	1-14
A	CN 209924679 U (NINGBO HUADE AUTOMOBILE PARTS CO., LTD.) 10 January 2020 (2020-01-10) entire document	1-14
A	CN 209670597 U (GUANGZHOU AUTOMOBILE GROUP CO., LTD.) 22 November 2019 (2019-11-22) entire document	1-14

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

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“&” document member of the same patent family

Date of the actual completion of the international search

18 February 2021

Date of mailing of the international search report

25 February 2021

Name and mailing address of the ISA/CN

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Authorized officer

Telephone No.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2020/135171

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN 208089050 U (CHONGQING YIMEI INDUSTRIAL DEVELOPMENT CO., LTD.) 13 November 2018 (2018-11-13) entire document	1-14
A	CN 206616991 U (BEIJING ELECTRIC VEHICLE CO., LTD.) 07 November 2017 (2017-11-07) entire document	1-14
A	CN 207960259 U (EAST JOY LONG AUTOMOBILE ELECTRONIC (SHANGHAI) CO., LTD.) 12 October 2018 (2018-10-12) entire document	1-14
A	CN 108843162 A (NINGBO HUADE AUTOMOBILE PARTS CO., LTD.) 20 November 2018 (2018-11-20) entire document	1-14
A	CN 109477348 A (HUF HULSBECK & FURST GMBH & CO. KG) 15 March 2019 (2019-03-15) entire document	1-14
A	CN 108979368 A (NINGBO HUADE AUTOMOBILE PARTS CO., LTD.) 11 December 2018 (2018-12-11) entire document	1-14
A	JP 2007046296 A (MITSUBISHI MOTORS CORP.) 22 February 2007 (2007-02-22) entire document	1-14
A	US 2013038074 A1 (HONDA MOTOR CO., LTD.) 14 February 2013 (2013-02-14) entire document	1-14

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/CN2020/135171

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
CN 206503456 U	19 September 2017	None	
CN 209924679 U	10 January 2020	None	
CN 209670597 U	22 November 2019	None	
CN 208089050 U	13 November 2018	None	
CN 206616991 U	07 November 2017	None	
CN 207960259 U	12 October 2018	None	
CN 108843162 A	20 November 2018	None	
CN 109477348 A	15 March 2019	EP 3504389 A1	03 July 2019
		WO 2018036867 A1	01 March 2018
		US 2019234117 A1	01 August 2019
		DE 102017118566 A1	01 March 2018
		CN 109477348 B	25 August 2020
CN 108979368 A	11 December 2018	None	
JP 2007046296 A	22 February 2007	JP 4635777 B2	23 February 2011
US 2013038074 A1	14 February 2013	US 8864193 B2	21 October 2014

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- CN 202020610791 [0001]