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(54) GAS CIRCUIT BREAKER

(57) Disclosed is a gas circuit breaker, including: a first contact portion including a first arc inducement contact; a second contact portion including a second arc inducement contact, which is formed so as to be relatively movable with respect to the first arc inducement contact so as to be in a state of being in contact with the first arc inducement contact or a state of being separated from the first arc inducement contact; a gas chamber configured to store extinguishing gas for extinguishing arc generated between the first arc inducement contact and the second arc inducement contact when the first arc inducement contact is separated from the second arc inducement contact; a gas injection nozzle formed of an electric insulating material and configured to form an injection passage of extinguishing gas; and an arc length limiting contact disposed so as to be spaced apart from the second arc inducement contact, and configured so as to be moved together with the second arc inducement contact when the second arc inducement contact moves, and configured so that an end of the arc length limiting contact at the second arc inducement contact side is located at a point beyond an end of the first arc inducement contact when the first arc inducement contact is farthest from the second arc inducement contact

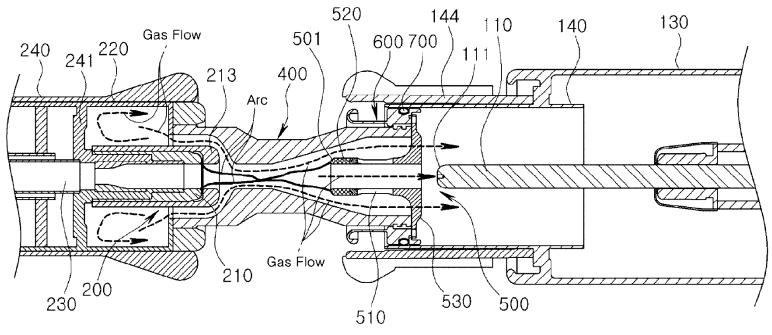

FIG.5

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Description

[Technical Field]

[0001] The present invention relates to a gas circuit breaker for extinguishing arc generated when electricity is blocked is performed by using extinguishing gas.

[Background Art]

[0002] A gas circuit breaker is a device, which is installed on an electric line, and blocks a current when an accident, such as artificial line blocking or short-circuit, occurs, and protects a power system and a power device. A typical gas circuit breaker includes a fixed electrode and a movable electrode, makes the fixed electrode and the movable electrode be separated from each other by a trip operation of the movable electrode, and injects compressed extinguishing gas (for example, SF_6) to a compression chamber and extinguishes arc generated when the fixed electrode and the movable electrode are separated from each other.

[0003] Arc is generated between an end of the fixed electrode and an end of the movable electrode in the gas circuit breaker, and the arc is gradually elongated together with a movement of the movable electrode until the arc is extinguished by the extinguishing gas.

[0004] When the length of the arc is increased, arc energy is increased and more extinguishing gas is required for extinguishing, and thus a volume of a cylinder of the gas circuit breaker is increased in order to store more extinguishing gas and an entire size of the gas circuit breaker needs to be also increased. Further, the increase in the volume of the gas circuit breaker causes an increase in operation force for moving the movable electrode, so that a size of an operating device needs to be also increased, and as a result, manufacturing cost is increased.

[Disclosure]

[Technical Problem]

[0005] The present invention provides a gas circuit breaker capable of performing an extinguishing function with the smaller amount of extinguishing gas.

[Technical Solution]

[0006] An exemplary embodiment of the present invention provides a gas circuit breaker, including: a first contact portion including a first arc inducement contact; a second contact portion including a second arc inducement contact, which is formed so as to be relatively movable with respect to the first arc inducement contact so as to be in a state of being in contact with the first arc inducement contact or a state of being separated from the first arc inducement contact; a gas chamber configured to store extinguishing gas for extinguishing arc generated between the first arc inducement contact and the second arc inducement contact when the first arc inducement contact is separated from the second arc inducement contact; a gas injection nozzle formed of an electric insulating material and configured to form an injection passage of extinguishing gas; and an arc length limiting contact disposed so as to be spaced apart from the second arc inducement contact, and configured so as to be moved together with the second arc inducement contact when the second arc inducement contact moves, and configured so that an end of the arc length limiting contact at the second arc inducement contact side is located at a point beyond an end of the first arc inducement contact when the first arc inducement contact is farthest from the second arc inducement contact.

[0007] The gas injection nozzle may be configured to be moved together with the second arc inducement contact, and the arc length limiting contact is fixed to the gas injection nozzle.

[0008] The first arc inducement contact may be formed in a rod shape, and the arc length limiting contact includes an axis-directional extended portion provided with a through-hole, into which the first arc inducement contact is inserted.

[0009] The axis-directional extended portion may be provided with a gas movement hole for allowing the extinguishing gas to move.

[0010] The axis-directional extended portion may be disposed within the gas injection nozzle, the arc length limiting contact may further include a plurality of radius-directional extended portions extended from the axis-directional extended portion in a radius direction and connected to the gas injection nozzle, and the plurality of radius-directional extended portions may be spaced apart from each other so that the extinguishing gas is movable therebetween.

[0011] The arc length limiting contact may include an arc tip, which is formed at the end of the arc length limiting contact at the second arc inducement contact side and has relatively large arc resistivity.

[0012] The arc tip may be formed of an alloy containing copper and tungsten.

[0013] The first contact portion may include an electrical conductive guide tube electrically connected to the first arc inducement contact.

[0014] The art length limiting contact may be electrically connected to the guide pipe, and is configured to be in contact with the first arc inducement contact in a state where the first arc inducement contact is in contact with the second arc inducement contact.

[0015] The gas circuit breaker may further include an electric field release shield electrically connected to the arc length limiting contact and configured to perform an electric filed release operation.

[0016] The electric field release shield may be interposed between the gas injection nozzle and the guide tube in a state of being connected to the arc length limiting

contact.

[0017] The electric field release shield may include an axis-directional extended portion extended in an axis direction, and a curved extended portion extended from an end of the axis-directional extended portion to an external side in a radius direction in a shape of a curved surface.

[0018] The gas circuit breaker may further include a contact member interposed between the electric field release shield and the tube member, and electrically connected to the electric field release shield and the tube member while being in contact with the electric field release shield and the tube member.

[0019] Another exemplary embodiment of the present invention provides an arc length limiting contact configured to limit a length of arc between a first contact portion including a first arc inducement contact and a second contact portion including a second arc inducement contact, which is formed so as to be relatively movable with respect to the first arc inducement contact so as to be in a state of being in contact with the first arc inducement contact or a state of being separated from the first arc inducement contact, in which wherein the arc length limiting contact is disposed so as to be spaced apart from the second arc inducement contact, and is configured so as to be moved together with the second arc inducement contact when the second arc inducement contact moves, and is configured so that an end of the second arc inducement contact is located at a point beyond an end of the arc length limiting contact at the first arc inducement contact side when the first arc inducement contact is farthest from the second arc inducement contact.

[0020] The arc length limiting contact may include an axis-directional extended portion provided with a through-hole, into which the first arc inducement contact is inserted, and a plurality of radius-directional extended portions extended from the axis-directional extended portion in a radius direction.

[0021] The plurality of radius-directional extended portions may be provided in plural, and may be spaced apart from each other.

[0022] The axis-directional extended portion may include an arc tip having relatively large arc resistivity.

[0023] The arc tip may be formed of an alloy containing copper and tungsten.

[Advantageous Effects]

[0024] According to the present invention, a length of arc is limited by using the arc length limiting contact, so that arc energy is limited, so that it is possible to implement an extinguishing gas with the smaller amount of extinguishing gas, and thus it is possible to decrease a volume of the gas circuit breaker and facilitate reduction of driving force of the gas circuit breaker.

[Description of Drawings]

[0025]

FIG. 1 is a cross-sectional view of a conducting state of a gas circuit breaker according to an exemplary embodiment of the present invention.

FIG. 2 is a diagram illustrating an arc length limiting contact of the gas circuit breaker according to the exemplary embodiment of the present invention.

FIG. 3 is a cross-sectional view of an electric field releasing shield of the gas circuit breaker according to the exemplary embodiment of the present invention.

FIG. 4 is a diagram illustrating a state where a first and second arc inducement contacts relatively move during an electricity blocking operation of the gas circuit breaker according to the exemplary embodiment of the present invention.

FIG. 5 is a diagram illustrating a state where arc is moved to the arc length limiting contact during the electricity blocking operation of the gas circuit breaker according to the exemplary embodiment of the present invention.

[Best Mode]

[0026] Hereinafter, a gas circuit breaker according to an exemplary embodiment of the present invention will be described in detail with reference to the accompanying drawings.

[0027] A gas circuit breaker according to an exemplary embodiment of the present invention may include first and second housings 130 and 240, which are electrically connected with each other in a general conducting state. For example, the first housing 130 and the second housing 240 may be formed of a metal material having electric conductivity, and as illustrated in FIG. 1, the first housing 130 and the second housing 240 may be disposed so as to face each other in a state of being spaced apart from each other by a predetermined distance in an axis direction (X-direction).

[0028] In the meantime, the gas circuit breaker according to the exemplary embodiment of the present invention includes a first contact portion 100 and a second contact portion 200 for electrically connecting the first housing 130 and the second housing 240 and electrically blocking the first housing 130 from the second housing 240, and performing an arc inducement function during an electricity blocking operation is performed. The first and second housings 130 and 240 are electrically connected and blocked, and the art inducement during the blocking of electricity by the operations of the first and second contact portions 100 and 200.

[0029] The first contact portion 100 may include a first main contact 144. For example, the first main contact 144 may have a tube shape, and may be in contact with and electrically connected to the first housing 130. Particularly, referring to FIG. 1, the first main contact 144 may be formed so as to be in contact with a connection portion 131, which is extended from an internal surface of the first housing 130 to an internal side.

[0030] The second contact portion 200 is installed to be movable in the axis direction (the X-axis direction in FIG. 1). For example, the second contact portion 200 may include a moving housing 220 and a second main contact 420 installed in the moving housing 220. The second main contact 420 is installed so as to be movable together with the moving housing 220, and is in contact with or separated from the first main contact 144 according to a movement position. For example, the second main contact 420 may be installed in a state of being in contact with a flange part 223 provided at an end of the moving housing 220.

[0031] In the meantime, the moving housing 220 is in contact with the second housing 240, and thus, the second main contact 420 is electrically connected to the second housing 240 through the moving housing 220. Accordingly, the first and second housings 130 and 240 are electrically connected by the first main contact 144, the second main contact 420, and the moving housing 220. In this case, the first main contact 144, the second main contact 420, and the moving housing 220 may be formed of a material having electric conductivity.

[0032] As illustrated in FIG. 1, when the second contact 420 is in contact with the first main contact 114, the first and second housings 130 and 240 are electrically connected with each other to maintain a conducting state, and when electricity is blocked, the second main contact 420 moves together with the moving housing 220, so that the second main contact 420 is separated from the first main contact 144.

[0033] In the meantime, the first contact portion 100 and the second contact portion 200 may include a first arc inducement contact 110 and a second arc inducement contact 210 for inducing arc when electricity is blocked, respectively. The first arc inducement contact 110 and the second arc inducement contact 210 may be formed of a material having electric conductivity. As illustrated in FIG. 1, the first arc inducement contact 110 and the second arc inducement contact 210 are in contact with each other and electrically connected with each other when electricity is conducted, and are separated from each other when electricity blocking is operated to perform the function of inducing arc.

[0034] The second arc inducement contact 210 is formed so as to be in a state (that is, a conducting state) of being in contact with the first arc inducement contact 110 or a state of being separated from the first arc inducement contact 110. To this end, the second arc inducement contact 210 may be formed so as to be relatively movable with respect to the first arc inducement contact 110 in the axis direction (the X-axis direction in FIG. 1). That is, the second arc inducement contact 210 may be relatively movable with respect to the first arc inducement contact 110 in the axis direction to be in a state of being separated from the first arc inducement contact 110 as illustrated in FIGS. 4 and 5, and in this state, the first arc inducement contact 110 and the second arc inducement contact 210 are spaced apart from each other, so that the electrical connection thereof of the first arc inducement contact 110 and the second arc inducement contact 210 are blocked and the first arc inducement contact 110 and the second arc inducement contact 210 are separated from each other, thereby inducing arc generated by the electricity blocking operation. In this case, the first arc inducement contact 110 may be configured so as to maintain a stop state in place, and in another example, the first arc inducement contact 110 may be configured so as to be slightly moved in a direction far from the second arc inducement contact 210. The case illustrated in the drawing is a case where the first arc inducement contact 110 is connected to a driving rod 113 to be movable within a predetermined range.

[0035] The first arc inducement contact 110 may have a shape of a rod as illustrated in FIG. 1, and a rear end of the first arc inducement contact 110 may be connected to a connection member 120.

[0036] The second arc inducement contact 210 may be fixed to a partition wall 221 provided inside the moving housing 220, and in this case, the partition wall 221 may be formed of a material having electric conductivity, similar to the moving housing 220. Accordingly, the second arc inducement contact 210 may be electrically connected with the second moving housing 220 and the second housing 240.

[0037] Further, the second arc inducement contact 210 may be provided with a through-hole 211, into which a front part of the first arc inducement contact 110 is inserted. That is, as illustrated in FIG. 1, the first arc inducement contact 110 maintains a state of being inserted into the through-hole 211 of the second arc inducement contact 210 in a general conducting state.

[0038] In the meantime, a cover member 213 surrounding an outer peripheral surface in a radius direction and a front part of the second arc inducement contact 210 may be provided. The cover member 314 may be formed of an electric insulating material, and provided with a through-hole 215 formed at a position corresponding to the through-hole of the second arc inducement contact 210. The cover member 213 serves to protect the second arc inducement contact 210, and make extinguishing gas be easily compressed and flow. The front part of the first arc inducement contact 110 is inserted into the through-hole 215 of the cover member 213 and the through-hole 211 of the second arc inducement contact 210.

[0039] The second arc inducement contact 210 may be installed so as to be connected to the driving rod 230 to be movable in a direction far from the first arc inducement contact 110 by driving force of the driving rod 230. In this case, the driving rod 230 may be connected to the partition wall of the moving housing 220. In this case, although not illustrated in the drawing, an actuator connected to the driving rod 230 to drive the driving rod 230 may be provided.

[0040] By the aforementioned structure, the moving housing 220 may be moved in the axis direction (a hor-

izontal direction in FIG. 1) by the driving force of the driving rod 230, and thus, the second main contact 420 and the second arc inducement contact 210 installed in the moving housing 220 may be moved in the axis direction.

[0041] In the meantime, the gas circuit breaker according to the exemplary embodiment of the present invention includes a gas chamber 300, and extinguishing gas stored in the gas chamber 300 has increased pressure by arc generated between the first arc inducement contact 110 and the second arc inducement contact 210 when the first arc inducement contact 110 and the second arc inducement contact 210 are separated from each other to perform an extinguishing operation. That is, when an electricity blocking operation is performed in order to block electricity in a case of electricity short-circuit and the like, the first main contact 114 and the second main contact 420 are separated from each other by the movement of the moving housing 220, and further, the first arc inducement contact 110 and the second arc inducement contact 210 are separated from each other by the movement of the second arc inducement contact 210, and in this case, electric arc is generated between the first arc inducement contact 110 and the second arc inducement contact 210 and the arc may be extinguished by extinguishing gas of which pressure is increased by the arc. For example, the extinguishing gas may be gas, such as SF_6, having an excellent extinguishing characteristic.

[0042] In the meantime, a gas injection nozzle 400 is provided. The gas injection nozzle 400 may be formed of an electric insulating material, and forms an injection passage of extinguishing gas. For example, as illustrated in the drawing, the gas injection nozzle 400 may be provided with a gas passage 410 extended in the axis direction. The gas passage 410 may include a portion 411 accommodating one side of the second arc inducement contact 210, a portion 415 located at an opposite side of the portion 411, and a neck portion 413 connecting both portions 411 and 415. The neck portion 413 may be formed in a neck shape having a smaller diameter than that of the portions 411 and 415 located at both sides thereof. The neck portion 413 may have the same shape as that of a cross-section of the first arc inducement contact 110 shaped like a rod, and have a slightly large size.

[0043] The gas injection nozzle 400 may be configured to be moved together with the second arc inducement contact 210. For example, as illustrated in the drawings, the gas injection nozzle 400 is fastened to the flange part 223 of the moving housing 220, so that the gas injection nozzle 400 may be installed to be moved together with the second arc inducement contact 210.

[0044] The gas circuit breaker according to the exemplary embodiment of the present invention includes an arc length limiting contact 500. The arc length limiting contact 500 is disposed to be spaced apart from the second arc inducement contact 210, and configured to be moved together with the second arc inducement contact 210 when the second arc inducement contact 210 moves. The arc length limiting contact 500 may be fastened to an end of the gas injection nozzle 400 to be movable together with the second arc inducement contact 210 when the moving housing 220 moves.

[0045] Further, the arc length limiting contact 500 is configured so that an end 501 of the arc length limiting contact 500 is located at a point beyond an end 111 of the first arc inducement contact 110 when the first arc inducement contact 110 and the second arc inducement contact 210 are farthest from each other. Accordingly, as illustrated in FIG. 5, when the first arc inducement contact 110 and the second arc inducement contact 210 are far from each other by a predetermined degree, the end 501 of the arc length limiting contact 500 is located closer to the second arc inducement contact 210 than the end 111 of the first arc inducement contact 110. By the aforementioned structure, the arc length limiting contact 500 may limit a length of the arc generated in the electricity blocking process. This will be described again below.

[0046] In the meantime, as illustrated in FIG. 1, a guide tube 140 may be provided at one side of the first housing 130. The guide tube 140 may be connected to the first housing 130 by the connection portion 131 illustrated in FIG. 1.

[0047] The arc length limiting contact 500 may be disposed so as to be located at an end of the guide tube 140 in the conducting state as illustrated in FIG. 1, and the arc length limiting contact 500 will be described in more detail below.

[0048] The arc length limiting contact 500 may be fixed to the gas injection nozzle 400. For example, as illustrated in the drawing, the arc length limiting contact 500 may be coupled to a front end of the gas injection nozzle 400.

[0049] Referring to FIG. 2, the arc length limiting contact 500 may include an axis-directional extended portion 510 forming the through-hole 511 into which the first arc inducement contact 110 is inserted. The axis-directional extended portion 510 is extended in the movement direction of the second arc inducement contact 210, that is, the axis direction (the X-axis direction in FIG. 1), and the through-hole 511 is extended in the axis direction.

[0050] In the meantime, the arc length limiting contact 500 may include a plurality of radius-directional extended portions 530. In this case, as illustrated in FIG. 2, the axis-directional extended portion 510 of the arc length limiting contact 500 is disposed within the gas injection nozzle 400, and the radius-directional extended portion 530 may be extended in the radius direction (a Y-axis direction in FIG. 1) from the end of the axis-directional extended portion 530 to be connected to the gas injection nozzle 400. In this case, the plurality of radius-directional extended portions 530 is formed while being spaced apart from each other so that extinguishing gas is movable between the plurality of radius-directional extended portions 530. Accordingly, as illustrated in FIG. 5, the extinguishing gas is movable through spaces between the through-hole 511 in the axis direction of the arc length limiting contact 500 and the plurality of radius-directional

extended portions 530.

[0051] Further, a gas movement hole 513 may be formed in the axis-directional extended portion 510 of the arc length limiting contact 500. Extinguishing gas is movable to internal and external sides of the axis-directional extended portion 530 through the gas movement hole 513 to facilitate the movement of the extinguishing gas.

[0052] In the meantime, the end of the axis-directional extended portion 530 (that is, the end of the arc length limiting contact 500 at the second arc inducement contact 210 side) of the arc length limiting contact 500 may be formed of an arc tip 520 having relatively large arc resistivity. Since the art is formed at the end of the axis-directional extended portion 530, it is possible to minimize an end part of the arc length limiting contact 500 from being damaged by high arc energy by forming the end with the arc tip 520 having relatively arc resistivity.

[0053] For example, the arc tip 520 may be formed of an alloy containing copper and tungsten. In the meantime, the axis-directional extended portion 530 except for the arc tip 520 may be formed of a copper material. As described above, instead of forming the entire axis-directional extended portion 530 of an arc resistive material, the arc tip 520 is formed of an arc resistive material, of which processing is relatively difficult and manufacturing cost is high, thereby easily manufacturing the gas circuit breaker and reducing manufacturing cost.

[0054] The arc length limiting contact 500 may be electrically connected to the aforementioned guide tube 140.

[0055] In the present exemplary embodiment, an electric field release shield 600 and a contact member 700 may be further provided, and the arc length limiting contact 500 may be electrically connected to the guide tube 140 through the electric field release shield 600 and the contact member 700. However, when the electric field release shield 600 is omitted, the arc length limiting contact 500 may be directly electrically connected to the guide tube 140. By the aforementioned structure, the arc length limiting contact 500 is electrically connected to the first housing 130.

[0056] The electric field release shield 600 is a member for releasing an electric field when the electricity blocking operation is performed, and may be fastened to the radius-directional extended portion 530 of the arc length limiting contact 500. Accordingly, the radius-directional extended portion 530 of the arc length limiting contact 500 is in contact with and electrically connected with the electric field release shield 600, and the electric field release shield 600 may be in in contact with and electrically connected with the guide pipe 140.

[0057] Referring to FIG. 3, the electric field release shield 600 may be formed in a tube shaped capable of accommodating one end of the gas injection nozzle 400, and may be formed of an electrical conductive material, such as aluminum. The electric field release shield 600 may include an axis-directional extended portion 610 extended in the axis direction, and include a curved extended portion 620 rolled in a curved-surface shape from an end of the axis-directional extended portion 610 to an external side in the radius direction. An electric field release effect may be obtained by adjusting lengths and shapes of the axis-directional extended portion 610 and the curved extended portion 620. The electric field release shield 600 releases an electric field between the electrodes, thereby preventing breakdown during the blocking of electricity.

[0058] In the meantime, the electric field release shield 600 may include an accommodating recess 630 for accommodating the contact member 700, and the contact member 700 is disposed in the accommodating recess 630 to be in contact with the electric field release shield 600 and the guide tube 140, so that the electric field release shield 600 and the guide tube 140 may be electrically connected. The contact member 700 may be a ring-shaped spring formed of an electrical conductive material.

[0059] Hereinafter, an operation of the gas circuit breaker according to the exemplary embodiment of the present invention will be described.

[0060] First, in a general conducting state illustrated in FIG. 1, a state where the first housing 130, the moving housing 220, and the second housing 240 are electrically connected to each other by a contact of the first main contact 144 and the second main contact 420 is maintained. In this case, the first arc inducement contact 110 and the second arc inducement contact 210 are electrically connected while maintaining a state of being in contact with each other.

[0061] In the meantime, when the electricity blocking operation is performed, the moving housing 220 is moved in the axis direction by an operation of the driving rod 230, and thus, the second main contact 420 and the second arc inducement contact 210 are moved toward a side far from the first housing 130 in the axis-direction together with the moving housing 220. In this case, as described above, the first arc inducement contact 110 may also be slightly moved in a direction far from the second housing 240 by the driving rod 111. By the movement, the first main contact 144 and the second main contact 420 are separated from each other, and then, the first arc inducement contact 110 and the second arc inducement contact 210 are also separated from each other. In this case, electric arc is induced between the first arc inducement contact 110 and the second arc inducement contact 210 while the first arc inducement contact 110 and the second arc inducement contact 210 are separated from each other, and pressure of extinguishing gas is increased by the generated arc and an arc extinguishing operation starts. FIG. 4 illustrates a state where arc is formed between the first arc inducement contact 110 and the second arc inducement contact 210 in a state where the first main contact 144 and the second main contact 420 are separated and further, the first arc inducement contact 110 and the second arc inducement contact 210 are separated from each other.

[0062] The arc length limiting contact 500 is moved by

the same amount as that of the movement of the second arc inducement contact 210 together with the movement of the second arc inducement contact 210, and when the arc length limiting contact 500 moves further from the state of FIG. 4, the end 501 of the arc length limiting contact 500 toward the second arc inducement contact 210 passes through the end 111 of the first arc inducement contact 110. That is, as illustrated in FIG. 5, the end 501 of the arc length limiting contact 500 is located closer to the second arc inducement contact 210 than the end 111 of the first arc inducement contact 110.

[0063] When the end 111 of the first arc inducement contact 110 is located at a place closer to the second arc inducement contact 210 than the end 501 of the arc length limiting contact 500, arc is formed between the end of the second arc inducement contact 210 and the end 111 of the first arc inducement contact 110 as illustrated in FIG. 4, but an arcing time is increased, so that arc at the end 111 of the first arc inducement contact 110 is moved to the arc length limiting contact 500 at a moment at which the end 501 of the arc length limiting contact 500 passes through the end 111 of the first arc inducement contact 110. Accordingly, as illustrated in FIG. 5, the arc between the arc length limiting contact 500 and the second arc inducement contact 210 is maintained from the time at which the end 501 of the arc length limiting contact 500 passes through the end 111 of the first arc inducement contact 110, so that a length of the arc does not further increased, and is maintained. Accordingly, a maximum length of the arc is limited to a distance between the end of the second arc inducement contact 210 and the end 501 of the arc length limiting contact 500. The length of the arc is limited as described above, extinguishing may be performed by the smaller amount of extinguishing gas.

[0064] In the meantime, the arc length limiting contact according to the exemplary embodiment of the present invention has been described above, so that a separate description thereof will be omitted. Further, the arc length limiting contact according to the exemplary embodiment of the present invention is applicable to various products, such as a switch, as well as the gas circuit breaker, to which the technical spirit of the limitation of the length of the arc is applicable.

[0065] In the above, the exemplary embodiment of the present invention has been described, but the scope of the present invention is not limited thereto, and includes all of the changes and corrections, which are easily changed by the person skilled in the art on the basis of the exemplary embodiment of the present invention and recognized as equivalent matters.

[Industrial Applicability]

[0066] The present invention relates to a gas circuit breaker and is applicable to an electric system, thereby being industrially applicable.

Claims

1. A gas circuit breaker, comprising:

a first contact portion including a first arc inducement contact;
a second contact portion including a second arc inducement contact, which is formed so as to be relatively movable with respect to the first arc inducement contact so as to be in a state of being in contact with the first arc inducement contact or a state of being separated from the first arc inducement contact;
a gas chamber configured to store extinguishing gas for extinguishing arc generated between the first arc inducement contact and the second arc inducement contact when the first arc inducement contact is separated from the second arc inducement contact;
a gas injection nozzle formed of an electric insulating material and configured to form an injection passage of extinguishing gas; and
an arc length limiting contact disposed so as to be spaced apart from the second arc inducement contact, and configured so as to be moved together with the second arc inducement contact when the second arc inducement contact moves, and configured so that an end of the arc length limiting contact at the second arc inducement contact side is located at a point beyond an end of the first arc inducement contact when the first arc inducement contact is farthest from the second arc inducement contact.

2. The gas circuit breaker of claim 1, wherein the gas injection nozzle is configured to be moved together with the second arc inducement contact, and the arc length limiting contact is fixed to the gas injection nozzle.

3. The gas circuit breaker of claim 1, wherein the first arc inducement contact is formed in a rod shape, and the arc length limiting contact includes an axis-directional extended portion provided with a through-hole, into which the first arc inducement contact is inserted.

4. The gas circuit breaker of claim 3, wherein the axis-directional extended portion is provided with a gas movement hole for allowing the extinguishing gas to move.

5. The gas circuit breaker of claim 3, wherein the axis-directional extended portion is disposed within the gas injection nozzle,
the arc length limiting contact further includes a plurality of radius-directional extended portions extended from the axis-directional extended portion in a

radius direction and connected to the gas injection nozzle, and
the plurality of radius-directional extended portions is spaced apart from each other so that the extinguishing gas is movable therebetween.

6. The gas circuit breaker of claim 3, wherein the arc length limiting contact includes an arc tip, which is formed at the end of the arc length limiting contact at the second arc inducement contact side and has relatively large arc resistivity.

7. The gas circuit breaker of claim 5, wherein the arc tip is formed of an alloy containing copper and tungsten.

8. The gas circuit breaker of claim 1, wherein the first contact portion includes an electrical conductive guide tube electrically connected to the first arc inducement contact.

9. The gas circuit breaker of claim 8, wherein the art length limiting contact is electrically connected to the guide pipe, and is configured to be in contact with the first arc inducement contact in a state where the first arc inducement contact is in contact with the second arc inducement contact.

10. The gas circuit breaker of claim 9, further comprising:

an electric field release shield electrically connected to the arc length limiting contact and configured to perform an electric filed release operation.

11. The gas circuit breaker of claim 10, wherein the electric field release shield is interposed between the gas injection nozzle and the guide tube in a state of being connected to the arc length limiting contact.

12. The gas circuit breaker of claim 10, wherein the electric field release shield includes an axis-directional extended portion extended in an axis direction, and a curved extended portion extended from an end of the axis-directional extended portion to an external side in a radius direction in a shape of a curved surface.

13. The gas circuit breaker of claim 10, further comprising:

a contact member interposed between the electric field release shield and the tube member, and electrically connected to the electric field release shield and the tube member while being in contact with the electric field release shield and the tube member.

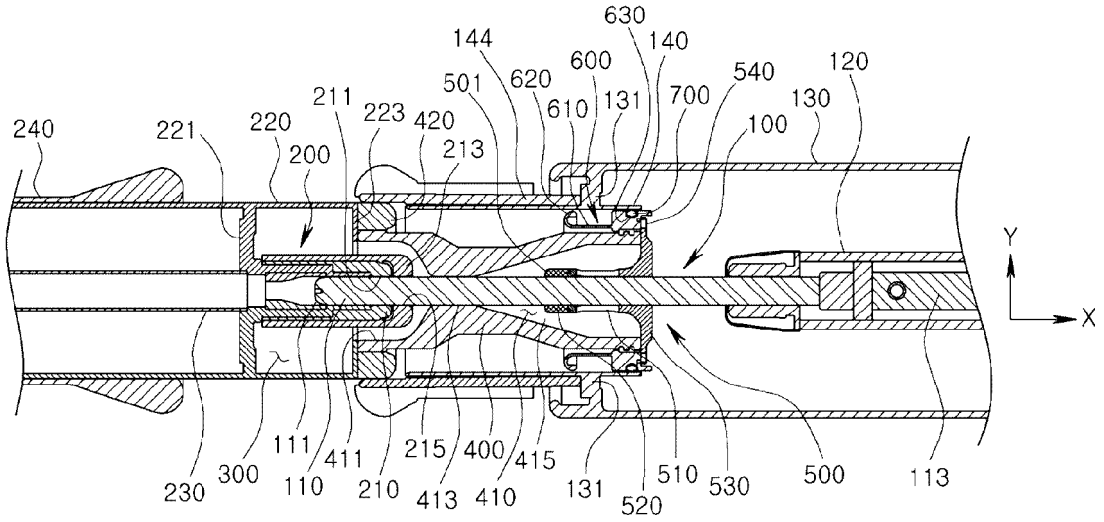
14. An arc length limiting contact configured to limit a length of arc between a first contact portion including a first arc inducement contact and a second contact portion including a second arc inducement contact, which is formed so as to be relatively movable with respect to the first arc inducement contact so as to be in a state of being in contact with the first arc inducement contact or a state of being separated from the first arc inducement contact,
wherein the arc length limiting contact is disposed so as to be spaced apart from the second arc inducement contact, and is configured so as to be moved together with the second arc inducement contact when the second arc inducement contact moves, and is configured so that an end of the second arc inducement contact is located at a point beyond an end of the arc length limiting contact at the first arc inducement contact side when the first arc inducement contact is farthest from the second arc inducement contact.

15. The arc length limiting contact of claim 14, wherein the arc length limiting contact includes an axis-directional extended portion provided with a through-hole, into which the first arc inducement contact is inserted, and a plurality of radius-directional extended portions extended from the axis-directional extended portion in a radius direction.

16. The arc length limiting contact of claim 15, wherein the plurality of radius-directional extended portions is provided in plural, and is spaced apart from each other.

17. The arc length limiting contact of claim 15, wherein the axis-directional extended portion includes an arc tip having relatively large arc resistivity.

18. The arc length limiting contact of claim 17, wherein the arc tip is formed of an alloy containing copper and tungsten.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213
100
Y
X
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111
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110
210
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400
415
413
410
131
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510
530
500
113

FIG.1

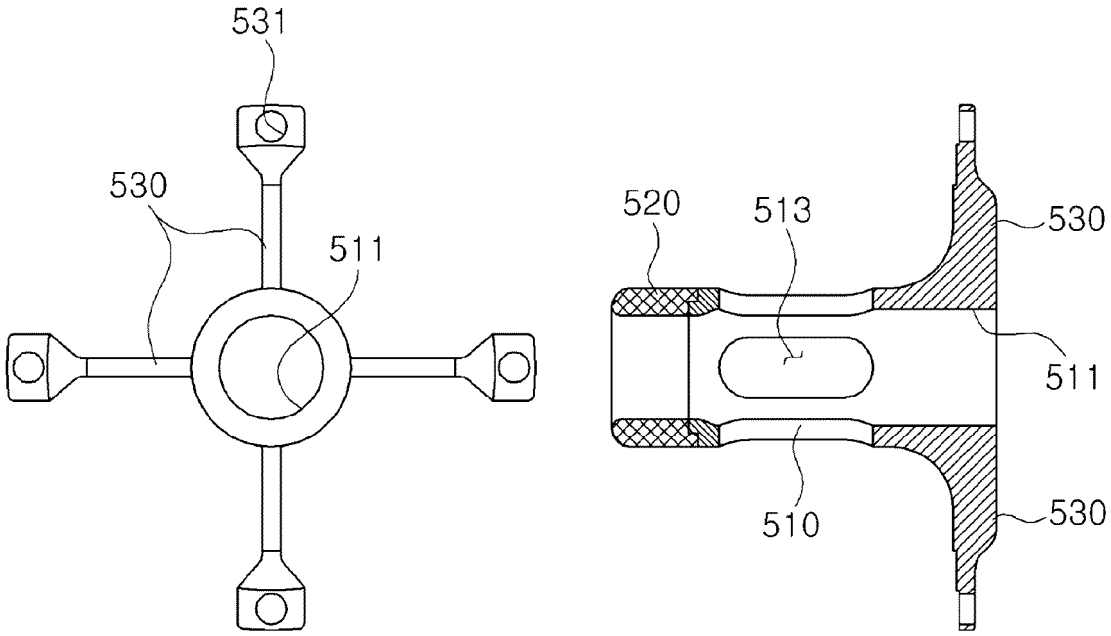
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FIG.2

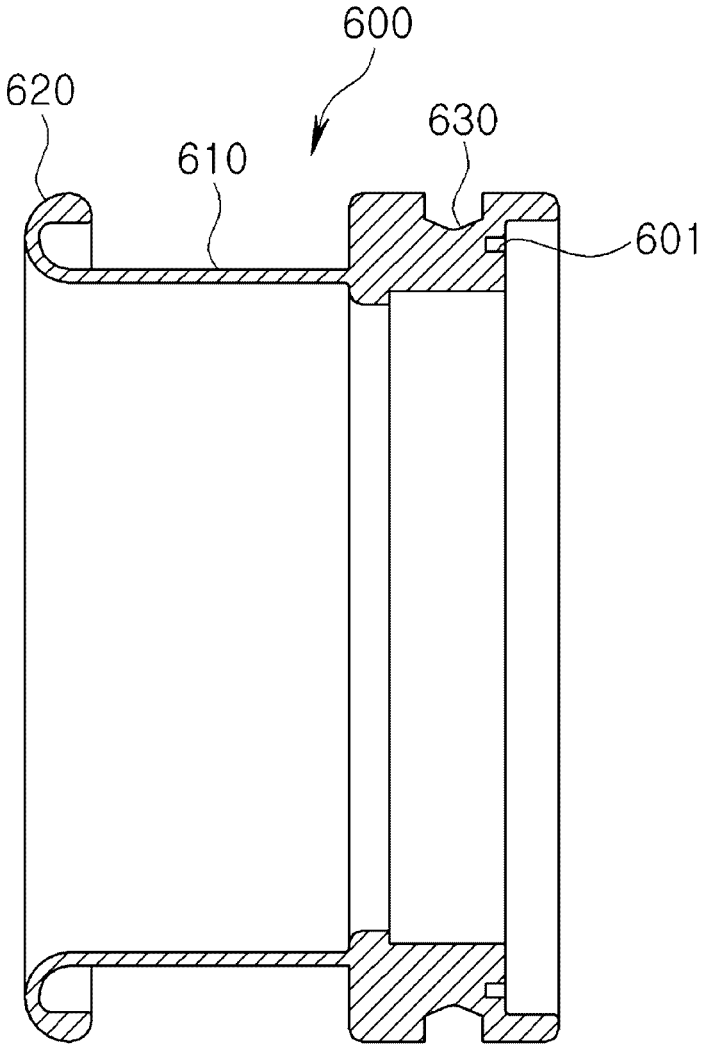
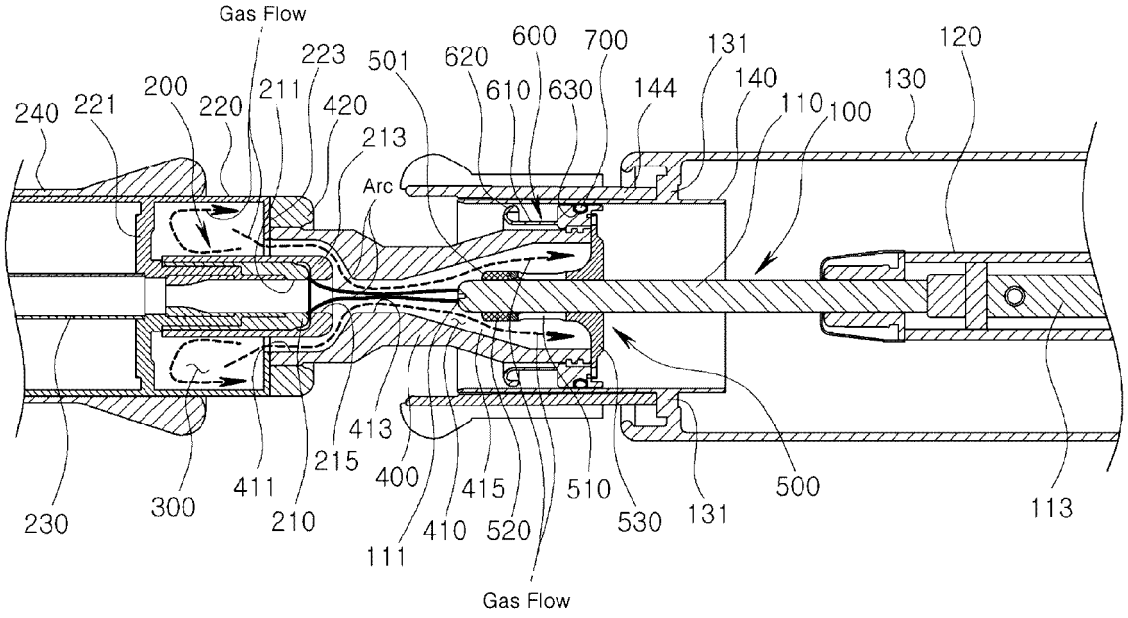


FIG.3


Gas Flow
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221
200
220
211
223
420
213
501
620
600
700
610
630
144
131
140
110
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130
120
Arc
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413
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415
520
510
530
131
500
113
Gas Flow

FIG.4

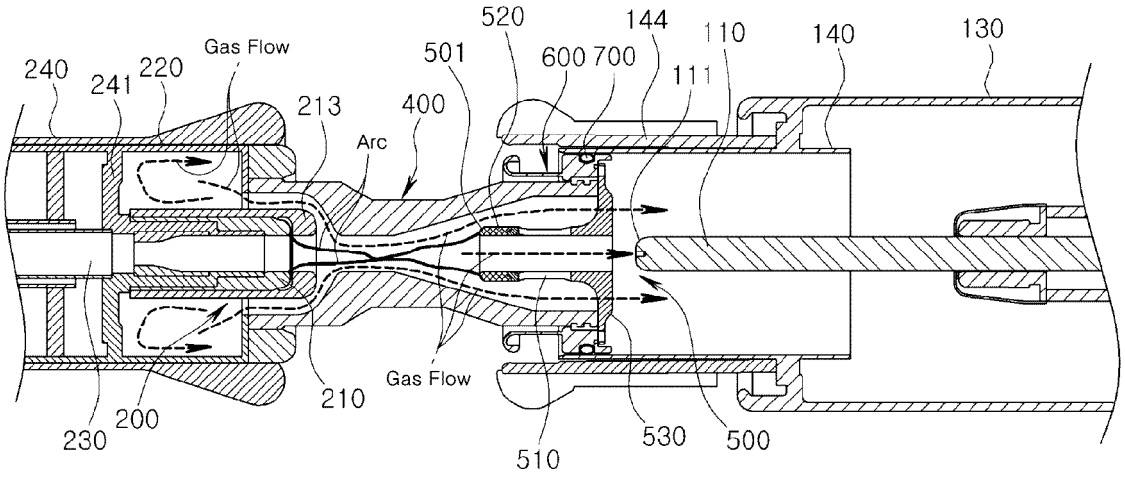
240
241
220
Gas Flow
213
400
Arc
501
520
600
700
144
110
111
140
130
230
200
210
Gas Flow
510
530
500

FIG.5

INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2014/003405

A. CLASSIFICATION OF SUBJECT MATTER

H01H 33/08(2006.01)i, H01H 33/76(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 33/08; H01H 33/56; H01H 33/72; H01H 33/53; H01H 33/04; H01H 33/76

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean Utility models and applications for Utility models: IPC as above
Japanese Utility models and applications for Utility models: IPC as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKOMPASS (KIPO internal) & Keywords: gas circuit breaker, gas injection nozzle, arc length, restricted contact

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	KR 10-2012-0088569 A (THOMAS & BETTS INTERNATIONAL, INC) 08 August 2012 See abstract, paragraphs [0015] to [0031] and figures 1a to 2b.	1,3,4,6,14
A		2,5,7-13,15-18
Y	KR 10-2012-0097856 A (LSIS CO., LTD.) 05 September 2012 See paragraphs [0040] to [0051] and figures 2 to 5.	1,3,4,6,14
A		2,5,7-13,15-18
A	KR 10-2009-0072581 A (HYUNDAI HEAVY INDUSTRIES CO., LTD.) 02 July 2009 See paragraphs [0017] to [0028] and figure 4.	1-18
A	US 05850065 A (YAGINUMA, Noriyuki et al.) 15 December 1998 See column 9 line 55 to line 65 and figure 6.	1-18

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

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

Date of the actual completion of the international search	Date of mailing of the international search report
18 JUNE 2014 (18.06.2014)	**18 JUNE 2014 (18.06.2014)**
Name and mailing address of the ISA/KR Korean Intellectual Property Office Government Complex-Daejeon, 189 Seonsa-ro, Daejeon 302-701, Republic of Korea Facsimile No. 82-42-472-7140	Authorized officer Telephone No.

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

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/KR2014/003405

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		CN1160922 CO	01/10/1997
		JP 09-231885 A	05/09/1997
		KR 10-0454455 B1	15/01/2005

Form PCT/ISA/210 (patent family annex) (July 2009)