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(54) **DC CIRCUIT BREAKER**

(57) A DC circuit breaker is provided. The DC circuit breaker comprises a first housing and a second housing, wherein the first housing and the second housing jointly define an accommodation space, and a stationary contact assembly and a mechanism assembly are arranged in the accommodation space, the mechanism assembly being able to move between an on position and an off position. The mechanism assembly comprises a center plate and a moving contact assembly. The center plate is rotatably supported, at both sides of the center plate,

by the first housing and the second housing respectively. The moving contact assembly is rotatably installed on the center plate by a moving shaft arranged on the center plate. The moving contact assembly is configured to rotate relative to the center plate during a rotation of the center plate relative to the first housing and the second housing. An elastic component of the mechanism assembly is configured to act between the moving contact assembly and the first housing.

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Description

TECHNICAL FIELD

[0001] The present disclosure relates to a DC circuit breaker. A double contact mechanism is designed in the DC circuit breaker and has the function of quick closing and large spacing, meeting the requirements of contact pressure of high current level, tripping force and element strength of existing accessories. The double contact mechanism can reliably adapt to accessories, and has a moving contact point which opens quickly.

BACKGROUND

[0002] Under large current level, the contact pressure of direct current (DC) circuit breaker is required to be very high. If the single-axis fixed-axis rotation and split-axis fixed-axis rotation structure of existing DC product mechanism are used, the tripping force will be correspondingly increased proportionally, resulting in the circuit breaker being unable to use the existing accessory products. At the same time, the existing single contact structure has insufficient current limiting ability for the required large short-circuit current.

SUMMARY

[0003] In order to solve one or more defects in the existing art, according to an aspect of the present disclosure, a DC circuit breaker, comprising a first housing and a second housing, wherein the first housing and the second housing jointly define an accommodation space, and a stationary contact assembly and a mechanism assembly are arranged in the accommodation space, the mechanism assembly being able to move between an on position and an off position.

[0004] The mechanism assembly comprises a center plate and a moving contact assembly.

[0005] The center plate is rotatably supported, at both sides of the center plate, by the first housing and the second housing respectively.

[0006] The moving contact assembly is rotatably installed on the center plate by a moving shaft arranged on the center plate.

[0007] The moving contact assembly is configured to rotate relative to the center plate during a rotation of the center plate relative to the first housing and the second housing.

[0008] An elastic component of the mechanism assembly is configured to act between the moving contact assembly and the first housing.

[0009] According to the above aspects of the present disclosure, the moving contact assembly comprises a moving contact point assembly.

[0010] The moving contact point assembly is U-shaped.

[0011] Two moving contact points are connected in se-

ries by the U-shaped moving contact point assembly.

[0012] The moving contact point assembly is connected to the moving contact assembly by a fastener.

[0013] According to the above aspects of the present disclosure the DC circuit breaker further comprises an operating handle, a handle connecting rod and a handle return spring.

[0014] The operating handle is configured to rotate around a handle shaft arranged on the first housing.

[0015] The handle return spring is sleeved on the handle shaft.

[0016] During a movement of the operating handle, one end of the handle return spring acts on a handle spring limiting rib on the first housing, and the other end of the handle return spring always acts on the operating handle.

[0017] One end of the handle connecting rod is connected to the operating handle.

[0018] The other end of the handle connecting rod is connected to the mechanism assembly.

[0019] According to the above aspects of the present disclosure, the mechanism component further comprises a tripping hook.

[0020] The tripping hook is provided with a tripping hook through-hole, a tripping hook through-hole groove, a tripping hook torsion spring limiting portion and a tripping hook notch.

[0021] The other end of the handle connecting rod passes through the tripping hook through-hole groove.

[0022] A center plate first shaft and a center plate first stopper are arranged on the center plate.

[0023] The tripping hook is rotatably installed on the center plate through a cooperation of the center plate first shaft and the tripping hook through-hole.

[0024] The center plate first stopper is configured to be fitted in the tripping hook notch.

[0025] According to the above aspects of the present disclosure, the center plate is further provided with a center plate blind groove.

[0026] The other end of the handle connecting rod passing through the tripping hook through-hole groove is fitted in the center plate blind groove.

[0027] According to the above aspects of the present disclosure, the center plate comprises a center plate base, and a first branch and a second branch extending from the center plate base.

[0028] The first branch and the second branch are parallel to each other and spaced apart.

[0029] According to the above aspects of the present disclosure, the center plate first shaft, the center plate first stopper and the center plate blind groove are arranged on the first branch.

[0030] The first branch is further provided with a center plate first supporting shaft.

[0031] The second branch is provided with a center plate second supporting shaft.

[0032] The center plate first supporting shaft and the center plate second supporting shaft are coaxially ar-

ranged.

[0033] The moving shaft is connected between the first branch and the second branch.

[0034] The center plate is rotatably supported on the second housing and the first housing by the center plate first supporting shaft and the center plate second supporting shaft respectively.

[0035] According to the above aspects of the present disclosure, a center plate spacing stopper is arranged on a side of the second branch facing the first branch.

[0036] The center plate spacing stopper is configured to cooperate with the moving contact assembly to control a spacing between the moving contact assembly and the stationary contact assembly.

[0037] According to the above aspects of the present disclosure, the first branch is further provided with a first branch tripping plate supporting shaft.

[0038] The second branch is further provided with a second branch tripping sensor supporting shaft.

[0039] The first branch tripping plate supporting shaft and the second branch tripping sensor supporting shaft are coaxially arranged.

[0040] According to the above aspects of the present disclosure, the mechanism assembly further comprises a tripping plate and a tripping sensor.

[0041] The tripping plate is provided with a tripping plate slot.

[0042] One end of the tripping sensor is provided with a tripping sensor hook.

[0043] The tripping sensor hook is fitted in the tripping plate slot, so that the tripping sensor and the tripping plate are connected together.

[0044] According to the above aspects of the present disclosure, the tripping plate is further provided with a tripping plate convex column.

[0045] A convex column through-hole is arranged in the tripping plate convex column.

[0046] The first branch tripping plate supporting shaft is configured to pass through the convex column through-hole and is fitted in the convex column through-hole, so that the tripping plate is able to rotate relative to the center plate.

[0047] According to the above aspects of the present disclosure, the other end of the tripping sensor is provided with a sensor through-hole and a sensor convex column.

[0048] The second branch tripping sensor supporting shaft is configured to pass through the sensor through-hole and is fitted in the sensor through-hole, so that the tripping sensor and the tripping plate can integrally rotate relative to the center plate.

[0049] According to the above aspects of the present disclosure, the tripping plate is further provided with a tripping plate locking surface.

[0050] The tripping hook is provided with a tripping hook locking surface.

[0051] Upon the mechanism assembly being in the on position, the tripping hook locking surface is not in contact with the tripping plate locking surface.

[0052] During a movement of the mechanism assembly from the on position to the off position, the tripping hook locking surface comes into contact with the tripping plate locking surface.

5 **[0053]** Upon the mechanism assembly being in the off position, the tripping hook locking surface keeps in contact with the tripping plate locking surface.

[0054] According to the above aspects of the present disclosure, the moving contact assembly comprises a bracket skirt portion, a bracket connecting portion and a bracket tension spring connecting portion.

10 **[0055]** The bracket connecting portion and the bracket tension spring connecting portion are located between the first branch and the second branch.

15 **[0056]** The moving contact point assembly is partially arranged in the bracket skirt portion.

[0057] The bracket connecting portion is provided with a connecting portion through-hole, and the moving shaft passes through the connecting portion through-hole.

20 **[0058]** One end of a tension spring of the moving contact assembly is connected to the bracket tension spring connecting portion.

[0059] The other end of the tension spring of the moving contact assembly is connected to a tension spring spindle arranged on the first housing.

25 **[0060]** According to the above aspects of the present disclosure, the moving contact assembly further comprises a bracket quick-closing cooperating portion.

[0061] The bracket quick-closing cooperating portion is located between the first branch and the second branch.

[0062] The bracket quick-closing cooperating portion is configured to cooperate with a quick-closing structure arranged inside the first housing, so that, during a closing process of the moving contact assembly, the quick-closing structure applies a force on the bracket quick-closing cooperating portion to accelerate closing of the moving contact assembly.

30 **[0063]** According to the above aspects of the present disclosure, the bracket quick-closing cooperating portion is provided with a bracket spacing cooperating surface;

[0064] The center plate spacing stopper is configured to cooperate with the bracket spacing cooperating surface, so as to control the spacing between the moving contact assembly and the stationary contact assembly.

35 **[0065]** According to the above aspects of the present disclosure, the first housing is provided with a driving torsion spring fitting convex column.

[0066] The driving torsion spring fitting convex column is provided with a fitting convex column blind hole.

40 **[0067]** The center plate second supporting shaft is rotatably inserted into the fitting convex column blind hole.

[0068] A driving torsion spring is sleeved on an outer surface of the driving torsion spring fitting convex column.

45 **[0069]** One end of the driving torsion spring is configured to act on the driving torsion spring housing limiting rib arranged in the first housing.

[0070] Upon the moving contact assembly being in the

on position, the other end of the driving torsion spring is not in contact with the tripping sensor, but in contact with a rib of the first housing.

[0071] During a movement of the mechanism assembly from the on position to the off position, a sensor convex column of the tripping sensor acts on the other end of the driving torsion spring.

[0072] According to the above aspects of the present disclosure, the tripping hook is provided with a tripping hook torsion spring limiting portion.

[0073] The tripping plate is provided with a tripping plate torsion spring limiting portion.

[0074] A tripping torsion spring is sleeved on an outer surface of the tripping plate convex column of the tripping plate.

[0075] One end of the tripping torsion spring is connected to the tripping plate torsion spring limiting portion.

[0076] The other end of the tripping torsion spring acts on the tripping hook torsion spring limiting portion.

[0077] during the movement of the mechanism assembly from the on position to the off position, the tripping torsion spring is configured to apply a force to keep the tripping hook locking surface in contact with the tripping plate locking surface.

[0078] According to the above aspects of the present disclosure, the DC circuit breaker further comprises a front panel and a fault indicator.

[0079] The front panel is provided with a fault display window.

[0080] The front panel is connected to the first housing and the second housing by panel connection slots arranged in the first housing and the second housing.

[0081] The fault indicator is configured to slide relative to the first housing and the second housing by cooperating with fault connection slots arranged in the first housing and the second housing.

[0082] The front panel is configured to cover the fault indicator.

[0083] According to the above aspects of the present disclosure, the tripping hook is provided with a tripping hook fault stopper.

[0084] The center plate is provided with a center plate fault stopper.

[0085] The fault indicator is provided with an indicator tongue.

[0086] In a normal working state of the DC circuit breaker, neither the tripping hook fault stopper nor the center plate fault stopper pushes the indicator tongue.

[0087] Upon the DC circuit breaker having a magnetic fault or a thermal fault, the tripping hook fault stopper pushes the indicator tongue, so that the fault indicator appears in a fault display window.

[0088] Upon the magnetic fault or the thermal fault of the DC circuit breaker being eliminated, the center plate fault stopper pushes the indicator tongue, so that the fault indicator no longer appears in the fault display window.

[0089] According to the above aspects of the present disclosure, the quick-closing structure comprises a closing

cam which is rotatably installed relative to the first housing and a closing cam return spring.

[0090] The closing cam comprises a cam cooperating portion having an arc surface and a cam concave portion.

[0091] The closing cam return spring is sleeved on the tension spring spindle.

[0092] One end of the closing cam return spring acts on the first housing.

[0093] The other end of the closing cam return spring is abutted and fitted in the cam concave portion.

[0094] According to the above aspects of the present disclosure, the bracket quick-closing cooperating portion of the moving contact assembly of the DC circuit breaker comprises a first cooperating surface and a second cooperating surface.

[0095] The first cooperating surface and the second cooperating surface are connected together through a bracket circular arc surface.

[0096] According to the above aspects of the present disclosure, upon the moving contact assembly of the DC circuit breaker being in the on position relative to the stationary contact assembly of the DC circuit breaker, under an action of the closing cam return spring, the closing cam abuts against an inner surface of the first housing, and a circular arc surface of the cam cooperating portion is not in contact with the first cooperating surface.

[0097] During the movement of the moving contact assembly from the on position to the off position relative to the stationary contact assembly, the first cooperating surface is in frictional contact with the circular arc surface of the cam cooperating portion and a contact position between the first cooperating surface and the circular arc surface of the cam cooperating portion changes with a rotation of the moving contact assembly, and the frictional contact slows down a closing movement of the moving contact assembly.

[0098] Upon the circular arc surface of the cam cooperating portion being out of contact with the first cooperating surface and coming into contact with the bracket circular arc surface, the force applied by the moving contact assembly to the closing cam causes the closing cam to press the first housing.

[0099] Upon the circular arc surface of the cam cooperating portion being out of contact with the bracket circular arc surface, under an action of torque generated by the pressure of the bracket circular arc surface, the closing cam quickly hits the second cooperating surface, so that the moving contact assembly quickly reaches the off position, and the closing cam return spring is in a compressed state at this time.

[0100] With a continuous closing action of the operating handle of the DC circuit breaker, the circular arc surface of the cam cooperating portion rests on the second matching surface.

[0101] In the DC circuit breaker according to the present disclosure, the mechanism uses a double moving contact point series structure such that the contact points are quickly opened under the action of a tension

spring, the electric arc is lengthened twice, and the current limiting ability meets the breaking requirements.

[0102] In the DC circuit breaker according to the present disclosure, the moving shaft of the moving contact assembly is designed on the center plate which moves around a fixed axis, and the tripping force can meet the requirements by adjusting the force arm of the tension spring to the moving shaft and the force arm of the moving shaft to the first supporting shaft and the second supporting shaft of the center plate. Under the action of tension spring, the moving contact opens at a high speed.

[0103] In order to reduce the tripping force and increase the releasing force, a driving torsion spring and its special working state are designed in the DC circuit breaker according to the present disclosure: the driving torsion spring is initially installed on the first housing, and upon the product being closed to a certain angle, the tripping sensor is in contact with one end of the driving torsion spring, and the driving torsion spring acts on the first housing and the tripping sensor until the product is completely closed, and the force of the driving torsion spring is designed to ensure that the closing process of the product does not slip. Upon the product being opened, the driving torsion spring always acts on the tripping sensor before the other pole or accessory trips, which plays the function of increasing the releasing force of the product, and reducing the tripping force.

[0104] The DC circuit breaker according to the disclosure meets the requirements of high contact pressure and low tripping force, and ensures the reliable tripping of the product under the influence of pollutants such as dust after breaking short-circuit current.

[0105] In the DC circuit breaker according to the present disclosure, because the quick-closing structure is not installed on the operating handle, the quick-closing structure and the functional surface of the moving contact assembly will not occupy the space of the magnetic assembly, which can give more space for the design of the magnetic assembly size, element arrangement and the like, so as to meet the requirements of the product for high breaking performance.

[0106] The quick-closing structure according to the present disclosure requires less space and saves space. The moving contact point assembly always moves when realizing the quick-closing function, thereby reducing the friction force of the working face and lowering the material strength requirement. The quick-closing function increases the releasing force of products and reliably drives multipolar products and accessory products. The quick-closing structure according to the present disclosure is easy to assemble, simple in structure and reliable in performance. Fast closing can effectively reduce contact ablation and prolong service life.

[0107] So far, in order that the detailed description of the disclosure here can be better understood, and in order that the contribution of the disclosure to the existing art can be better recognized, the disclosure has outlined

the content of the disclosure quite extensively. Of course, embodiments of the present disclosure will be described below and will form the subject of the appended claims.

[0108] Likewise, those skilled in the art will recognize that the concept on which the present disclosure is based can easily be used as a basis for designing other structures, methods and systems for carrying out several purposes of the present disclosure. Therefore, it is important that the appended claims should be regarded as including such equivalent structures as long as they do not go beyond the spirit and scope of the present disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

[0109] Those skilled in the art will have a better understanding of the present disclosure through the following drawings, and the advantages of the present disclosure can be more clearly reflected. The drawings described here are only for illustrative purposes of selected embodiments, not all possible embodiments, and are intended not to limit the scope of the present disclosure.

Fig. 1 shows an interior of a DC circuit breaker according to the present disclosure, wherein the mechanism assembly is in the on position;

Fig. 2 shows an interior of a DC circuit breaker according to the present disclosure, wherein the mechanism assembly is in the off position;

Fig. 3 shows relative positions of an operating handle, a handle connecting rod and a moving contact assembly in an open state according to the present disclosure;

Fig. 4 shows relative positions of an operating handle, a handle connecting rod and a moving contact assembly in a closed state according to the present disclosure;

Fig. 5 and Fig. 6 illustrate a center plate according to the present disclosure;

Fig. 7 and Fig. 8 illustrate a tripping hook according to the present disclosure;

Fig. 9 and Fig. 10 illustrate a tripping plate according to the present disclosure;

Fig. 11 and Fig. 12 illustrate a moving contact assembly according to the present disclosure;

Fig. 13 and Fig. 14 illustrate a tripping sensor according to the present disclosure;

Fig. 15 shows a moving contact assembly, a tension spring and a moving contact assembly according to the present disclosure;

Fig. 16 and Fig. 17 show a relative positional relationship between a center plate and a moving contact assembly in the open state and the closed state, respectively;

Fig. 18 and Fig. 19 show a relative positional relationship of a center plate, a tripping plate and a moving contact assembly in an open state and a closed state, respectively;

Fig. 20 and Fig. 21 show a relative positional rela-

tionship of a center plate, a tripping hook, a tripping plate and a moving contact assembly in an open state and a closed state, respectively;

Fig. 22 and Fig. 23 show a relative positional relationship of a center plate, a tripping plate and a moving contact assembly in an open state and a closed state, respectively, especially show cooperating surfaces of the tripping hook and the tripping plate;

Fig. 24 and Fig. 25 show a relative positional relationship of a center plate, a tripping sensor and a moving contact assembly in an open state and a closed state in a plan side view, respectively;

Fig. 26 and Fig. 27 are perspective views showing a relative positional relationships of a center plate, a tripping hook, a tripping plate, a tripping sensor and a moving contact assembly in an open state and a closed state, respectively;

Fig. 28 and Fig. 29 show states of a driving torsion spring and a handle return spring in an open state and a closed state, respectively;

Fig. 30 and Fig. 31 illustrate a front panel according to the present disclosure;

Fig. 32 and Fig. 33 illustrate a fault indicator according to the present disclosure;

Fig. 34 shows a panel connection slot and a fault connection slot provided on a first housing and a second housing according to the present disclosure;

Fig. 35 shows a cooperation of a fault indicator with a first housing according to the present disclosure;

Fig. 36 shows relative positions of a quick-closing assembly and a moving contact assembly in an open state according to the present disclosure;

Fig. 37 shows relative positions of a quick-closing assembly and a moving contact assembly in a closed state according to the present disclosure; and

Fig. 38 shows an internal structure of a first housing according to the present disclosure.

DETAILED DESCRIPTION

[0110] Hereinafter, specific embodiments according to the present disclosure will be described in detail with reference to Figs. 1 to 37.

[0111] As illustrated by Fig. 1 and Fig. 2, an embodiment of the present disclosure provides a DC circuit breaker 1, which includes a first housing 2 and a second housing 3 (referring to Fig. 34). The first housing 2 and the second housing 3 jointly define an accommodation space, in which a stationary contact assembly 4 and a mechanism assembly 5 are arranged, and the mechanism assembly 5 is able to move between an on position (as illustrated by Fig. 1, that is, an open state) and an off position (as illustrated by Fig. 2, that is, an off state).

[0112] Fig. 1 and Fig. 3 do not show a magnetic assembly, and Fig. 2 and Fig. 4 show a magnetic assembly. The first housing 2 is not shown in Fig. 3 and Fig. 4.

[0113] The mechanism assembly 5 includes a center plate 6 and a moving contact assembly 7.

[0114] The center plate 6 is rotatably supported, at both sides of the center plate, by the first housing 2 and the second housing 3 at both sides of the center plate 6 respectively.

[0115] The moving contact assembly 7 is rotatably installed on the center plate 6 through a moving shaft 8 (see Fig. 17) arranged on the center plate 6.

[0116] During the rotation of the center plate 6 relative to the first housing 2 and the second housing 3, the moving contact assembly 7 is able to rotate relative to the center plate 6.

[0117] An elastic component of the mechanism assembly acts between the moving contact assembly 7 and the first housing 2.

[0118] According to the above embodiment of the present disclosure, the mechanism assembly 5 further includes a moving contact point assembly 9.

[0119] The moving contact point assembly 9 has a U shape.

[0120] As illustrated by Fig. 15, two moving contact points 9-1 are connected in series by the moving contact point assembly 9 having a U shape.

[0121] The moving contact point assembly 9 is connected to the moving contact assembly 7 by a fastener 9-3.

[0122] According to the above embodiments of the present disclosure, the DC circuit breaker 1 further includes an operating handle 10, a handle connecting rod 11 and a handle return spring 12.

[0123] The operating handle 10 rotates around a handle shaft 13 provided on the first housing 2.

[0124] The handle return spring 12 is sleeved on the handle shaft 13.

[0125] During the movement of the operating handle 10, one end of the handle return spring 12 acts on a handle spring limiting rib (not shown) on the first housing 2, and the other end of the handle return spring 12 always acts on the operating handle 10.

[0126] One end of the handle connecting rod 11 is connected to the operation handle 10.

[0127] The other end of the handle connecting rod 11 is connected to the mechanism assembly 5.

[0128] According to the above embodiments of the present disclosure, as illustrated by Figs. 7 and 8, the mechanism assembly 5 further includes a tripping hook 14.

[0129] The tripping hook 14 is provided with a tripping hook through-hole 14-1, a tripping hook through-hole groove 14-2, a tripping hook torsion spring limiting portion 14-3 and a tripping hook notch 14-4.

[0130] The other end of the handle connecting rod 11 passes through the tripping hook through-hole groove 14-2.

[0131] The center plate 6 is provided with a center plate first shaft 6-1 and a center plate first stopper 6-2.

[0132] The tripping hook 14 is rotatably installed on the center plate 6 through the cooperation of the center plate first shaft 6-1 and the tripping hook through-hole 14-1.

[0133] The center plate first stop 6-2 is able to be fitted in the tripping hook notch 14-4.

[0134] According to the above embodiments of the present disclosure, the center plate 6 is further provided with a center plate blind groove 6-3.

[0135] The other end of the handle connecting rod 11 passing through the tripping hook through-hole groove 14-2 is fitted in the center plate blind groove 6-3.

[0136] According to the above embodiments of the present disclosure, as illustrated by Figs. 5 and 6, the center plate 6 includes a center plate base 6-4, and a first branch 6-5 and a second branch 6-6 extending from the center plate base 6-4.

[0137] The first branch 6-5 and the second branch 6-6 are parallel to each other and spaced apart.

[0138] According to the above embodiments of the present disclosure, the center plate first shaft 6-1, the center plate first stopper 6-2 and the center plate blind groove 6-3 are arranged on the first branch 6-5.

[0139] The first branch 6-5 is further provided with a center plate first supporting shaft 6-7.

[0140] The second branch 6-6 is provided with a center plate second supporting shaft 6-8.

[0141] The center plate first supporting shaft 6-7 and the center plate second supporting shaft 6-8 are coaxially arranged.

[0142] The moving shaft 8 is connected between the first branch 6-5 and the second branch 6-6.

[0143] The center plate 6 is rotatably supported on the second housing 3 and the first housing 2 by the center plate first supporting shaft 6-7 and the center plate second supporting shaft 6-8, respectively.

[0144] According to the above embodiments of the present disclosure, a center plate spacing stopper 6-6-1 is arranged on a side of the second branch 6-6 facing the first branch 6-5.

[0145] The center plate spacing stopper 6-6-1 cooperates with the moving contact assembly 7, thereby controlling the spacing between the mechanism assembly 5 (moving contact point) and the stationary contact assembly 4 (stationary contact point).

[0146] According to the above embodiments of the present disclosure, the first branch 6-5 is further provided with a first branch tripping plate supporting shaft 6-9.

[0147] The second branch 6-6 is further provided with a second branch tripping sensor supporting shaft 6-10.

[0148] The first branch tripping plate supporting shaft 6-9 and the second branch tripping sensor supporting shaft 6-10 are coaxially arranged.

[0149] According to the above embodiments of the present disclosure, the mechanism assembly 5 further includes a tripping plate 15 (as illustrated by Fig. 9 and Fig. 10) and a tripping sensor 16 (as illustrated by Fig. 13 and Fig. 14).

[0150] The tripping plate 15 is provided with a tripping plate slot 15-1.

[0151] One end of the tripping sensor 16 is provided with a tripping sensor hook 16-1.

[0152] The tripping sensor hook 16-1 is fitted in the tripping plate slot 15-1, so that the tripping sensor 16 and the tripping plate 15 are connected together.

[0153] According to the above-mentioned embodiments of the present disclosure, a tripping plate convex column 15-2 is further provided on the tripping plate 15.

[0154] A convex column through-hole 15-2-1 is arranged in the tripping plate convex column 15-2.

[0155] The first branch tripping plate supporting shaft 6-9 passes through the convex column through-hole 15-2-1 and is fitted in the convex column through-hole 15-2-1, so that the tripping plate 15 is able to rotate relative to the center plate 6.

[0156] According to the above embodiments of the present disclosure, the other end of the tripping sensor 16 is provided with a sensor through-hole 16-2 and a sensor convex column 16-3.

[0157] The second branch tripping sensor supporting shaft 6-10 passes through the sensor through-hole 16-2 and is fitted in the sensor through-hole 16-2, so that the tripping sensor 16 and the tripping plate 15 can integrally rotate relative to the center plate 6.

[0158] According to the above-mentioned embodiments of the present disclosure, as illustrated by Figs. 22 and 23, a tripping plate locking surface 15-3 is further provided on the tripping plate 15.

[0159] The tripping hook 14 is provided with a tripping hook locking surface 14-5.

[0160] Upon the mechanism assembly 5 being in the on position, as illustrated by Fig. 22, the tripping hook locking surface 14-5 is not in contact with the tripping plate locking surface 15-3.

[0161] During the movement of the mechanism assembly 5 from the on position to the off position, the tripping hook locking surface 14-5 comes into contact with the tripping plate locking surface 15-3, as illustrated by Fig. 23.

[0162] Upon the mechanism assembly 5 being in the off position, the tripping hook locking surface 14-5 keeps in contact with the tripping plate locking surface 15-3.

[0163] According to the above embodiments of the present disclosure, as illustrated by Figs. 15 and 16, the moving contact assembly 7 includes a bracket skirt portion 7-1, a bracket connecting portion 7-2 and a bracket tension spring connecting portion 7-3 (these three portions constitute a movable contact bracket).

[0164] The bracket connecting portion 7-2 and the bracket tension spring connecting portion 7-3 are located between the first branch 6-5 and the second branch 6-6.

[0165] The moving contact point assembly 9 is partially arranged in the bracket skirt portion 7-1.

[0166] The bracket connecting portion 7-2 is provided with a connecting portion through-hole 7-2-1, and the moving shaft 8 passes through the connecting portion through-hole 7-2-1.

[0167] The elastic component includes but is not limited to a tension spring 17. One end of the tension spring 17 of the mechanism assembly 5 is connected to the

bracket tension spring connecting portion 7-3.

[0168] The other end of the tension spring 17 of the mechanism assembly 5 is connected to a tension spring spindle 18 arranged on the first housing 2.

[0169] According to the above-mentioned embodiments of the present disclosure, the moving contact assembly 7 further includes a bracket quick-closing cooperating portion 7-4.

[0170] The bracket quick-closing fitting 7-4 is located between the first branch 6-5 and the second branch 6-6.

[0171] The bracket quick-closing cooperating portion 7-4 is configured to cooperate with a quick-closing structure arranged inside the first housing 2, so that, during a closing process of the mechanism assembly 5, the quick-closing structure applies a force on the bracket quick-closing cooperating portion 7-4 to accelerate the closing of the mechanism assembly 5.

[0172] According to the above embodiments of the present disclosure, the bracket quick-closing cooperating portion 7-4 is provided with a bracket spacing cooperating surface 7-4-1.

[0173] The center plate spacing stopper 6-6-1 is configured to cooperate with the bracket spacing cooperating surface 7-4-1, so as to control the spacing between the mechanism assembly 5 and the stationary contact assembly 4.

[0174] According to the above embodiments of the present disclosure, as illustrated by Fig. 38, the first housing 2 is provided with a driving torsion spring fitting convex column 2-1.

[0175] The driving torsion spring fitting convex column 2-1 is provided with a fitting convex column blind hole 2-1-1.

[0176] The center plate second supporting shaft 6-8 is rotatably inserted into the fitting convex column blind hole 2-1-1.

[0177] As illustrated by Fig. 28, a driving torsion spring 19 is sleeved on the outer surface of the driving torsion spring fitting convex column 2-1.

[0178] One end of the driving torsion spring 19 acts on the driving torsion spring housing limiting rib arranged in the first housing 2.

[0179] Upon the mechanism assembly 5 being in the on position, the other end of the driving torsion spring 19 is not in contact with the tripping sensor 16, as illustrated by Fig. 28.

[0180] During the movement of the mechanism assembly 5 from the on position to the off position, the sensor convex column 16-3 of the tripping sensor 16 acts on the other end of the driving torsion spring 19, as illustrated by Fig. 29.

[0181] According to the above embodiments of the present disclosure, the tripping hook 14 is provided with a tripping hook torsion spring limiting portion 14-3.

[0182] The tripping plate 15 is provided with a tripping plate torsion spring limiting portion 15-4.

[0183] A tripping torsion spring 20 is sleeved on the outer surface of the tripping plate convex column 15-2 of

the tripping plate 15.

[0184] One end of the tripping torsion spring 20 is connected to the tripping plate torsion spring limiting portion 15-4.

5 **[0185]** The other end of the tripping torsion spring 20 acts on the tripping hook torsion spring limit portion 14-3.

10 **[0186]** During the movement of the mechanism assembly 5 from the on position to the off position, the force applied by the tripping torsion spring 20 keeps the tripping hook locking surface 14-5 in contact with the tripping plate locking surface 15-3.

15 **[0187]** According to the above embodiments of the present disclosure, as illustrated by Figs. 30 to 35, the DC circuit breaker further includes a front panel 21 and a fault indicator 22.

[0188] The front panel 21 is provided with a fault display window 21-1.

20 **[0189]** The front panel 21 is connected to the first housing 2 and the second housing 3 through panel connection slots 23 arranged in the first housing 2 and the second housing 3.

25 **[0190]** The fault indicator 22 is able to slide relative to the first housing 2 and the second housing 3 by (for example, through its elastic arm 22-2) fitting with fault connecting slots 24 arranged in the first housing 2 and the second housing 3.

[0191] The front panel 21 covers the fault indicator 22.

30 **[0192]** According to the above embodiments of the present disclosure, the tripping hook 14 is provided with a tripping hook fault stopper 14-6.

[0193] The center plate 6 is provided with a center plate fault stopper 6-11.

[0194] The fault indicator 22 is provided with an indicator tongue 22-1.

35 **[0195]** In the normal working state of the DC circuit breaker 1, neither the tripping hook fault stopper 14-6 nor the center plate fault stopper 6-11 pushes the indicator tongue 22-1.

40 **[0196]** Upon the DC circuit breaker 1 having a magnetic fault or a thermal fault, the tripping hook fault stopper 14-6 pushes the indicator tongue 22-1, so that the fault indicator 22 appears in the fault display window 21-1.

45 **[0197]** Upon the magnetic fault or thermal fault of the DC circuit breaker 1 being eliminated, the center plate fault stopper 6-11 pushes the indicator tongue 22-1, so that the fault indicator 22 no longer appears in the fault display window 21-1.

50 **[0198]** According to the above-mentioned embodiments of the present disclosure, as illustrated by Figs. 36 and 37, the quick-closing structure includes a closing cam 25 which is rotatably installed relative to the first housing 2 and a closing cam return spring 26.

[0199] The closing cam 25 includes a cam cooperating portion 25-1 having a circular arc surface and a cam concave portion 25-2.

55 **[0200]** The closing cam return spring 26 is sleeved on the tension spring spindle 18.

[0201] One end of the closing cam return spring 26

acts on the first housing 2.

[0202] The other end of the closing cam return spring 26 is abutted and fitted in the cam concave portion 25-2.

[0203] According to the above embodiments of the present disclosure, as illustrated by Figs. 11 and 12, the bracket quick-closing cooperating portion 7-4 of the moving contact assembly 7 of the DC circuit breaker 1 includes a first cooperating surface 7-4-2 and a second cooperating surface 7-4-3.

[0204] The first cooperating surface 7-4-2 and the second cooperating surface 7-4-3 are connected together through a bracket circular arc surface 7-4-4.

[0205] According to the above embodiments of the present disclosure, upon the mechanism assembly 5 of the DC circuit breaker 1 being in the on position relative to the stationary contact assembly 4 of the DC circuit breaker 1, the closing cam 25 abuts against an inner surface of the first housing 2 under the action of the closing cam return spring 26, and the circular arc surface of the cam cooperating portion 25-1 is not in contact with the first cooperating surface 7-4-2, as illustrated by Fig. 36.

[0206] During the movement of the mechanism assembly 5 from the on position to the off position relative to the stationary contact assembly 4, the first cooperating surface 7-4-2 is in frictional contact with the circular arc surface of the cam cooperating portion 25-1 and the contact position between the first cooperating surface and the circular arc surface of the cam cooperating portion changes with the rotation of the moving contact assembly 7, and the frictional contact slows down the closing movement of the mechanism assembly 5.

[0207] Upon the circular arc surface of the cam cooperating portion 25-1 being out of contact with the first cooperating surface 7-4-2 and coming into contact with the bracket circular arc surface 7-4-4, the force applied by the moving contact assembly 7 to the closing cam 25 causes the closing cam 25 to press the first housing 2.

[0208] Upon the circular arc surface of the cam cooperating portion 25-1 being out of contact with the bracket circular arc surface 7-4-4, under an action of torque generated by the pressure of the bracket circular arc surface 7-4-4, the closing cam 25 quickly hits the second cooperating surface 7-4-3, so that the mechanism assembly 5 can quickly reach the off position, and the closing cam return spring 28 is in a compressed state.

[0209] With the continuous closing action of the operating handle 10 of the DC circuit breaker 1, the circular arc surface of the cam cooperating portion 25-1 rests on the second cooperating surface 7-4-3, as illustrated by Fig. 37.

[0210] As illustrated by Figs. 18 to 27, when the DC circuit breaker according to the present disclosure is in the open state and the closed state:

[0211] 1. One end of the driving torsion spring 19 acts on the driving torsion spring housing limiting rib of the first housing 2, while the other end of the driving torsion spring 19 is not in contact with the tripping sensor 16.

[0212] 2. The tripping hook 14 and the tripping plate 15 are respectively installed on two posts of the center plate 6. One end of the handle connecting rod 11 is connected with the operating handle 10, and the other end of the handle connecting rod 11 is connected with the tripping hook (tripping hook through-hole slot 14-2) and the center plate (center plate blind slot 6-3).

[0213] 3. In the open state, the operating handle 10 is in contact with a rib on the first housing 2, and the center plate 6 is in contact with a rib on the second housing 2. One end of the tripping torsion spring 20 is connected with the tripping plate 15, and the other end of the tripping torsion spring 20 is connected with the tripping hook 14. The tripping torsion spring 20 is configured to make the tripping hook locking surface 14-5 of the tripping hook 14 contact with the tripping plate locking surface 15-3 of the tripping plate 15 during the closing process of the DC circuit breaker after the tripping plate 15 is tripped.

[0214] 4. Upon the DC circuit breaker being open, the tripping hook locking surface 14-5 of the tripping hook 14 is not in contact with the tripping plate locking surface 15-3 of the tripping plate 15.

[0215] 5. The tripping plate 15 is provided with a tripping plate slot 15-1; one end of the tripping sensor 16 is provided with a tripping sensor hook 16-1; the tripping sensor hook 16-1 is fitted in the tripping plate slot 15-1, so that the tripping sensor 16 and the tripping plate 15 are connected together. The first branch 6-5 is further provided with a first branch tripping plate supporting shaft 6-9; the second branch 6-6 is further provided with a second branch tripping sensor supporting shaft 6-10; the first branch tripping plate supporting shaft 6-9 and the second branch tripping sensor supporting shaft 6-10 are coaxially arranged; the tripping sensor 16 and the tripping plate 15 can integrally rotate relative to the center plate 6.

[0216] 6. One end of the tension spring 17 of the mechanism assembly 5 is connected to the bracket tension spring connecting portion 7-3; the other end of the tension spring 17 of the mechanism assembly 5 is connected to the tension spring spindle 18 arranged on the first housing 2.

[0217] 7. The spacing is controlled by the structural features of the center plate 6 and of the moving contact assembly 7 and the moving contact assembly 7 is connected to the center plate 6 through the moving shaft 8. The moving shaft 8 is tightly connected with the center plate 6, and the moving shaft 8 is in clearance fit with the moving contact assembly 7, so that the moving contact assembly 7 is able to rotate around the moving shaft 8.

[0218] 8. The quick-closing structure is assembled by the shaft 29 assembled on the first housing 2, and the tension spring 17 is assembled by the tension spring spindle 18 assembled on the first housing. The closing cam return spring 26 is installed below the tension spring spindle 18.

[0219] 9. The two contact points 9-1 are welded on the moving contact point assembly 9, for example, the two contacts 9-1 are riveted with the moving contact assem-

bly 7 through copper rivets, but are not limited thereto, so as to meet the requirements of high breaking performance of the product.

[0220] In the closing process, as illustrated by Figs. 1 to 2, the operating handle 10 rotates clockwise, and the handle connecting rod 11 is in contact with the tripping hook through-hole groove 14-2 of the tripping hook and the center plate blind groove 6-3 of the center plate 6. The tripping hook locking surface 14-5 of the tripping hook 14 is in contact with the tripping plate locking surface 15-3 of the tripping plate 15. Upon the operating handle 10 being rotated by a certain angle, the driving torsion spring contacts the tripping sensor.

[0221] Before the quick-closing, the operating handle, the handle connecting rod, the tripping hook, the tripping plate, the center plate and the moving contact assembly move together. Upon the quick-closing starting, the operating handle, the handle connecting rod, the tripping hook, the tripping plate and the center plate move together, while the moving contact assembly moves around the center plate at a slower speed. After the quick closure is realized, the product is closed.

[0222] If there is no quick-closing function, the operating handle, the handle connecting rod, the tripping hook, the tripping plate, the center plate and the moving contact assembly move together at the beginning. After the moving contact is closed, before the product is closed, the operating handle, the handle connecting rod, the tripping hook, the tripping plate and the center plate move together, and the moving contact assembly rotates around the moving shaft and the moving contact slides on the stationary contact.

[0223] In the opening process, the operating handle rotates counterclockwise, and the moving contact assembly rotates around the moving shaft under the force of the tension spring, and is in contact with the features controlling the spacing. Subsequently, the whole mechanism moves counterclockwise together under the action of the handle return spring, and the product is opened.

[0224] The foregoing disclosure provides illustration and description, but it is not intended to be exhaustive or to limit the embodiments to the precise forms disclosed. Modifications and changes can be made according to the above disclosure, or can be acquired from the practice of the embodiments.

[0225] Even though specific combinations of features are recited in the claims and/or disclosed in the specification, these combinations are not intended to limit the disclosure of various embodiments. In fact, many of these features can be combined in ways not specifically described in the claims and/or not specifically disclosed in the specification. Although each dependent claim listed below may directly depend on only one claim, the disclosure of various embodiments includes each dependent claim combined with each other claim in the claim set.

[0226] Unless explicitly stated, any element, action or instruction used herein should not be interpreted as critical or necessary. In addition, as used herein, the terms

"a" and "an" are intended to include one or more items and can be used interchangeably with "one or more". In addition, as used herein, the term "the" is intended to include one or more items cited in conjunction with the article "the" and can be used interchangeably with "one or more". In addition, as used herein, the term "set" is intended to include one or more items (such as related items, unrelated items, a combination of related and unrelated items, etc.), and can be used interchangeably with "one or more". If only one item is intended, use the phrase "only one item" or similar language. In addition, as used herein, the term "has" and its variants are intended to be open-ended terms. In addition, the phrase "based on" is intended to mean "at least partly based on", unless explicitly stated otherwise. In addition, as used herein, the term "or" is intended to be inclusive when used in series, and can be used interchangeably with "and/or", unless otherwise explicitly stated (for example, if used in combination with "or" or "one of them").

Claims

1. A DC circuit breaker, comprising a first housing and a second housing, wherein the first housing and the second housing jointly define an accommodation space, and a stationary contact assembly and a mechanism assembly are arranged in the accommodation space, the mechanism assembly being able to move between an on position and an off position, **characterized in that:**

the mechanism assembly comprises a center plate and a moving contact assembly;
the center plate is rotatably supported, at both sides of the center plate, by the first housing and the second housing respectively.;
the moving contact assembly is rotatably installed on the center plate by a moving shaft arranged on the center plate;
the moving contact assembly is configured to rotate relative to the center plate during a rotation of the center plate relative to the first housing and the second housing; and
an elastic component of the mechanism assembly is configured to act between the moving contact assembly and the first housing.

2. The DC circuit breaker according to claim 1, **characterized in that:**

the moving contact assembly comprises a moving contact point assembly;
the moving contact point assembly is U-shaped;
two moving contact points are connected in series by the U-shaped moving contact point assembly;
the moving contact point assembly is connected

to the moving contact assembly by a fastener.

3. The DC circuit breaker according to claim 2, characterized in that:

the DC circuit breaker further comprises an operating handle, a handle connecting rod and a handle return spring,
wherein the operating handle is configured to rotate around a handle shaft arranged on the first housing;
wherein the handle return spring is sleeved on the handle shaft;
wherein during a movement of the operating handle, one end of the handle return spring acts on a handle spring limiting rib on the first housing, and the other end of the handle return spring always acts on the operating handle;
wherein one end of the handle connecting rod is connected to the operating handle and the other end of the handle connecting rod is connected to the mechanism assembly.

4. The DC circuit breaker according to claim 3, characterized in that:

the mechanism component further comprises a tripping hook;
the tripping hook is provided with a tripping hook through-hole, a tripping hook through-hole groove, a tripping hook torsion spring limiting portion and a tripping hook notch;
the other end of the handle connecting rod passes through the tripping hook through-hole groove;
a center plate first shaft and a center plate first stopper are arranged on the center plate;
the tripping hook is rotatably installed on the center plate through a cooperation of the center plate first shaft and the tripping hook through-hole; and
the center plate first stopper is configured to be fitted in the tripping hook notch.

5. The DC circuit breaker according to claim 4, characterized in that:

the center plate is further provided with a center plate blind groove; and
the other end of the handle connecting rod passing through the tripping hook through-hole groove is fitted in the center plate blind groove.

6. The DC circuit breaker according to claim 5, characterized in that:

the center plate comprises a center plate base, and a first branch and a second branch extend-

ing from the center plate base; and
the first branch and the second branch are parallel to each other and spaced apart.

7. The DC circuit breaker according to claim 6, characterized in that:

the center plate first shaft, the center plate first stopper and the center plate blind groove are arranged on the first branch;
the first branch is further provided with a center plate first supporting shaft;
the second branch is provided with a center plate second supporting shaft;
the center plate first supporting shaft and the center plate second supporting shaft are coaxially arranged;
the moving shaft is connected between the first branch and the second branch; and
the center plate is rotatably supported on the second housing and the first housing by the center plate first supporting shaft and the center plate second supporting shaft respectively.

8. The DC circuit breaker according to claim 7, characterized in that:

a center plate spacing stopper is arranged on a side of the second branch facing the first branch; and
the center plate spacing stopper is configured to cooperate with the moving contact assembly to control a spacing between the moving contact assembly and the stationary contact assembly.

9. The DC circuit breaker according to claim 8, characterized in that:

the first branch is further provided with a first branch tripping plate supporting shaft;
the second branch is further provided with a second branch tripping sensor supporting shaft; and
the first branch tripping plate supporting shaft and the second branch tripping sensor supporting shaft are coaxially arranged.

10. The DC circuit breaker according to claim 9, characterized in that:

the mechanism assembly further comprises a tripping plate and a tripping sensor;
the tripping plate is provided with a tripping plate slot;
one end of the tripping sensor is provided with a tripping sensor hook; and
the tripping sensor hook is fitted in the tripping plate slot, so that the tripping sensor and the tripping plate are connected together.

11. The DC circuit breaker according to claim 10, **characterized in that:**

the tripping plate is further provided with a tripping plate convex column;
a convex column through-hole is arranged in the tripping plate convex column; and
the first branch tripping plate supporting shaft is configured to pass through the convex column through-hole and is fitted in the convex column through-hole, so that the tripping plate is able to rotate relative to the center plate.

12. The DC circuit breaker according to claim 11, **characterized in that:**

the other end of the tripping sensor is provided with a sensor through-hole and a sensor convex column; and
the second branch tripping sensor supporting shaft is configured to pass through the sensor through-hole and is fitted in the sensor through-hole, so that the tripping sensor and the tripping plate can integrally rotate relative to the center plate.

13. The DC circuit breaker according to claim 12, **characterized in that:**

the tripping plate is further provided with a tripping plate locking surface;
the tripping hook is provided with a tripping hook locking surface;
upon the mechanism assembly being in the on position, the tripping hook locking surface is not in contact with the tripping plate locking surface; during a movement of the mechanism assembly from the on position to the off position, the tripping hook locking surface comes into contact with the tripping plate locking surface; and
upon the mechanism assembly being in the off position, the tripping hook locking surface keeps in contact with the tripping plate locking surface.

14. The DC circuit breaker according to claim 9, **characterized in that:**

the moving contact assembly comprises a bracket skirt portion, a bracket connecting portion and a bracket tension spring connecting portion;
the bracket connecting portion and the bracket tension spring connecting portion are located between the first branch and the second branch;
the moving contact point assembly is partially arranged in the bracket skirt portion;
the bracket connecting portion is provided with a connecting portion through-hole, and the mov-

ing shaft passes through the connecting portion through-hole;
one end of a tension spring of the moving contact assembly is connected to the bracket tension spring connecting portion;
the other end of the tension spring of the moving contact assembly is connected to a tension spring spindle arranged on the first housing.

15. The DC circuit breaker according to claim 14, **characterized in that:**

the moving contact assembly further comprises a bracket quick-closing cooperating portion;
the bracket quick-closing cooperating portion is located between the first branch and the second branch;
the bracket quick-closing cooperating portion is configured to cooperate with a quick-closing structure arranged inside the first housing, so that, during a closing process of the moving contact assembly, the quick-closing structure applies a force on the bracket quick-closing cooperating portion to accelerate closing of the moving contact assembly.

16. The DC circuit breaker according to claim 15, **characterized in that:**

the bracket quick-closing cooperating portion is provided with a bracket spacing cooperating surface;
the center plate spacing stopper is configured to cooperate with the bracket spacing cooperating surface, so as to control the spacing between the moving contact assembly and the stationary contact assembly.

17. The DC circuit breaker according to claim 13, **characterized in that:**

the first housing is provided with a driving torsion spring fitting convex column;
the driving torsion spring fitting convex column is provided with a fitting convex column blind hole;
the center plate second supporting shaft is rotatably inserted into the fitting convex column blind hole;
a driving torsion spring is sleeved on an outer surface of the driving torsion spring fitting convex column;
one end of the driving torsion spring is configured to act on the driving torsion spring housing limiting rib arranged in the first housing;
upon the moving contact assembly being in the on position, the other end of the driving torsion spring is not in contact with the tripping sensor,

but in contact with a rib of the first housing;
during a movement of the mechanism assembly
from the on position to the off position, a sensor
convex column of the tripping sensor acts on the
other end of the driving torsion spring.

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18. The DC circuit breaker according to claim 13, characterized in that:

the tripping hook is provided with a tripping hook
torsion spring limiting portion;
the tripping plate is provided with a tripping plate
torsion spring limiting portion;
a tripping torsion spring is sleeved on an outer
surface of the tripping plate convex column of
the tripping plate;
one end of the tripping torsion spring is connect-
ed to the tripping plate torsion spring limiting por-
tion;
the other end of the tripping torsion spring acts
on the tripping hook torsion spring limiting por-
tion;
during the movement of the mechanism assem-
bly from the on position to the off position, the
tripping torsion spring is configured to apply a
force to keep the tripping hook locking surface
in contact with the tripping plate locking surface.

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19. The DC circuit breaker according to claim 13, characterized in that:

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the DC circuit breaker further comprises a front
panel and a fault indicator;
the front panel is provided with a fault display
window;
the front panel is connected to the first housing
and the second housing by panel connection
slots arranged in the first housing and the sec-
ond housing;
the fault indicator is configured to slide relative
to the first housing and the second housing by
cooperating with fault connection slots arranged
in the first housing and the second housing; and
the front panel is configured to cover the fault
indicator.

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20. The DC circuit breaker according to claim 19, characterized in that:

the tripping hook is provided with a tripping hook
fault stopper;
the center plate is provided with a center plate
fault stopper;
the fault indicator is provided with an indicator
tongue;
in a normal working state of the DC circuit break-
er, neither the tripping hook fault stopper nor the
center plate fault stopper pushes the indicator

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tongue;
upon the DC circuit breaker having a magnetic
fault or a thermal fault, the tripping hook fault
stopper pushes the indicator tongue, so that the
fault indicator appears in a fault display window;
upon the magnetic fault or the thermal fault of
the DC circuit breaker being eliminated, the
center plate fault stopper pushes the indicator
tongue, so that the fault indicator no longer ap-
pears in the fault display window.

21. The DC circuit breaker according to claim 15, characterized in that:

the quick-closing structure comprises a closing
cam which is rotatably installed relative to the
first housing and a closing cam return spring;
the closing cam comprises a cam cooperating
portion having an arc surface and a cam concave
portion;
the closing cam return spring is sleeved on the
tension spring spindle;
one end of the closing cam return spring acts on
the first housing; and
the other end of the closing cam return spring is
abutted and fitted in the cam concave portion.

22. The DC circuit breaker according to claim 21, characterized in that:

the bracket quick-closing cooperating portion of
the moving contact assembly of the DC circuit
breaker comprises a first cooperating surface
and a second cooperating surface; and
the first cooperating surface and the second co-
operating surface are connected together
through a bracket circular arc surface.

23. The quick-closing structure according to claim 22, characterized in that:

upon the moving contact assembly of the DC
circuit breaker being in the on position relative
to the stationary contact assembly of the DC cir-
cuit breaker, under an action of the closing cam
return spring, the closing cam abuts against an
inner surface of the first housing, and a circular
arc surface of the cam cooperating portion is not
in contact with the first cooperating surface;
during the movement of the moving contact as-
sembly from the on position to the off position
relative to the stationary contact assembly, the
first cooperating surface is in frictional contact
with the circular arc surface of the cam cooper-
ating portion and a contact position between the
first cooperating surface and the circular arc sur-
face of the cam cooperating portion changes
with a rotation of the moving contact assembly,

and the frictional contact slows down a closing movement of the moving contact assembly; upon the circular arc surface of the cam cooperating portion being out of contact with the first cooperating surface and coming into contact with the bracket circular arc surface, the force applied by the moving contact assembly to the closing cam causes the closing cam to press the first housing; upon the circular arc surface of the cam cooperating portion being out of contact with the bracket circular arc surface, under an action of torque generated by the pressure of the bracket circular arc surface, the closing cam quickly hits the second cooperating surface, so that the moving contact assembly quickly reaches the off position, and the closing cam return spring is in a compressed state at this time; with a continuous closing action of the operating handle of the DC circuit breaker, the circular arc surface of the cam cooperating portion rests on the second matching surface.

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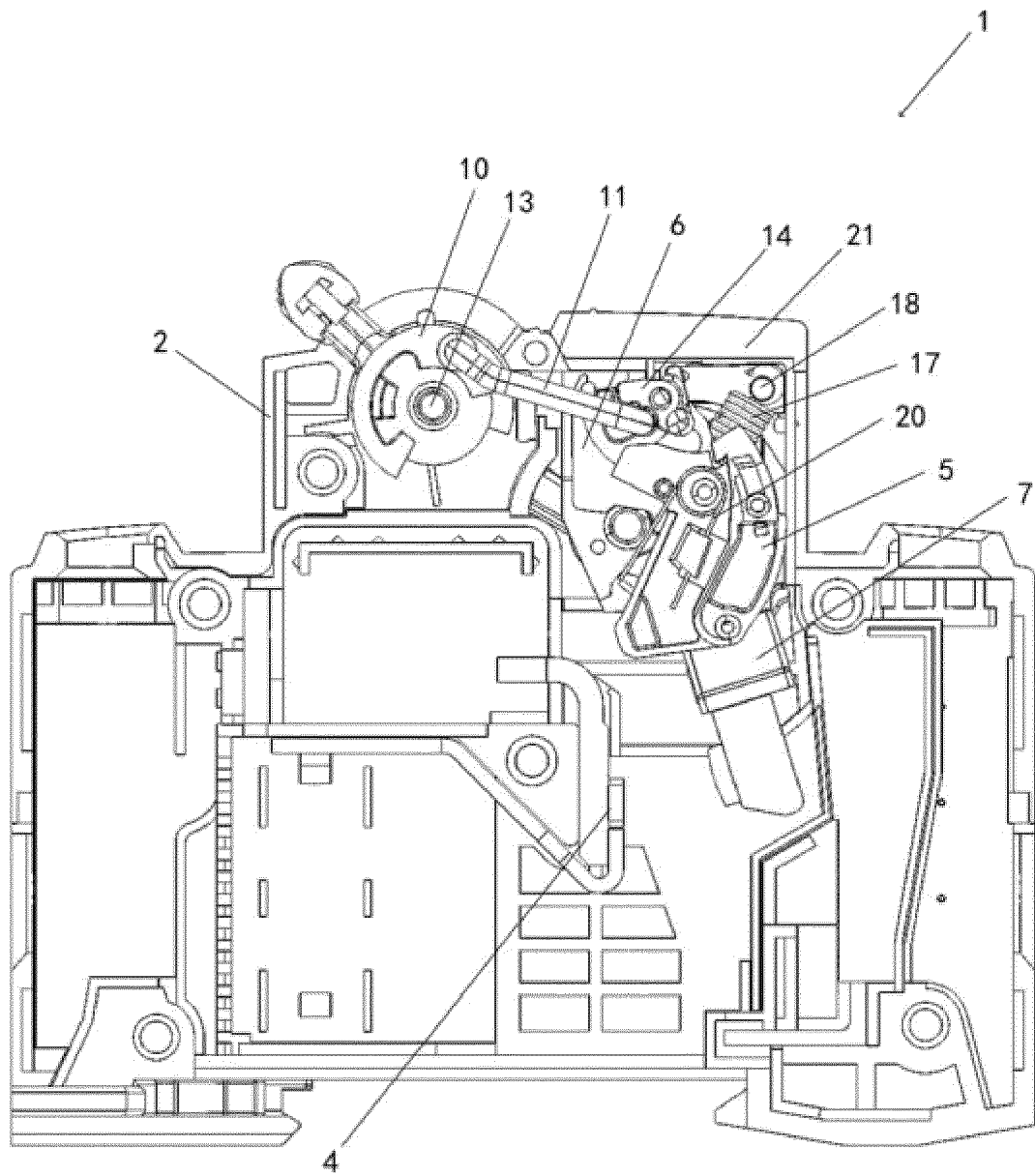


FIG. 1

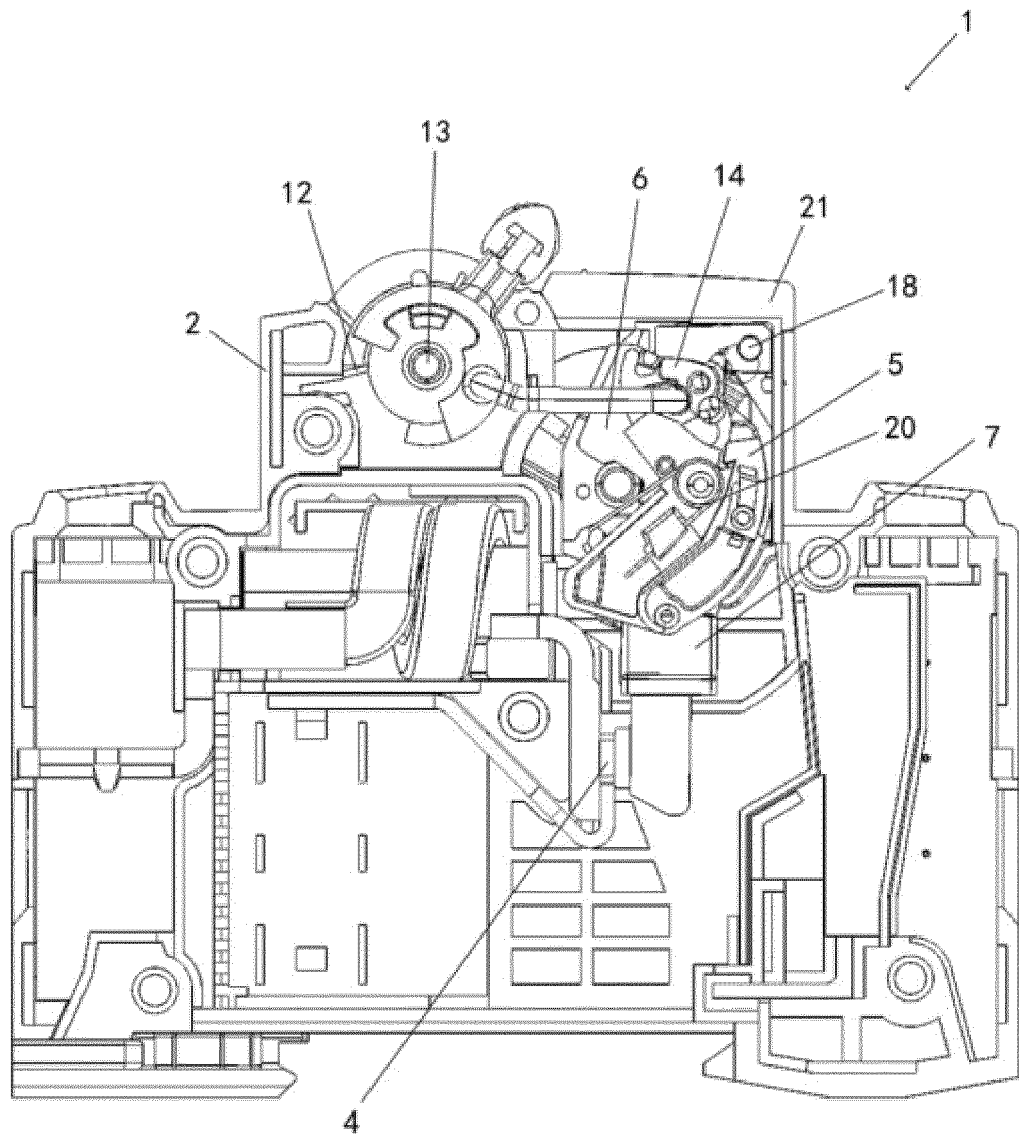


FIG. 2

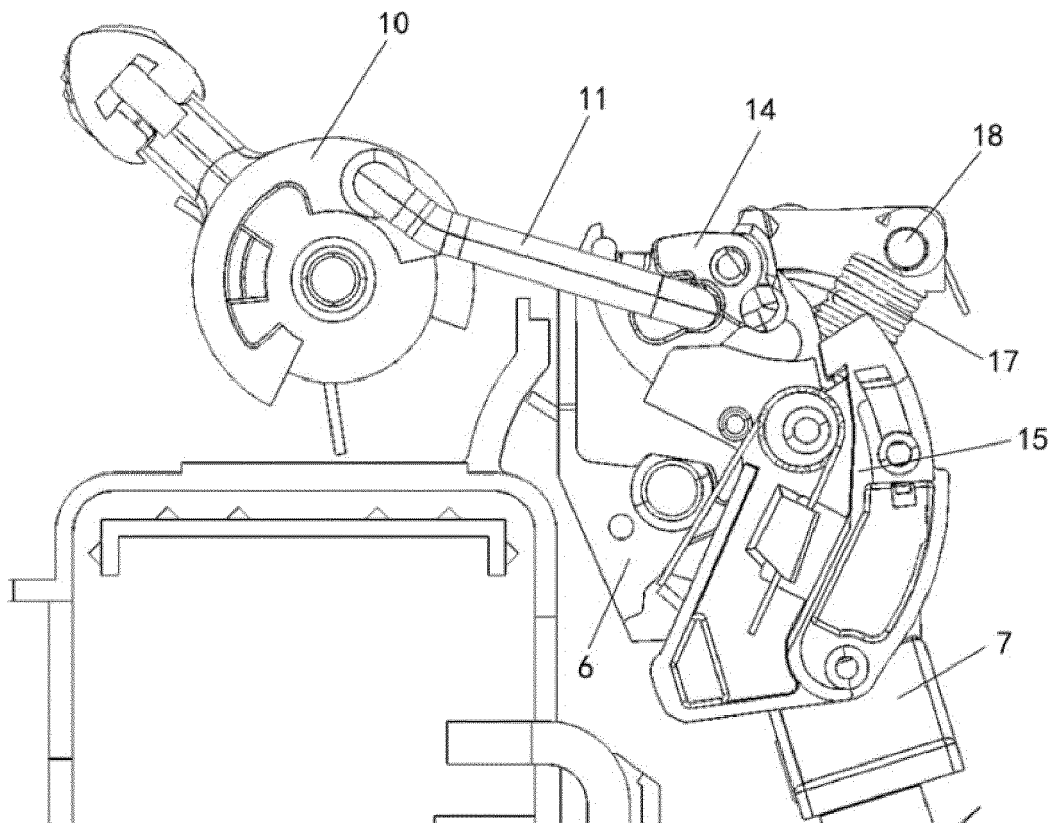


FIG. 3

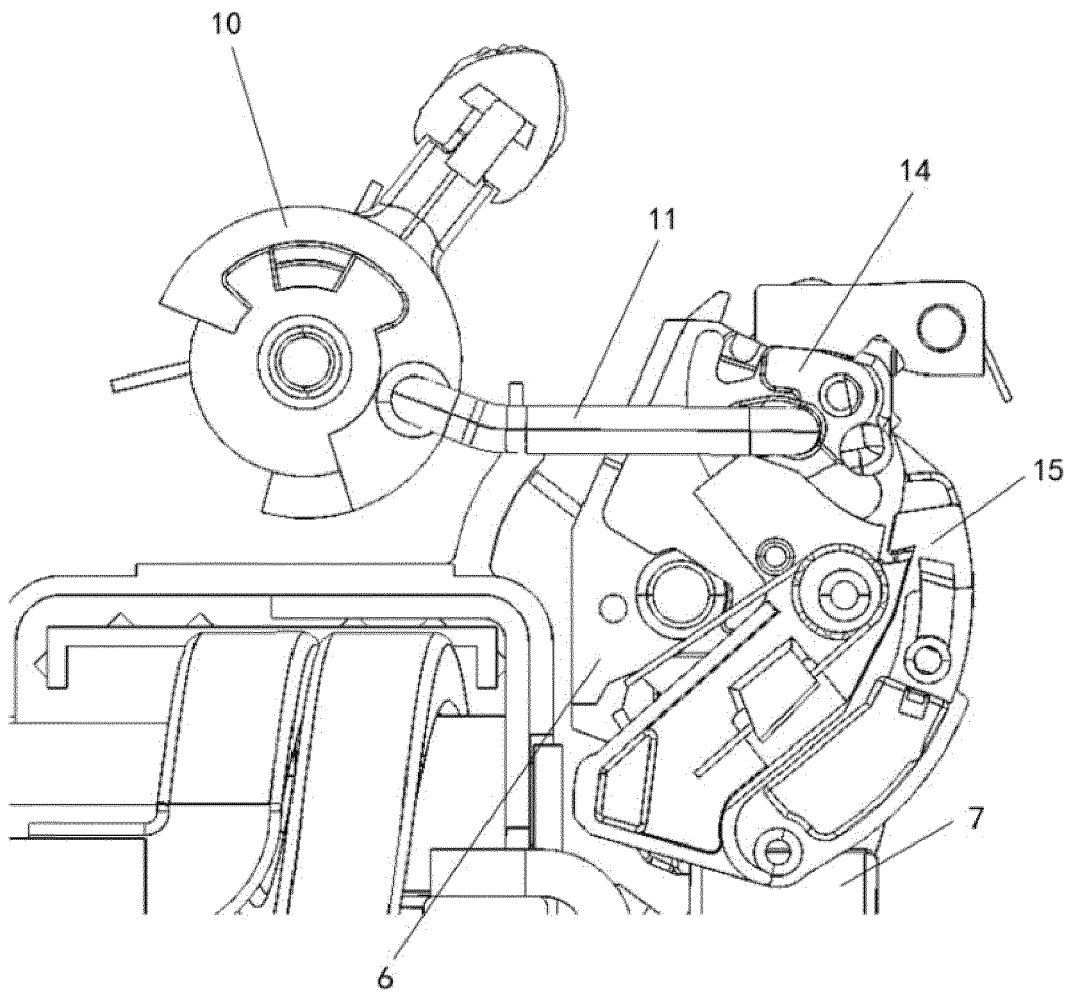


FIG. 4

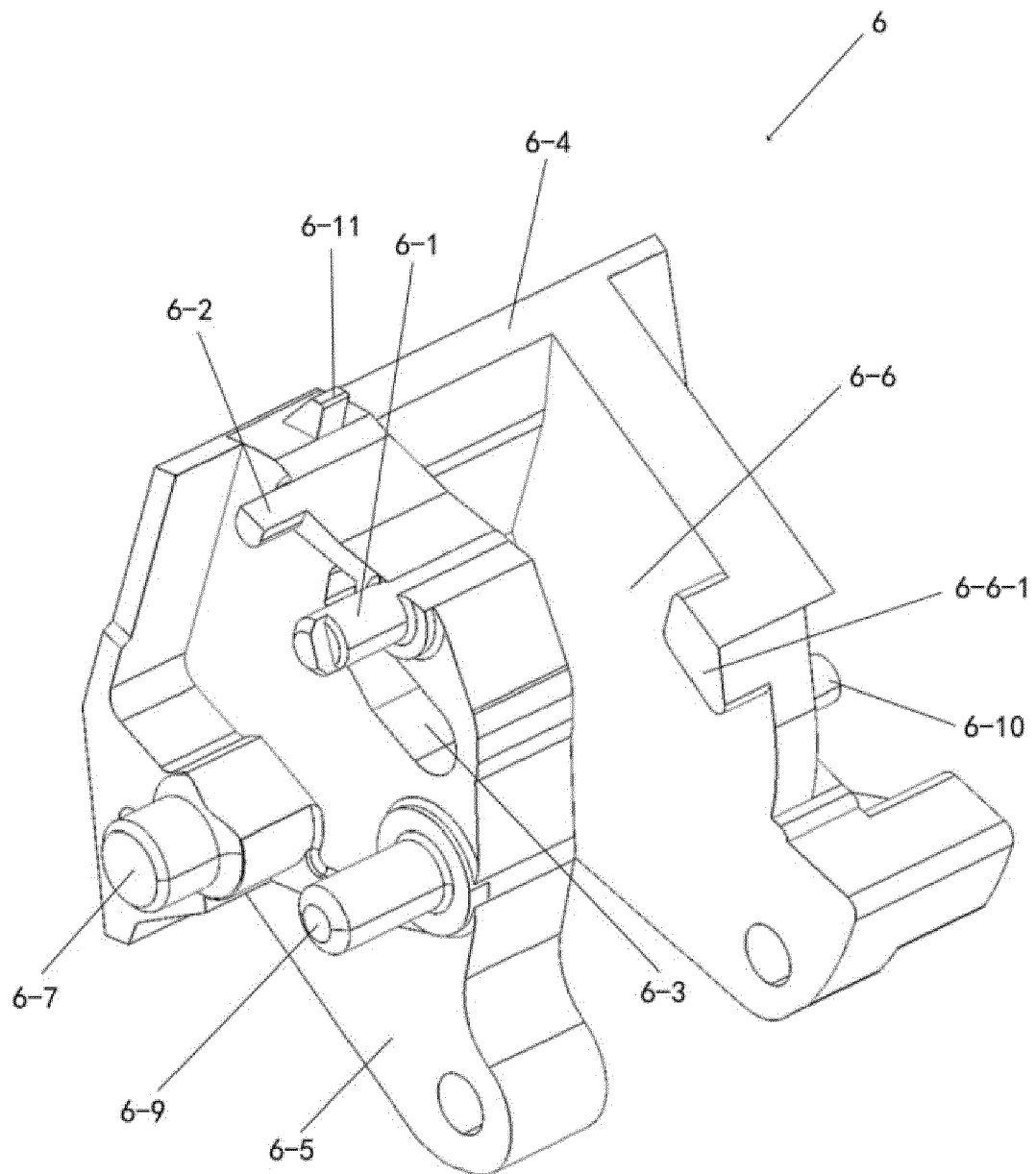


FIG. 5

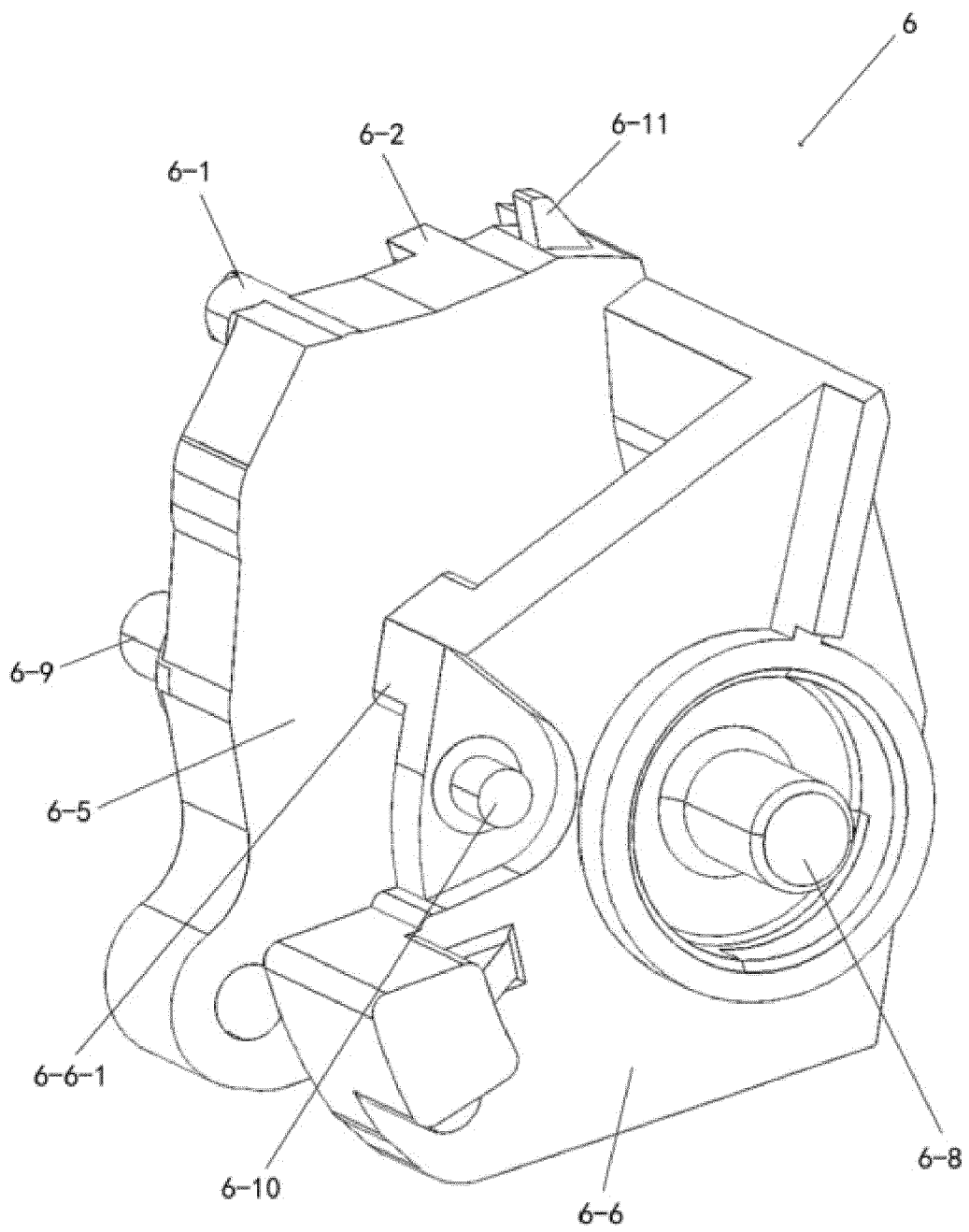


FIG. 6

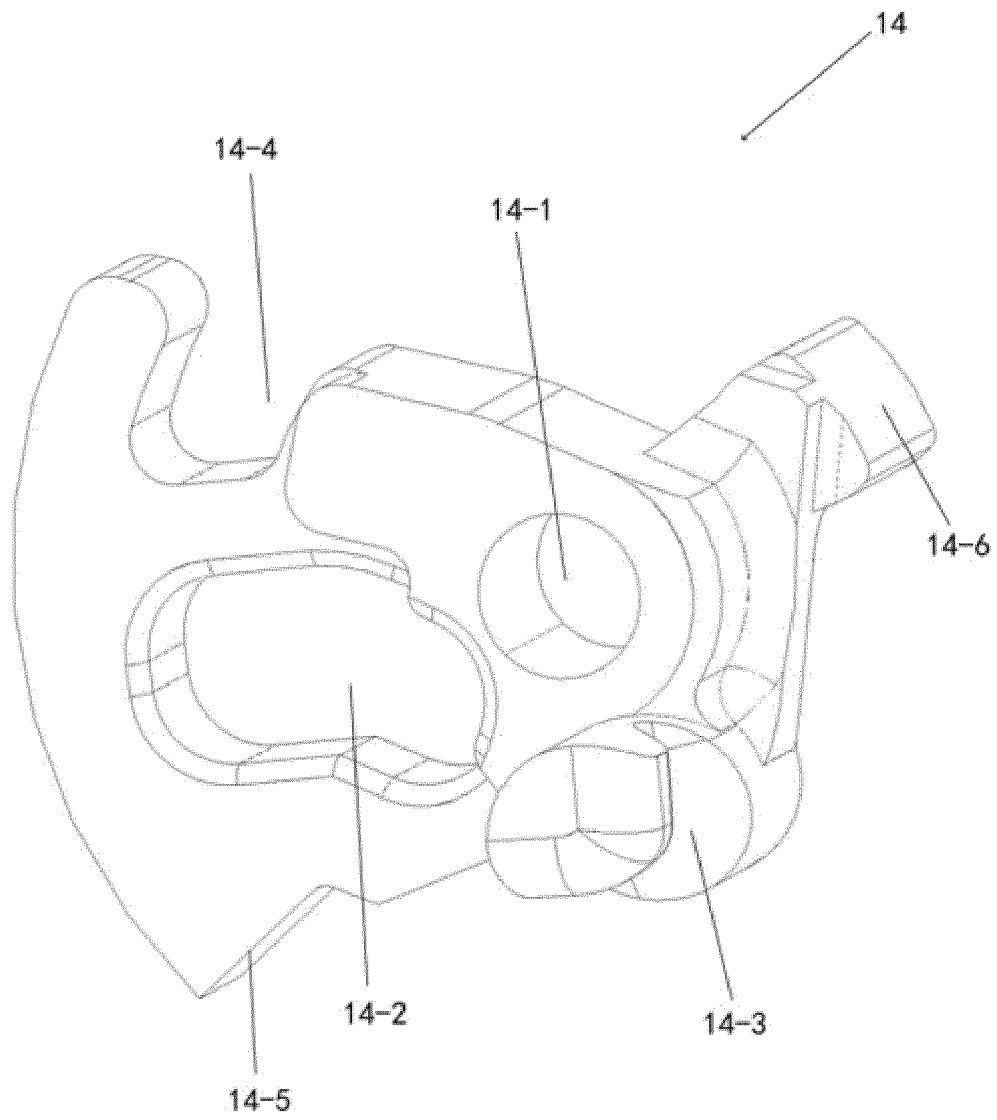


FIG. 7

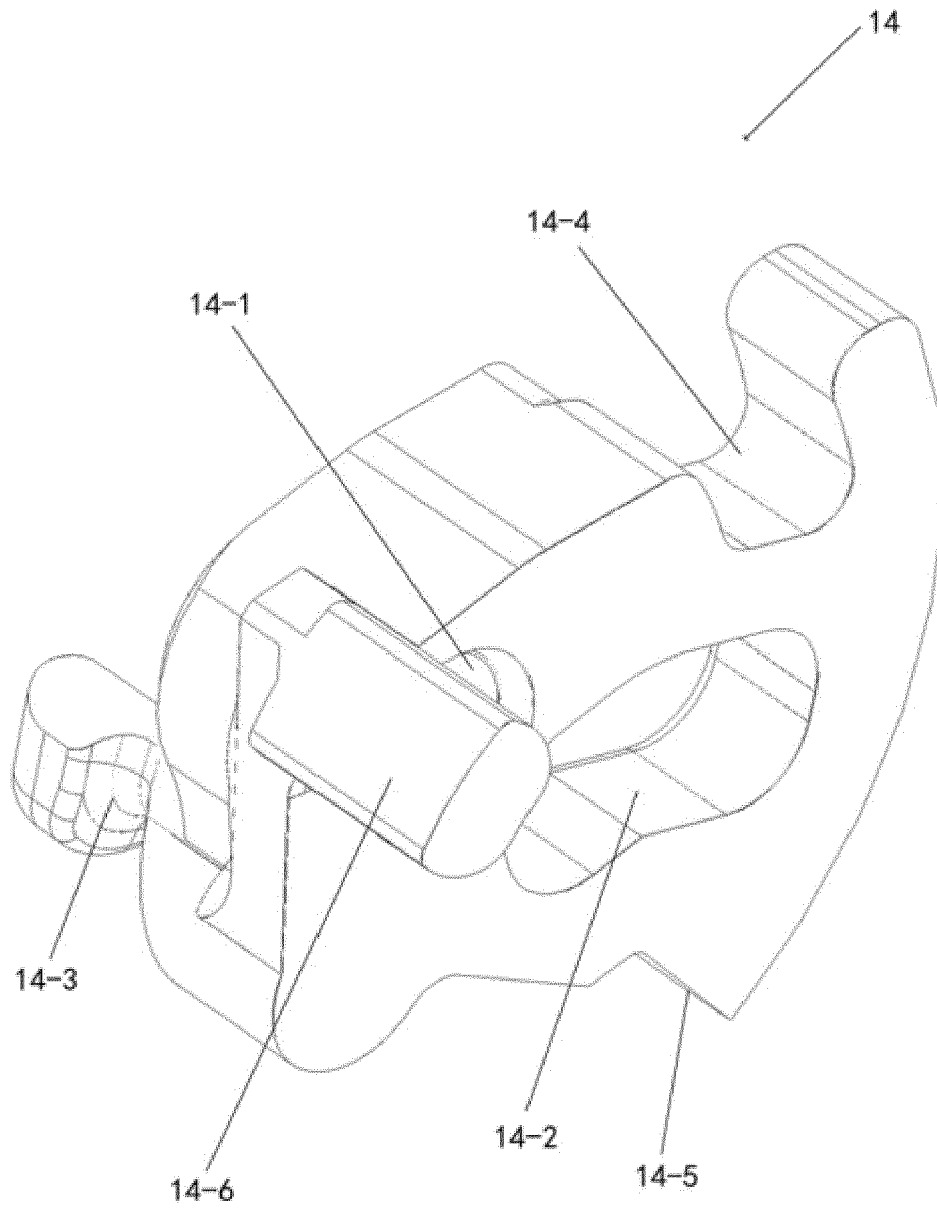


FIG. 8

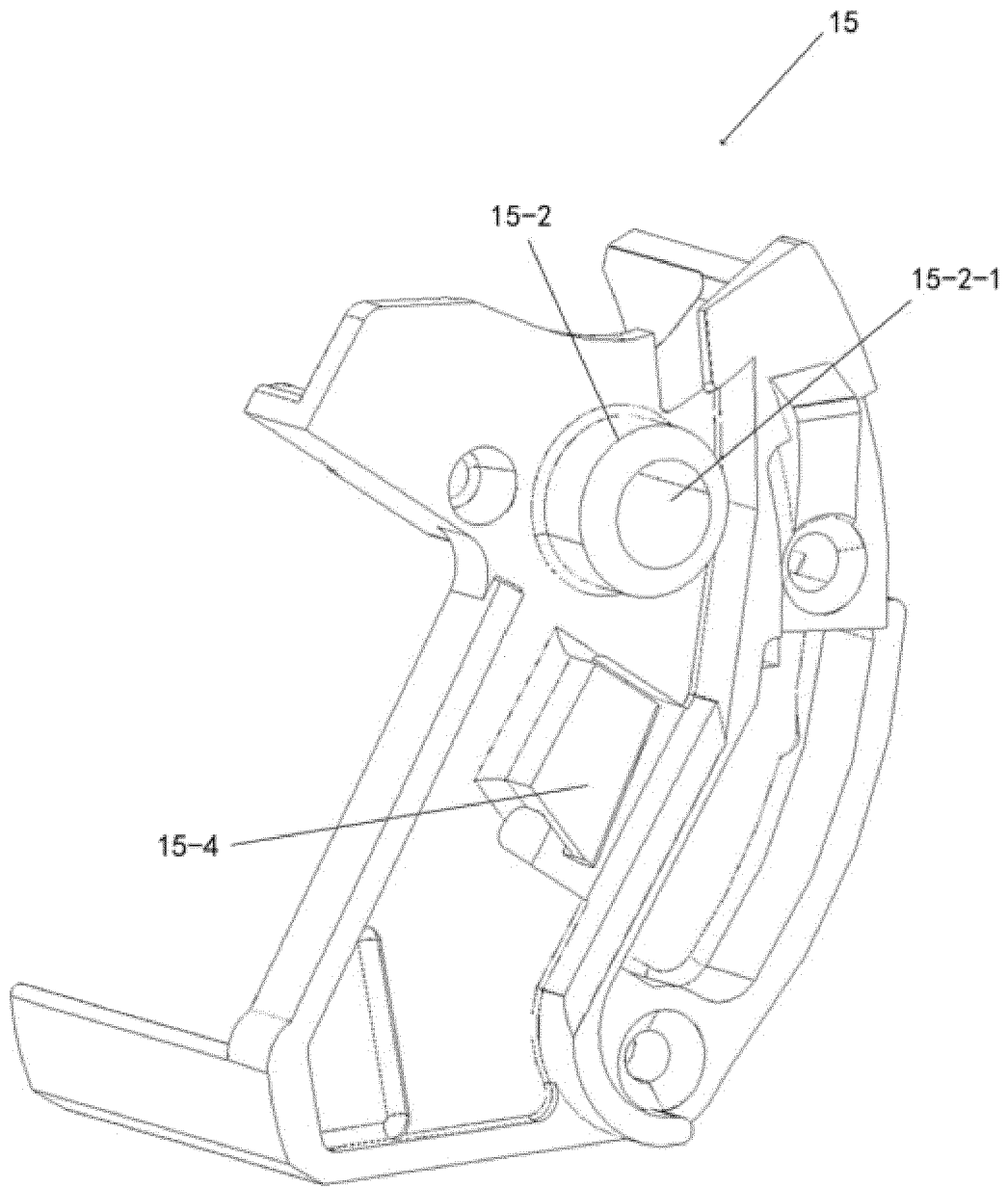


FIG. 9

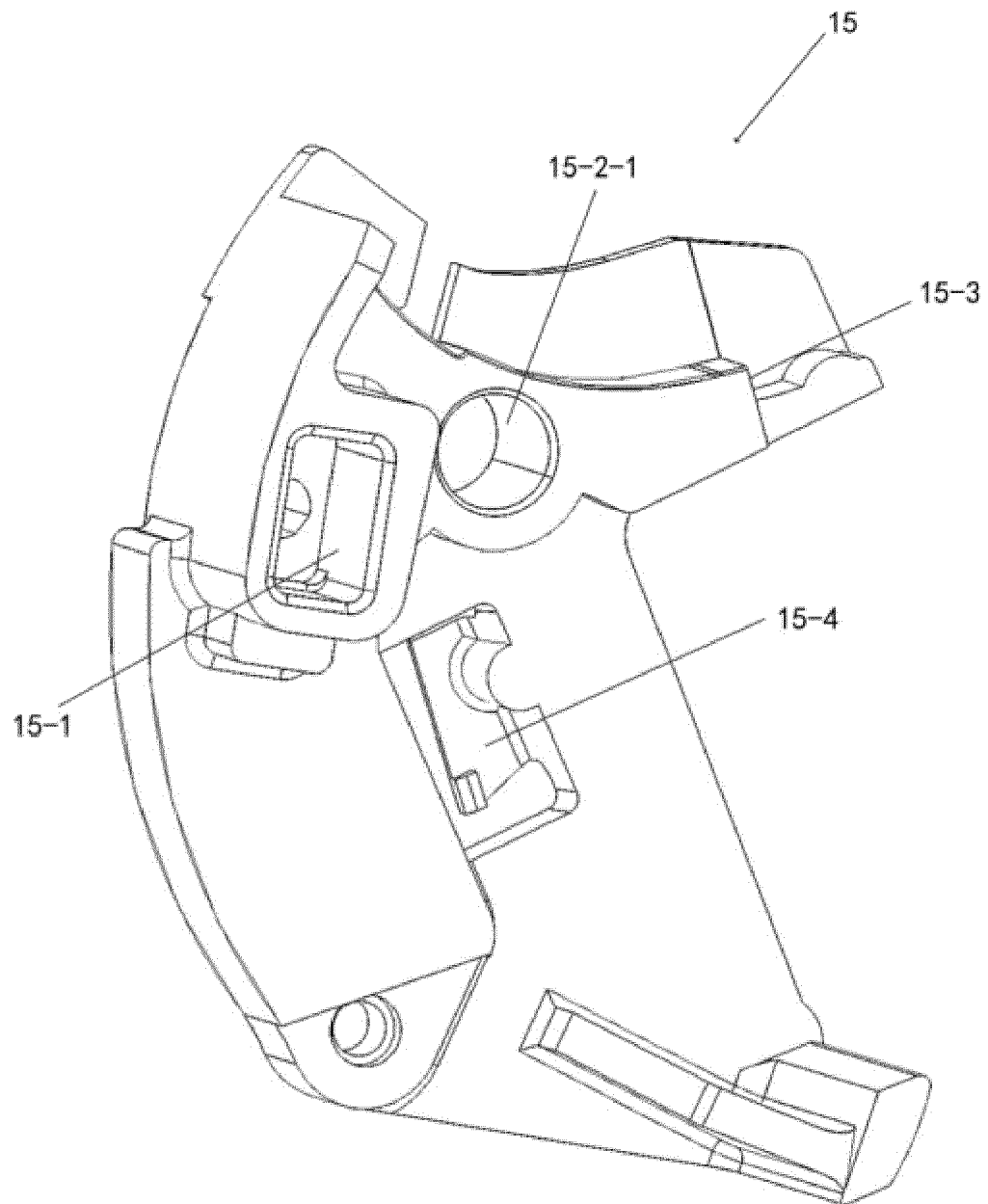


FIG. 10

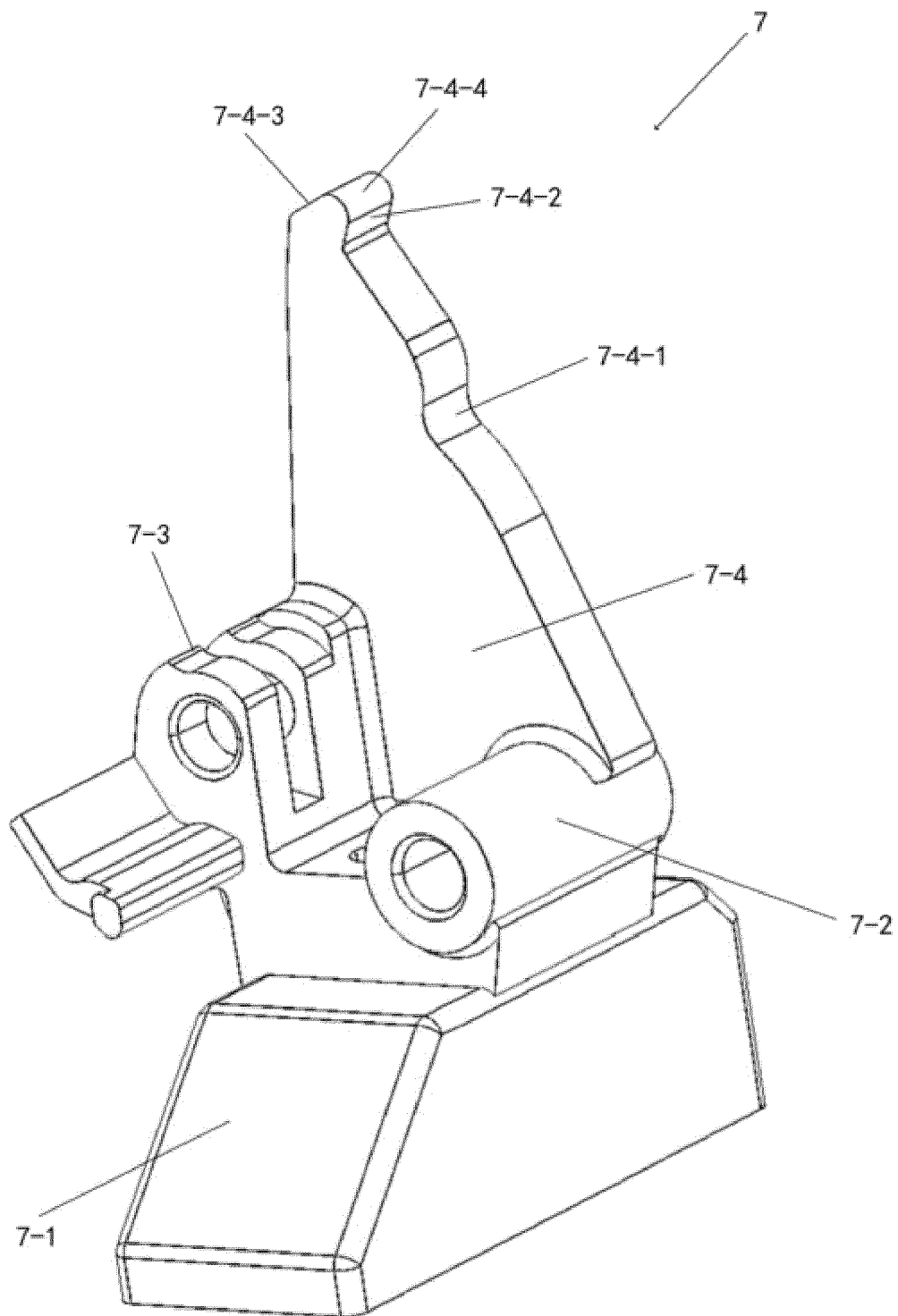


FIG. 11

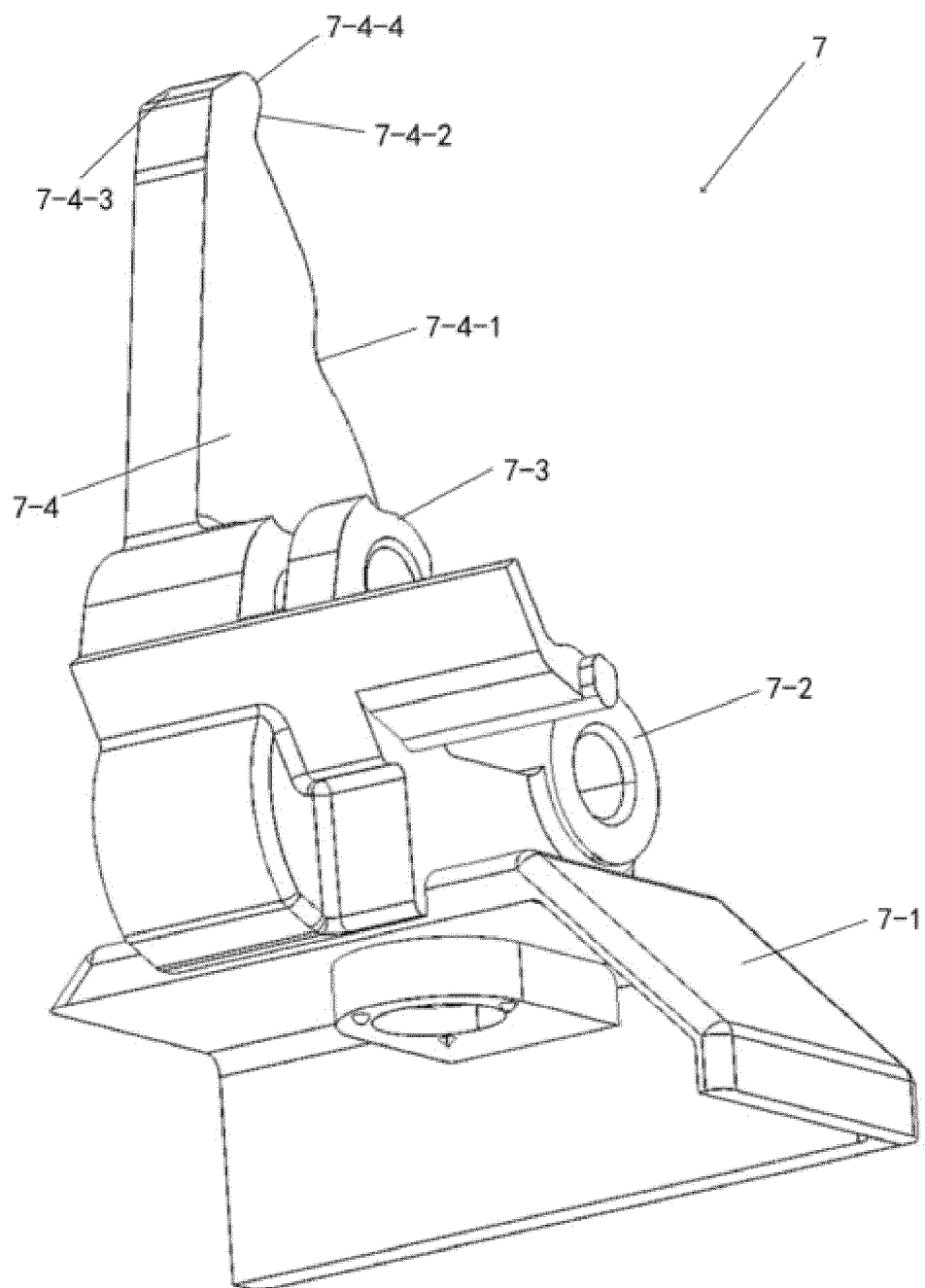


FIG. 12

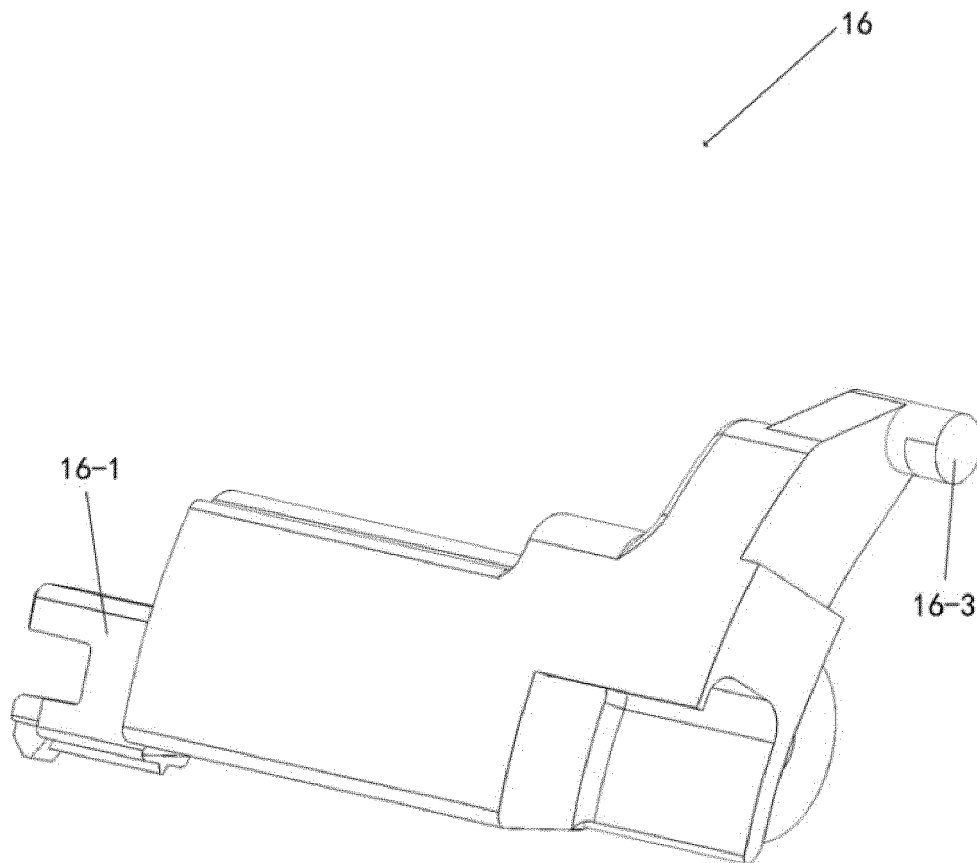


FIG. 13

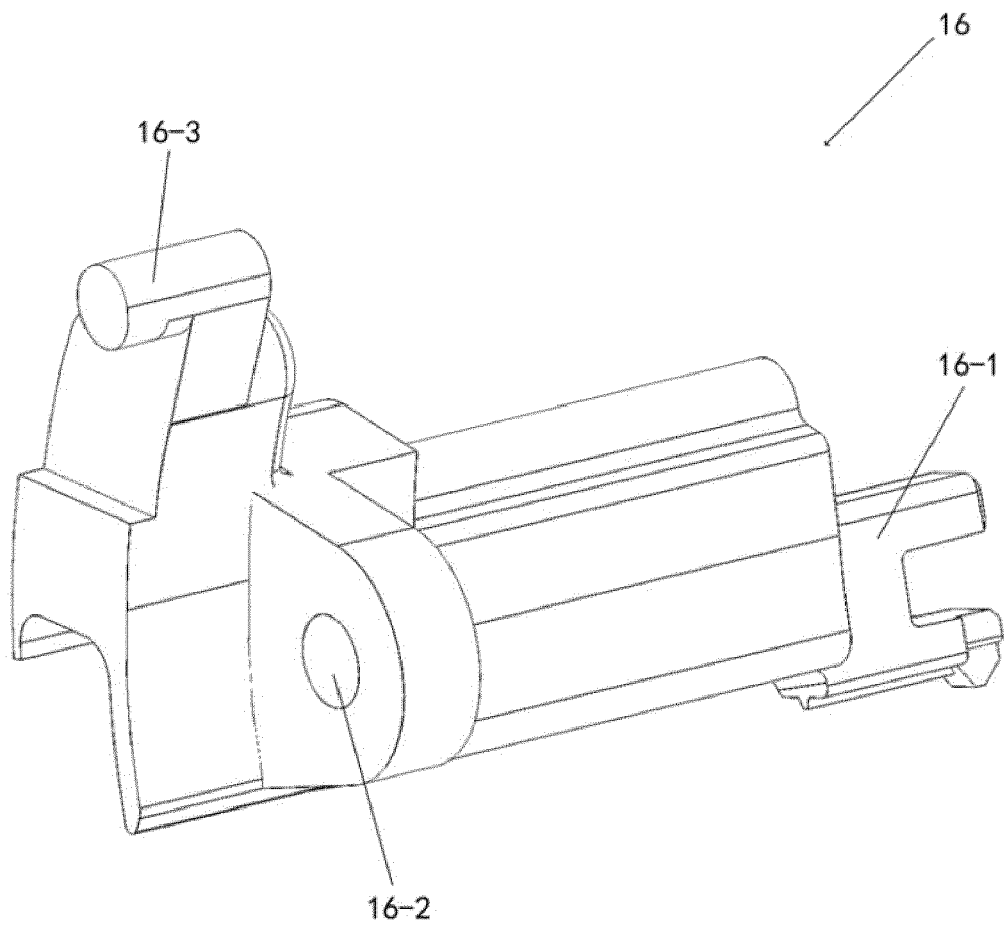


FIG. 14

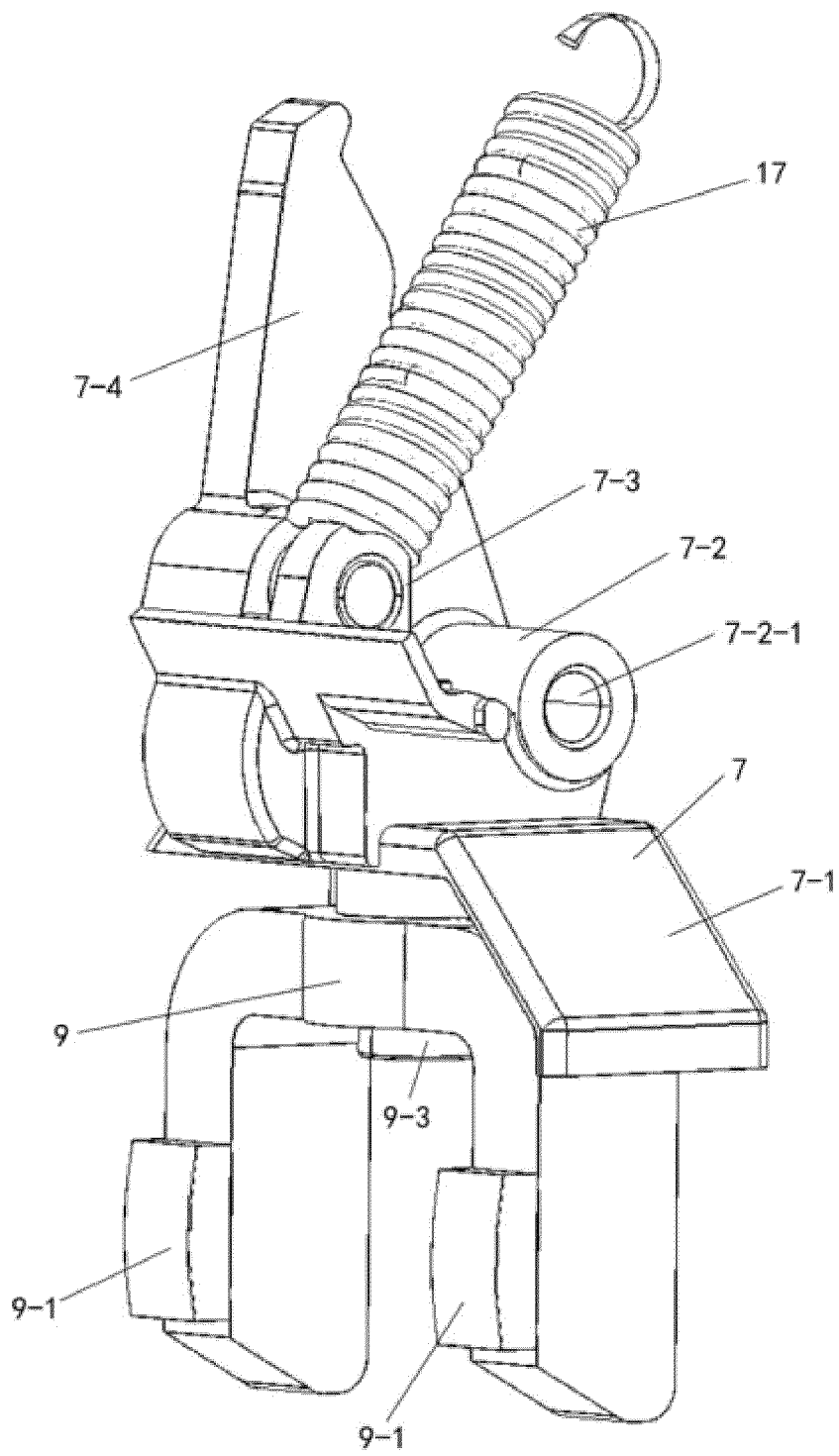
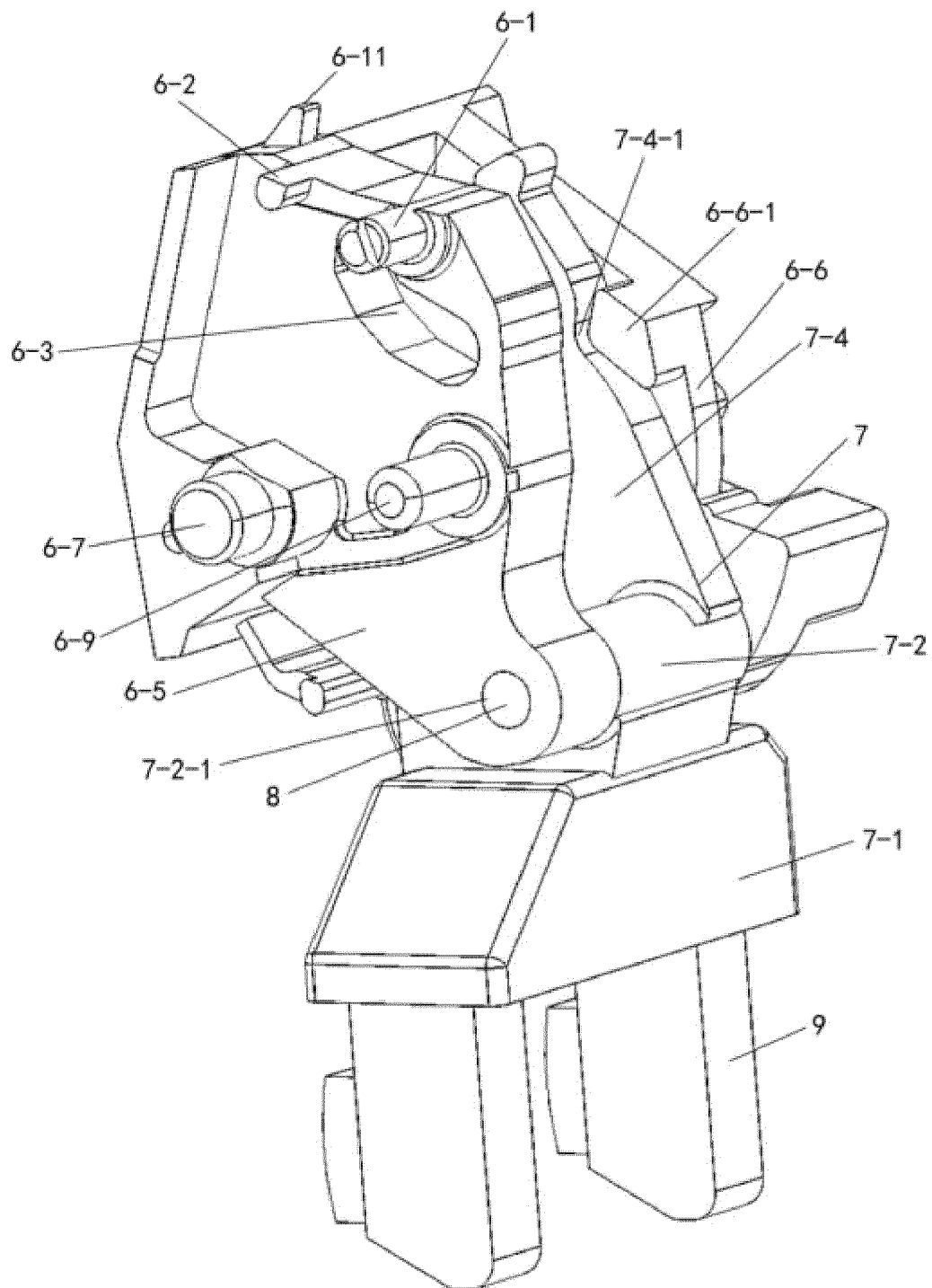
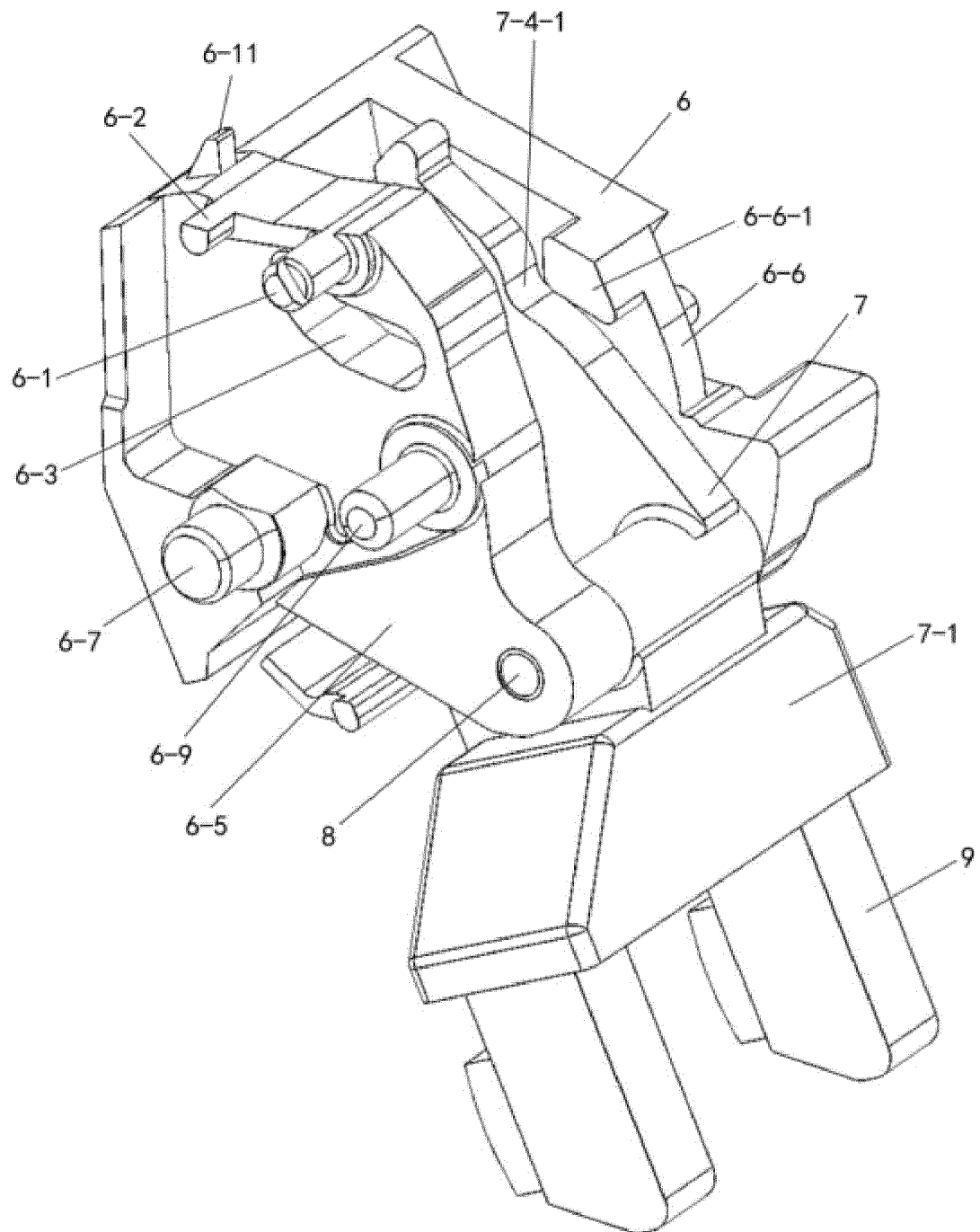


FIG. 15



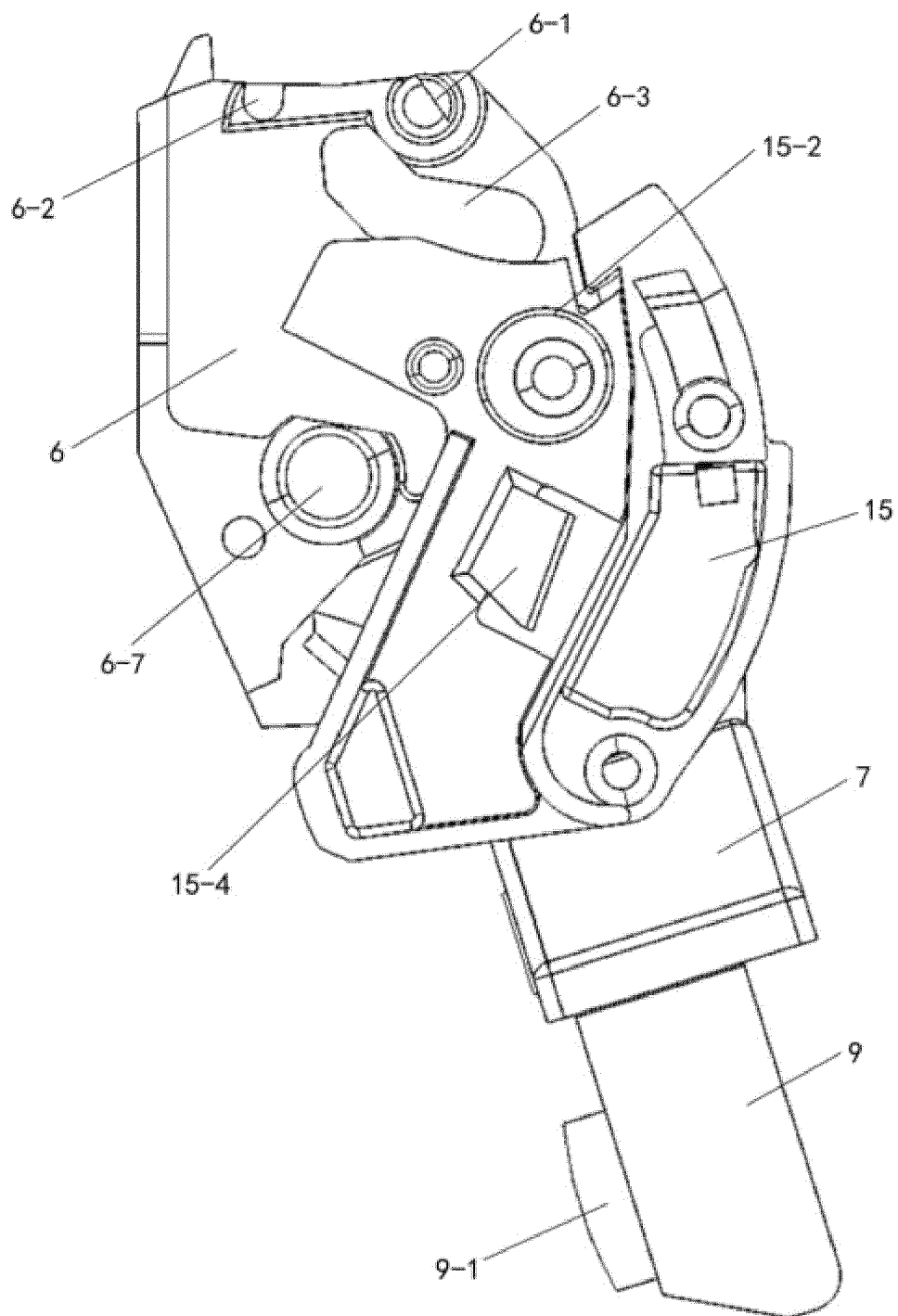
Open state

FIG. 16

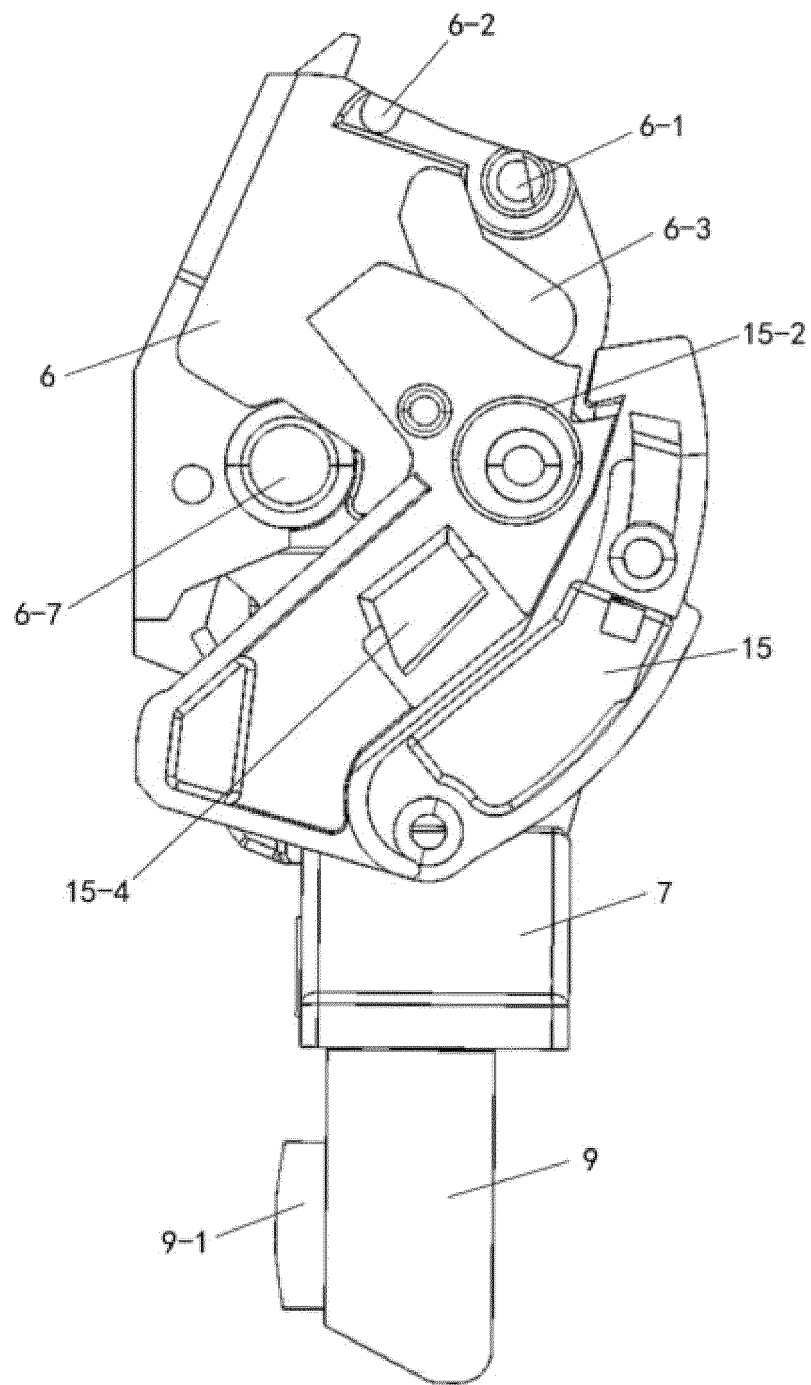


Closed state

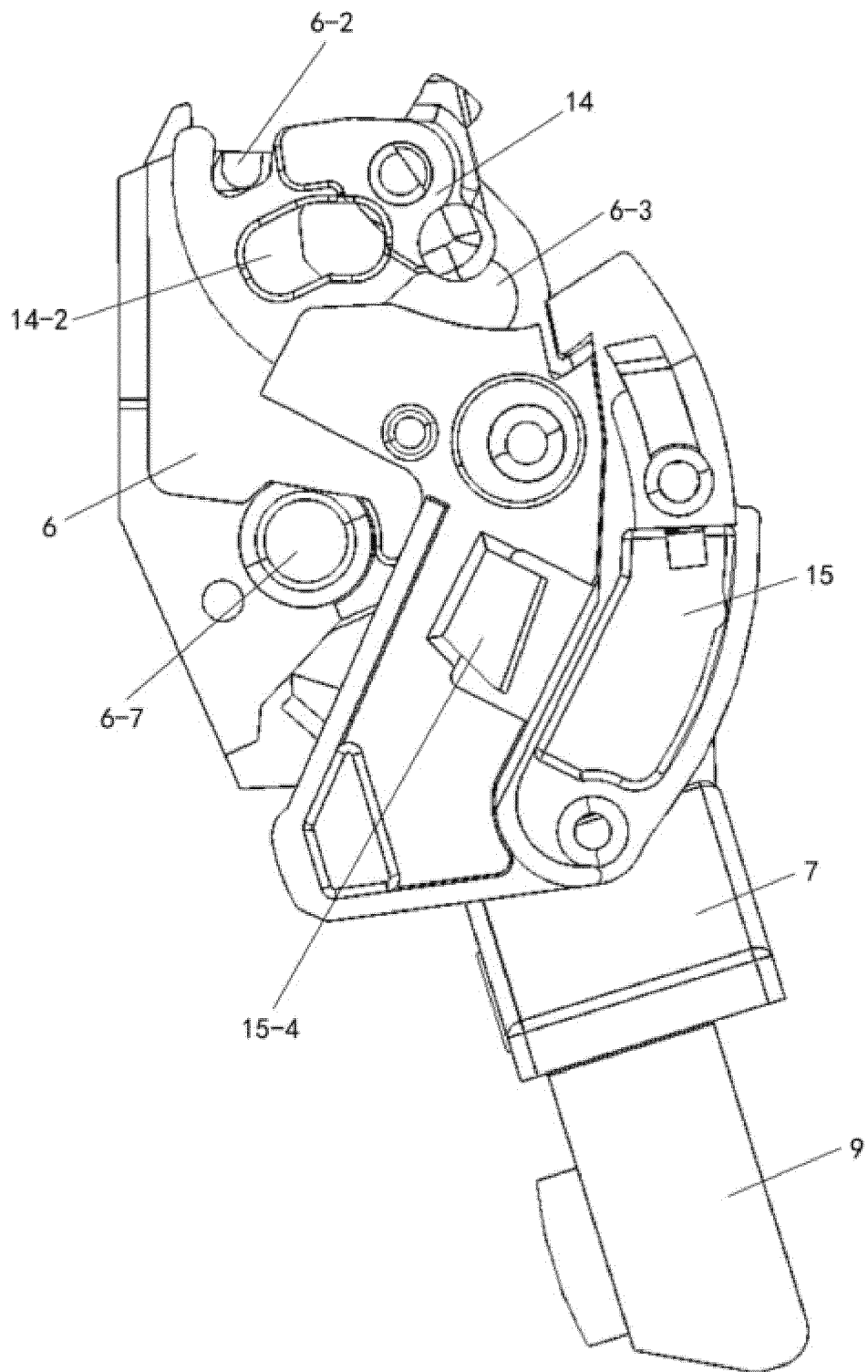
FIG. 17



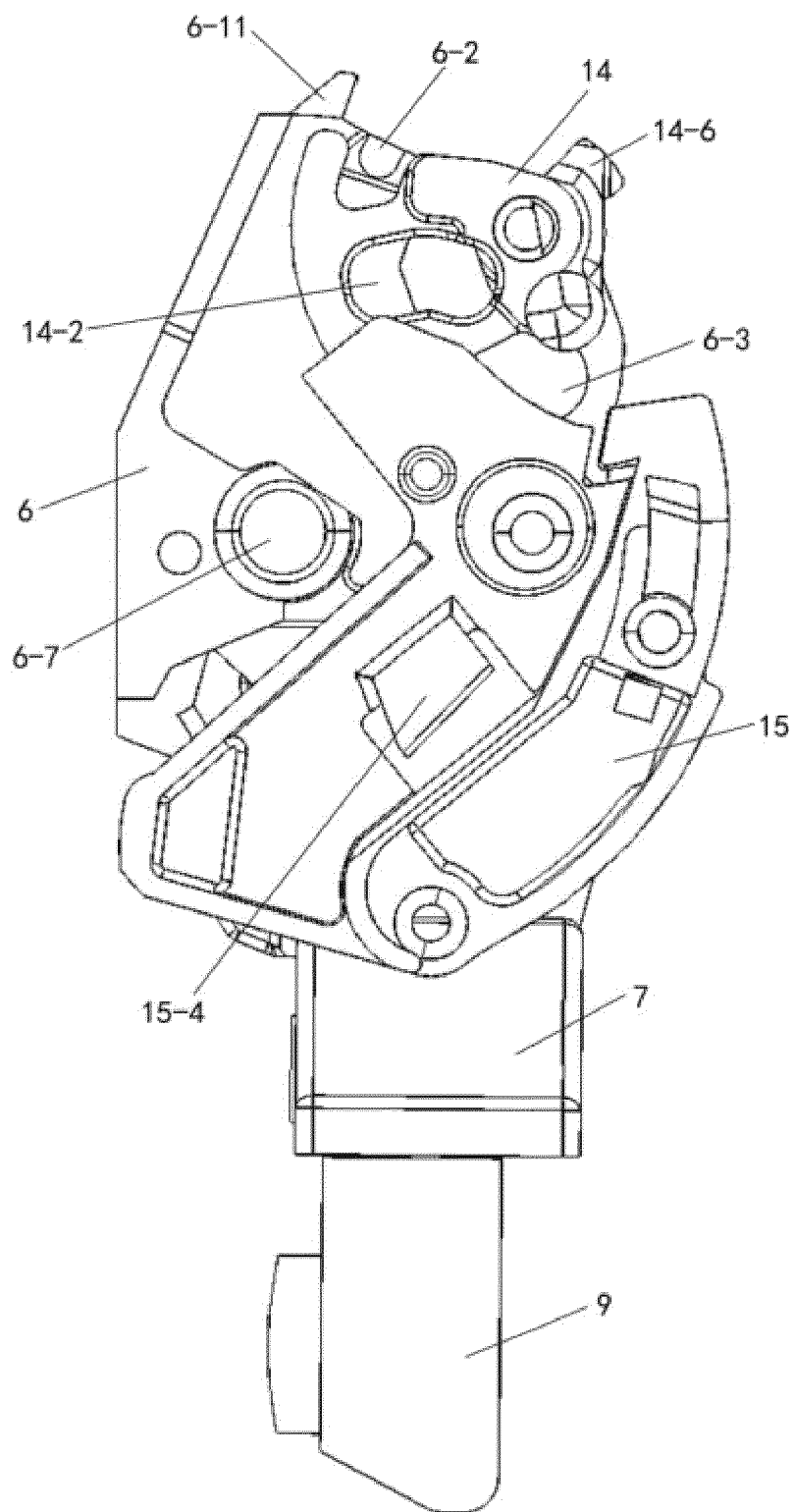
Open
FIG. 18



Closed
FIG. 19

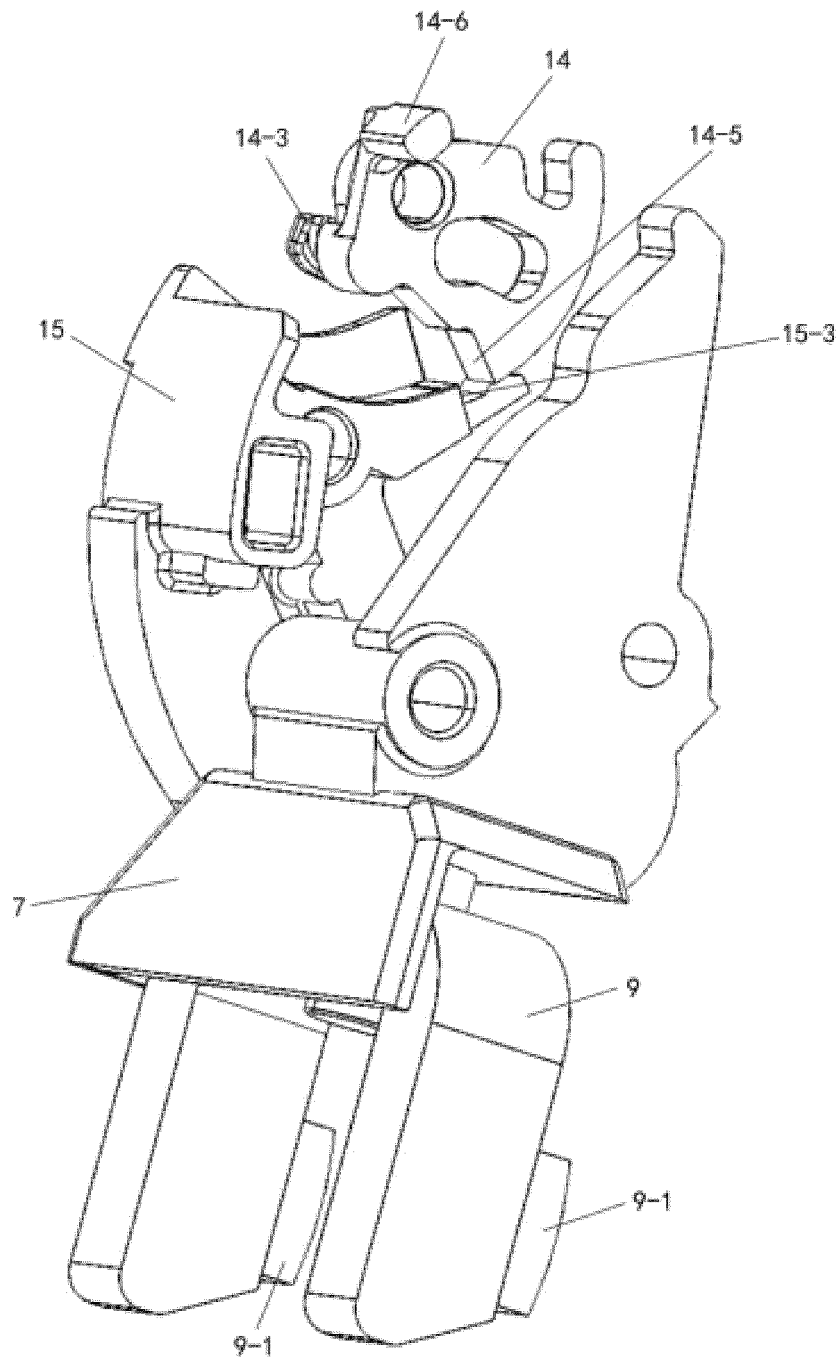


Open
FIG. 20



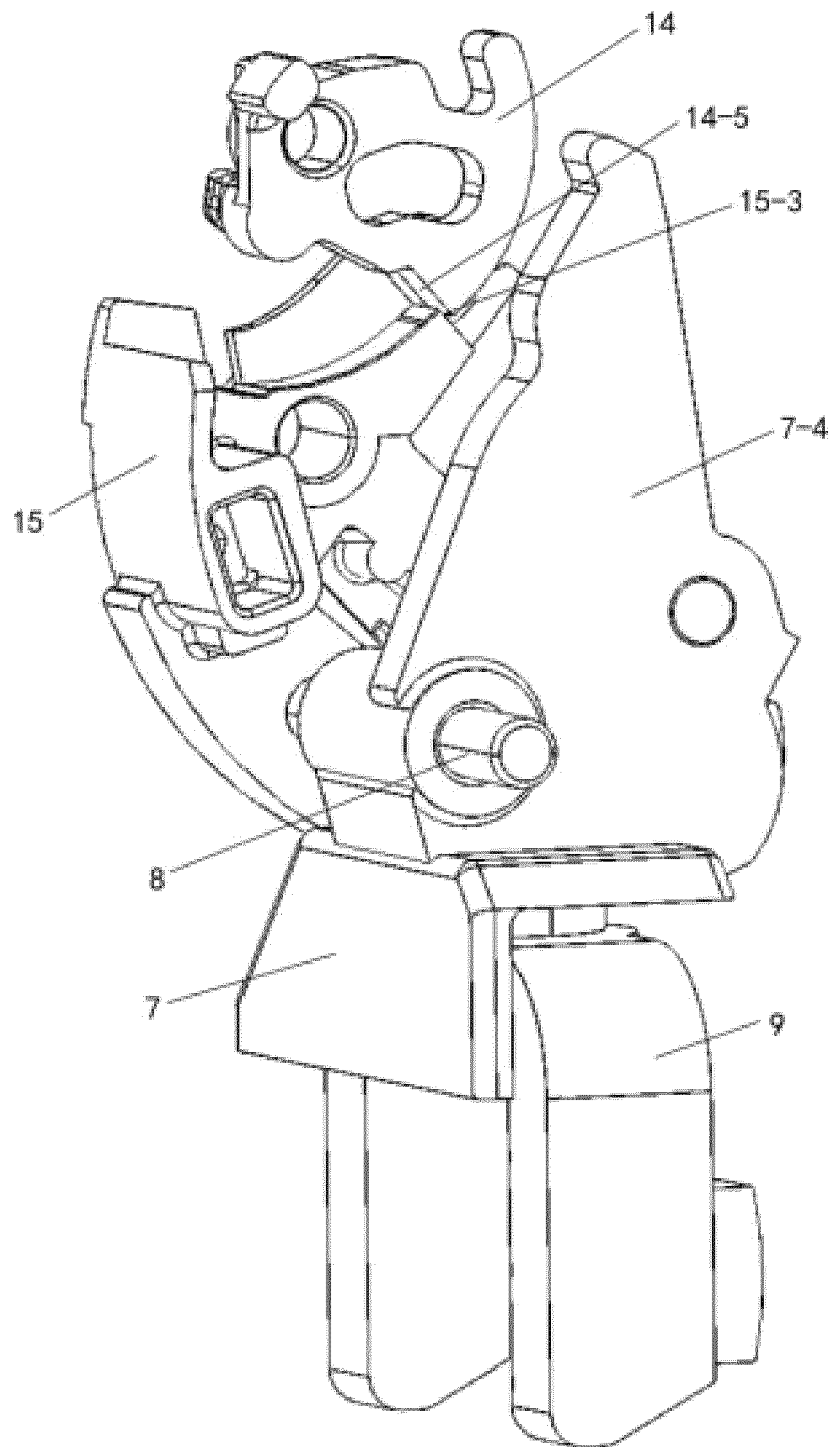
Closed

FIG. 21



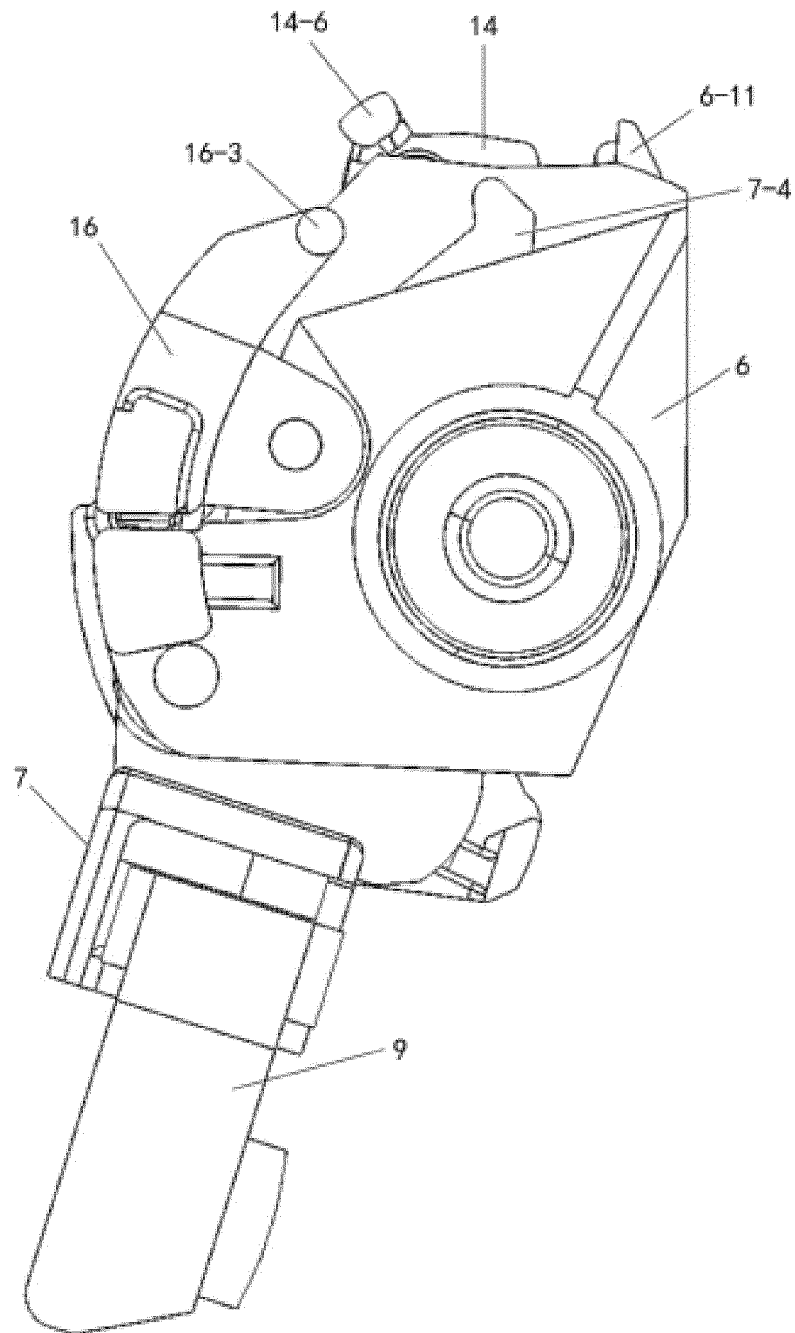
Open

FIG.22



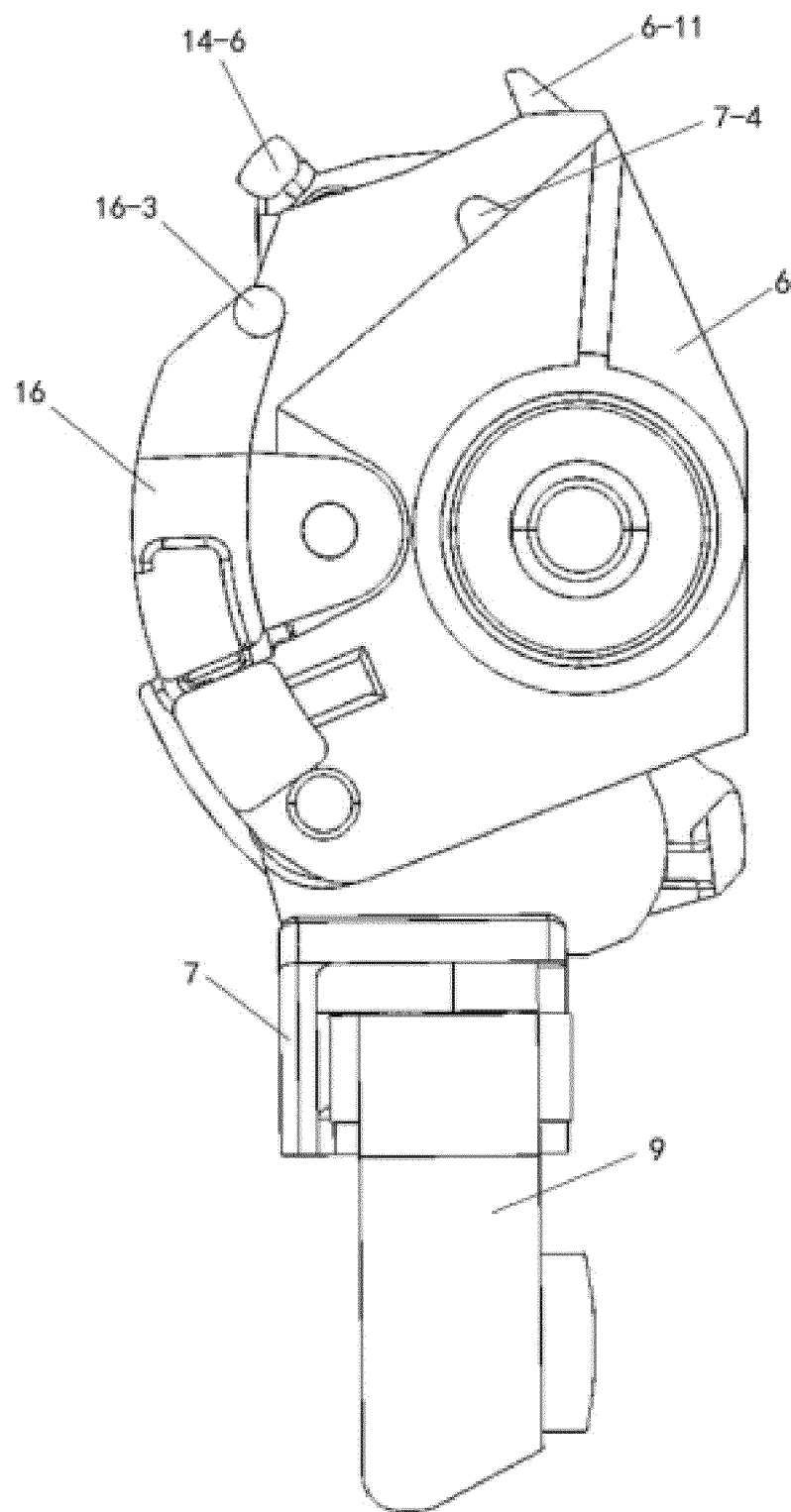
Closed

FIG. 23



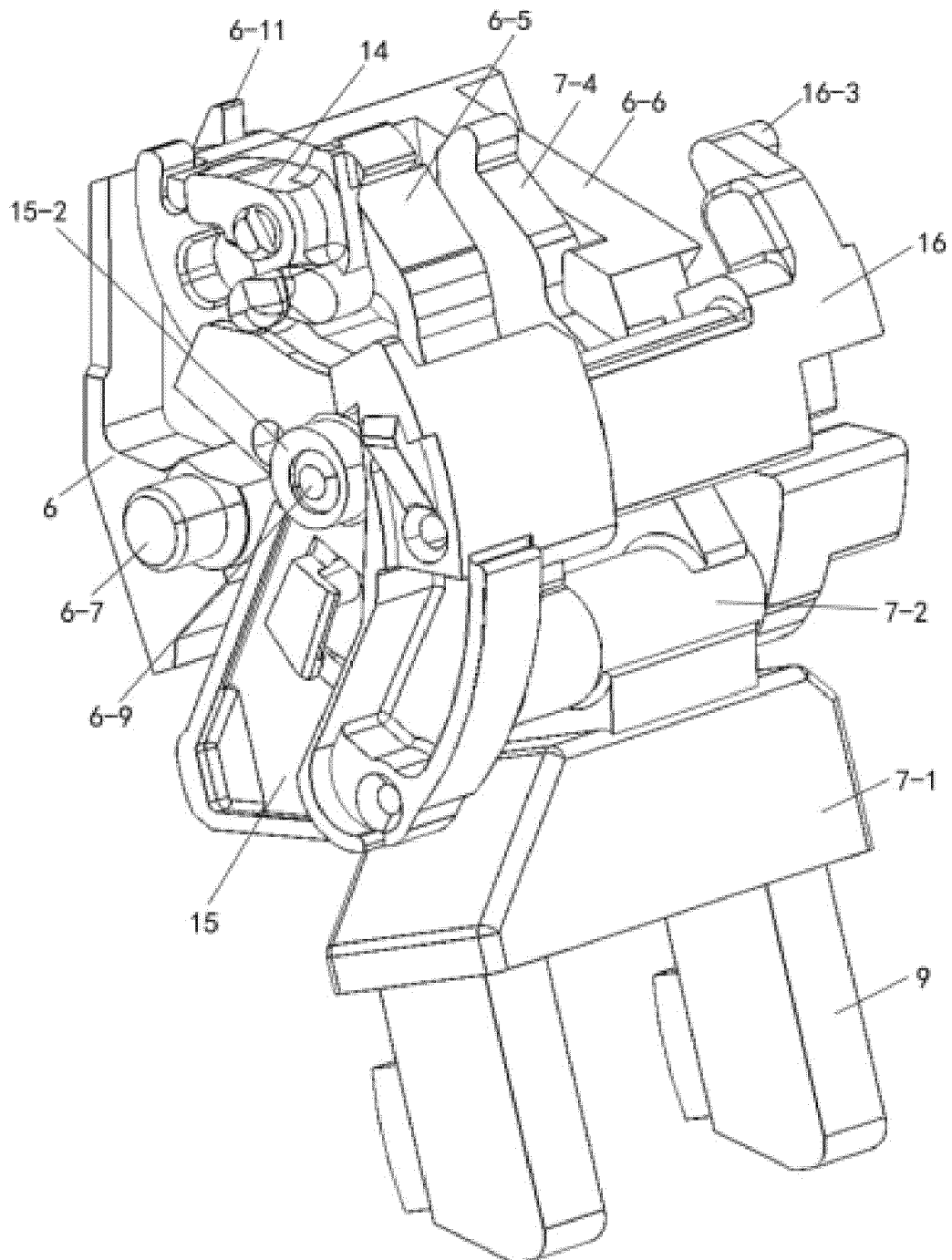
Open

FIG.24



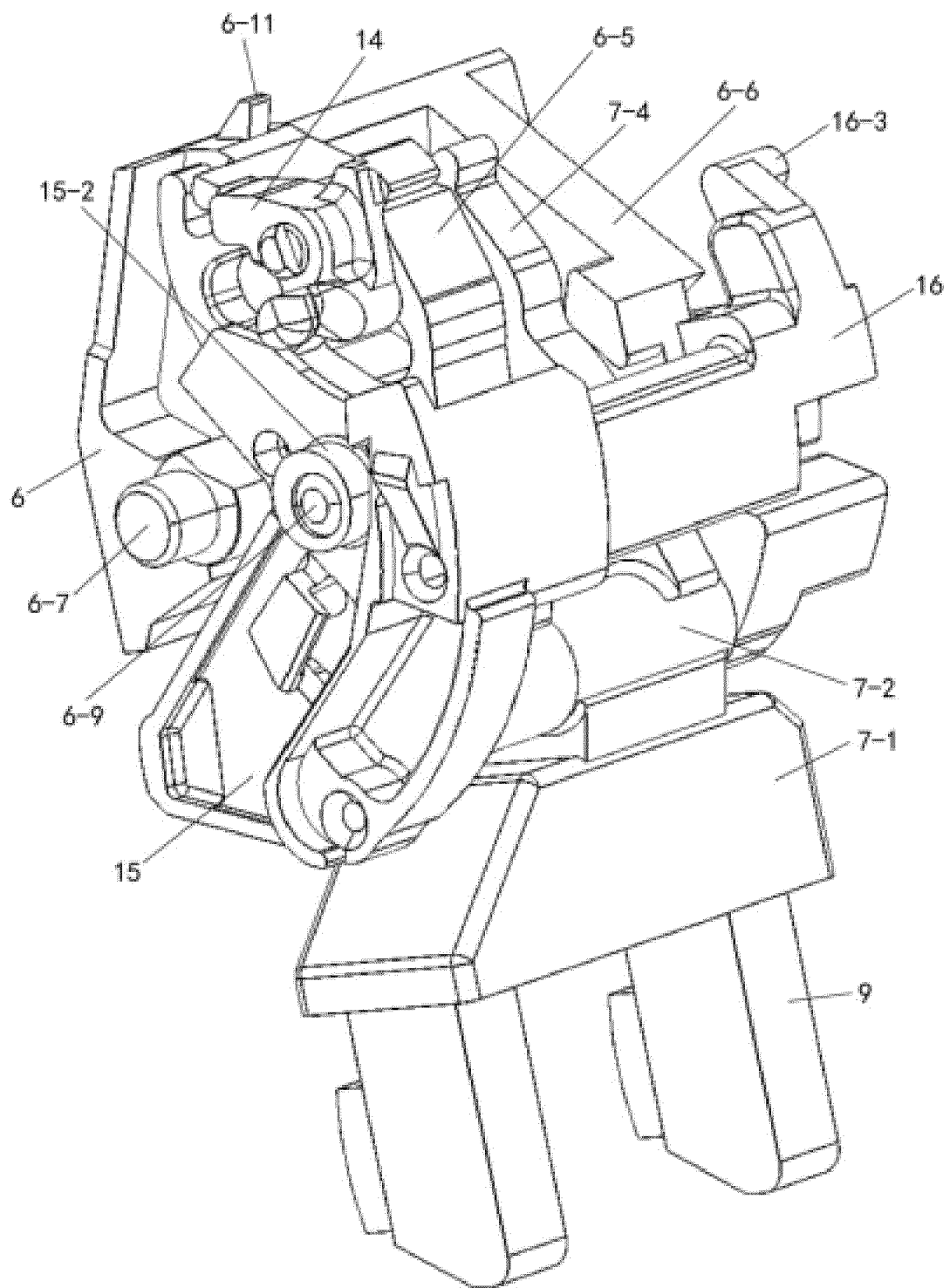
Closed

FIG.25



Open

FIG.26



Closed

FIG. 27

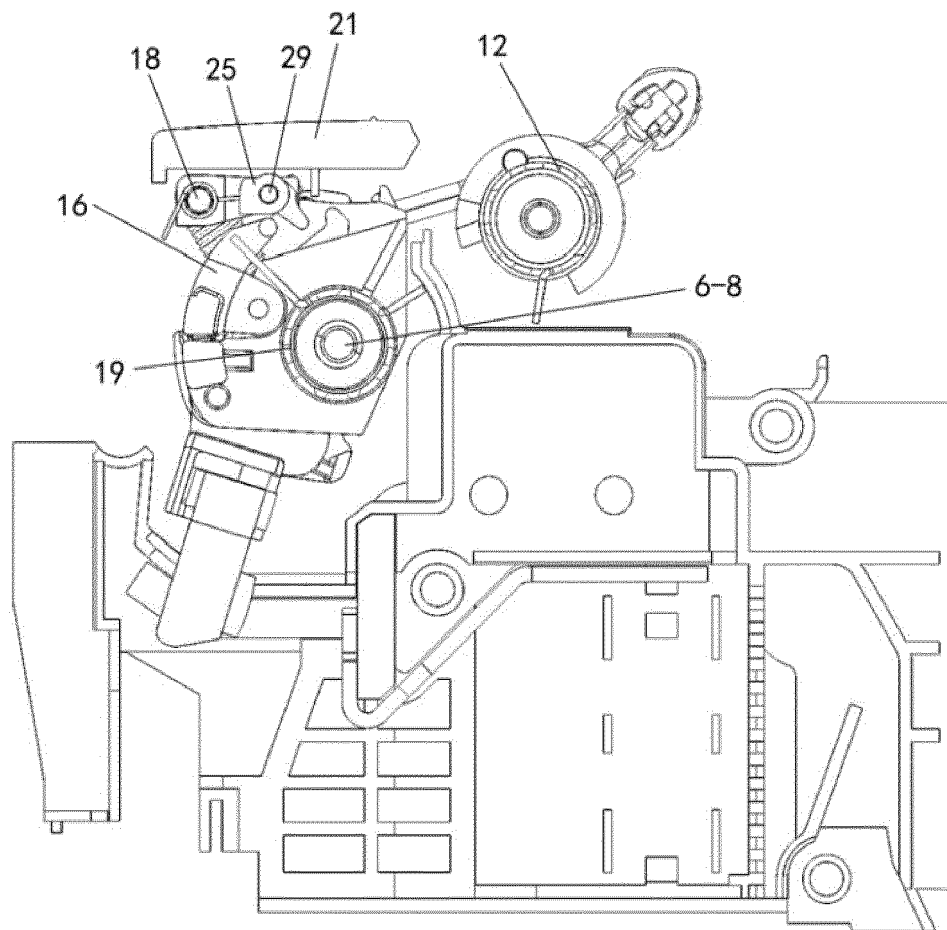


FIG.28

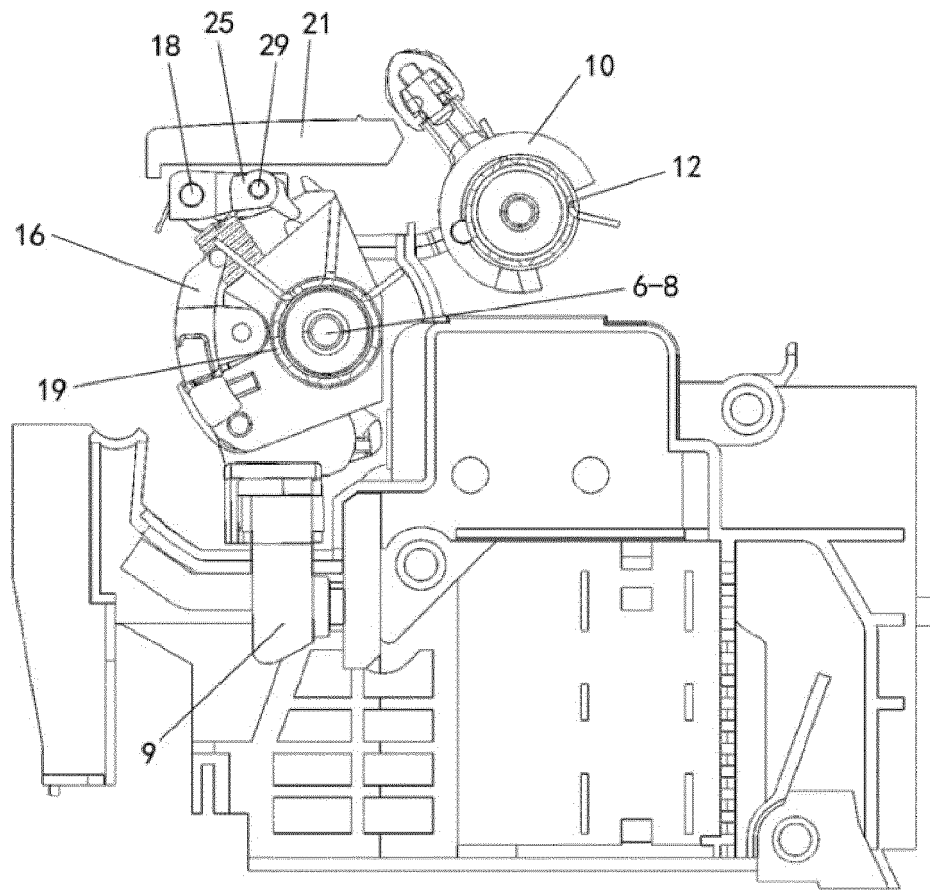


FIG. 29

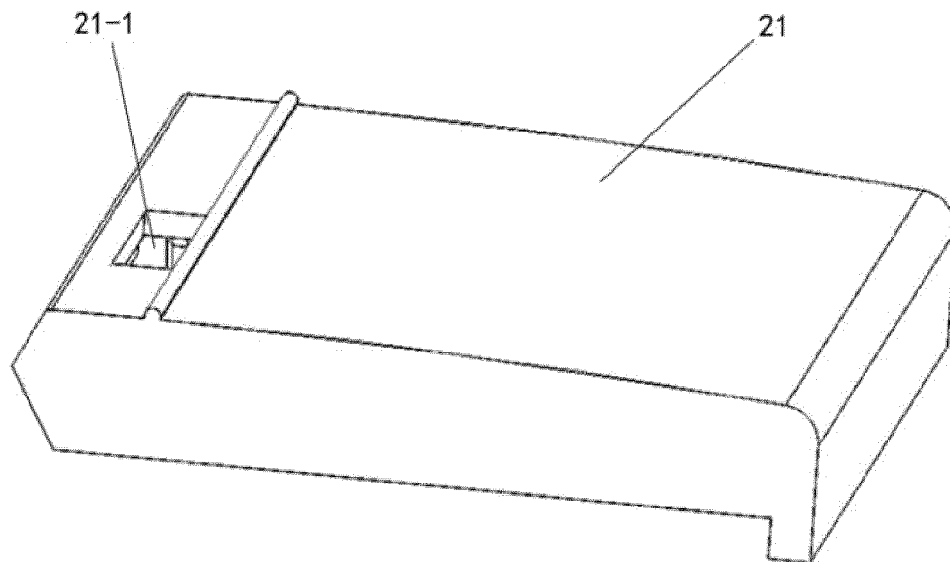


FIG. 30

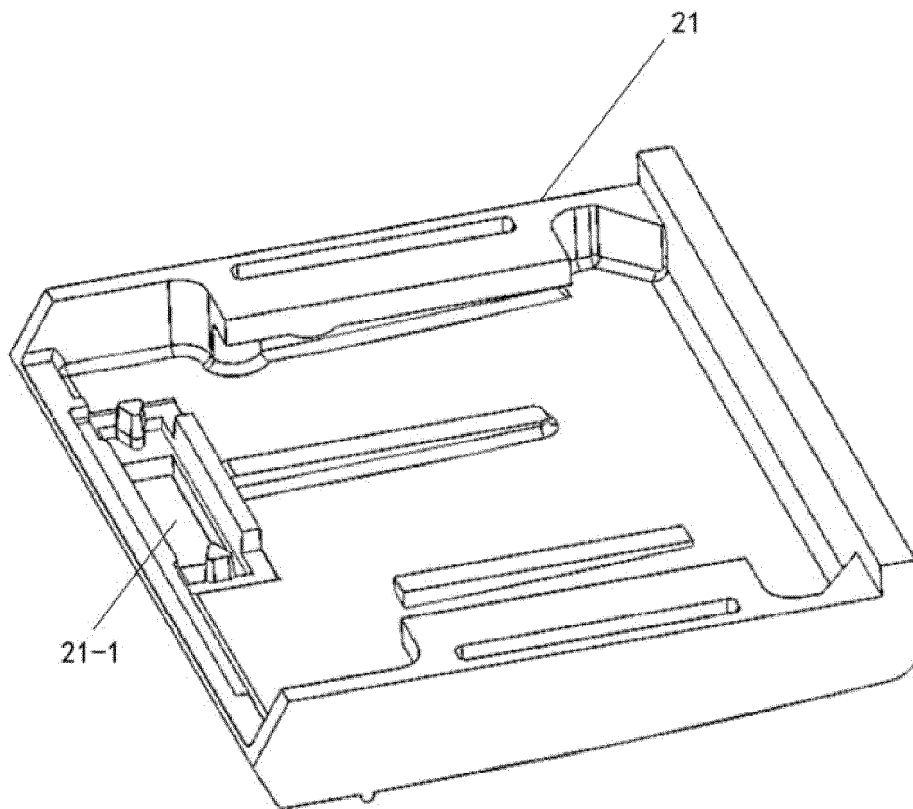


FIG.31

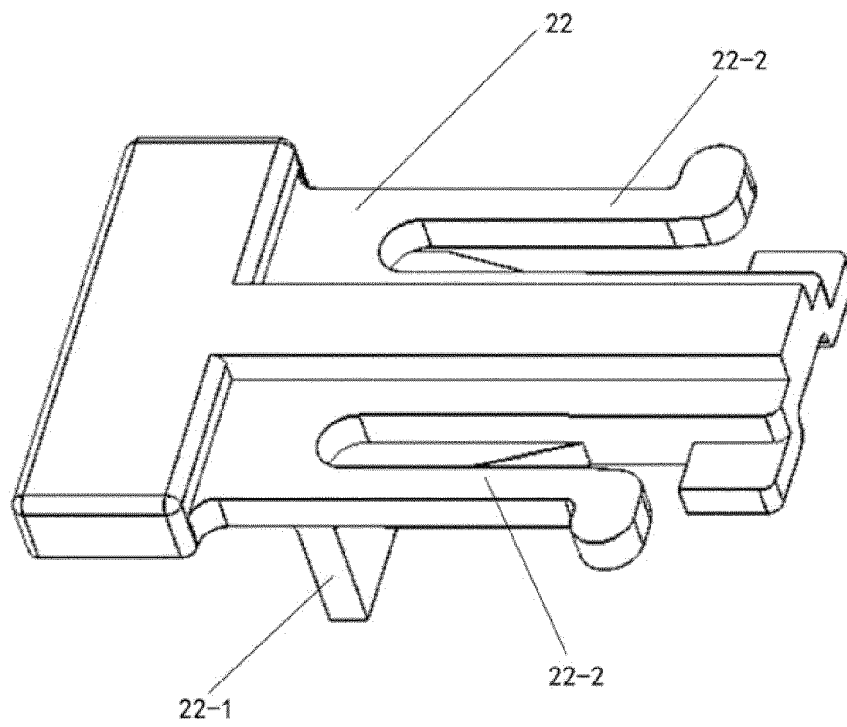


FIG.32

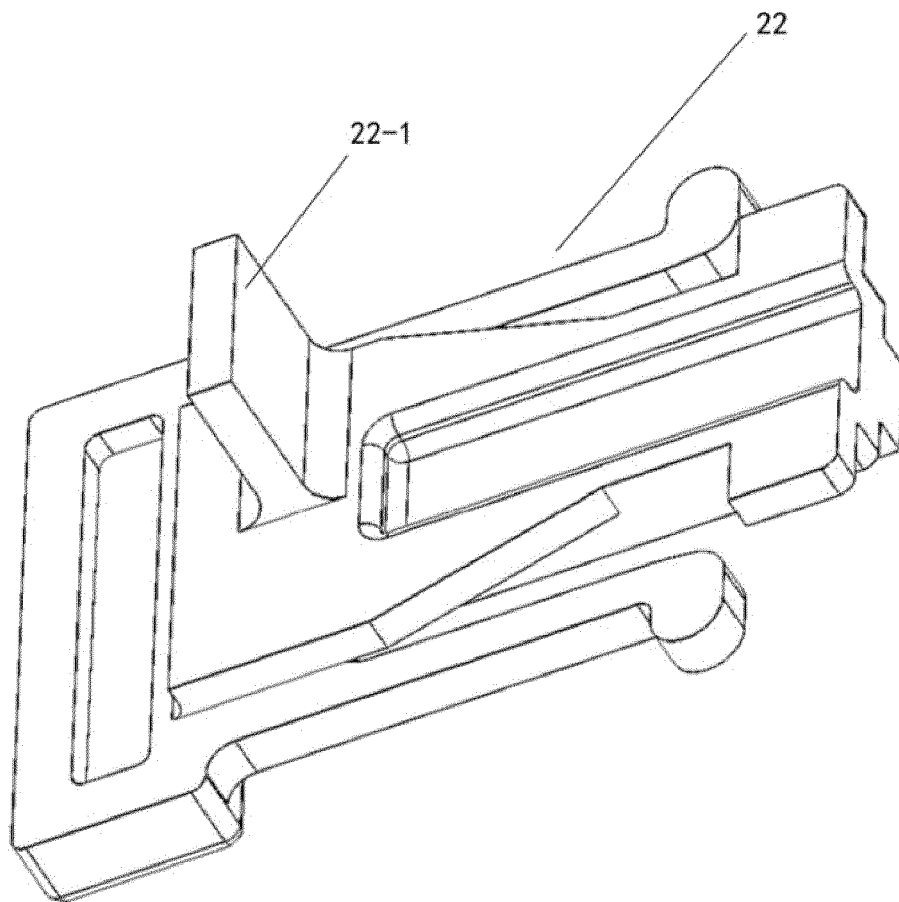


FIG.33

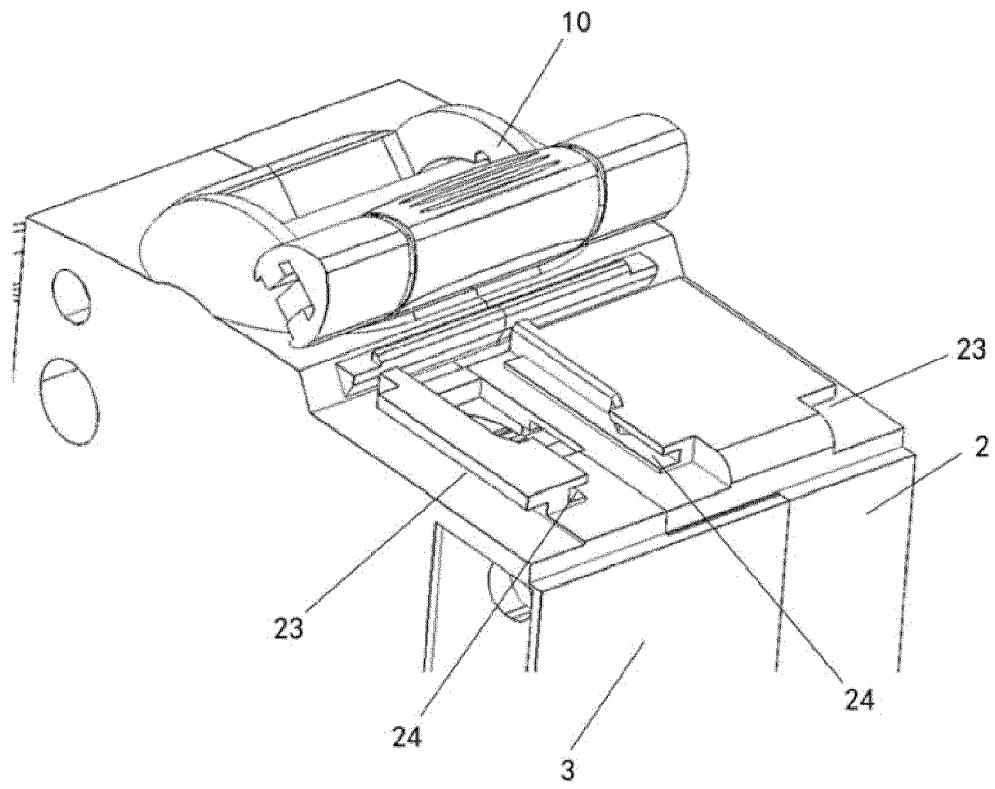


FIG.34

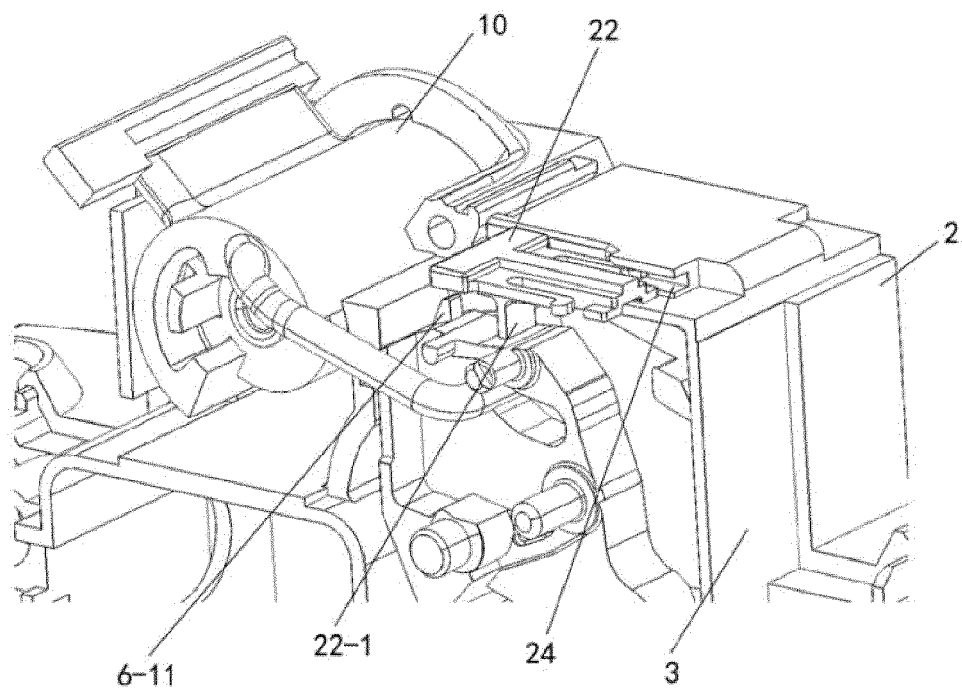


FIG.35

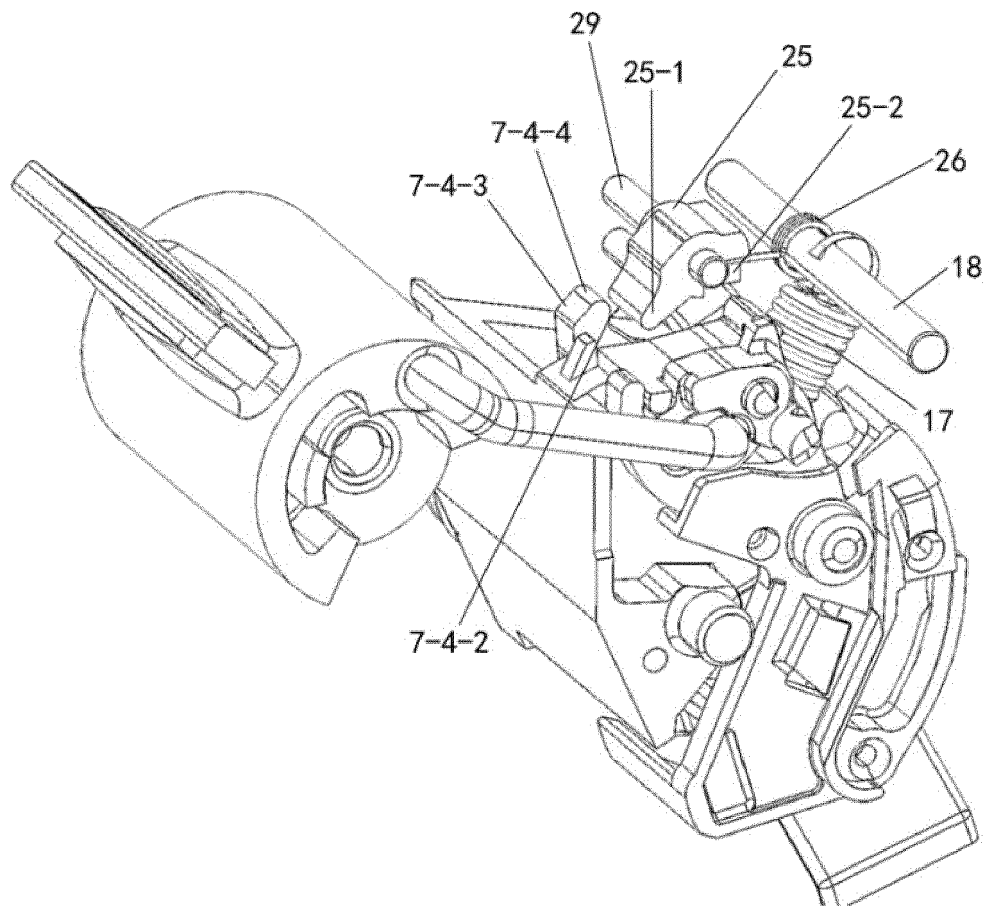


FIG.36

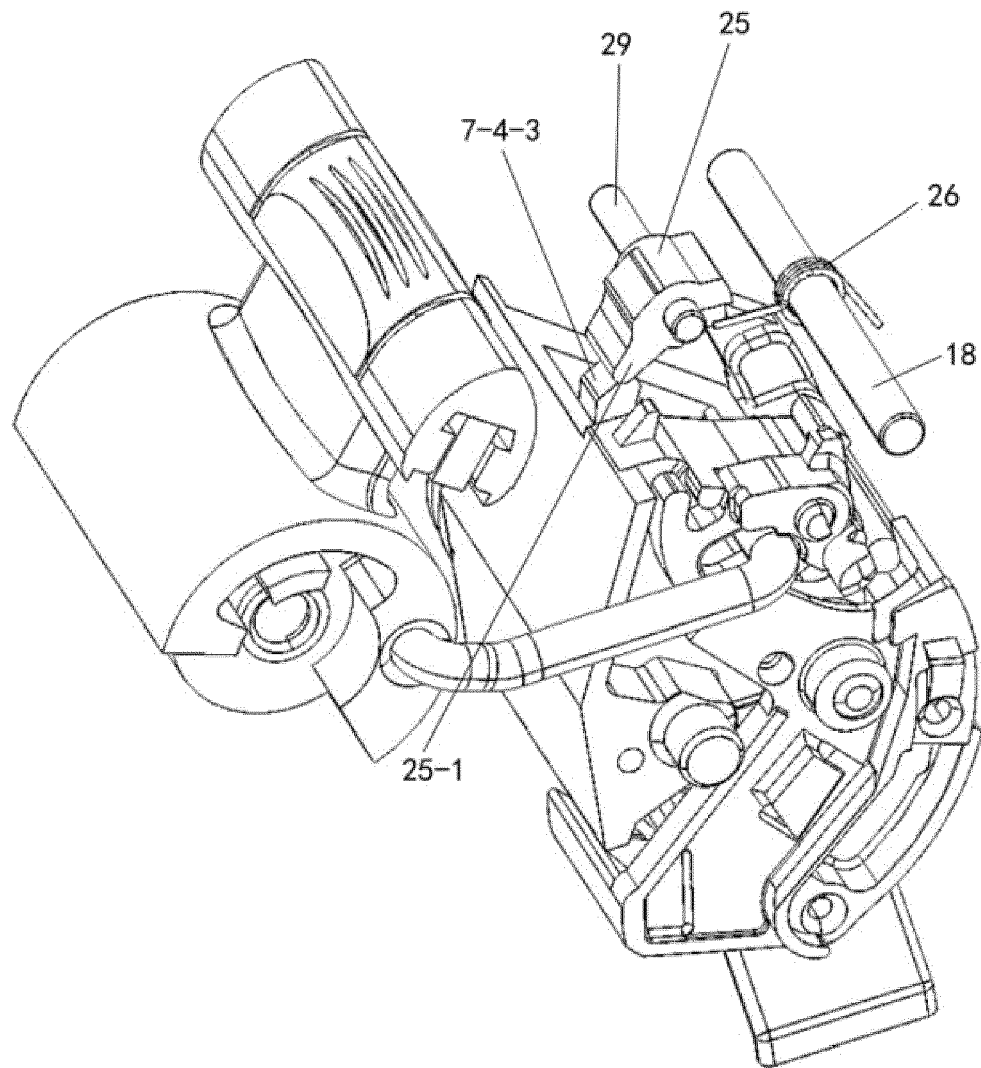


FIG.37

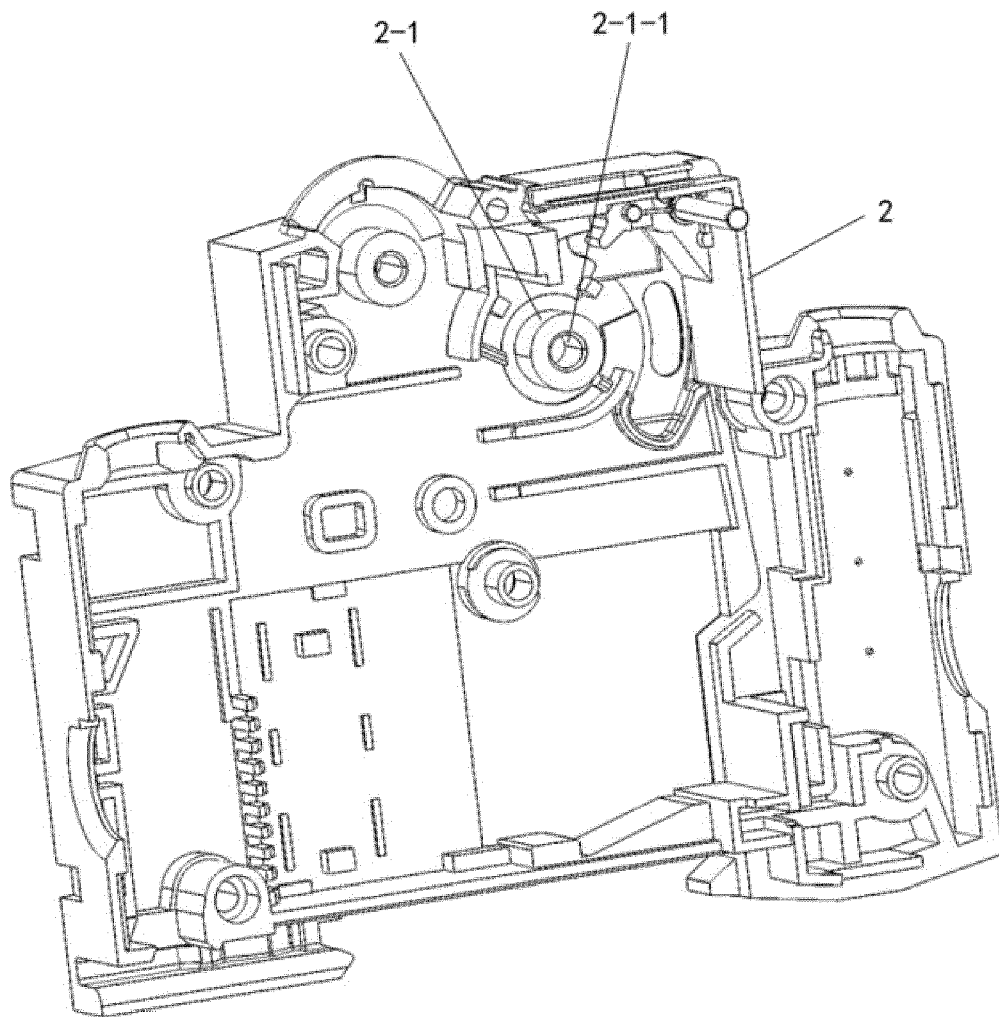


FIG.38



EUROPEAN SEARCH REPORT

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EP 22 30 5136

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EP 0 570 647 A1 (HAGER ELECTRO [FR]) 24 November 1993 (1993-11-24) * column 5, line 14 - column 9, line 57; figures * -----	1-23	INV. H01H71/52
A	EP 1 146 534 A1 (FELTEN & GUILLEAUME KG [AT]) 17 October 2001 (2001-10-17) * paragraphs [0037] - [0062]; figures * -----	1	
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			TECHNICAL FIELDS SEARCHED (IPC)
			H01H
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 29 June 2022	Examiner Findeli, Luc
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

**ANNEX TO THE EUROPEAN SEARCH REPORT
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5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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