

[54] **COMPRESSED-GAS CIRCUIT BREAKER**

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[58] Field of Search ..... 200/148 B, 148 G, 148 R, 200/146 R

[56] **References Cited**

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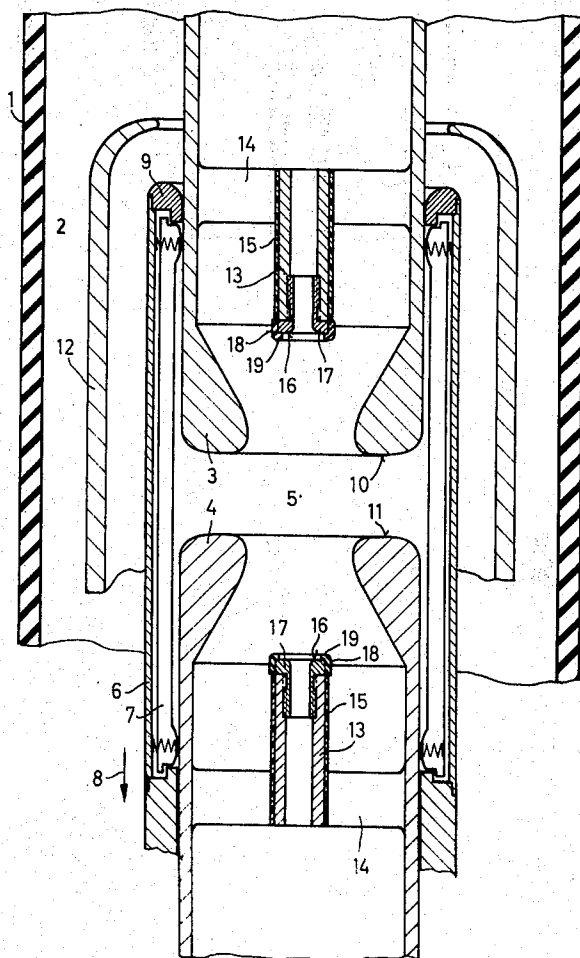
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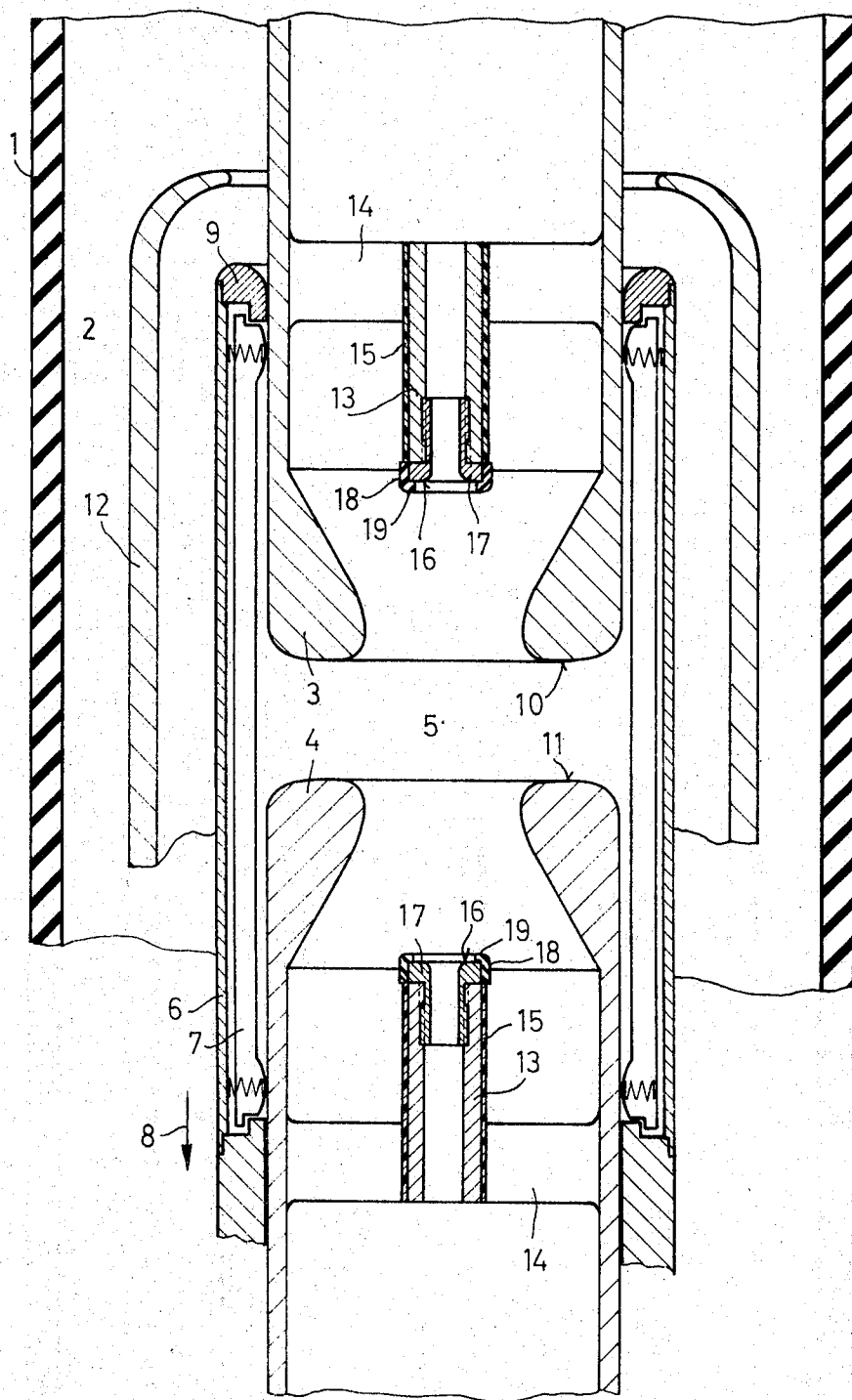
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**ABSTRACT**

This invention relates to a compressed-gas circuit breaker having two hollow, nozzle-shaped contacts arranged on a common axis and between which an arc is formed upon the disconnection of the breaker. The compressed-gas circuit breaker has an essentially cylindrical arcing electrode centrally disposed in at least one of the hollow contacts and set back within the nozzle opening which surrounds the gap. When the breaker is disconnected the arc is confined between the two contacts within the gap by the flow of the quenching medium and possibly other additional forces. If a strong blast of quenching medium is employed on the arc, according to the invention, to prevent the arc from drifting off the inner arcing electrode during such strong blasts because of increased quenching medium flow and additional forces, the arcing electrode is provided with insulating material on its cylindrical surface and a contact surface is formed on its end face for the arc.

**4 Claims, 1 Drawing Figure**





**COMPRESSED-GAS CIRCUIT BREAKER****BACKGROUND OF THE INVENTION****1. Field of the Invention**

In published German Pat. application No. 1,190,077 5  
a compressed-gas circuit breaker is disclosed in which the arc formed during the opening of a circuit breaker jumps between two oppositely disposed nozzles and near the end of the opening of the breaker it is directed to two arcing or burnoff electrodes disposed inside the nozzles. The compressed gas flows through the nozzles in opposite directions, and the quenching gas flows over the burnoff electrodes disposed inside. During the opening of the breaker the forces generated by the quenching gas stream act upon the arc driving it away from the nozzles toward the central axis. If the blast on the arc is large, the arc formed at the burnoff electrodes can be forced further into the interior of the nozzles, so that it confines itself to the cylindrical surface of the elongated burnoff electrode. This may also be accomplished through the action of additional forces such as magnetic forces. The arc is thus subjected to a curvature, in the form of a loop, and in the worst situation it will touch the surrounding nozzle contact and again form its base there.

**SUMMARY OF THE INVENTION**

This invention is concerned with a compressed-gas circuit breaker having two hollow, nozzle-shaped contacts arranged on a common axis, between which an arc is formed during the opening of the breaker. An essentially cylindrical arcing electrode, is centrally arranged within at least one of the hollow contacts and set back from the nozzle opening surrounding the gap. During the opening of the breaker the arc is driven on to the arcing electrodes by the action of the flow of the quenching medium and, possibly, by additional forces. In order to be able to effectively increase the forces acting on the arc, particularly by increasing the flow of the quenching medium, according to the invention, provision is made to equip the arcing electrode with insulating material on the cylinder surface to form a contact surface on the end face for the base of the arc. By utilizing the invention, the arc is thereby prevented from drifting off at the inner arcing electrode, so that the arc cannot be driven back to the nozzle contact even if the arc is blasted strongly.

In one embodiment of the invention, the contact surface is formed from a graphite member connected with the arcing electrode at the end face, and is preferably surrounded by a ring of insulating material. This ring of insulating material may be formed with an inwardly turned edge extending partially over the contact surface at the end face of the arcing electrode. To direct the flow of the quenching medium, it may be advantageous to make the arcing electrode and the graphite member hollow.

**BRIEF DESCRIPTION OF THE DRAWING**

An example of an embodiment constructed according to the invention and illustrating the manner of its operation is shown in the accompanying drawing which is schematically illustrated in a longitudinal cross-section of the contact system of a compressed-gas circuit breaker. All parts of the compressed-gas circuit breaker which are not necessary for an understanding of the invention, such as, for example, the drive and the

means for generating the flow of the quenching medium, are not shown for the sake of greater clarity.

**DESCRIPTION OF THE PREFERRED EMBODIMENT**

The compressed-gas circuit breaker shown in the FIGURE comprises a switching chamber 2, surrounded by a tube 1 in which there is located the quenching and insulating gas, for example, sulfur hexafluoride ( $\text{SF}_6$ ). In the interior of the switching chamber 2, two contacts 3 and 4, are mounted on a common axis, and mutually displaced from each other to form a gap 5. In the closed position of the compressed-gas circuit breaker the gap 5 is bridged by a bridging contact 6 having contact elements 7 electrically connecting the stationary contacts 3 and 4 with each other. In the course of disconnecting the breaker, the bridging contact is moved in the direction of the arrow 8, and an arc is formed after the separation of the arcing electrode 9 of bridging contact 6 from the nozzle-shaped contact 10 of the stationary contact 3. During the continued course of disconnecting the breaker, the arc is commutated to the arcing ring 11 of stationary contact 4. The flow of quenching gas, which in the embodiment shown, is generated by blast piston arrangement 12, drives the arc toward the center of the two stationary contacts 3 and 4 during the disconnect process, so that the arc is lengthened and forms a loop. The dynamic forces resulting from this action, prior to the extinction of the arc, drive it on to the two arcing electrodes 13 disposed within the interior of the stationary contacts 3 and 4. These arcing electrodes 13 consist of electrically conductive material and are rigidly connected by electrically conductive supports 14 with the corresponding contacts 3 and 4.

In the embodiment shown, the arcing electrode 13 is tubular shaped and has on its cylindrical surface a layer of insulating material 15, (for example, polytetrafluoroethylene (PTFE, Teflon) or a cycloaliphatic casting resin,) so that only a contact surface 16 is formed on its end face for the base of the arc. The contact surface 16 is formed from a graphite member 17 connected with the arcing electrode 13 at the end face and surrounded by a ring 18 of insulating material, for example, of polytetrafluoroethylene (PTFE, Teflon) or a cycloaliphatic casting resin. The ring of insulating material 18 has a beveled edge 19 which at the end face extends slightly over the contact surface 16. The graphite member 17 is made hollow, as is the arcing electrode 13.

By constructing the compressed-gas circuit breaker in accordance with the FIGURE, it operates as follows:

The arc burning between the arcing electrodes 13 of both contacts 3 and 4 cannot reach the cylinder surface, covered by the layer of insulating material 15, even if it is strongly blasted by a stream of quenching gas and the action of additional forces, for example, magnetic forces. The possibility that the arc may be subjected to a curved deflection so that it touches portions of the outer nozzle contact 10 and again remains there, is thus largely eliminated. During the disconnecting of the breaker, the arc is therefore formed in a desired, stable position until it is extinguished at the zero crossing point of the alternating current.

In the foregoing, the invention has been described in reference to specific exemplary embodiments. It will be

evident, however, that variations and modifications, as well as the substitution of equivalent constructions and arrangements for those shown for illustration, may be made without departing from the broader scope and spirit of the invention as set forth in the appended claims. The specification and drawing are accordingly to be regarded in an illustrative rather than in a restrictive sense.

What is claimed is:

1. In a compressed-gas circuit breaker wherein a flow of quenching medium is directed toward the arc developed when the breaker is switched to the off position, a switching contact arrangement comprising: two hollow, nozzle-shaped contacts disposed on a common axis, said contacts being spaced from each other to conjointly define a gap therebetween across which the arc is drawn; and a substantially cylindrical arcing electrode centrally mounted in at least one of the hollow contact and set back from the nozzle opening of the hollow contacts, the arcing electrode defining an end-

face contact surface for receiving the foot point of the arc driven thereon by the action of the quenching medium during the switch-off operation, said arcing electrode being covered with insulating material on the outer surface thereof up to said end-face contact surface thereby confining the action of the arc on said arcing electrode to said contact surface.

2. A compressed-gas circuit breaker as in claim 1 in which the contact surface is formed from graphite mounted at the end face of the electrode.

3. A compressed-gas circuit breaker as in claim 2 in which the graphite member is surrounded by a ring of insulating material having an upper lip extending partially over the contact surface of the graphite member.

4. A compressed-gas circuit breaker as in claim 3 in which both the arcing electrode and the graphite member are hollow.

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