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(54) **MULTI-POLE DOUBLE-BREAKPOINT PLASTIC-SHELL CIRCUIT BREAKER**

(57) The invention relates to a multi-pole double-break contact plastic case circuit breaker. A plurality of single pole circuit breaking units are arranged in an insulation case. The unit plastic case of each single pole circuit breaker is provided with a contact system and a matched arc extinguishing system. The contact system of each pole comprises two static contacts configured oppositely and a bridge-shaped movable contact, wherein each bridge-shaped movable contact is mounted on a contact support. Each arc extinguishing system comprises two arc extinguishing chambers that are arranged symmetrically. Outer rings of a plurality of rolling bearings are fixedly mounted on partition walls through a bearing mechanism, inner rings of the rolling bearings are directly connected with the contact supports in a stationary fit manner, and every two adjacent contact supports are in plug connection directly in a stationary fit manner; a cylindrical chamber for accommodating each contact support is arranged between two arc extinguishing chambers of the unit plastic case of each single pole circuit breaking unit. Therefore, high sensitivity and high precision of rotation of each contact support are ensured, and the precision and synchronism requirements can be ensured through machining just relying on the precision of a die itself.

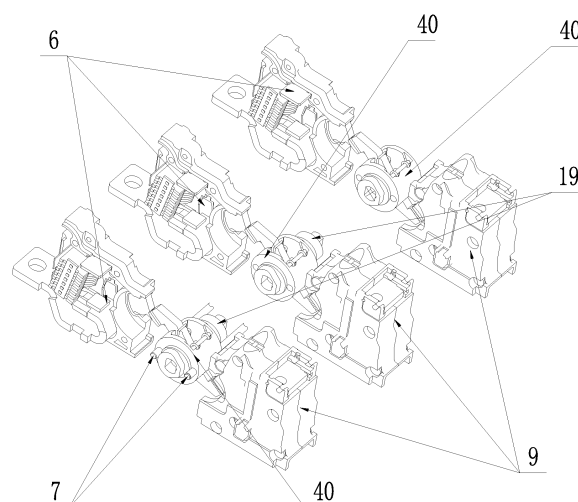


Fig. 3

Description

TECHNICAL FIELD

[0001] The present invention relates to the field of low-voltage apparatuses, in particular to a multi-pole double-break contact plastic case circuit breaker.

BACKGROUND ART

[0002] A multi-pole double-break contact plastic case circuit breaker is an extensively used devices circuit breaker in low-voltage circuit breakers. All the parts and components of the multi-pole double-break contact plastic case circuit breaker are mounted in a box-type plastic case. A molded insulation plastic case of the multi-pole double-break contact plastic case circuit breaker generally comprises a plastic case base as a case base and a plastic case cover plate matched with the plastic case base, and the plastic case base and the plastic case cover plate constitute a chamber. Circuit breaking units of a plurality of poles, each of which including a contact system configured to execute closing and breaking of a circuit and an arc extinguishing system thereof, are arranged in the molded insulation case. As a typical structure, each circuit breaking unit has a box of the same specification, which is made of molded plastic, and contacts, arc extinguishing chambers and matched members of one pole are mounted in the box. A plurality of circuit breaking units which have the same structure are arranged in the plastic case base side by side, wherein a shared operating mechanism is arranged on the circuit breaking units, and each circuit breaking unit and the operating mechanism are encapsulated inside the chamber by the plastic case cover plate to form a multi-pole circuit breaker. The contact system of each pole comprises two movable contact components and a double-contact point movable contact bridge which can be in contact with or separated from the static contact components of this pole under the driving of the operating mechanism, wherein the double-contact point bridge-shaped movable contact is matched with two static contacts arranged oppositely. Two arc extinguishing chambers of each pole include arc extinguishing grids which are mounted inside two arc extinguishing chambers symmetrically. Because a user requires favorable closing and breaking capacities and thermal stability of such circuit breaker, but parts and components constituting the contacts, the arc extinguishing systems and releasing and operating mechanisms are miscellaneous, and movable and static connection fit links formed after assembly of the parts and components are large in quantity and complicated, the performances, such as the breaking capacity, the action synchronism of contacts of each pole, the contact pressure of the movable contacts and the static contact and breaking and closing speeds, of such circuit breaker and the product reliability are greatly related to the reasonability in structure design of the circuit breaker,

and the machining and assembling precision of parts and components, however, the machining and assembling precision of parts and components is directly related to the production efficiency and the manufacturing cost. In consideration of the requirements of improving the production efficiency, reducing the manufacturing cost and facilitating large-scale automatic production, on the promise of ensuring the product quality and performance requirements, it is always an important problem to be solved in structural design to reduce the machining and assembling precision of parts and components as much as possible and simplify assembling and debugging processes as much as possible.

[0003] There also exists a multi-pole circuit breaker in the prior art, which only has single pole circuit breaking units, wherein a bridge-shaped contact of the circuit breaker is supported by a rotary rod-shaped block, the rod-shaped block extends transversely out from the center of a box of each circuit breaking unit, is inserted into two big side surfaces of the box and can move transversely in parallel to the centers of the two big surfaces; these rod-shaped blocks of different parallel units are coupled with a crank of the operating mechanism through two parallel connecting rods; the shared operating mechanism is fixed at the upper part of the middle circuit breaking unit of the circuit breaker and is provided with two metal flanges for supporting a bearing of the crank and a connecting rod for driving the bottom of the crank. The actions of the operating mechanism are transferred to the rod-shaped rod of each pole upon the rotation of the crank to drive two connecting rods, such that the movable and static contacts of each pole are broken or closed. Since the bridge-shaped movable contact of the circuit breaker is mounted on each rod-shaped block in a floating manner, and different rod-shaped blocks are mechanically connected just by two connecting rods, the following problems are caused: the relative deformation among the rod-shaped blocks of poles are great relatively due to a slender structure of the two connecting rods, such deformation directly affecting the action synchronism of the bridge-shaped movable contact; because two connecting rods are very low in rotation precision per se and have slender structures, the two connecting rods does not possess a function of providing the rotation precision for each rod-shaped block, and therefore the rotation precision of each rod-shaped block is ensured necessarily relying on a clearance between the rod-shaped block and the box, but the defect of a manufacturing error needs to be compensated by virtue of said clearance, and this compensation will damage the rotation precision of the rod-shaped block, therefore it is necessary for each rod-shaped block to be mounted in the box with a certain clearance. That is to say, the clearance between the rod-shaped block and the box cannot be made to be very small, but high-precision rotation of each rod-shaped block cannot be realized if the clearance is large relatively; airflow generated during circuit breaking is inevitably discharged from the clearance between each rod-

shaped block and the box, and the high-temperature air-flow with great impact will inevitably cause random damage to the clearance, thereby causing instability, even easy failure of rotation precision of each rod-shaped block with increase of the service time of the product. However, the rotation precision of each rod-shaped block is a key to ensure the synchronism of breaking and closing actions of the contacts and the contact pressure performances of the movable and static contacts that are closed, and therefore such prior art has a very high requirement on the machining precision and the assembling precision of related parts and components, and the action synchronism among contacts of each pole, the contact pressure performances of contacts of each pole, the breaking capacity of the contacts, the reliability and the service life of the product, and the like are waiting to be further improved.

[0004] There still exists a multi-pole circuit breaker in the prior art, which only has multi-pole circuit breaking units, wherein movable contacts of a plurality of circuit breaking units of the circuit breaker are arranged on one rotating shaft through contact supports, and the integrally designed rotating shaft is mounted on a partition wall of a big plastic case through a bearing cover and a bearing base. A bridge-shaped movable contact is mounted on the contact supports on the rotating shaft in a floating manner, each contact support is integrally, rigidly and mechanically connected with the rotating shaft, and therefore the action consistency of the movable contact and the rotating shaft of each pole is improved, and the defect of a manufacturing error can be compensated by virtue of an overtravel difference between the contact bridge and two static contacts. However, the new problem lies in: it is necessary to improve the machining precision requirements on parts and components in order to ensure ideal fit assembly between the rigid integrated rotating shaft and the big plastic case, and it is necessary to ensure that a rigid friction surface of fit movement between the rotating shaft and the bearing cover as well as the bearing base has very high wear resistance, or wear of the rotating shaft and failure of the precision of parts and components still will cause asynchronism of actions of the movable contact of each pole relative to static contacts; since it is very difficult to ensure high machining precision of parts and components in large-scale production, which will increase in cost and reduction in production efficiency, it is necessary to increase a fit clearance between the rotating shaft and the bearing cover as well as the bearing base, or the problem of inflexible rotation of the rotating shaft will be caused to directly affect the breaking and closing speeds of the contacts, whereas increase of the fit clearance will affect the rotation precision of the rotating shaft.

[0005] It is a very good idea to solve the problems encountered by the multi-pole double-break contact plastic case circuit breaker using the advantages of high rotation precision and flexible rotation of rolling bearings, but, in specific implements, it is also necessary to solve a series

of technical problems, for example: how to realize a structure in which inner rings of enclosed rolling bearings are conveniently mounted to the middle of the rotating shaft which has two thick ends and a thin middle, how to ensure the rigidity, the precision of form and position and the rotation precision of a rotary structure composed of the contact supports and the rolling bearings, and how to satisfy the technical requirements, such as easy machining, assembly and debugging, fewer parts, low manufacturing cost and suitability for large-scale production of a complicated structure composed of a plurality of rolling bearings, contact supports, movable contacts, circuit breaking units and the plastic case.

15 SUMMARY OF THE INVENTION

[0006] An objective of the present invention is to overcome the defects of the prior art and provide a novel multi-pole double-break contact plastic case circuit breaker, which adopts a reliable and relatively simple mechanism, is beneficial to realizing synchronism among contacts while reducing the inevitable influences from factors of poor coaxiality, rigidity and strength due to more connecting links, achieves reliable mechanical connection and transmission among circuit breaking units of different poles, improves the performances and the reliability of the product and is easy to machine and debug.

[0007] To achieve the said objective, the present invention provides the following specific technical solutions.

[0008] With respect to a multi-pole double-break contact plastic case circuit breaker, a plurality of chambers 22 for accommodating a plurality of single pole circuit breaking units 30, which are separated by partition walls g, are arranged in an insulation case, wherein each single pole circuit breaking unit 30 has a unit plastic case; each unit plastic case is internally provided with a contact system configured to execute closing and breaking of a main circuit in a pole where the unit plastic case is located, and a matched arc extinguishing system; the contact system of each pole comprises two static contacts 14, 16 which are configured oppositely and a bridge-shaped movable contact 20 which can be closed with and broken from the two static contacts 14, 16 respectively; each bridge-shaped movable contact 20 is mounted on a contact support in an elastic overtravel manner; an operating mechanism 4 of the circuit breaker drives the contact supports of a plurality of single pole circuit breaking units 30 by a driving mechanism to rotate synchronously; each arc extinguishing system comprises two arc extinguishing chambers 6, 9 that are arranged in the unit plastic case symmetrically; two static contacts 14, 16 are arranged in arc extinguishing areas of the two arc extinguishing chambers 6, 9 respectively; the multi-pole double-break contact plastic case circuit breaker further comprises a plurality of rolling bearings 19, wherein inner rings of the rolling bearings 19 are directly connected with the contact supports in a stationary fit manner, and

two adjacent contact supports are in plug connection directly in a stationary fit manner; a cylindrical chamber b for accommodating the contact support is arranged between the two arc extinguishing chambers 6, 9 of the unit plastic case of each single pole circuit breaking unit 30; each cylindrical chamber b comprises a circular arc surface a; two arc insulating walls 6a, 9a are arranged between the cylindrical chamber b and the two arc extinguishing chambers 6, 9 respectively and are respectively provided with two windows that are communicated with each other; two ends of the bridge-shaped movable contact 20 extend into the two arc extinguishing chambers 6, 9 from the two windows respectively; each contact support comprises an outer cylindrical surface 183 which is matched with the circular arc surface a, and a fit clearance is arranged between the outer cylindrical surface 183 and the circular arc surface a.

[0009] Further, a connecting shaft is arranged at one end of the contact support of one of the two adjacent single pole circuit breaking units in an axial direction X of the contact support, wherein the connecting shaft is integrally formed and is coaxial with the outer cylindrical surface 183 of the contact support; the connecting shaft is sleeved with the inner rings of the rolling bearings 19 in a stationary manner; a connecting shaft hole 100 which is connected with the connecting shaft in a stationary fit manner is formed in one end of the contact support of the other single pole circuit breaking unit 30 in an axial direction X of the contact support; and the arrangement and connection of the connecting shaft and the connecting shaft hole 100 satisfy conditions under which the outer cylindrical surfaces 183 of all the contact supports are coaxial.

[0010] Further, the circuit breaker comprises three single pole circuit breaking units 30 that are arranged side by side, wherein a connecting shaft is arranged at each of two ends of the contact support of the middle single pole circuit breaking units 30 among the three single pole circuit breaking units in an axial direction X of the contact support, wherein each connecting shaft is integrally formed and is coaxial with the outer cylindrical surface 183 of the contact support; the connecting shafts at two ends of the middle contact support are sleeved with the inner rings of two rolling bearings 19 respectively in a stationary fit manner; a connecting shaft hole 100 which is connected with each connecting shaft in a stationary fit manner is formed in one end of the contact support of each of the other two single pole circuit breaking units 30 in an axial direction X of the contact support, and the arrangement and connection of the connecting shafts and the connecting shaft holes 100 satisfy conditions under which the outer cylindrical surfaces 183 of all the contact supports are coaxial.

[0011] Further, each connecting shaft comprises a rolling bearing connecting segment 181 which is connected with the inner rings of the rolling bearings 19 in a stationary fit manner and a contact support connecting segment 180 which is matched with the connecting shaft hole 100,

wherein the diameter of the contact support connecting segment 180 is less than that of the rolling bearing connecting segment 181; each contact support is made of a dough moulding compound or a sheet moulding compound by integral forming.

[0012] Further, the contact support connecting segment 180 of each contact support has a polygonal cross section, and the connecting shaft hole 100 of the contact support has a polygonal cross section matched with the cross section of the contact support connecting segment 180.

[0013] Further, a shaft shoulder 184 which is in contact fit with the inner rings of the rolling bearings 19 is arranged on the contact support connecting segment 180 of the contact support 18, and the outer end surface of the connecting shaft hole 100 of the contact support is provided with an assembling surface 185 which is in contact fit with the inner rings of the rolling bearings 19.

[0014] Further, the driving mechanism comprises two through shafts 7 which are arranged in parallel to each other, each contact support is provided with two small through holes 18a in an axial direction X of the contact support, and the two through shafts 7 penetrate through the two small through holes 18a in each contact support respectively and are then fixedly connected with a contact coupling piece of an operating mechanism 4; a rotation axis of the contact coupling piece is coaxial with the axis of the outer cylindrical surface 183 of each contact support.

[0015] Further, the driving mechanism comprises two convex shafts which are arranged on the contact coupling piece of the operating mechanism 4 and two small through holes 18a which are formed in the contact support close to the contact coupling piece of each operating mechanism 4, and the two convex shafts are in plug connection with the two small through holes 18a respectively; a rotation axis of the contact coupling piece is coaxial with the axis of the outer cylindrical surface 183 of the contact support.

[0016] Further, the bearing mechanism comprises a fixing plate 3 having a bearing semi-hole and a bearing base f which is arranged on the partition wall g and has a bearing semi-hole, wherein the fixing plate 3 is connected with the bearing base f, such that the two bearing semi-holes are butted; the outer rings of the rolling bearings 19 are connected and mounted with the two butted bearing semi-holes in a stationary fit manner.

[0017] Further, the unit plastic case of each single pole circuit breaking unit 30 comprises a first small side case plate 10, a second small side case plate 11, a third small side case plate 12 and a fourth small side case plate 13, wherein the first small side case plate 10 and the second small side case plate 11 are assembled oppositely to form a first arc extinguishing chamber 6 and a first semicylindrical chamber, and the third small side case plate 12 and the fourth small side case plate 13 are assembled oppositely to form a second arc extinguishing chamber 9 and a second semicylindrical chamber; the first arc ex-

tinguishing chamber 6 is provided with a first clamping part c1 and a second clamping part c2; the second arc extinguishing chamber 9 is provided with a third clamping part d1 and a fourth clamping part d2; the first clamping part c1 is in clamping fit with the third clamping part d1 to form fixed connection; the second clamping part c2 is in clamping fit with the fourth clamping part d2 to form fixed connection; the first semicylindrical chamber and the second semicylindrical chamber are fixedly connected through the first arc extinguishing chamber 6 and the second arc extinguishing chamber 9 and assembled to form a cylindrical chamber b.

[0018] Further, the unit plastic case of each single pole circuit breaking unit 30 comprises a first big side case plate 23 and a second big side case plate 24, wherein the first big side case plate 23 and the second big side case plate 24 are assembled oppositely to form two arc extinguishing chambers 6, 9 and a cylindrical chamber b.

[0019] With respect to any one of the above technical solutions of the present invention, the contact supports, as well as the contact supports and the rolling bearings are in plug connection directly, which is beneficial to realizing synchronism among contacts while reducing the inevitable influences from factors of poor coaxiality, rigidity and strength due to more connecting links, achieves reliable mechanical connection and transmission among circuit breaking units of different poles, and improves the performances and the reliability of the product. The reasonable design of the rolling bearings and the partition walls, as well as the contact supports and the cylindrical chambers of the arc extinguishing chambers is easier to ensure the precision of the rotary supports and the anti-load rigidity of the shafts, reduce the manufacturing precision and cost of parts and components of the movable contact bridge assembly, and facilitate to machine and debug, and improve the performances and production efficiency of the movable contact bridge assembly. The defects in terms of strength requirements, temperature resistance requirements and insulation performances of the movable contact bridge assembly appearing in long-term use of the circuit breaker are solved.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020] The advantages and features of the present invention will be seen more clearly from the description of the embodiments as shown in drawings, wherein:

Fig. 1 is an overall exploded drawing of the multi-pole double-break contact plastic case circuit breaker of the present invention, which illustrates an overall exploded structure of a three-pole double-break contact plastic case circuit breaker.

Fig. 2 is a structural schematic drawing of a molded insulation case base 21 of the multi-pole double-break contact plastic case circuit breaker of the present invention as illustrated in Fig. 1, which illus-

trates a three-pole double-break contact plastic case circuit breaker supported by the a case base 21.

Fig. 3 is an exploded drawing of a three-pole circuit breaking unit of the multi-pole double-break contact plastic case circuit breaker of the present invention as illustrated in Fig. 1, where the single pole circuit breaking unit 30 adopts a structure of the first embodiment.

Fig. 4 is an assembled appearance schematic drawing of a circuit breaking unit of the first embodiment of one pole in the multi-pole double-break contact plastic case circuit breaker of the present invention as illustrated in Fig. 3, where two arc extinguishing chambers of the single pole circuit breaking unit of the first embodiment can be split.

Fig. 5 is an internal structural schematic drawing of one arc extinguishing chamber 6 of the two split arc extinguishing chambers as illustrated in Fig. 4.

Fig. 6 is an internal structural schematic drawing of the other arc extinguishing chamber 9 of the two split arc extinguishing chambers as illustrated in Fig. 4.

Fig. 7 is an assembled appearance schematic drawing of a circuit breaking unit of the second embodiment of one pole in the multi-pole double-break contact plastic case circuit breaker of the present invention, where two arc extinguishing chambers of the single pole circuit breaking unit of the second embodiment can be split.

Fig. 8 is an internal structural drawing of a single pole circuit breaking unit 30 of the second embodiment as illustrated in Fig. 7.

Fig. 9 is a structural schematic drawing after the contact supports of each pole of the multi-pole double-break contact plastic case circuit breaker of the present invention as illustrated in Fig. 1 are assembled, where one contact support 17, two contact supports 18 and two rolling bearings 19 are assembled together to form a specific structure of a three-pole movable contact bridge assembly 8.

Fig. 10 is an exploded drawing of three contact supports and two rolling bearings 19 as illustrated in Fig. 9.

Figs. 11-13 are structural drawings of parts of the contact supports 18 in three contact supports as illustrated in Fig. 9, wherein

Fig. 11 is a planar main view of the contact supports 18;

Fig. 12 is a planar right view of Fig. 11;

Fig. 13 is a planar left view of Fig. 11.

Fig. 14 is another embodiment of the three-pole movable contact bridge assembly 8 of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0021] Specific embodiments of a multi-pole double-break contact plastic case circuit breaker of the present

invention are further illustrated as below in conjunction with the embodiments provided by Figs. 1 to 14. The following embodiments of the circuit breaker of the present invention are described just as non-restrictive examples.

[0022] The embodiment in the exploded drawing of the overall structure as illustrated in Fig. 1 is a three-pole double-break contact circuit breaker, which comprises an upper cover 1, an intermediate cover 2, an operating mechanism 4, a handle 5 and a case base 21. The case base 21 and the intermediate cover 2 and the upper cover 1 which are matched with the case base 21 and mounted on the case base 21 constitute an insulation case of the multi-pole double-break contact circuit breaker together, the insulation case being referred to as a big plastic case. The insulation case is made of PBT or PA66 engineering plastic and is in a hexahedron shape approximately. Internal members of the multi-pole double-break contact circuit breaker are mounted inside the big plastic case assembled by the case base 21 and the intermediate cover 2, the upper part of the intermediate cover 2 of the big plastic case is sealed by the upper cover 1, and the handle 5 penetrates out from a hole in the intermediate cover 2.

[0023] Referring to Figs. 1-3, a plurality of chambers 22 for accommodating a plurality of single pole circuit breaking units 30 and separated by partition walls g are arranged in the insulation case, that is, each chamber 22 is internally provided with a single pole circuit breaking unit 30 of one pole. Each single pole circuit breaking unit 30 has a unit plastic case which is in a hexahedron shape approximately. The unit plastic case is also referred to as a small plastic case which is internally provided with a contact system configured to execute closing and breaking of a main circuit where the unit case is located, and a matched arc extinguishing system. Or to say, the contact system and the arc extinguishing system of one pole are encapsulated in the small plastic case. With respect to the double-break contact plastic case circuit breaker, the contact system of each pole certainly comprises two static contacts 14, 16 that are configured oppositely and a bridge-shaped movable contact 20 which can be simultaneously closed with and broken from the two static contacts 14, 16 respectively, to be specific, the bridge-shaped movable contact 20 is simultaneously closed with the two static contacts 14, 16 or simultaneously broken from the static contacts 14, 16, and the main circuit controlled by the circuit breaker is switched on when the movable contact and the static contacts are closed, and is switched off when the movable contact is broken from the static contacts. With respect to the double-break contact plastic case circuit breaker, the arc extinguishing system of each pole needs to comprise two arc extinguishing chambers 6, 9 which are arranged in the small plastic case symmetrically, two arc extinguishing grids 15a, 15b are arranged in the two arc extinguishing chambers 6, 9 respectively, the two static contacts 14, 16 are arranged in arc extinguishing areas of the two

arc extinguishing chambers 6, 9 respectively, and the arc extinguishing areas where the two static contacts 14, 16 are located are areas where the bridge-shaped movable contact 20 is in closing and breaking fit with the two static contacts 14, 16 respectively. Each bridge-shaped movable contact 20 is mounted on a contact support 17 or 18 in an elastic overtravel manner to form a movable contact bridge assembly 40, thereby realizing the structure of such elastic overtravel manner. As illustrated in Fig. 9, an elastic overtravel assembly 20a comprises an overtravel spring by which the bridge-shaped movable contact 20 is mounted in a big through hole 182 of the contact support 17 or 18. An operating mechanism 4 shared by multiple poles is arranged above the circuit breaking unit of the middle pole, and drives each of the support contacts 17, 18 by a driving mechanism to synchronously rotate. There are a plurality of mounting structures provided for the operating mechanism 4. Generally, a structure in which a stander (not shown in drawings) of the operating mechanism is fixedly connected with the case base 21 is adopted to facilitate assembly and debugging. Each of the operating mechanisms of such kind of circuit breaker is provided with a driving mechanism for driving the contacts to rotate. The driving mechanism certainly comprises a contact coupling piece (not shown in Drawings). The operating mechanism is connected with the bridge-shaped movable contact through the contact coupling piece (directly or indirectly) to realize linkage between the contact coupling piece and the bridge-shaped movable contact, i.e., the contact system is driven by the contact coupling piece to make closing and breaking actions.

[0024] The improvements and innovations of the present invention will be further described as below in conjunction with drawings, with its cores about how to simultaneously drive the contact supports 17, 18 of each pole to rotate by the operating mechanism, how to ensure the rotation synchronism and flexibility of the contact supports 17, 18 of each pole, how to obtain an optimized structure easily achieving large scale, high efficiency and low cost production, how to reduce the manufacturing precision and cost of parts and components of the movable contact bridge assembly, how to improve the overall performances of the movable contact bridge assembly and improve the production efficiency, and how to solve the defects in terms of strength requirements, temperature resistance requirements, insulation performances and the like of the movable contact bridge assembly in long-term use of the circuit breaker.

[0025] Referring to Figs. 1-14, the multi-pole double-break contact plastic case circuit breaker of the present invention further comprises a plurality of rolling bearings 19, wherein outer rings of the rolling bearings 19 are fixedly mounted on the partition walls g through a bearing mechanism, inner rings of the rolling bearings 19 are directly connected with the contact support 17 or 18 in a stationary fit manner, and two adjacent contact supports 17 and/or 18 are in plug connection directly in a stationary

manner. By means of such structure, a plurality of rolling bearings 19 and the contact support 17 or 18 form the movable contact bridge assembly 8 as illustrated in Fig. 9. The stationary fit manner refers to that two parts that are matched with each other are connected by fit without moving oppositely, including interference fit or transition fit.

[0026] A cylindrical chamber b for accommodating a contact support 17 or 18 is arranged between two arc extinguishing chambers 6, 9 of the unit plastic case of each single-pole circuit breaking unit 30, wherein the cylindrical chamber b comprises a circular arc surface a; two arc insulating walls 6a, 9a are arranged between the cylindrical chamber b and two arc extinguishing chambers 6, 9 respectively and respectively provided with two windows that are communicated with each other; two ends of the bridge movable contact 20 extend into the two arc extinguishing chambers 6, 9 respectively from two windows; each of the contact support 17, 18 comprises an outer cylindrical surface 183 which is matched with the circular arc surface a, and a fit clearance is arranged between the outer cylindrical surface 183 and the circular arc surface a. It should be understood that the so-called fit clearance refers to that a clearance between the outer cylindrical surface 183 of the contact support 17 and the circular arc surface a of the small plastic case of the single pole circuit breaking unit 30 can be fit with a clearance between the contact support 18 and the circular arc surface a of the small plastic case of the single pole circuit breaking unit 30, thereby not only ensuring that the contact supports 17, 18 can rotate therein flexibly, but also preventing high-pressure gas in the two arc extinguishing chambers from leaking to the circular chamber b because each of the clearances is very small enough. Of course, the fit clearance of the present invention not only has the function of preventing high-voltage gas in the arc extinguishing chambers from leaking to the cylindrical chamber, but also has a function of improving the rotation precision and rigidity of the contact supports. However, the "micro clearance" or "certain clearance" in the prior art mainly has a function of preventing high-pressure gas in the arc extinguishing chambers from leaking to the circular chamber, or enabling rod-shaped blocks to move slightly in other direction in order to compensate the irregularity in manufacturing and mounting. In order to obtain a more ideal fit, a preferred solution lies in that the axis of the outer cylindrical surface 183 of each of the contact supports 17, 18, the axis of each contact support connecting segment 180 and the axis of each connecting shaft hole are coaxial mutually.

[0027] The movable contact bridge assembly 8 consists of a plurality of contact supports that are in plug connection directly, wherein a connecting shaft that is integrally formed is arranged at one end of the contact support of one single pole circuit breaking circuit 30 in two adjacent single pole circuit breaking units 30 in an axial direction X of the contact support, and a connecting shaft hole 100 corresponding to the connecting shaft is

formed in one end of the contact support of the other single pole circuit breaking unit 30 in an axial direction X of the contact support; the connecting shaft hole 100 is connected with the connecting shaft in a stationary fit manner; rolling bearings 19 are arranged on the connecting shaft of the two adjacent contact supports, wherein inner rings of the rolling bearings 19 are directly connected with the connecting shaft in a stationary fit manner. There are a plurality of specific structures can be provided for the contact supports, and a preferred structure as illustrated in Figs. 9-13 includes contact supports 18 and a contact support 17 which are slightly different in shape. A rolling bearing connecting segment 181 which is coaxial with the outer cylindrical surface 183 is arranged at one end of each contact support 18 in an axial direction X of the contact support, and a contact support connecting segment 180 extends out from one end of the rolling bearing connecting segment 181 in an axial direction X of the contact support; a connecting shaft comprises the rolling bearing connecting segment 181 and the contact support connecting segment 180 which are integrally formed with the contact support 18; the diameter of the contact support connecting segment 180 is less than that of the rolling bearing connecting segment 181, and the rolling bearing connecting segment 181 is sleeved with the inner rings of the rolling bearings 19 in a transition fit manner. The contact support 17 differs from each contact support 18 in that: the contact support 17 is not provided with the rolling bearing connecting segment 181 and the contact support connecting segment 180. The contact support 18 is the same as each contact support 18 in the following structure: a connecting shaft hole 100 is formed in the other end of each of the contact support 17, 18 in an axial direction of the contact support, the connecting shaft hole 100 being used for accommodating the adjacent contact support connecting segment 180 of the contact support 17 or 18, and is connected with the contact support connecting segment 180 in an interference fit manner. In addition, the arrangement and connection of the contact support connecting segment 180 and the connecting shaft hole 100 satisfy conditions under which the outer cylindrical surfaces 183 of the contact supports 17, 18 are coaxial; the outer cylindrical surface of each of the contact support 17, 18 is provided with a big through hole 182 which is penetrated radially and used for accommodating the bridge-shaped movable contact 20, two ends of the bridge-shaped movable contact 20 mounted inside the big through hole 182 through the elastic overtravel assembly 20a extend out of the outer cylindrical surface 183 symmetrically respectively, and the two extending ends extend into parts inside the two arc extinguishing chambers 6, 9 respectively from two windows on two arc insulating walls 6a, 9a of the single pole circuit breaking unit 30. Another more preferred solution is as illustrated in Fig. 14, wherein the circuit breaker comprises three single pole circuit breaking units 30 that are arranged side by side. Each single pole circuit breaking unit 30 comprises a contact support, and three contact

supports are in plug connection directly to form a movable contact bridge assembly 8. A connecting shaft is arranged at each of two ends of the middle contact support of the single pole circuit breaking unit 30 in an axial direction X of the contact support, the connecting shaft being integrally formed and being coaxial with the outer cylindrical surface 183 of the contact support; the connecting shaft at two ends of the middle contact support are sleeved with the inner rings of two rolling bearings 19 respectively in a stationary fit manner; a connecting shaft hole 100 which is connected with the connecting shaft in a stationary fit manner is formed in one end of each of the two contact support of the single pole circuit breaking unit 30 in an axial direction X of the contact support. In addition, the arrangement and connection of the connecting shaft and the connecting shaft hole 100 satisfy conditions under which the outer cylindrical surfaces 183 of all the contact supports are coaxial. The coaxiality of the outer cylindrical surfaces 183 of the movable contact bridge assembly 8 in this embodiment is better. Of course, the connecting shaft in this embodiment may also comprise a rolling bearing connecting segment 181 and a contact support connecting segment 180. Because there is force transfer existing in connection between the contact support connecting segment 180 and the connecting shaft hole 100, in order to realize more stable and reliable stationary fit therebetween and achieve higher rigidity, a preferred structure solution is as follows: the cross section of the contact support connecting segment 180 of the contact support 18 is of polygonal, or elliptical or other non-circular specially-shaped structure, and the cross section of the connecting shaft hole 100 of each of the contact support 17, 18 is of a polygonal, elliptical or other non-circular specially-shaped structure matched with the cross section of the contact support connecting segment 180. In order to realize more stable and reliable stationary fit between the rolling bearing connecting segment 181 and the inner rings of the rolling bearings 19 and prevent the inner rings of the rolling bearings 19 from slipping along the axial direction of the rolling bearing connecting segment 181, a preferred solution is as follows: a shaft shoulder 184 which is in contact fit with the inner rings of the rolling bearings 19 is arranged on the contact support connecting segment 180 of the contact support 18, an assembling surface 185 which is in contact fit with the inner rings of the rolling bearings 19 is arranged on the outer end surface of the connecting shaft hole 100 of each of the contact support 17, 18, and after the rolling bearings 19 are mounted on each contact support, two end surfaces of the inner rings of the rolling bearings 19 butt against the shaft shoulder 184 and the assembling surface 185 respectively to prevent the rolling bearings 19 from shifting axially. Each of the contact supports 17, 18 is made of DMC (Dough Moulding Compound) or SMC (Sheet Moulding Compound) engineering moulded plastic so as to improve the overall heat resistance performance of the circuit breaker. During mounting, the connecting shaft

of the contact supports 18 passes through the metal rolling bearings 19 in an interference fit manner and is aligned and inserted into two side surfaces e of the connecting shaft hole of the contact support 17, and the side surfaces e are used to implement axial centralized positioning of the aligned and inserted overall rotating shaft. Then, the contact supports 17, 18 are connected in series by using two through shafts 7 to ensure the rigidity and positioning the integrally spliced movable contact bridge assembly 8, and then the rotating shaft is fixed at a bearing base f having a bearing semi-hole of the insulation plastic case by using a fixing plate 3 and the metal rolling bearings 19 to realize centralized positioning of the rotating shaft and the contacts may not shake.

[0028] The driving mechanism connected with the operating mechanism 4 comprises two through shafts 7 which are arranged in parallel to each other, each of the contact supports 17, 18 is provided with two small through holes 18a arranged in an axial direction X of the contact support, and the two through shafts 7 penetrate through the two small through holes 18a in each of the contact supports 17, 18 respectively and are then fixedly connected with a contact coupling piece of the operating mechanism 4, accordingly, it is satisfied that a rotation axis of the contact coupling piece is coaxial with the axis of the outer cylindrical surface 183 of each of the contact supports 17, 18, i.e., is coaxial with a rotation axis of each of the contact supports 17, 18. The contact supports of each pole are connected in series adopting two through shafts to ensure the synchronism and the centering property of the contact supports of each pole, improve the overall rigidity and strength of the movable contact bridge assembly and ensure the stress uniformity of the contact supports of each pole, such that a solution is provided for improving a rated current of the circuit breaker, and the problem in terms of synchronism caused by loosening of the contact supports after the movable contact bridge assembly is operated repeatedly is solved; in addition, the contact supports are more flexible and convenient to mount, and the assembling process can be simplified. Due to the above special structures, the movable contact bridge assembly 8 of the present invention has relatively high rotation precision and rotation rigidity, or the precision and rigidity of mutual linkage between the contact supports 17, 18 is very high, and therefore it is not difficult to conceive that other contact supports 17, 18 can rotate synchronously as long as the operating mechanism 4 drives one of the contact support 17 or 18 to rotate. Therefore the structures of the embodiments provided by the above drawings can be substituted with the following structure (not shown in drawings): the driving mechanism comprises two convex shafts arranged on the contact coupling piece of the operating mechanism 4 and two small through holes 18a which are formed in the contact support 17 or 18 of the contact coupling piece close to each operating mechanism 4, wherein the two convex shafts are in plug connection with the two small through holes 18a respectively to satisfy that the rotation axis of

the contact coupling piece is coaxial with the axis of the outer cylindrical surface 183 of the contact support 17 or 18. It is obvious that such substitution scheme is not adaptive in the above prior art, and because of the deficiency in coaxiality and rotation precision of the prior art, this substitution scheme cannot be adopted, or the action synchronism of each contact support reduces significantly after the substitution scheme is adopted. Of course, the above substitution scheme in which the structure can be simplified can be adopted as one of the following beneficial technical effects of the present invention per se.

[0029] Referring to Figs. 1, 2, 9 and 10, the bearing mechanism comprises a fixing plate 3 having a bearing semi-hole and a bearing base f which is arranged on the partition wall g and has a bearing semi-hole, wherein the fixing plate 3 is fixedly connected with the bearing base f, such that the two bearing semi-holes are butted; the outer rings of the rolling bearings 19 are connected and mounted with the two butted bearing semi-holes in a stationary fit manner. It should be understood that, because the rolling bearings 19 are adopted, the "manufacturing and mounting irregularity" can be compensated by fixed connection of the fixing plate 3 and the bearing base f. But differing from the prior art, such compensation in the present invention will not cause the reduction in the coaxiality and the rotation precision; in order to realize the principle of this effect, radial and axial positions of the rolling bearings 19 can be finely adjusted when the fixing plate 3 is fixedly connected with the bearing base f, and by means of such fine adjustment structure, stable and reliable fixed connection between the outer rings of the rolling bearings 19 and the partition walls g can be realized, and high-precision flexible rotation of the inner rings of the rolling bearings 19 can be ensured.

[0030] Referring to Figs. 1-6, a small plastic case of each single pole circuit breaking unit 30 adopts a split structure, i.e.: the small plastic case of the single pole circuit breaking unit 30 comprises a first small side case plate 10, a second small side case plate 11, a third small side case plate 12 and a fourth small side case plate 13, wherein the first small side case plate 10 and the second small side case plate 11 are assembled oppositely to form a first arc extinguishing chamber 6 and a semicylindrical chamber, and the third small side case plate 12 and the fourth small side case plate 13 are assembled oppositely to form another arc extinguishing chamber 9 and a semicylindrical chamber; the arc extinguishing chamber 6 is provided with a first clamping part c1 and a second clamping part c2; the another arc extinguishing chamber 9 is provided with a third clamping part d1 and a fourth clamping part d2; the first clamping part c1 is in clamping fit with the third clamping part d1 to form fixed connection; the second clamping part c2 is in clamping fit with the fourth clamping part d2 to form fixed connection; the two semicylindrical chambers are fixedly connected through the two arc extinguishing chambers and assembled to form a complete cylindrical chamber b; the two arc extinguishing chambers 6 and 9 can be split in-

dependently. The present invention also has another technical effect: relative to the integral rotating shaft, the small plastic case of each single pole circuit breaking unit 30 of the present invention also adopts an integral structure which can be alternately substituted with the split structure, but is simpler than the split structure, and therefore the precise fit between the circular arc surface a on the small plastic case and the outer cylindrical surface 183 of each of the contact supports 17, 18 can be well ensured. The integral structure is as illustrated in Fig. 7-8: the small plastic case of each single pole circuit breaking unit 30 comprises a first side big case plate 23 and a second side big case plate 24 which are assembled into two arc extinguishing chambers 6, 9 and a cylindrical chamber b, and the two arc extinguishing chambers 6 and 9 are assembled integrally.

[0031] As illustrated in Figs. 1-2, the case base 21 of the big plastic case is provided with pole partition walls g, wherein a fixing plate 3 required for fixing the rolling bearings 19 is arranged on each partition wall g and can be detachably connected with the bearing base f in a screw fastening manner so as to facilitate mounting and changing, and the fixing plate 3 can adopt any one of systems suitable for such structure. In one preferred embodiment, an upper semicircular bearing semi-hole and a lower semicircular bearing semi-hole formed in the fixing plate 3 and the partition wall g respectively constitute a structure for fixing the rolling bearings 19. A semicircular groove formed by a body of the partition wall g is used as the bearing base f in the lower semicircle and has a diameter matched with the outer diameter of each rolling bearing 19; the fixing plate 3 having a bearing semi-hole as illustrated in Fig. 1 is used as a bearing cover plate in the upper semicircle and has a diameter matched with the outer diameter of each rolling bearing 19, and the fixing plate 3 is fixed on the big plastic case through screws. The outer rings of the rolling bearings 19 are fixed in the case base 21 through fit connection between the bearing base f and the fixing plate 3. Due to the adoption of this mounting structure, no loosening and convenient mounting of the rolling bearings 19 as illustrated in Fig. 9 for positioning and supporting can be ensured, and very flexible rotation performances of each contact support can be achieved. Meanwhile, a series of problems affecting product performances caused by machining errors and mounting errors, which have never been solved by the prior art, can be overcome at the same time, and relatively high mounting and positioning precision and enough bearing capacity can be obtained economically.

[0032] From the above, each of the existing circuit breakers is designed to be provided with a rotary rod-shaped block or rotating shaft which is used for fixedly connecting movable contact components of adjacent poles and supporting closing and breaking of the movable contact bridges. In order to realize the consistency in configuration of different circuit breaking units, it is necessary to ensure precise fit between the rotating shaft and the big plastic case of the circuit breaker, which de-

depends on the precision of the rod-shaped block or rotating shaft and a metal specially-shaped shaft connected in series therewith to act. However, the metal specially-shaped shaft is machined hardly, and the size precision is hard to ensure not to reduce the insulation performance and strength of the rotating shaft, and the manufacturing and assembling errors of the rotating shaft for supporting closing and breaking of the movable contact bridge is difficult to arrive at the supporting precision and assembling precision requirements of designed related parts and components, and therefore reliable mechanical connection and transmission among units of each pole cannot be realized. In the present invention, as improvements to the contact supports serving as core components of the circuit breaker and the synchronism as well as the arc extinguishing system of the circuit breaker, the ideal coaxiality, rigidity and flexibility of the rotation axis of each of the contact supports 17, 18 with the bridge-shaped movable contact 20 of each pole are realized by directly performing plug connection on a plurality of contact supports skillfully, adding the rolling bearings to the directly connected structure skillfully and connecting the contact supports of each pole in series by the two mutually parallel through shafts 7, the defects of strength reduction, poor temperature resistance, insulation performance reduction and the like of the movable contact bridge of each pole in long-term use of the circuit breaker in the past because the contact supports are arranged on one rotating shaft are solved, and the technical indexes in terms of the breaking capacity, working stability and the like of the low-voltage plastic case circuit breaker are completely improved. In the present invention, the double-break contact bridge-shaped movable contact is supported by the contact support 17 or 18, without the need of arranging a rotating shaft between the contact supports of adjacent poles, or without the need of arranging a connecting rod between the contact supports of each pole, and each contact support is directly connected with one of the adjacent contact supports 18, therefore connecting points are reduced to improve the coaxiality. A rolling bearing 19 is arranged between every two adjacent contact supports and is fixedly mounted on a partition wall g of the big plastic case of the circuit breaker. The rotation center of each contact support is defined by the rotation center of the rolling bearing 19, such that the rotation axis of each of the contact supports 17, 18 is coaxial with the rotation axis of the rolling bearing 19. Because each rolling bearing 19 has extremely high rotation precision and sensitivity, high rotation sensitivity and high rotation precision of each contact support 18 are ensured. Each rolling bearing 19 only needs to be connected with the bearing connecting end extending out from the contact support 18, and because one rotating shaft is reduced from each pole, the precision of rotary support and the rigidity of anti-load deformation can be ensured more easily, which is beneficial to realizing the synchronism among contacts. The multi-pole double-break contact plastic case circuit breaker disclosed by

the invention can ensure the precision requirements just relaying on the precision of a die itself, reduces the inevitable influences from factors of poor coaxiality, rigidity and strength due to more connecting links, and is easy to machine and debug.

[0033] The above embodiments are just preferred embodiments of the present invention, and all the technical equivalent variations and modifications made according to claims of the present invention should be deemed

Claims

1. A multi-pole double-break contact plastic case circuit breaker, wherein a plurality of chambers (22) that are used for accommodating a plurality of single pole circuit breaking units (30) and separated by partition walls (g) are arranged in an insulation case; each single pole circuit breaking unit (30) has a unit plastic case which is internally provided with a contact system which is configured to execute closing and breaking of a main circuit in a pole where the unit plastic case is located, and a matched arc extinguishing system; the contact system of each pole comprises two static contacts (14,16) configured oppositely and a bridge-shaped movable contact (20) which can be simultaneously closed with and broken from the two static contacts (14,16) respectively, wherein each bridge-shaped movable contact (20) is mounted on a contact support in an elastic over-travel manner; an operating mechanism (4) of the circuit breaker drives the contact supports of the plurality of single pole circuit breaking units (30) by a driving mechanism to synchronously rotate; each arc extinguishing system comprises two arc extinguishing chambers (6, 9) that are symmetrically arranged in the unit plastic case; the two static contacts (14,16) are arranged in arc extinguishing areas of the two arc extinguishing chambers (6, 9) respectively, wherein, the multi-pole double-break contact plastic case circuit breaker further comprises a plurality of rolling bearings (19), wherein outer rings of the rolling bearings (19) are fixedly mounted on the partition walls (g) through a bearing mechanism, inner rings of the rolling bearings (19) are directly connected with the contact supports in a stationary fit manner, and every two adjacent contact supports are in plug connection directly in a stationary manner; a cylindrical chamber (b) for accommodating each contact support is arranged between two arc extinguishing chambers (6, 9) of the unit plastic case of each of the single pole circuit breaking units (30), wherein each cylindrical chamber (b) comprises a circular arc surface (a), two arc insulating walls (6a, 9a) are arranged between the cylindrical chamber (b) and the two arc extinguishing chambers (6, 9) respectively, and are respectively provided with two

windows that are communicated with each other, and two ends of the bridge-shaped movable contact (20) extend into the two arc extinguishing chambers (6, 9) respectively from the two windows; each of the contact supports comprises an outer cylindrical surface (183) which is matched with the circular arc surface (a), and a fit clearance is formed between the outer cylindrical surface (183) and the circular arc surface (a).

2. The multi-pole double-break contact plastic case circuit breaker according to claim 1, wherein a connecting shaft is arranged at one end of the contact support of one of two adjacent single pole circuit breaking units (30) in an axial direction X of the contact support, wherein the connecting shaft is integrally formed and is coaxial with the outer cylindrical surface (183) of the contact support; the connecting shaft is sleeved with the inner rings of the rolling bearings (19) in a stationary fit manner; a connecting shaft hole (100) which is connected with the connecting shaft in a stationary fit manner is formed in one end of the contact support of the other single pole circuit breaking unit (30) in an axial direction X of the contact support, and the arrangement and connection of the connecting shaft and the connecting shaft hole (100) satisfy conditions under which the outer cylindrical surfaces (183) of all the contact supports are coaxial.
3. The multi-pole double-break contact plastic case circuit breaker according to claim 1, comprising three single pole circuit breaking units (30) that are arranged side by side, wherein a connecting shaft is arranged at each of two ends of the contact support of the middle single pole circuit breaking units (30) among the three single pole circuit breaking units in an axial direction X of the contact support, wherein each connecting shaft is integrally formed and is coaxial with the outer cylindrical surface (183) of the contact support; the connecting shafts at two ends of the middle contact support are sleeved with the inner rings of two rolling bearings (19) respectively in a stationary fit manner; a connecting shaft hole (100) which is connected with each connecting shaft in a stationary fit manner is formed in one end of the contact support of each of the other two single pole circuit breaking units (30) in an axial direction X of the contact support, and the arrangement and connection of the connecting shafts and the connecting shaft holes (100) satisfy conditions under which the outer cylindrical surfaces (183) of all the contact supports are coaxial.
4. The multi-pole double-break contact plastic case circuit breaker according to claim 2 or 3, wherein the connecting shaft comprises a rolling bearing connecting segment (181) which is connected with the inner rings of the rolling bearings (19) in a stationary

fit manner and a contact support connecting segment (180) which is matched with the connecting shaft hole (100), and the diameter of the contact support connecting segment (180) is less than that of the rolling bearing connecting segment (181); each contact support is made of a dough moulding compound or a sheet moulding compound by integral forming.

5. The multi-pole multi-break contact plastic case circuit breaker according to claim 4, wherein the contact support connecting segment (180) of each contact support has a polygonal cross section, and the connecting shaft hole (100) of the contact support has a polygonal cross section matched with the cross section of the contact support connecting segment (180).
6. The multi-pole double-break contact plastic case circuit breaker according to claim 4, wherein a shaft shoulder (184) which is in contact fit with the inner rings of the rolling bearings (19) is arranged on the contact support connecting segment (180) of each contact support (18), and the outer end surface of the connecting shaft hole (100) of the contact support is provided with an assembling surface (185) which is in contact fit with the inner rings of the rolling bearings (19).
7. The multi-pole double-break contact plastic case circuit breaker according to any one of claims 1-3, wherein the driving mechanism comprises two through shafts (7) which are arranged in parallel to each other, each contact support is provided with two small through holes (18a) arranged in an axial direction X of the contact support, and the two through shafts (7) penetrate through the two small through holes (18a) in each contact support respectively and are then fixedly connected with a contact coupling piece of an operating mechanism (4); a rotation axis of the contact coupling piece is coaxial with an axis of the outer cylindrical surface (183) of each contact support.
8. The multi-pole double-break contact plastic case circuit breaker according to any one of claims 1-3, wherein the driving mechanism comprises two convex shafts which are arranged on the contact coupling piece of the operating mechanism (4) and two small through holes (18a) which are formed in the contact support close to the contact coupling piece of each operating mechanism (4), and the two convex shafts are in plug connection with the two small through holes (18a) respectively; the rotation axis of the contact coupling piece is coaxial with the axis of the outer cylindrical surface (183) of the contact support.

9. The multi-pole double-break contact plastic case circuit breaker according to any one of claims 1-3, wherein the bearing mechanism comprises a fixing plate (3) having a bearing semi-hole and a bearing base (f) which is arranged on the partition wall (g) and has a bearing semi-hole, the fixing plate (3) is fixedly connected with the bearing base (f), such that the two bearing semi-holes are butted; the outer rings of the rolling bearings (19) are connected and mounted with the two butted bearing semi-holes in a stationary fit manner.
10. The multi-pole double-break contact plastic case circuit breaker according to claim 1, wherein the unit plastic case of each single pole circuit breaking unit (30) comprises a first small side case plate (10), a second small side case plate (11), a third small side case plate (12) and a fourth small side case plate (13), wherein the first small side case plate (10) and the second small side case plate (11) are assembled oppositely to form a first arc extinguishing chamber (6) and a first semicylindrical chamber, the third small side case plate (12) and the fourth small side case plate (13) are assembled oppositely to form a second arc extinguishing chamber (9) and a second semicylindrical chamber; the first arc extinguishing chamber (6) is provided with a first clamping part (c1) and a second clamping part (c2); the second arc extinguishing chamber (9) is provided with a third clamping part (d1) and a fourth clamping part (d2); the first clamping part (c1) is in clamping fit with the third clamping part (d1) to form fixed connection; the second clamping part (c2) is in clamping fit with the fourth clamping part (d2) to form fixed connection; the first semicylindrical chamber and the second semicylindrical chamber are fixedly connected through the first arc extinguishing chamber (6) and the second arc extinguishing chamber (9) and assembled to form a cylindrical chamber (b).
11. The multi-pole double-break contact plastic case circuit breaker according to claim 1, wherein the unit plastic case of each single pole circuit breaking unit (30) comprises a first big side case plate (23) and a second big side case plate (24), wherein the first big side case plate (23) and the second big side case plate (24) are assembled oppositely to form two arc extinguishing chambers (6, 9) and a cylindrical chamber (b).

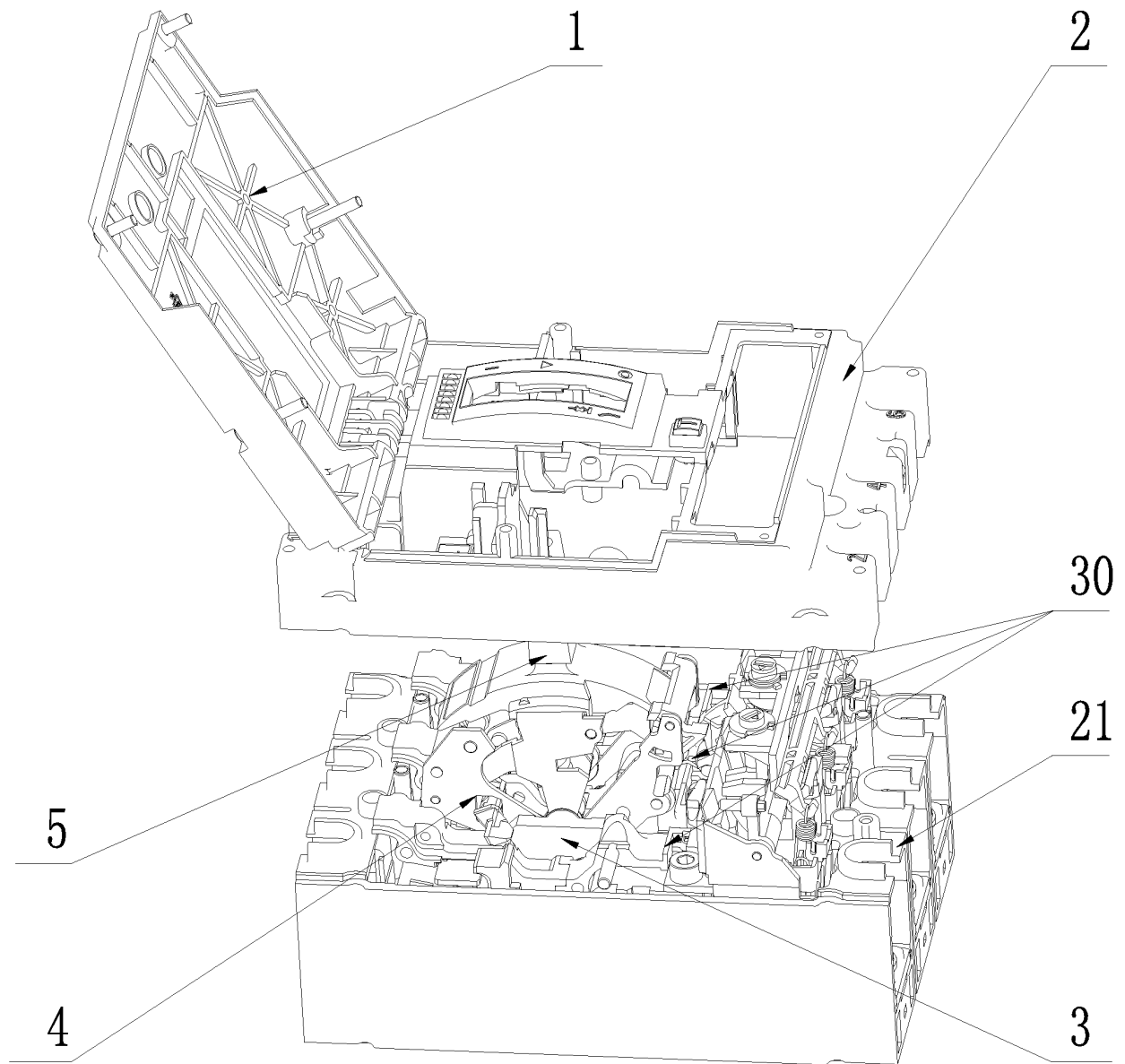


Fig. 1

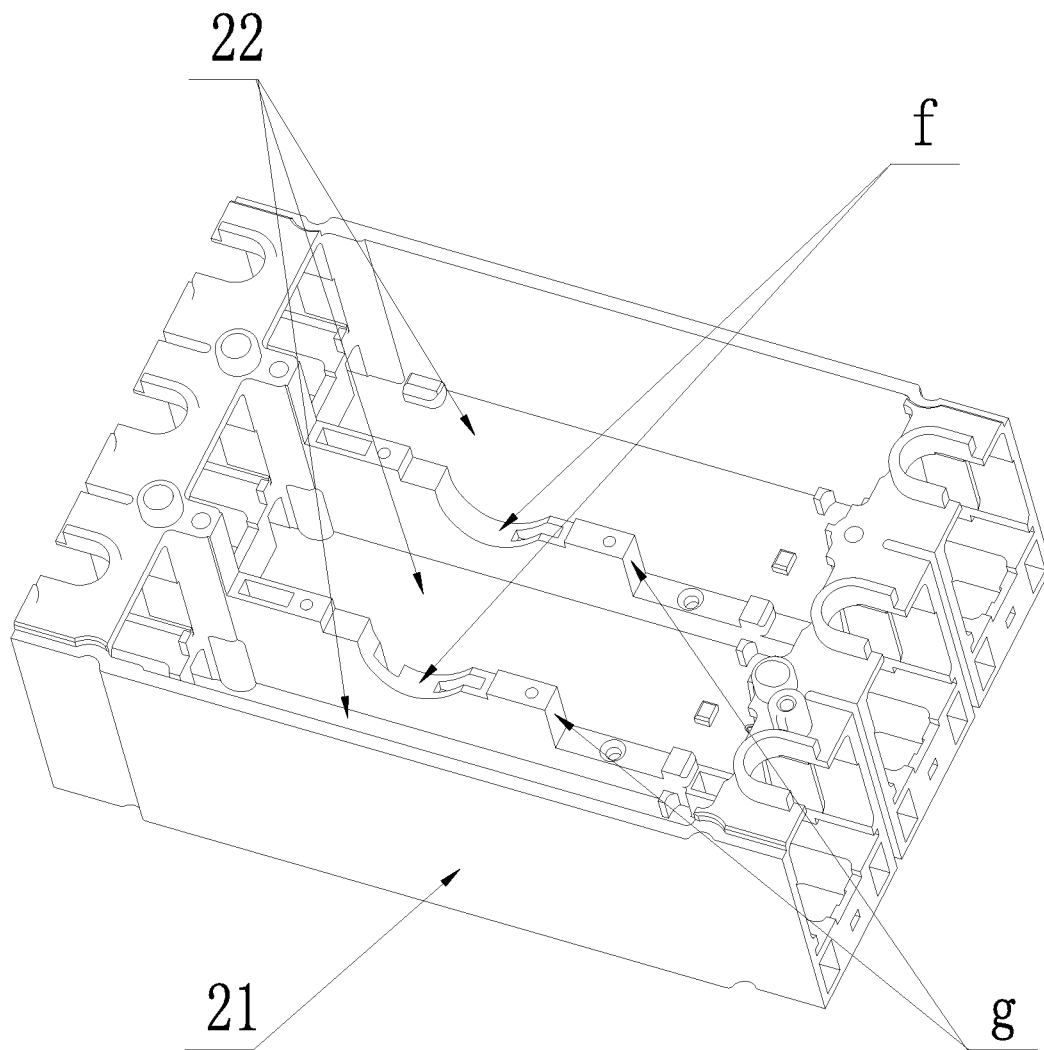


Fig. 2

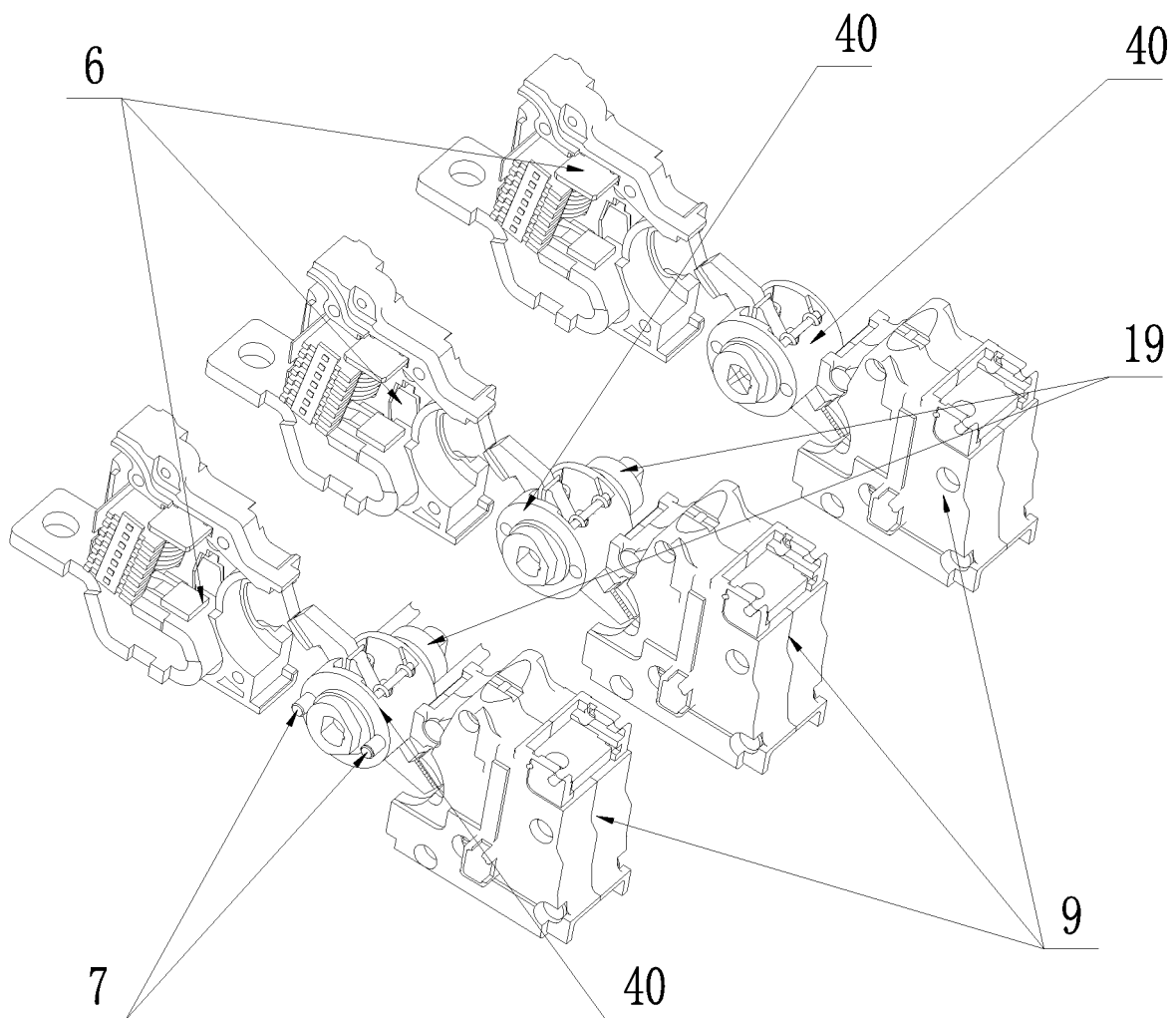


Fig. 3

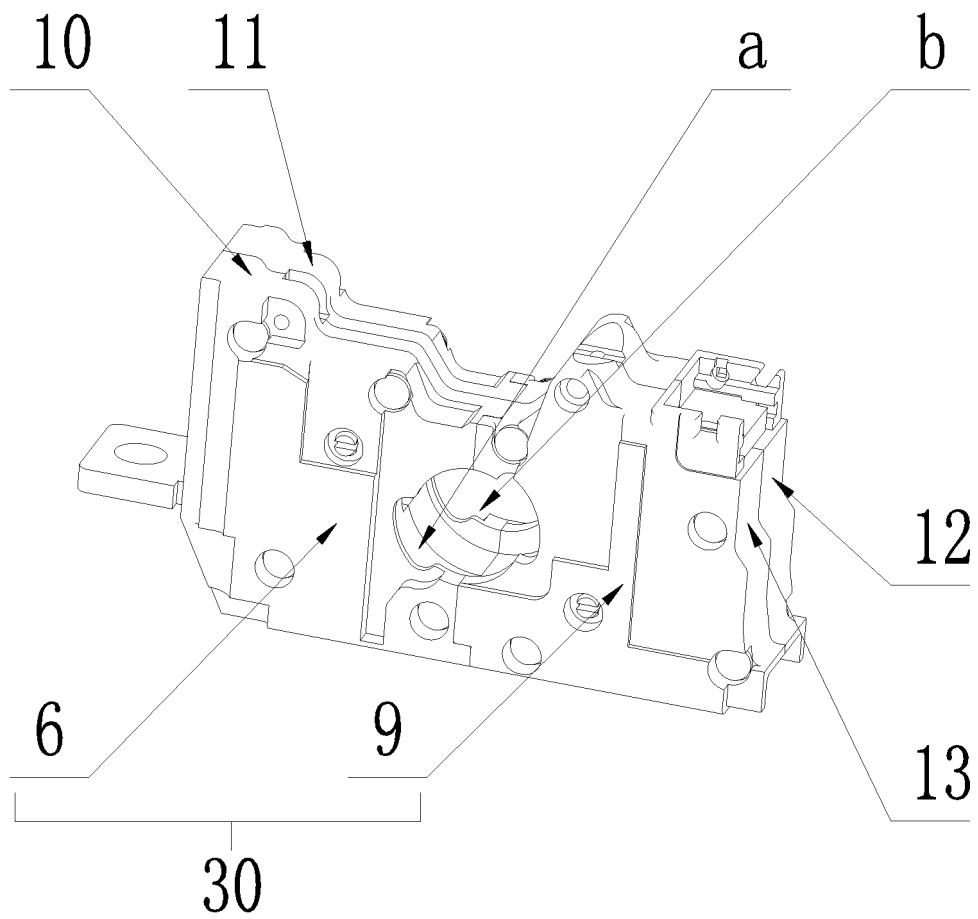


Fig. 4

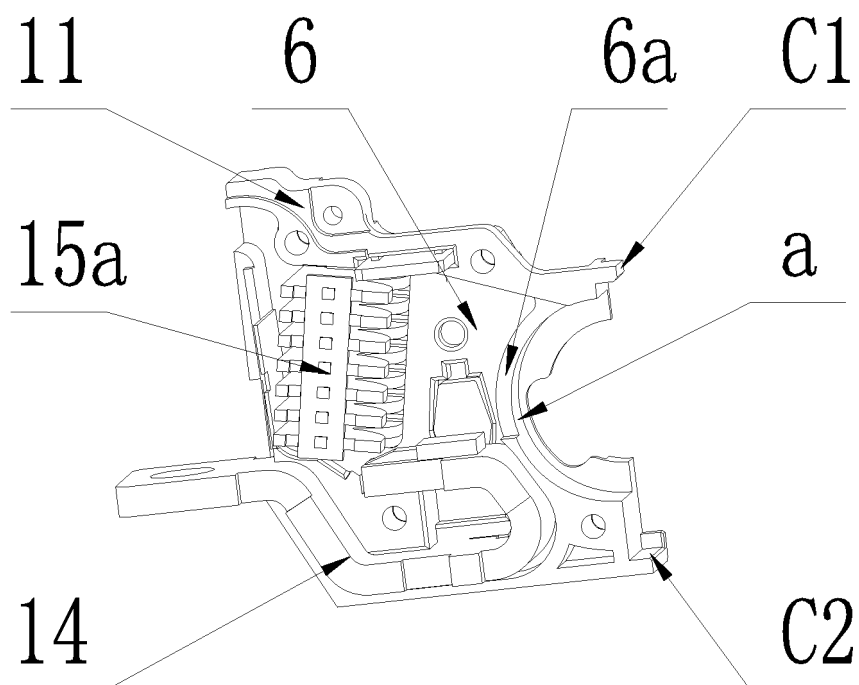


Fig. 5

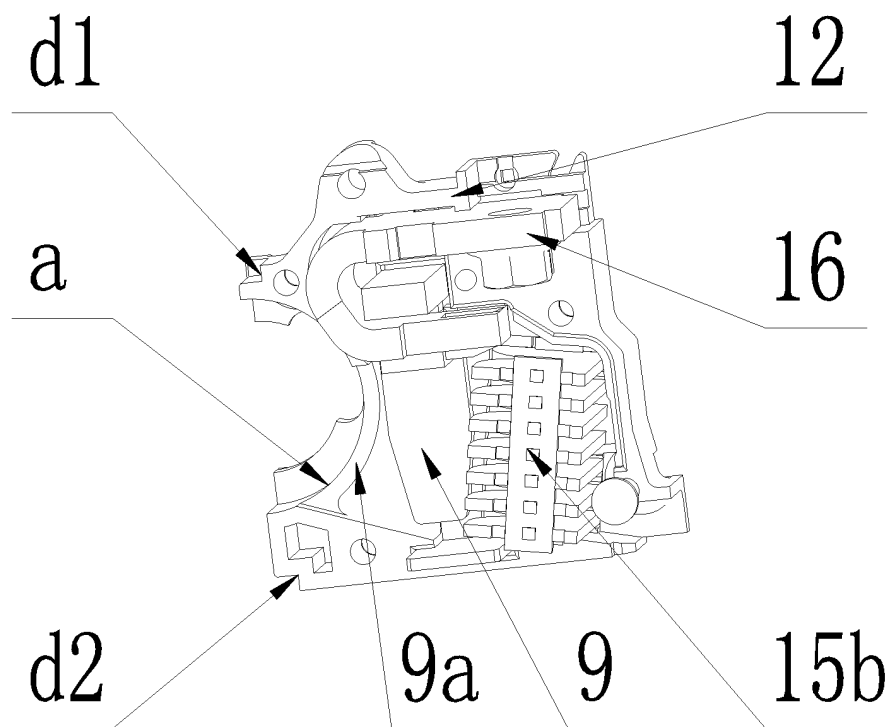


Fig. 6

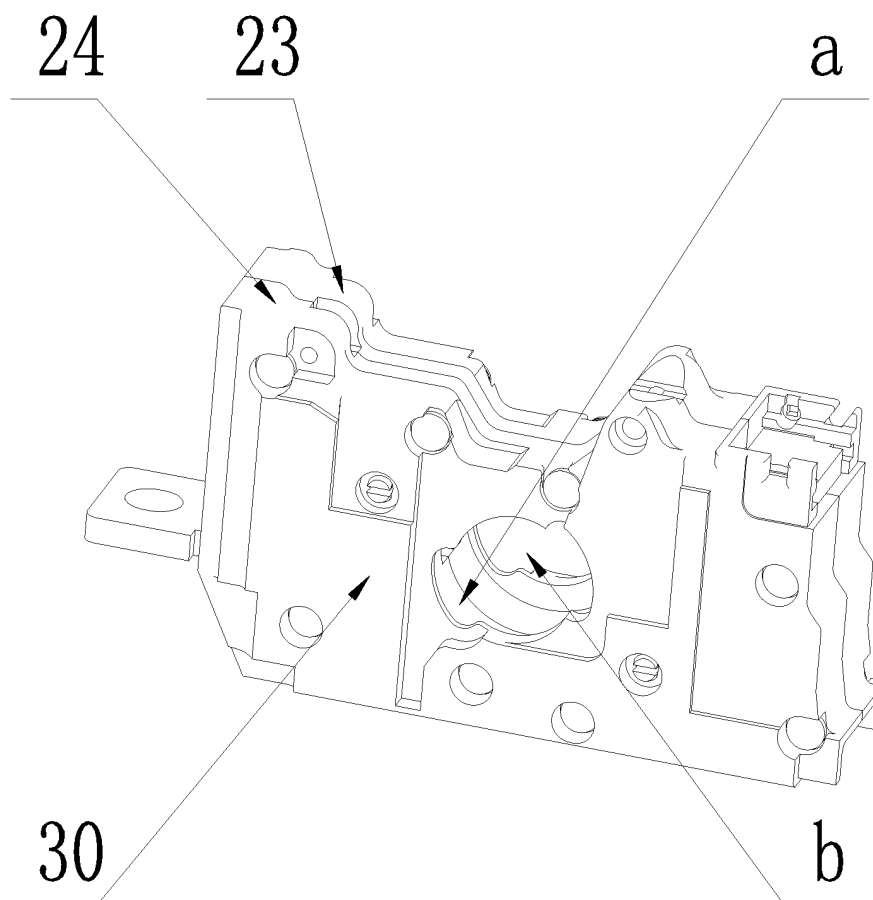


Fig. 7

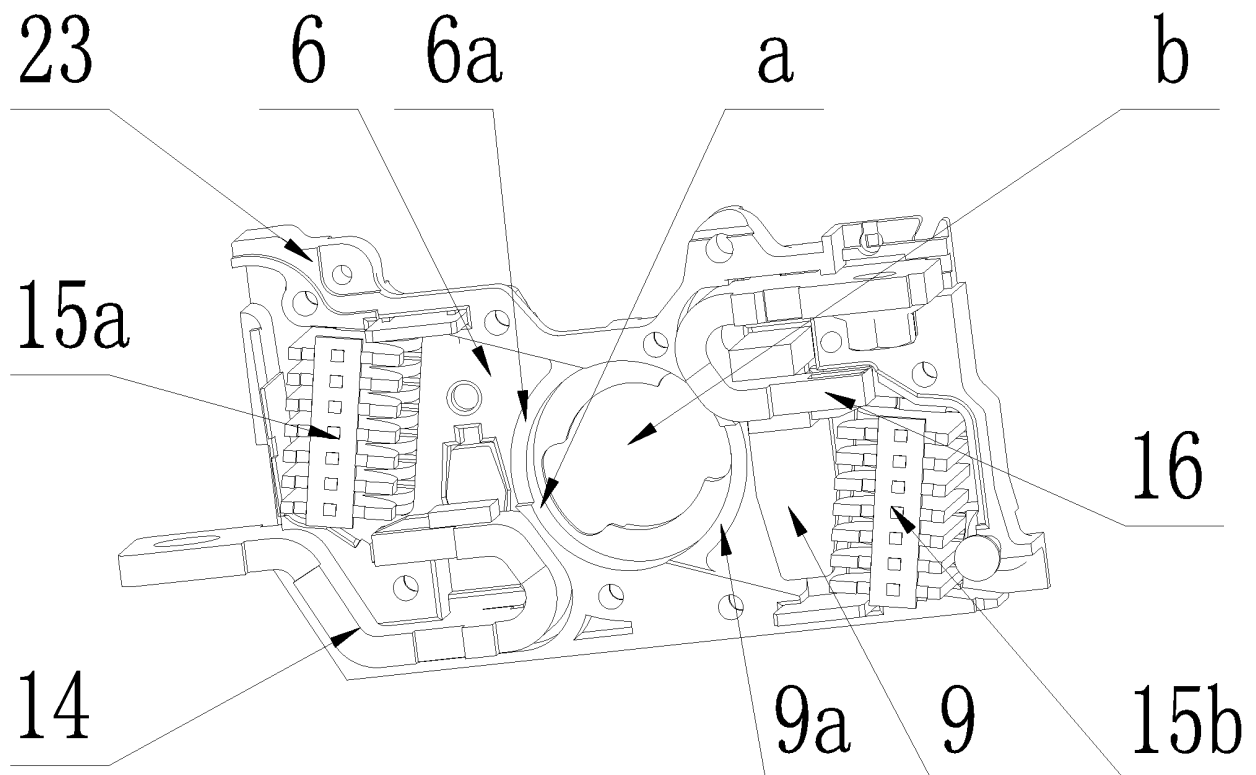


Fig. 8

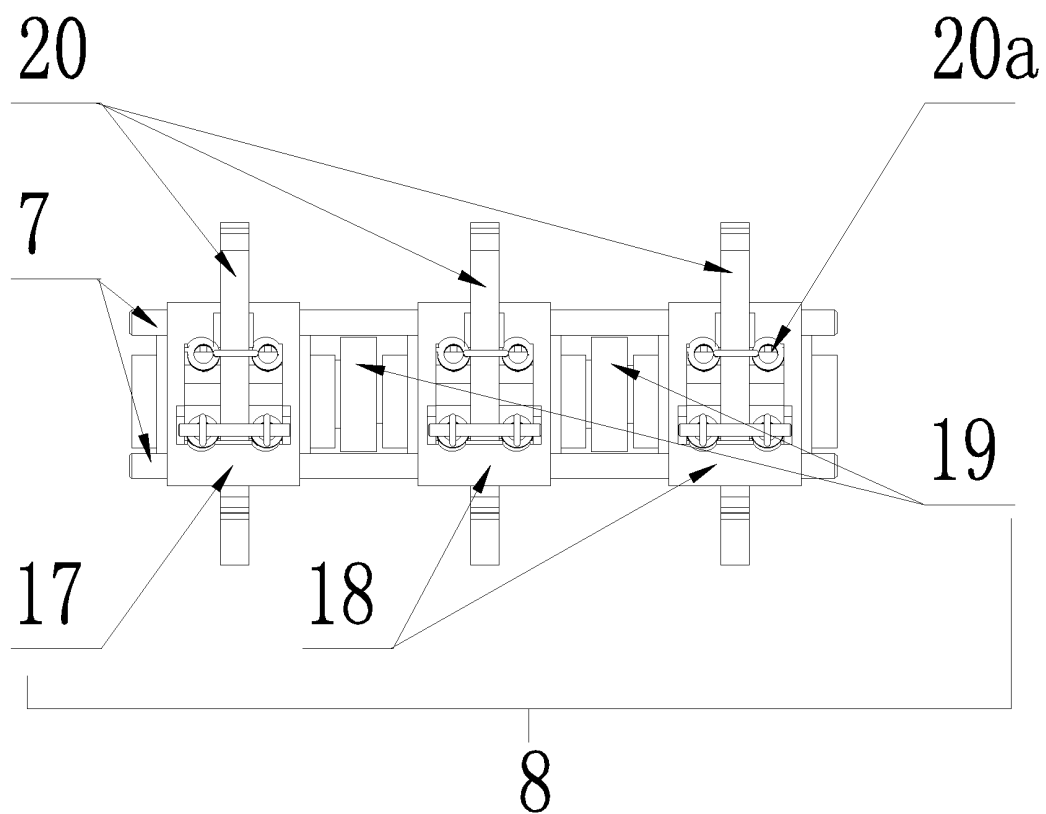


Fig. 9

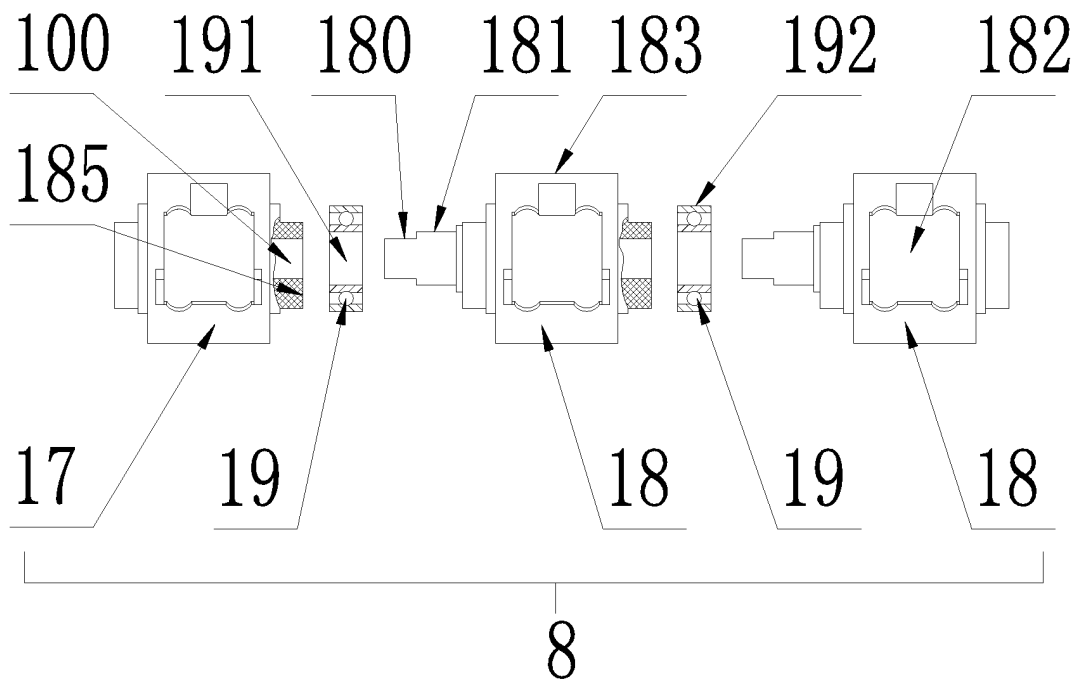


Fig. 10

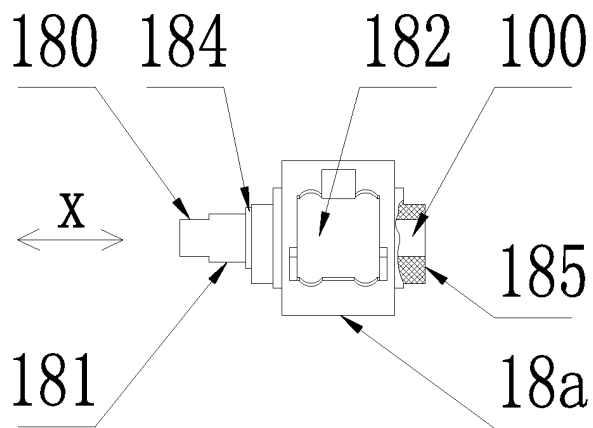


Fig. 11

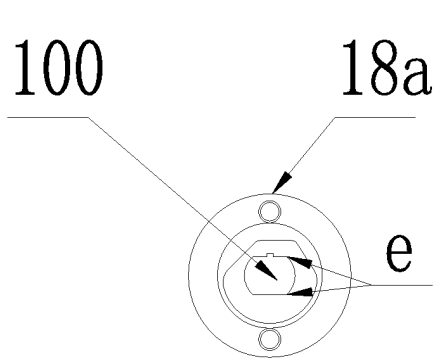


Fig. 12

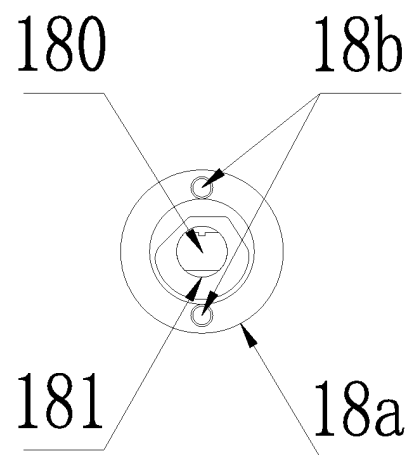


Fig. 13

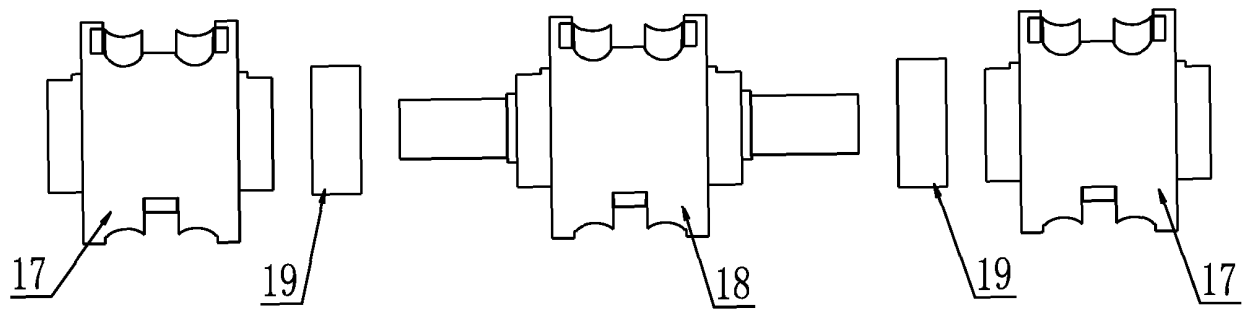


Fig. 14

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2015/091532

A. CLASSIFICATION OF SUBJECT MATTER

H01H 71/10 (2006.01) i; H01H 73/04 (2006.01) i; H01H 73/18 (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)

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)
CNPAT, WPI, EPODOC, CNKI: arc quenching, contact support, breaker, multiple pole, multipole, contact, terminal, bearing

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 204375671 U (ZHEJIANG CHINT ELECTRICS CO., LTD.), 03 June 2015 (03.06.2015), claims 1-11	1-11
A	CN 1416150 A (ZHEJIANG CHINT ELECTRICS CO., LTD.), 07 May 2003 (07.05.2003), description, pages 3-4, and figures 1-7	1-11
A	CN 101399137 A (ZHEJIANG CHINT ELECTRICS CO., LTD.), 01 April 2009 (01.04.2009), the whole document	1-11
A	CN 101604600 A (SHANGHAI NOARK ELECTRIC CO., LTD.), 16 December 2009 (16.12.2009), the whole document	1-11
A	CN 102496529 A (CHANGSHU SWITCHGEAR MFG. CO., LTD. (FORMER CHANGSHU SWITCHGEAR PLANT)), 13 June 2012 (13.06.2012), the whole document	1-11
A	US 6259338 B1 (MOELLER GMBH), 10 July 2001 (10.07.2001), the whole document	1-11

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

* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	
"E" earlier application or patent but published on or after the international filing date	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	"&" document member of the same patent family

Date of the actual completion of the international search 28 December 2015 (28.12.2015)	Date of mailing of the international search report 13 January 2016 (13.01.2016)
Name and mailing address of the ISA/CN: State Intellectual Property Office of the P. R. China No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088, China Facsimile No.: (86-10) 62019451	Authorized officer DU, Rui Telephone No.: (86-10) 62414027

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

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/CN2015/091532

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
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