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(54) CONTACT SWITCH FOR ELEVATOR SAFETY DOOR

(57) A contact switch for an elevator safety door, comprising a contact switch body, wherein the contact switch body comprises a housing and a push rod (3), the push rod (3) being arranged on one side of the housing, and the housing comprising an upper box cover (1) and a lower box body (2), the upper box cover (1) being arranged above the lower box body (2). The contact switch for an elevator safety door has a simple structure, is convenient to use and is capable of being mounted in a mounting space of an existing narrow elevator door motor, thereby reducing the hidden danger of poor connection, ensuring that safety electrical components of an elevator door system are not influenced by the environment and loads, and thus ensuring a long-term safe operation of an elevator.

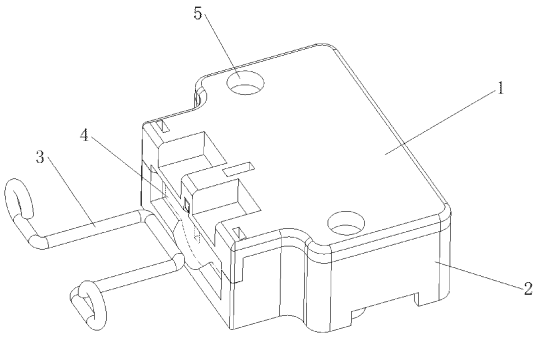

Figure 1

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Description

Technical Field

[0001] The present invention relates to the field of machinery, in particular to a contact switch.

Background Art

[0002] A contact switch for an elevator safety door controls the closure and openness of an elevator car door and an elevator landing door and protects the safety of an elevator passenger and the normal operation of an elevator. An existing widely-used contact switch for an elevator door has the protection grade IP20; due to limitations from the structure and mounting space of an elevator door motor, a safety limit switch which is higher in protection grade cannot be used for upgradation and replacement; due to the adoption of the protection grade IP20, a silver contact in the contact switch is completely exposed, and dust generated in the operation process of the elevator or dust suspended in the air may be attached to the silver contact; and as the rated voltage and current of an electrical control loop are smaller and smaller, which easily causes poor contact of an existing elevator door contact in use due to the dust, thereby resulting in faults such as emergency braking and outage of the elevator. Therefore, with the requirements on the upgradation and reliability of the electrical control loop of the elevator, the existing widely-used IP20 contact switch for a door has been incapable of guaranteeing the long-term safety operation of the elevator. In addition, in most cases, an elevator of a high-rise building and a landing door thereof are mounted after a major structure of the building is completed, more dust and impurities are inevitably generated and attached to the surface of a contact of an elevator safety door in the mounting program of ah elevator system to cause faults during elevator running and debugging; and when an owner of the high-rise building decorates an apartment, due to the low protection grade of the safety contact switch, faults and even safety accidents may be caused in a process that decoration garbage, etc. is transported by the elevator, and the existing safety contact switch is poor in reset effect.

[0003] For the problems in the related art, no effective solutions have been proposed at present.

Summary of the Invention

[0004] The objective of the present invention is to provide a contact switch for an elevator safety door so as to solve at least one of the above-mentioned technical problems.

[0005] In order to achieve the objective, the present invention adopts the following technical solutions:

provided is a contact switch for an elevator safety door, including a contact switch body, the contact switch body including a housing and a push rod, the push rod being arranged on one side of the housing, characterized in that the housing includes an upper box cover and a lower box body, and the upper box cover is arranged above the lower box body;

the lower box body close to the push rod is provided with a first mounting groove, one side of the first mounting groove is provided with a second mounting groove, and a partition plate is arranged between the first mounting groove and the second mounting groove and is provided with a first through hole for communicating the first mounting groove and the second mounting groove;

the first mounting groove is internally provided with a push plate matched with the push rod, each of two sides of the push plate is provided with a fixing column sleeved with a first spring, one end of the first spring supports against the push plate, and the other end of the first spring supports against the partition plate;

the middle of the push plate is provided with a connecting column, one side of the connecting column penetrates into the second mounting groove via the first through hole, the connecting column is fixedly provided with a connecting block arranged in the second mounting groove, the connecting block is provided with a mounting hole where a second spring is mounted, one end of the second spring supports against the inner wall of the mounting hole, the other end of the second spring supports against the inner wall of the second mounting groove, and each of two sides of the connecting block is provided with a strip-shaped connecting sheet on which a first projection is arranged;

the lower box body is provided with two fixing grooves respectively arranged in two sides inside the second mounting groove, each of the fixing grooves is internally provided with a fixing block, the side wall of the fixing groove is provided with a first gap, and the fixing block close to the first gap is provided with a second projection matched with the first projection; the upper part of the fixing block is provided with a first bolt hole, the middle of the fixing block is provided with a first threading hole communicating with the first bolt hole, and a wiring screw is screwed and connected to the first bolt hole; and

the lower box body close to the fixing groove is provided with a first clamping groove, the fixing groove communicates with the first clamping groove where a rubber block is arranged, and the rubber block is provided with a second threading hole matched with the first threading hole in position.

[0006] The cross section of the first clamping groove is semicircular, the cross section of the rubber block is circular, the lower part of the rubber block is clamped into the first clamping groove, the rubber block is arranged on a connection of the upper box cover and the lower

box body, the upper box cover is provided with a second clamping groove of which the cross section is semicircular, and the upper part of the rubber block is clamped into the second clamping groove.

[0007] The side, close to the first mounting groove, of the partition plate is provided with an embedded groove in which a rubber ring is mounted, the rubber ring is provided with a second through hole, the front side of the connecting column penetrates through the second through hole, the diameter of the front side of the connecting column is smaller than the diameter of the rear side of the connecting column, and the diameter of the rear side of the connecting column is greater than the diameter of the second through hole; and

the upper part of the partition plate is provided with a slot communicating with the embedded groove, a fixing sheet for fixing the rubber ring is inserted into the slot, the lower part of the fixing sheet is provided with a second gap, and the width of the second gap is greater than the diameter of the rear side of the connecting column. The rubber ring close to the first mounting groove is provided with an annular projection, and the cross section of the annular projection is semicircular.

[0008] A third mounting groove is arranged on a connection of the push plate and the connecting column and is internally provided with a first stationary shaft;

the third mounting groove is provided with a flip fastener including a sheet-like body, and the lower part of the sheet-like body is provided with a first rotary groove matched with the first stationary shaft;

the rear of the sheet-like body is provided with a second rotary groove through which a second stationary shaft penetrates, and two ends of the second stationary shaft are both fixed to the upper box cover; and

the front of the sheet-like body is provided with a clamping hook for clamping the push rod. A rubber gasket is arranged above the second mounting groove, the middle of the rubber gasket is provided with an opening matched with the second mounting groove in shape, and the rubber gasket is arranged between the upper box cover and the lower box body.

[0009] The lower box body is provided with two second bolt holes respectively arranged in two sides of the second mounting groove, and the upper box cover is provided with two third bolt holes matched with the second bolt holes in position.

[0010] The upper box cover and the lower box body are connected by a buckle.

[0011] By such a design, the present invention provides the contact switch for the elevator safety door, which is simple in structure and convenient to use, can be mounted in an existing narrow mounting space for an elevator door motor, reduces the hidden danger of poor contact and ensures that safety electrical components of an elevator door system are not affected by environments and loads, thereby guaranteeing the long-term safety operation of an elevator.

Brief Description of the Drawings

[0012]

Fig. 1 is a schematic diagram showing a partial structure in the present invention;

Fig. 2 is a schematic diagram showing a partial structure of a lower box body in the present invention;

Fig. 3 is a schematic diagram showing a partial structure of a rubber block in the present invention;

Fig. 4 is a schematic diagram showing a partial structure of a second mounting groove in the present invention;

Fig. 5 is a schematic diagram showing a partial structure of a partition plate in the present invention;

Fig. 6 is a schematic diagram showing a partial structure of a rubber ring in the present invention;

Fig. 7 is a schematic diagram showing a partial structure of a fixed block in the present invention; and

Fig. 8 is a schematic diagram showing a partial structure of a flip fastener in the present invention.

Detailed Description of the Invention

[0013] The specific implementations of the present invention will be further described below with reference to the accompanying drawings.

[0014] As shown in Fig. 1 to Fig. 8, a contact switch for an elevator safety door includes a contact switch body, the contact switch body includes a housing and a push rod 3, the push rod is arranged on one side of the housing, the housing includes an upper box cover 1 and a lower box body 2, and the upper box cover is arranged above the lower box body; the lower box body close to the push rod is provided with a first mounting groove 12, one side of the first mounting groove is provided with a second mounting groove 11, and a partition plate 7 is arranged between the first mounting groove and the second mounting groove and is provided with a first through hole for communicating the first mounting groove and the second mounting groove; the first mounting groove is internally provided with a push plate 4 matched with the push rod, each of two sides of the push plate is provided with a fixing column 23 sleeved with a first spring 22, one end of the first spring supports against the push plate, and the other end of the first spring supports against the partition plate; the middle of the push plate is provided with a connecting column 6, one side of the connecting column penetrates into the second mounting groove via the first through hole, the connecting column is fixedly provided with a connecting block 10 arranged in the second mounting groove, the connecting block is provided with a mounting hole 15 where a second spring 18 is mounted, one end of the second spring supports against the inner wall of the mounting hole, the other end of the second

spring supports against the inner wall of the second mounting groove, and each of two sides of the connecting block is provided with a strip-shaped connecting sheet 19 on which a first projection 20 is arranged; the lower box body is provided with two fixing grooves 13 respectively arranged in two sides inside the second mounting groove, each of the fixing grooves is internally provided with a fixing block 24, the side wall of the fixing groove is provided with a first gap, and the fixing block close to the first gap is provided with a second projection 25 matched with the first projection; the upper part of the fixing block is provided with a first bolt hole 29, the middle of the fixing block is provided with a first threading hole 28 communicating with the first bolt hole, and a wiring screw 14 is screwed and connected to the first bolt hole; and the lower box body close to the fixing groove is provided with a first clamping groove, the fixing groove communicates with the first clamping groove where a rubber block 16 is arranged, and the rubber block is provided with a second threading hole 17 matched with the first threading hole in position. By such a design, the present invention provides the contact switch for the elevator safety door, which is simple in structure and convenient to use, can be mounted in an existing narrow mounting space for an elevator door motor, reduces the hidden danger of poor contact and ensures that safety electrical components of an elevator door system are not affected by environments and loads, thereby guaranteeing the long-term safety operation of an elevator.

[0015] By such a design, not only is the convenience in wiring guaranteed, but also a better dustproof effect is achieved, the protection grade IP54 or IP65 may be reached, the using effect of the contact switch for the elevator safety door is improved, and the design is applicable to the contact switch, provided with a low-current electrical loop, for the elevator safety door. During wiring, a user needs to open the upper box cover to penetrate a conducting wire via the second threading hole, screw down a wiring screw to tightly press the conducting wire, and fix the upper box cover to complete wiring.

[0016] When a device is used, the push rod pushes the push plate, the push plate drives the connecting column to move, the connecting column drives the connecting block to move, and then, the connecting sheets are gradually close to the fixing blocks, and the first projections on the connecting sheets are in contact with the second projections on the fixing blocks; at the moment, the first springs located on two sides of the push plate and the second spring on the connecting block are all in a compressed state, after the push rod retreats, the first springs and the second spring may provide a better reset effect, and then, the service life of the contact switch for the elevator safety door is prolonged.

[0017] The cross section of the first clamping groove is semicircular, the cross section of the rubber block is circular, the lower part of the rubber block is clamped into the first clamping groove, the rubber block is arranged on a connection of the upper box cover and the lower box body, the upper box cover is provided with a second clamping groove of which the cross section is semicircular, and the upper part of the rubber block is clamped into the second clamping groove. Therefore, the rubber block is conveniently clamped by the upper box cover and the lower box body.

[0018] The side, close to the first mounting groove, of the partition plate is provided with an embedded groove in which a rubber ring 27 is mounted, the rubber ring is provided with a second through hole, the front side of the connecting column penetrates through the second through hole, the diameter of the front side of the connecting column is smaller than the diameter of the rear side of the connecting column, and the diameter of the rear side of the connecting column is greater than the diameter of the second through hole; and the upper part of the partition plate is provided with a slot communicating with the embedded groove, a fixing sheet 21 for fixing the rubber ring is inserted into the slot, the lower part of the fixing sheet is provided with a second gap, and the width of the second gap is greater than the diameter of the rear side of the connecting column. The rubber ring close to the first mounting groove is provided with an annular projection 26, and the cross section of the annular projection is semicircular. After the push rod pushes the push plate, and the push plate drives the connecting column to move for a certain distance, the rear side thereof is blocked by the rubber ring, the rubber ring plays roles in limiting the movement distance of the connecting column and buffering, and thus, the service life of the device is prolonged. In order to guarantee the using effect of the device, the push rod, the push plate, the connecting column, the connecting block, the connecting sheets, the first projections, the second projections and the fixing blocks are all made of a conductive material. For example, the push rod, the push plate, the connecting column, the connecting block, the connecting sheets, the first projections, the second projections and the fixing blocks are all made of copper. The outer surfaces of the first projections and the second projections are provided with silver coatings.

[0019] A third mounting groove 34 is arranged on a connection of the push plate and the connecting column and is internally provided with a first stationary shaft 33; the third mounting groove is provided with a flip fastener 30 including a sheet-like body, and the lower part of the sheet-like body is provided with a first rotary groove matched with the first stationary shaft; the rear of the sheet-like body is provided with a second rotary groove 31 through which a second stationary shaft 32 penetrates, and two ends of the second stationary shaft are both fixed to the upper box cover; and the front of the sheet-like body is provided with a clamping hook for clamping the push rod. The flip fastener ensures that the contact is absolutely disconnected, when the push rod is pushed into the housing, the push plate and the connecting column move towards the inner side of the housing, the lower part of the flip fastener moves towards the

inner side of the housing along with the first stationary shaft, and the rear thereof is limited by the second stationary shaft, so that the flip fastener flips towards the front side around the second stationary shaft, and then, the push rod is clamped by the clamping hook on the front side thereof; and when the push rod is separated, the push rod drives the flip fastener to flip again, the lower part of the flip fastener drives the first stationary shaft to move, so that the push plate and the connecting column move towards the outer side of the housing, then, the first projections are not in contact with the second projections any more, and the contact between the contacts is forcedly disconnected, so that the function of absolutely disconnecting safety contacts is achieved. A rubber gasket 9 is arranged above the second mounting groove, the middle of the rubber gasket is provided with an opening matched with the second mounting groove in shape, and the rubber gasket is arranged between the upper box cover and the lower box body. Therefore, the sealing effect between the upper box cover and the lower box body is improved, and a dustproof effect is further achieved.

[0020] In order to facilitate mounting the contact switch, the lower box body is provided with two second bolt holes 8 respectively arranged in two sides of the second mounting groove, and the upper box cover is provided with two third bolt holes 5 matched with the second bolt holes in position. The contact switch may be fixed by penetrating bolts through the second bolt holes and the third bolt holes.

[0021] In order to provide convenience for a user to open the upper box cover, the upper box cover and the lower box body are connected by a buckle.

[0022] Finally, it should be noted that the above-mentioned embodiments are merely preferred embodiments of the present invention, but are not intended to limit the present invention. Although the present invention has been described in detail with reference to the aforementioned embodiments, the skill in the art may still modify the technical solutions recorded in each of the foregoing embodiments or equivalently substitute parts of technical features therein. Any modifications, equivalent substitutions, improvements, etc. made within the spirit and principle of the present invention shall fall within the protection scope of the present invention.

Claims

1. A contact switch for an elevator safety door, comprising a contact switch body, the contact switch body comprising a housing and a push rod, the push rod being arranged on one side of the housing, **characterized in that** the housing comprises an upper box cover and a lower box body, and the upper box cover is arranged above the lower box body;

   the lower box body close to the push rod is provided with a first mounting groove, one side of the first mounting groove is provided with a second mounting groove, and a partition plate is arranged between the first mounting groove and the second mounting groove and is provided with a first through hole for communicating the first mounting groove and the second mounting groove;

   the first mounting groove is internally provided with a push plate matched with the push rod, each of two sides of the push plate is provided with a fixing column sleeved with a first spring, one end of the first spring supports against the push plate, and the other end of the first spring supports against the partition plate;

   the middle of the push plate is provided with a connecting column, one side of the connecting column penetrates into the second mounting groove via the first through hole, the connecting column is fixedly provided with a connecting block arranged in the second mounting groove, the connecting block is provided with a mounting hole where a second spring is mounted, one end of the second spring supports against the inner wall of the mounting hole, the other end of the second spring supports against the inner wall of the second mounting groove, and each of two sides of the connecting block is provided with a strip-shaped connecting sheet on which a first projection is arranged;

   the lower box body is provided with two fixing grooves respectively arranged in two sides inside the second mounting groove, each of the fixing grooves is internally provided with a fixing block, the side wall of the fixing groove is provided with a first gap, and the fixing block close to the first gap is provided with a second projection matched with the first projection;

   the upper part of the fixing block is provided with a first bolt hole, the middle of the fixing block is provided with a first threading hole communicating with the first bolt hole, and a wiring screw is screwed and connected to the first bolt hole; and the lower box body close to the fixing groove is provided with a first clamping groove, the fixing groove communicates with the first clamping groove where a rubber block is arranged, and the rubber block is provided with a second threading hole matched with the first threading hole in position.

2. The contact switch for the elevator safety door of claim 1, **characterized in that** the cross section of the first clamping groove is semicircular, the cross section of the rubber block is circular, the lower part of the rubber block is clamped into the first clamping groove, the rubber block is arranged on a connection of the upper box cover and the lower box body, the

upper box cover is provided with a second clamping groove of which the cross section is semicircular, and the upper part of the rubber block is clamped into the second clamping groove.

3. The contact switch for the elevator safety door of claim 1, **characterized in that** the side, close to the first mounting groove, of the partition plate is provided with an embedded groove in which a rubber ring is mounted, the rubber ring is provided with a second through hole, the front side of the connecting column penetrates through the second through hole, the diameter of the front side of the connecting column is smaller than the diameter of the rear side of the connecting column, and the diameter of the rear side of the connecting column is greater than the diameter of the second through hole; and
the upper part of the partition plate is provided with a slot communicating with the embedded groove, a fixing sheet for fixing the rubber ring is inserted into the slot, the lower part of the fixing sheet is provided with a second gap, and the width of the second gap is greater than the diameter of the rear side of the connecting column.

4. The contact switch for the elevator safety door of claim 3, **characterized in that** the rubber ring close to the first mounting groove is provided with an annular projection, and the cross section of the annular projection is semicircular.

5. The contact switch for the elevator safety door of claim 1, **characterized in that** a third mounting groove is arranged on a connection of the push plate and the connecting column and is internally provided with a first stationary shaft;

the third mounting groove is provided with a flip fastener comprising a sheet-like body, and the lower part of the sheet-like body is provided with a first rotary groove matched with the first stationary shaft;
the rear of the sheet-like body is provided with a second rotary groove through which a second stationary shaft penetrates, and two ends of the second stationary shaft are both fixed to the upper box cover; and
the front of the sheet-like body is provided with a clamping hook for clamping the push rod.

6. The contact switch for the elevator safety door of claim 1, **characterized in that** a rubber gasket is arranged above the second mounting groove, the middle of the rubber gasket is provided with an opening matched with the second mounting groove in shape, and the rubber gasket is arranged between the upper box cover and the lower box body.

7. The contact switch for the elevator safety door of claim 1, **characterized in that** the lower box body is provided with two second bolt holes respectively arranged in two sides of the second mounting groove, and the upper box cover is provided with two third bolt holes matched with the second bolt holes in position.

8. The contact switch for the elevator safety door of claim 1, **characterized in that** the upper box cover and the lower box body are connected by a buckle.

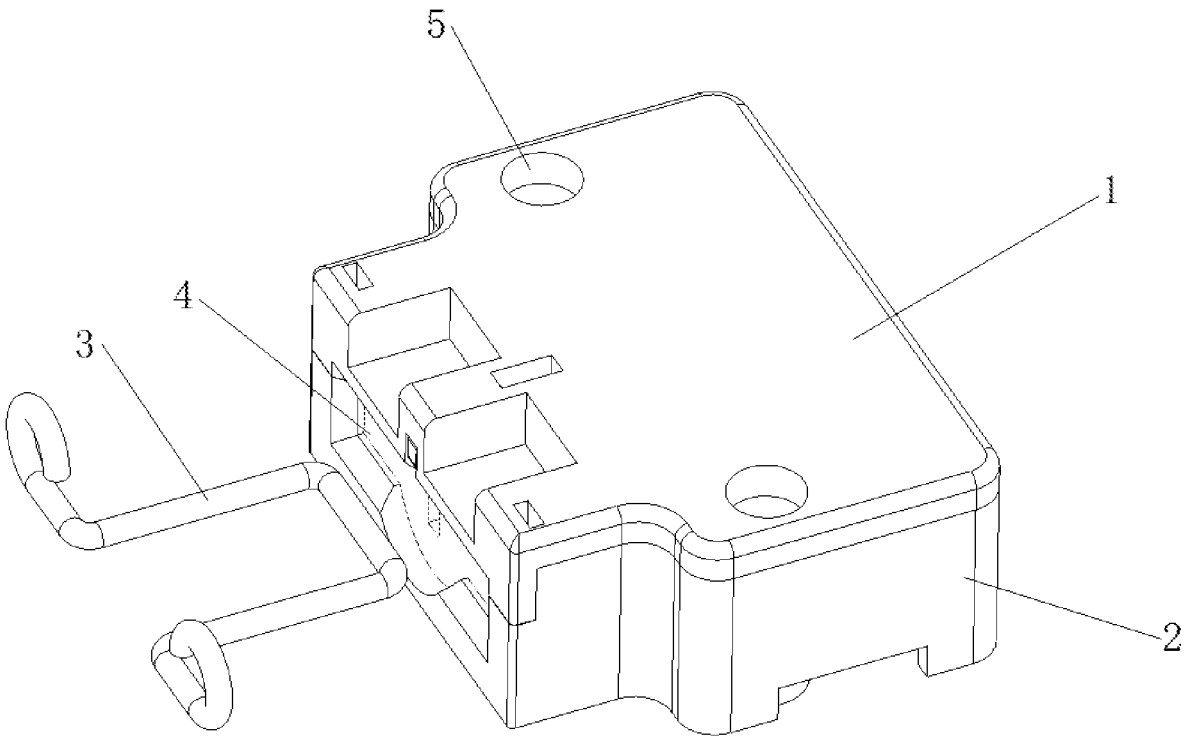

Figure 1

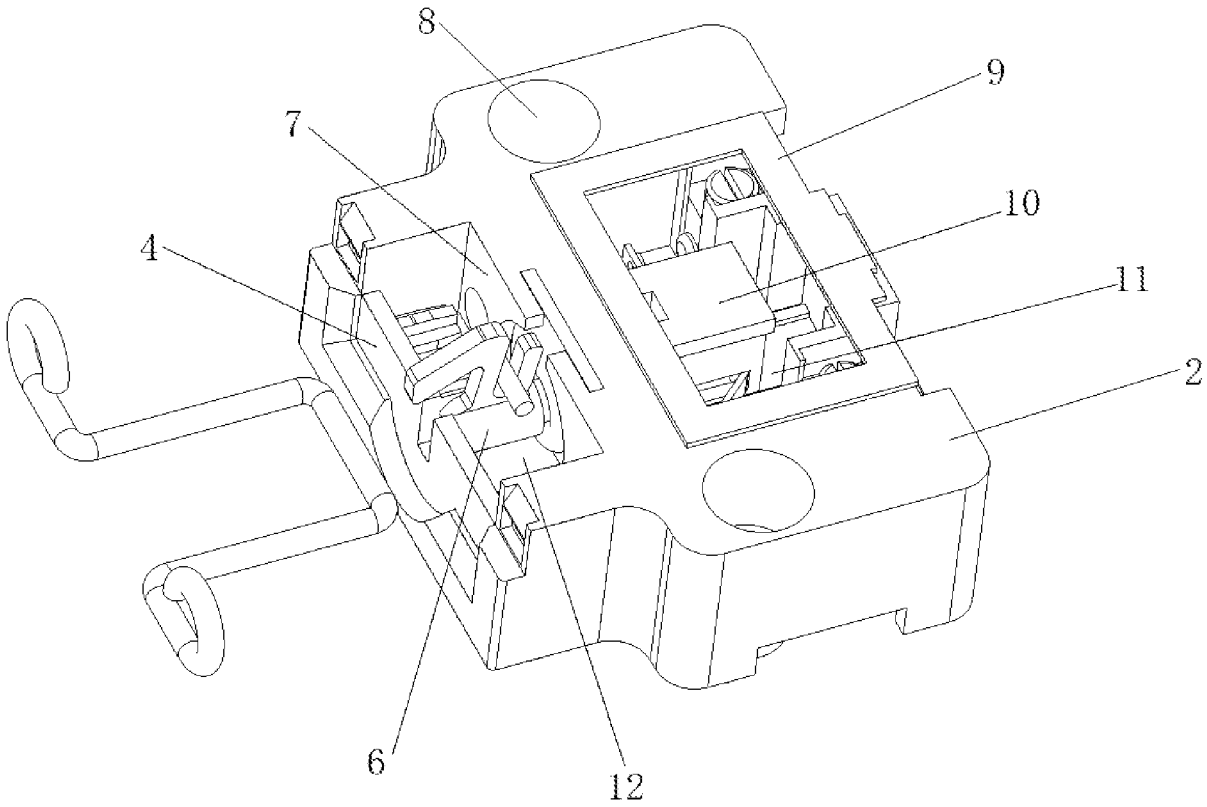

Figure 2

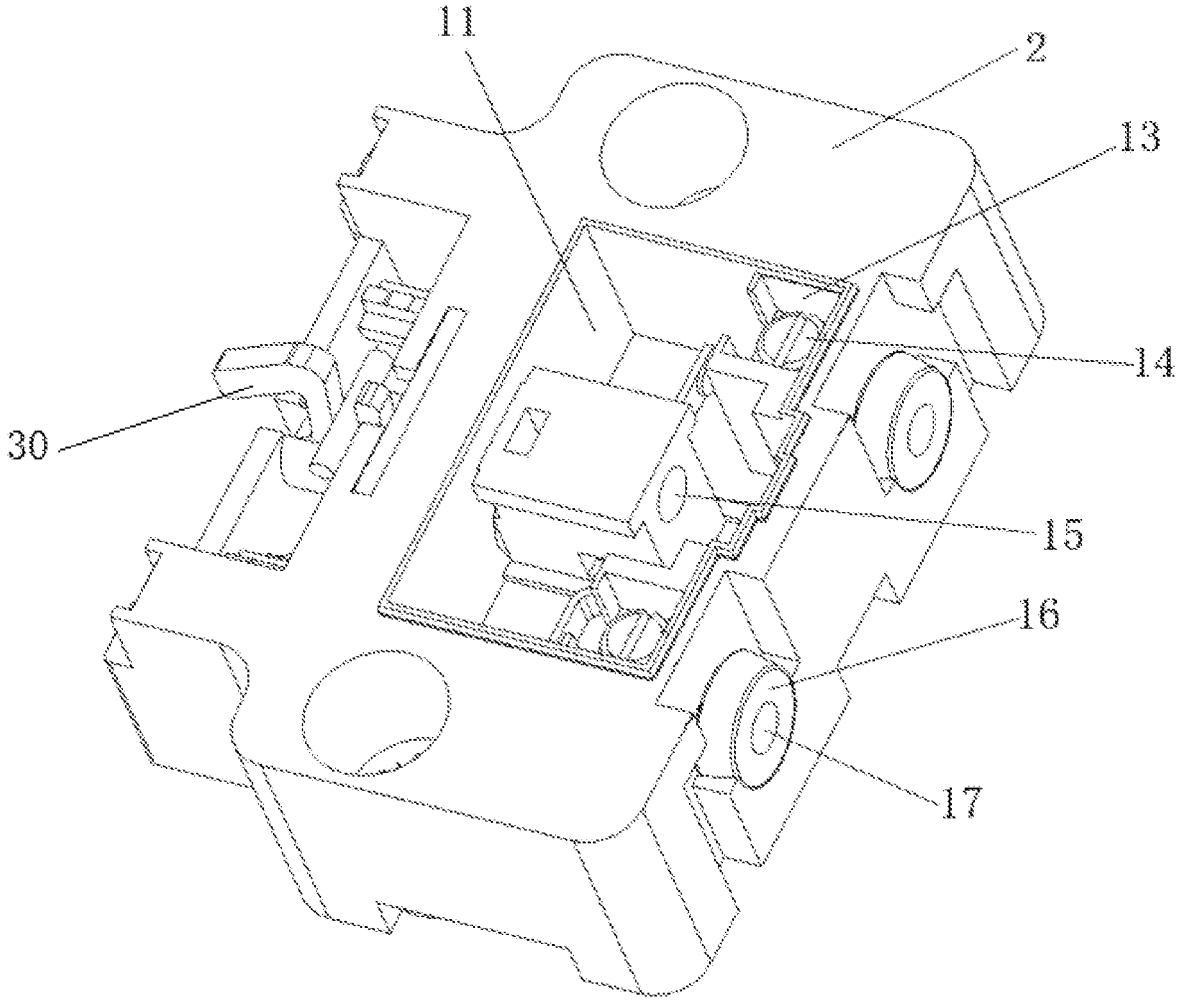

Figure 3

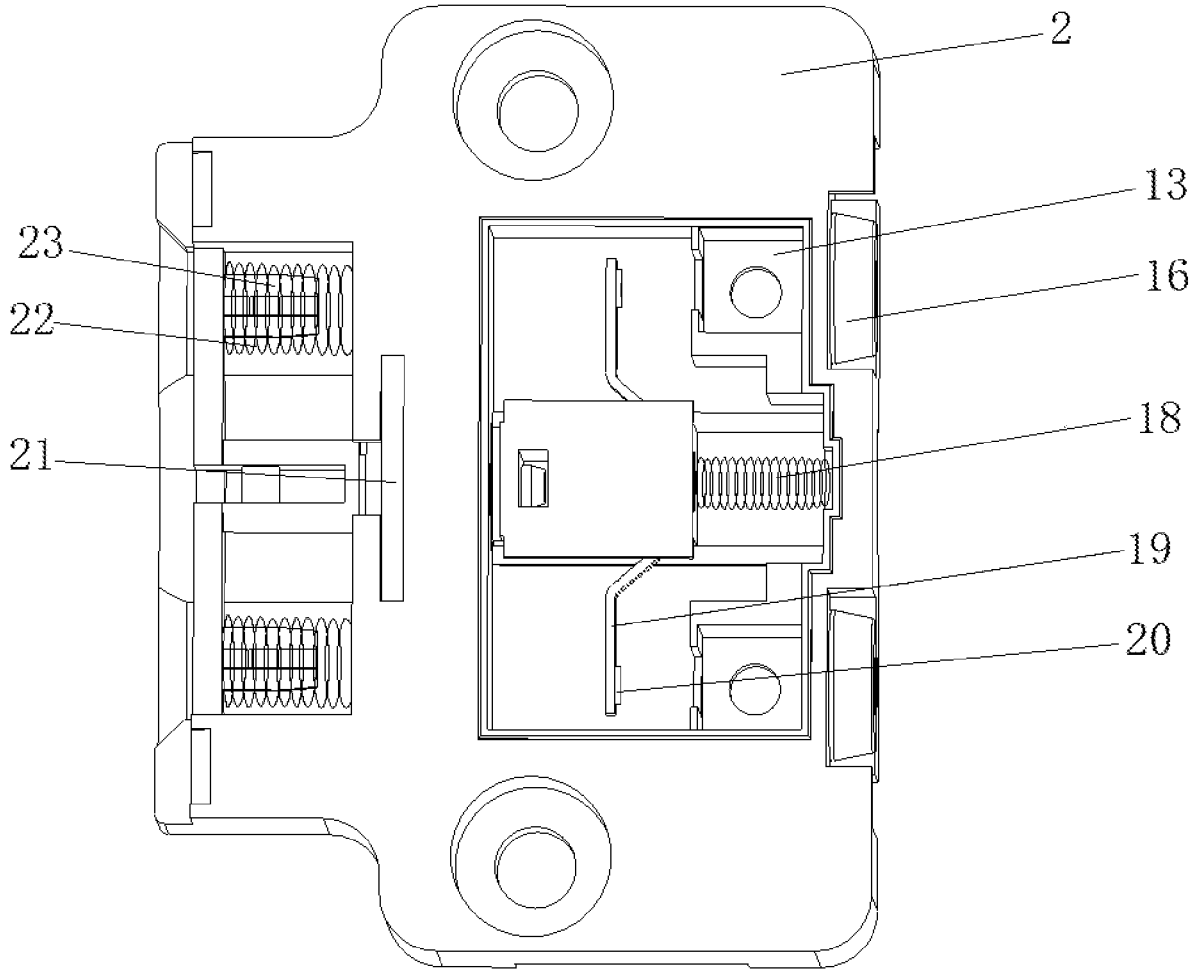

Figure 4

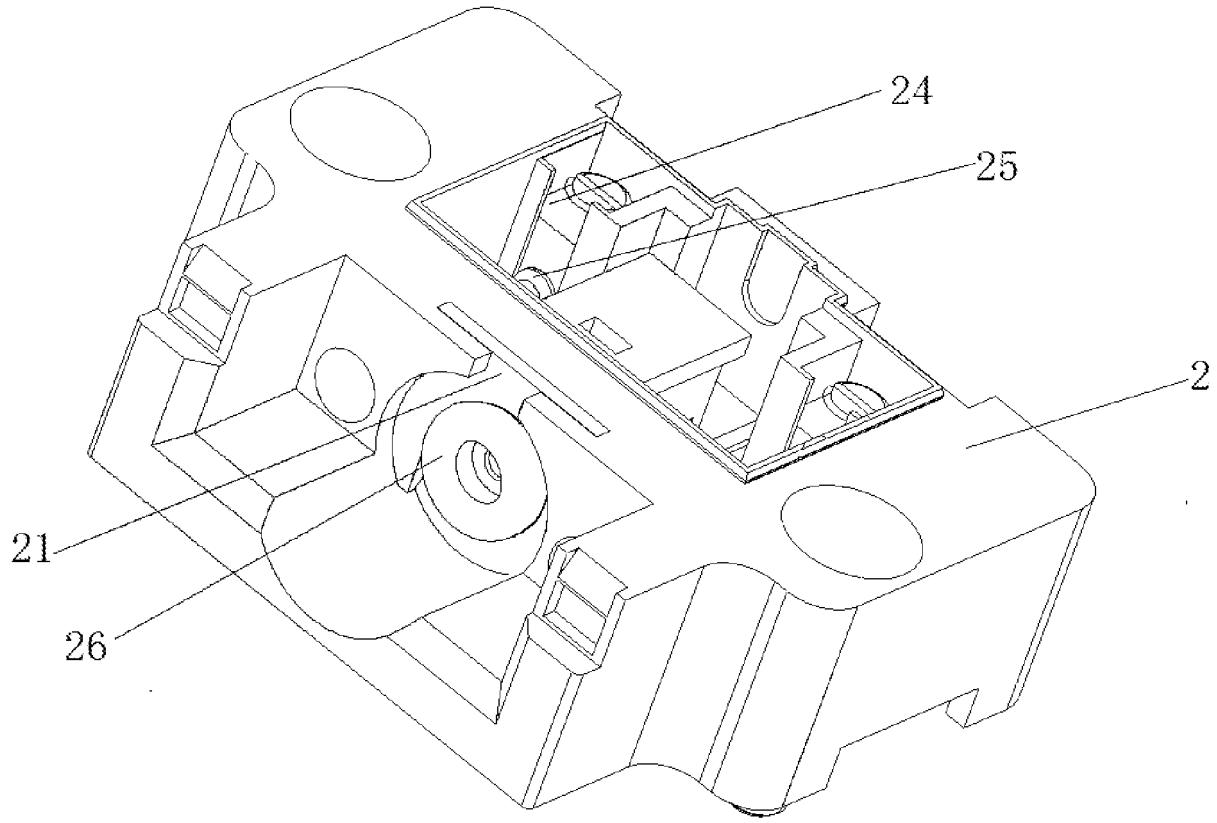

Figure 5

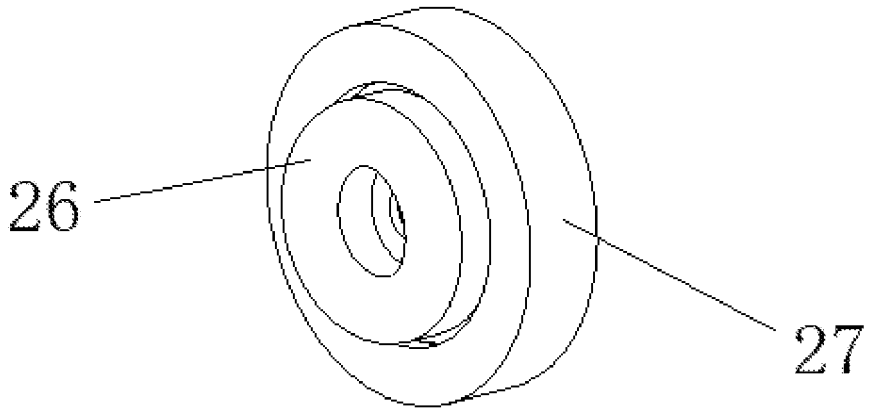

Figure 6

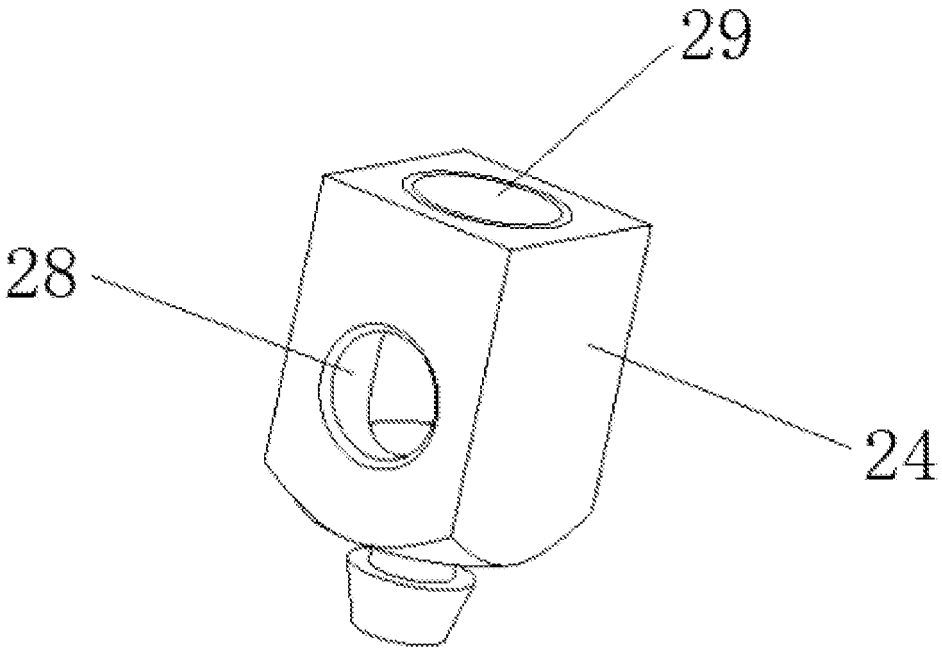

Figure 7

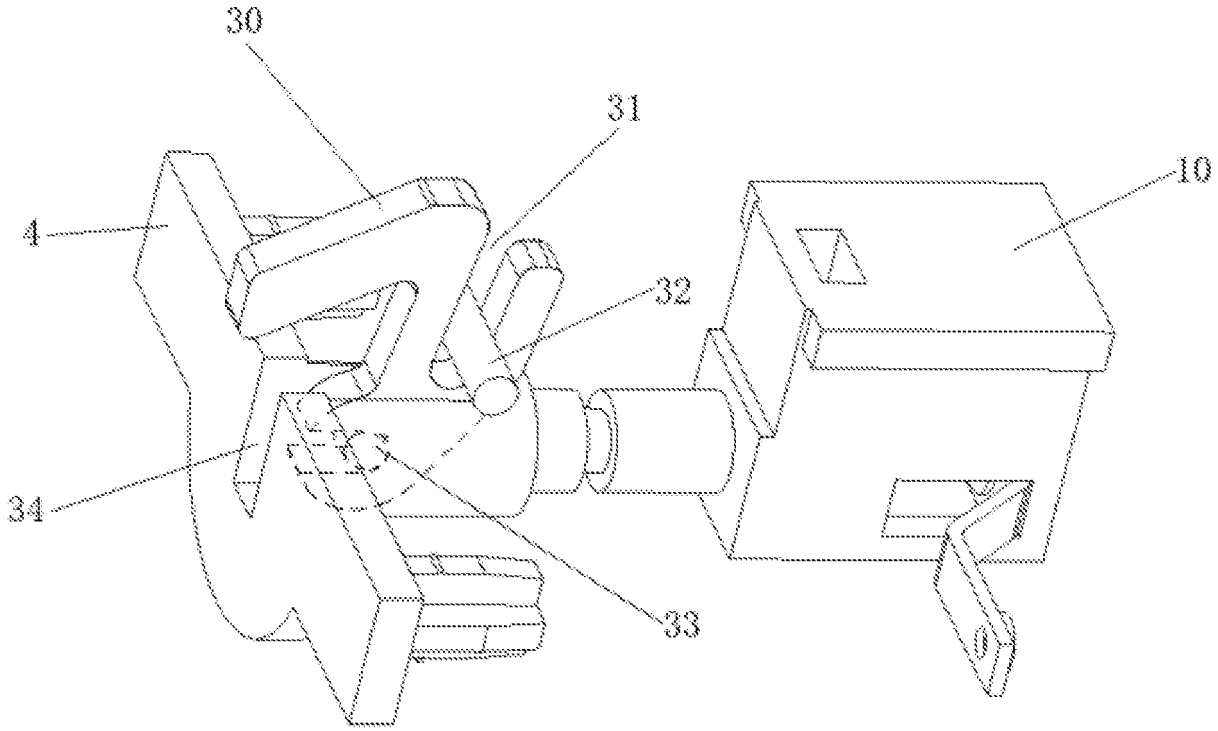

Figure 8

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2021/095477

A. CLASSIFICATION OF SUBJECT MATTER

B66B 1/46(2006.01)i; B66B 13/02(2006.01)i; H01H 3/16(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)

B66B;H01H

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; CNKI; VEN: 开关, 触点, 防尘, 密封, 橡胶, 上海泰盖特信息科技有限公司; switch, contact, seal, dust, rubber.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 111547590 A (SHANGHAI TAIGAITE INFORMATION TECHNOLOGY CO., LTD.) 18 August 2020 (2020-08-18) see claims 1-8	1-8
PX	CN 212315233 U (SHANGHAI TAIGAITE INFORMATION TECHNOLOGY CO., LTD.) 08 January 2021 (2021-01-08) see claims 1-8	1-8
A	CN 202585164 U (HONEYWELL SENSING AND CONTROL (CHINA) CO., LTD.) 05 December 2012 (2012-12-05) see description, paragraphs [0018]-[0037], figures 1-8	1-8
A	CN 110571071 A (SHANGHAI MITSUBISHI ELEVATOR CO., LTD.) 13 December 2019 (2019-12-13) see entire document	1-8
A	CN 110277256 A (SCHINDLER CHINA ELEVATOR CO., LTD.) 24 September 2019 (2019-09-24) see entire document	1-8
A	JP 2006331810 A (OMRON TATEISI ELECTRONICS CO.) 07 December 2006 (2006-12-07) see entire document	1-8

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

* Special categories of cited documents:
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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
13 August 2021	**30 August 2021**

Name and mailing address of the ISA/CN	Authorized officer
China National Intellectual Property Administration (ISA/CN) **No. 6, Xitucheng Road, Jimenqiao, Haidian District, Beijing 100088** **China**	
Facsimile No. **(86-10)62019451**	Telephone No.

Form PCT/ISA/210 (second sheet) (January 2015)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2021/095477

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
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